

POPULAR MECHANICS

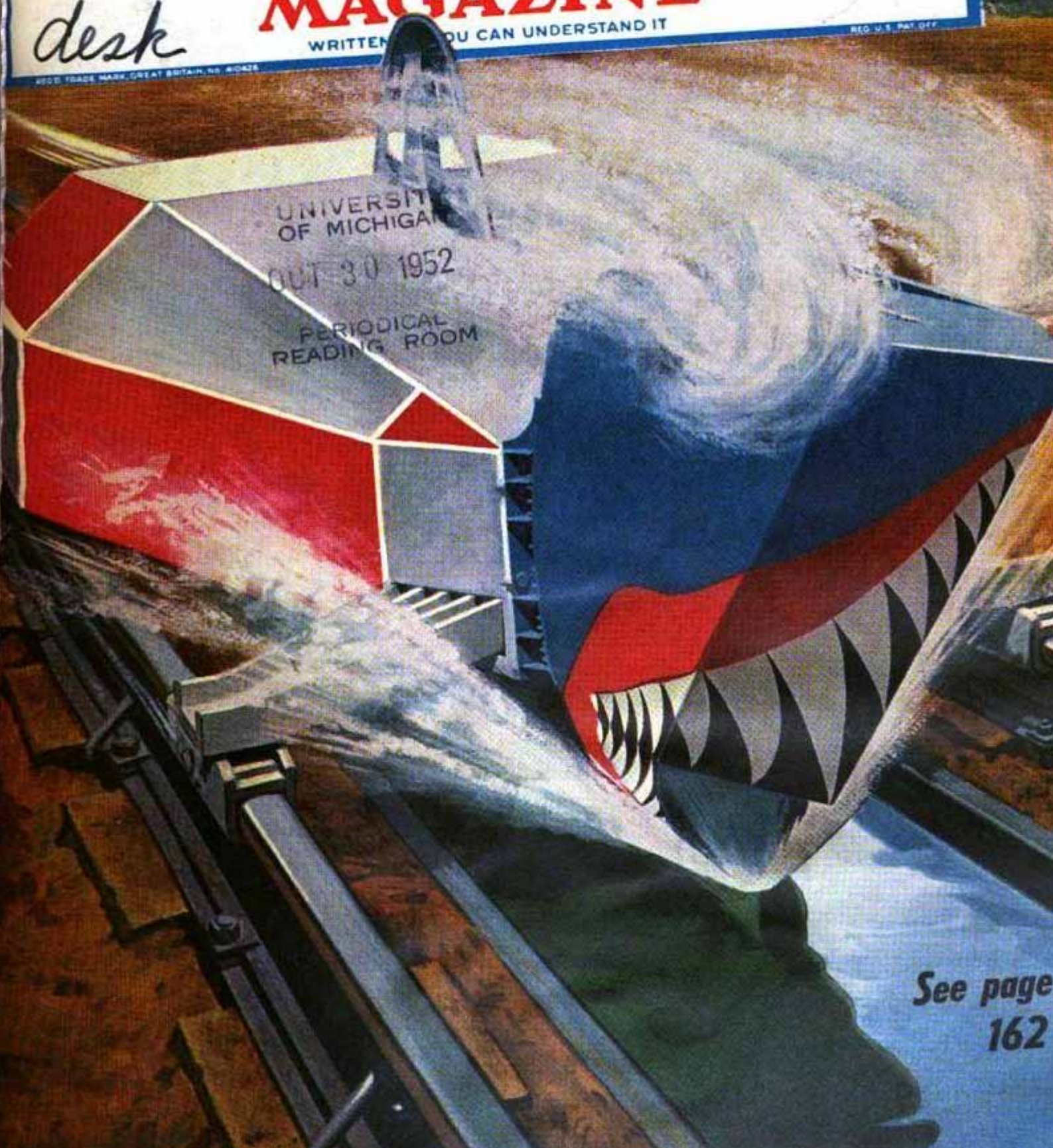
MAGAZINE

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See page
162



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Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

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this month's cover

WHOOOOOSH! The world's fastest train screams down its 10,000-foot track, dips its gaudy mouth into a water trough and slams to a stop. The train is incredibly fast—so fast it's traveling 1000 miles per hour approximately two seconds after it starts its run! Installed at the Air Force Flight Test Center, Edwards Air Force Base, Calif., it is used to test parachutes, aircraft wings or other aerodynamic shapes at high speed. There are no passengers aboard the strange train—its powerful rockets send it roaring down the track at the push of a button. It glides along on rail-gripping slippers, and instead of braking itself, it gobbles up water by the ton, which comes spewing out its "ears" to slow it to a safe stop. Information obtained from the high-speed tests supplements wind-tunnel and actual flight data. Turn to page 162 to learn how "double headers" are used on the strange railroad

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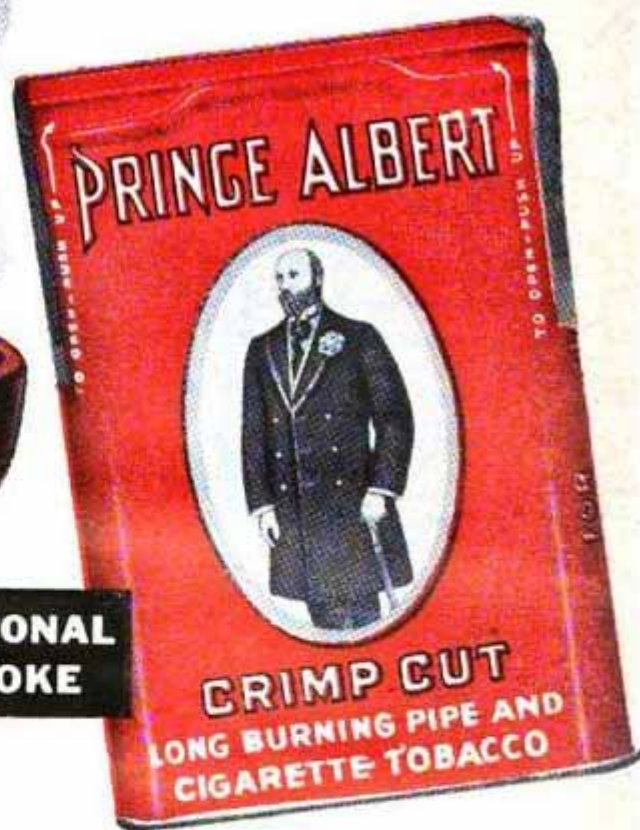
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THE EDITORS



Letter to the Editor

A 51-year-old Air Force sergeant at Mountain Air Force Base, Idaho, has ridden a bicycle over 10,500 miles in the last two years.

A record? Probably not. He doesn't ride for records. It's his mode of travel.

Sgt. Casper L. DeOlivares of the 581st Air Resupply and Communication Wing, U. S. Air Force, once cycled from Great Falls, Mont., to Mountain Home—634 miles in 7½ days.



The Pasadena, Calif., airman went through three steep mountain passes on his trek. The grade was slightly uphill all the way, but he kept pedaling. His bike has a three-speed gear, weighs 55 pounds.

On his latest excursion he carried 15 pounds of luggage making his pedaling burden 70 pounds, plus his own weight of 145. He had no flats or mechanical trouble along the way.

Sergeant DeOlivares, who looks the part of an old-line army regular, bikes for exercise and recreation. It's only a passing thought for him to pedal to Boise, over 50 miles away, or to Mountain Home, 13 miles from the base. In fact, when the weather is warm he pedals to Mountain Home everyday and Boise on week ends.

"Bike riding has a particular fascination for me," Sergeant DeOlivares said quietly. "I've been riding one since I was 12. Cars wreck me in more ways than one, especially

(Continued to page 8)



To the man who wants to enjoy
an ACCOUNTANT'S CAREER



IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of \$4,000 to \$10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex—soon you'd master them all.

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You cover accountancy from the basic Principles right up through Accountancy Systems and Income Tax Procedure. Then you add C. P. A. Training and prepare for the C. P. A. examinations.

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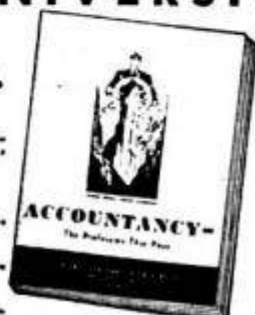
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TRAIN IN MIAMI - AIR CAPITAL OF THE WORLD

(Continued from page 6)

financially. But my bicycle gives me plenty of exercise and I get a better view of the countryside."

His top speed on the level is 40 miles per hour.

The sergeant, born in Pasadena, Calif., in 1901, has been in the Air Force since 1942.

Dick LaCoste

Don't miss our six-page section in the December issue devoted to Christmas gifts—new ideas for the man of the house, the youngsters, the home.

Author at Work

When Mrs. E. R. Haan insisted that the family take their usual summer vacation on the shores of Lake Michigan, the author of numerous PM craft articles declared he



was too busy. Then he weakened and brought his work along with him. He is shown here at work on the beach protected from deer flies and mosquitoes. When the sun was too bright he propped a folding chair over his typewriter to shade the paper. His article, "Jointer Know-How," which arrived in this office with sand between the typewritten pages, is on page 210.

Letter to the Editor:

This is my first letter to your magazine since I started reading it over 20 years ago . . . it is like getting a birthday present each month, there is always something exciting about it.

In February 1947 while hauling logs I was unlucky enough to receive a fractured spine when crushed by a log which rolled off my truck at the mill. But it's an ill wind—as after the first three or four weeks I had plenty of time, in fact nine or ten

(Continued to page 10)



Picture yourself going places



You've done it often. Call it day-dreaming if you like, but you've seen yourself in a bigger job — giving orders and making decisions — driving off in a smart new car — buying your family a fine home.

There's nothing wrong with dreams. But how about making them come true? *You can do it*, if you're willing to try!

Look around you. The men who are going places are the *trained* men. They've learned

special skills that bring them better jobs and higher pay. It's the men *without* training whose dreams never come true.

What are you going to do about it? Just wait and wish? If you really *want to succeed*, you can get the training you need by studying at home in your spare time. International Correspondence Schools offer you a course in just about any field you choose, giving you the practical plus the bedrock facts and theory. No skimming or skimping! And you'll be earning while you learn. Students report better jobs and more pay within a few months.

Look over the list of subjects in the coupon below. Pick out the one that interests you most — the one that holds the greatest future for you. Then mark the coupon, and mail it today. *Find out* what I. C. S. can do for you. It costs only a stamp or postcard, but it's the first step if you want to go places!



DON'T let these poor excuses make you **FAIL**

1. I never got started.
2. I want a good time.
3. I don't want any responsibility.
4. I can't stick to it.
5. I haven't enough education.
6. I don't know where to get training.



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L. P. S., Elkhart, Ind.

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(Continued from page 8)
months, in which to read. I guess I read each of my *PM* magazines a dozen times and found them just as interesting the last time as when I first read them.

In December 1950 my home was destroyed by fire and with it everything we possessed, which included my library of *PM* magazines, and since have found it impossible to replace them . . . Some of your readers may know where I could get second-hand ones . . . from 1946 to December 1950.

W. Kilpatrick,
188 Nepean Highway,
Seaford, Victoria,
Australia

Editor's Note:

If any readers can supply these back issues to Mr. Kilpatrick it is suggested that they write him direct to avoid duplication.
The Editors

Letter to the Editor:

Considered to be the oldest active truck in the United States, and perhaps in the world, is this 1915 model owned by a Chicago man.

At that time, \$1900 was a lot of money to put into a vehicle of any kind, and to Ralph



De Young, then just 20, it was an enormous investment. He owns a wholesale cookie business, and with his faithful truck still makes the daily rounds delivering to stores.

Not an accident in more than 150,000 miles, said De Young, and but one traffic ticket in 37 years, and that was for a parking violation. The truck still has most of its original parts. He had expected it to wear out in a year or two. Small repairs he has done himself have been the only replacements. The last major item was an overhaul of the magneto five years ago. The transmission, differential, steering and brake parts are the original ones.

Marian Larson,
Chicago, Ill.

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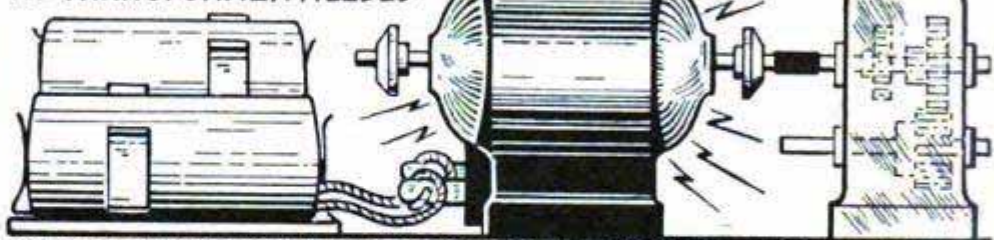
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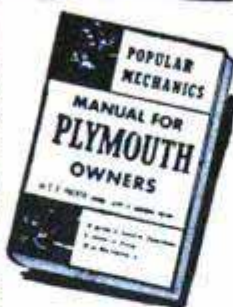
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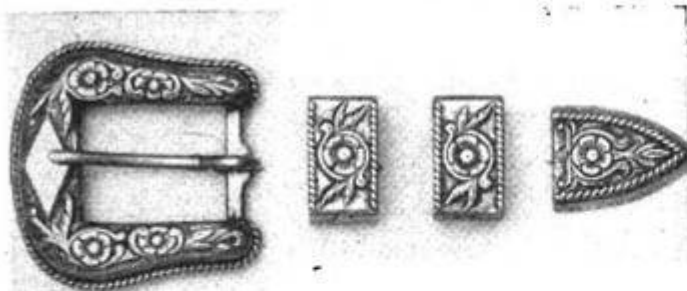


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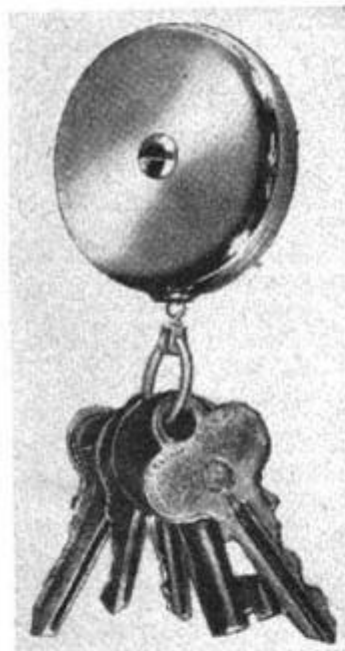


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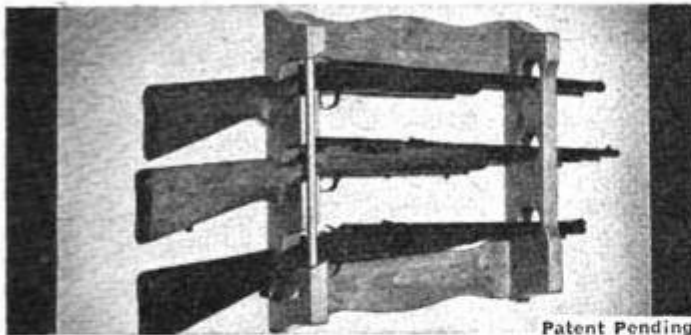


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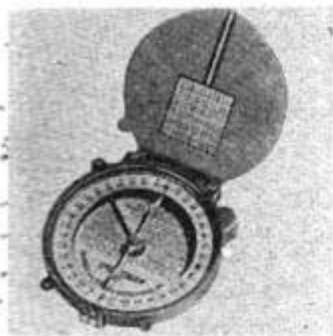
Patent Pending

Safe-Lock Gun Rack—This fool proof rack beautifully displays 3 guns in "show position" under lock and key. Guns cannot fall or be taken out. Family is protected—guns are secure. The only one like it. In mellow honey-tone knotty pine or mahogany finish. 24"x21" high. Only \$12.95 plus \$1.05 shipping chg. No. C.O.D.'s. Yield House Dept. M11-2, N. Conway, N. H.



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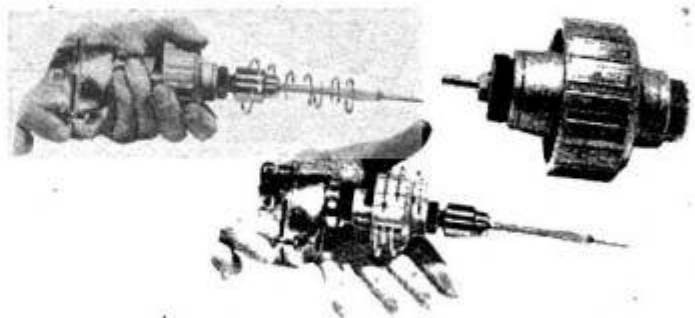
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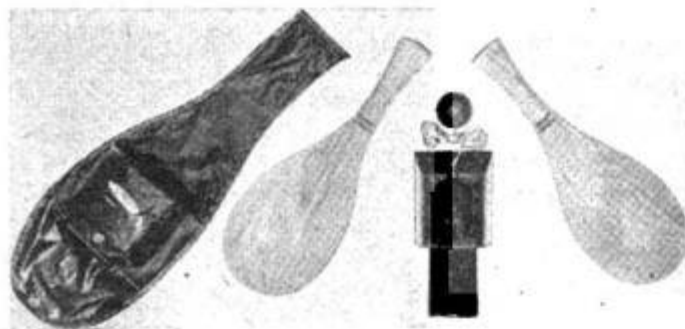
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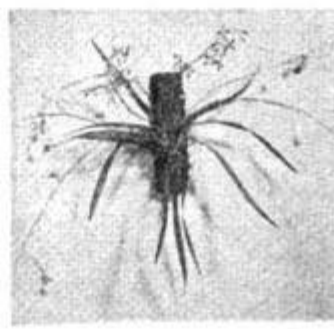
See your movies anytime, anywhere. Nothing else needed, just film and Melton. Holds 50-ft. 8 mm. film, your own or choose from our list. Viewer, \$4.95, ppd., guar. Film, \$1 ea.: Beauties of Bali Grand Canyon Abbott & Costello Robinson-Turpin Fight. Melton, Dept. PM4, Bx. 390, Reno, Nev.



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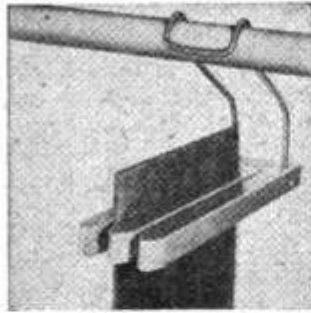
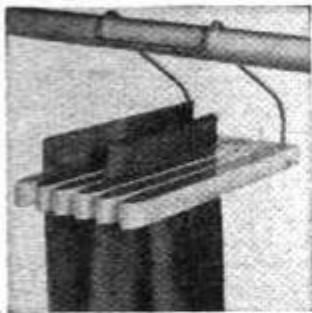
Crown of 10 or more bulbs is mounted on highly decorative oak slab, ready to hang or set anywhere. Fun to grow, and a delight to give or to own. Simple growing instructions are provided. Only \$2.00 ppd. Max Schling Seedsmen, 614P Madison Ave., New York 22, N. Y.



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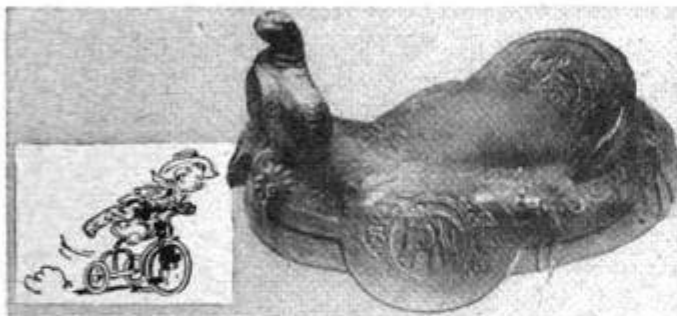


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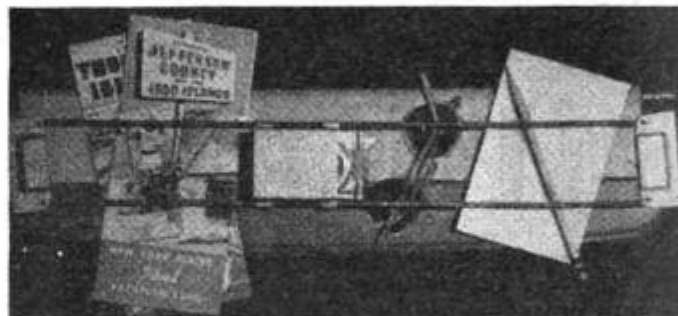
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Western Saddle for Bicycle or Tricycle—He'll gallop hard after those outlaws with this authentic Western saddle in soft molded rubber. Real saddle color with rich tooled design, it slips over bicycle or tricycle seat. A cowboy's (or cowgirl's) dream for Christmas. 13" long. \$3.50 ppd. Check or m.o.; no c.o.d.'s. Dreer's, 369 Dreer Bldg., 105 N. 5th Street, Philadelphia 6, Pa.



Safety Hold-All Clips on Car Visor—Tough steel springs on Vis-O-Rak grip safely everything you try to hold with your car visor. Drive without risk of falling objects, enjoy convenient pick-up of smokes, maps, etc. Adjustable, clips on either side of any car visor. Durable aluminum; rustproof. \$1.25 postpaid. Bell Industries, 21 East 22nd Street, Dept. M11, New York, New York.

New oil economy.. lasting power



SOLID CHROME PROTECTS THESE WEARING SURFACES

Two interchangeable expander springs with each oil ring—NORMAL PRESSURE spring for rebored and slightly worn cylinders, HIPRESSURE spring for badly worn engines and known oil pumpers.

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Perfect Circle's 2 in 1 chrome piston ring set

Your car and your money . . . both will go farther with a set of 2-in-1 Chrome Piston Rings. For the 2-in-1 Chrome Set more than doubles the life of cylinders, pistons and rings!

Positive oil control is assured because *only* the 2-in-1 Set provides two interchangeable expander springs with each oil ring. For the first time, mechanics can select the spring pressure that's *right* for your engine. And with 2-in-1 you'll enjoy smooth, instantly responsive power, right from the start with no tedious break-in period.

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Perfect Circle

PISTON RINGS

The Standard of Comparison



The big show is just ready to go out on a nation-wide network when something goes "ph-t-t-t" and studio monitors go blank. Here's where they yell for Lew Winkler. He's

POPULAR NOVEMBER 1952 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 98 NO. 5

HOLLYWOOD'S... TV Bug Eradicator

By Jan Dawson Jensen

Photographs by Robert R. Jensen

HOW'S IT GOING, LEW?" someone asks the lanky, sandy haired engineer, as he strides into the foyer of Hollywood's El Capitan theater.

"Great," Lew Winkler answers, grinning. "I've had an uneasy feeling all day, and that's a good sign. When I don't worry about a show, that's just about when trouble usually crops up."

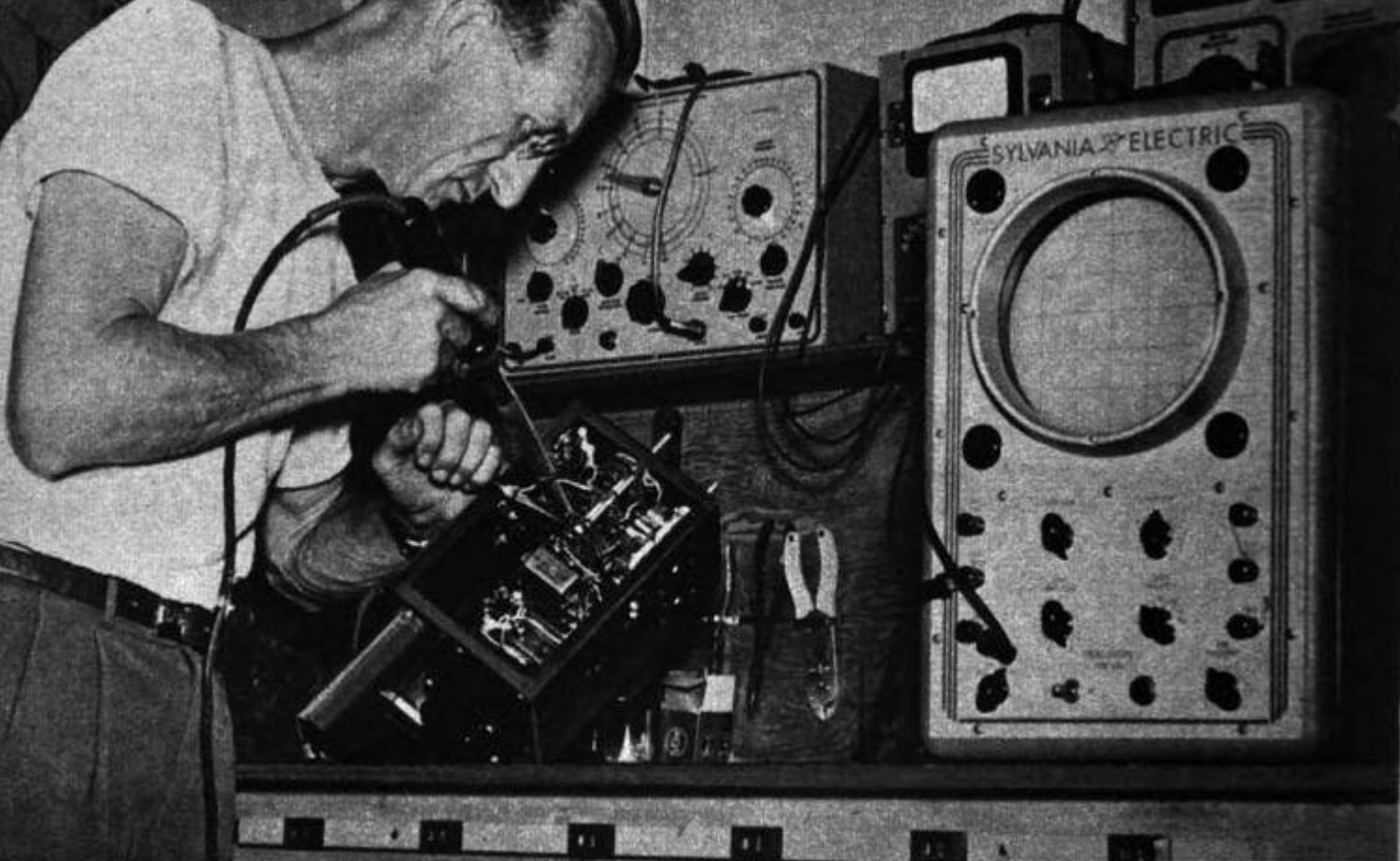
To be responsible for the engineering equipment on a \$60,000 television production is reason enough for any man to be a candidate for the ulcer brigade, and that is

exactly the burden resting upon Winkler's angular shoulders every time a TV show rolls out from the remodeled stage of the historic El Capitan. When "bugs" get into the works, everyone hollers for Lew, and equipment just cannot fail for long when thousands of dollars are involved. Not if Mr. Winkler wants to keep eating regularly, that is.

The day the first telecast was scheduled, Lew was nervous as a cat on moving day. Even though he and his assistant, John Larrimer, had carefully checked and re-checked every piece of apparatus, still it was the first show and anything could happen.

Comedians Dean Martin and Jerry Lewis add a light touch to engineer Lew Winkler's TV troubleshooting. He is examining an electronic view finder, a monitoring device





Winkler's curiosity knows no "office hours." In his home shop he completes an automatic station selector

At the synchronizing generator, Lew adjusts number of equalizing pulses while watching a video monitor



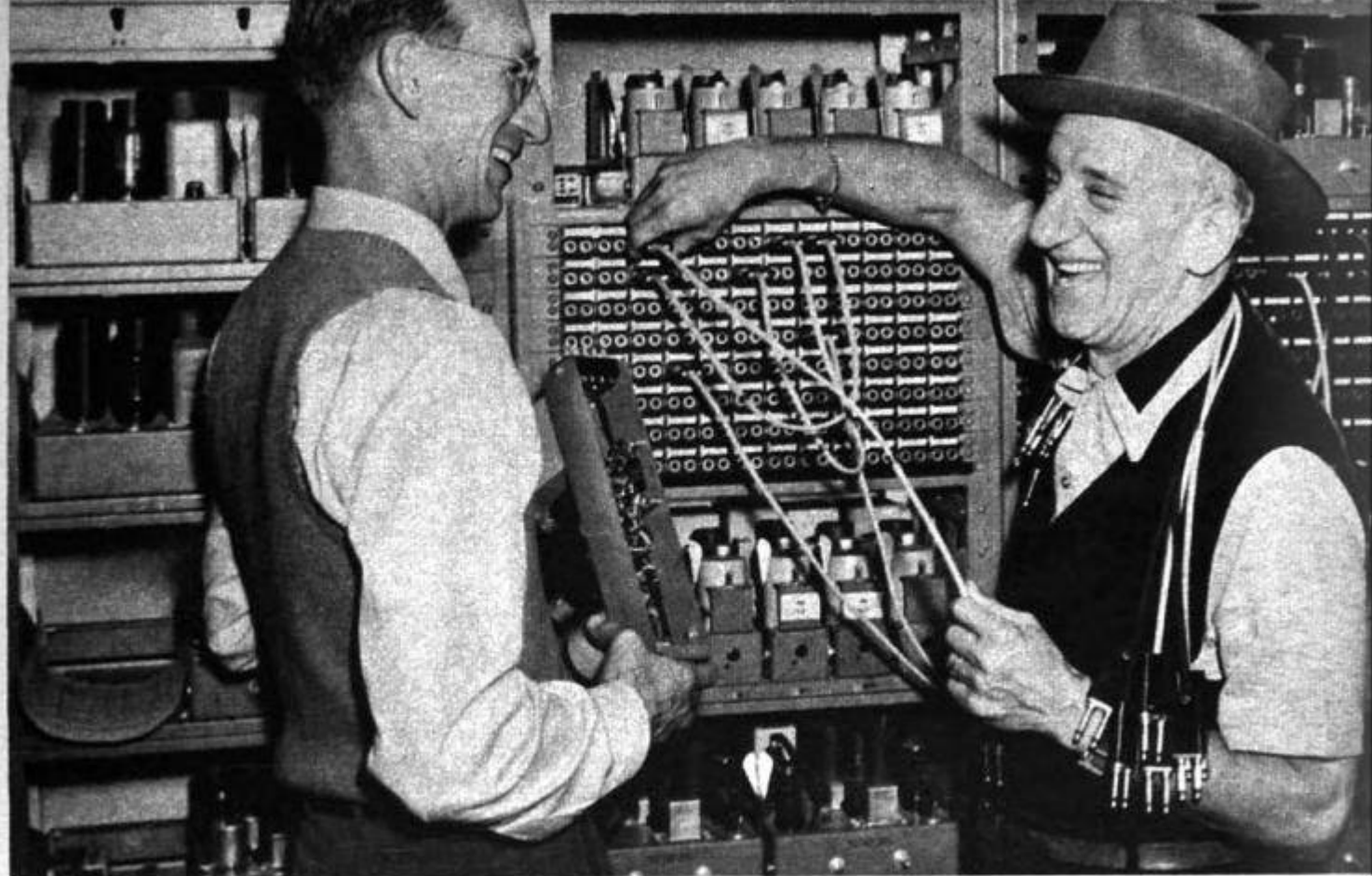
By the time they were actually on the air, and Eddie Cantor, the star, was singing his opening song, Lew had calmed down to a methodical pacing back and forth, an alert eye watching the camera monitors. Twenty minutes into the show, he smelled smoke! His mind went into a fast spin, traversing all possible trouble spots, but still, it took him longer than he liked to discover fire had broken out in the equipment racks. The stack exhausts were carrying away most of the odor, making it difficult to trace.

By the time he went to work with a fire extinguisher, actual flames were mingling with the smoke. Not only was the rectifier for the 24-volt supply operating the relays in the racks, but also, the emergency power supply was right above the one that was burning. Fire in either was serious, but if they should both blaze up, then "conditions beyond our control" would halt the show abruptly.

"We were lucky," said Lew, remembering, "for it hadn't reached the emergency rectifier. It took only seconds to douse it, and we didn't lose any air time."

Emergencies and trouble are the television-maintenance engineer's steady diet. Next time your picture starts making like a hula dancer, or a commercial happens to pop up in the middle of Martin and Lewis' craziest act, you know some maintenance man's hair is increasing its gray number as he grabs his tools and makes a hasty patch, sweating to hold the show together smoothly until it's off the air.

"And," says good-natured Lew Winkler,



Jimmy Durante "helps" Winkler patch around a noisy microphone preamplifier just taken from equipment rack

one of the best engineers in the business, "your heart is in your throat lots of the time. You're thinking 90 miles a second, and sometimes still can't quite figure your way out of the woods."

When a snarl occurs, or a piece of equipment develops bugs, the operating engineers keep strictly hands off until the maintenance man arrives. In that way, it's easier to discover just what went haywire and prevent its happening again. There's not much he can do while they're actually on

the air except put in a temporary patch around the difficulty and pray, but once the last plug is pulled he really goes to work.

"First," Lew states, "we try to reproduce the trouble, and if we cannot make it do a repeat performance, then we really get disgusted."

It may take him hours, or even days, to discover that a piece of solder lodged in a relay caused the dissolve unit to act up, but he doesn't give up until the problem's licked. (A dissolve unit fades one picture

During a telecast, the engineer and the directors scan all the picture monitors for the slightest picture flaw





Inspecting the 80,000-volt connections to the projection kinescope tube for possible high-voltage arcing

into another, or superimposes one upon another.) Sometimes at home, instead of relaxing after dinner with his family, he spreads out textbooks on the kitchen table to dig for the answer with some concentrated brain-cudgeling.

For instance, there may be a difficult angle in improving a picture. The fault may be in the timing of a triggered circuit where a fraction of a microsecond (millionth of a second) may mean the difference between correct and incorrect operation. So he studies the function of delay lines, or electronic triggers, which may hold back the pulse perhaps a portion of infinitesimal time to a camera chain.

His wife laughs about the time at a family gathering, when the conversation was at its peak, her husband quietly pulled an old envelope from his pocket and sat there drawing little corkscrew lines, deep in an electrical diagram.

"But they weren't saying anything interesting!" protests Lew.

An overwhelming desire to know exactly what makes things tick keeps him constantly studying the circuits. "Otherwise," says Lew, "if you don't know how they operate, you can't analyze trouble and are shooting blind."

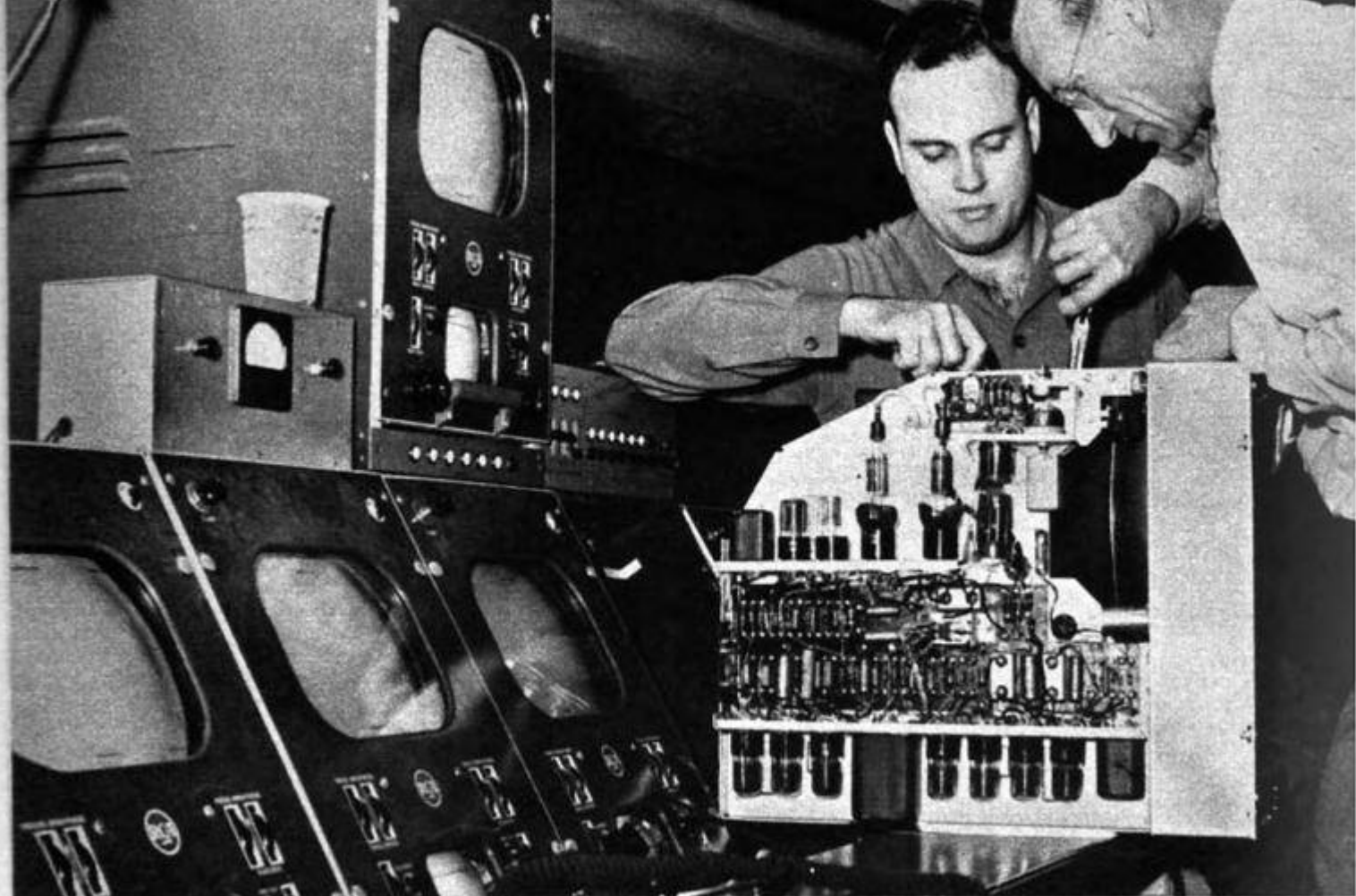
On days when there aren't any shows scheduled, he and his three-man crew constantly go over all the gear. In the not-too-distant future, when a telecast will be com-

ing out of the El Capitan each day, they'll have to start doing nighttime maintenance.

"Pessimists," the other fellows call them, but they breathe it gratefully, realizing that by incessantly looking for and expecting trouble, they avoid many mishaps. Readily at hand are emergency amplifiers and power supplies, even spare loops for transmission of video and sound between the El Capitan and the main master control, so if one fails, the other may be switched on immediately. The telephone company, also, has duplicate equipment in each direction across the country on the microwave. Yet in spite of all precautions, the bugs creep in.

The most common source of difficulty is the vacuum tube. Every circuit works around one of these delicate glass or metal bulbs. Even the picture monitors, placed around the stage to give cues to the actors, can develop tube trouble. When you stop to think there are 50 or 60 tubes in one camera chain, plus all the additional equipment to operate it, and also, probably 50 or 60 circuits involved, you can see why, of all the people in television, Lew Winkler deserves to have his ulcers work overtime. For not only must he figure quickly what circuit contains the bad tube, he must, just as swiftly, cut it down to one particular section.

"In most cases," he asserts casually, "a look at the picture tells what part it's in."



Winkler and his assistant, John Larrimer, repair a camera master monitor at the vital video-control console

No mean trick, when you realize there's video, deflection (or sweep), pulse amplifier, power supply, high voltage, relay system (or switching), and synchronizing-generator circuits to be considered. The last is the heart of the whole system, keeping all the cameras and receivers locked together. Its timing adjustment is so sensitive, a portion of a microsecond is essential to its effectiveness.

"The toughest bugs to track down," Lew declares, "are those small defects which crop up in a picture, like slightly displaced lines. These are usually caused by a cross between two circuits. For instance, part of the main supply may jump over and get in the sweep circuit. Or worse still, bugs get in the video circuits to make the lines darker or lighter."

Since there are four stage cameras used on a show, you can lose one and still have the telecast operate smoothly. But twice, Lew has had to transfer a viewfinder from one camera to another while they were on the air, for without this monitor, which gives an electronic picture, the cameraman is lost and can't tell what he's shooting.

When the boys are talking shop around the engineers' lounge, the funny side of a serious business comes to light. For instance, Lew and the dead-mike audition. An advertising agency was attempting to sell a show to an important sponsor, and a few minutes before it was due to be piped

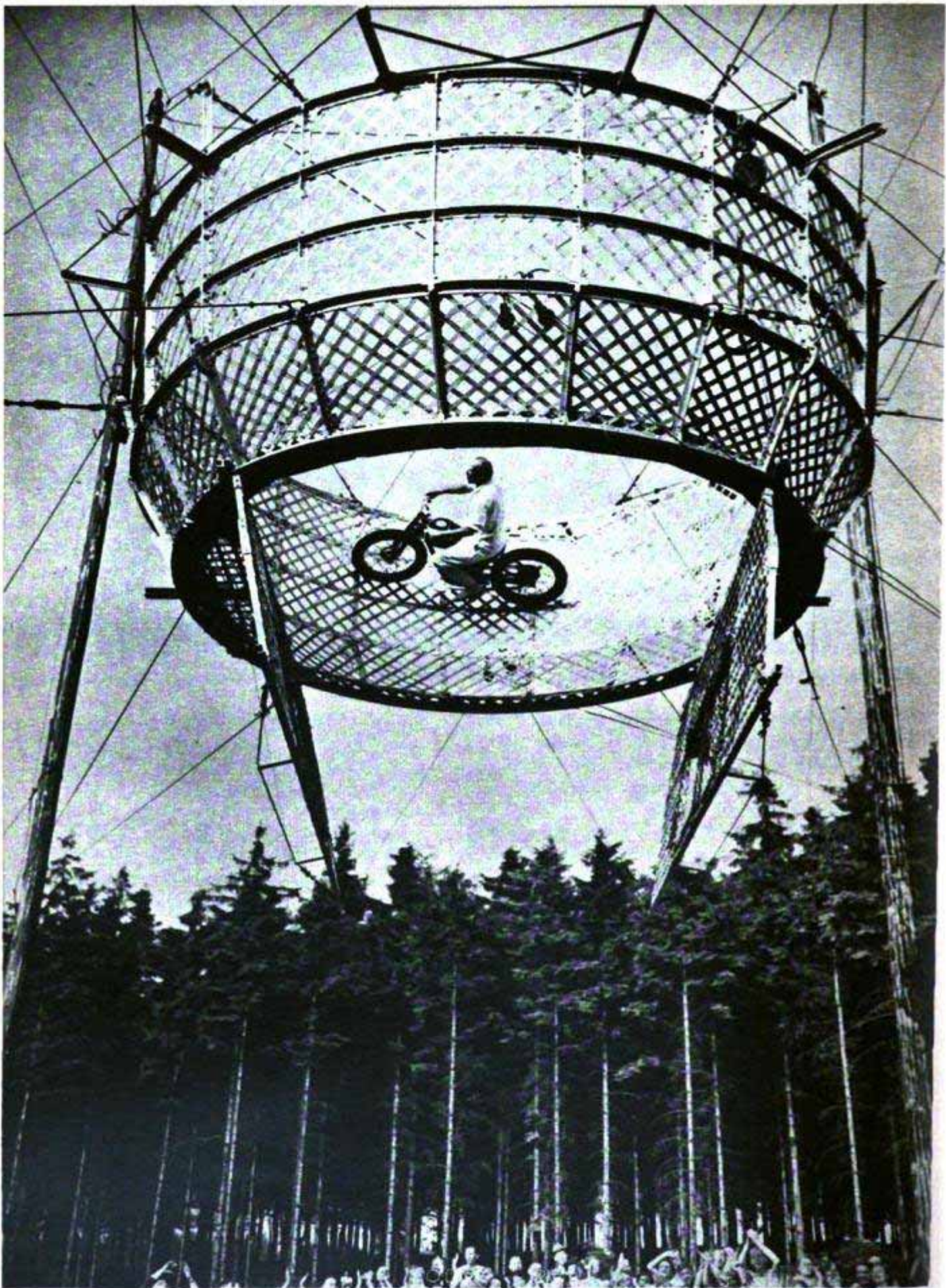
to the client's room, the audio engineer gave Lew a frantic buzz, saying, "We've got a dead mike in here." However, by the time he arrived at the studio, he discovered not one but three were out of commission, so he knew there must be equipment failure somewhere.

"Probably a circuit breaker's been thrown," he muttered, going into the control booth to check. There he stopped short, trying hard not to laugh. The head of the advertising agency, the very man who was

(Continued to page 250)

Veteran showman Ed Wynn listens as Lew explains the workings of a 35-mm. TV motion-picture projector





Squirrel-Cage Track for Motorcycle Acrobat

Held against a vertical wall by centrifugal force, a stunt motorcyclist in Germany does his act 50 feet above the ground. The cage in which he performs is made of aluminum mesh. It is six feet high and fifteen feet in diameter. The track is five

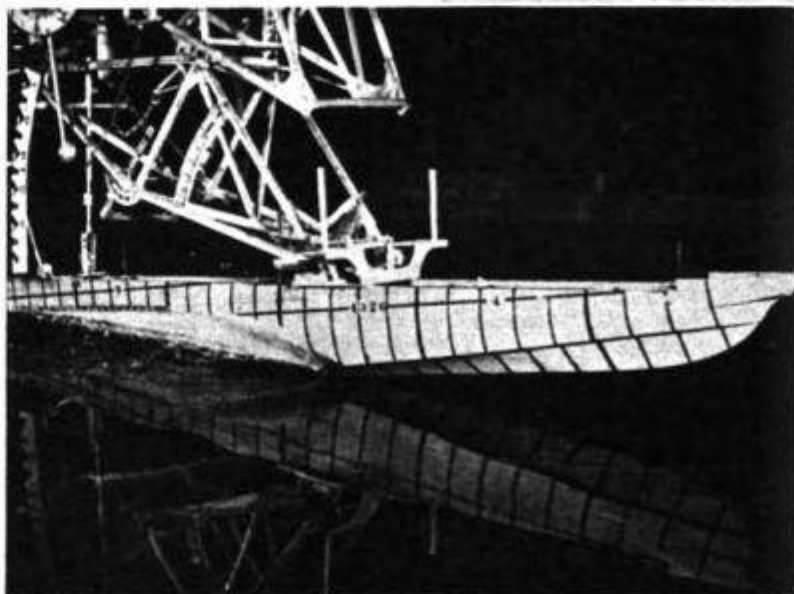
feet wide. When the rider has picked up enough speed to ride the vertical wall, the gates at the bottom of the bowl, which form the floor for the start of his ride, are opened, leaving nothing between him and the earth except air.



Glenn L. Martin Company photos

Martin Tests Hull For Jet Seaplanes

Seeking better streamlining for future jet-powered seaplanes, the Glenn L. Martin Company is test-flying a radically new flying-boat hull bottom. It is longer and slimmer—built in 15-1 ratio between length and beam—and is now attached to the wing and crown of a World War II vintage seaplane. Both nose and afterbody of the old airplane had to be lengthened six feet to accommodate the new hull. As a double check on earlier model tests, vertical and horizontal white lines on the experimental craft are located in the same relative positions as similar lines painted on the towing-tank model. During water tests the airplane will either be paced by a mo-

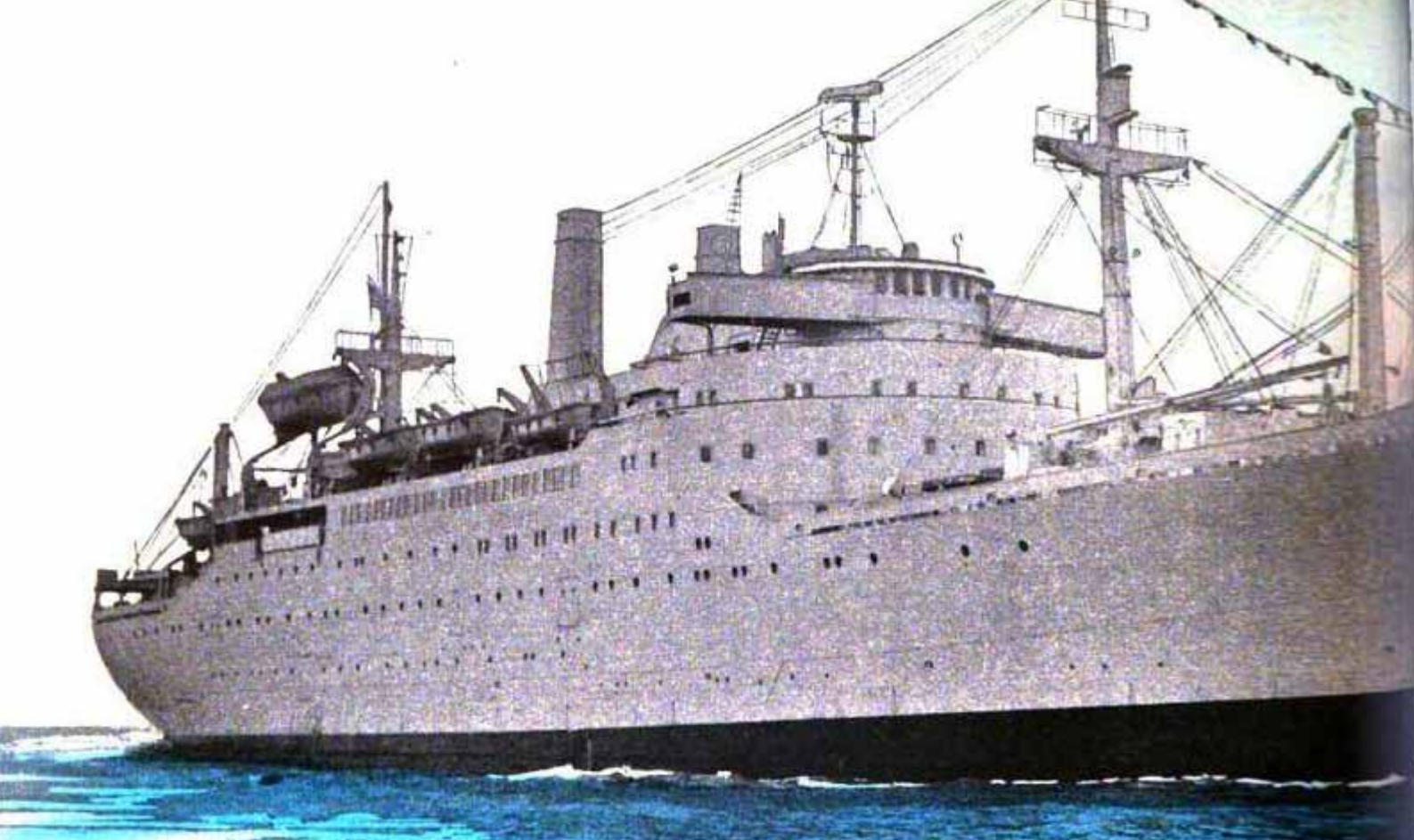


tor launch or make passes at a stationary boat, while motion pictures are being made of her spray patterns.

Rugged Army Telephone Is Lighter, More Efficient in Combat



Even the softest whisper can be heard over a new telephone developed for the Army Signal Corps, yet the instrument is rugged enough to withstand the pounding of artillery shock waves. The new phone weighs three pounds less than the Army phone currently being used, and its talking range is 20 to 30 percent greater. It can be powered by a pair of flashlight batteries. Should the batteries wear out or the transmitter become damaged, the phones can be used up to five miles merely by talking into the hearing end; the voice's sound waves supply all the power needed. Instead of ringing a bell, the new set sends out a woodpecker-tapping sound that can be heard more easily and about twice as far in battle noise. The new sound can also be toned down for troop-position security.



Hey Joe—know what? They've got sweet music, a soda bar and—yep, a nursery and baby formula room on this

ATOMIC VESSEL

G'S GOING OVERSEAS never had it so good. One look at the United States Naval ship *Barrett*—newest, fastest and safest troop transport in the Navy—and you know why. The \$20,000,000 ship has everything from milk shakes to special smokestacks designed to ward off effects of an atomic explosion.

The 17,600-ton vessel wasn't constructed as a transport. She's an offshoot of the United States postwar fleet of fast cargo-passenger liners, competing for the world's ocean-transportation market. However, following the outbreak of hostilities in Korea, the Joint Chiefs of Staff recommended that the *Barrett* and her sister ships, the *Geiger* and *Upshur* be converted into military transports. Despite the change, the *Barrett* still is a floating hotel.

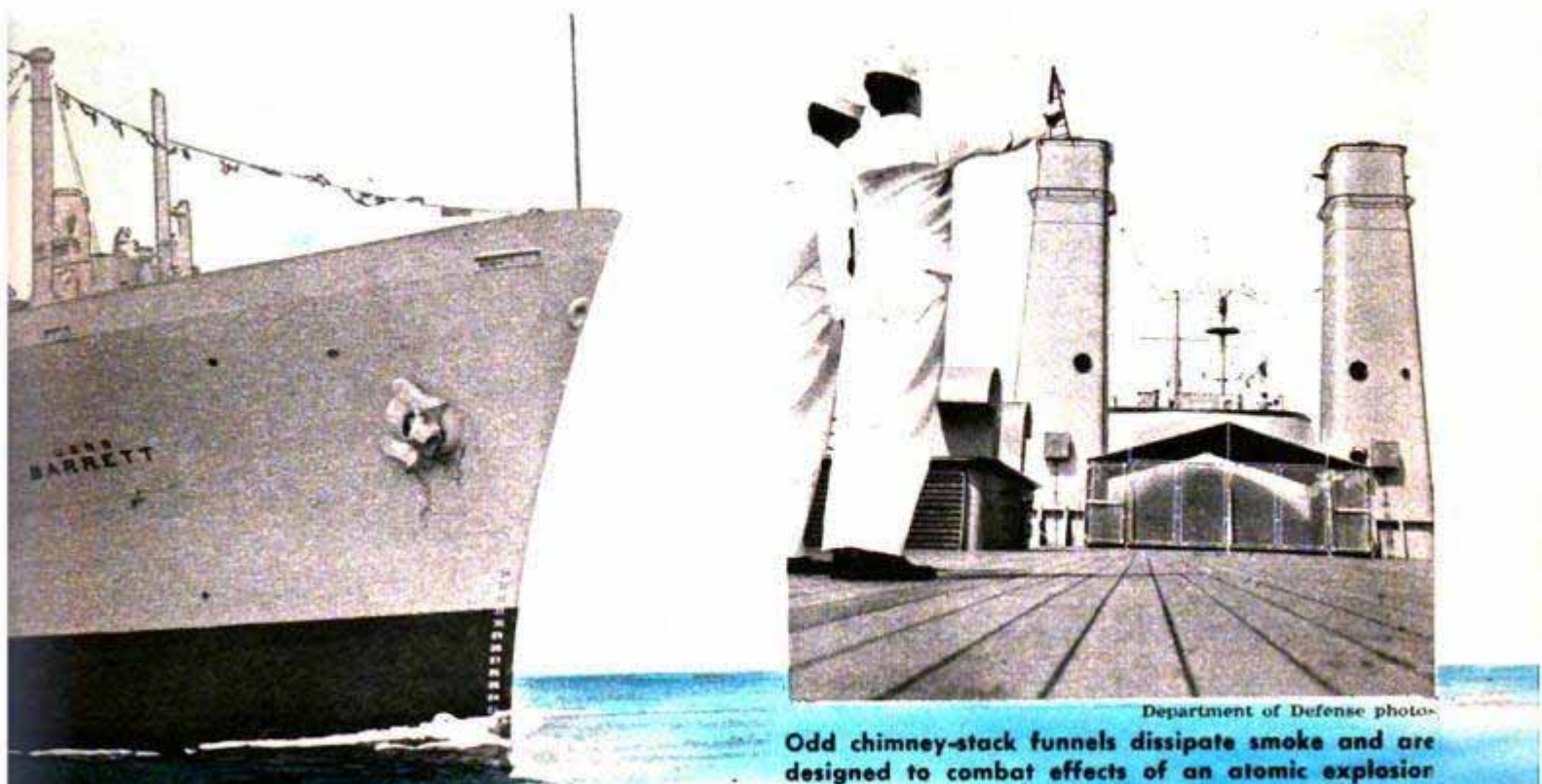
Operated by the Navy's Military Sea Transportation Service, the *Barrett* has a rated capacity of 1556 troops, quartered in the cargo-hold dormitories, and 382 passengers in the cabin class. M.S.T.S. estimates that the troop figure could be raised to 2500 in an emergency.

The *Barrett's* telltale trademarks are her

two unique chimney-stack funnels. Lying port and starboard amidships behind the bridge, they are designed to keep weather decks free of smoke and to prevent the effects of an atomic explosion from reaching the ship's interior. Blowers and a Venturi passage inside the stacks help solve both problems.

Smoke is controlled by the blowers, located at the top of each stack. They expel the smoke through a Venturi passage, which spirals it skyward through a small opening in the stack. The smoke is dissipated into the air.

Vacuum and condensation follow in the wake of an atomic explosion. The condensation, in the form of radioactive droplets of water, would "rain" down a ship's funnel to contaminate the vessel. At the same time the blast's vacuum would create disastrous pressure within the ship. The two atomic aftereffects could be thwarted by the *Barrett's* forced-draft ventilation. If radioactive water penetrated the narrow stack opening it would be forcibly ejected and the blowers would tend to neutralize the lopsided pressure made by the blast.



Department of Defense photo-

Odd chimney-stack funnels dissipate smoke and are designed to combat effects of an atomic explosion

By Raymond A. Wittek

TROOP TRANSPORT

The 533-foot vessel is probably the only troop transport that's fully air-conditioned, with the temperature regulated by an automatic thermostat.

The *Barrett* boasts a music and public-address system that broadcasts on two channels to all group and recreation areas on the ship. Using both AM and FM, the system has a microphone, record player, tape recorder and radio.

According to an M.S.T.S. safety expert, the *Barrett* has all the latest improvements to make her one of the safest ships afloat. In addition to life rafts, she has eight aluminum lifeboats capable of carrying 572 persons and four steel lifeboats with a 514-passenger capacity.

There are eight troop compartments with 1506 bunks. The bunks—hang on to your hats, veterans—are equipped with mattresses and pillows and have ample headroom.

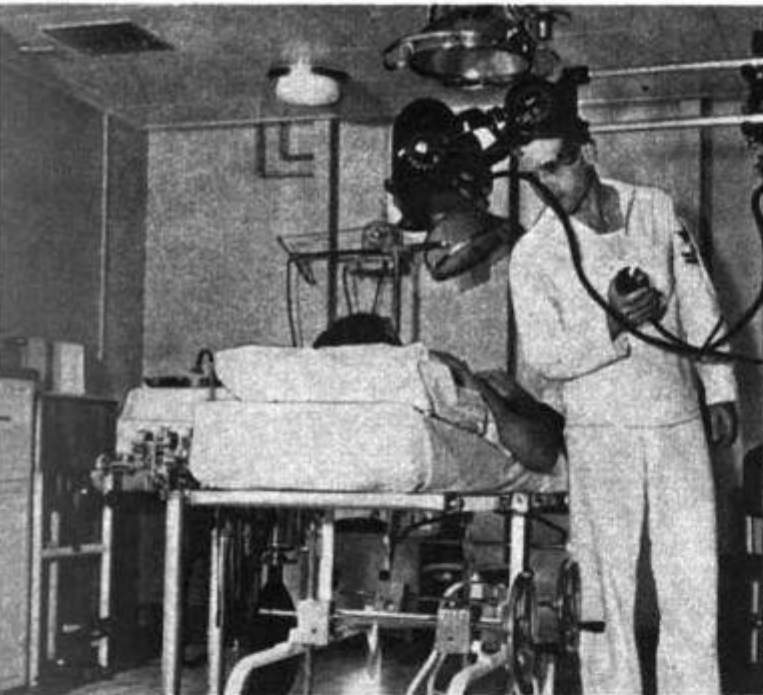
The troop mess hall is a compartment to bring tears to the eyes of a

Announcements and recordings go out from "music room"

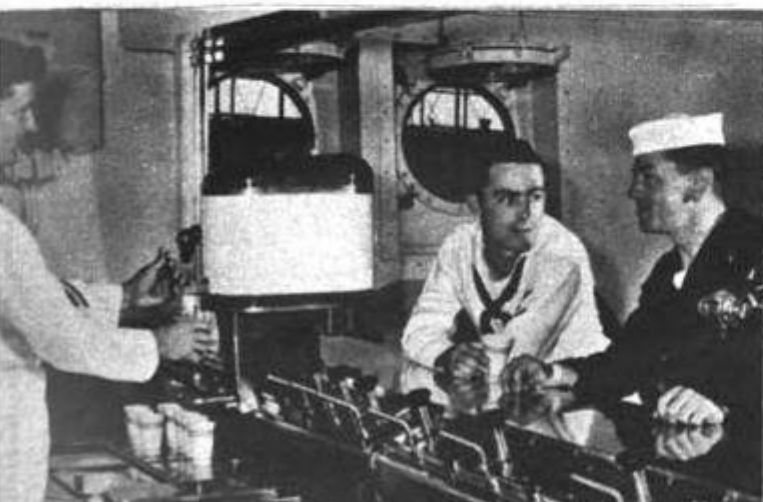




Look crowded? Ask vets whether they'd like the mattresses, pillows and extra space between the bunks



In troops' surgical dressing room a corpsman times an X-ray unit of the type used in combat. Hospital wards have the latest equipment. Below, sailor whips up concoction for a mate in one of two soda fountains



veteran top kick. It is air-conditioned, with light streaming through the portholes, and 221 hungry soldiers can eat there at once while listening to the soft strains of dinner music from the public-address system.

The scullery cleans utensils with forced air under 180 to 200 pounds of pressure—nothing is touched by hand. A separate galley below the mess hall prepares the troops' food, and elevators convey it up to the compartment.

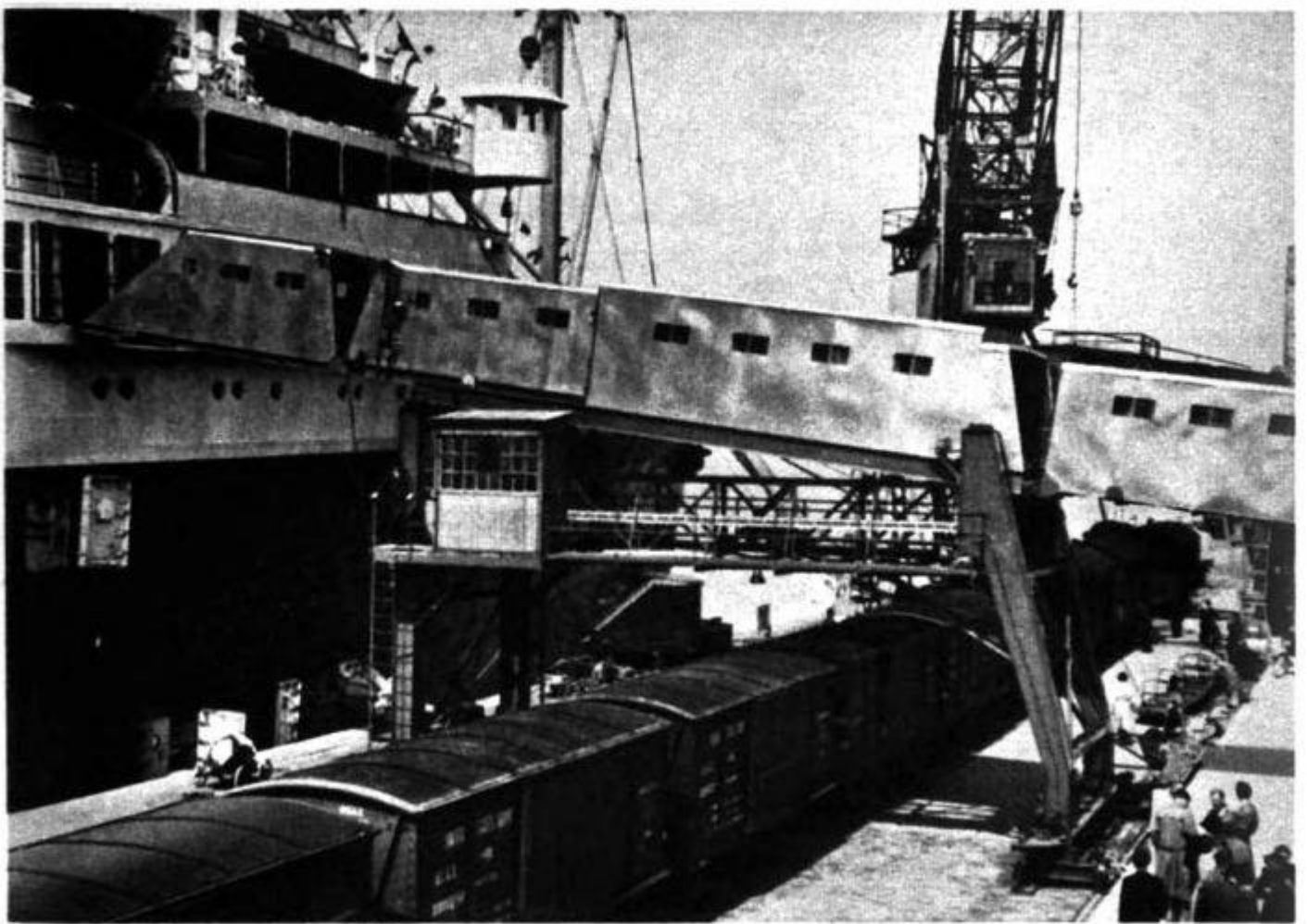
Two soda fountains serve milk shakes, ice cream and soft drinks. There are also barber shops, big libraries and post exchanges scattered through the ship.

Three troop lounges, each with sound-proof walls, are equipped with writing tables, leather-upholstered furniture and built-in speakers, screens and projectors.

Because the *Barrett* also is carrying wives and babies of servicemen, the cabins retain most of their "hotel" furnishings. There are 20 cabins of six-passenger capacity, 64 cabins for four passengers, and 8 for two persons. They are equipped with cabinets, coffee tables, chests of drawers and armchairs. The six-passenger cabins have settees that unfold into double beds.

The passengers' dining room seats 210 persons. Catering to the kids are diet pantries, laundries, a baby formula and bottle-sterilizing room, a nursery and a playpen on the sun deck.

Three 2000-pound elevators carry passengers from deck to deck, and three lift elevators help in loading stores. The ship's storage space will hold enough food, fuel and equipment for a voyage of much more than 10,000 miles. ★ ★ ★



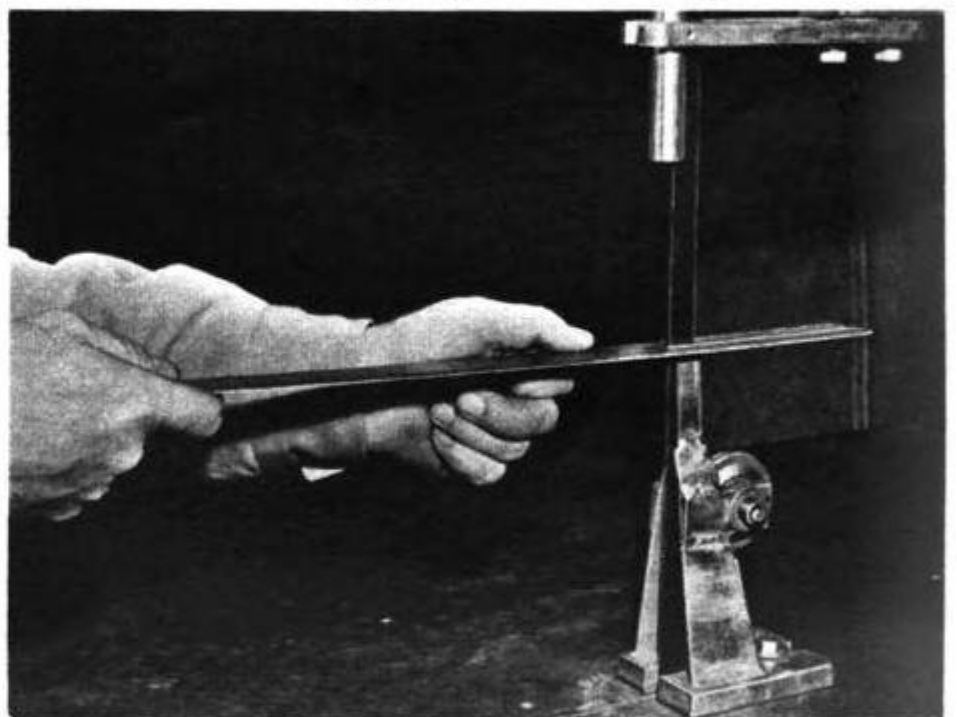
Enclosed Gangplank Is Movable Bridge

Passengers disembarking at Bremerhaven, Germany, walk off the ship over a covered bridge that is moved into position on rails. Between the two supports of the gangplank, freight trains and other traffic

move without interruption. The two ends of the gangplank telescope into the center section to increase or decrease its length and are hinged so they can be raised or lowered to adjust to various ship heights.

Toothless Bandsaw Blade From Metal Strapping Slices Through Steel

Ordinary steel strapping, used to strengthen packing boxes, will cut steel as well as the best toothed saw blades at high speed on a bandsaw. Ordinary bandsaw blades that cost more than \$3 each and last less than two hours can be replaced by steel box strapping that costs about 10 cents and lasts up to 29 hours. The new sawing method was discovered at the Solar Aircraft Company, which had been spending several thousand dollars a month for bandsaw blades. It had been thought that teeth were necessary to bring enough oxygen into the cutting area to speed the burning that results from blade friction. Solar discovered that the toothless blades



hardened and roughened within a few seconds of use so they scoop at least as much oxygen as the toothed blades.



Left, before starting poletop resuscitation of victim, rescuer, right, swings him astride his own safety belt

Poletop First Aid Saves Hot-Wire Victims

FAST ACTION is the big difference between life and death when a hot wire knocks out an electric lineman. To accomplish it, line crews throughout the United States are learning poletop resuscitation—artificial respiration applied while the victim is being brought down the pole. Chances of reviving decrease rapidly after the first two minutes following the shock. As soon as the victim is cleared of the live wire, a rescuer climbs up opposite the victim, fastening his safety strap around the pole slightly below the victim's belt line. He grasps the man's near foot and leg and swings him astride

the safety belt. The victim's body then is swung to a vertical position. The rescuer takes one step down and draws the victim toward him so their weight is supported on the safety strap. After clearing the victim's mouth, the rescuer places the heels of his hands on the man's hipbones and moves them together until his fingertips touch the stomach. Then the rescuer gently squeezes the abdomen upward, then releases, at a rate of 12 to 15 times a minute. This is continued for five minutes. Using a line to hold the victim erect, the rescuer and helper descend, applying artificial respiration.

Artificial respiration is continued during descent, left, and resumes again, right, on reaching the ground





Portable Speed Flash Powered by Dry Batteries

You can shoot a picture every five seconds with a portable speed flash that is powered by dry batteries. The flash duration is $\frac{1}{1000}$ second and more than 1000 flashes are made by one set of batteries. Said to be the lightest electronic flash in production, the unit's power pack weighs only $4\frac{1}{2}$ pounds. The flash gun, which attaches to the camera, weighs no more than the conventional flashbulb gun. The new electronic flash tube in combination with a specifically designed reflector gives high light intensity. It is rated at about 10,000



flashes. An oscillating ready light shows the condition of the battery and informs the photographer when the unit is ready for the next flash.

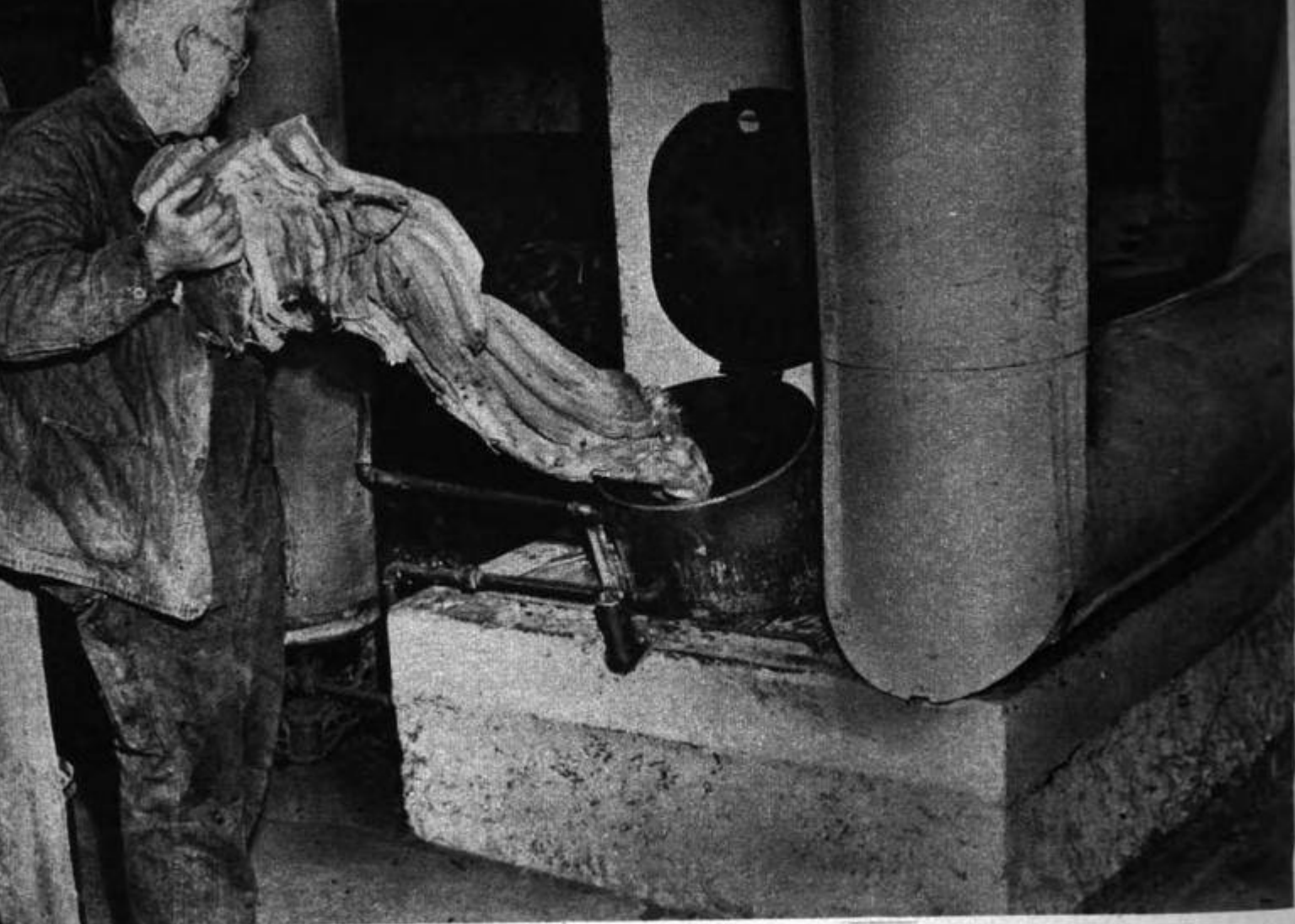
Toothpick Tower Is 10-Foot Model of Original in Paris



Toothpicks are more than after-dinner accessories to H. C. Harris of Fullerton, Calif. They are building materials. With them he builds bridges, towers, Ferris wheels and other structures. He is proudest of a 10-foot scale model of the Eiffel Tower. The only construction materials used were 35,000 toothpicks and several tubes of glue.

Electric Choke Ends Flooding

Installed on most cars in a few minutes, an electric automatic choke is said to assure instant starts and better engine performance in any type of weather. It requires no seasonal adjustments and can't be affected by dirt or gum. When the starter button is pressed, an electromagnet is energized, moving the choke valve to the correct position for easy starting at the existing engine temperature. During the engine warmup period, a thermostatic control opens the choke valve gradually, maintaining the correct choke.



Into the tube goes a big, twisted hemlock log. It will feed to the bottom of the strange furnace by gravity

HEATING WITH LOG BURNERS

Metal hose slips over tube to combustion pit. Suction from a fan brings up ashes, blows them into a container outdoors

By William Gilman

Photos by Eleanor Gilman



THERE'S one fuel that you can stock-pile for yourself. It's the nation's only renewable fuel—and in many sections it simply rots on the ground, even though a cord of good wood equals a ton of good coal in heat content.

Wood's drawback as a fuel always has been too much labor for too little heat. Now some homeowners are using new downdraft stoves and furnaces to convert wood into heat efficiently. Some are crude in appearance, but they offer these advantages: A fire started in October need not go out until May; the slow-combustion heaters normally need stoking only once every 12 to 24 hours; their greater efficiency means little ash and less fuel going up the chimney in smoke, and they have

the convenience of thermostatic controls.

Anyone can build the type of wood furnace Dr. C. E. Jenkins installed in his six-room country home in East Westmoreland, N. H. It will take unsplit logs up to eight feet long.

Doctor Jenkins simply drops a big log into his tubelike furnace. The wood stands on end and is gravity-fed to the fire at the bottom of the tube. He says the self-feed idea came to him as he once watched a loafer, sitting by a kitchen stove, and feeding in more of a long wooden pole as fast as the fire consumed it.

The Jenkins furnace uses the wood-distillation principle to "eat its own smoke." A downdraft goes by tube to a combustion pit below where the wood is roasted. This results in practically smokeless burning of both the charcoal and exhaust gases. Doctor Jenkins also installed a looped pipe to supply his hot water, and uses a suction line run by a small motor to bring up the ashes and blow them out of the basement.

Arthur Pinard of Drewsville, N. H., redesigned his old furnace's bonnet and air ducts to produce a furnace patterned after that of Doctor Jenkins.

The same downdraft principle is used in commercial wood furnaces and stoves. The secret of their efficiency is slow and complete combustion. The wood is roasted as it settles, producing charcoal. The charcoal burns below while gases are consumed by an additional draft mixing with them before they exit out the chimney. ★ ★ ★



Commercial heater needs stoking only once or twice a day, burns wood slowly and completely and is governed by automatic controls. It roasts wood to charcoal and burns combustion gases before they escape

Homeowner feeds a 24-inch slab into the magazine of a wood furnace that heats his nine-room house. Right, one man retained bonnet and ducts of old furnace, sank steel tube into pit to build a downdraft furnace

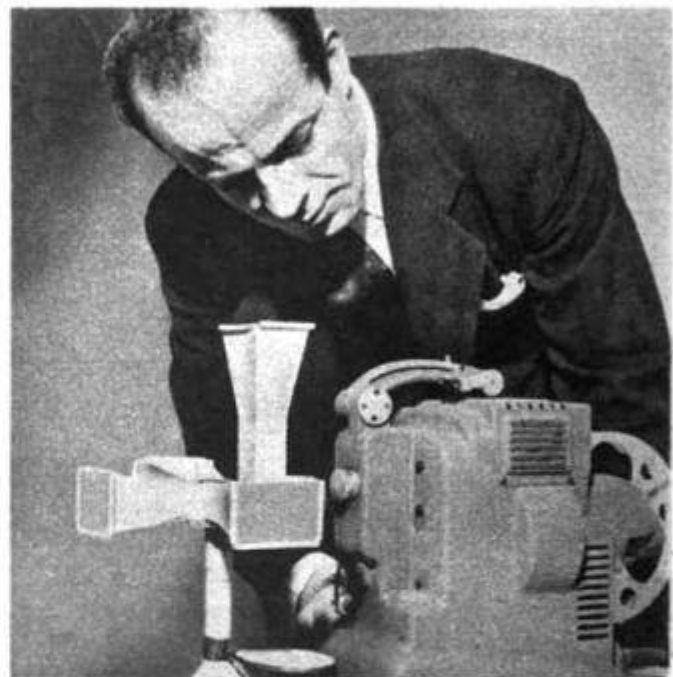




Prefabricated Lightweight Chimney Permits Easy Installation

Easily and quickly installed, a prefabricated chimney is now available to home builders. Each section is a thick-walled cylinder of special lightweight masonry, approximately $\frac{1}{10}$ the weight of brick, with an insulating value equal to 24 inches of brick. A cylinder of fire-clay tile comprises the inner layer. Cemented together and bound with reinforcing metal bands, the sections of an entire chimney may be in-

stalled in about three hours by one workman. A rectangular cap fits over the end which projects above the roof to give it the appearance of a traditional chimney. Approved by Underwriters Laboratories for use with all fuels, the chimney is large enough for a 10-room residence, and is designed to last the life of the house. Cost is approximately 20 to 50 percent less than that of a brick chimney.



Projector Shows Film in Four Directions Simultaneously

Prisms and mirrors enable a new invention to simultaneously project a film in four directions. The device, resembling a cross and based on partial-reflection principles,

can be applied to any 16-mm. projector. Its inventor, Emile R. Soloum, believes it can also be adapted for any standard movie projector of 35-mm. size.

SULPHUR--SCARCITY IN ABUNDANCE

By Arthur R. Railton

ASK THE FIRST five persons you meet what sulphur is used for and you'll probably get answers ranging from "sulphur and molasses" to "matches." It's a good bet that not one of them will be aware of sulphur's role in our economy.

It's also a good bet that not one will be familiar with the world's unceasing efforts to produce more sulphur—efforts that have enlisted help from such unrelated sources as bacteria in the Libyan Desert and mountain climbers in the Chilean Andes!

Sulphur is essential to so many products that a listing would run for pages—it would include virtually everything man eats, wears or uses. That is why a sulphur shortage is so alarming and why recent news that the end of the shortage is in sight has been so joyfully received by the world.

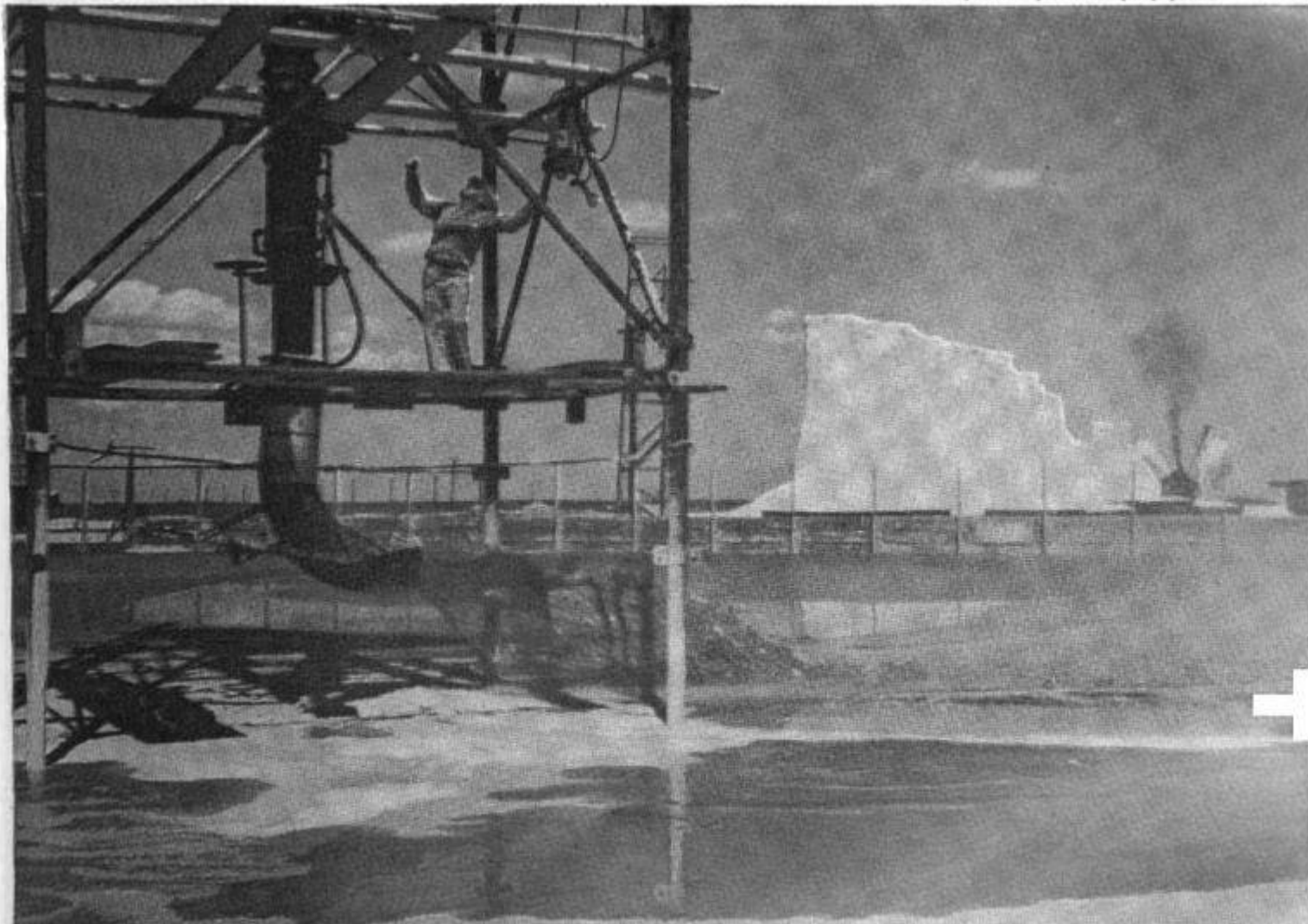
Biggest user is the farmer. His superphosphate fertilizer is made with the help of about 4,000,000 tons of sulphuric acid

each year. To make that much acid takes about 1,200,000 tons of sulphur. Other agricultural uses lift the total to 5,000,000 tons or 40 percent of our annual consumption.

But the farmer is not the only sulphur user. Second largest use for sulphur is in chemicals. Next biggest user is the petroleum industry. Then, too, it takes 35 pounds of the yellow mineral to make a car. The magazines you read, the books, the Christmas wrappings and the thousands of other uses you make of paper account for 400,000 tons every year. It takes sulphur to produce steel, rubber, explosives, paints, soaps, detergents and countless other products. For each person in this country we consume 75 pounds of sulphur a year (compared with 35 pounds prewar). Also, we export about 1,300,000 tons a year to other countries.

In a world rearming, sulphur has become as important as atomic weapons, although much less publicized. It's one of the world's

Reddish-orange molten sulphur pours from a salt dome into a huge vat where it hardens to form a yellow block
Freeport Sulphur Company photo



most abundant minerals, yet it's so scarce that it is keeping scientists busy finding ways to conserve and recover it.

Sulphur occurs in many forms. Virtually every nation has it in some form. Some countries, like the United States, are lucky enough to have it in an almost pure form called brimstone or native sulphur. Others have it, less conveniently, in combination with other minerals as pyrites, or fool's gold. Sulphur can be recovered from sour natural gas, petroleum-refinery gas and smelter gas. Tons and tons of sulphur are present in gypsum and coal (you smell it as coal gas when your furnace is operating improperly). So abundant is sulphur that there's no fear of running out of it—that's not the problem at all.

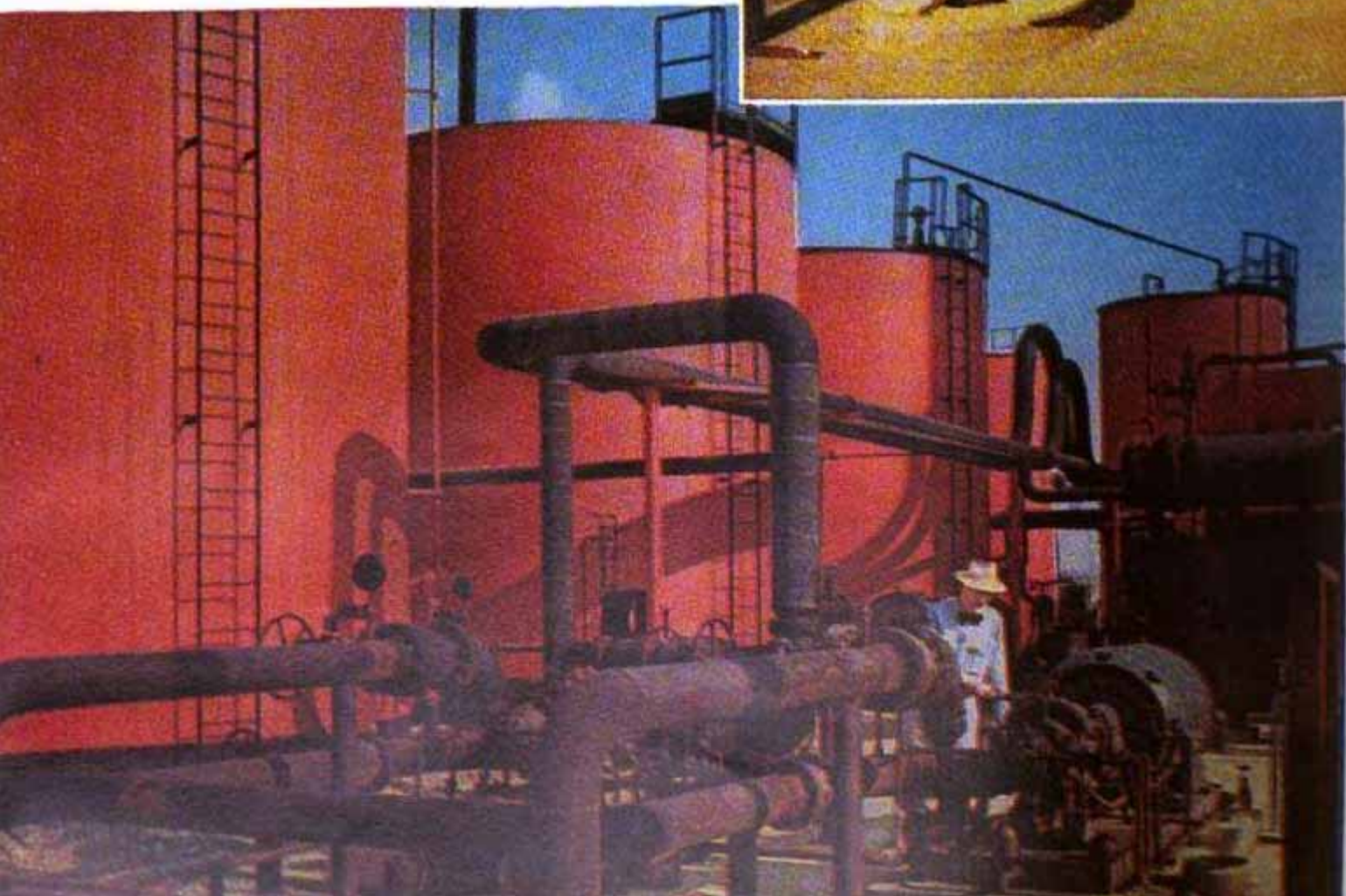
Rather, the problem is one of economics. Brimstone from U. S. salt-dome deposits is the cheapest and purest of all forms of sulphur. It can be mined and sold profitably at \$22 a ton—far below the cost of foreign sulphur. As a result, sulphur users around the world gradually switched from pyrites to brimstone during the past 10 years. Today the economies of many nations in the world depend upon low-priced sulphur and therein is the problem. Because demands

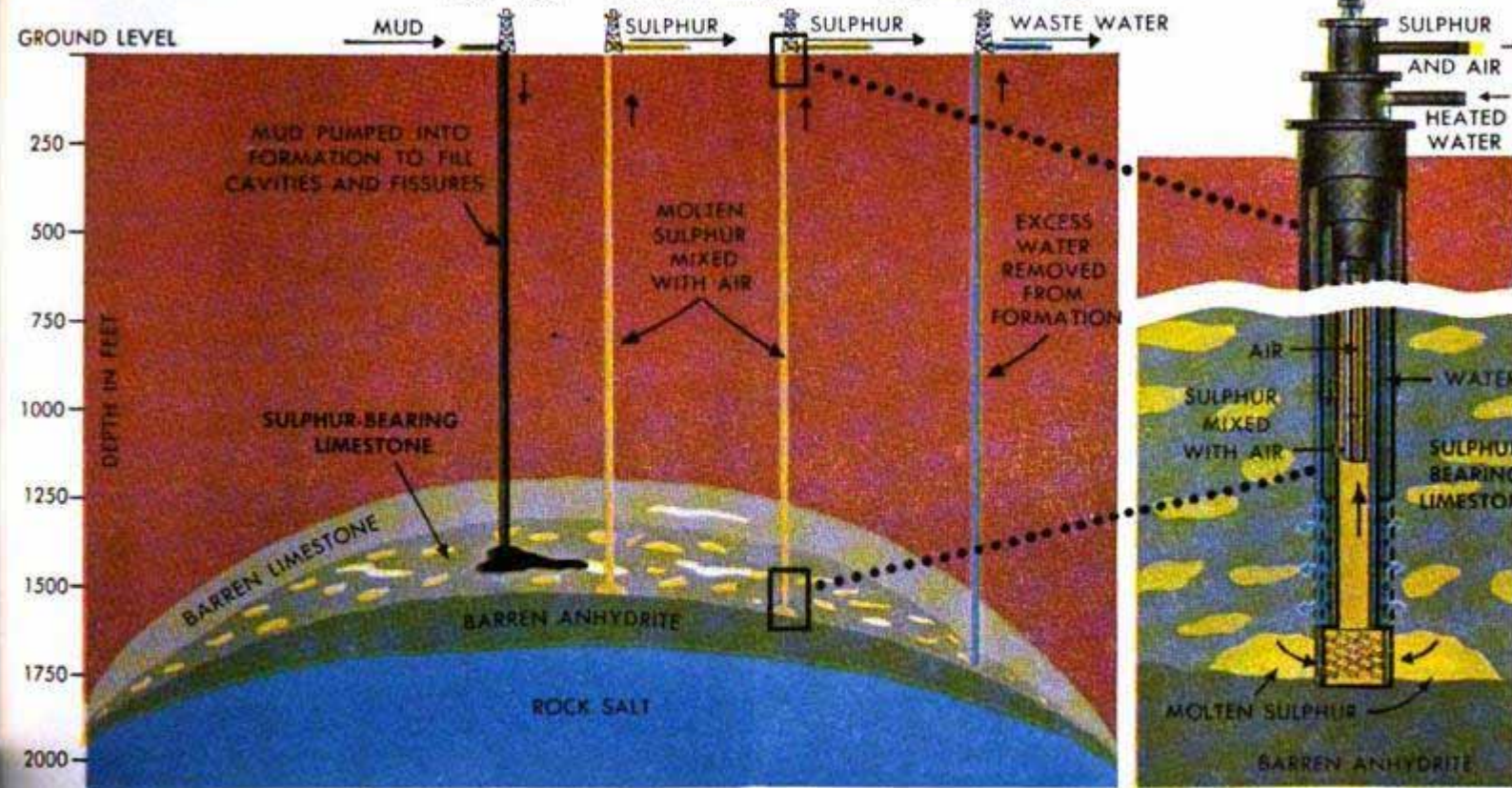
Not all sulphur comes from salt-dome deposits. Some contaminates oil and has to be removed by refining. Tanks, below, hold chemicals that trap refinery gases so they can be stripped to recover sulphur. Right, recovery-plant chemist pours off a sample of sulphur

for low-cost American brimstone have out-run the supply, these nations are caught in a squeeze.

Industrialists can't switch back to pyrites quickly because different equipment is required when using pyrites to make sulphuric acid (acid is the form in which about 80 percent of all sulphur is used). To buy new pyrite-using equipment takes money and time and, moreover, such equipment is hard to get. Furthermore, brimstone is so much cheaper to use that the manufacturer would rather take a chance on improved supplies of brimstone in the near future than risk the time and cost of the switch-over to pyrites.

World War II contributed greatly to the problem. When Europe's damaged industrial plants were being rebuilt and new plants being added, it was logical to change from pyrites to brimstone in sulphuric-acid



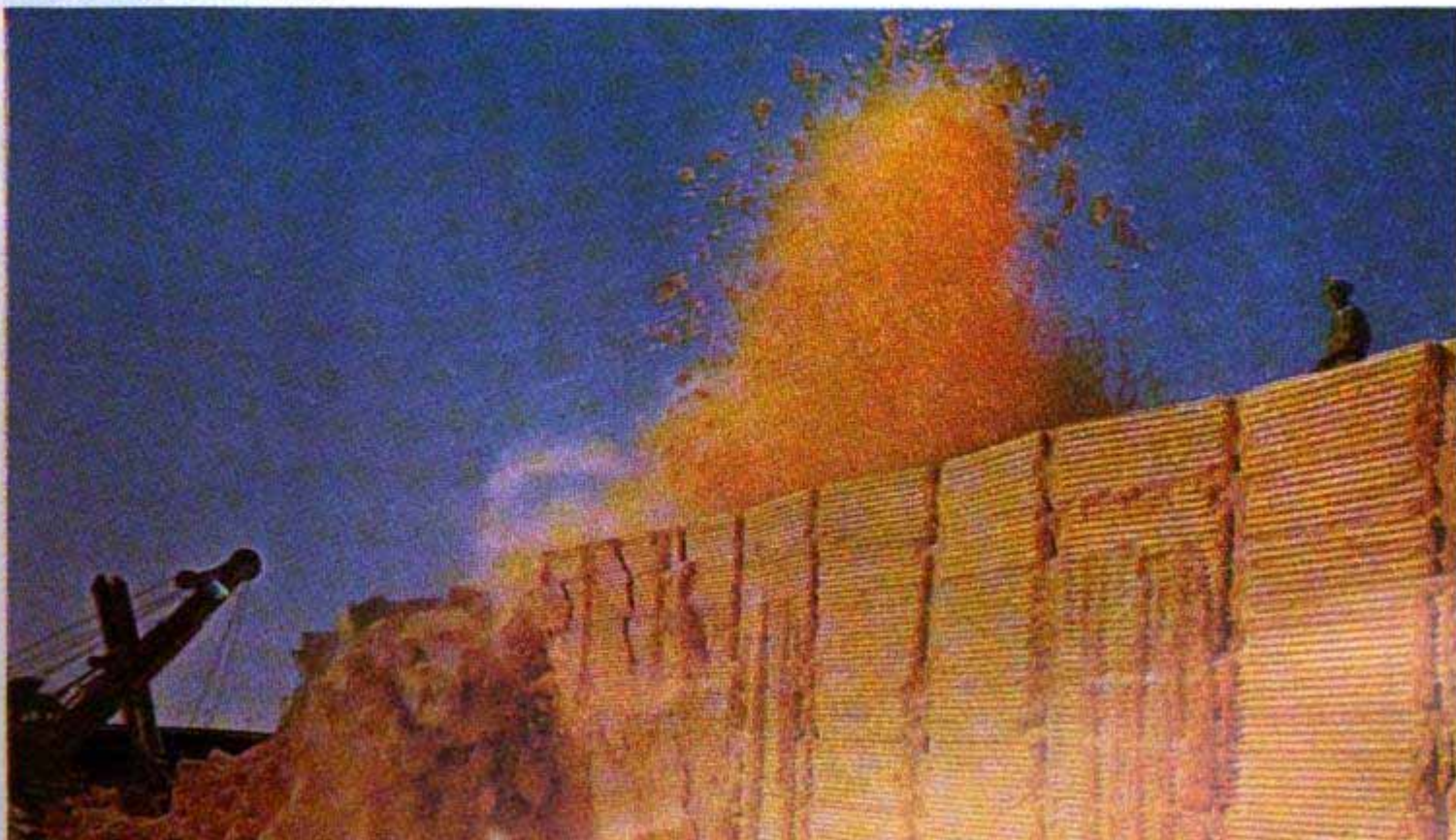


Cutaway diagram of salt-dome sulphur mine. Sulphur wells consist of three concentric pipes, shown at right

production. Brimstone-using plants cost less than half as much to build and only a third as much to operate. American mines in Louisiana and Texas were producing ample sulphur at low prices. The big unknown in the business at that time was whether the demand would hold up! Experts from a leading company reported in February 1950 that "foreign demand [in 1950] may not be so great as that of 1949" and, further, that the "industry expects an

increase in its stock piles at the mines." But along came rearmament. Demands for brimstone leaped sharply. Production couldn't keep pace. It was increased as much as possible, but because of the nature of brimstone mining there is a limit to the amount of increase from a deposit. Brimstone is mined by the Frasch hot-water process. The sulphur is mined as a liquid and brought to the surface in a pipe, like oil. In fact, a sulphur mine consists of

After sulphur pile has hardened, it is broken up by explosives and the yellow mineral shipped to industry
 Freeport Sulphur Company photo



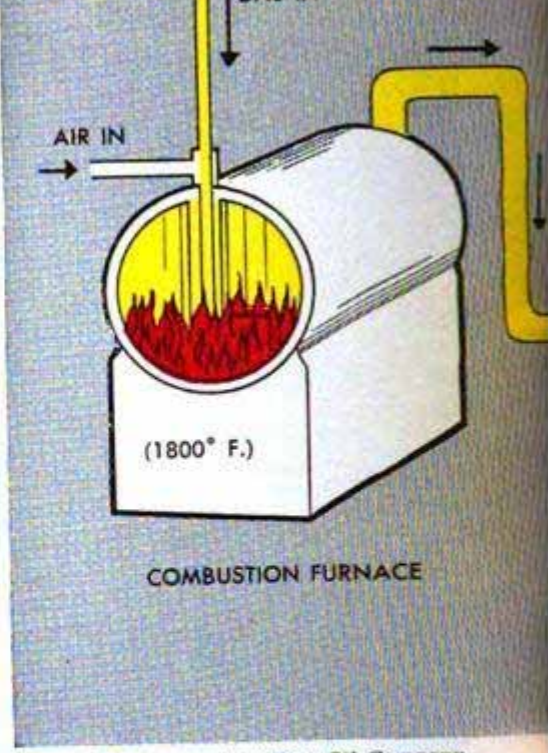
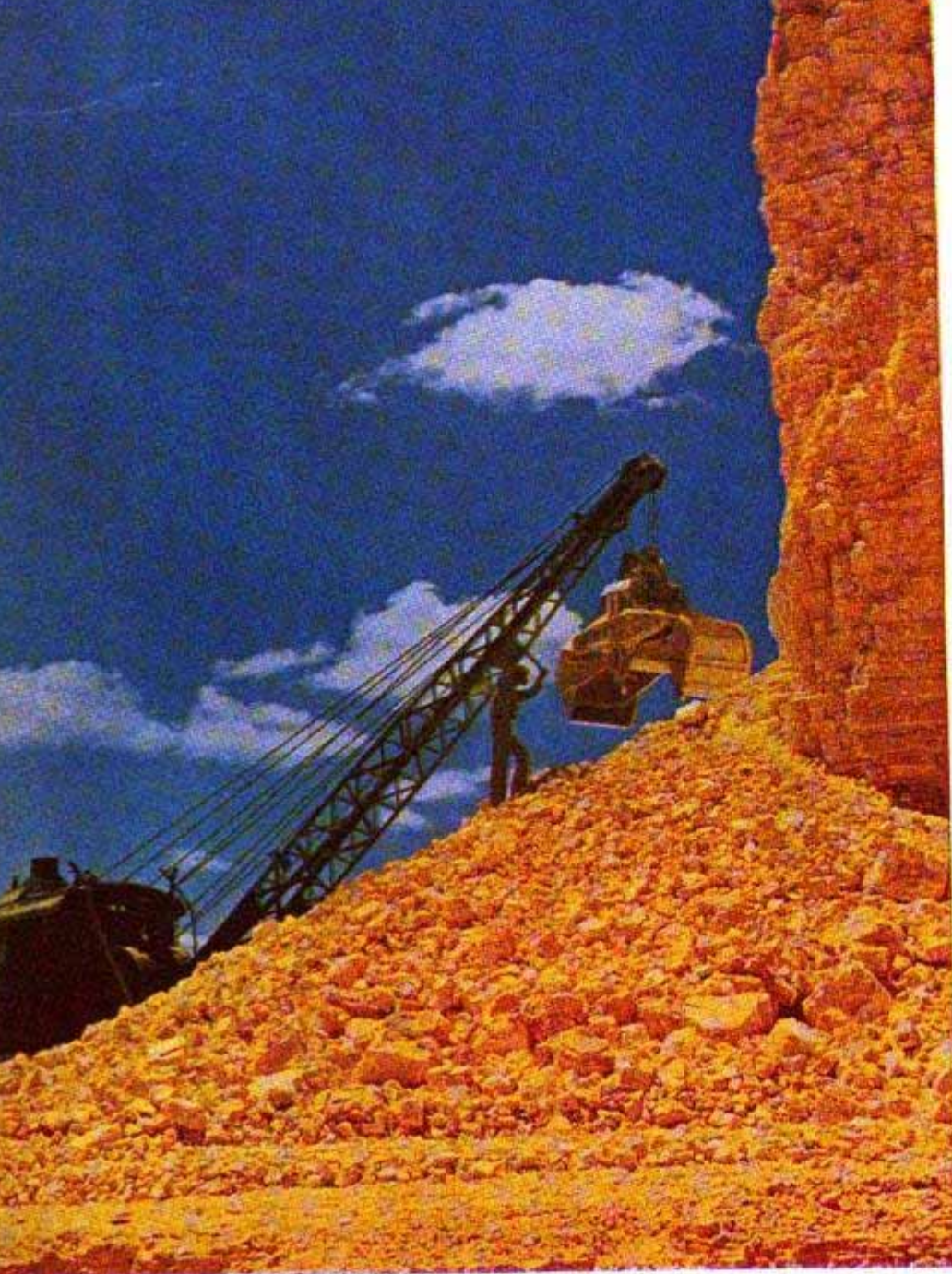
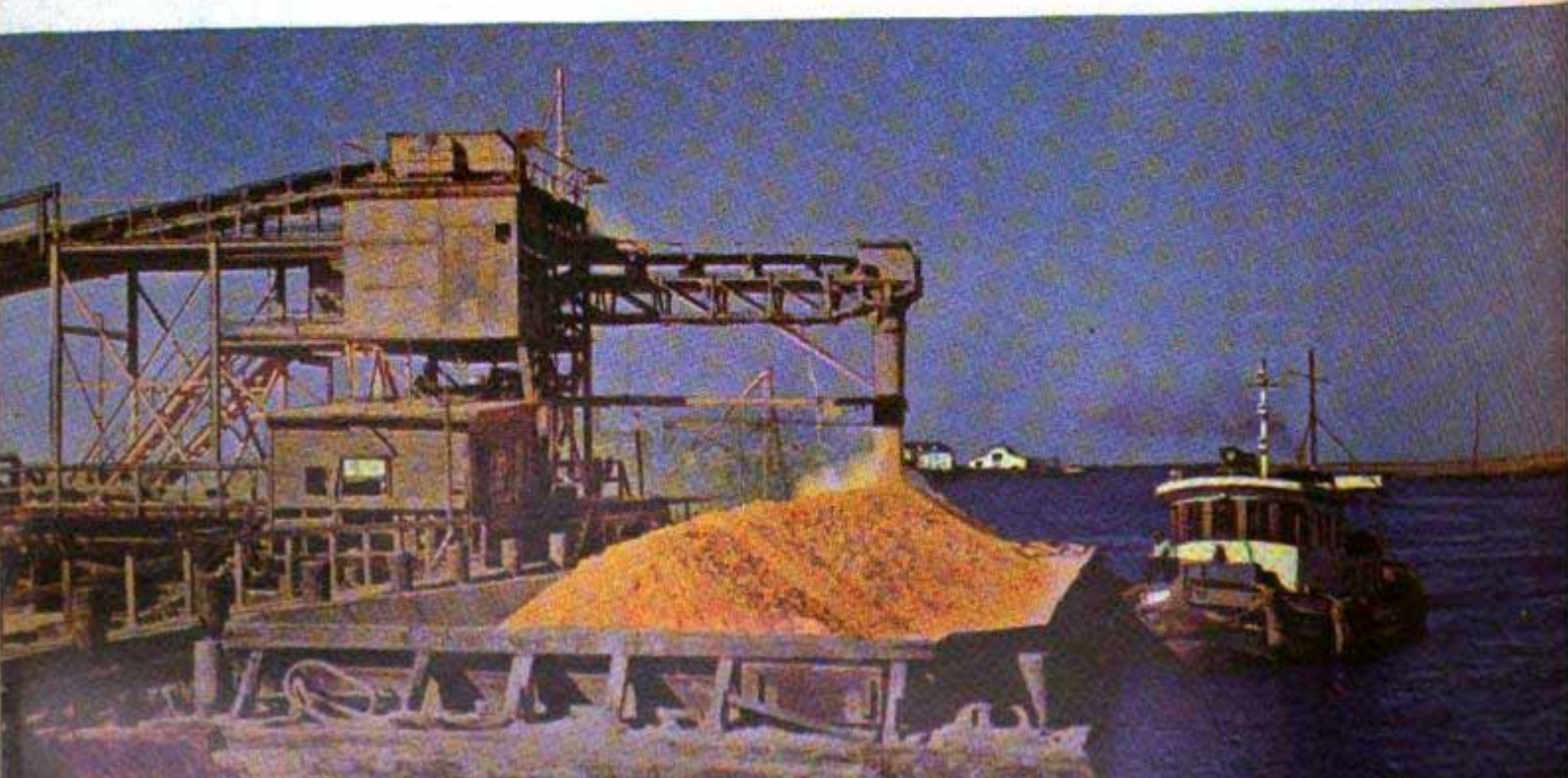


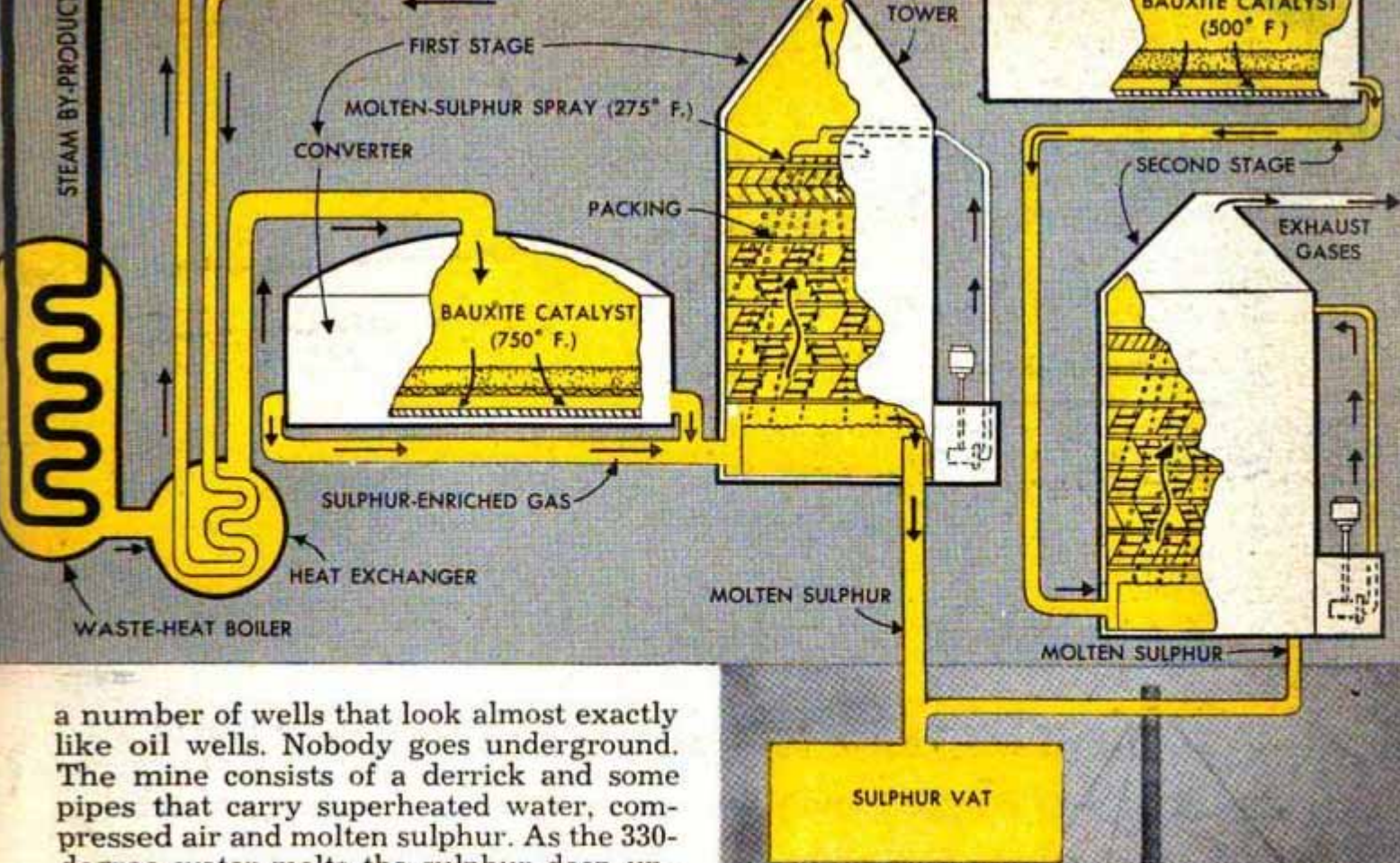
Diagram courtesy Pure Oil Company
Above, schematic diagram of method of recovering sulphur from sour natural gas. This not only adds to the supply of sulphur, but sweetens the gas so it can be used safely

Left, after explosives have broken up some of the sulphur block, a big clamshell bucket on a railroad crane loads two tons of sulphur per bite into freight cars. This photo was taken at Hoskins Mound, Tex.

Freeport Sulphur Company photos

Below, sulphur mined at Grande Ecaille, La., must be hauled in barges because area is isolated by marshes

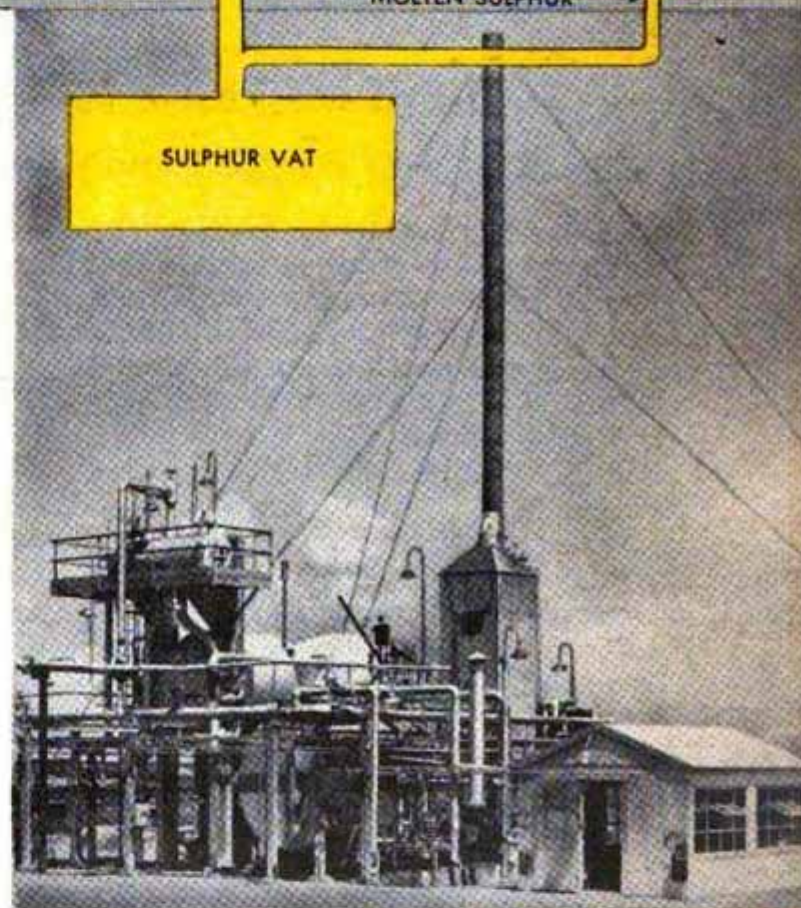




a number of wells that look almost exactly like oil wells. Nobody goes underground. The mine consists of a derrick and some pipes that carry superheated water, compressed air and molten sulphur. As the 330-degree water melts the sulphur deep underground, a pool is formed. Being twice as heavy as water, the molten sulphur drops to the bottom of the pool and is forced to the surface by a stream of compressed air. At the surface it is carried by pipes into tremendous vats, as big as city blocks, where it hardens as it cools to form a gigantic chunk of almost-pure sulphur.

That's all there is to the process, but it takes large quantities of water, heat and piping. Until this year, only fresh water could be used—a terrific handicap in many areas. But now the Freeport Sulphur Company has developed a way to use sea water. This company's deposit at Bay Ste. Elaine will be mined from huge barges that float on the marshes near the Gulf of Mexico. Nearly 2,000,000 gallons of superheated sea water will be pumped underground daily.

Production cannot be increased very much from any one deposit because there is a point beyond which additional water forced into the sulphur might cause the ground to subside with damage to pipes and equipment. To complicate the situation further, sulphur mines are usually located where expansion is expensive and in some cases impossible. Most of the Bay Ste. Elaine dome, for instance, is in Louisiana marshland. All the equipment—power plants, pumps, derricks, living quarters—floats on huge barges. Channels have to be dredged in the "floating prairie" so other barges can haul away the sulphur as it is pumped up. The hauling barges are giant insulated steel "bottles" that carry the hot,



Fluor Corporation photo

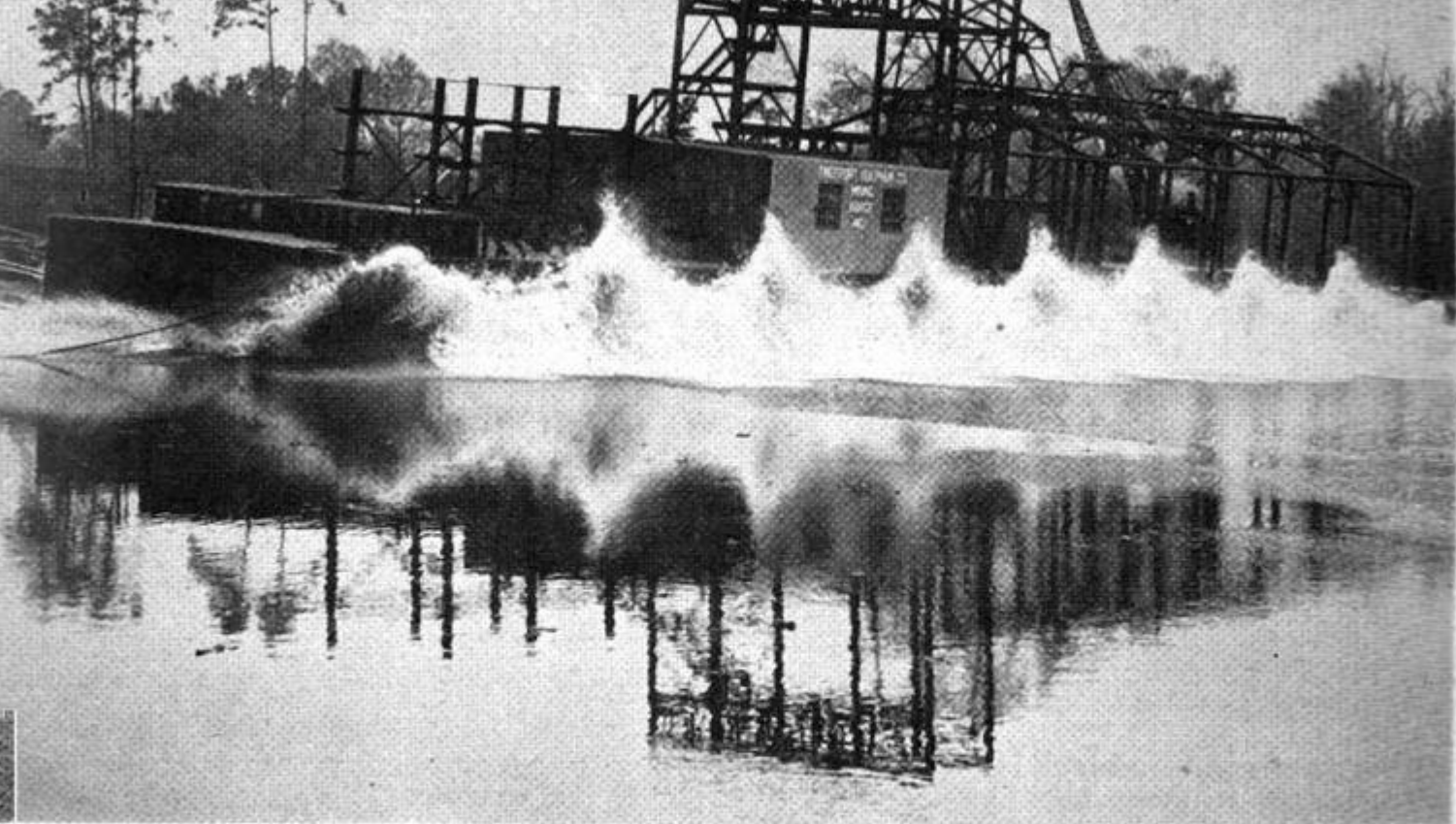
Small but efficient plants like this convert waste hydrogen sulphide in sour natural gas into sulphur

molten sulphur 75 miles to dry land where it can be pumped into vats to solidify.

In spite of these handicaps, brimstone producers have boosted output 2½ times over prewar. In 1951, they mined 5,278,000 long tons of sulphur. Total U. S. sulphur production for all sources was 6,200,000 long tons. Yet that's not enough brimstone to satisfy the world.

These are the reasons why sulphur is making news headlines:

Recently, the discovery of a new brimstone deposit at the southern tip of the



Deposit at Bay Ste. Elaine is underwater. Mining equipment will be mounted on big barge being launched here

Mississippi River delta below New Orleans brightened the picture considerably. The Freeport Sulphur Company, which controls the new find, expects to be producing about 500,000 tons annually from this deposit by late 1953. But that's not until late next year. What about today?

Scientists around the world are developing ways to recover sulphur from a variety of sources, most of which heretofore have been ignored.

Natural gas is one promising source. Scattered around the world are fields of sour natural gas that has no value until its hydrogen sulphide is removed. At Worland, Wyo., the Texas Gulf Company is recovering 100,000 tons of sulphur a year from the Pure Oil natural-gas field. In Arkansas, the Mathieson Chemical Company recovers about 40,000 tons a year from sour gas. Other such activities are carried out in Texas, Mexico and Canada, with a total production of 275,000 tons annually.

Refinery gases also contain recoverable sulphur. Oil refiners, themselves buyers of large quantities of sulphur, now take advantage of these sulphur-bearing gases that formerly were wasted in the air. The Gulf Oil Corporation built the world's largest fluid catalytic cracker at Port Arthur, Tex. It includes a sulphur-recovery unit that will produce enough sulphuric acid to make 720,000 gallons of aviation 100-plus-octane gasoline daily. In the whole United States, waste refinery gases might eventually produce 250,000 tons of sulphur a year.

Smelter gases are another sulphur source.

Annually, in the U. S. as well as Canada, about 5,000,000 tons of sulphur could be recovered from zinc, nickel and copper refineries. Yet in 1951 only 450,000 tons were recovered (an increase of 50 percent over 1949, nonetheless). Additional recovery operations will not only help the sulphur situation, but will also help reduce air pollution near these plants. However, it does present a transportation problem. The smelters produce sulphuric acid, not elemental sulphur. Acid is expensive to ship and few smelters are located near big users of the acid.

Flue gas, which pours out of coal-burning furnaces and boilers into the air, has recoverable sulphur in it. British scientists are removing 95 percent of the sulphur from flue gas in a pilot-plant operation. This is another two-bladed attack: It produces sulphur and, at the same time, helps reduce air pollution. But it is not profitable as yet. It costs about \$1 per ton of coal burned above the value of the sulphur recovered.

Both the British and French are working on methods to cut the amount of sulphuric acid used in phosphatic-fertilizer production. Our own TVA has a system that eliminates sulphuric acid entirely. An electric furnace does the job and all that is needed is ample electricity—something which, unfortunately, is neither cheap nor abundant in many parts of the country.

South America promises to be an important sulphur producer of the future. A deposit of native sulphur estimated at about 20,000,000 tons exists in the Andes. How-



Above, sulphur deposits are located in places that make scenes like this routine. Surveyors stake out channel to be cut to new Garden Island Bay deposit. Below, drilling at Grande Ecaille in Louisiana swamp

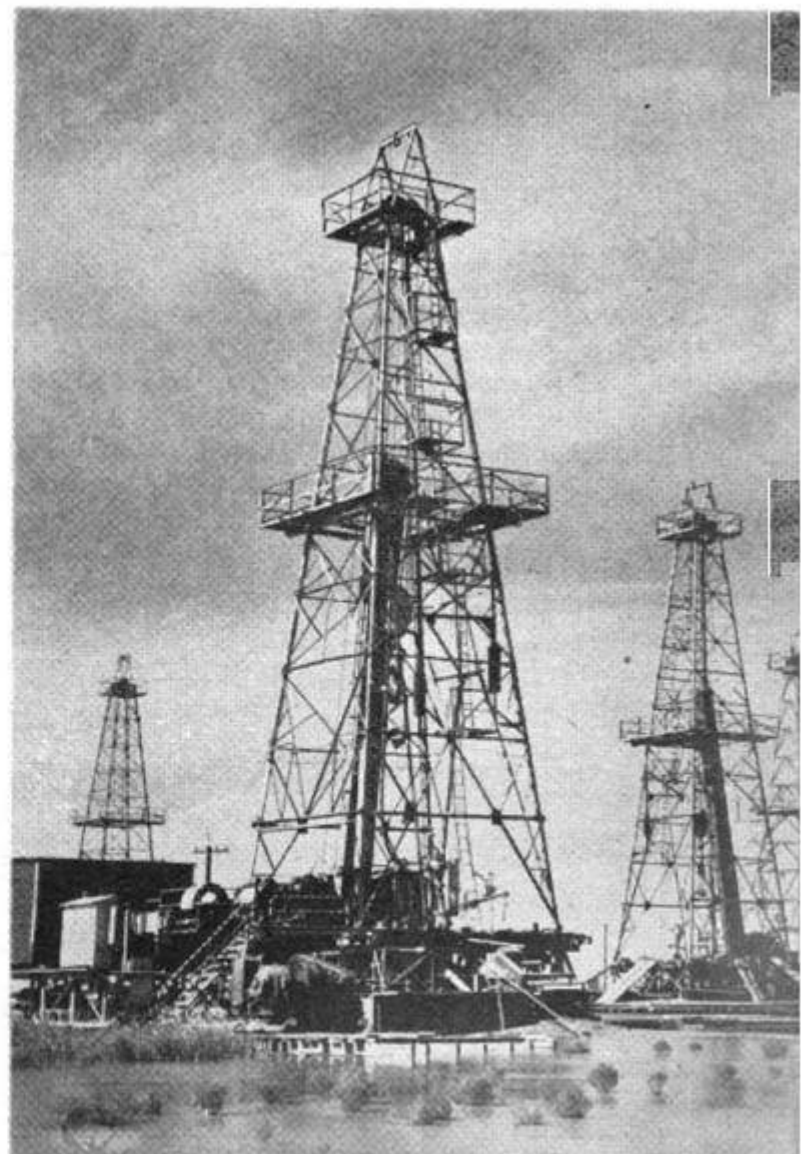
ever, it is at an altitude of 20,000 feet and recovery will certainly be a complex engineering problem.

The most amazing and, in theory, the most promising sulphur-production story comes from Teddington on the Thames in England. There two British scientists are "training" microbes to manufacture sulphur. If successful, they may make sulphur shortages impossible in the future.

The scientists are making sulphur the same way nature makes it—by microbes. The process is based on observations at a lake in the Libyan Desert. The air around the lake is perfumed with the odor of sulphureted hydrogen. The lake mud is rich in sulphates. One group of bacteria in the mud reduces these sulphates to sulphides. Other groups turn the sulphides into natural sulphur—all with no help or coaxing from man! It would be a promising solution.

The problem is to increase the speed of production. The scientists have bred these bacteria to obtain "pure" strains with production records 10 times greater than the run-of-the-strain groups. They hope to boost the speed 100 times, as has been done in the penicillin-producing bacteria.

They figure that a sulphur "factory" about the size of a large swimming pool would produce 250 tons a week. The raw materials needed, such as gypsum, are plentiful in England. The amount that could be produced in a large lake is tremendous! If their process lives up to its promise, the world no longer will be concerned about sulphur shortages. ★ ★ ★

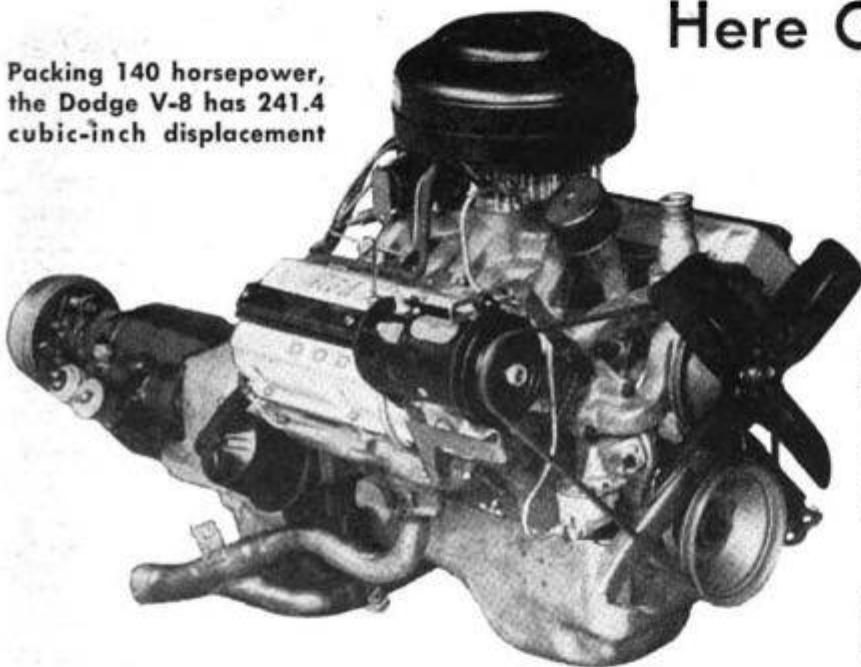




Clean lines, absence of gingerbread, no separate rear fenders are features of the 1953 Dodge V-8 hardtop

Here Come the '53 Cars!

Packing 140 horsepower, the Dodge V-8 has 241.4 cubic-inch displacement



IT'S THAT TIME again — time for the annual new-car parade. First to show is the 1953 Dodge. Offering a complete new body, the Dodge comes in two series, the Coronet, with the 140-horsepower V-8 engine, and the Meadowbrook, retaining the in-line six. The V-8 has a 7.1-to-1 compression ratio. Wheelbase on the four-door and club coupe is reduced to 119 inches. On the hardtop and convertible, it's 114 inches.

Packard, too, is on parade. No major styling change, but the '53 has more power and offers air conditioning and power steering as optional equipment.

Packard's Patrician 400 continues same basic body style as last year, but engine power has been increased





Detroit Listening Post

By Siler Freeman

NOVEMBER traditionally is the month when new models appear in the showrooms. But this year, delays (like the steel strike) have held up most announcements. **Dodge** and **Packard** have already been shown and here's what you can expect in the month of November:

Hudson—its new, as yet unnamed, low-price car will be unveiled this month. Engine: 100 horsepower with a 7.5-to-1 compression ratio. Weight: 2800 pounds, midway between the Henry J and Ford. Low, roomy and fast (it will hit 100, they say), it looks nothing like present Hudsons, does have famed step-down design. Price not released yet, but will compete with Ford, Chevrolet, etc. Unlike the Henry J and Willys, it's a four-door model.

Chrysler, DeSoto and **Plymouth**—new bodies with shorter wheelbases, a lower look and more glass, especially in the Plymouth division.

Lincoln—face lifting only, after the changes in 1952.

Kaiser-Frazer—face lifting only. New look for the Sears, Roebuck Allstate.

Here's the December schedule:

Ford and **Mercury**—face lifting only.

Hudson—face lifting.

Pontiac—new body lines, power brakes.

Studebaker—new body, power steering.

January will bring out the following:

Cadillac—200 horsepower for the V-8, body changes and air conditioning.

Oldsmobile—more horsepower in the Rocket, new body lines, air conditioning.

Buick—V-8 engine, new body and air conditioning for Roadmaster, power steering for Super.

Chevrolet—new body, aluminum-pistoned six with 112-horsepower engine and new Powerglide unit.

Nash—face lifting; the all-new Rambler will come out later.

Willys—face lifting.

One of the most noticeable features of 1953 cars will be shinier chrome. And, what is more, it will last longer. This is not due to any new development by the industry, but to the government's relaxation on the use of nickel for nonfunctional parts, prin-

cipally ornaments and grilles. The .00005 inch of nickel under the chrome does the trick.

Easing of copper restrictions means radiators that won't spring pinhole leaks after a few months. This was a big headache in early 1952 models and it cost some car makers thousands of dollars.

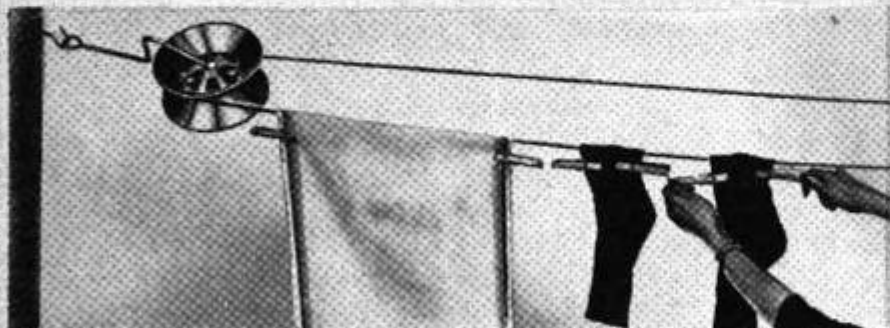
As great as interest has been in V-8 engines, there's an equal amount today in power steering. General Motors is showing its confidence in the device by not only extending it through its plush divisions, such as Cadillac, Olds and Buick Roadmaster, but as production increases, it has plans to extend it down through other lines. Buick Super may get it and eventually Pontiac. In fact, Pontiac is making up service manuals covering it right now.

So confident is GM of public acceptance of power steering that it's investing \$70,000,000 in a new plant in Saginaw to make nothing else. The corporation is pushing for mid-1953 production from the plant, which then not only will make power steering available to its divisions, but will bring the price down so that even Chevrolet (just girding for an all-out battle with its rivals) may be able to offer this item as optional equipment in the low-price field.

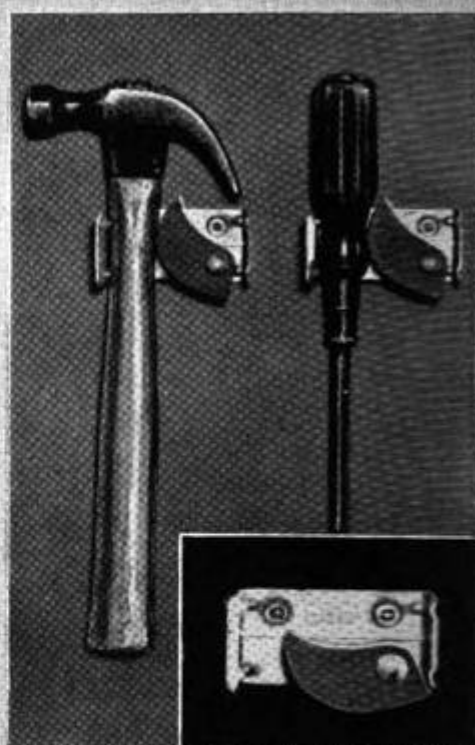
Power steering may provide a pattern for air conditioners. They are not planned for luxury lines and the most frequently mentioned price is \$700. But volume is the basis of all automotive business, so it is conceivable that smaller, lighter and cheaper air conditioners may eventually come. Incidentally, all cars with air conditioners have 12-volt batteries (actually, two 6-volters mounted together).

Prominent among 1953 models will be several versions of the "real American sports car." At first they may appear in the guise of "show cars," made especially for dealer showings or, in the case of GM, for its Waldorf show in mid-January. But, behind the lavish expenditures on small-volume models is an earnest desire to corral this market from the deluge of foreign makes that has been carting off a lot of American cash.

WHAT'S NEW FOR Your Home



FREE-WHEELING PULLEY doubles laundry-hanging capacity. Its "lip" cradles clothes as they are rotated. Pins are placed under the line



HANDLE HOLDERS grip implements of different sizes with a rubber cam



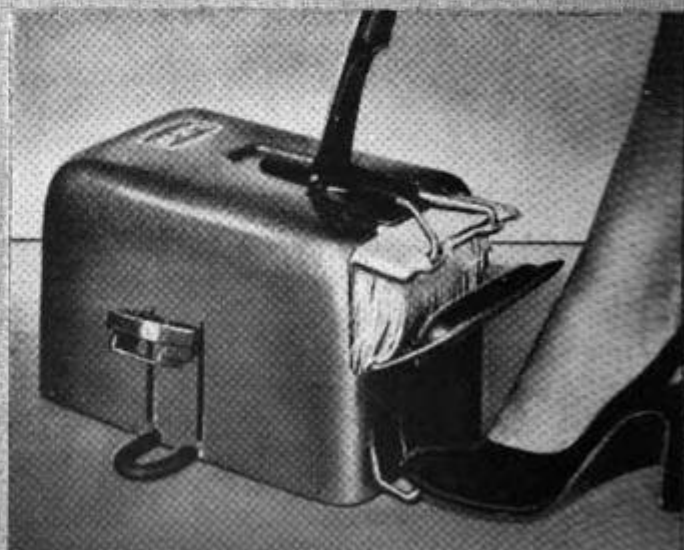
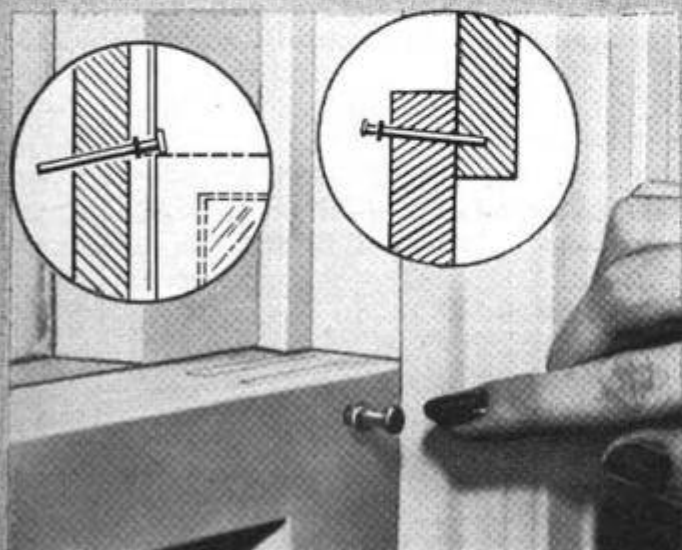
RING HUSHER inserted in "bell-in-set" telephones quiets the sound to stage as low as a gentle purr

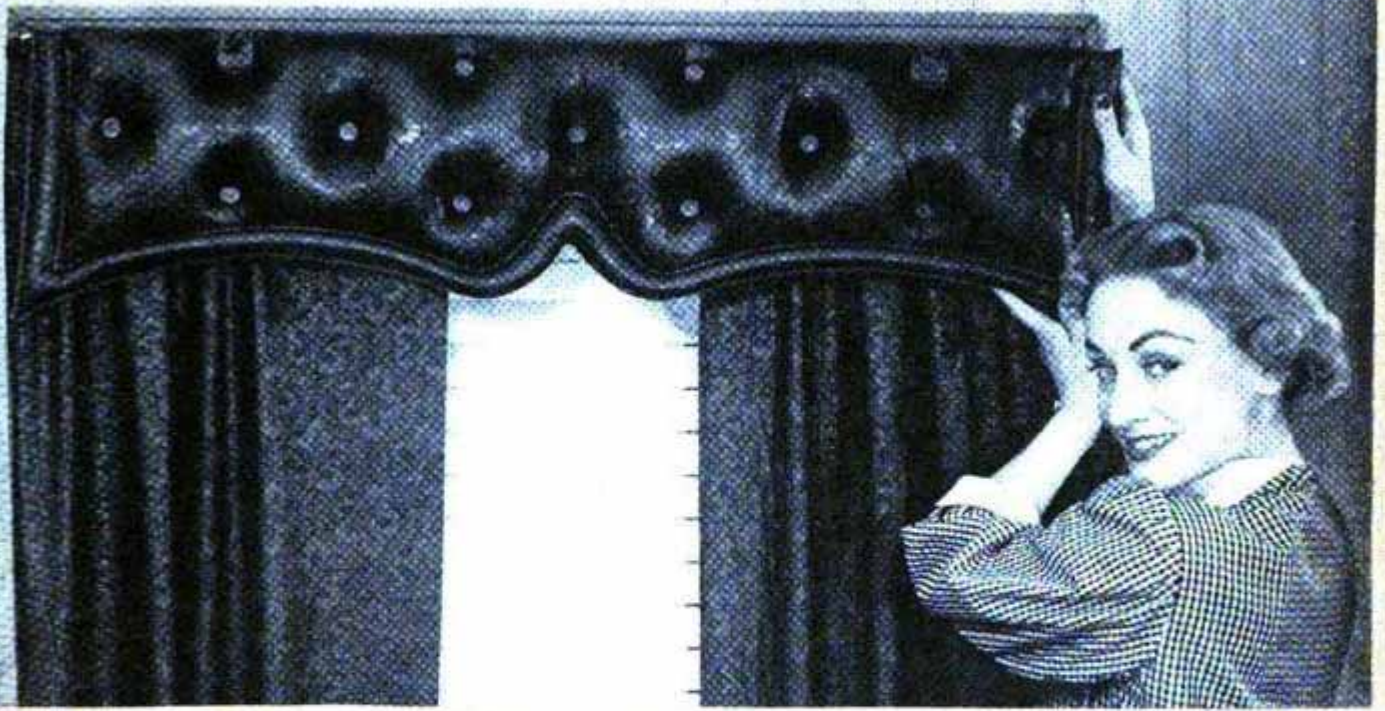


CHEF'S BLOCK flattens food such as bacon during cooking and keeps it in closer contact with heat

WINDOW-LOCK pegs made of metal are "jimmy-proof" and can resist 45 tons pressure per square inch

DUST-MOP CLEANER operated by a spring mechanism shakes the mop clean inside a dustproof housing





INFLATABLE CORNICE that is slipped over a curtain rod gives the appearance of a thick tufted material. Deeply embossed with a rich textured pattern, it can be kept clean by merely wiping with a damp cloth

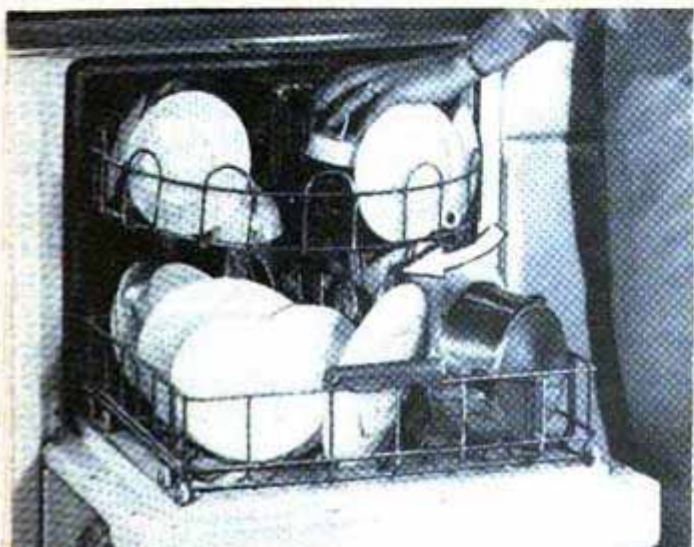


ROTARY MASHER with interchangeable colander units easily prepares food in three different consistencies

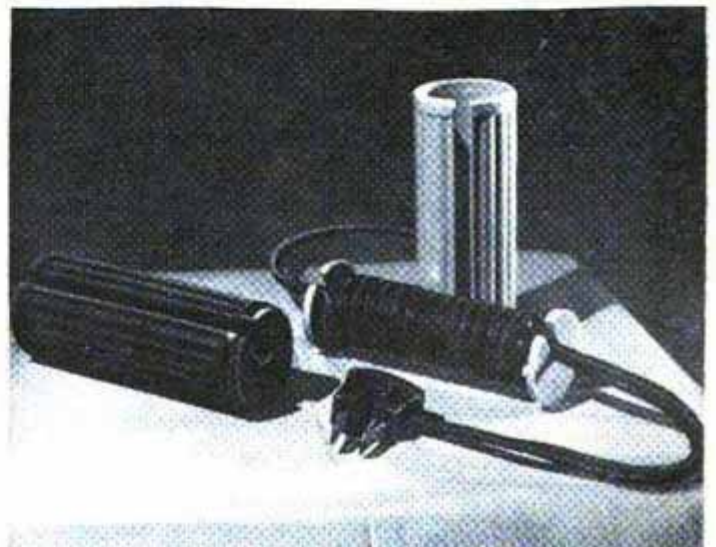


RECIPE REDUCER that works like a simplified slide rule revises directions to provide fewer servings

REVOLVING TRAY in a new automatic dishwasher gives spray action greater access to all dishes and pans

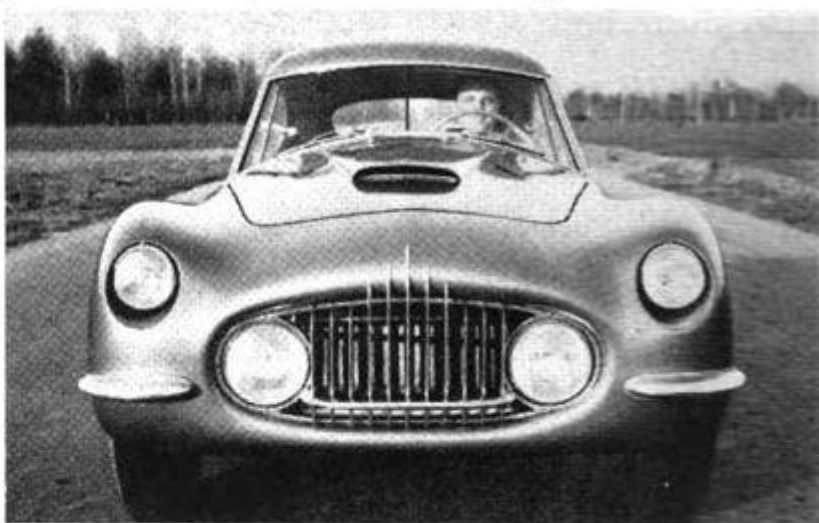


ELECTRIC-CORD SLACK is taken up and concealed in plastic cylinders, made in light and dark finishes



Fiat Sport Coupe Powered by 110-Horsepower V-8 Engine

Weighing only about 2000 pounds, the new Fiat sport coupe has a 110-horsepower V-8 engine that gives it a top speed of 130 miles per hour. Unitized body construction provides maximum strength. All four wheels are independently sprung with coil springs inside oil-filled housings. The V-8 engine has dual carburetors and a compression ratio of 8 to 1. The transmission features four speeds forward. The engine housing is of aluminum. The price of the car was not available.



Sinkproof Swimming Suit Aids Treatment of Polio Victims



Sinking isn't possible with a bathing suit which has the buoyancy of a life preserver. Developed in England, the treated suit is particularly useful in helping polio victims take water treatments. If a person wearing the suit remains still in water, he will automatically turn over and float on his back. Worn under ordinary clothing, the suit will keep its wearer afloat even though his clothes are saturated.

¶Some 50 years ago, Henri Moissan, French chemist and Nobel prize winner, made real diamonds out of sugar by subjecting some of the pure-carbon form of sugar charcoal to 4000 degrees of heat with 100 tons' pressure to the square inch.

Safety-Control System Uses Radioactive Scrap Material

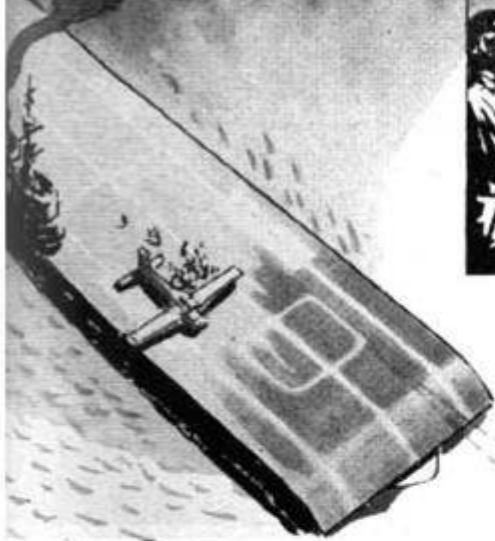
Atomic scrap is being put to work saving workers' lives and limbs. A unique safety-control system requires the operator of a machine to wear a small amount of radioactive material in a wristband. A detector tube mounted on the machine shuts it off

when the worker's hand enters a danger area. The radioactive scrap, gathered from atomic laboratories, may also be used in similar systems to stop elevators at proper levels, warn of burglars and sort freight cars in railroad hump yards.

FCC System Foils Possible Use of Radio Waves As Guide to Enemy

Any enemy attempts to use commercial radio waves as a guide to bomb targets would be thwarted by "Conelrad," a countermeasure developed by the Federal Communications Commission. Conelrad (control of electromagnetic radiation) is essentially a system of scrambling radio waves. Ordinarily, an enemy flyer would tune his direction-finding equipment to an AM broadcasting station in the target town. A compasslike needle would show him in which direction to fly to reach the city. After getting there, the navigator might even be able to use the radio station to help him find his specific target, perhaps a rail yard,

a dock or a war plant. Under the Conelrad system, already tested in mock attacks, all AM stations are switched to either 640 or 1240 kilocycles and FM and TV stations are ordered off the air. The instructions will come, whenever an attack appears imminent, from central dispatching points sprinkled throughout the country. Each will control a large "cluster" of stations, which in turn will be broken into smaller groups in an effort to thoroughly confuse the enemy. The FCC emergency system will also scramble station powers so that an enemy pilot will not know where the normally strong-signal stations are located.

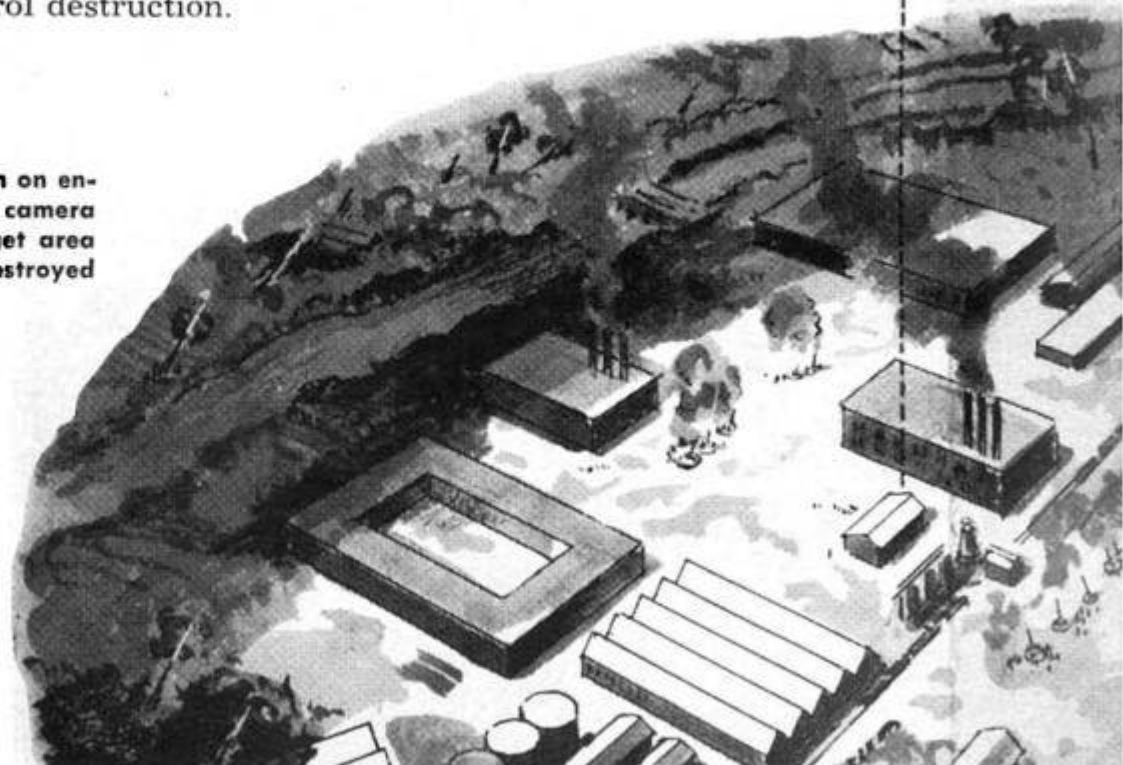


Circling "mother" plane, equipped with television screen and controls to guide robot, takes over from control plane on deck once robot is in air and guides it to target

TV-Robot Plane Advances Push-Button Warfare

BOMB-LADEN ROBOT "suicide" planes now being readied for the destruction of military targets are only a glimpse of things to come, say guided-missile experts. Soon it will be possible to send a robot bomber any place in the world. Where television isn't practicable, electronic "brains" on the planes may guide them by following magnetic lines of the earth or sightings from tiny telescopes fixed on certain stars. Present television-equipped robots can fly to an enemy installation, drop their bombs or strafe the enemy and return to base. A whole fleet of robots can be directed by one "mother" plane. In the first combat use of the unmanned American "Kamikazes," an obsolete Grumman fighter carried a 2000-pound bomb. The plane, equipped with television camera and electronic controls, was catapulted from the carrier *Boxer*. A Douglas AD-2 control plane on deck guided it to a level of 1000 feet where another control plane took over and escorted it 150 miles over the Sea of Japan and deep into flak-ridden territory. Flying well above anti-aircraft range, the control pilot watched on his TV screen the view unfolding ahead of the robot plane. Finally, the target was in sight. With a flick of a lever he plunged the robot down onto the target for a direct hit—and another "first" in remote-control destruction.

"Suicide" plane zooms down on enemy installation. Television camera in nose relays view of target area until plane and camera are destroyed



The true test of an automobile begins when the owner takes the wheel. This is another report from owners of 1952 cars who answered questionnaires sent by Popular Mechanics to 1000 Willys owners from coast to coast

By Floyd Clymer

THE POPULAR MECHANICS MOTOR SURVEY
AS CONDUCTED BY FLOYD CLYMER

ABOUT AVERAGE,
POLL SHOWS

MOST OWNERS
SAID
"VERY GOOD"

- 1- I am the owner of a 1952 Willys: Aero Lark Aero Wing Aero Ace
It is equipped with: Conventional transmission Conventional with overdrive
2- I have owned it approximately 7 months. Speedometer mileage is now 1500
3- For normal driving, my Willys operates satisfactorily using:
regular gasoline premium (high test) gasoline m.p.g. for city driving, and
4- My average gasoline mileage: 24 m.p.g. for country driving. 65 M.P.H.

- 5- I CHANGE OIL every 1500 miles - (and never add oil between changes).
I change oil every 25-26 miles, but also ADD one quart every 1500 miles.

- 6- Roadability and handling qualities are: Excellent Good Unsatisfactory
7- Maneuverability in traffic seems to be: Excellent Good Unsatisfactory
8- Acceleration is: Exceptional Very Good Average Poor
9- Curb and road clearance are: Satisfactory Too High Too Low

- 10- Here are my main reasons for purchasing a new Willys:
park easily in heavy city traffic. Small cars handle and city driving economy good

- 11- My comment on these features:
The 6-cyl. overhead Hurricane engine: Like Dislike No comment
Visibility, front and rear: Like Dislike No comment
Riding qualities in general: Like Dislike No comment
The 108-inch wheelbase: Like Dislike No comment
The drawer-type glove compartment: Like Dislike No comment
Pull-type door handles and lock feature: Like Dislike No comment
12- Generally, what do you dislike about your new Willys? poor shift action, weak parking brake, seat action, poor rear passenger, and too few dash inst.

- 13- Have you ever owned a Willys-built car before? Yes No How many? _____
14- Would you buy another Willys? Yes Possibly No
15- How do you rate your dealer service? Excellent Good Average Poor
16- How do you rate your Willys, generally? Excellent Good Average Poor

- 17- What type of engine would you prefer in your next new car? In-line V-type
Number of cylinders: 4 6 8
18- Are you satisfied with the horsepower rating of your Willys (90 or 75 h.p.)? Yes No
Approximately what H.P. rating would you like in your next new car? 80-90 H.P.
19- What specific improvements would you like in your next car? Quicker valve action!
20- Based on your present experience, which transmission would you prefer: Conventional
Heavier shocks for stiffer ride. Better design of front seat fold-over.
Conventional with overdrive An automatic transmission (What kind?) _____

This questionnaire will be tabulated fairly, and your name will be held in strict confidence: we request that you attend to each question listed. Thank you.
Please mail promptly to: _____
My name: _____
Address: _____
City & State: _____
Occupation: Tulsa, Oklahoma Mechanical Engineer
(Comments on reverse side.)

MOST POPULAR
REASON
FOR BUYING
FREQUENT
COMPLAINT IS
ACCESS TO
REAR SEAT



ON THE WILLYS



Clymer says the Willys' low center of gravity (23 inches from ground) makes it a difficult car to overturn

WITH ONE HORSEPOWER for every 28.5 pounds of car weight, the 1952 Willys Aero models provide the highest horsepower-to-weight ratio of any U.S. car. And, as a result, Willys-Overland, after an absence of several years, has re-entered the straight-passenger-car market with a stylish and formidable competitor.

Our poll of Willys owners seems to indicate that its biggest weakness is its price. While it's strongly competitive by performance in the low-price field, it suffers price-wise, many owners feel.

The replies we received showed conclusively that Willys is regarded by owners as competition to the dominance of Ford, Chevrolet and Plymouth in that price group—if Willys prices were reduced to the same level. Eighty-three percent of owners polled indicated general satisfaction with their cars but thought they paid \$150 to \$200 too much for them. The public seems to regard the Willys as no better or worse than its competitors, and feels the price should be in accordance.

A Tulsa, Okla., mechanical engineer summed up this opinion when he wrote: "The new Willys partially fills the need for a quality small car, maneuverable without

needing a complicated power-steering system. I suggest, however, that a determined effort be made to hold the delivered price below that of Chevy or Ford."

From a Lawrence, Mass., investment broker: "This car should sell for \$250 less, even if at a loss, at first. Then I am willing to wager that it would be up near the top within five years . . ." A Meriden, Conn., truck driver wrote: "I think that if Willys is given a fair amount of time to complete improvements and adjust prices to those of The Big Three, it will provide hard competition. My Willys will outperform any one of the three in acceleration and top speed."

A Baltimore, Md., steelworker said, "Willys' cost is high but gas mileage makes up the difference." Several owners, such as a Los Angeles traveling salesman, emphasized the favorable economy aspects of the Willys. Reporting 26 miles per gallon for city driving and 31 miles per gallon for country driving, he wrote: "With taxes and other expenses climbing, I bought a Willys to try for economy . . . It is excellent."

While most owners were equally favorable on the gas-mileage question, some felt they had been "oversold" on economy at 35 miles per gallon. (Such mileage is obtained by carefully tuned cars, expert drivers and lower speeds than most drivers maintain.) The final averages in the survey

← Willys' turning circle is 21 feet inside, 38 feet outside — not exceptional for its short wheelbase

Percentages From PM Poll

Owners of Aero Wing models	72%
Ace models	24%
Lark models	4%
Owners of overdrive-equipped models	94%
conventional transmission only	6%
Owners using regular gasoline	70%
premium gasoline	30%
Average gasoline mileage in country driving—	
Wing and Ace models	27.3 m.p.g.
Lark models	26.4 m.p.g.
Average gasoline mileage in city driving—	
Wing and Ace models	22.9 m.p.g.
Lark models	21.8 m.p.g.
(Overdrive-equipped car owners reported 2-4 m.p.g. better than ones with conventional 3-speed transmission)	
Average mileage for change of oil	1638
Owners who add oil (also change periodically)	11%
Average mileage for adding one quart	1325
Roadability excellent	74%
good	23%
unsatisfactory	3%
Maneuverability excellent	85%
good	14%
unsatisfactory	1%
Acceleration exceptional	23%
very good	58%
average	14%
poor	5%
Road clearance satisfactory	95%
too low	5%

OWNER COMMENTS ON PARTICULAR FEATURES

	Like	Dis- like	No Com- ment
Visibility, front and rear	97%	0%	3%
6-cyl. F-head Hurricane engine	90%	2%	8%
Riding qualities	90%	4%	6%
108-inch wheelbase	79%	6%	15%
Pull-type door handles and locks	78%	14%	8%
Drawer-type glove compartment	57%	32%	11%

(These percentages are based on answers to direct questions asked in questionnaire—some commented on more than one feature)

OWNERS' RATING OF CAR

Excellent	47%	Average	11%
Good	36%	Poor	6%

GENERAL INFORMATION

Owners preferring the following on next new car:	
In-line engine	74%
V-type engine	26%
Six cylinders	78%
Eight cylinders	18%
Four cylinders	4%
F-head valve arrangement	73%
Overhead valve arrangement	17%
Side valve location	10%

No increase in horsepower output	87%
Average horsepower output desired	59
(Respective Willys horsepower figures—90 or 75—were tabulated for those owners who expressed satisfaction with present ratings)	
Conventional transmission with overdrive	78%
An automatic-transmission unit	17%
Conventional transmission only	5%
Hydro-Matic drive particularly	36%
Other type of automatic transmission	9%
No make stated in preference	55%

Percentage of the 17% preferring automatic transmission units	
Previous owners of Willys-built cars	50%
Will buy another Willys	55%
Might buy another Willys	35%
Will not buy another Willys	10%
Dealer service rated excellent	32%
good	21%
average	19%
poor	28%

Chief purchase reasons (in order of popularity):

1. Economy of operation expected
2. Styling features—interior and exterior
3. Previous satisfactory Willys ownership
4. Driving ease—roadability and handling
5. Mechanical features—engine, transmission, etc.
6. Trade-in allowance received on previous car
7. Maneuverability due to size—ease of parking specifically
8. Riding qualities, comfort of seating, etc.

Improvements desired in next new car (in order of popularity):

1. Increased legroom, front and rear
2. Better body fitting, assembly, workmanship
3. Increased power—more acceleration, top speed
4. Higher quality interior trim and upholstery
5. Heavier, more spacious car in general
6. Longer wheelbase
7. Mechanical improvements generally—for convenience, accessibility
8. Increased gasoline economy
9. An automatic-transmission unit
10. Better quality paint and chrome trim

Most frequent objections:

1. Body fitting, poor assembly or workmanship
2. Inadequate legroom in front and rear
3. Loose or poorly fitting hub caps
4. Cheap interior trim and upholstery
5. Gear-shifting difficult and noisy
6. Body-styling features—only two doors, short wheelbase
7. Lower-than-advertised gasoline economy
8. Door locks and handles thin or faulty
9. Dealer service inadequate, unsatisfactory or lacking
10. Noisy engine and transmission units
11. Brake and clutch pedals too close together

Clymer rates the Aero excellent on hill climbing. It topped this 32-percent grade at 24 miles per hour



Short, sloping hood provides close-up vision. The driver can see the road only 10 feet ahead of bumper



CLYMER COMMENTS ON WILLYS PRICES

"When will we get back to the \$1000 automobile?" many persons ask. True, the small car takes a little less steel—not very much less than the amount used on the large car; however, the added cost is not so much in the material as in production, where labor costs both in separate units and in the completed car are at an all-time high.

It costs just as much to mount a tire on a Willys as it does on a Cadillac, takes just as long to install a windshield on a Henry J as it does on a Packard, and requires just as much time to attach the wheels to a Nash Rambler as to a Lincoln. Therefore, there is no saving in labor costs on many important operations in small-automobile assembly, because the Willys, Rambler or Henry J

workman makes just as much per hour as the man who builds a Chrysler or a Cadillac.

We will get the \$1000 car when we go back to the days of \$25 a week for a stenographer, 50 cents an hour for labor—or even the "fabulous" \$5-a-day salary that Henry Ford originated (and millions thought he was crazy), the 15-cent banana split, 5-cent hamburger or hot dog, the nickel street-car fare, and the familiar "All you can eat for 49c" signs that once appeared in city restaurants.

So why kid ourselves? The \$1000 car has gone forever, and I doubt that many would care to return to what we sometimes call "the good old days" just to be able to buy a \$1000 automobile.

show that Willys owners receive the exceptionally good average of 27.3 miles per gallon in country driving and 22.9 miles per gallon in the city.

Some opinions were:

"I've owned Willys cars for 10 years. All were good but the Ace is finest of all and better than any other low-priced car, in my opinion."—Springfield, Ill., carpenter.

"It is a good car and I am pleased with it. However, I was a little disappointed in the gas mileage. I average 25.5 in the country and 21 in the city."—Big Spring, Tex., pharmacist.

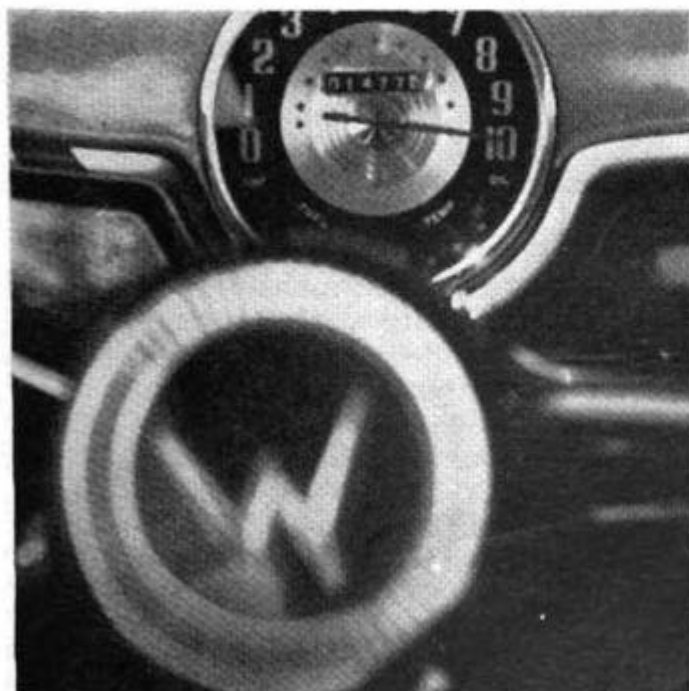
"My Willys is tops. Easy to handle and cheap to run. Better than my last car, which cost \$3300. Would like more protection for grille and a splash pan on right side of engine for better water and mud protection."—South Bend, Ind., farmer.

A Biltmore, N. C., news-route man said

he was satisfied with his mileage figures of 28 miles per gallon in the country and 21 in the city, and wrote: "I make more than 900 starts and stops daily delivering newspapers and drive 1000 miles a week, so gas mileage is my main interest. The Willys does very well and rides satisfactorily."

"My Willys' cost was high but I quickly make it back in gas, oil and operating economy. It's a great car."—Denver, Colo., contractor.

Several owners agreed with a Wytheville, Va., insurance salesman, a Denver crane operator and a Jersey City, N. J., businessman that the Willys Aero Wing and Aero Ace ride like heavier cars with equal power, speed, acceleration and maneuverability. Another strong Willys selling point was the interior and exterior styling; several owners, such as a Birmingham, Ala., ironworker, said their main reason

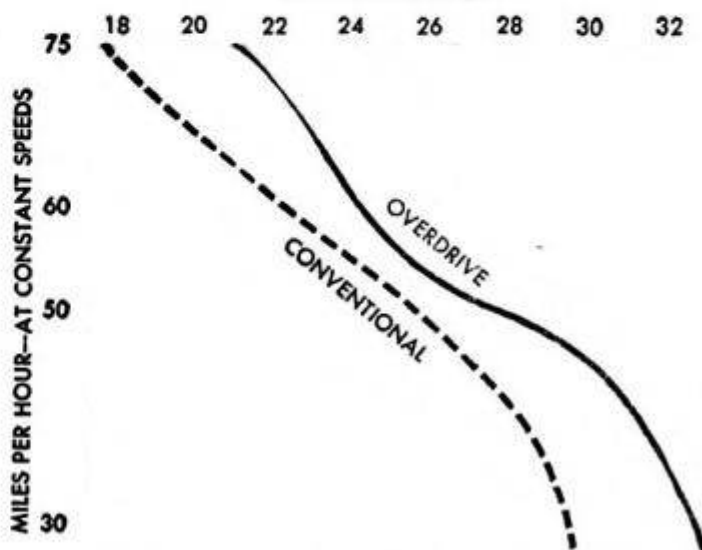


Not recommended is this stunt of Clymer's. He shot a photo while driving car with speedometer at 100

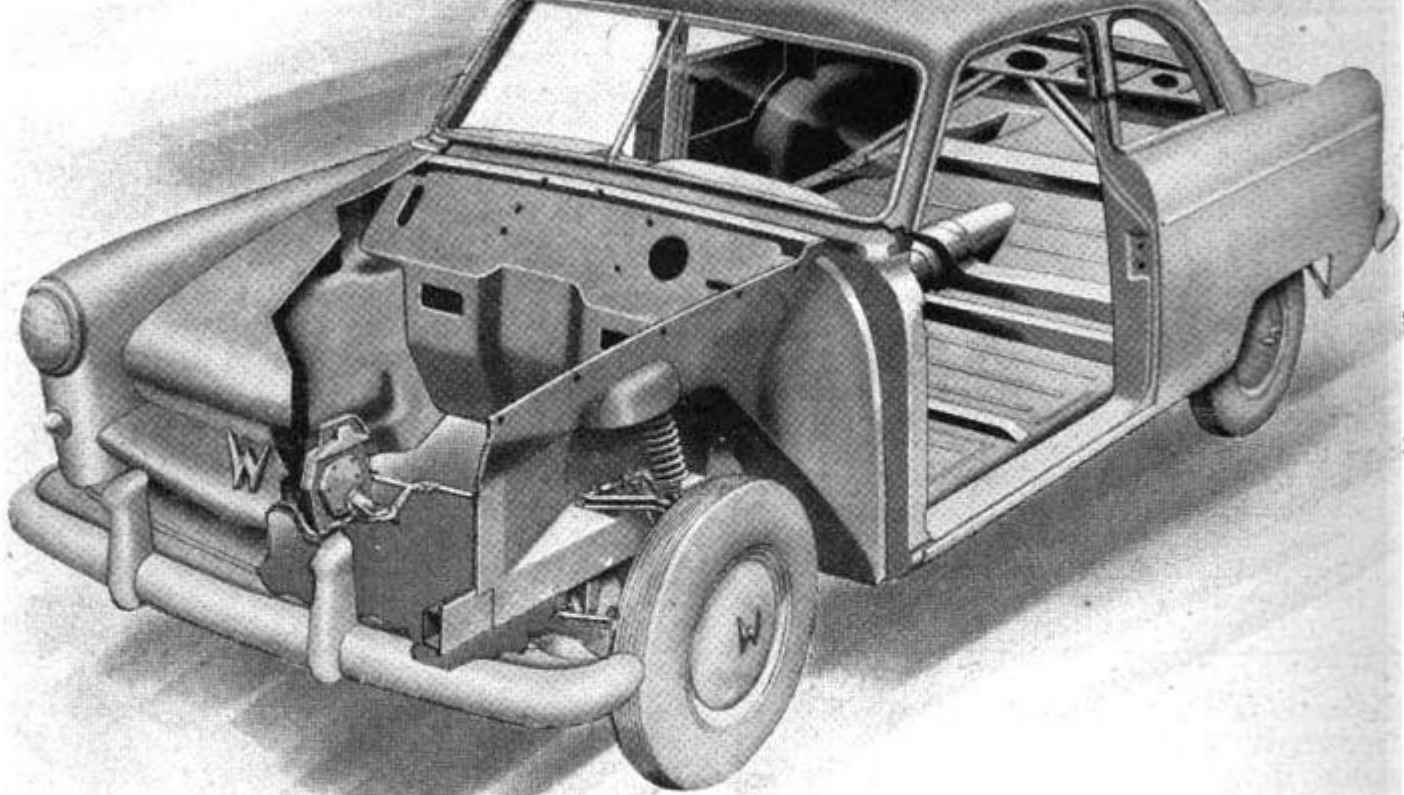
ECONOMY TEST

With conventional and overdrive

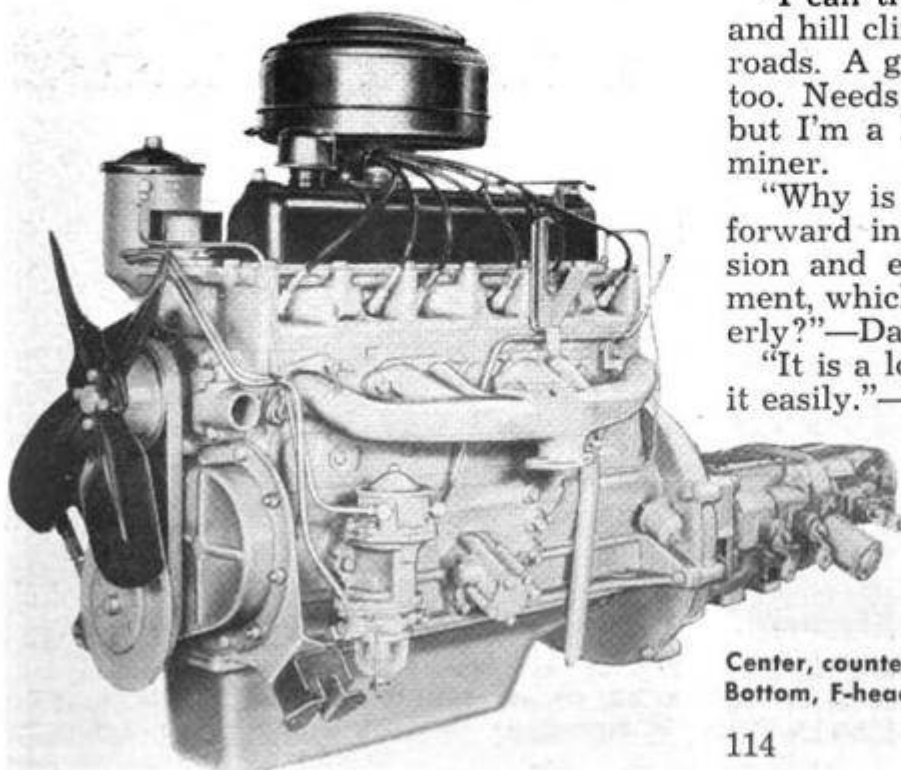
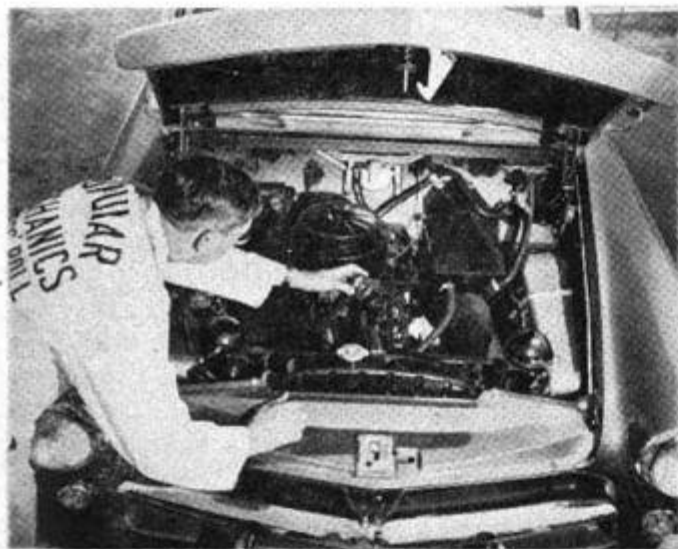
MILES PER GALLON



Regular gas was used on constant-speed mileage test. At 60, the overdrive Willys made 24 miles a gallon



Willys adopted unit construction for added strength and less noise. Sketch shows front-spring location



for purchase was the car's sleek body lines.

Some owners, including a Lake Wales, Fla., teacher and a Jackson, Miss., service-station owner, liked everything about the car but wished it had four doors.

Comments also included:

"I put 29,000 miles on my Willys in six months. I carry newspapers to many towns, making hundreds of stops daily and drive long hours at high speeds. Get wonderful mileage. Best-handling car I've ever used."
—Boise, Idaho, newspaper-route man.

"Best power-to-weight ratio on the U.S. market. In this respect Willys is going in the right direction—not far enough for me, though. Riding comfort need not be sacrificed, it just takes a bit more effort on the suspension."
—Silver Spring, Md., industrialist.

"I can trim 9 out of 10 cars in getaway and hill climbing in the winding mountain roads. A great performer and economical, too. Needs little heavier metal in the body, but I'm a happy owner."
—Denver, Colo., miner.

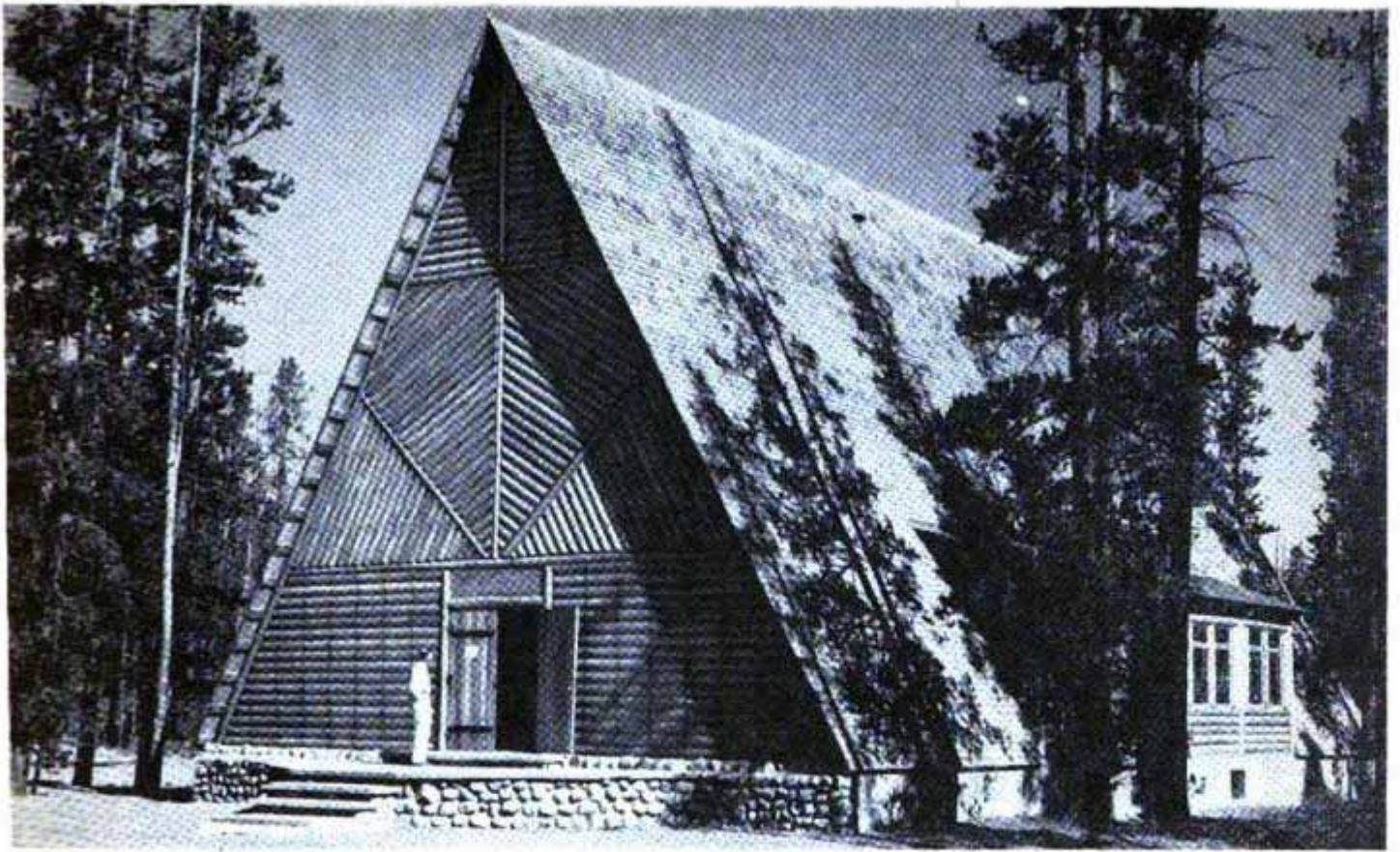
"Why is it they don't put four speeds forward in a conventional-type transmission and eliminate the overdrive attachment, which sometimes doesn't work properly?"
—Davenport, Iowa, mechanic.

"It is a low car and my wife can handle it easily."
—Oakland, Calif., painter.

"Best road holder I ever drove. No feeling of a small car. It's economical and I can do 95 to 100 miles per hour for mile after mile in overdrive.

(Continued to page 258)

Center, counterbalanced hood requires no support rod.
Bottom, F-head engine has 7.6-to-1 compression ratio



This striking church rears its roof almost as high as surrounding pines and sheds heaviest mountain snowfalls

Rustic Church in the Woods Built to Defy Winter Snows

WHEN CITIZENS of West Yellowstone, Mont., decided to build a church, they wanted a structure that would withstand the heavy snows of a high-altitude mountain area. Conventional buildings in the little town at the gateway to Yellowstone National Park required constant shoveling to keep roofs free of crushing snow.

Last winter a snowfall of 211 inches had the village almost buried, but the completed church, Our Lady of the Pines, stood safe and serene, its 65-degree shingle roof shedding snow like a duck's back.

Built entirely by community labor, the beautiful, rustic church has a floor area of 45 by 90 feet. A low wall of cobblestones and concrete supports the combined roof and walls at the lower ends. Ten-inch log rafters, 40 feet long, extending from lower supports to gable, are set on 10-foot centers.

Eight-inch log cross-ties are notched and bolted into the rafters. To these, at the center, trusses of similar size extend to the rafters at a 45-degree angle, all joints being accurately fitted and secured with half-inch bolts.

To further strengthen the roof, a pattern of cross logs supports the shingled roof directly under the sheathing. The pleasing herring-bone effect on front and rear, with



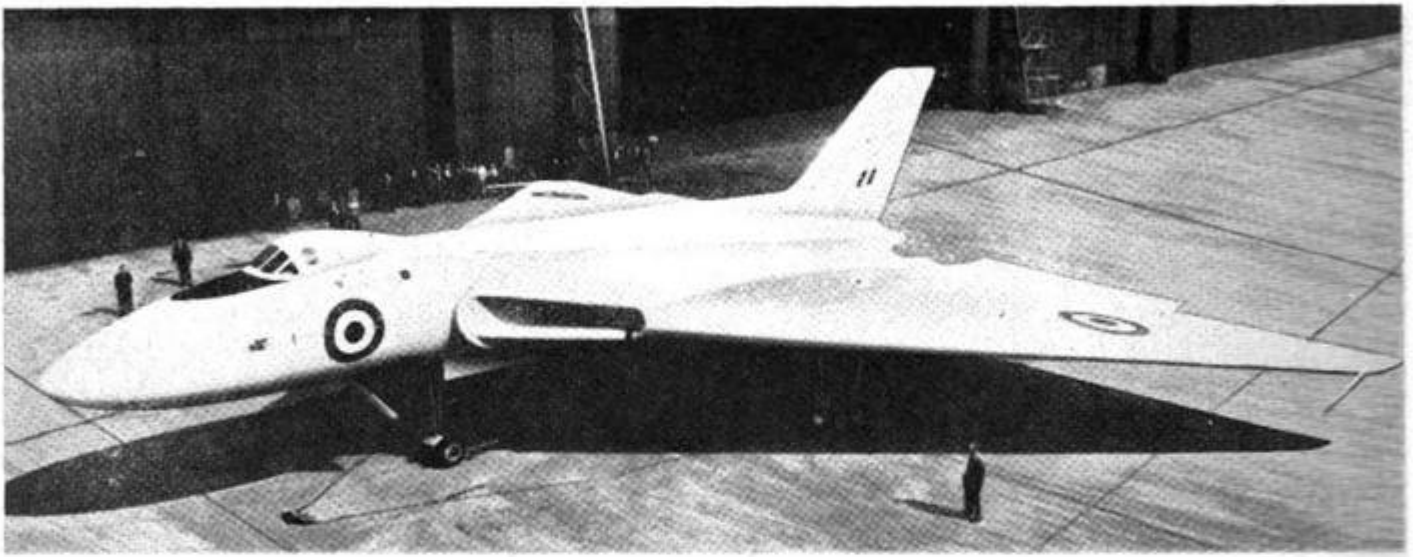
Rugged strength combined with simple beauty characterizes the interior of homemade church at gateway to Yellowstone Park

logs accurately fitted and spiked into place, adds strength as well as beauty.

All logs were peeled, oiled and varnished in their natural color. They came from the surrounding lodgepole pine forest, and were chosen for matching size and straight lengths.

Broad windows fitted with stained glass let into each side, admitting a soft light in keeping with the rich, golden color of the finished pine interior. Here is appropriate simplicity, pews made of the native pine and a modest altar rising a few steps above the floor.

Dedicated in 1950, the church is open at all times to the tourists of Yellowstone.



British Triangular-Wing Jet Bomber Scheduled for Production

Britain's new four-jet, triangular-wing heavy bomber, the Avro 698, demonstrated good maneuverability during a 36-minute first flight, according to test engineers. Production models will have Bristol Olympus

turbojet engines, rated in the 10,000-pound-thrust class and now installed in a flying-test bed rig on a Canberra bomber. The 698 is believed capable of approaching the speed of sound.

Switchyard Television Facilitates Movement of Rolling Stock



Small industrial-TV cameras and receiving systems may soon be used in major railroad yards to save wear and tear on both rolling stock and personnel. In a Chicago demonstration, three receivers were installed in a control room manned by supervisors and checkers. Views on two of the screens were picked up by cameras mounted on swivel bases atop a 60-foot tower, giving an over-all picture of the yard and a close-up of the tracks leading in. A checker sat before a third television screen and recorded car numbers as trains passed before an unattended track camera. The cable-connected system makes trips through the yard by the checker unnecessary and allows supervisors to move cars and engines along the shortest possible routes. The unit consists of a small, lightweight camera about the size of a 16-mm. home-movie device and a combination monitor, power supply and controller housed in a luggage-type case. Heart of the new industrial camera is a supersensitive tube only one inch in diameter and six inches long.

☐ More than 50,000 single-engine private aircraft are in use in the United States, compared with approximately 540 four-engine and 12 trimotored planes.



Pulse-jet engines at the rotor tips give the Army's new one-man helicopter an 80-mile-per-hour top speed

Helicopter Has Pulse-Jet Engines

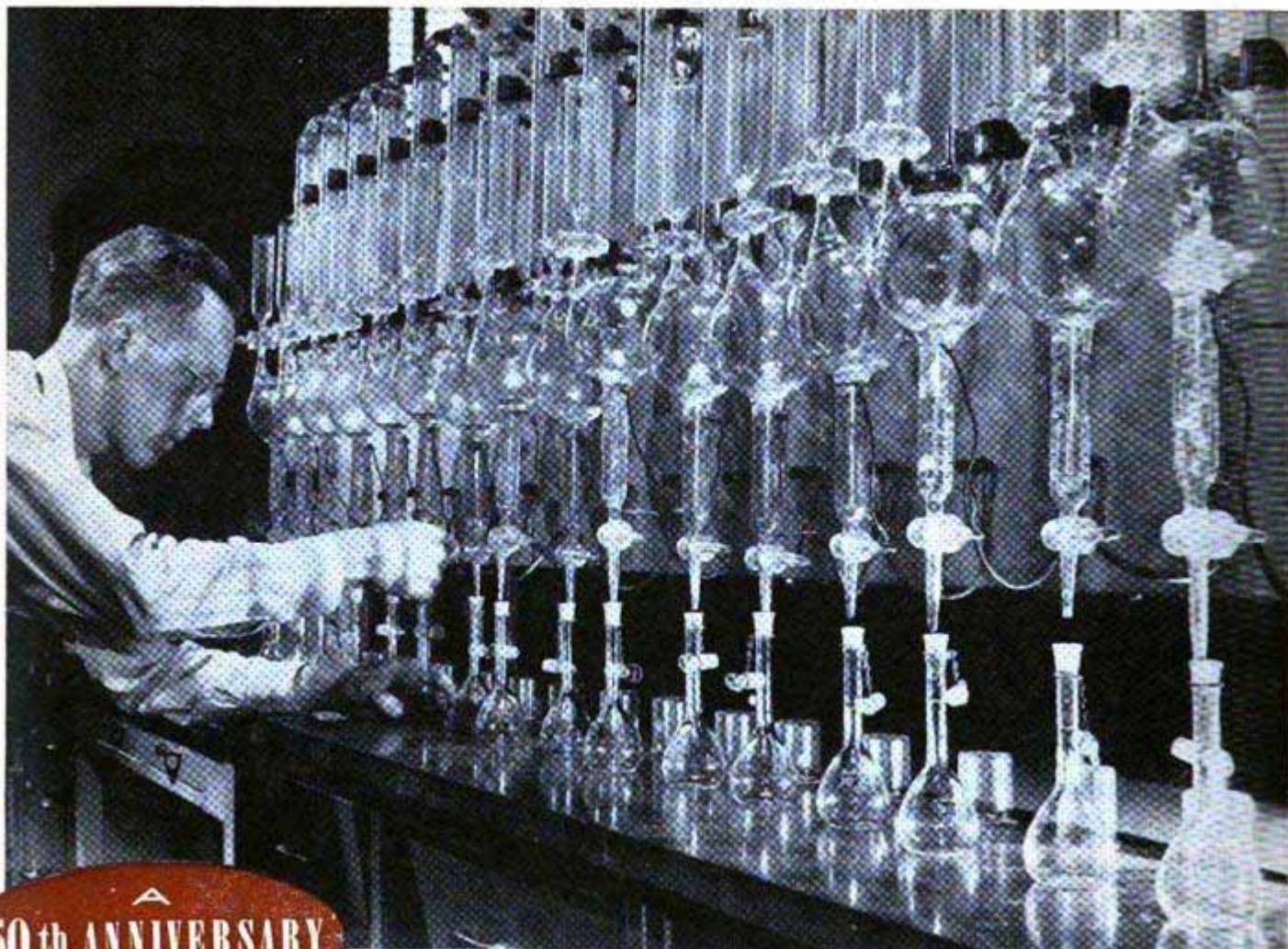
A TINY one-man helicopter that can climb straight up into the air like an elevator has been developed for the Army. The XH-26 is powered by noisy but efficient pulse-jet engines attached to the tips of the rotor blade. The Jet Jeep helicopter can be collapsed into a small package for delivery by parachute to ground troops, or towed knocked-down in a small trailer behind a Jeep. It is six feet high, weighs 300 pounds and can lift twice its weight. The craft's top speed is 80 miles per hour.

Pilot flies "hands off" to show XH-26's stability. The machine can maintain altitude on only one engine



Knocked down, the helicopter is easily transported. Tail rotor in pilot's hand, below, improves steering





Standard Oil Co. of N. J. photos

Laboratory tests of gasoline mean better fuels and more powerful engines

**50th ANNIVERSARY
FEATURE**

REVOLUTION in the

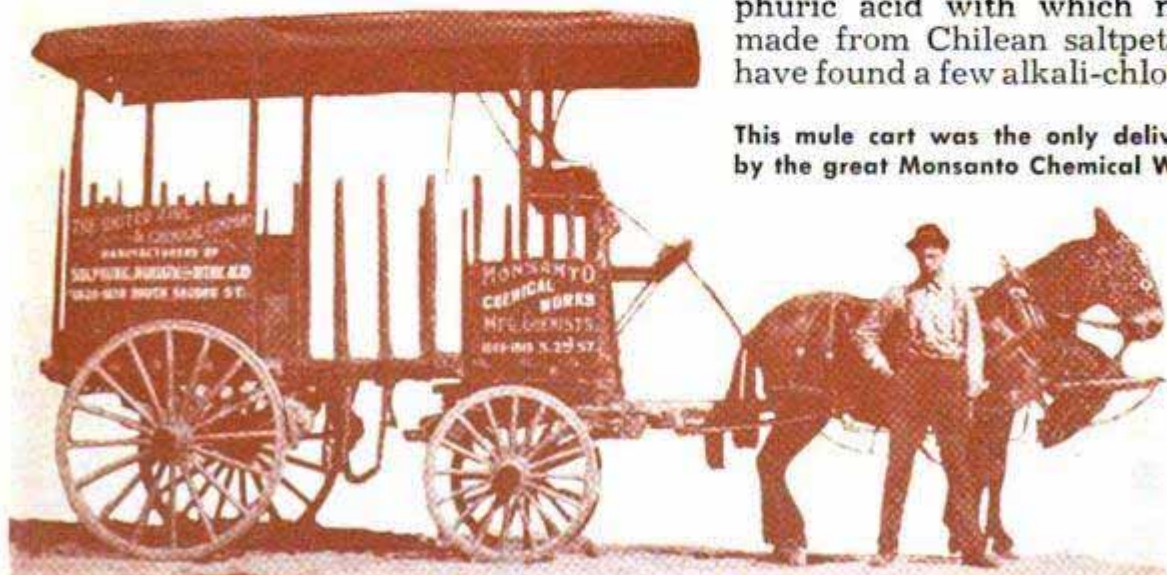
Americans can be proud of their miracle-making chemical engineers who, in the last 50 years, moved the chemical center of the world from Germany to the U.S.

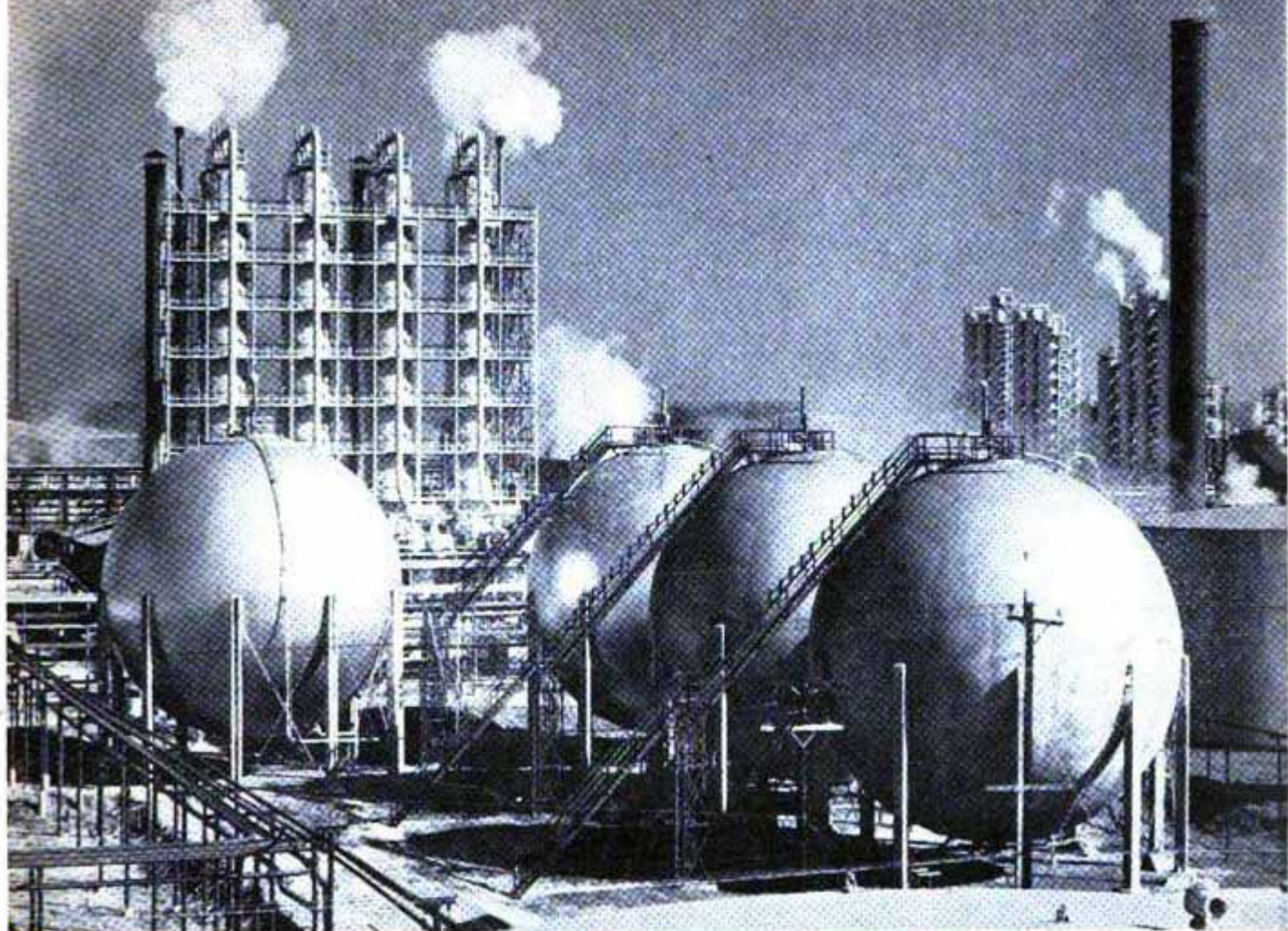
By Edgar C. Britton

President, American Chemical Society

THE AMERICAN CHEMICAL industry, although older than 50 years, at the turn of the century was but a skeleton of what it is today. By far the larger part of the worldwide chemical industry was centered in Germany, where dyes, pharmaceutical and heavy chemicals had been produced in substantial quantities. The U.S. had a few heavy chemicals such as sulphuric acid with which nitric acid was made from Chilean saltpeter. One would have found a few alkali-chlorine plants very

This mule cart was the only delivery wagon owned by the great Monsanto Chemical Works back in 1905!





The sky line of this modern oil refinery would have seemed like something from Mars to the chemist of 1902

TEST TUBES

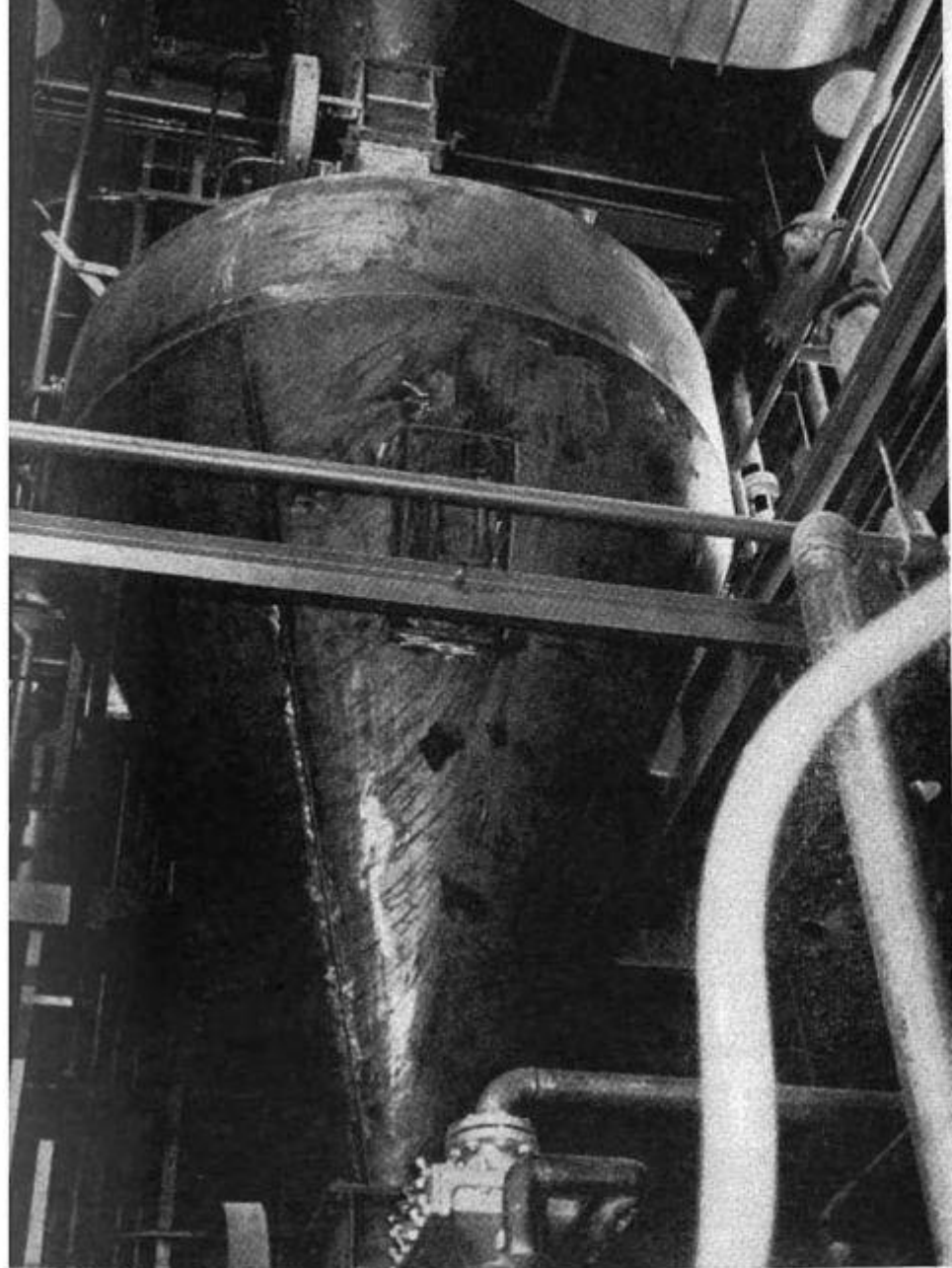
small in comparison with today's industry. One would also have found a small Solvay process for producing soda and soda ash, a few plants for producing bleaching powder and a few pharmaceutical firms for manufacturing drugs from natural products.

We had a soap industry which produced glycerin for dynamite, but synthetic detergents were unheard of at this early date. We had a coal-distillation industry which produced some coke for the steel industry, but by far the greater amount of steel was produced with charcoal. This charcoal was usually the only product from the carbonization of wood, but a few plants for handling the by-products such as wood alcohol and acetic acid were in existence.

Back in 1902, we had no plastics industry, no synthetic-fiber industry, no agricultural-chemical industry, no gasoline and petroleum industry, no alloy-steel industry, no synthetic-medicinal industry, no antibiotic industry and no idea of atomic energy. We have all these industries today because of the work of the chemist, the engineer, the physicist, the physician, the laborer and the

executive. It is our purpose to take a look into these industries and see what 50 years of chemical advance have done.

The greatest industry in the U.S. is the transportation industry embracing automobiles, trucks, railroads and airplanes. These can all be taken together since they are primarily based on the use of metals, especially iron. Other metals such as aluminum, copper, magnesium, vanadium, tungsten, nickel, chromium and others find their way into this industry. The modern automobile and truck are assemblages by engineers of the products of the chemical industries. Primary iron is produced from iron ore by a chemical process and its various alloys with carbon, vanadium and molybdenum are all part of the structural steels used in our gasoline-driven vehicles, railroad engines, rails and airplane parts. The lightweight metals, aluminum and magnesium, are too weak as pure materials, but alloyed they find their use especially in the airplane structure. Magnesium is produced from sea water and since one cubic mile of sea water contains 9,000,000,000 pounds of



J. I. du Pont de Nemours & Co. photos

This huge automatic weigh tank installed in a modern plant manufacturing plastic fibers is symbolic of a giant industry created by chemists. Below, continuous-filament yarn feeds from creel in processing operation



magnesium, it is perhaps our most-available metal. In fact, if magnesium were taken from the ocean at the rate of 100,000,000 tons a year for the next million years, the ocean supply would be reduced only seven percent. This is reassuring not only to big producers like the Dow Chemical Company but to the nation at large.

The electroplating of metals to make the nickel and chrome finish on the decorative as well as useful parts of autos has come to us only during the last 50 years, although the principles underlying this industry have been known to chemists and physicists for years.

Before World War II all of our rubber was manufactured from natural rubber, but owing to the large use for rubber and our curtailed supply the synthetic-rubber industry was established. Made as it is from two unusual hydrocarbons, styrene and butadiene, both manufactured from petroleum products, ample supplies are available. The industry founded on synthetic rubber has expanded and grown. Just for the record, the pioneering work on neoprene had already started before the war. We older people all remember the 3000-mile auto tire of 1910 and later, but most of us do not appreciate the work in the rubber-research laboratories which gives us our 30,000-mile tire.

The gasoline used in autos and trucks today was not known 50 years ago, but lead tetraethyl and ethylene dibromide changed all gasoline to good gasoline. The bromine for ethylene dibromide comes from sea

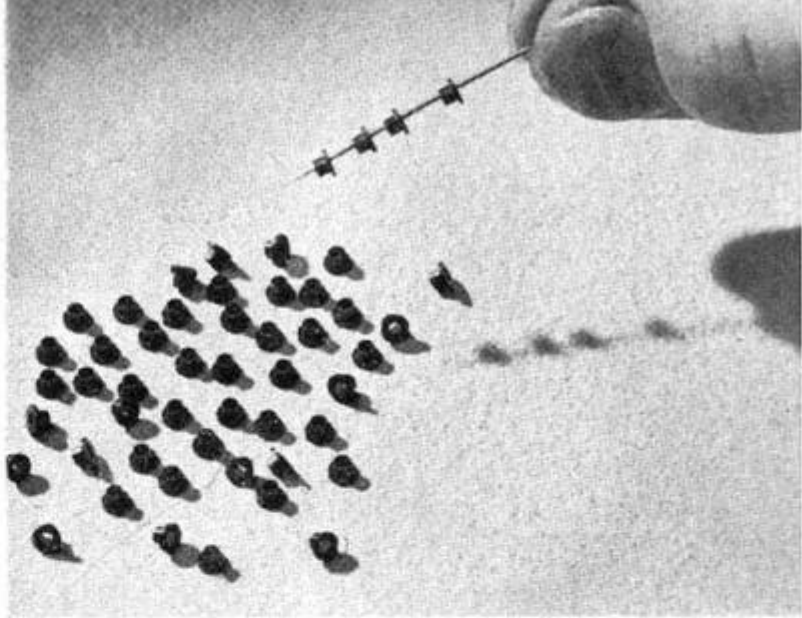


A. Mour & Co. photo

Chemical research aids medicine. Here a flask of pure ACTHAR solution is placed in a vacuum drier

water. The amount of gasoline also obtainable from crude oil has increased so that there is no foreseeable shortage, although processes for producing gasoline from coal are being projected by the government. Lubricating oils today last longer and furnish better lubrication due to the research work of the chemist and engineer; in fact, a great deal of our advance in transportation is due to our present high-pressure lubricants.

The winter coolants for our cars have all come about within the last 50 years due to the production of ethylene glycol and alco-



These tiny bushings are believed to be the smallest molded of Bakelite — used in jewellike instruments

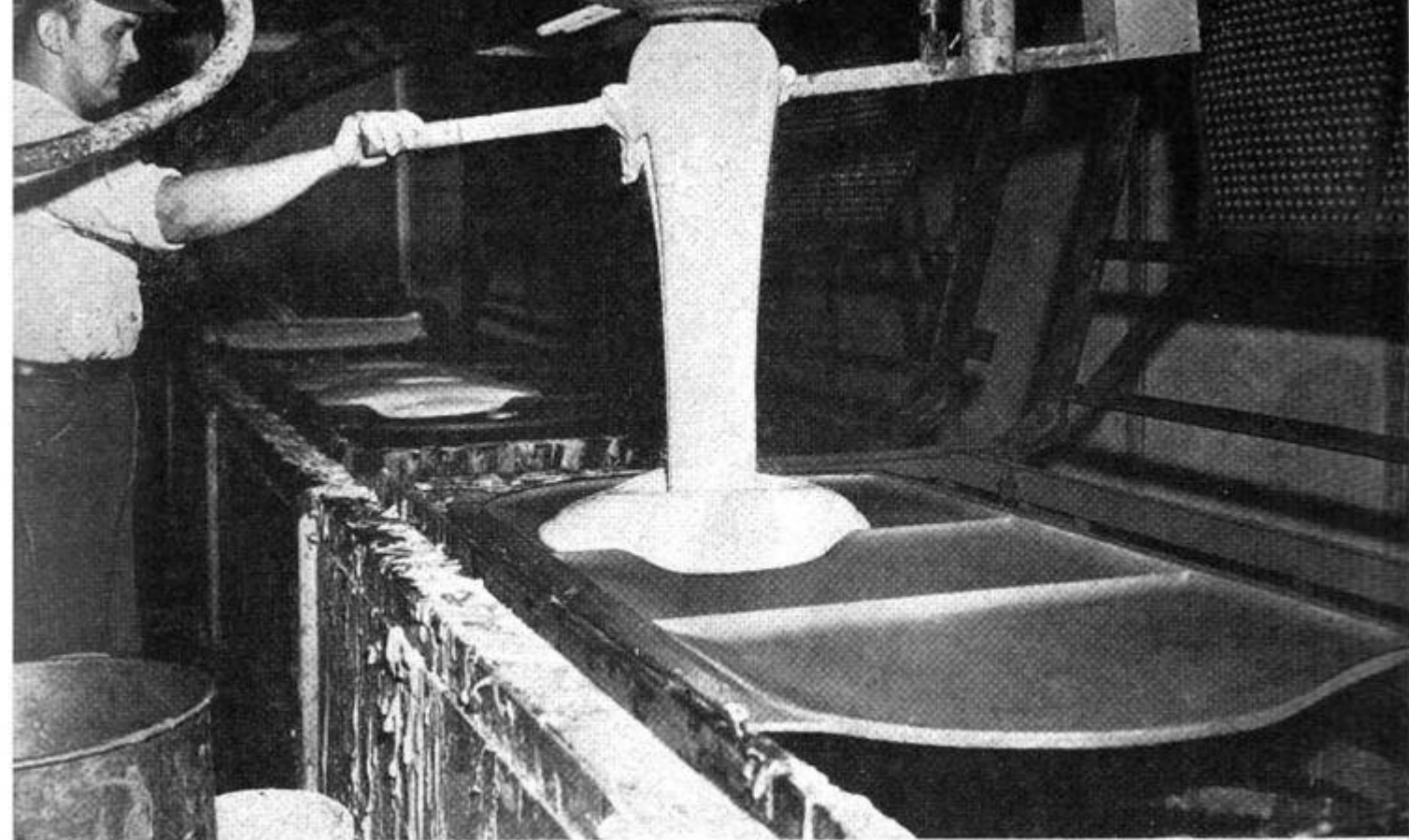
hol and inhibitors which prevent corrosion of these coolants in the gasoline engine. These glycols also form a large part of the brake fluids which appear in our hydraulic brakes.

A fairly recent family of chemicals, the silicones, has come along to help out the transportation and other industries by being the base for high-temperature electrical insulation, vibration dampener, high-temperature rubber, car polish and a host of other uses where stability, water repellency and other properties are needed.

Another great industry where chemicals

These machines are autoclaves in Du Pont nylon plant where small molecules are joined to make large ones





Goodyear Tire & Rubber Co. photo

Odorless manmade latex is shown flowing into molds where it will later be cured as foam rubber of many uses

play a vital part is the food industry. Without agricultural chemicals such as DDT, benzene hexachloride, lead arsenate, dithane, fermate and a long list of insecticides and fungicides, the growing of fruit and vegetable crops would not be at its present high level. In the back yard we can have vegetable gardens, a fruit tree or two and we will do pretty well, but multiply this into acres and the pest and fungus problems multiply many fold. Those nice apples, oranges, peaches and pears were all grown with the help of insecticide and fungicide sprays and perhaps dipped in a nontoxic

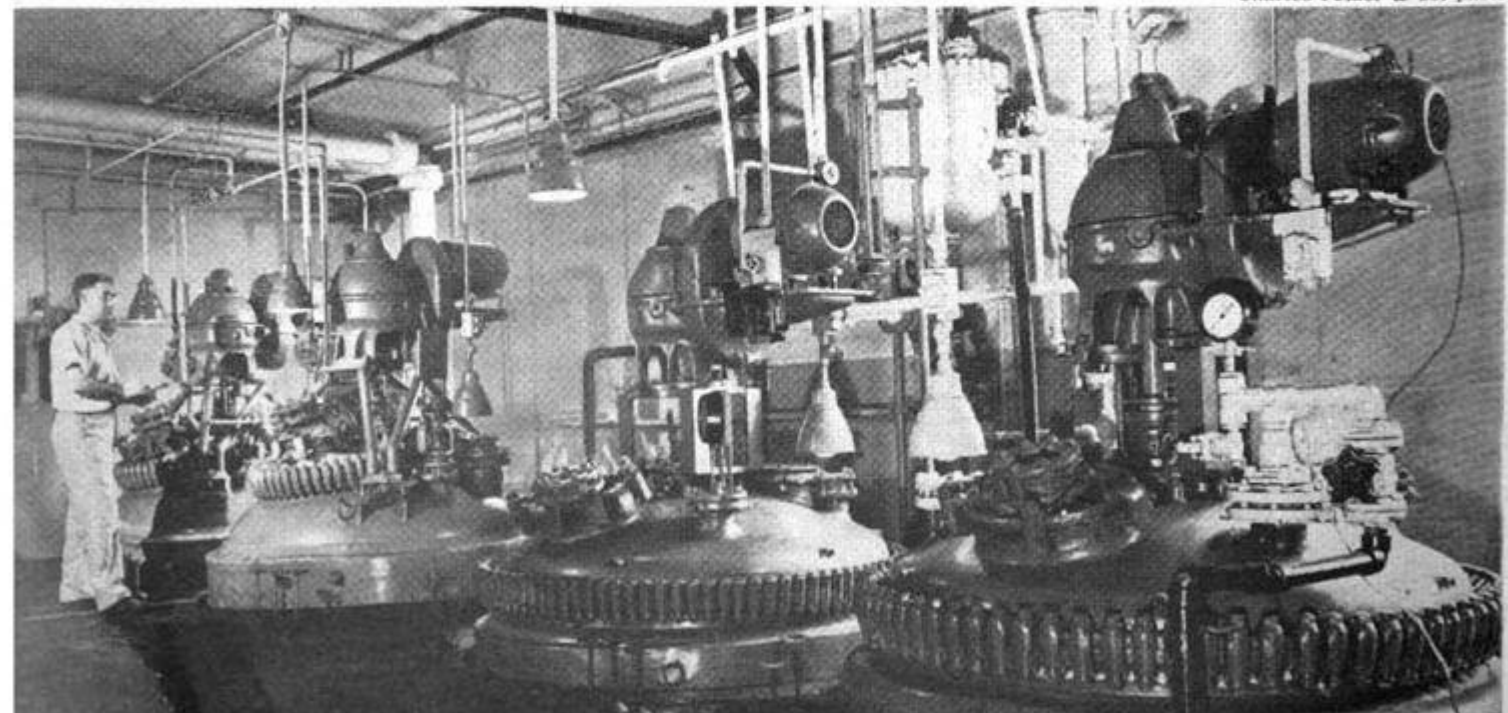
preservative solution to preserve them during shipment. Of course it is axiomatic that fertilizers were used in growing these crops, but it is only in recent years that ammonia has been used as a source of nitrogen fertilizer which is also obtained from ammonium sulfate, urea or nitrates.

In World War II came the introduction of our weed killers and plant hormones. Most of our weed killers were inorganic salts such as sodium arsenite, sodium chlorate or just ordinary salt. But these weed killers sterilized the soil so that crops could not be

(Continued to page 268)

These strange machines are terramycin-processing vessels. Chemists play important role in making new drugs

Charles Pfizer & Co. photo





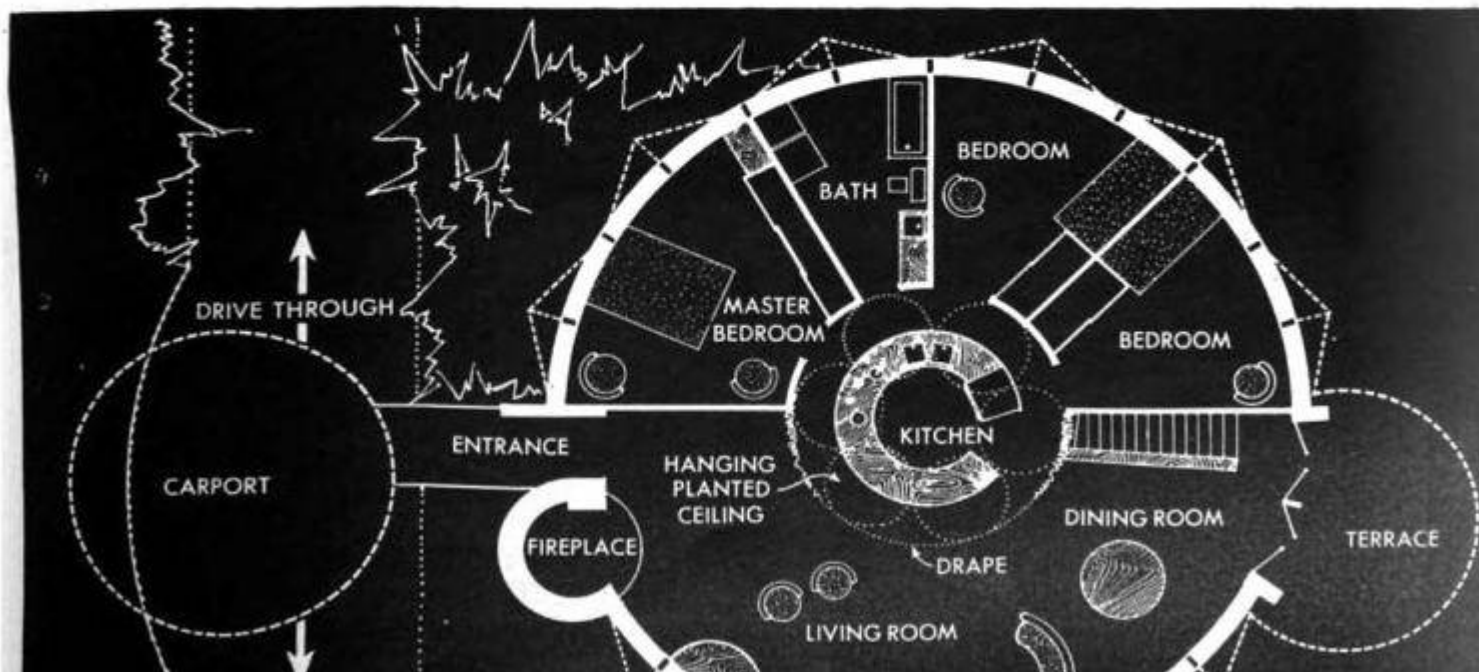
The earth itself forms outer wall of this round house with concrete dome; round chimney is for fireplace

“Sunflower House”

COBWEBS will never collect in the corners of James Dresser's new house in Madison, Wis. There aren't any corners. Dresser, a young architect, calls his home the “sunflower house” because it resembles the flower in shape. It is made of concrete with a fringe of peripheral windows where the dome meets the wall. Light for all rooms comes from a six-foot round skylight. This is possible because the interior partitions, which are made of cork, are only 7 feet high and the dome's center is 14 feet above the floor. The diameter of the outer walls is 40 feet. The dome was framed with standard metal Quonset ribs covered with strips of wood and wire mesh to hold the concrete. A feature of the house is a translucent-plastic floor in the kitchen which serves as a skylight for the basement. Recreation room, workshop and heating plant are in the basement. The heating plant is a hot-air perimeter system. Cost of the house is estimated at \$17,000.



Slanting circular carport roof is made of plywood molded on the job. The floor plan below covers 1800 square feet. Beneath center skylight are hanging bowls of planted greenery to form woodland ceiling





With a blast of smoke and flame a shell leaves the muzzle. Gun can lob a shell with an atomic warhead 20 miles

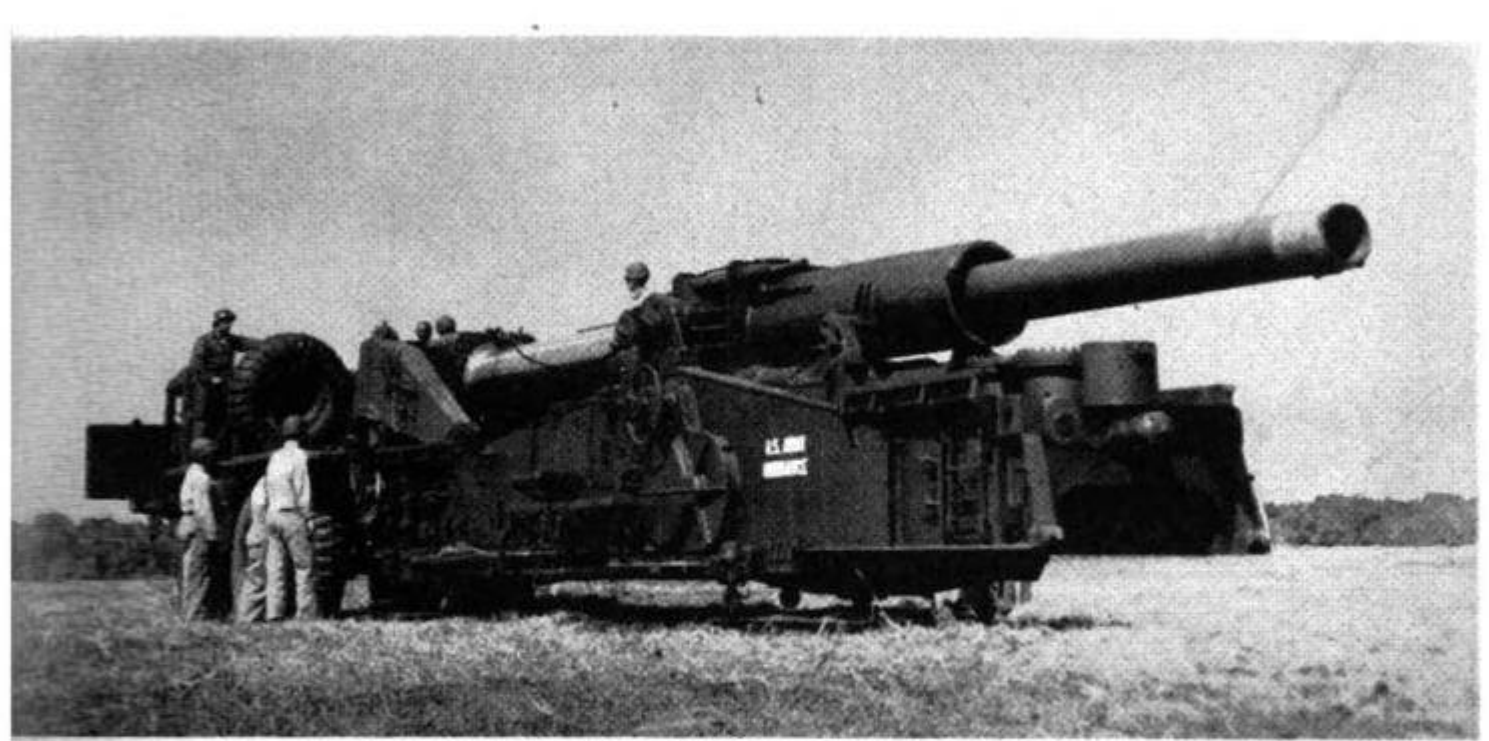
Army Unveils Atomic Artillery

WITH A reverberating boom the Army Ordnance Corps has blown the lid off one of its closely guarded secrets. The new weapon is a monster artillery piece capable of hurling an atomic shell a distance of 20 miles with pin-point accuracy. Packed for traveling, the 280-mm. gun is slung between two gigantic prime movers. At the firing site the traction units wiggle the gun into

position and a 12-man crew starts pulling pins and pumping levers. Hydraulic cylinders lower the gun to the ground. Out rolls the telescoping barrel. A hydraulic rammer slams home the projectile and powder, and the breech thuds into position. It is reported that the Navy is converting 16-inch guns on some battleships so they can fire atomic shells if necessary. ★ ★ ★

On road, gun hangs between engine cabs, making a unit 85 feet long. Drivers synchronize actions by telephone





Hydraulic cylinders lower the monster to the ground. Note how sections of the barrel telescope for traveling

↓ Long, sleek barrel rolls out 15 feet beyond its traveling length. One man pumps a lever to raise or lower jacks, leveling the carriage. Hydraulic power then will swing the barrel to maximum elevation of 55 degrees



Shell is wheeled to the gun on a dolly and hoisted aboard by a hydraulic lift built into the mount. Hydraulic rammer then slams home shell, powder charge and breech. A generator supplies power to hydraulic mechanisms

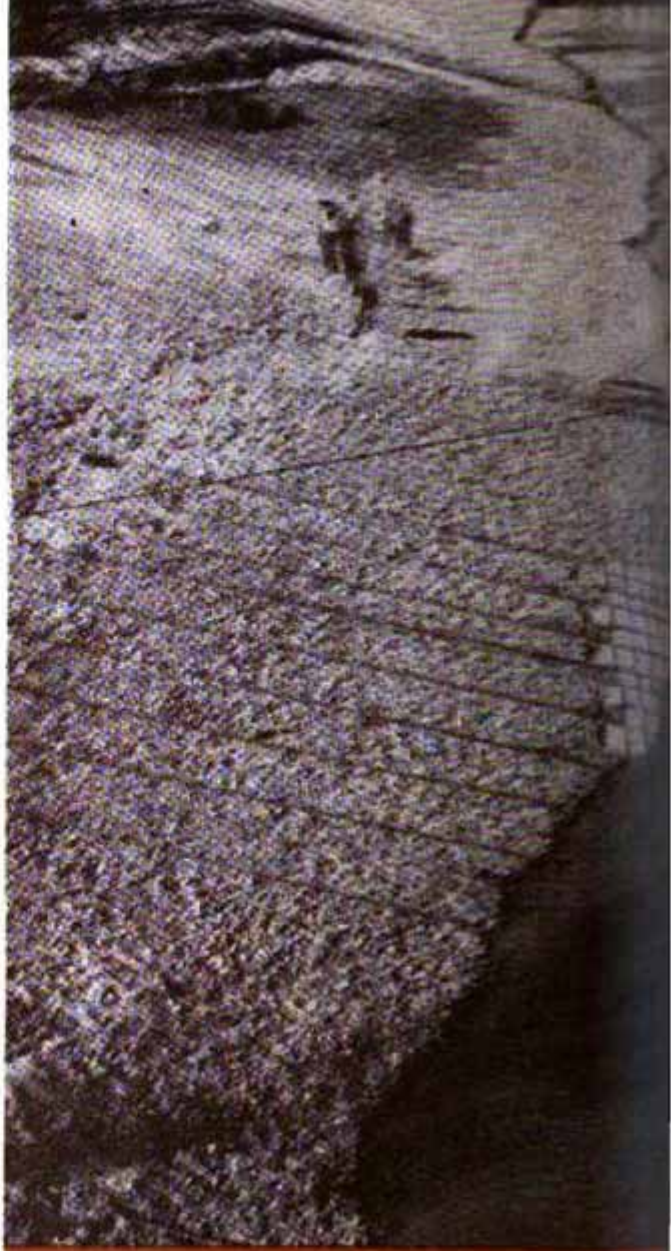




Above, concrete mattresses along the banks of the river prevent erosion and caving in of the Mississippi levees

Right, the concrete mattresses are assembled aboard huge barges and then are hauled up on the bank by long cables

Below, in the model of the Mississippi Valley, brush and trees along the banks are simulated by wire "accordions"

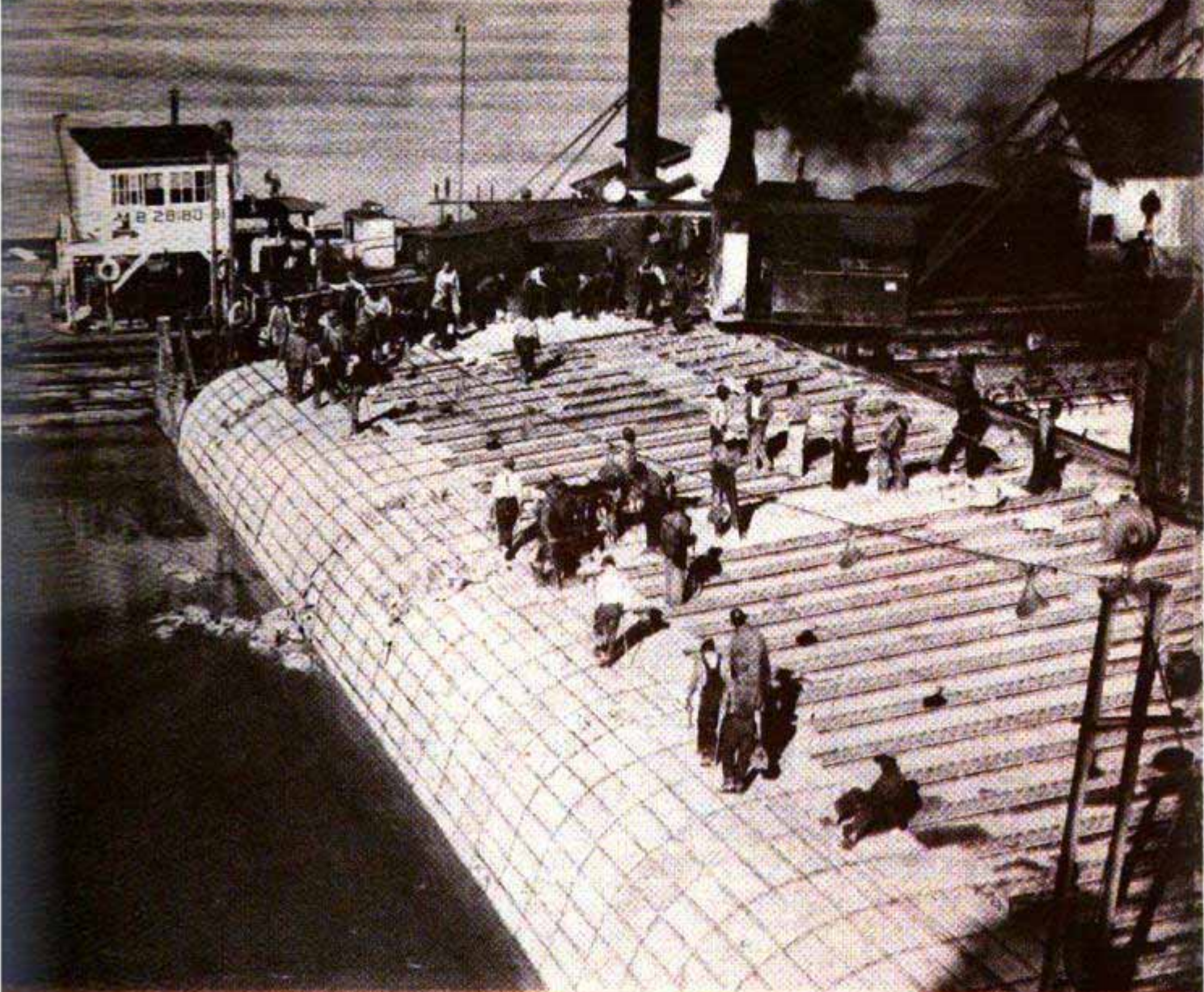


Strait Jackets

A RMY ENGINEERS are getting ready to make Ol' Man River behave and, recalling last spring's flood stories, most of us will say, "It's about time!"

Already parts of the river system have been put in a strait jacket. Now they hope to starve it into total submission. Several hundred dams are planned upstream on the Mississippi and its giant tributaries to catch flood waters and store them until it's safe to release the water downstream.

Eventually, one office will control the whole Mississippi Valley watershed—a tremendous area that spreads from the Rockies to the Appalachians and from Canada to the Gulf. The job will take years to complete because of its magnitude. The watershed covers 41 percent of the United States—all or



for Ol'Man River

*By Thomas E.
Stimson, Jr.*

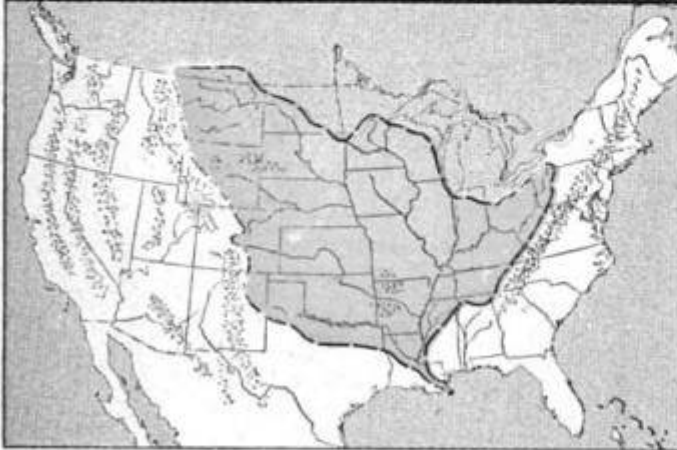
parts of 31 states. The Ohio, Tennessee, Missouri, Arkansas and the Red, among other large rivers, all empty their waters into the Mississippi.

To help decide the locations and sizes of the dams and other structures they need for taming the rivers of this enormous basin the Corps of Engineers is completing a hydraulic scale model of the entire river system. The model is located on a reservation near Jackson, Miss., as a suboffice of the Corps' Waterways Experiment Station at Vicksburg.

The model, under construction for years, occupies much of a square mile of ground and is not yet finished. Major portions of it, however, are complete and in use. The model is in the immediate charge of H. C. McGee under the direction of Col. H. J. Skidmore, director of the Waterways Experiment Station.

This miniature Mississippi basin goes all the way downstream to New Orleans. Previously built Vicksburg models duplicate reaches from below Memphis to above New Orleans, and from below New Orleans to the Gulf, although the latter reach does not present a flood-control problem.

As much as is practical the basin model is an exact-scale copy of the real rivers. Contours of the riverbeds are duplicated in scale; the concrete channels make every twist and turn that occur in the actual rivers. The amounts and velocities of water that flow through the model are keyed to the flows of the rivers. "Accordions" of pleated wire mesh are stacked along the banks of the channels to represent brush and trees. Small concrete or brass cubes on pegs on the bottoms of the channels duplicate the natural roughness of the riverbeds.

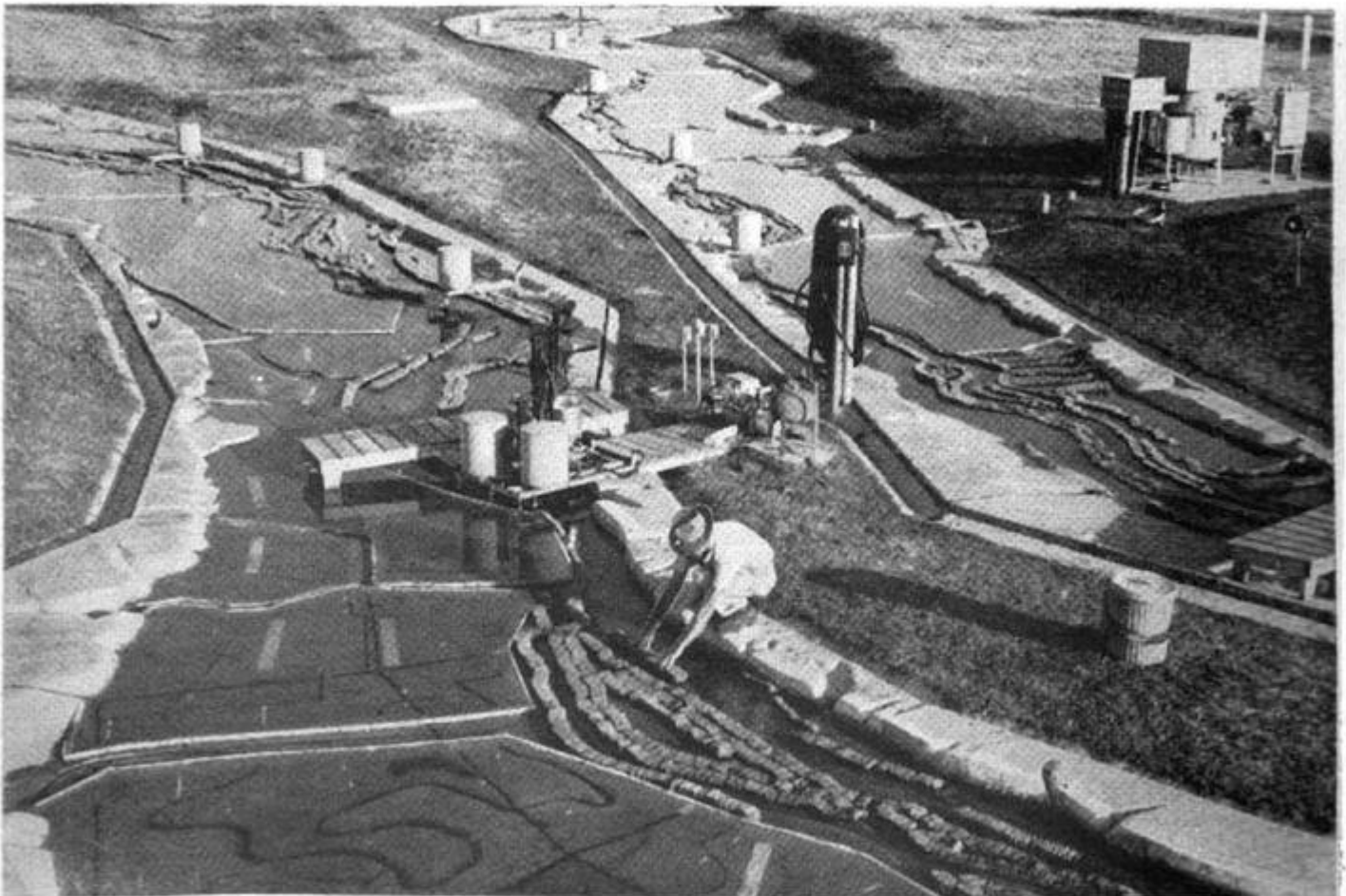


Top, covering almost a square mile, the scale model of the Mississippi watershed gives Army engineers a working miniature of the area shown in yellow on map. It includes 41 percent of continental United States

The model is built on a horizontal scale of 1 to 2000 and a vertical scale of 1 to 100. Thus Helena, Mont., and Pittsburgh, Pa., are 4500 feet apart on the model and the plains of Wyoming are some 50 feet higher than New Orleans. Not every stream or even every large river is represented; instead, quantities of water representing their discharge are metered into the model at the correct places.

To admit all this water in the correct amounts and the right times and places and to record the resulting increases in water levels would require a crew of 1500 technicians. Instead, the model is operated electrically by means of "programmers" and recorders. The programmers are some-

Here's the model at maximum flood stage. Cylinders along banks contain instruments that measure water height



thing like the music rolls for player pianos and consist of rolls of paper on which punched holes automatically operate the different water valves on schedule.

By means of the programmers it's possible to recreate any flood that has happened in the past and to simulate any flooding condition that may occur in the basin in the future.

Mostly the engineers work with standard statistical floods that are apt to happen every so often. The "50-year flood" is one that may occur, on the average, twice a century. The "200-year flood" is of real disaster size, comparable to the tremendous flow that took place in 1844.

Greatest of all is the "standard project flood," a situation in which the channel areas are filled with water from bluff to bluff. All the lowlands are under water. Nothing like this has happened in recorded history and yet it's a possibility almost any time. It could be brought about by a disastrous combination of weather phenomena that would cause the rapid melting of heavy snows in the northern Rockies and then, later, torrential warm rains extending to the Appalachians.

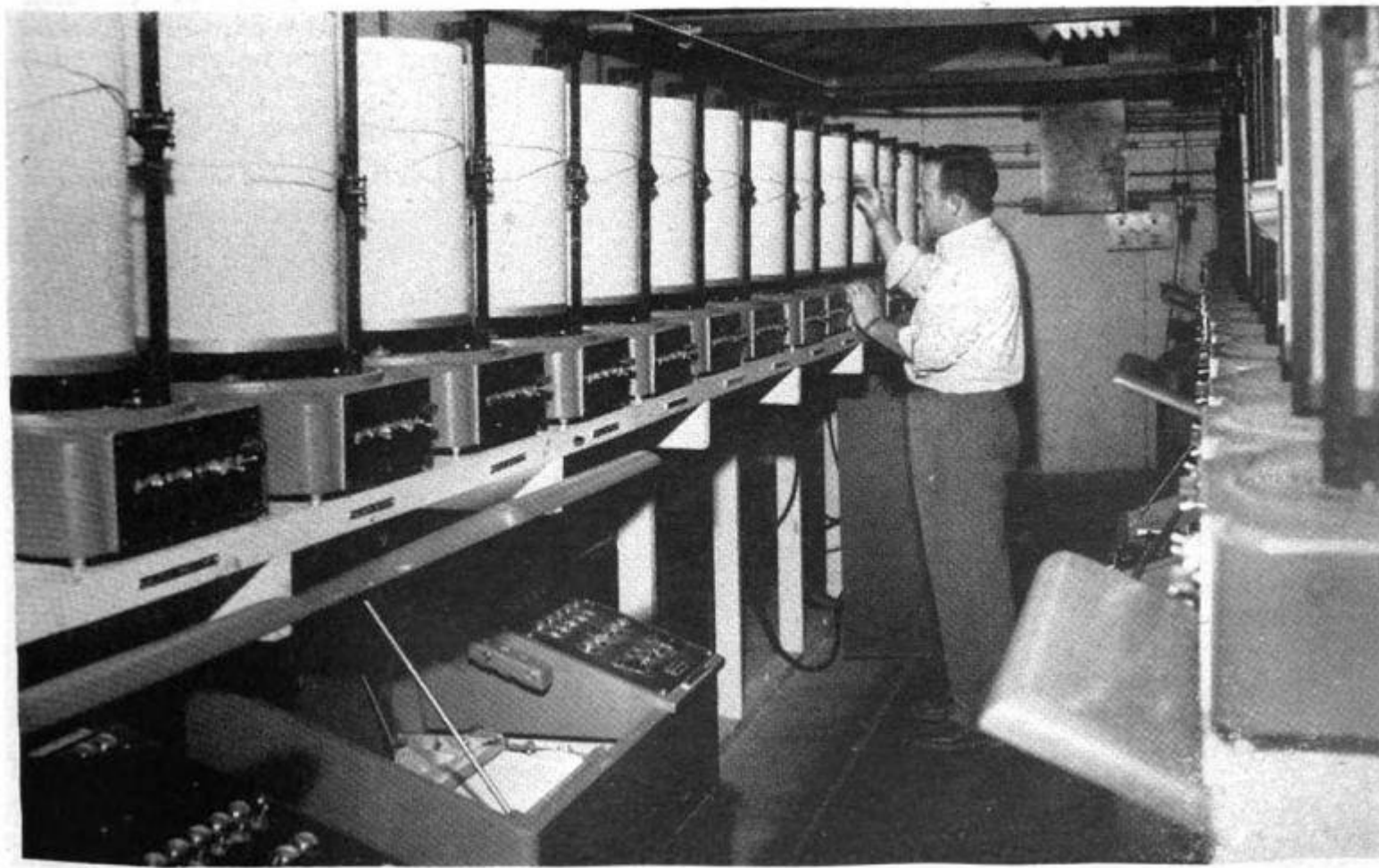
If the timing of those conditions was just right, the crests of the floods in the Missouri, Mississippi, Illinois, and Ohio rivers would join and sweep everything before them.

Such a flood would wipe out numerous



One of many instruments that measure the height of water at various points along the rivers and relay this information to recorders in the control houses

Vertical cylinders are data recorders. Below them are the "programmers" that admit water on an exact schedule





Water from the Mississippi races through Bonnet Carre as that "safety valve" is opened to release pressure

upstream cities but it probably would leave New Orleans, near the mouth of the river, almost unscathed. This is because of numerous improvements that the Corps has been making to the downstream portions of the river.

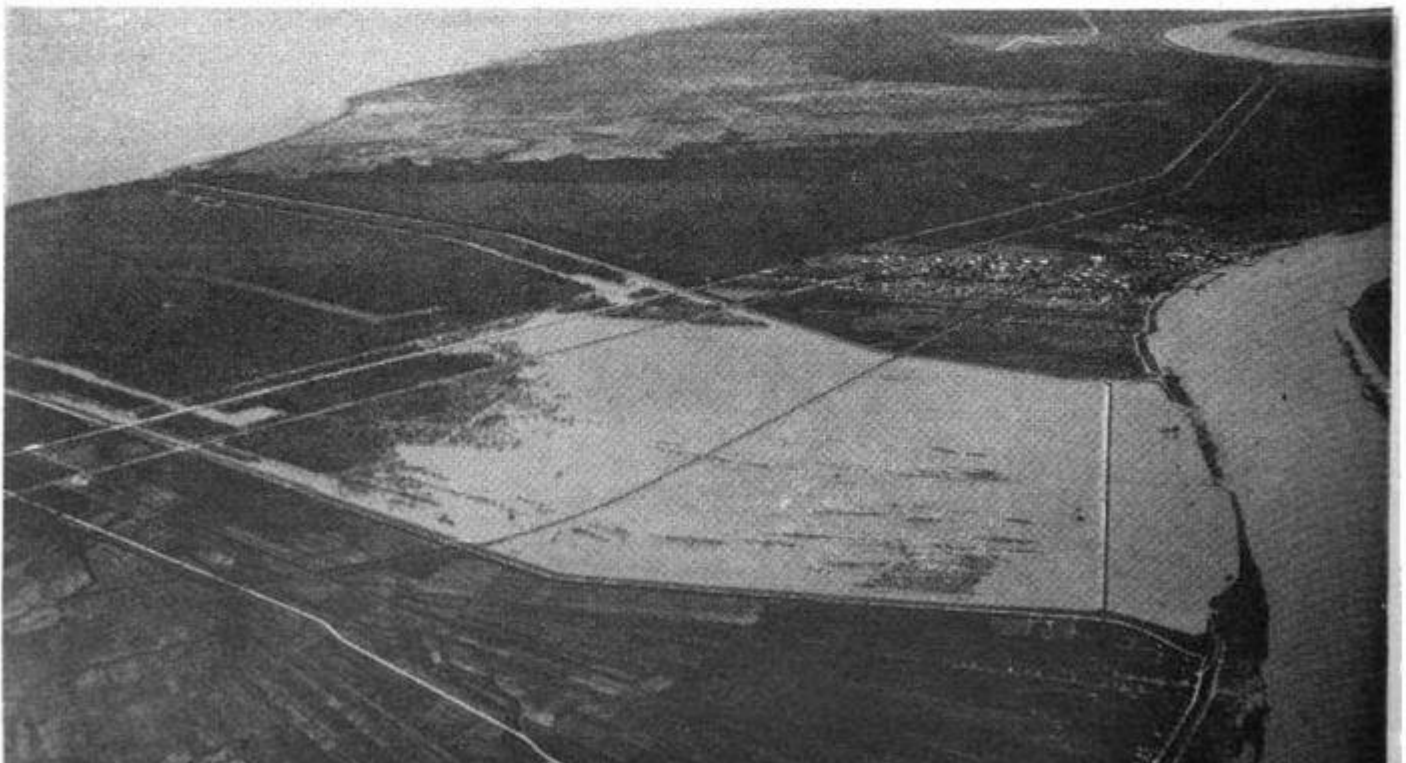
These include cutoffs that shorten the river and thus increase its slope and discharge capacity, additional and higher levees, and considerable channel stabilization by means of flexible concrete blankets that are laid down to protect the river bottom and banks from scouring action.

The principal flood-control improvements, however, consist of two new flood-

ways that divert excessive amounts of water away from the New Orleans area. One of them, Bonnet Carre spillway that carries water east to Lake Pontchartrain and out to the Gulf, already is in use. It has a capacity of 250,000 cubic feet per second. The other floodway is a new combination consisting of the Atchafalaya River and the West Atchafalaya and Morganza floodways that together can handle 1,500,000 cubic feet per second. Model studies of these structures were conducted at the Vicksburg experiment station before construction started.

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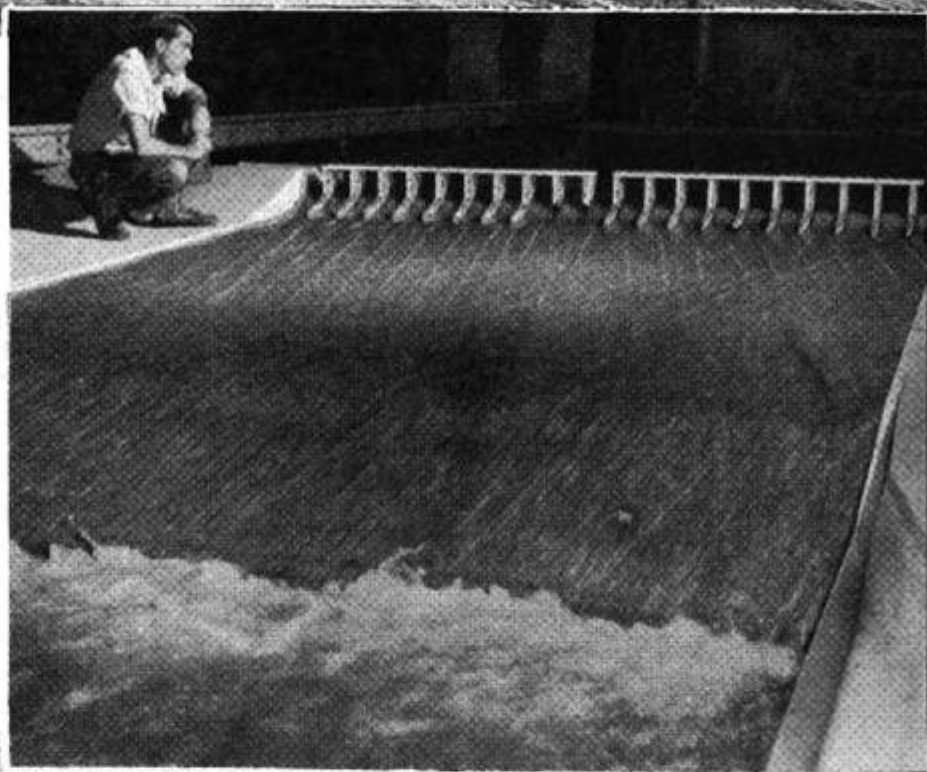
Air view of Bonnet Carre shows how it directs water into lake (at left) to prevent levee and property damage





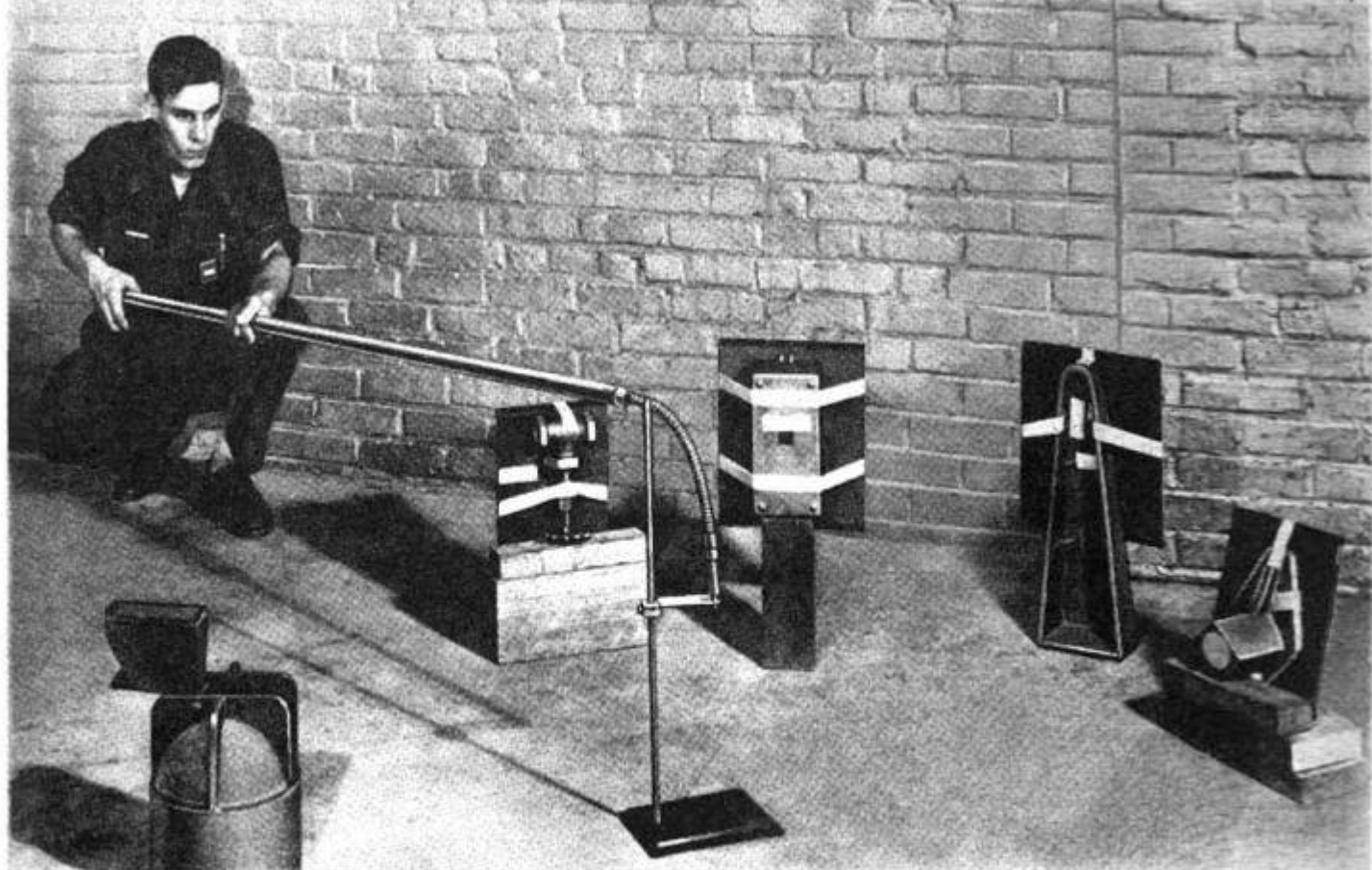
Above, construction of Garrison Dam on the Missouri is expected to be completed in 1955. It will take a full year's flow of the Missouri to fill its reservoir

Right, model of Fort Randall Dam in South Dakota provides engineers with an advance test of complete project. The water shown here equals 630,000 cubic feet per second in full scale



Below, model of Mississippi at Greenville, Miss., shows how it meanders. Present channel (it runs almost straight down the center of picture) is only 30 miles long; 20 years ago, the channel meandered for 58 miles

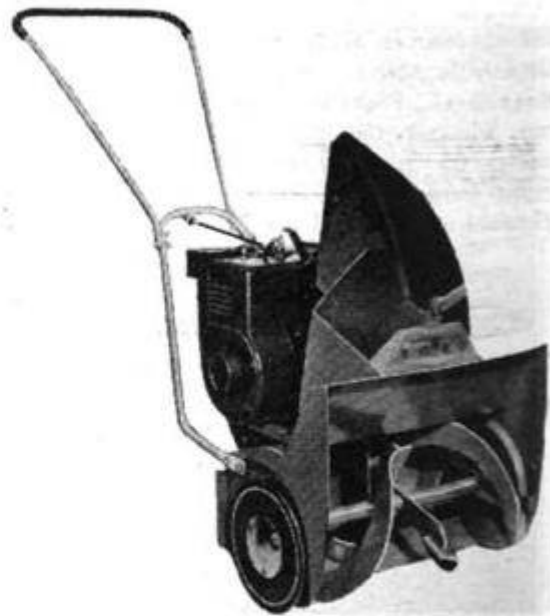




Isotope Tool Permits Remote Control of Radioactive Materials

Fitted with a retractable magnetic tip, a safety tool protects those handling "hot" radioactive materials. The operator, from a distance of seven feet, can manipulate radioactive materials as though he were han-

dling them with his fingers. Pressure on the handle releases its hold. The device, weighing about three pounds, has a handle of aluminum tubing and a flexible gooseneck leading to the magnetic tip.

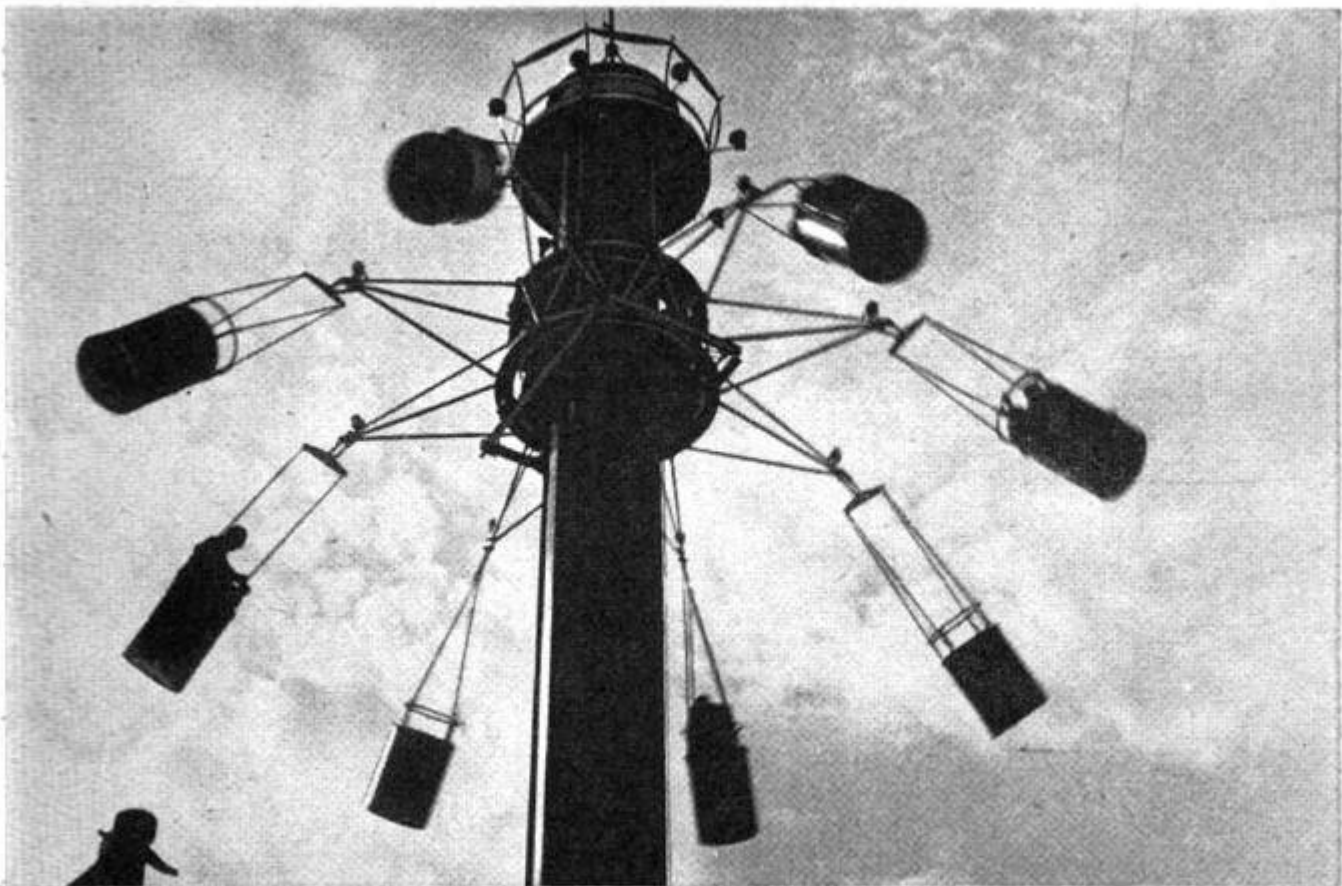


Rotor Snowplow for Homeowners Propels Snow to Side

Bearing a strong resemblance to a lawnmower, a home snowplow developed by a manufacturer of grass-cutting equipment clears a 17-inch swath up to two feet deep. A screw-action rotor collects the snow and propels it up and out of a directional chute. Snow is thrown 10 to 15 feet on either the right or left side of the machine, eliminating

the problem of compaction in front of the plow. A heating device mounted on the 2½-horsepower 4-cycle motor prevents the carburetor and governor from freezing.

Development work on an atomic power plant for large ships, such as aircraft carriers, is being done by Westinghouse.



Centrifugal force keeps riders from falling out, as they spin around almost horizontally in giant buckets

Upside-Down Rides Thrill Viennese Crowds

TO THE LIGHTHEARTED Viennese, Sunday means only one thing—a day in the *Prater*. On the banks of the Danube, just inside the city, this is the sprawling forest preserve the once-reigning Hapsburgs used as a hunting grounds. Most popular spot in the preserve is the so-called *wurstelprater* (freely translated: hot-dog park), a gaudy amusement park dominated by a world-famous Ferris wheel right at the edge of the Russian Zone. Though badly battered during the Russian advance into Vienna, it didn't take the natives long to get their bit of gaiety back on its feet.

On snowless toboggan, right, riders reach bottom in a hurry. Below, car-boat looping the loop into water





Fences which hang from the ceiling of the open shed help this farmer sort his milked cows from unmilked ones

Timesavers

ON THE DAIRY FARM

Carrier transports hay to an outdoor manger. With this arrangement farmer feeds 70 cows in 10 minutes

By Rafe Gibbs



GEORGE BURRI, dairy farmer of Nampa, Idaho, put off an operation until the Christmas holidays when his two sons, Don and Wayne, would be home from college and could help with the farm work. Burri just completed installation of a home-made power speed-up system for feeding chopped hay to his 70 head of cattle in 21½ minutes and he didn't know how well his sons would get along operating it.

Burri needn't have worried. While he was in the hospital, the youths simply speeded up the speed-up system until now it takes only 10 minutes to feed the 70 cows.

Mechanical equipment put into general use during the last quarter century has just about cut in two the average number of man-hours required per cow. In no type of farming today are mechanical improvements a greater asset than in dairying.

The Burri fast-feed delivery system starts in the hay barn. A carrier made of two sets of steel chains with connecting wooden slats is sunk in a pit along the entire length of the barn.

Hay is pitched onto the moving carrier, which is operated by a ¾-horsepower mo-



Hay elevator has been rigged so it can be flipped over and run downhill to feed bales into the chopper

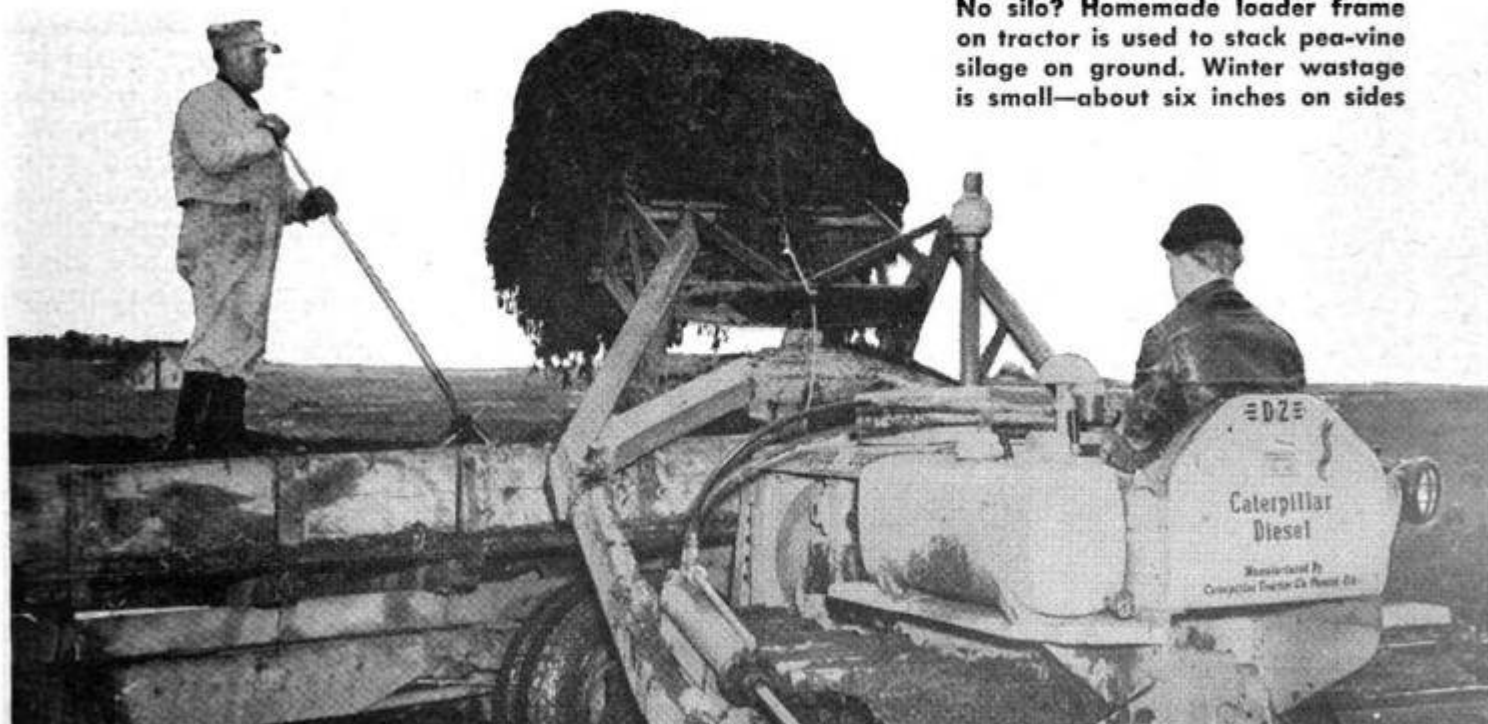
tor and a transmission salvaged from an old rock crusher. Transported to an opening in the end of the barn, the hay drops onto another chain carrier that runs along an outdoor roofed manger 140 feet in length. When the hay reaches the end of the manger, the feeding chore is done.

Formerly it took 1½ hours to load and unload a cart in feeding. Burri thought he was doing fine when his new system cut this time to 21½ minutes but Don and Wayne tried a gear the father had not used and saved still more time.

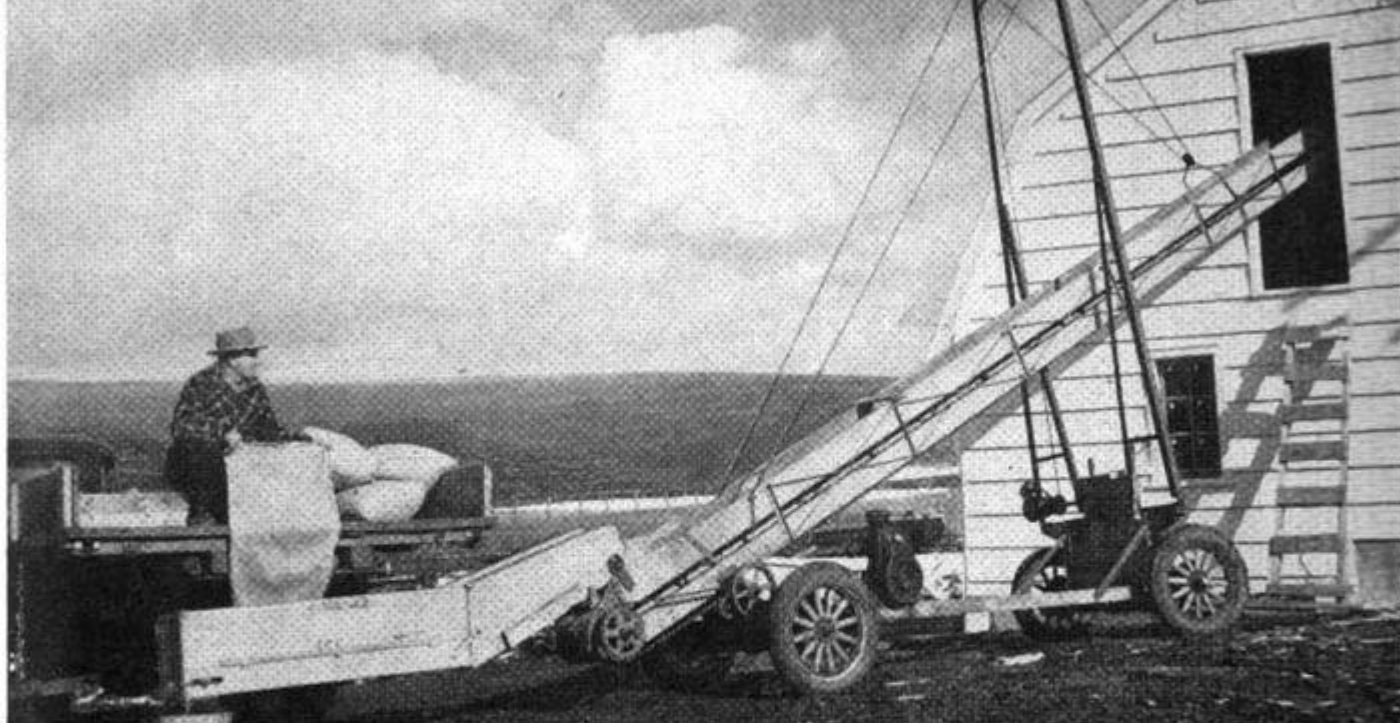
Another labor-saving idea on the Burri

farm is the system for getting hay into the barn. Burri had a portable elevator to stack baled hay but that was only a one-way use of the elevator. Wrestling the bales off the stack to run them through a chopper took considerable time. Burri rigged up the elevator so that he could flip it over and make it run downhill. Now the bales are quickly transported to the chopper, which then blows the hay into the barn. To assure that the cows get no stray metal in their diet, Burri attached magnets to the chopper.

"No dairy farmer, large or small, can afford to be without a manure loader," said



No silo? Homemade loader frame on tractor is used to stack pea-vine silage on ground. Winter wastage is small—about six inches on sides



Farmer-designed elevator lifts mixed feed into mow and moves manure from shed directly into the spreader

Burri. "A loader has many uses on a farm."

The Burris also pour concrete with theirs. Even drive fence posts with it. When the ground is wet and ready for post planting, they load up the bucket with rocks and drop it on the posts.

Over in Whitman County, Wash., Albert Kienholz has developed his biggest time-saver by remodeling an elevator originally designed to convey grain into storage bins.

"I decided to convert the equipment into a dual-purpose machine—for elevating mixed feed into the mow of the milking shed and for elevating manure out of the shed directly into a spreader," he explained.

Salvaging the trough (32 feet long and 14 inches wide) and the bin, Kienholz built a new wooden frame, which he mounted on front and rear axles and wheels of a junked

automobile. Then he constructed a metal hoist which can be adjusted to any height or angle with a worm gear. Added to the frame was a 7½-horsepower motor—the power controlled by a simple, homemade clutch which tightens or loosens the drive belt. The elevator is easily and quickly pulled around the barnyard with a truck or tractor.

"Used to pitch the manure out of the milking shed, then into a spreader," says Kienholz. "Now a step has been eliminated."

The elevator is also a timesaver in handling chopped hay. The record to date—2810 pounds of hay loaded on a truck in 10 minutes flat.

Howard Schoepflin of Viola, Idaho, was wasting considerable time sorting out un-milked cows from milked ones in his open shed. Occasionally, too, "ringers" got back into the milking parlor. Schoepflin decided he needed fences in the shed. But fences would be a nuisance unless they could be swung up to the ceiling when not needed. And that's the way fences he built operate.

Panels are fastened to the ceiling with leather-strap hinges. When the panels are raised, they are held in place by free-swinging wood catches. The panels are high enough from the floor to clear the manure pack.

Individual feeding stalls in loafing sheds is the idea of Carl Gray, Whitman County farmer, for saving both time and hay. He built some from scrap lumber. They are 28 inches wide, 5 feet high and 4 feet back from the manger. Disturbance among the cows is kept to a minimum, not so much hay

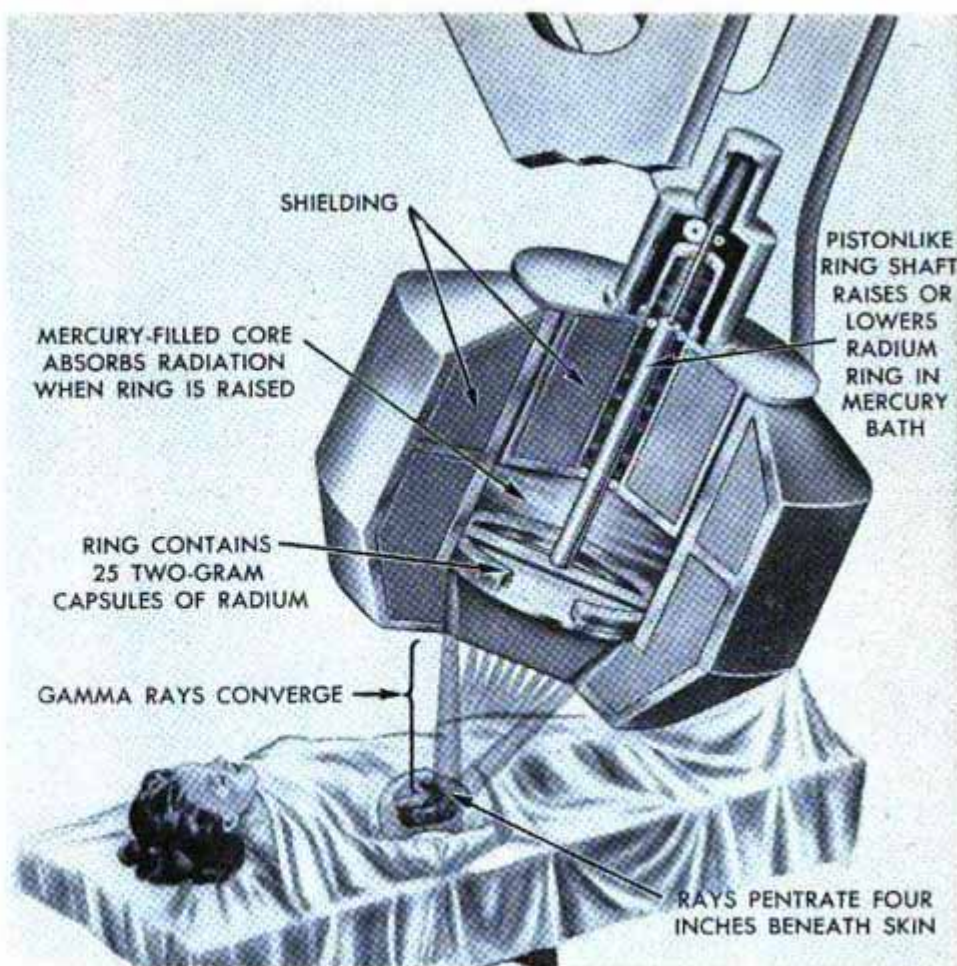
(Continued to page 242)



Portable, individual brooder pen for calves permits specialized care that will pay off in faster growth

Converging Beams Treat Cancer

Built for deep-cancer treatment, a new unit at Roosevelt Hospital in New York City converges the beams from 25 two-gram radium capsules on an affected area. The unit minimizes skin damage and increases the efficiency of the radiation. The capsules are in a ring in the mercury-filled core of the beam projector. When the ring is raised 13 inches to the upper limit of its bath, the mercury absorbs the radiation and technicians can enter the treatment room without receiving any radiation. A safety device prevents the radium from becoming effective until everyone except the patient has left the room. During treatment the patient is observed continuously through a plate-glass water-filled tank, two feet thick. The focal point of the rays for deep-seated tu-



mors is about four inches below the skin surface. The 50 grams of radium equal 2,000,000 volts of X-ray potential.

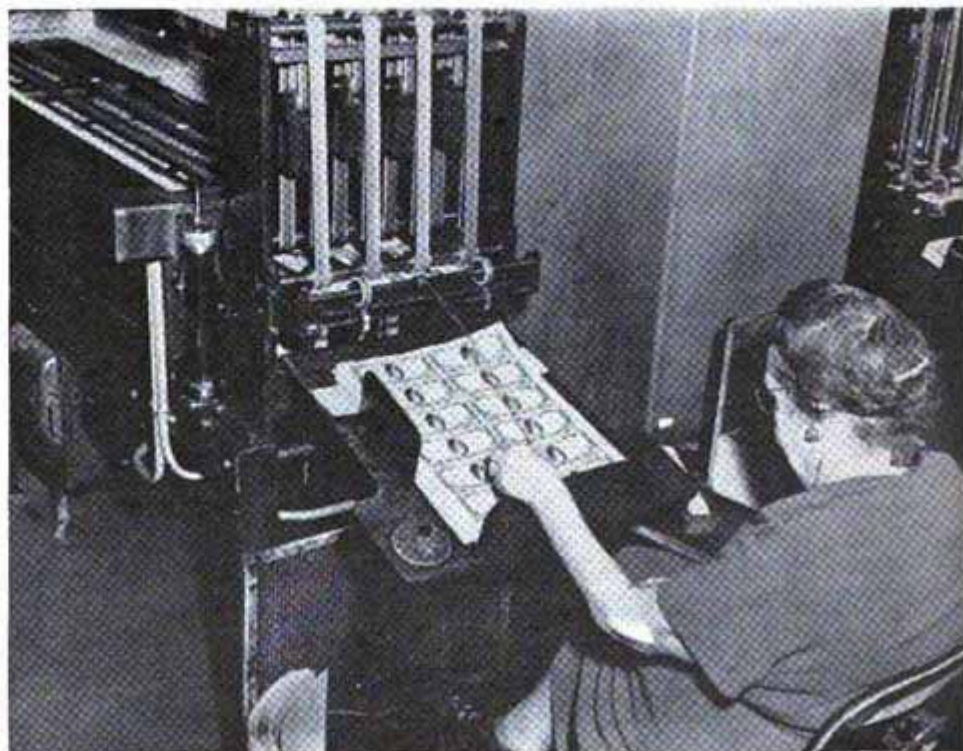
Auto Air Conditioner for Cadillac, Oldsmobile

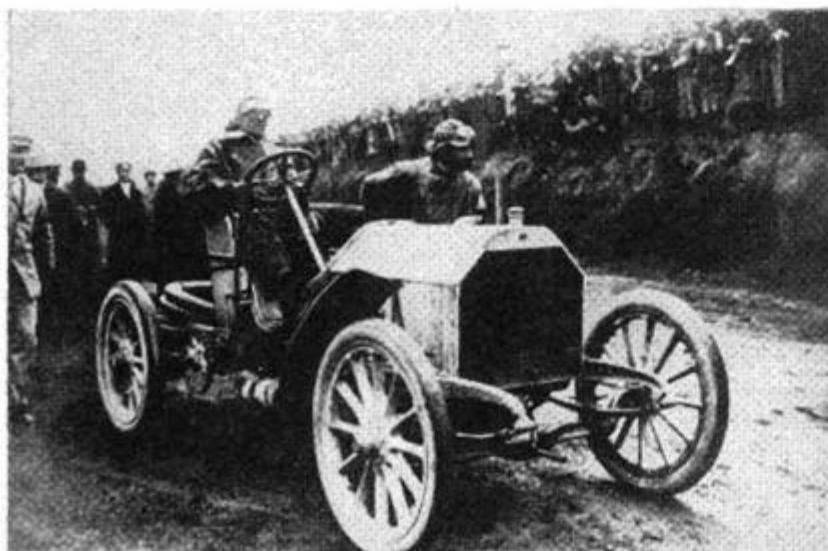
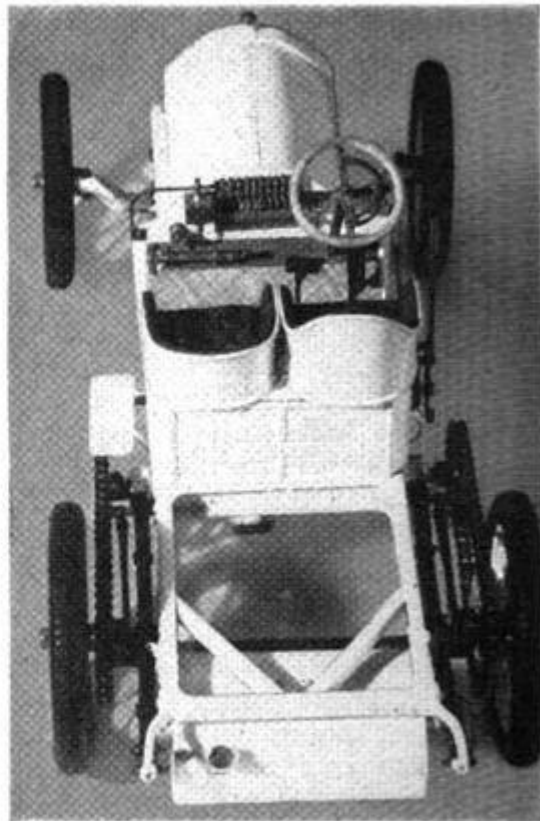
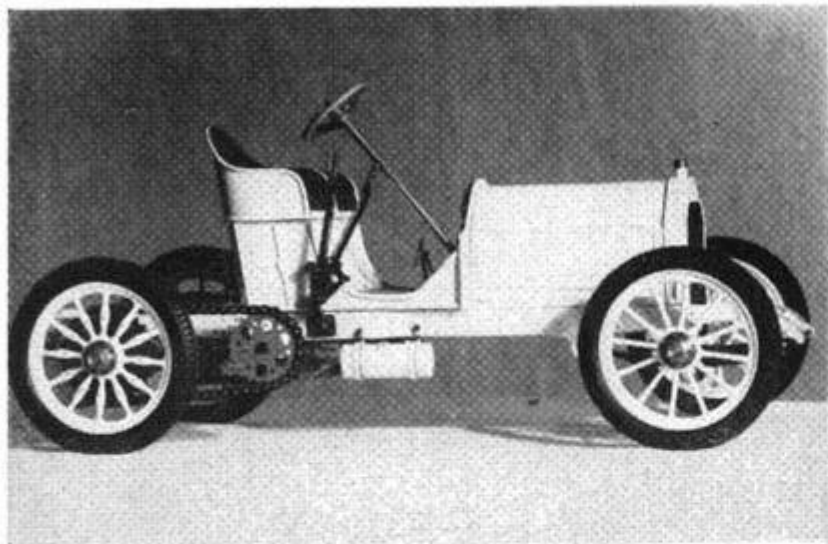
Cars that have been standing in the hot sun can be cooled to a comfortable driving temperature in about a minute by an air-conditioning unit developed by General Motors. Available as optional equipment on the 1953 Cadillac and Oldsmobile, the unit uses a rotary compressor mounted on

the car engine. A sealed refrigeration unit is mounted in the trunk. Neither the interior nor exterior appearance of the car is changed appreciably by the installation. The car is driven in hot or dusty areas with the windows closed, thus making heretofore unpleasant drives comfortable.

Money Rides On Glass Tapes

"Money fires" have been reduced in U. S. mints by the use of coated glass-fiber conveyor tapes. Cotton tapes used in a 360-degree Fahrenheit drying-out trip soon became worn and occasionally caught fire, igniting the bills. Tensile strength lessened and shrinking caused problems. At best, the tapes lasted only 10 days. The new tapes have performed successfully for over five months, helping to assure steady production of an average \$37,300,000 per day.





In 1903, the talk of the automotive world was the Mercedes-Benz touring car (left) that competed against the pick of the world's racing machines and won. A working model (upper left and above), recently built by a British officer, is a faithful reproduction of the famous auto. Coffee tins furnished most of the metal for parts and body. Seats are made of linen

Miniature Mercedes-Benz Built by British Major

Built to reproduce faithfully the dimensions of the famous Mercedes-Benz touring car which took top honors at the 1903 Gordon Bennett races in Europe, a working model develops a top speed of 30 miles per hour. Only 18 inches long, and only $\frac{1}{8}$ full size, it is complete in every detail. Powered

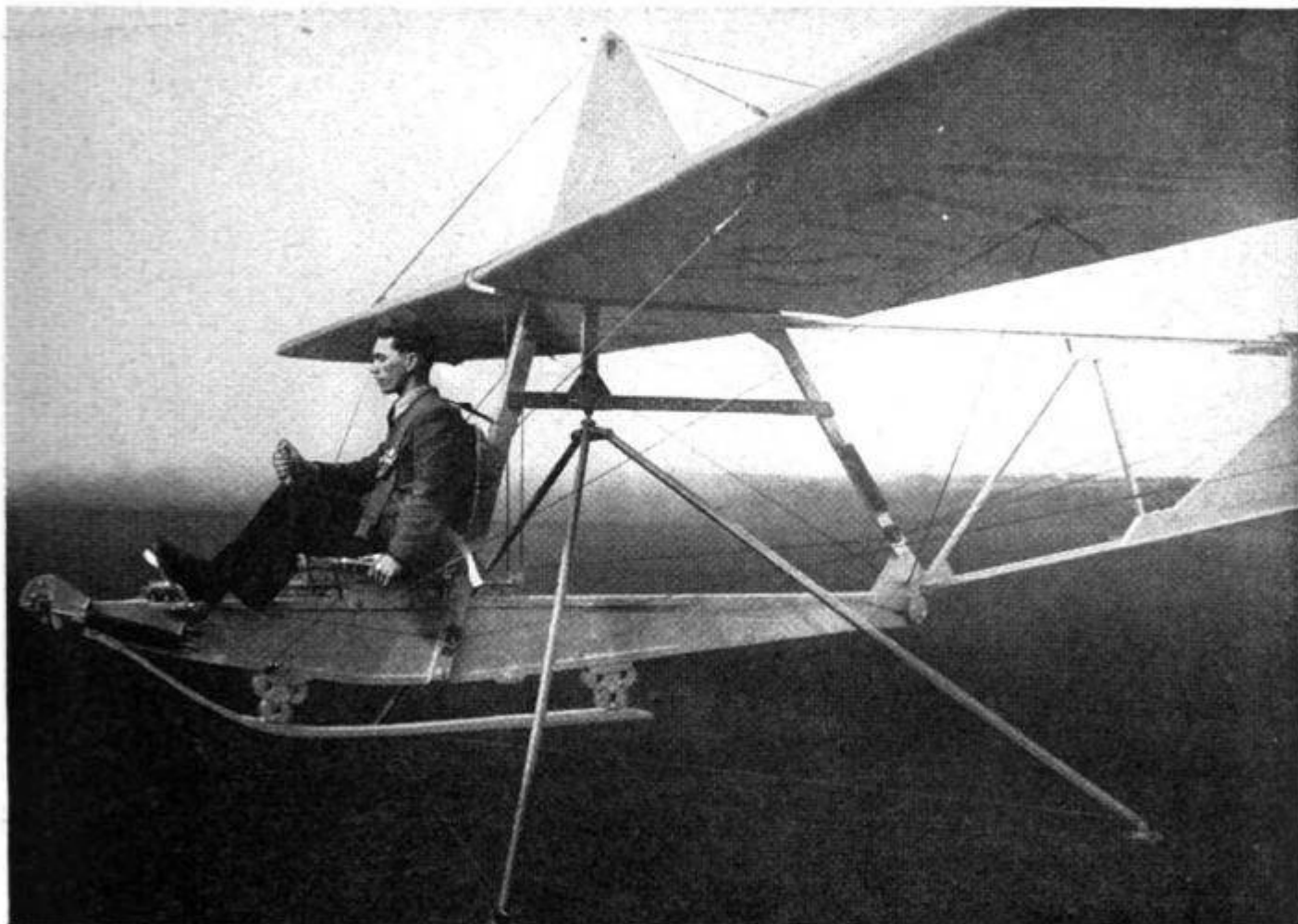
by a twin-cylinder, water-cooled side-valve engine, the car has a miniature transmission system, final drive by tiny pitch chains and sprockets, and a full array of dashboard instruments. Modelmaker Maj. W. T. Stubbs, British army officer in Germany, constructed the model in his spare time.

Mechanical "Scrubwoman" Keeps Garage Clean

Los Angeles has a new underground garage and it is kept clean by a mechanical "scrubwoman." The scrubbing machine, that looks like an overgrown Jeep, soaps and scrubs the floor, then rinses and wipes it in one operation. A large tank in the rear contains water and soap which are fed to the scrubbing brushes in front.



Information not listed on articles in the index often is listed in the WHERE-TO-FIND-IT LIST, available at no cost from the Bureau of Information, *Popular Mechanics*, 200 East Ontario, Chicago 11



Earthbound Glider Trains English Fledglings

English schoolboys are learning to fly gliders without ever losing contact with the ground. Facing the wind, they "fly" gliders suspended from seven-foot-high steel tripods. The unit, balanced on a ball joint at the apex of the tripod, can swing 30 degrees

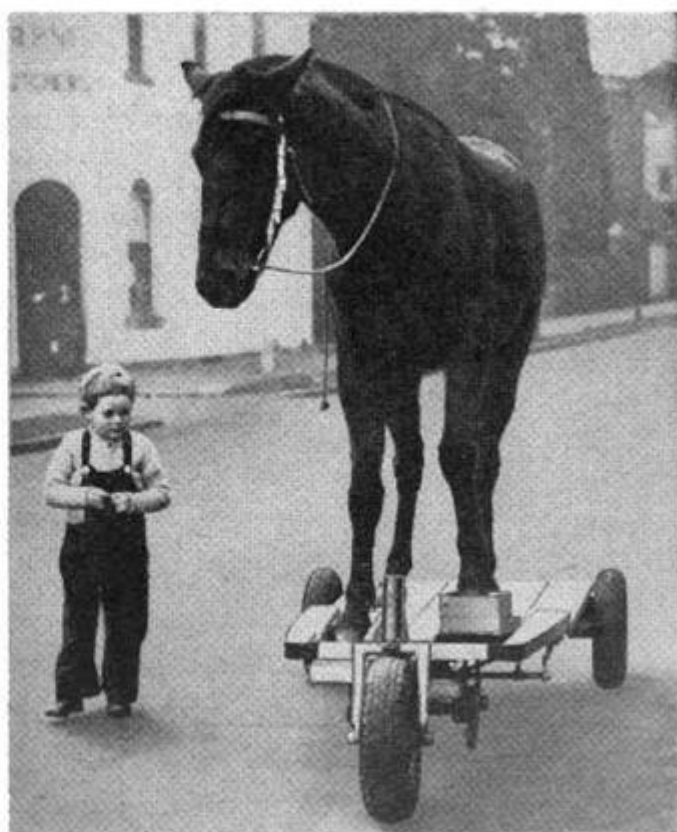
in any direction. Its controls operate with only a slight breeze blowing and the trainee can learn to use stick and rudder with only three feet of air beneath him. The gliders are being sent to schools with Royal Air Force training units.

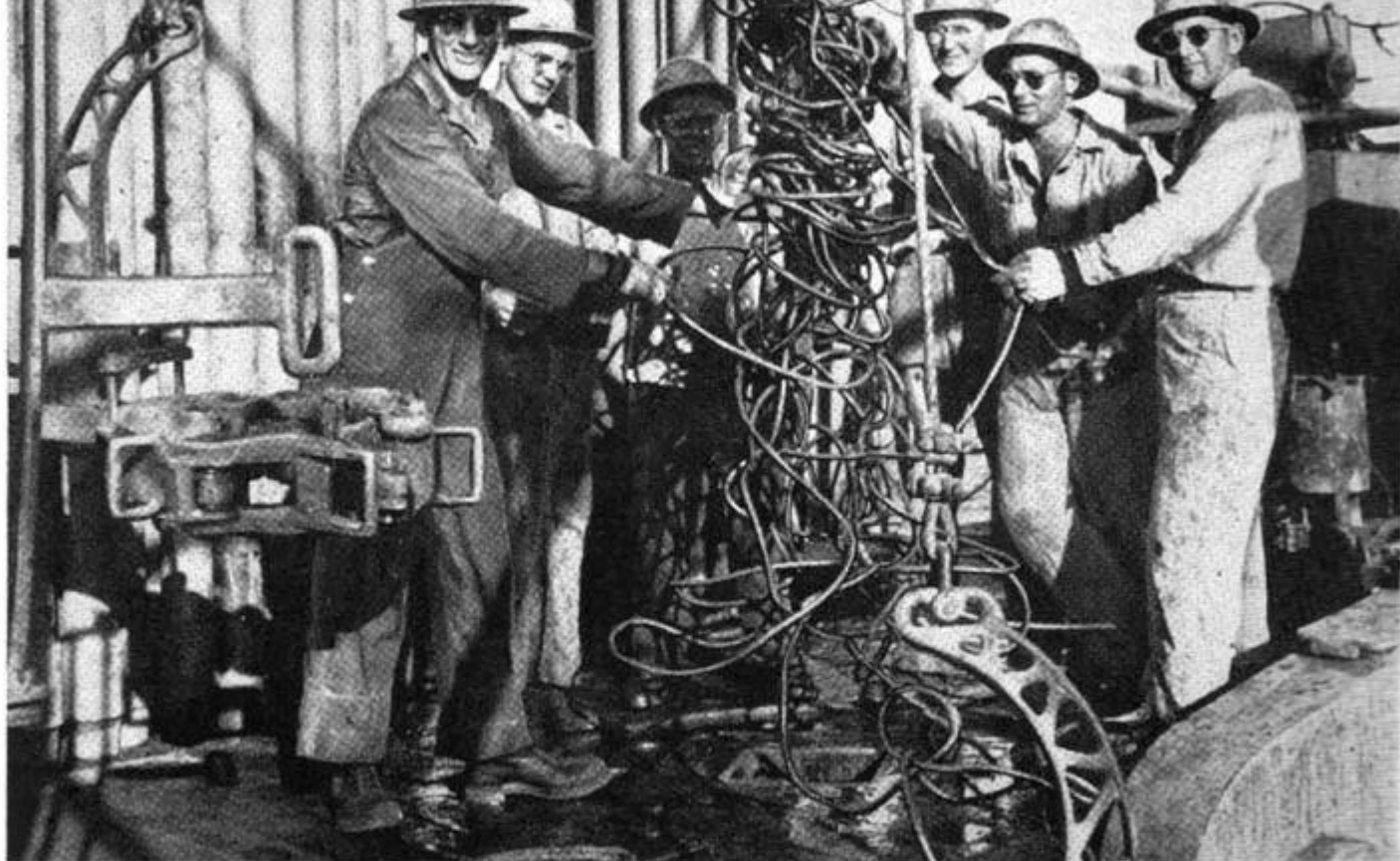
One-Horsepower Tricycle Built for Aussie Equine

There are some things that Pete, an Australian horse, can't do—talk, for example—but he does have a remarkable list of talents. He smokes a pipe and seems to enjoy it. He's adept at catching rubber rings in his mouth. But his best-known trick is riding a special tricycle around the streets. His two front hoofs operate pedals to give the three-wheeled vehicle a performance rating of one horsepower.

Plastic Battery Separators

Because they are more porous than wood, plastic battery separators permit faster circulation of acid and therefore develop greater starting power. Better able to withstand heat and overcharging, they are said to last 50 percent longer. They can't split and cause short circuits. Better capillary action brings moisture to the top of the plates when water runs low.





Happy "fishermen" retrieve a broken logging line that had to be brought up, piece by piece, from an oil well

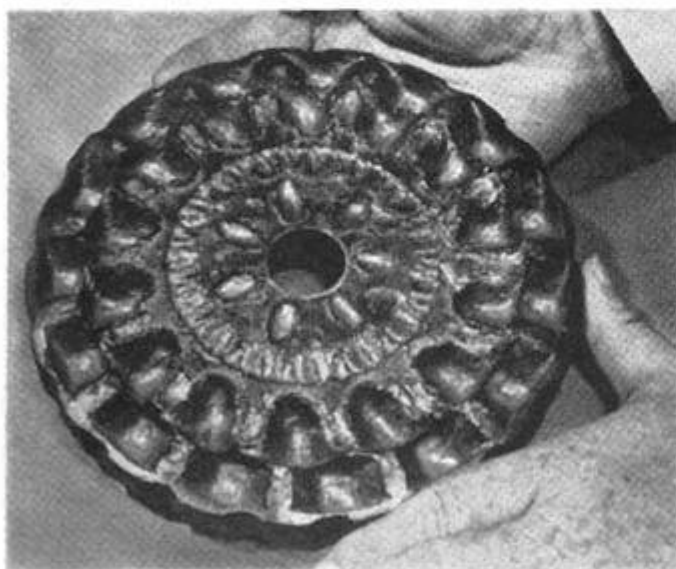
IT'S NO FUN FISHING... IN AN OIL WELL

By Gene D. Legler

IN OIL-FIELD language, anything that gets stuck or lost in the hole while an oil well is being drilled is called a "fish." Any roughneck knows there are as many different kinds of fish around a drilling rig as there are in the sea.

Drill pipe and drill collars sometimes break or twist off. Holes cave in, wedging pipe in a viselike grip. Parts of drilling

This "fish," a round piece of metal, stopped production. Drill made dents but could not penetrate metal



bits shear off and stay at the bottom. Core barrels and logging instruments are pulled off their lines like fishhooks left in a sunken log. A drilling crew can never be sure of *anything* that goes into the hole. It may come out or it may not.

On the drilling floor, a hole left open during "round trips" seems to have an almost magnetic attraction for anything that rolls or drops. A drilling bit, after being unscrewed, sometimes rolls into the hole and plunks to a stop two miles below. A sledge hammer spurts from a roughneck's grasp and ends up in the bottom of the hole. Nearly three miles of logging line snaps apart and curls up on the bottom like so much spaghetti. Even lunch boxes, safety hats, and other objects have taken the long plunge and become fish. Some of these objects present no serious problem; they are soft enough to break up by drilling. Others take the devil's own time coming out and cost the drilling company thousands of dollars in rig time and labor.

If there is a fish that cannot be removed by drilling, the crew can try to "sidetrack" (drill around the fish), or plug and abandon the hole. Those last two choices are usually last-resort measures. In most cases, the



Fishing tools — a short mill for grinding objects; center, "junk basket" for scooping, and spear for seizing and lifting. A taper tap is being loaded

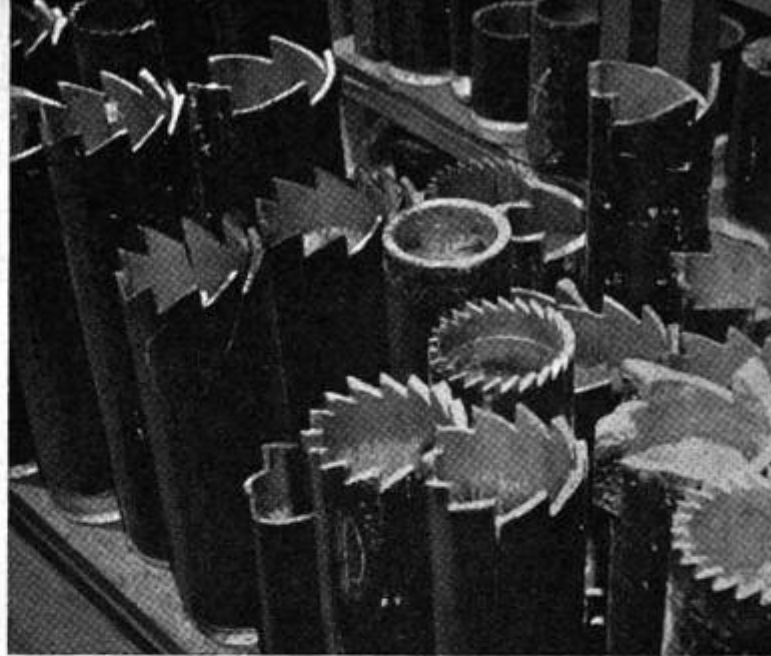
crew goes fishing or calls in an expert to do it for them.

The expert, like any real angler, carries several kinds of bait in his box and chooses each one with loving care for the job it will do best. He uses overshots (fit over the fish and trap it snugly), "junk baskets" (to scoop up small fish), taps (that fit into the fish), jars (to pound and loosen the fish), spears (which snag onto and hold the fish), alligator grabs (pincers that snap together and grasp the fish), mills (to grind up the fish), busters (which break up the fish) and scores of others.

Where pipe doesn't break, but sticks in the hole, the job of freeing and recovering it may be big and bad. In the worst cases, a combination of many tools and techniques may be necessary to bring up the fish.

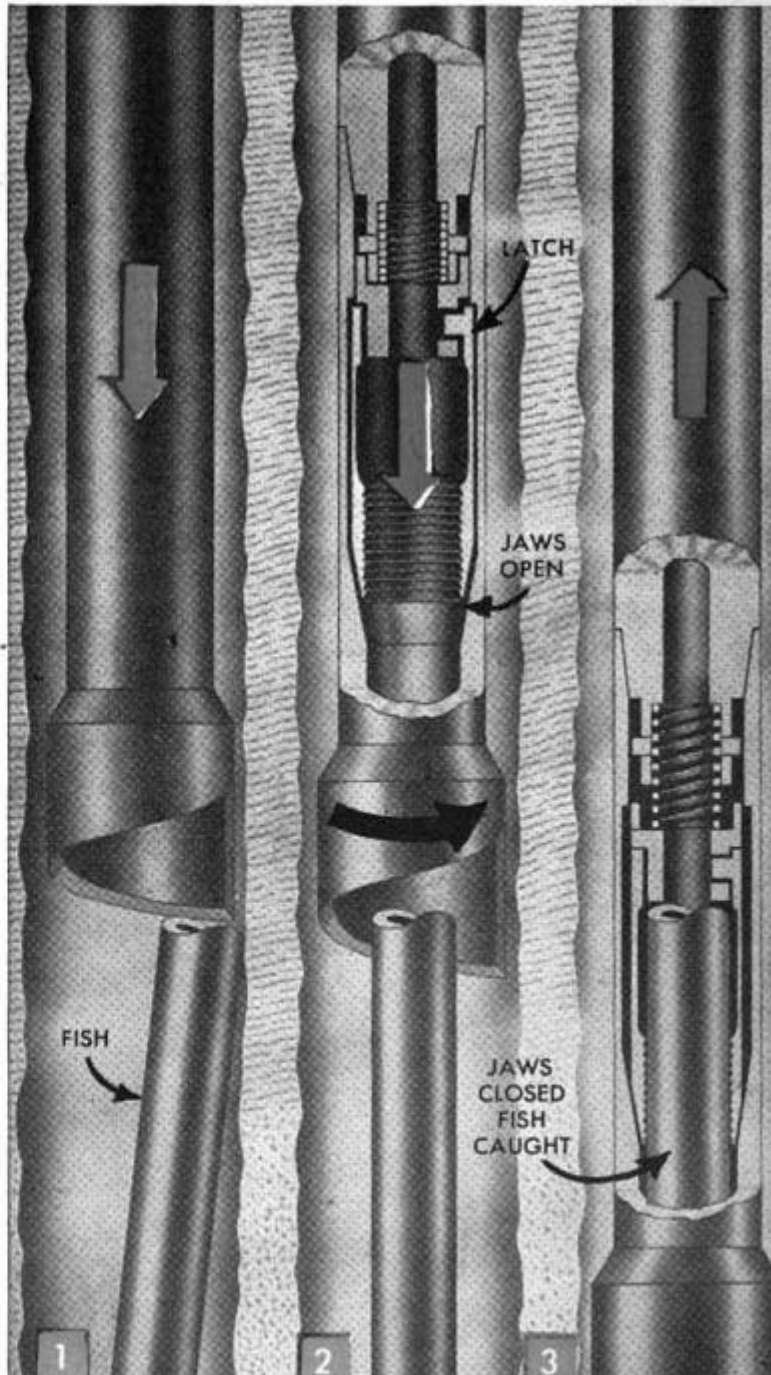
Small objects lost in the hole usually don't cause as much trouble and lost time as pipe that sticks or twists off, but they can be hard to handle. In one case, the wire line on a logging instrument was lost in more than 12,000 feet of hole on an offshore rig. It was recovered by a spear, piece by piece, after 79 trips!

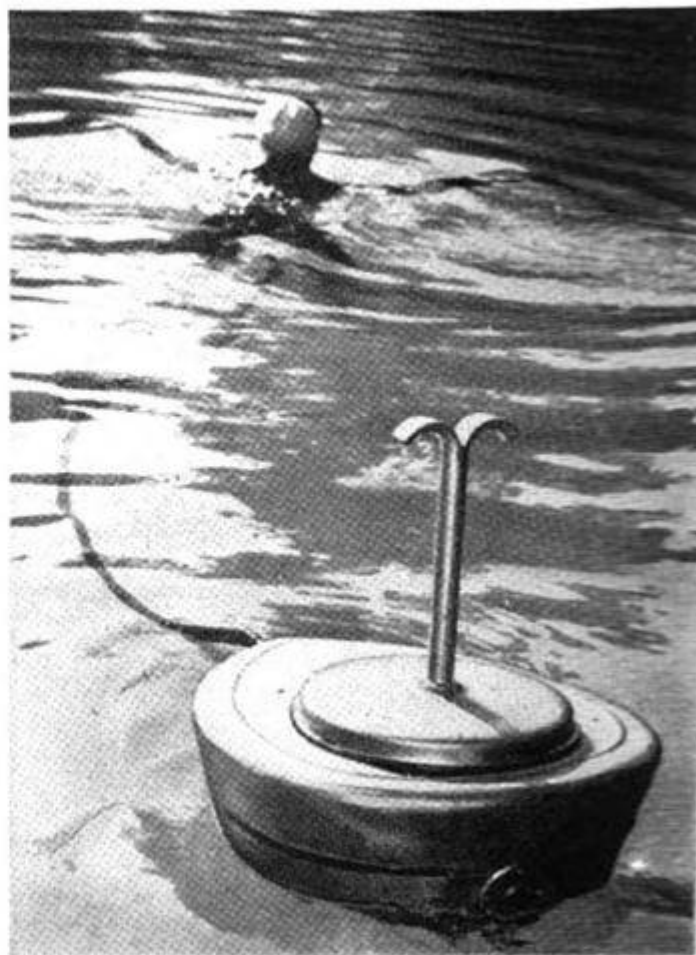
That's expensive fishing. Not only must the fisherman be paid, but productive drilling is at a standstill while the fish is being caught. From \$40 to \$50 an hour is a high price to pay for something that doesn't make the hole any deeper—and that is about the average drilling cost these days for a heavy rig. ★ ★ ★



Sharp-toothed "washover shoes" are hollow bits that drill away whatever holds fish lost in deep hole

Below, (1) fishing tool is lowered into hole; (2) bit is revolved to center fish; (3) fish is caught securely





German Floating Motor Propels Swimmer

Swimmers who are in a big hurry will appreciate the "water horse" which propels swimmers at speeds up to 10 miles an hour—three or four times faster than usual. The floating motor trails behind

the swimmer and spins a caged propeller that is strapped to the waist. A long, flexible cable connects motor and propeller. Air for the motor is drawn through a T-shaped snorkel, similar to a submarine.

Numbered Airways Guide Pilots Across Country

Route-numbered airways, similar to America's highways, now crisscross the United States. Established by the Civil Aeronautics Administration, the new system links approximately 400 omnirange-

stations, ground-base high-frequency-radio units that guide pilots along their routes. The 45,000 miles of numbered omnirange airways are in addition to 60,000 miles still using old-style low-frequency radio beams.

Boat Stabilizer Prevents Capsizing in Windswept Water

Small boats are stabilized in rough water by two metal pontoons that extend from the sides like outriggers. The pontoons are

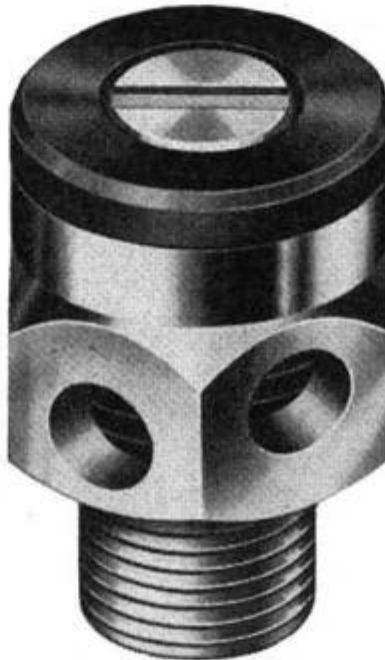
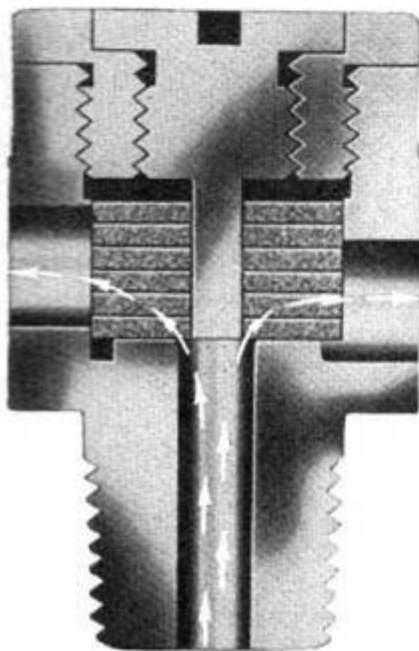
supported by steel arms that are connected to the boat by strong springs, producing a movement similar to knee action

in an automobile. Each half of the stabilizer weighs about 20 pounds and is mounted with clamps over padded wooden blocks. In tests, three men leaned far over the side of a boat in an attempt to push the gunwale down to water level, but could bring it only within five inches of the water. The gunwale of the boat alone was 12 inches above water.



Community Nest

Eggs laid in a metal community nest are cleaner, easier to gather and less likely to be broken. The nest is actually one large compartment, but is divided by plastic flaps into small cubicles to provide the illusion of hidden nests. When the eggs are laid, they roll forward through a long, narrow slot into a covered egg compartment. The hens cannot reach the eggs which are safe from damage and soiling. Removable trays ease cleaning.



Silent Air Valve For Steam-Heating Systems

Small, inconspicuous air valves for steam-heating systems measure only $\frac{3}{4}$ by 1 inch. With no hiss or ping, the valve operates by letting air out between special composition disks. As steam enters the valve, moisture starts to swell the disks, but they do not completely seal until all air has been forced out and the valve is full of steam. When the thermostat is satisfied and steam subsides, the system goes into a vacuum for a few minutes. During this period, the disks dry and shrink and are again ready for another cycle.

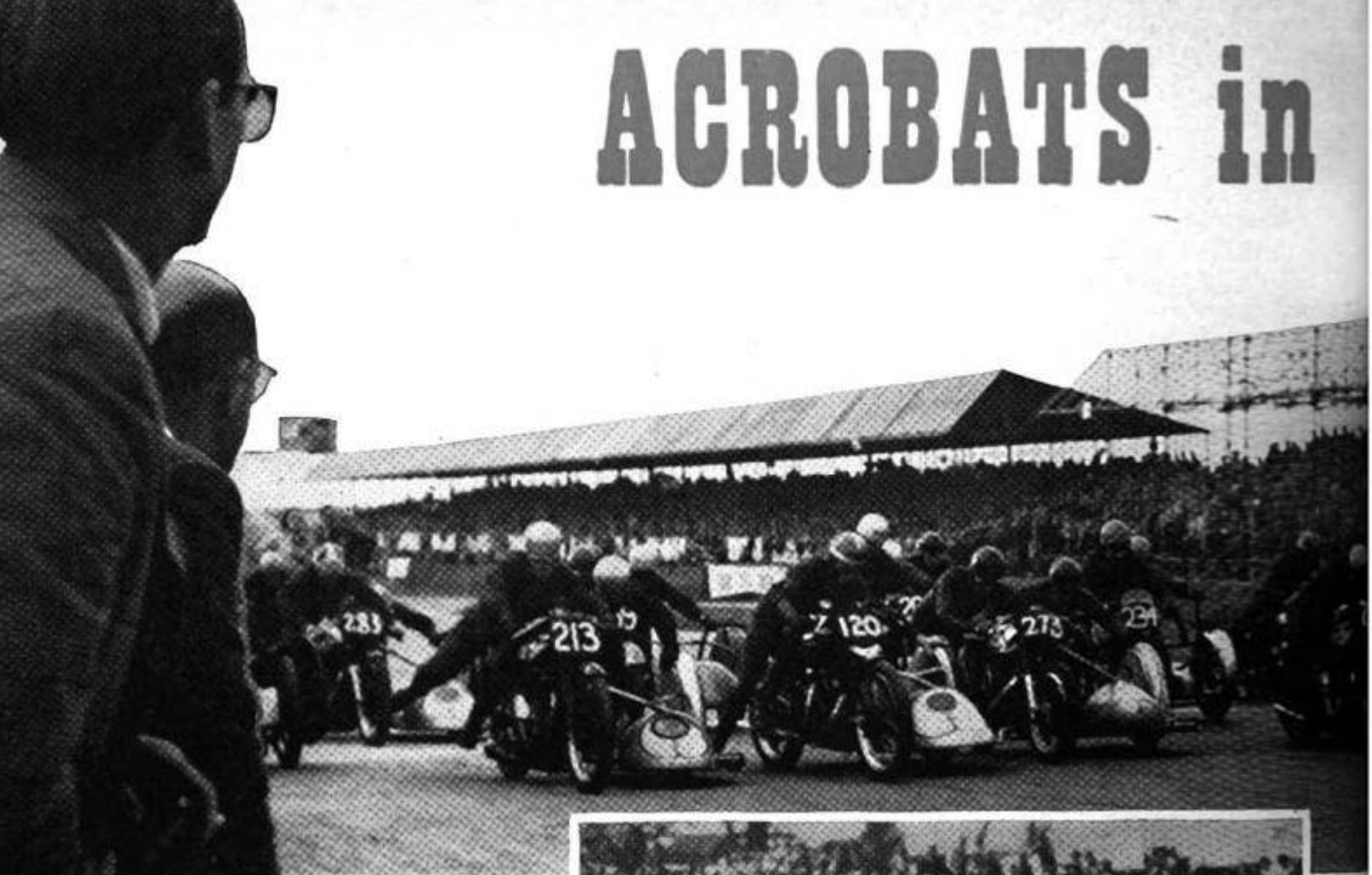
Resin-Treated Paper-Plywood Floor Tile Requires No Polishing

U. S. Forest Products Laboratory photo

Coated with a thin skin of resin-treated paper, an experimental plywood floor tile requires no polishing and is more scuff-resistant than any wood flooring. The top skin, only .09 inch thick, is made by pressing numerous sheets of resin-impregnated paper into thin sheets of solid plastic at high temperatures. The Douglas-fir plywood that forms the body of the tile is five-ply and utilizes tongue-and-groove joints to assure a tight fit. The $10\frac{1}{2}$ -inch squares are easily laid with tile cement.



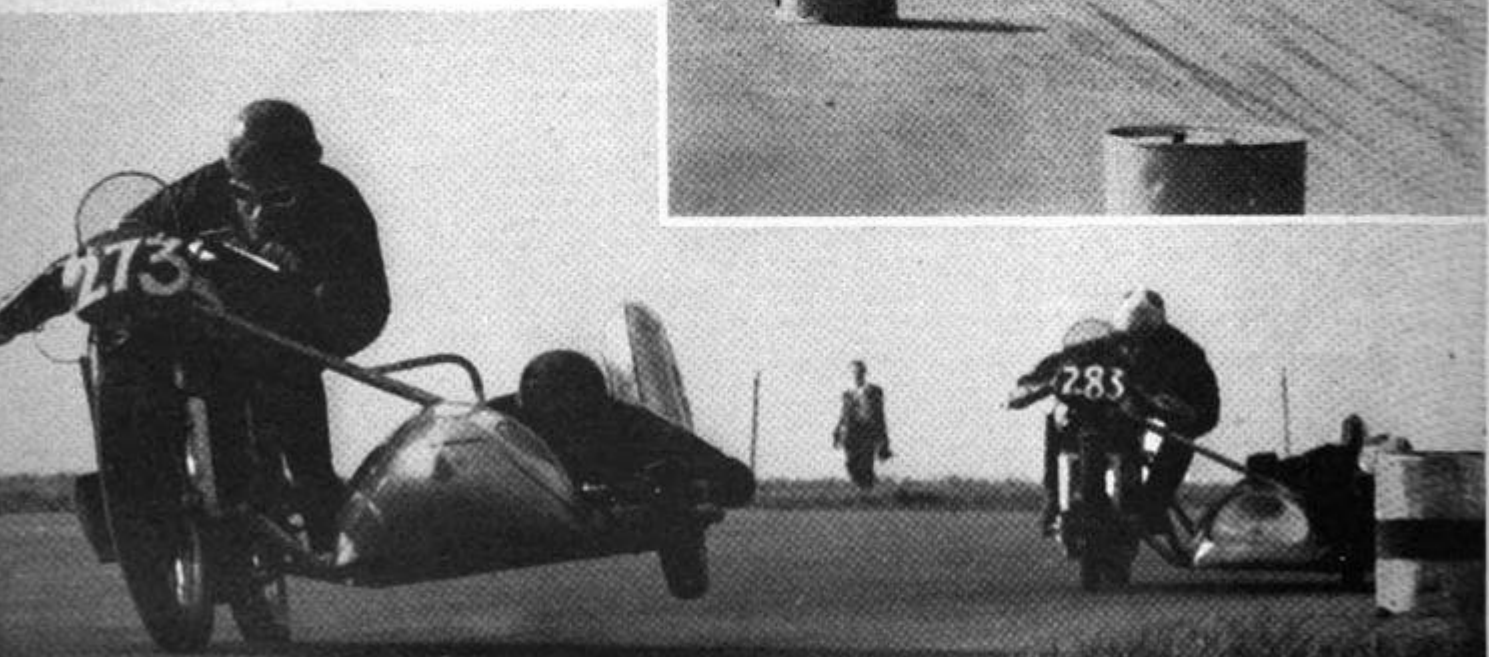
ACROBATS in



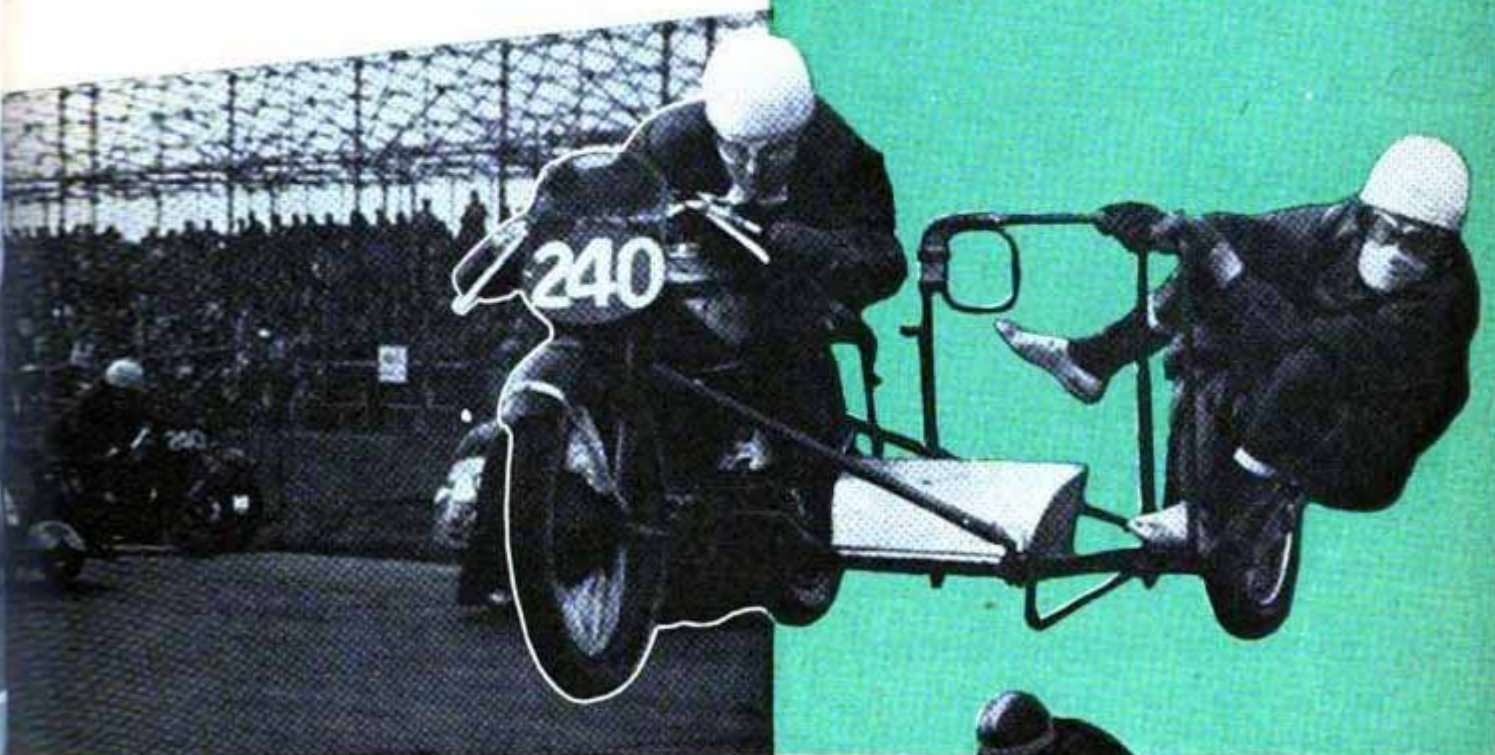
Massed at the start of a 30-mile race at Silverstone, England, both drivers and passengers push their entries to get them started, then hop on. Stands in the background are jammed with spectators

Right, a rider and his passenger lean inward as they whirl around a right curve. Passengers rarely remain in the same position for more than 30 seconds

European champion Eric Oliver, below, is coming out of a turn so fast that his sidecar wheel is off the ground. Almost hidden from view, the crouching passenger is helping to counterbalance the tilt



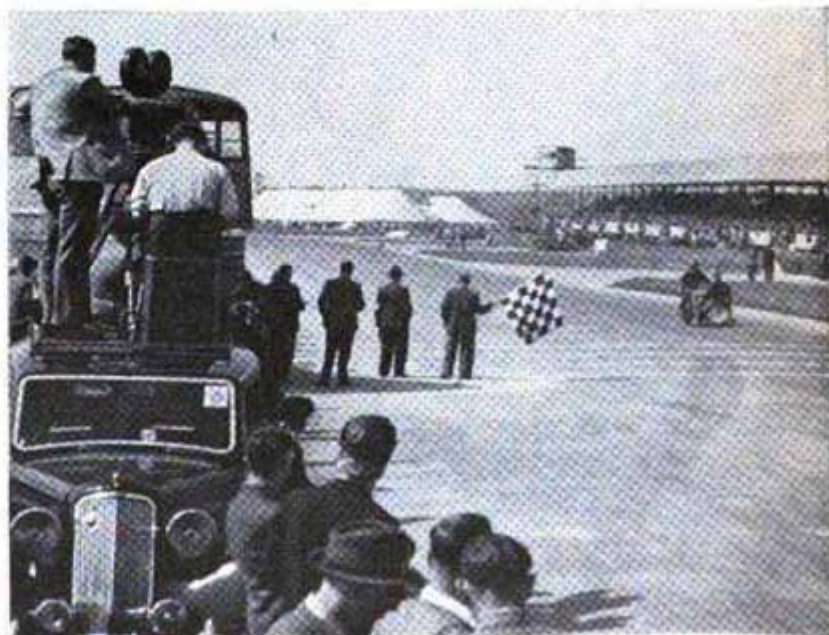
SIDECARS



LEANING, STRETCHING and balancing in grotesque positions—as they skim along at 80 miles an hour—passengers in the sidecars of the world's fastest motorcycles are giving European sports crowds some of their biggest thrills. Their performances are drawing crowds of 100,000 and more. Bumping and rocking along, the daredevil passengers hang on desperately with all four extremities as they lean first to one side and then the other to keep all three wheels of the lightweight conveyance on the ground. Turning a left-hand corner, the high-powered bikes tend to turn over on their right side unless the counterbalancing passenger leans far to the left. In their zeal, they often scrape the ground or send up sprays of loose stones from sides of the track with their helmets. The passenger sprawls horizontally across the motorcycle on right turns so that his head emerges behind the driver's body. As a sign of the motor sport's tremendous growth, 1939 race meetings 25 miles from London drew 5000 to 10,000 spectators. Now the races at Silverstone, 60 miles from London, attract 50,000 to 60,000 watchers. ★ ★ ★



High-speed acrobatics, like those above, put a premium on agility as well as engine power in sidecar racing. Handkerchief partly protects passenger from suffocating dust. Below, the finish of a 30-mile sidecar race, with winner averaging 78.22 miles per hour

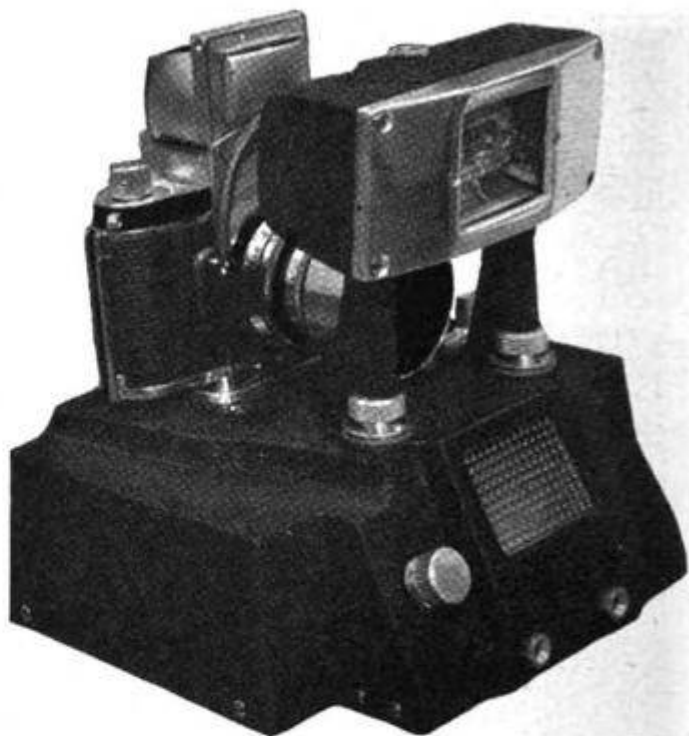




Scientist stands behind protective shield to watch new instrument produce electricity from atomic energy

Electricity From Atomic Energy

For the first time electrical energy is being generated directly from atomic energy. In the past, electricity has been generated by using heat from an atomic pile to make steam to operate a turbine. Dr. Ernest G. Linder, a physicist with the Radio Corporation of America, developed the new method. Radioactive substance produces either alpha or beta rays, which travel through a vacuum to a collector electrode. The electrode becomes charged negatively, and if a load is connected between the electrode and radioactive source, a current will flow.



Flash unit for 35-mm. reflex cameras brings new simplicity to the taking of critically sharp color slides

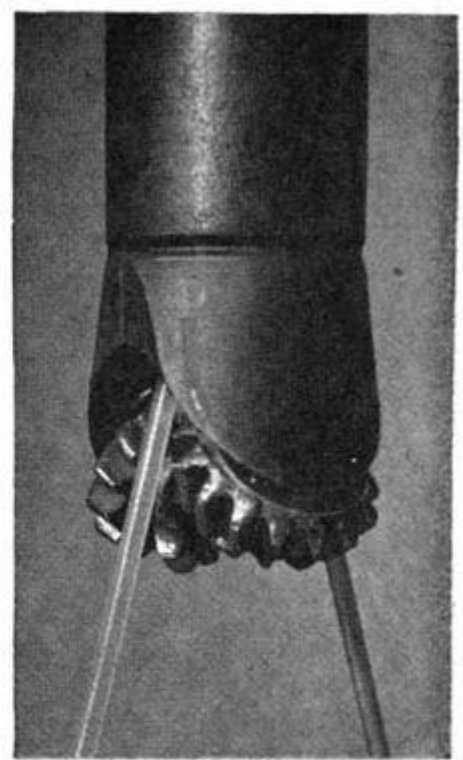
Electronic Flash Unit Designed for Color Work

Sharp color slides for medical, industrial or criminal-detection purposes can be made by inexperienced operators with an electronic flash unit. The device produces a $\frac{1}{1000}$ -second flash of the correct color temperature, eliminating the need for filters, meters or complex calculations. It is designed for any 35-mm. single-lens reflex camera, such as Kine Exakta. An automatic exposure calculator and a focusing light are built into the unit.



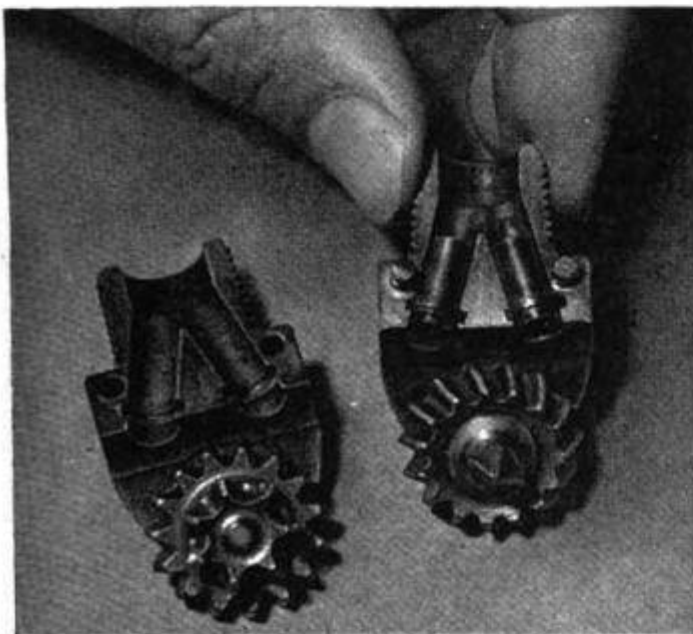
Asphalt Compounds Make Home Walks

Inexpensive pavement for patios and garden walks can be made from asphaltic emulsions now available. The recommended mix for pavement $\frac{1}{2}$ to 1 inch thick, laid over a sand base, is seven parts of crushed rock, 1 part of the asphaltic emulsion, $\frac{1}{2}$ part sand and $\frac{1}{2}$ part cement, with barely enough water to make a plastic mix. The material is troweled to a textured surface and dries within a day. The pavement then can be covered with a thin layer of colored "walk top" asphaltic emulsion.



Jets Push Drilling Bits To Underground Speed Marks

Besides making possible new speed marks in the air, the jet principle is enabling well drillers to set new penetration-rate records underground. Drilling mud whooshes out the sides of recently developed jet bits at velocities as high as 500 feet a second. Drilling time is cut in half. Mud flows over the bits of old-style cutters at only 20 to 80 feet a second. The mud jets whisk cuttings out of the bit's way and accelerate their climb to the surface. A bit can get a better bite with an uncluttered well bottom. The jet streams also increase the footage per bit as much as 48 percent, and decreases the number of trips to the surface for changing bits.



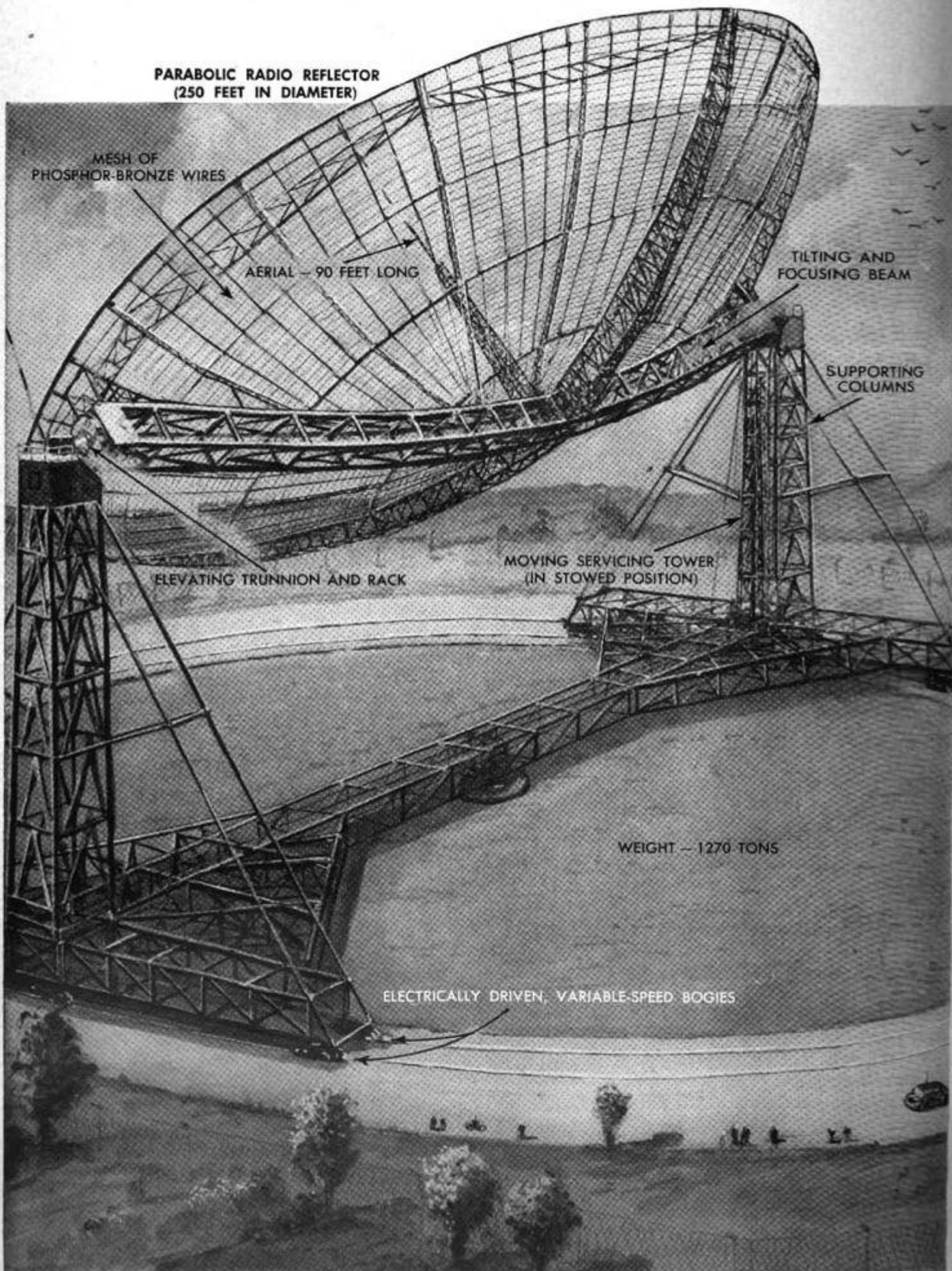
Powerful Ram-Action Grease Gun Loaded in 20 Seconds

So accurate it could be used for target practice, a ram-action grease gun shoots grease up to 24 feet. It takes only 20 seconds to load the special measured amount of grease that comes in a plastic bag. Hands are never soiled from handling the grease as both bag and grease are loaded into the gun. Powered by a steel spring, the gun releases grease under 2500 pounds' pressure. An "overdrive" feature provides 5000 pounds' pressure to force grease into difficult fittings. Trigger-operated, the gun releases a measured amount of grease every time the trigger is pulled.



If you do not find the information you need in the index on pages 12, 14 and 16, sources of further information are available without charge from *Popular Mechanics*. Write to the Bureau of Information, 200 East Ontario Street, Chicago 11, Illinois

GIANT RADIOTELESCOPE MAPS UNEXPLORED SKIES



MAIN TILTING RACK (FORMERLY USED TO TRAVERSE 15-INCH GUN TURRET OF AN OBSOLETE BATTLESHIP)

MAIN TRUNNION

REDUCTION GEARING

ELECTRIC MOTOR

18-INCH PINION, ENGAGING TILTING RACK

GEAR FOR TILTING TELESCOPE

METEORITE

STAR

PRESENCE OF A STAR IS SIMULTANEOUSLY RECORDED ON TELEVISION SCREEN AND ON A PHOTO STRIP

Drawn especially for Popular Mechanics by the British Illustrator, G. H. Davis

Precise gearing, left, controls reflector's movements. Right, radar and cameras will record the observations

DISCOVERY OF STARS over 750,000 light-years away is expected with the completion of a giant, rotating radiotelescope being built in England. A smaller, fixed instrument, probing nearly that far, has already detected about 100 additional stars. Shaped like a huge electric fan, the new telescope will be 250 feet in diameter, weigh 1270 tons and will rotate on a platform mounted on 185-foot elevating racks. A 90-foot aerial

will extend out from its center. The reflector itself will be a web of phosphor-bronze wires one tenth inch in diameter, supported by a metal framework. The aerial will send out short pulses of energy at regular intervals. If they strike against a distant star or other solid body in space, a small amount of incident energy is scattered and a radio "echo" is returned to the station where it is received and amplified. Since the angle at which the radio wave was transmitted and the speed at which it travels will both be known, the star's location can be fixed by the elapsed time between the sending and receiving of the signal. The telescope is automatically controlled by a clock that enables it to be trained constantly at any particular point in space, despite the earth's movement.

A solid reflector was believed impracticable because the aerial probably would melt from the sun's heat reflected on it by a metal bowl, and wind and snow would overtax the structure's strength. ★ ★ ★

Below, dials and clocks on a panel in control house will facilitate a constant checking of observations

SIDEREAL CLOCK

ELEVATION DIAL

STANDARD CLOCKS

LONGITUDE DIAL

LATITUDE DIAL

RADIO-TELESCOPE CONTROL PANEL

CONTROL HOUSE

G. H. DAVIS
1952



Atomic Radiations Control Automatic Elevators

Atomic radiations and geiger counters are the operators in an automatic-elevator-control system. Small radium buttons, shielded in lead, are mounted at each floor level. A narrow slit about the width of the edge of a sheet of paper releases a stream of radiations. In the elevator itself is a small geiger counter that stops the cage at the

point where the radiations are most intense, leveling cage with floor. The manufacturers claim a leveling accuracy of .05 inch, whereas the usual automatic control is accurate to within .25 inch. The atomic control eliminates complex wiring, reduces cost and is said to function indefinitely without repair or maintenance.

Test Old Indian Tanning Material for Modern Domestic Use

Canaigre, a sweet-potato-like plant of the Southwest, may soon supply tannin for your shoes. Used for centuries by Indians and Mexicans in their home tanning operations, the plant may become a major domestic source of tannin. Blight has practi-

cally exhausted the chief former source, chestnut wood. Department of Agriculture chemists, having discovered economical methods of obtaining high-grade canaigre extract, are testing a domestic-vegetable tanning material using 50 percent canaigre.

Survival Ration Lasts Six Days

Adequate food for one person for six days is included in a survival ration designed for civilian use in time of emergency. Food in individual cans is packed in a large outer container coated with special enamel. Among the foods included are spaghetti and meat balls, ravioli, concentrated vegetable soup and a hot, sweet drink. There are a candle and safety matches, a sealed can which holds a half pint of drinking water and a hard-boiled egg. Contents of the inner containers will resist heat up to 350 degrees centigrade, it is claimed.



"Wading" Bus for Sightseers

Nobody gets seasick while "sailing" to an island near Bigbury-on-Sea, England, in a strange-looking machine that "walks" on the ocean bottom. Because of the rough water and high tides, boats are not practical to carry sightseers between the mainland and the old pirates' haunt on the island a quarter mile offshore. The stilt-mounted passenger compartment seats 14. It takes the track-laying vehicle 10 minutes to make the round trip.



Blizzardproof Tent to Be Used in Arctic Region Goes Up Inside Out



Built inside out so it won't blow away in a blizzard, an unusual tent will be used as a base shelter by arctic explorers on Baffin Island. Aluminum tubing forms a framework from which the tent fabric is hung. Insulating material, which is in the form of fabric bags, can also be attached to the framework to keep the heat inside the tent. No interior supporting poles are necessary. The framework is strong enough to support the weight of two men.

Mail Bags Unloaded in "Cages"

Mail bags are unloaded from passenger cars within seconds through a new system adopted by the Frisco Railway. "Cages" made of wire mesh are used to handle as many as 30 sacks of mail at once. The containers, collapsed, are placed in the cars by a fork lift truck. Aboard the train they are set up to hold the sorted mail sacks. At the destination a cage can be lifted out within a few seconds by another lift truck. The system gives greater mail-sack protection.

Sources of available products described in this issue are listed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, which is available without charge to readers upon request to the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Illinois





HSR Talks

By Henry S. Galus

Harbor-surveillance radar (HSR) shows ship entering fogbound harbor either from close-up or long-range view. The ship gets its directions by radiophone

THE WEATHERMAN was never more impudent than in August 1951. With skimpiest warning he pulled a massive blanket of fog over several hundred miles of the North Atlantic seaboard that completely suffocated every vital port and inlet. The propellers of million-dollar activity chugged to a stop as numerous blinded vessels were forced to drop anchor off port, including the *Queen Elizabeth* at New York with 1200 passengers aboard.

In other harbors like Boston, Providence, Newport and Portland, naval ships and commercial tankers dared not risk either inbound or outbound crawls through buoy-

choked lanes. Sports cruisers and yachts became lost temporarily or crashed, as did Judge Harold Medina's 46-foot *Spindrift II*, which struck an unseen breakwater and sank off Cape Cod. The fishing fleets of Massachusetts' coastal cities, fighting against time in the job of dulling the nation's meat appetite, postponed trips that yield up to 100,000 pounds per boat. And inshore airfields—LaGuardia, Idlewild and Logan International—canceled flights wholesale.

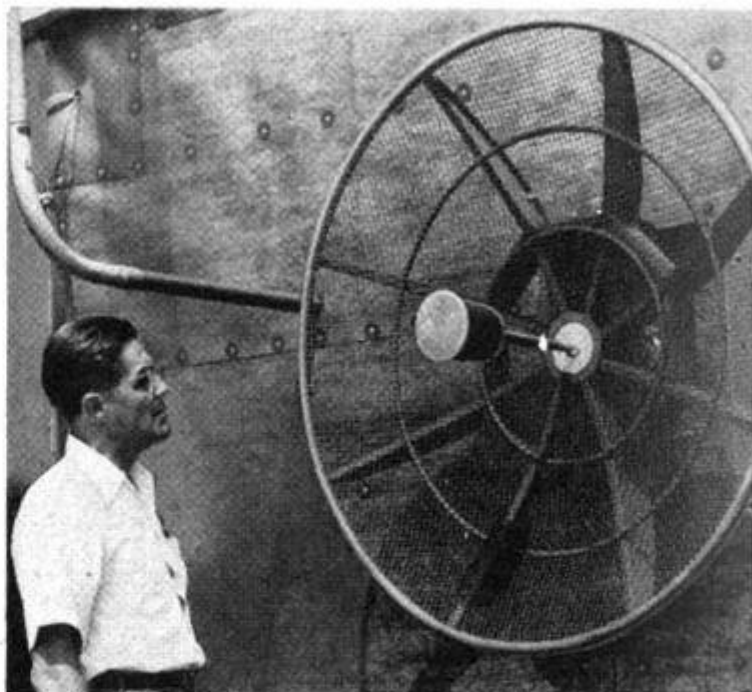
Lacking is an estimate of the total loss from that single siege of mist, which clung in various areas from 12 hours to 21 days. A hundred miles inland, defense lathes were stopped because steel shipments were five days late. In Washington, a meeting was postponed because a foreign diplomat's

chair was empty. A hospital awaited a critically short drug. Any number of monkey wrenches were thrown into the gears of current economy, all because of fog.

Fog's claim of lives through collisions and groundings easily makes it the most unappreciated phenomenon of nature encountered by seamen. International law demands that every ship slow down upon entering a vapor bank; yet even at a turtle-like pace many tragedies have occurred, such as the one in the Gulf of Mexico when two Esso tankers crunched together and 36 men died in the holocaust. Fog, science's constant target, has been fought with bell, beacon and, lately, shipborne radar. But the ship's navigator continues to use these with strained eye and prayer—not with the confidence promised by science's newest achievement, HSR.

Harbor-surveillance radar is a laboratory pet that's been pampered since the war by engineers of the Raytheon Manufacturing Company of Waltham, Mass. Not until July 1951 were they ready to pull away a veil of secrecy to reveal the largest commercial-radar unit ever devised. This was before the usual gathering of electronics experts, port authorities and shipping-industry hopefuls. They had come to see a miracle come true and now they were looking at an awkward 41-foot "eye" which was planted on Deer Island at the entrance to Boston Harbor.

The test day had been picked carefully. Visibility simulated zero-zero and actual ship movements in Boston Harbor remained undisturbed as Capt. George H.

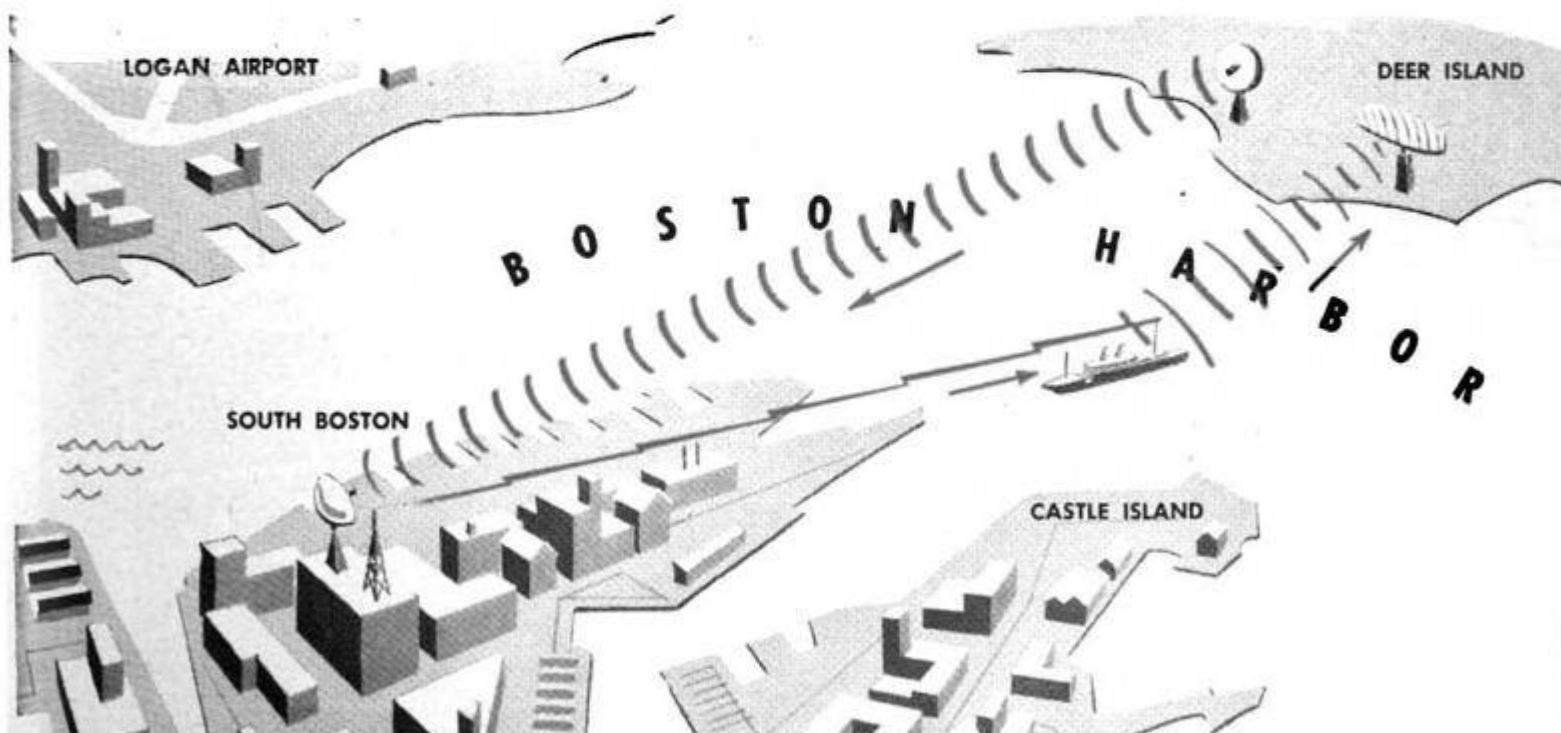


Microwave link at Deer Island installation uses this antenna to send radar information to receiving station located at Commonwealth Pier in South Boston

Lauriat, Jr., steered the pilot boat *Roseway* out of the Harbor. There he swung about, waiting to be "talked" ashore by means of his radiophone equipment. "That's all any boat will need with HSR on the job," a Raytheon engineer had told him.

To the *Roseway's* stern was Deer Island where a 10,000-pound scanner capable of operating in a 100-mile gale revolved eight times a minute. At its right a microwave transmitter was ready to cast a radar image across the Harbor to Commonwealth Pier, where a receiver would present a picture of

Ships Through FOG



This giant radar antenna was built by the Raytheon Company for the HSR installation at the port of Le Havre, France, last year



the incoming boat on four identical viewing consoles, which resemble ordinary TV sets.

"Okay, George, come on in," barked the radiotelephone aboard the *Roseway*. Tension gripped the assembly at the South Boston shore. Ordinarily a pilot would be crazy to try a zero-zero harbor approach without shipborne radar to guide him. Ahead and to each side of the moving craft lurked threatening buoys and directional markers that quickly could have shattered the trim

hull. But these were seen clearly on the stationary scopes and a swift succession of cautions reached Lauriat.

At first the scope showed a long-range, encompassing view of the port, like the infinity focus of a camera. Then a switch was thrown to bounce a magnified section on the screen, something never before accomplished in radar. Meanwhile, the console engineer was chalking a "plot" directly on the surface of the image tube. Done at intervals, this revealed Captain Lauriat's exact speed and position. A single swipe of the hand and the plot was erased to make room for another "fix." Through all those screen flickers, witnesses of the amazing radar-conning experiment sat stiff with suspense or stood in silent doubt but soon all were to be convinced that a new history of navigational safety was opened when Captain Lauriat jumped ashore. "It works," he stated with a grin.

But the *Roseway* was one craft—can HSR do the same with a wartime merchant or naval fleet in dispersed port approach?

Raytheon engineers, among them Roy M. Graham, retired rear admiral, report: "This harbor-radar system can give complete coverage of not only inner channels but of outlying approaches. A unique chain of stations could be set up with an ability to transmit valuable information at great distances by either microwave or coaxial cable." HSR can finger a steel vessel 20 miles at sea and a wooden one about 5 or 6 miles, although metal reflectors installed on the latter could increase the range almost three times.

For example, weather and directional

(Continued to page 246)

HSR tests made in Boston Harbor used four 16-inch radar scopes to verify location of a ship moving in fog





U. S. Army photographs

Chassis of new combat camera, left, is easily accessible. Right, plunger at top slices off needed exposures

Rapid-Shooting Combat Camera Chops Off Pictures as Needed

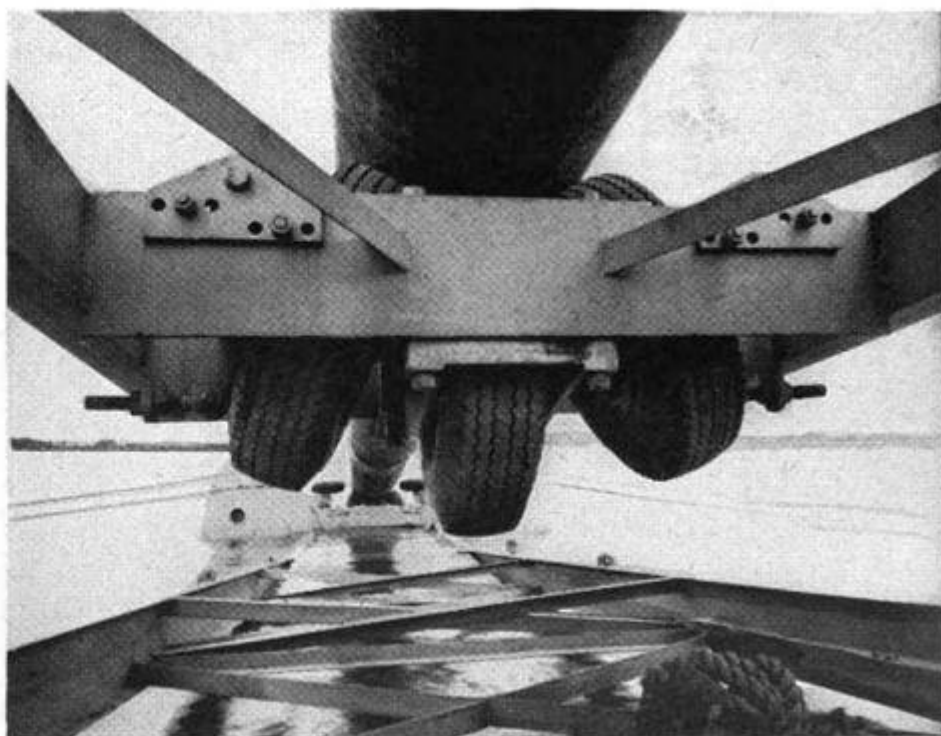
Army photographers using a new light-weight combat camera can shoot pictures as fast as they can be clicked off. Fully loaded and with a four-inch lens, it weighs 5½ pounds, far less than press cameras now in use. Up to fifty 2¼ by 2¾-inch exposures can be made on a roll of 70-mm. film. A built-in knife slices off the exposures needed if the user doesn't want to wait until the entire roll is exposed. The film advances automatically and a photographer shooting at 1/500 second, the camera's maximum speed, can make 10 pictures in five seconds. A counter turns each time the shutter is clicked and a red flag pops into the viewfinder-range-finder peephole when no film remains. For following rapid action, the camera has a focusing scale, a depth-of-field scale and a sports-type view-finder.



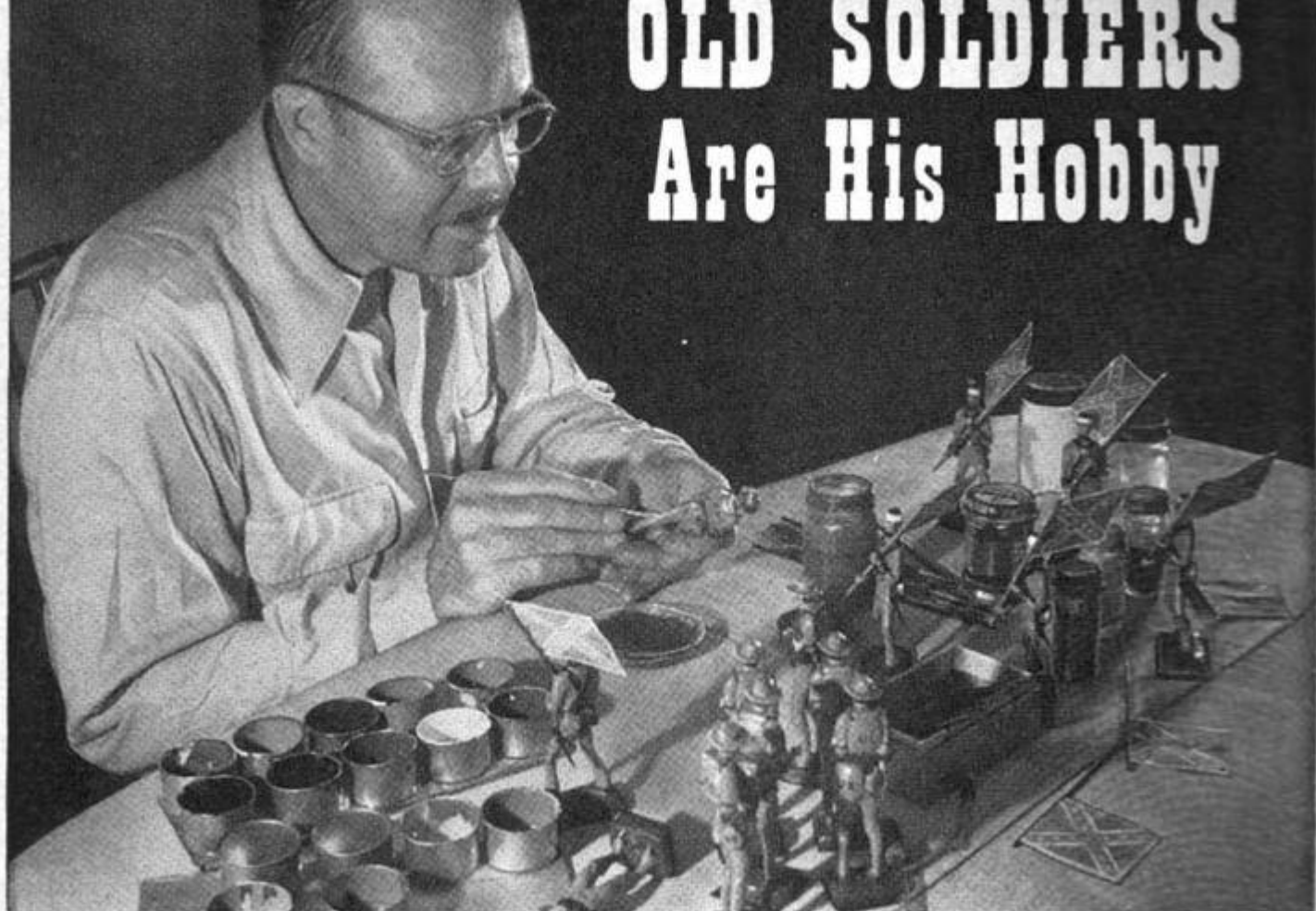
When no film remains, a red flag automatically pops into the combined view-finder-range-finder peephole

Pipe Launcher

Heavy-duty truck tires were the "ways" on which a heavy 24-inch pipe line was launched across the Narrows of New York harbor. Concrete-encased steel pipe, weighing 235 tons per section, slid smoothly atop 18 tires mounted on a long, inclined frame from railroad flatcars to the harbor bed. Careful handling prevented the concrete casing from cracking. Giant winches on the Brooklyn shore pulled 6514 feet of pipe across the Narrows in a 25-foot-deep trench in the harbor bottom.



OLD SOLDIERS Are His Hobby



Careful study provides hobbyist Brady with the data he needs to paint historical uniforms authentically

OLD SOLDIERS won't fade away if Richard T. Brady can help it. A Baltimore, Md., banker, he makes a hobby of reproducing authentic lead models of historical soldiers—including those of the Revolution, the War of 1812, the Civil War, and even Napoleon's staff.

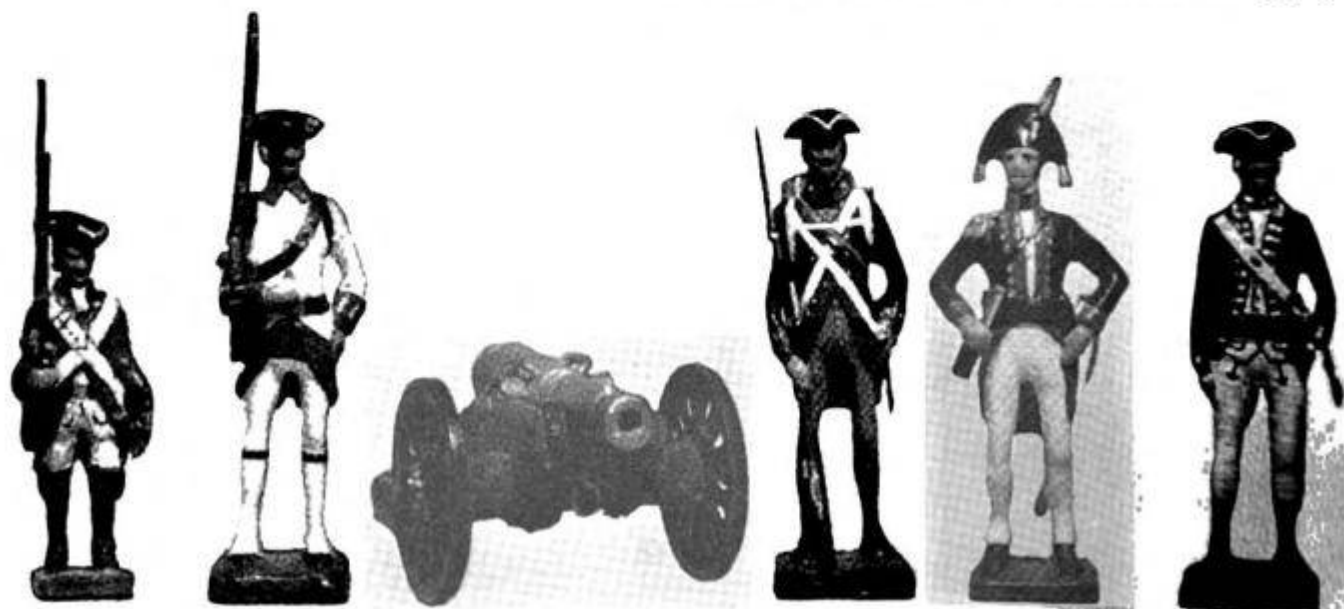
His models have a reputation for authenticity which is based on long hours of tireless historical research.

Most of his figures are 4½ inches high

and weigh approximately 8 ounces. His first operation (after he has completed his research and knows what his model must look like) is to make a master figure of clay. From this he forms a mold of plaster of paris and feldspar into which he pours the casting metal—an alloy of lead, tin and antimony. He paints them with the correct colors of their uniforms, using a special lacquer made for hobbyists.

He has no trade secrets, he explains, ex-

Brady's earliest models were very short, left. Model of General Grant is second from left on facing page



cept careful and thorough research. But he has developed production tricks that are interesting. Tiny buttons on the uniforms are made with a tool he designed from a 10-penny nail. Miniature dies stamp regimental numbers on belt buckles. Swords and muskets are cast separately from the figures. He files off the pan of the flintlock on his basic musket to convert it into a different model. A soft iron wire inserted in the musket mold becomes a bayonet. It is bent to shape, hammered flat and filed to a point. The bayonet scabbard is a small nail.

His basic sword is a Civil War heavy cavalry saber which he files down to make other models. For example, by filing off the quillon, it becomes a light artillery saber.

Weapons of Col. Richard Rush's Lancers, the only lancer regiment in the Civil War, are made from a wire coat hanger. The pennons are made of pieces of shellacked linen. Plumes, regulation uniform for a major in the Confederate cavalry, are fashioned from a pipe cleaner.

His soldiers have been displayed at the Confederate Museum in Richmond, Va., at the Boston Public Library, and Fort Ticonderoga.

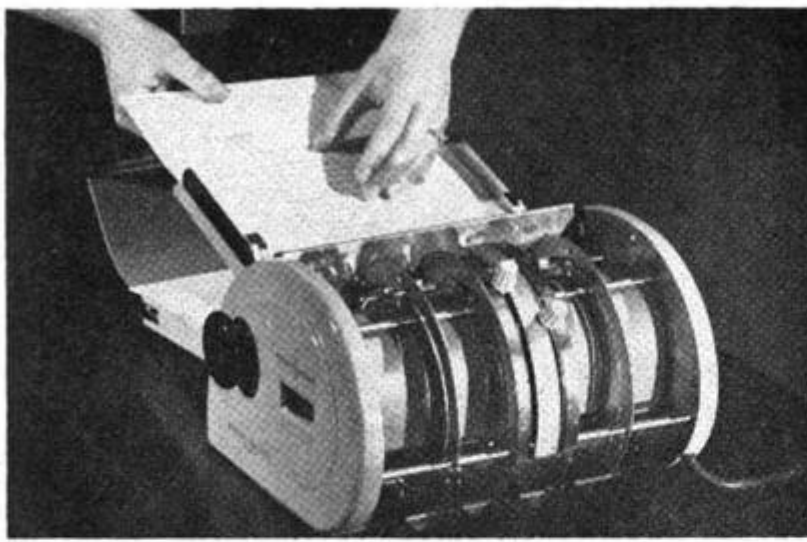
He is a veteran of several wars himself—a sergeant in the 5th Marine Brigade of World War I and a major in military intelligence in World War II. He has no desire to make model soldiers of those wars, however.

"No glamour in today's wars," is his explanation. ★ ★ ★



Small changes are made with a file before models are painted. No expensive equipment is required. The Baltimore banker uses the kitchen range as a foundry for casting his lead figurines.



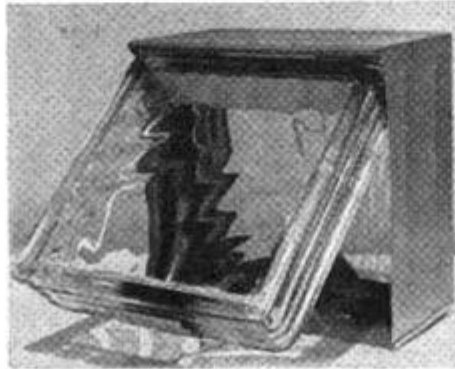


Desk-Size Letter Folder

Up to 5000 sheets an hour are folded precisely by an electric machine that is not much larger than a typewriter. Designed for the average business office, the machine can make two parallel folds in one operation and has in its "repertoire" eight basic folds for a wide variety of paper sizes and weights. It feeds and stacks from the same end and can be set up in about one minute. Paper sizes range from 3 inches square to 8½ by 14 inches.

Glass Block Ventilator

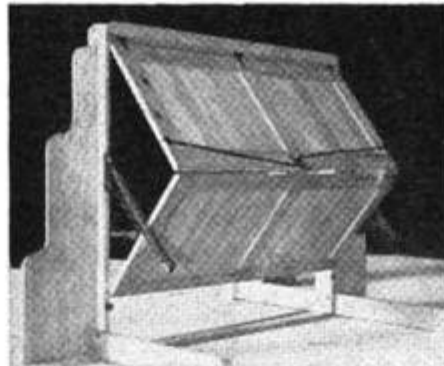
Concealed ventilators now can be built into wall panels made of glass blocks. The ventilators actually are half blocks set in aluminum frames. Each one replaces a full-size block in the wall. The ventilating block is hinged at the top; when the homeowner wants to open the vent he pushes a short metal rod which swings out the bottom of the block.



The inner side of each ventilator is screened. When closed, the block fits snugly against a weathertight rubber gasket.

Garage Door Uses No Tracks

No tracks or rollers are required for a new garage door, built in two sections which fold together like the pages of a book. The sections are hinged; as the door is raised the hinge moves into the garage and upward. In the open position the two sections are folded together at the top of the jamb. Two coil springs permit the door to be opened and closed with lit-

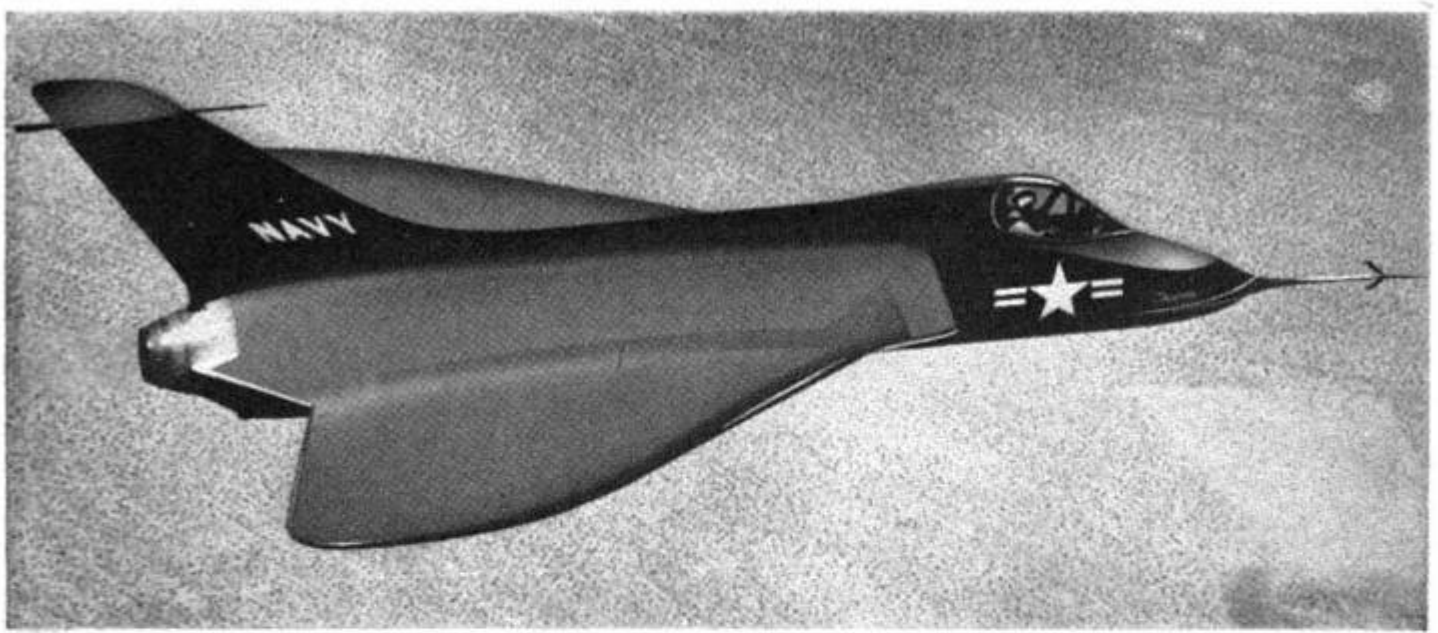


tle effort. One advantage of the door is that no headroom is required above the jamb for its installation.



Food-Preserving by Teakettle

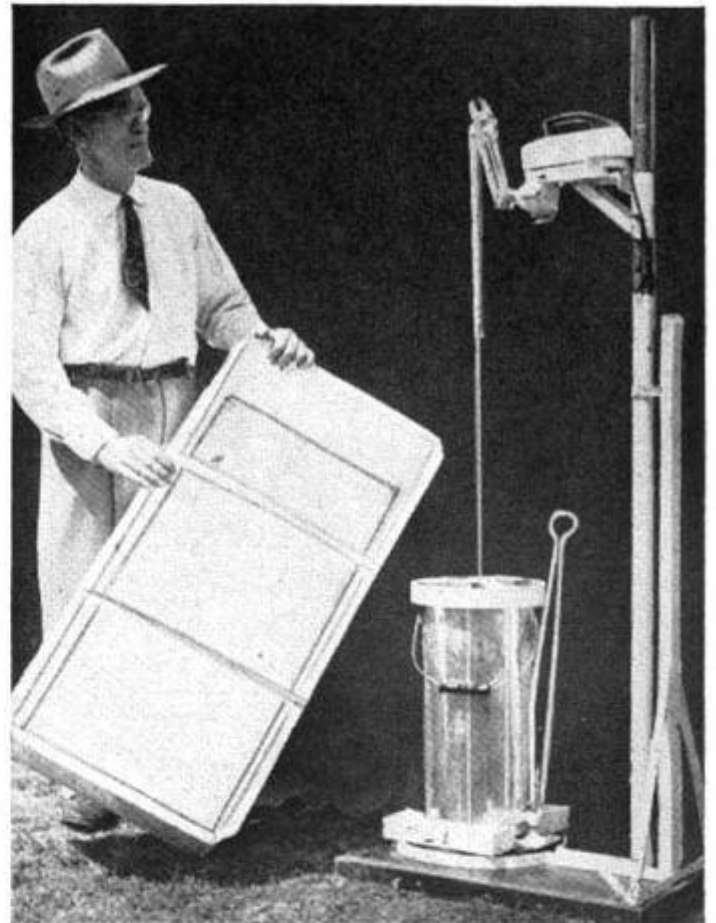
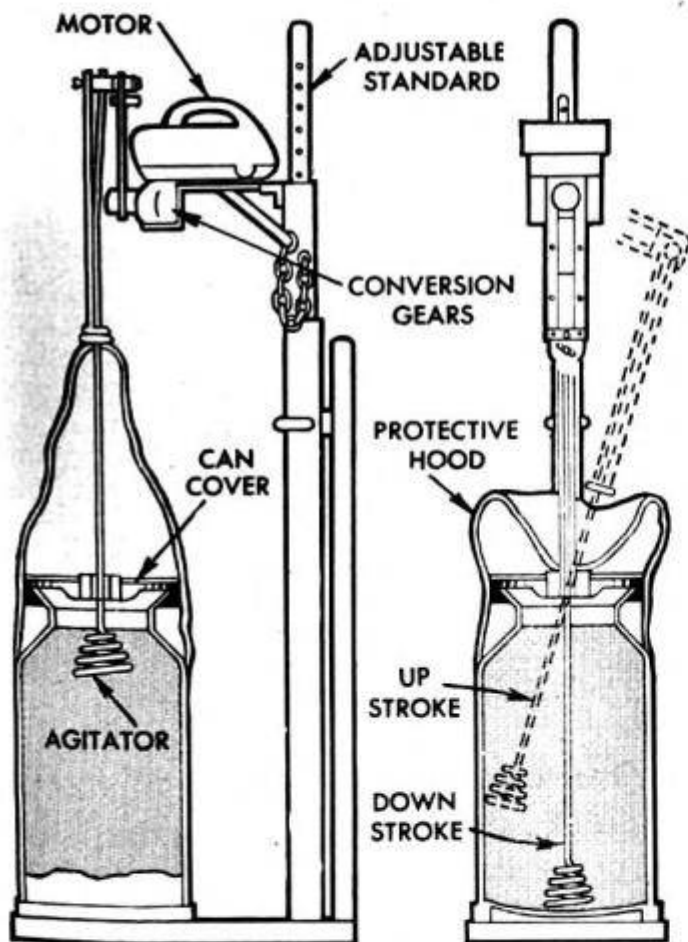
Food is preserved in less than two minutes by a German invention. Small metal tubes carry steam from a teakettle into a pair of glasses or jars, entering special loose-fitting aluminum lids. Glass covers are clamped on after the contents have been steamed for approximately 1½ minutes. Fifteen minutes later the clamps are removed and the jars are sealed airtight. The process marks one of the first switches from the old, conventional system.



Navy Adds Supersonic Punch to Its Carrier Air Fleet

With a jet engine almost as long as its fuselage, the Douglas F4D *Skyray* will soon be adding a supersonic punch to the Navy's carrier air fleet. Performance figures have not yet been released, but the craft is re-

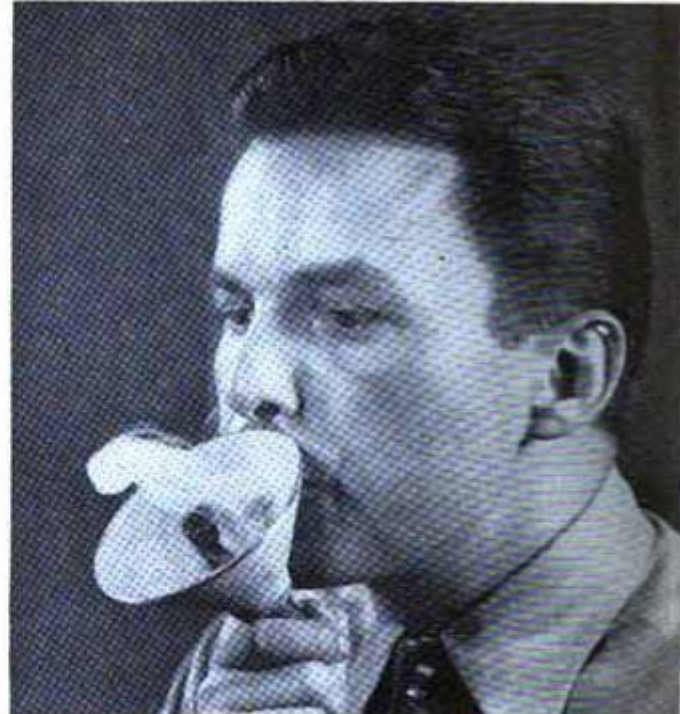
portedly capable of an exceptionally fast climb to extreme altitudes. Single place, it has a swept wing that blends into the fuselage. The *Skyray* gets its name from a resemblance to the ocean-dwelling manta ray.



Aerator for Fresh Cream Quickens Cooling and Retards Souring

Fresh cream taken directly from the separator is rapidly cooled by a new aerator. In one test, cream cooled by the machine remained sweet for 12 days. The machine is a metal frame 5½ feet high with a weighted clamp at the base to hold the cream can securely in a tub of cool water. Atop the frame is a small electric motor which actu-

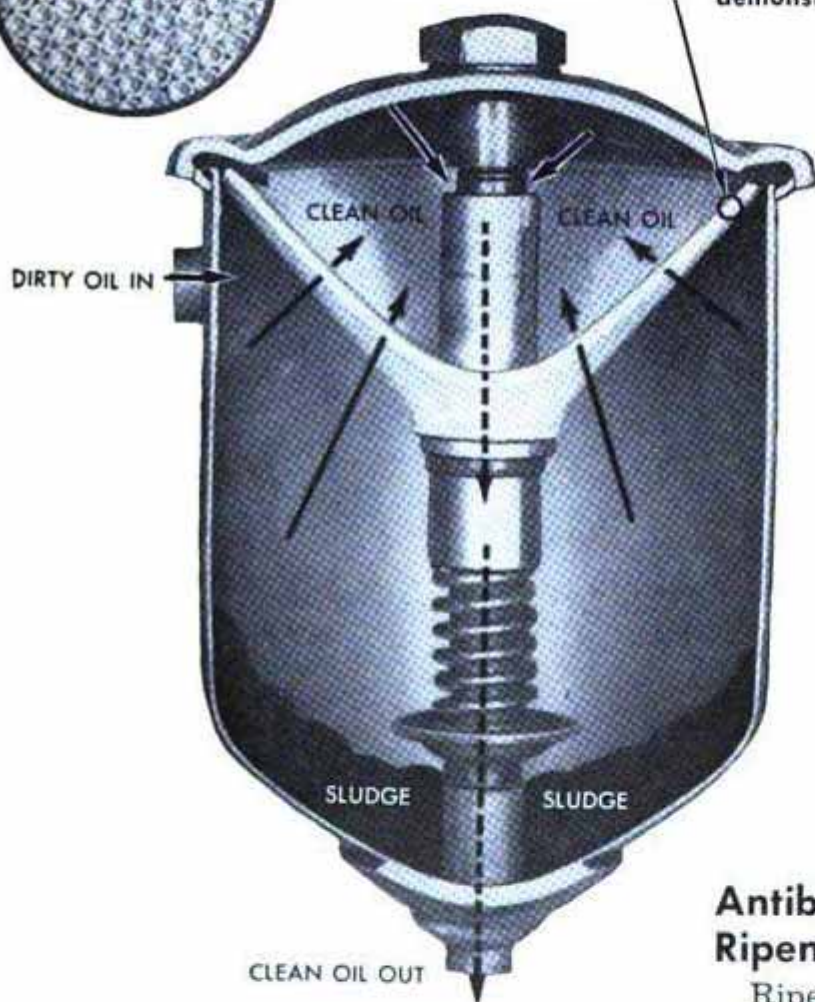
ates a plunger rod. At the end of the rod is a stainless-steel agitator. In action, the rotating arm makes about 45 revolutions per minute, raising the cool cream from the bottom, mixing air with the liquid and reducing its temperature quickly. The aerator has reduced the temperature of a can of cream from 90 to 48 degrees in 15 minutes.



Left, metal cone replaces cartridge. Above, smoke demonstrates the filtering action of bronze spheres



← BRONZE PARTICLES



Permanent Bronze-Cartridge Filter

You never have to replace a bronze cartridge for your oil filter—all you do is take it out and wash it every 2000 miles. The filter cartridge is cone shaped and constructed of thousands of tiny spherical-shaped bronze particles fused together. Infinitesimal spaces between the spheres allow the free passage of oil, but trap minute particles of dust and dirt measuring no more than 39 millionths of an inch in diameter. Another advantage of the cartridge is that it does not absorb or remove the additives used in good motor oils today. Kits are available to convert a conventional filter for use with the bronze cone and, of course, a complete filter unit is also available.

Tinted Window Spray Cuts Heat and Glare

Antiglare compound sprayed from a small pressurized-can dispenser imparts a soft, blue-green tint to a windshield. It reduces heat and glare without harming visibility. The plastic film will not crack or peel, according to the manufacturer, and is said to last indefinitely. It can be removed with lacquer thinner.

Antibiotics Help Cheese Ripen Faster

Ripening in a fraction of the normal time, cheese sprayed with an antibiotic solution does not develop mold growth, discovered in studies at Louisiana State University. After being sprayed or dipped, the cheese is coated with paraffin to prevent evaporation of moisture. Because the antibiotic inhibits mold growth, a higher ripening temperature can be maintained and, therefore, the time required for ripening can be cut from 12 months to 3 months. Because there is no mold growth, no cheese has to be cut away and wasted.



Craft Becomes "Flying Boat" With Hydrofoil Rigging

Hydrofoil "legs" that lift a boat 18 inches above the water can now be installed on any standard craft powered by a Mercury motor with an extra-long drive shaft. The cross section of the hydrofoil is similar to that of an airplane and the lift is accom-

plished by water flowing over it. With a full load of passengers, a hydrofoil-equipped boat will cruise at about 35 miles an hour with the motor operating at only half throttle. Safe turns can be made without slowing and with very little banking.

Two-Piece Interlocking Plastic Handle on Bowling-Ball Bag

Bowlers will find a new plastic bowling-bag handle easier on their hands and also less likely to tear loose from the mounting points on the sides of the bag. It is made of molded plastic, and the sturdy two-piece handle interlocks neatly to form a solid, smooth grip, similar to the handle on a suitcase. To separate the two parts of the handle, all that is required is a slight upward push on one end with the thumb. The handle is guaranteed unbreakable. By distributing the stress equally to the four holders on the bag at all times, the handle eliminates the major cause of bag damage. The design of the handle prevents pinching of the hands.

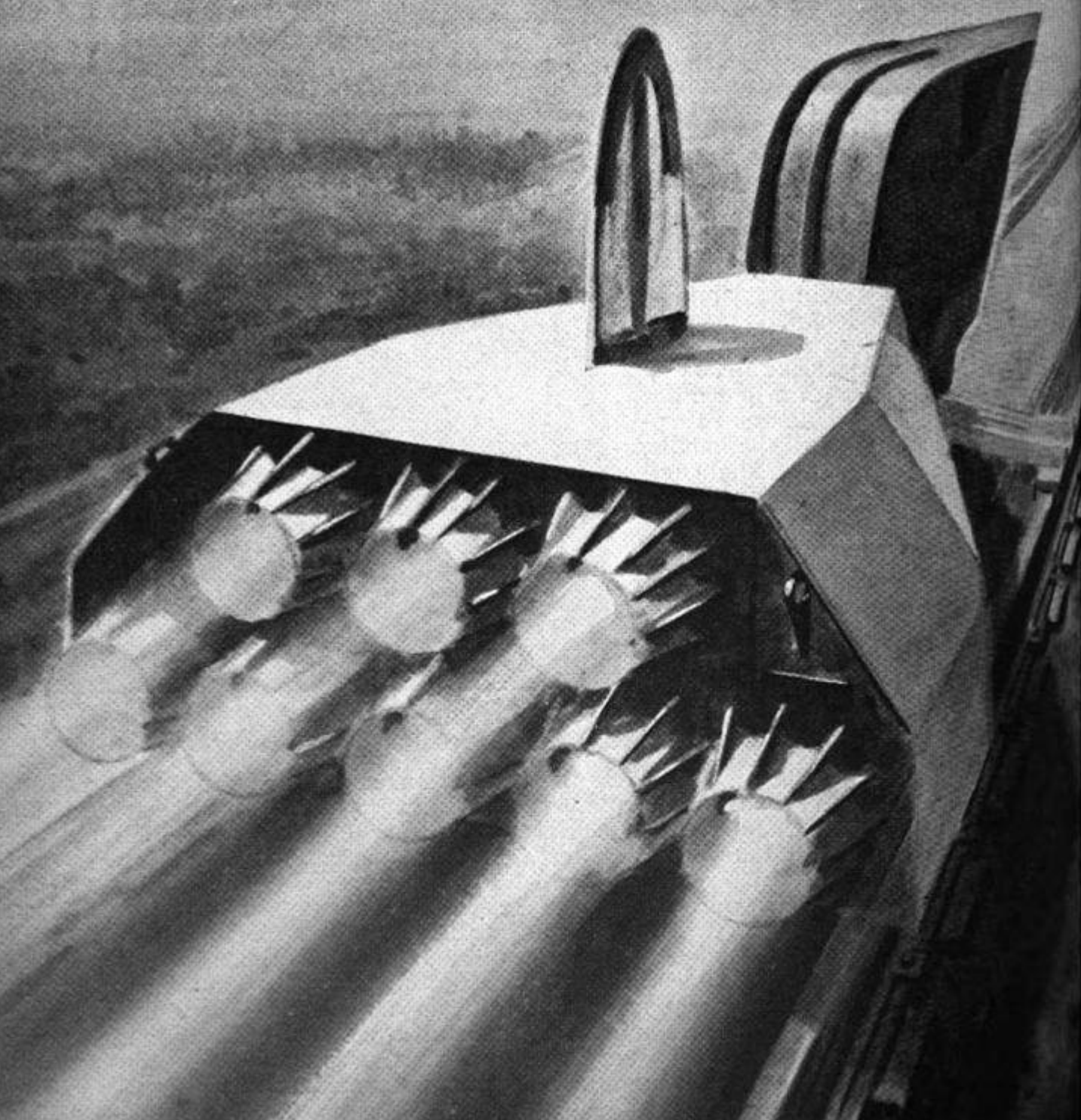


Lab Tests Indicate Mountain Ranges Determine World's Weather

Mountain chains, like the Rockies, the Andes and others, probably have a determining influence on the weather the world gets, says Dr. Robert R. Long of Johns Hopkins University. To test his theory, Doctor Long brought the world's atmosphere into the laboratory. He took two half globes, one inside the other, and filled the space between them with water. By rotating this double-walled bowl, he sets up currents and eddies in the water that resemble the circulation of the atmosphere over the Northern Hemisphere. By placing objects

of various shapes and sizes in the water to represent mountain chains and rotating them either faster or slower than the bowl, he simulates west-east or east-west wind currents. His experiments show that mountain chains put up atmospheric barriers to winds. When the winds are able to break through these atmospheric barriers (which extend far above the mountain summits), anticyclones are formed, creating waves in general circulation, determining whether cold air moves down from the arctic or warm air up from the equator.

***1000 Miles
Per Hour
on Rails***





Small sprays of water are still shooting out ahead of a rocket sled just before it comes to a full stop. Water in the trough between the rails, entering an orifice under the head of the vehicle, supplies braking power

WHEN THE ENGINEER of the world's fastest railroad presses his firing button there's an enormous *whoosh!* of rocket smoke and the afternoon express leaps away from the station. Within approximately two seconds the rocket sled is traveling at 1000 miles per hour. Down near the end of the track the supersonic engine dips its beak in a water trough placed between the rails, flings twin jets of water vapor ahead of it, and slams to a stop. The run is over.

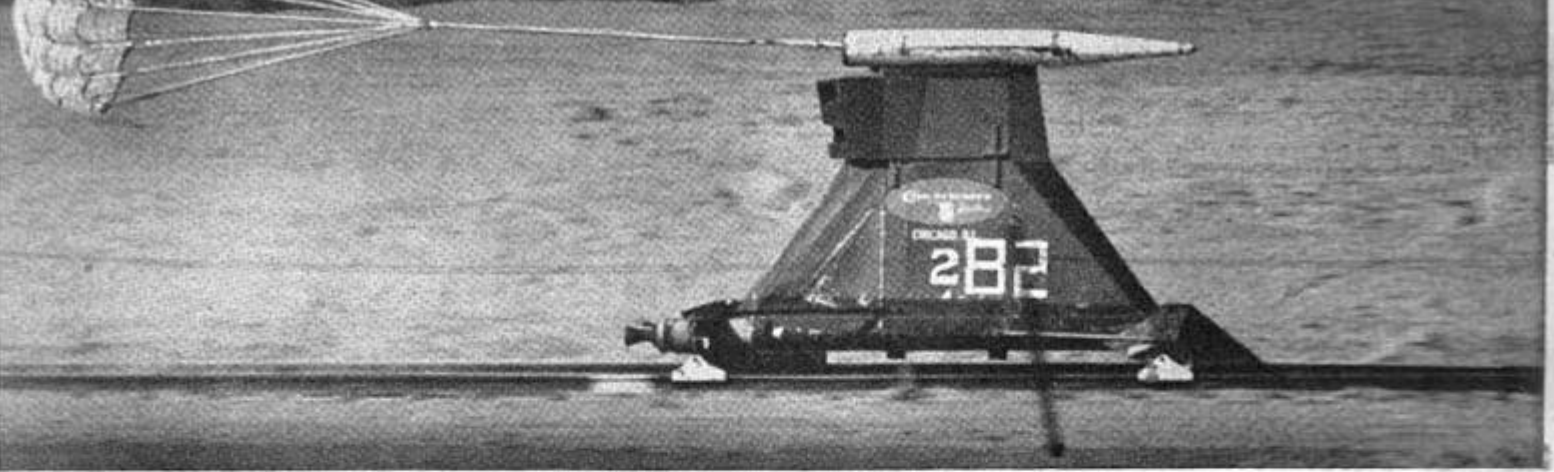
The engineer doesn't ride his engine. He, as well as the operating crew, crouches inside a reinforced concrete "station" when the train departs. The only cargo that the engine carries is a parachute, aircraft wing, or other aerodynamic shape that is being tested at high speed. The railroad is the

newest transsonic and supersonic testing facility installed at the Air Force Flight Test Center at Edwards Air Force Base in California.

The engines, actually called sleds, move on rail-gripping slippers instead of on wheels. The research people under Robert L. King, in charge of the high-speed track, are using a dozen types of sleds for different purposes, including the weird steel and aluminum bug-like vehicle illustrated here. This sled was built to test the efficiency of the water brake at high speed. Water in the trough between the rails enters the orifice under the head of the vehicle and moves through tubes that turn it through 180 degrees of arc so that the water is thrown out and forward from the vehicle's "ears." Deceleration is at the rate of 5 to 50 Gs,

Bug-like high-speed sled uses slippers instead of wheels to remain on rails along which it travels at speeds of up to 1000 miles an hour. Here a technician is installing a radiotelemetering unit inside the body





Minus water brakes, some test sleds are used for parachute testing. At a set point the chute is released from a nacelle attached to the top of the sled and its opening slows the vehicle to a complete stop



Closeup of water-filled trough in the braking area. A worker is examining one of the electrical trippers along rail by which speed of the sled is measured

depending on the type of test, and the vehicle slows to a safe stop.

For some of the extremely high-speed tests the technicians use two rocket sleds, one behind the other. The pusher sled gets the train up to a speed of several hundred miles per hour, then a parachute that it carries pops open and slows it down, after which the rocket motors of the front section are fired. This boosts the speed to the velocity desired. Information on the behavior of the shape that is being tested at high speed is recorded by apparatus on the sled or is transmitted by radiotelemeter circuits to oscilloscope cameras placed near the right of way.

The high-speed track is 10,000 feet long and consists of precision-aligned standard-gauge railroad track mounted on concrete crossties embedded in concrete. Information obtained from the high-speed tests augments wind-tunnel and actual-flight data in the supersonic range. ★ ★ ★

Installing rocket motors just before a test. Two sleds are used for some experiments, with second serving as a booster during initial part of run

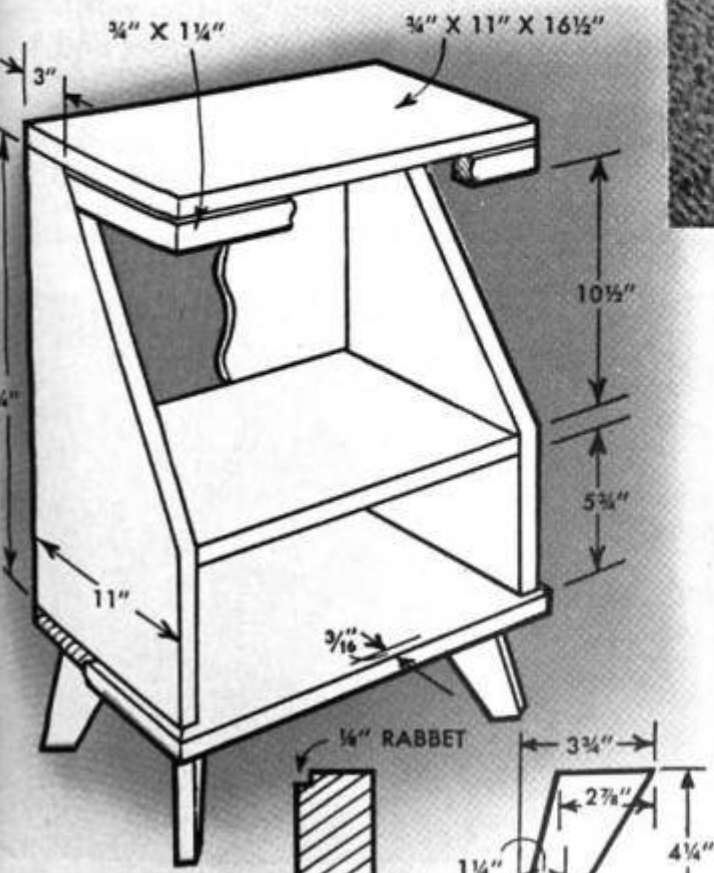


the POPULAR MECHANICS CRAFTSMAN

Functional END TABLE

By John Bergen

Designed especially for the craftsman who works only with hand tools, this smart-looking functional unit serves equally well as an end table or night stand. The construction is almost as simple as building a wooden box, and yet, with its clean lines and a careful finishing job, the table will be right at home with the best in living-room or bedroom furniture. As dimensioned, the table is made primarily from $\frac{3}{4}$ -in. plywood with solid stock being used only for the top apron and the legs. However, the table can be built from clear 1 x 12-in. stock if a slight variation is made in the width dimension. In this case, face the front and side edges of the bottom with $\frac{1}{4}$ -in. stock to extend the bottom slightly beyond the sides. Each leg is located $1\frac{3}{4}$ in. from the corner of the table. When



cutting the legs, be sure that the grain runs lengthwise to assure maximum strength. The $\frac{1}{8}$ -in. rabbet in the top apron is optional but can be cut with a small chisel after the apron has been fastened to the top piece. Use a fence made of two wooden strips to guide the chisel along the joint and continue the rabbet on the sides all the way to the back of the table. Either hardboard or thin plywood is suitable for the back panel. Glue and finishing nails, or countersunk wood screws, are used to assemble the table—all nail or screw heads being filled with wood putty. Although the table may be finished in a number of ways, the one pictured was covered with wood-grain plastic veneer.

FROM PALEFACE

WHETHER it's a family tribal affair, a Boy Scout jamboree or a school production of the first Thanksgiving, you can dress your young warrior as authentically as any redskin who trod the Great Plains. For a small investment of time and even less of money, a full-fledged, all-American Indian boy may be outfitted from his bonnet of eagle feathers to his moccasined feet. Under the direction of C. Morton Cliff, who has made a career of studying Indian lore, here is how to duplicate all the basic items of the Indian's colorful regalia. Proper face make-up, which is especially important for plays and various ceremonies, also is described in some detail, ordinary cosmetics and theatrical grease paint being used to produce startling, realistic results.

The basic costume consists of headdress, vest, loincloth and moccasins, and these can be made as simply or elaborately as desired. The necessary materials are available in kit form from several craft companies, or may be purchased separately.

Large feathers and "fluffs," which are small, downy feathers used for added color and mass, are the principal items in the headdress. The Indian used eagle feathers the way the white man uses medals, each feather representing an award for bravery or for prowess in sport, and the headdress thus became the personal heroic history of its wearer. Eagle feathers, of course, are relatively scarce today but a suitable substitute can be had in turkey feathers. These may be purchased in sets of 30, the minimum number required for a headdress, and are available in a variety of colors. They

The full-dress Indian costume pictured at the left includes the basic headdress, vest, loincloth and moccasins as worn by the Indians of the Great Plains. Front and back loincloth panels are pictured below



*By Norb Hildebrand
and
Vories Fisher*



TO INDIAN

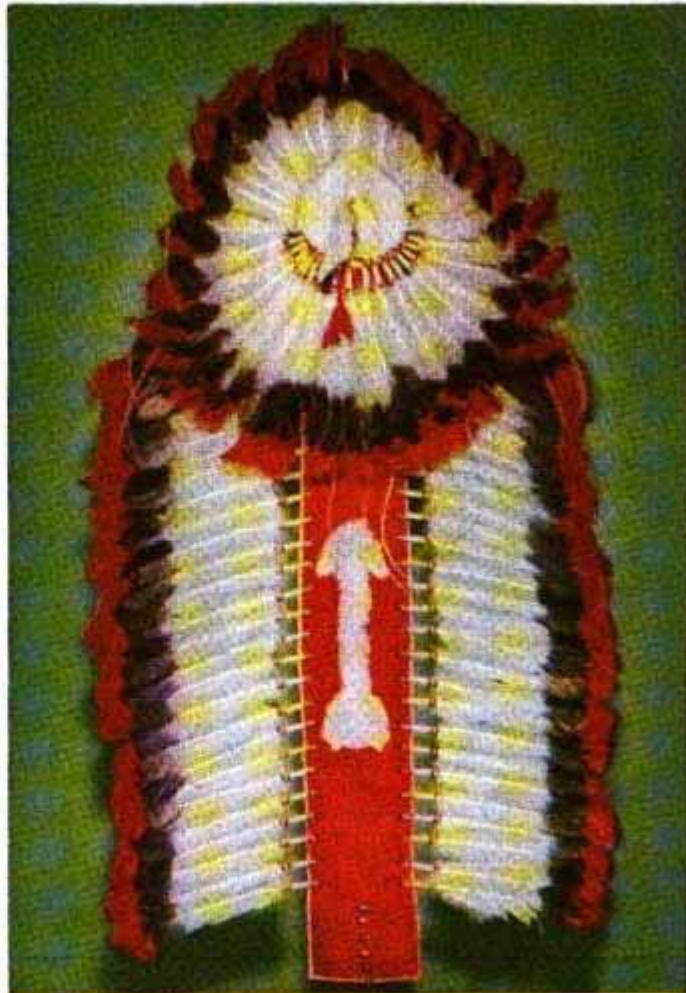
also may be obtained as imitation eagle feathers, with only the tips colored, or in natural brown or all white.

The feathers purchased in sets are selected for uniform shape and matched as pairs in size. To be authentic, the color chosen for all key, or large, feathers should be the same. However, a contrasting color can be used for the fluffs, or several colors may be employed by using one color for key feathers, another color for base fluffs and a third color for tip fluffs.

Steps in making the headdress are pictured on page 172. Base plumes, or fluffs, are added to give the finished bonnet a rich, full look. After the fluffs have been bound in place, narrow tape or yarn of a contrasting color may be added to the felt wrapping. Then, a tuft of horsehair is cemented on the front, or round side of the rib, about a quarter of the way down from the feather tip, and the top fluffs are cemented in place—three on the front and one on the back—similar to the base treatment.

The headpiece may be purchased as a felt crown or it may be made from an old hat, as in detail D. If the size of the head is too small to allow spacing 30 pairs of slits as in the detail, the space between the pairs may be reduced from $\frac{1}{4}$ in. to $\frac{1}{8}$ in. or $\frac{3}{16}$ in. and the two slits of each pair can be $\frac{3}{16}$ in. instead of $\frac{1}{4}$ in. apart.

Before placing the feathers in the headpiece they should be sorted into right and left curves. Feathers, when purchased in sets, will be half rights and half lefts; that is, the natural curve of the feather will be toward the right or left. There also will be a slight variation in length. The longest feathers should be used for the front-center location and the rest of the feathers should be placed in matched pairs, with the shortest feathers at the rear of the headdress.



Colorful headdress and trailer are worn by chief of tribe. Note red plumes, or fluffs, on ends of feathers



Patterns for custom-made moccasins, above, are taken directly from wearer's feet and transferred to leather. The plainsman vest, pictured below, is made from buckskin or from brown-colored cotton or flannel





Color photos above demonstrate the effect gained by applying theatrical face make-up. Lines or symbols usually expressed Indian's personal preference or had a particular purpose like the war paint in the third photo

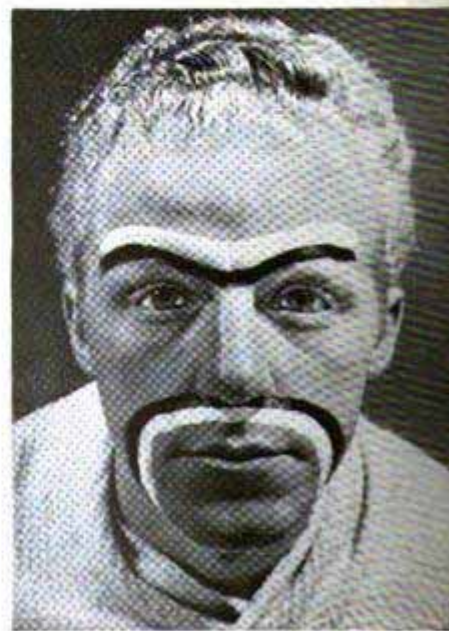
Begin lacing by alternately passing a brown shoelace or leather thong through the base loop of a feather and then through the slits in the headpiece, lacing from center rear to front, and back on the other side to the rear of the headdress. Then tie the two ends of the drawstring at the back, drawing it just tight enough to make it fit snugly on the head. Next, a guy string of strong button thread is added to hold the feathers evenly spaced and erect. From the back side of each feather, about half way up the quill, the thread is drawn through the rib once, over and around the rib and back through

the same hole in the rib of the feather.

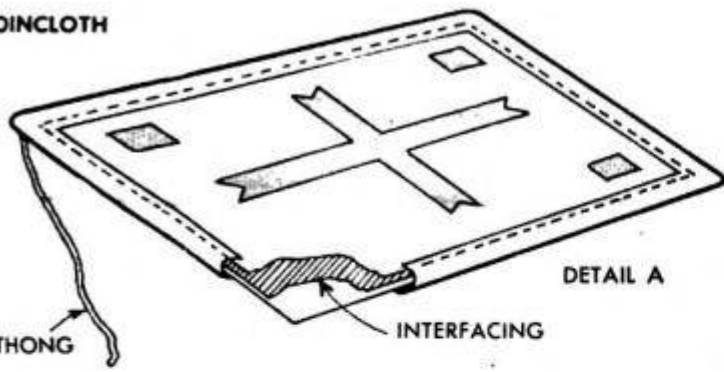
When assembled this far, the bonnet is placed on the wearer's head and any necessary adjustments are made to achieve a uniform spread of the feathers. If the feathers are unevenly spaced, loosen the guy string and move the feathers accordingly. Look at the sides as well as the front and back of the bonnet. Each feather should overlap the bottom edge of the feather in front. If the bonnet turns inside out when the head is tipped forward, the feathers should be moved closer together and the guy string shortened as necessary.

When the bonnet is adjusted, add the major plume—a long single feather, or several short feathers spliced together. This is trimmed with colored fluffs

Close-up of headdress, left, shows plumes on the feathers and crown



LOINCLOTH



and is attached to the crown a little forward of center. Cut a slit in the headpiece and lace the feather to the headpiece with a short thong passed through the loop at the base of the feather and knotted at both ends. The rest of the crown is then covered with colored fluffs or bits of fur or ribbon.

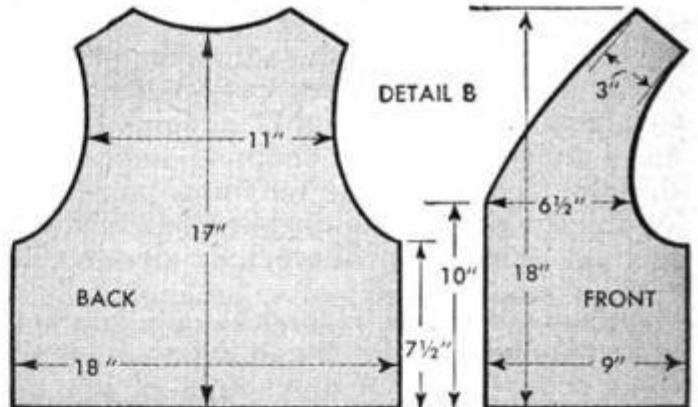
A trailer, which may be fastened by snaps to the back of the headdress, is a long piece of material flanked by two rows of feathers. Attach the feathers in much the same way as those of the headpiece and make the trailer long enough to reach just below the knees of the wearer. The feathers should be laced tightly and supported with a guy string to hold them outward at almost right angles to the length of cloth. See photo on page 167.

The plainsman vest, detail B, is made of coarse cotton cloth, flannel or buckskin. A pattern of the three parts—back, right front and left front—may be cut from measurements taken from a shirt which fits the wearer. Measurements shown in detail B are average for boys aged 12 to 15 years. After sewing the vest, add a red-felt border around the armholes and all exposed edges of the material. Indian designs may then be cut from colored felt and sewn to the vest. Authentic Indian symbols are described below detail D, page 173. Tie strings may



At Michigan Avenue bridge, Chicago, Boy Scouts practice crowning "Indian" princess for Independence Day celebration. Bridge is at site of Fort Dearborn

PATTERNS FOR PLAINSMAN VEST



Black and white grease paint applied as in the sequence of photos below leave little doubt that this Indian is on the warpath. First, draw general guide lines, apply paint sparingly, then smooth out over features

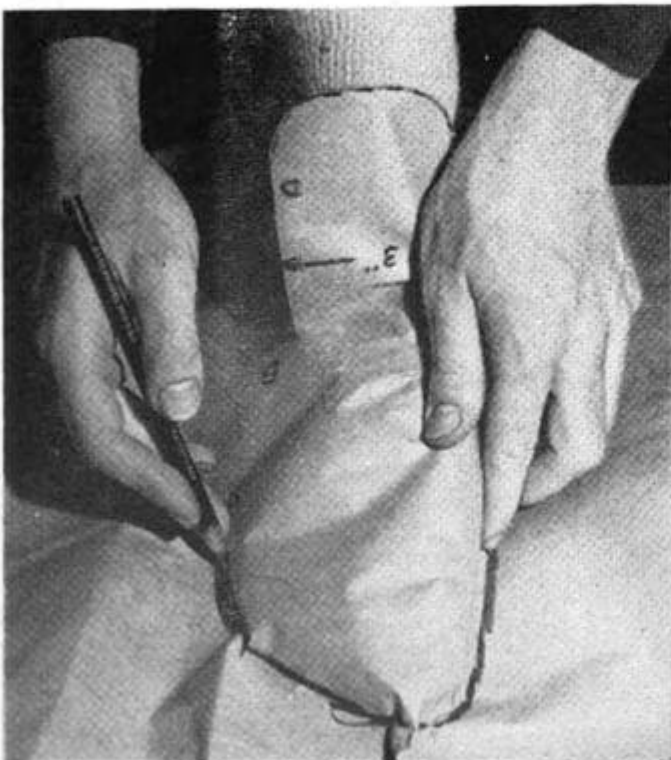


be added to the front of the vest if desired.

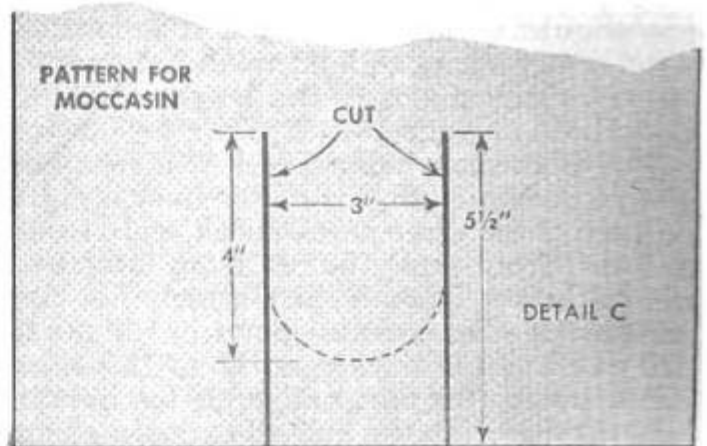
The loincloth, detail A, consists of two panels of dark-colored durable material on which designs in contrasting colors are sewn. Cut four pieces of the dark cloth, making the width one half the waist measurement of the wearer and the length slightly less. Sew designs to each of the four pieces of the loincloth material so that both front and back panels will be reversible. Sandwich light-canvas interfacing between the two pieces of each panel and sew together around all edges. Next, bind all edges with red felt and add a short shoelace or thong to each upper corner of the panels. These are used for tying the loincloth over bathing trunks.

To make the moccasins, trace the outline of the right and left foot on cardboard or wrapping paper and then transfer to sole leather which is trimmed to the pattern lines. Make the upper portions of the moccasin for each foot in much the same fashion, using a piece of paper large enough to cover the top of the foot and cutting the paper to form a flap as in detail C. Now slide the foot under the paper, turning back the flap, and gently press on the paper so that it conforms loosely with the foot. Carefully trace a line on the paper all the way around the foot. Transfer this pattern to cardboard and then to a lightweight leather selected for the uppers. From the scrap leather remaining from the uppers, cut out two heel flaps about 2 in. wide and 11 in. long. Later, these are sewn around the heel, extending along both sides of the foot to a point adjoining the base of the tongue. Decorations, such as beading, quill work or designs in

Wrapping-paper pattern for upper moccasin is marked for cutting, below, after flap is cut as in detail



Theatrical make-up, applied as in the photo sequence on the next page, adds realism to the Indian costume



Pattern traced on cardboard directly from foot is transferred to piece of sole leather as shown below





To make up face, work baby oil well into skin and remove oil with tissue. Next apply "Indian color" grease paint in spots, using it sparingly, and smooth out over face and neck. To emphasize eyes, apply shadow to upper and lower eye areas, and use rouge on upper cheeks, fading downward to simulate high cheekbones. Outline eyes with thin lines on upper and lower lids, extending lines beyond eye on either side of face



Fill in between black lines and edges of the lower eyelids with white grease stick, carrying the white color to the outer ends of the lines. Darken the eyebrows with black grease stick. Next, apply lip rouge, following the natural lines of the lips to a certain extent, but keeping the contour of the lips thin and fairly straight. Then use grease sticks to apply the cheek designs which may be colored lines or various Indian symbols



Indian symbols in photos above are: right cheek, butterfly; left cheek, sun symbol; chin, rattlesnake jaws. To keep grease paint on neck from rubbing off on costume, powder lightly with talcum or face powder. Finally, an Indian wig and beaded headband are added. To remove grease paint, first wipe thoroughly with facial tissue. Then apply cold cream generously and remove. Wait a few minutes and wash face with soap and water



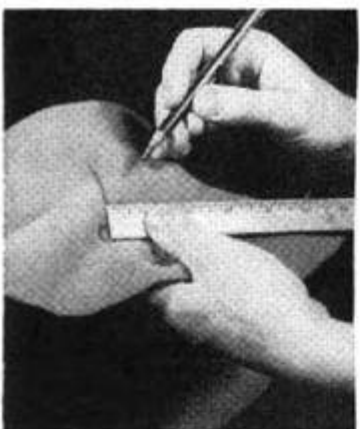
Steps in Making Headdress



Each feather is prepared by rounding tip with scissors and adding base plumes. Use maximum of three plumes in front and one in back, binding to quill with thread and coating binding with household or airplane cement



Next, bind a leather strip to quill to form short loop and coat thread with cement. Wrap quill with felt, sewing with matching thread and bind with narrow tape. Cement tuft of horsehair and top plumes to feather



Headpiece is felt-hat crown cut and slit as in detail. Feathers are attached with brown shoelace or leather thong passed through loops in feathers and slits in headpiece. Guy string is added to hold feathers erect



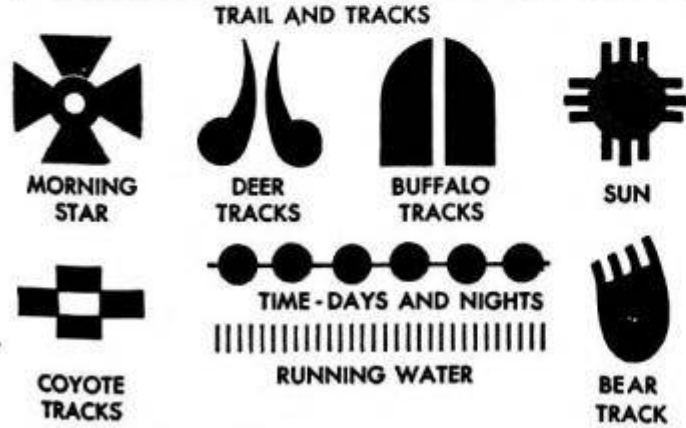
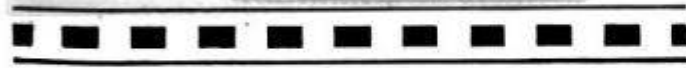
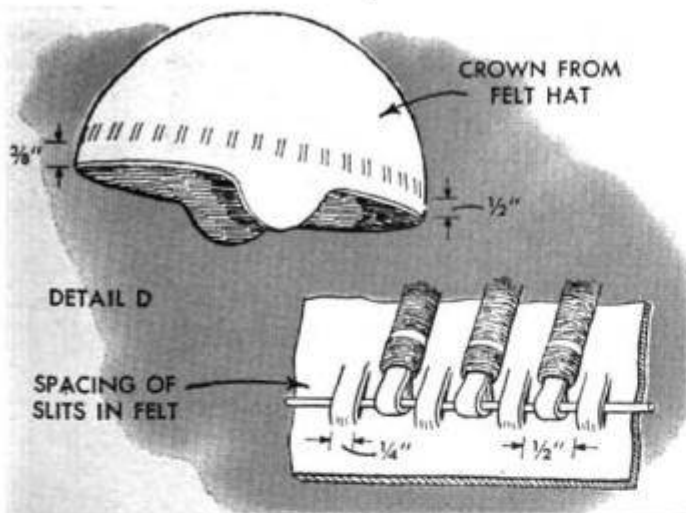
Beaded browband or ribbon, 1 to 1½ in. wide, is sewn to outside of headpiece below drawstring. Decorations and small fluffs plus ermine tails, fur strips or feather tassels are added to ear flaps with snap fasteners

tempera paint or even crayon, may be added to the uppers.

Sewing the moccasins together is done with an overhand stitch, holding the sole and upper portion inside out. Sew only half way through the thickness of the sole leather. Turn the moccasin right side out and sew up the back. Next, sew the heel flap to the edge of the foot opening, working from the base of the tongue on one side, around the heel and to the base of the tongue on the other side. When worn, this flap is folded down. Now cut a row of slits completely around the foot opening through which a thong about 20 in. long is laced and then tied in front.

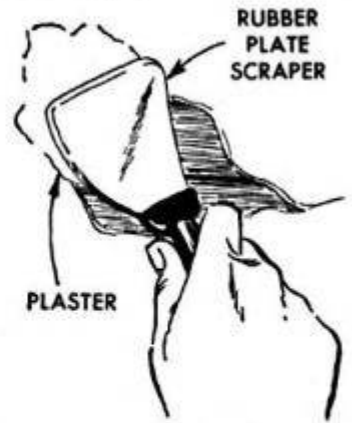
For those who want to go "Indian" from the skin out, body and face make-up may be applied. Body make-up is easily accomplished with suntan lotion, leg make-up or theatrical body paint. Although these may be rubbed on with the hands, using a small sponge does a faster and neater job. The make-up washes off easily in the shower.

Some of the most outstanding artistry of the Indian is found in the face make-up, and each individual may choose his own kind of decoration and color scheme. It's a good idea to work out a few patterns or ideas on paper before starting to apply the make-up so that you have a definite idea of what you want to look like when finished. The photos on page 171 give a detailed description of the application. ★ ★ ★



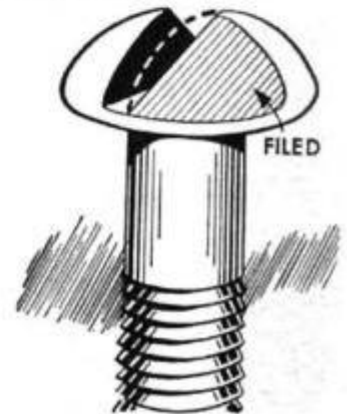
Trowel for Patching Plaster Provided by Plate Scraper

You will find that a rubber plate scraper is a good substitute for a steel trowel when used for patching small holes in a plastered wall. The scraper also may be used for smoothing small concrete-patching jobs around the home. If the plaster or cement adheres to the rubber while smoothing a patch, dip the scraper in water from time to time.



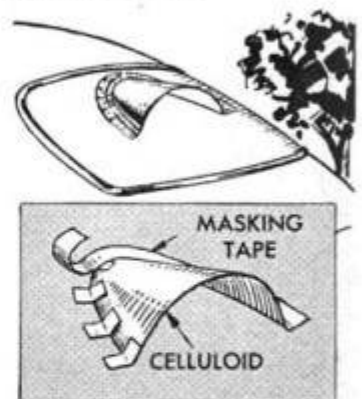
Nonremovable Wood Screw

By simply filing or grinding away a portion of the head at each end of the slot, an ordinary screw is altered so that it can be turned into the wood but cannot be backed out. Either flat or round-head screws for wood or metal may be altered in this manner. It is important that the flats be filed on alternate sides of the slot as indicated in the detail.



Snow Visor on Rear Car Window Keeps Portion of Glass Clear

If snow builds up on the rear window of your car and completely obstructs vision, clean off a section of the glass and tape this celluloid visor to the window. The visor will shield a portion of the window from the snow or sleet, thus permitting safe rear vision even during a severe storm. To make the visor, cut a semicircle from heavy celluloid, the base measuring about 14 in., and tape the celluloid to the window. Use tabs of masking tape to hold the visor in a bowed position, as in the drawing, and seal the edges of the visor with several strips of tape to keep snow from seeping under the edges.





Once a Tin Can

PART II

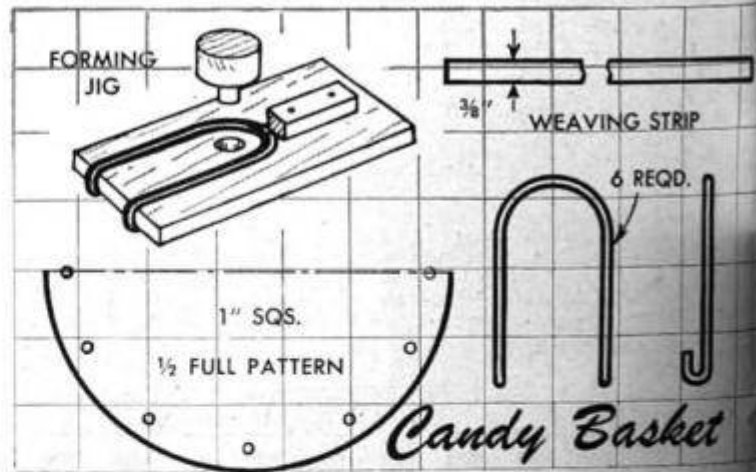
By Bertram Brownold

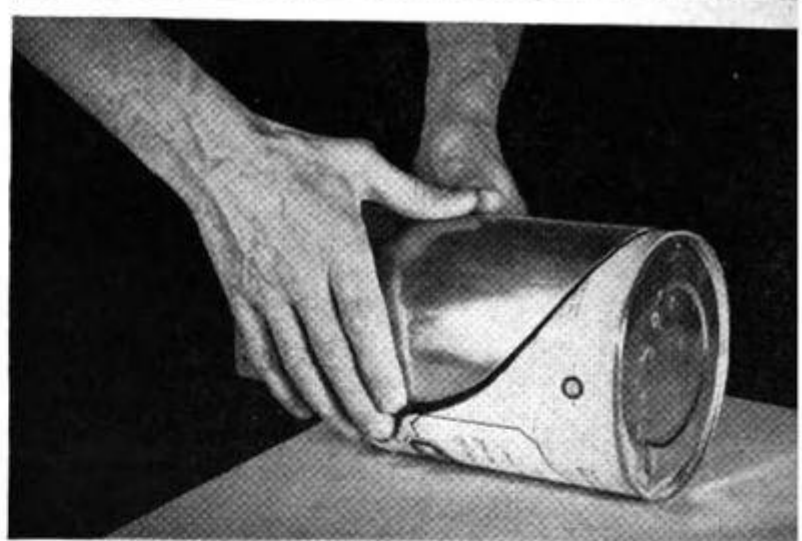
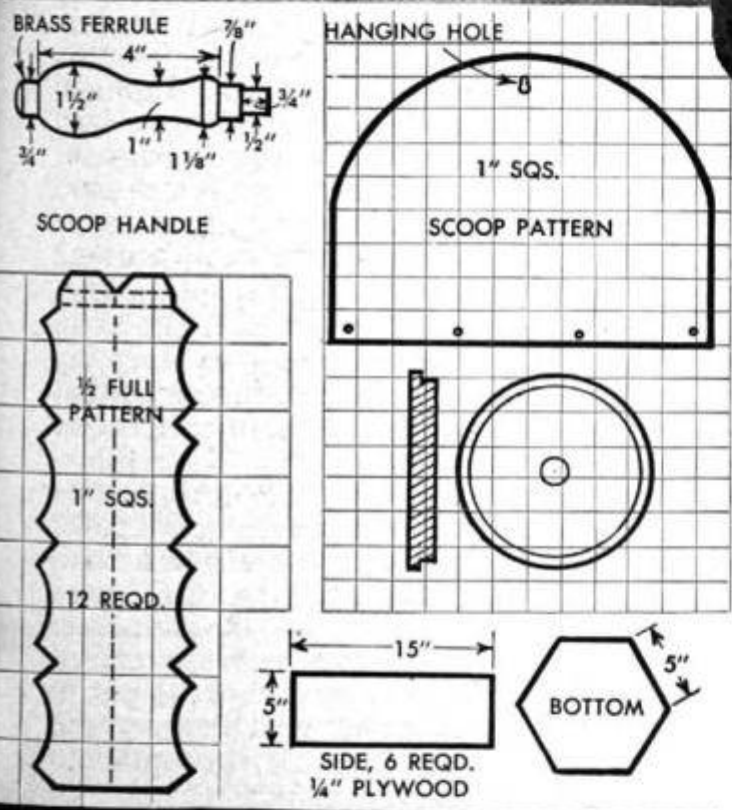
USING the same simple procedures described in Part I, it is possible to utilize strips and sheets cut from tin cans to make the attractive candy basket shown in the photo below, and the grocer's scoop and wastebasket pictured on the opposite page. The friction lid from a large can is used to form the bottom of the candy basket. Equally spaced holes are drilled or punched near the edge of the lid as in the detail below. Then six U-shaped units formed from medium-heavy wire are made on the forming jig shown in the detail. The ends of the formed half loops are passed through the holes and clinched as in the lower right-hand photo. This assembly serves as the spider on which the basket is woven with narrow strips cut from large tin cans. Cut the strips to a uniform width and smooth the edges with fine emery cloth.

Use a simple in-and-out basket weave as shown in the photo. Note that the original basket is made with six strips, but if desired the strips can be cut to a narrower width and ten or twelve used instead of six. The handle is made by folding the edges of a wide strip and hammering flat. After hammering, the ends of the strip are passed through the wire half loops on opposite sides of the basket, then bent back and riveted. Spraying the entire basket with a coat of clear metal lacquer will prevent discoloration due to rust.

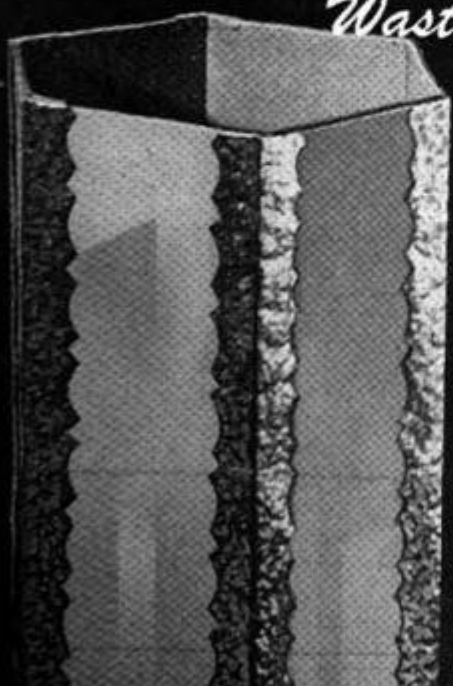
The grocer's scoop requires a fairly large piece of metal and two hardwood turnings made according to the details on the opposite page. Note that the hardwood disk which provides the back, or bottom, of the scoop, is turned with a shallow rabbet and is center-drilled for the 1/2-in. tenon

The candy basket pictured below is made by weaving strips of sheet metal cut from tin cans into a frame formed by a disk of sheet metal and wire half loops made in jig. Use a simple in-and-out basket weave, beginning at the bottom and working up to top of half loops. Handle is sheet-metal strip with edges folded





Wastebasket



The grocer's scoop is made from a single piece of sheet metal cut from a large can. The metal is attached to a rabbeted disk turned from hardwood and fitted with a handle. Finish hardwood in color desired

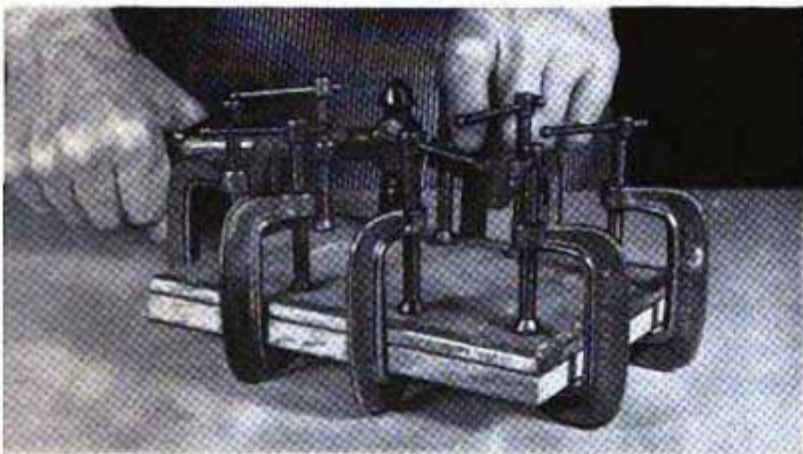
Metal trim on the wastebasket pictured at the left is made of strips cut from tin cans. After edges of strips have been scalloped, the strips are hammer-finished and then coated with a clear metal lacquer



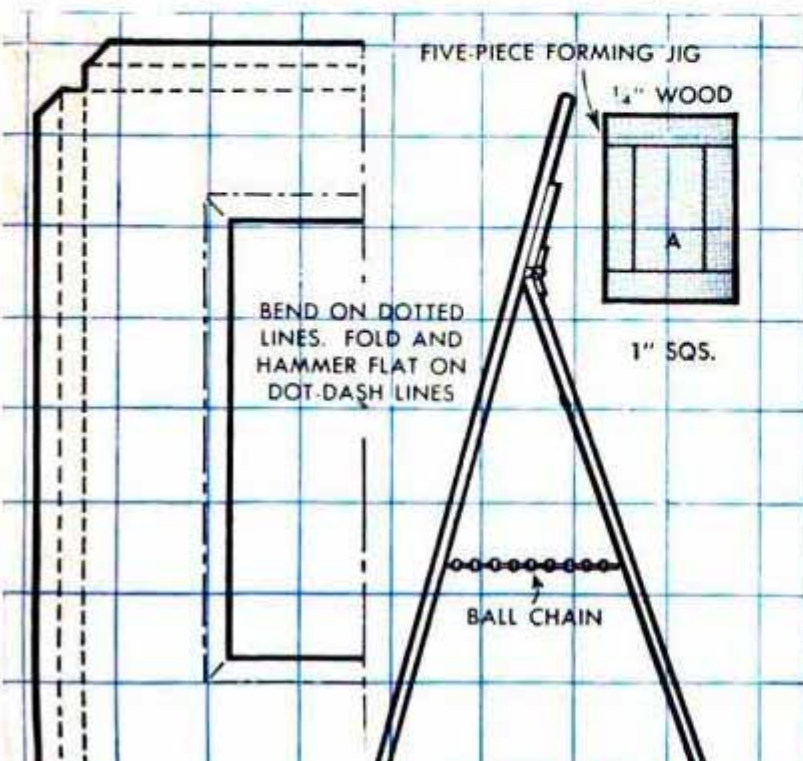


Picture Frame

Hammer-finishing metal in this picture frame makes it unusually novel and attractive. Fitted with an easel-type leg, it stands firmly on mantel or table



Metal frame is formed in a special five-piece jig which can be removed after frame is bent to shape



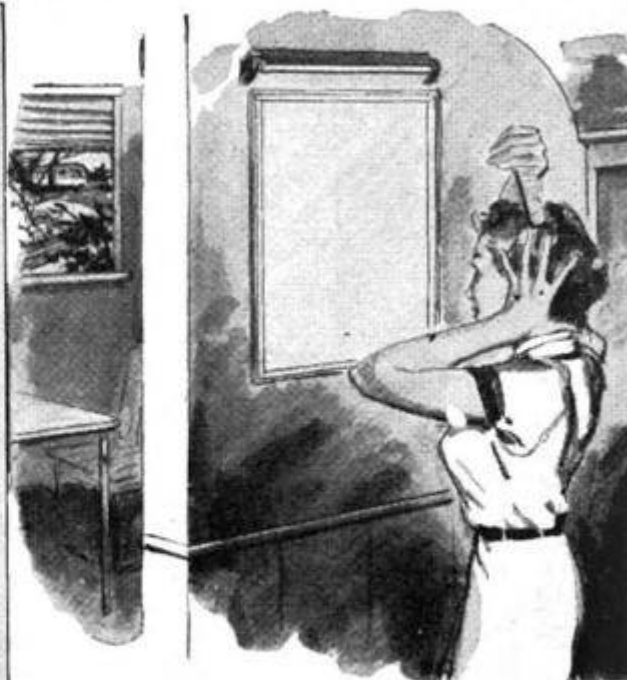
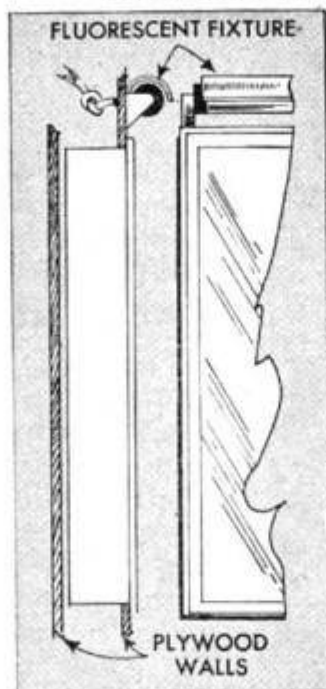
turned on the handle. The square flange left after rabbeting the disk is rounded slightly to form a bead. The brass ferrule at the outer end of the handle is optional. Finish the disk and handle in whatever color desired. Then cut the metal from a large can as in the center photo on the preceding page, punch or drill as indicated and attach to the rabbeted disk with four round-headed brass screws. Smooth the edges of the sheet metal with fine emery cloth. Finish with a coat of metal lacquer.

The hexagon wastebasket detailed and pictured on the preceding page is constructed of plywood and trimmed with scalloped strips of sheet metal cut from large tin cans. The lower right-hand photo (preceding page) shows a simple two-piece jig which is used in bending the strips to fit the basket. This is done after cutting the scalloped design on the edges and hammer-finishing the surface as described in Part I. Make the basket of 1/4-in. plywood, cutting six sides and the bottom as detailed. Assemble and finish in the color desired before applying the ornamental strips of tin with short brads or tacks. It's a good idea to coat the metal strips on both sides with clear metal lacquer before application.

The novel photo frame pictured and detailed at the left is formed in a jig as in the center photo. First, make the forming jig, detail A, in five separate pieces so that it can be removed from the metal frame after the forming operation. The thickness of the wood in the jig makes the frame deep enough to take a backing piece of 1/8-in. plywood plus the picture, glass and a thin mat. Note in the detail that the dotted lines indicate bends, while the dot-dash lines indicate a fold, which is hammered flat. Be sure that the metal sheet is cut to ample size, then make a trial fit over the forming jig. After trimming the metal to the correct size, clamp in place in the jig and bend as indicated. After forming, hammer-finish the metal. Although some craftsmen may prefer to hammer-finish the metal before forming, there is the possibility that the dimples in the surface may be flattened somewhat by clamping in the forming jig. After forming, remove the jig and coat the metal with clear lacquer. Then cement the picture to a mat and cut glass and a backing piece to fit. Assemble these parts in order and slide into place in the frame. If desired, the frame may be fitted with a hinged, easel-type support. Glue a small block of 1/4-in. hardwood to the center of the backing piece about 1 1/2 in. from the top and hinge a narrow strip to this to form the leg. Attach a short length of light ball chain to the leg and the backing to hold the leg in position when it is swung back to support the frame. ★ ★ ★

By utilizing the space between the walls of a house-trailer partition, you can install a recessed, out-of-the-way medicine cabinet near the lavatory or bedroom. First, cut an opening in the wall slightly larger than the cabinet box, and drill holes above the opening for attaching a fluorescent-light fixture. Then install the fixture and connect the necessary wiring, running the wires inside the partition. Fit the cabinet in the opening, with the outer flange placed tightly against the wall, and fasten it in place with screws. If the space between the walls is too narrow to accommodate the cabinet box, an opening can be cut through both walls provided the partition has a closet on the opposite side. This arrangement will permit the back of the cabinet to

Medicine Cabinet and Wiring for Light Fixture Installed in Hollow Partition of House Trailer



project into the closet where it will be out of sight.

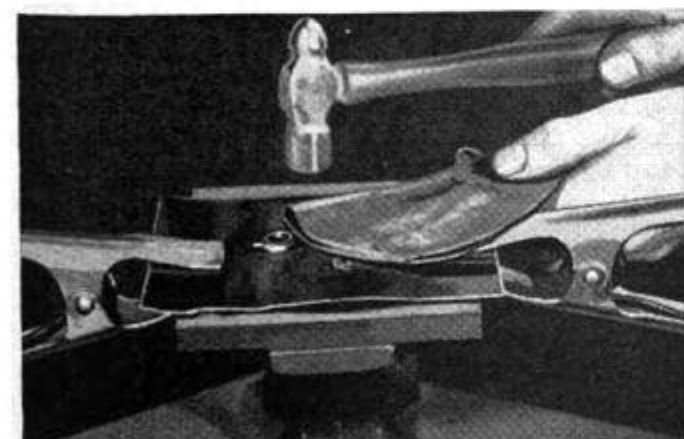
Victor H. Tauferner, Hawthorne, Calif.

Embossed Letters on Sheet Metal Created With Wire "Dies"

With the aid of "dies" formed from wire, sheet metal can be embossed with letters, numerals and decorative designs to provide monograms or name plates for jewelry boxes, luggage and special craft projects. The die is placed between the sheet metal and a flat-steel plate. A double thickness of inner tubing is then placed over the metal, which is on top, and hammered around the area above the die. The rubber, under

compression from the hammer blows, soon depresses all of the metal except that directly over the die, thus causing the lettering or figures to stand out in relief. It is possible to use a rubber mallet in place of the hammer and inner tubing if desired.

Walter E. Burton, Akron, Ohio.



Rubber Pads Inside Boots Grip Trousler Legs

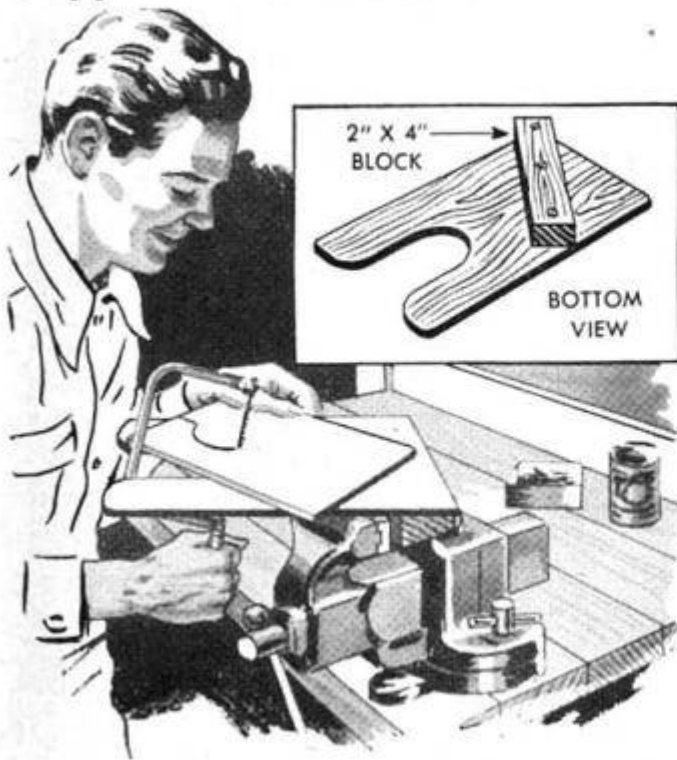
To prevent the legs of his trousers from creeping and pulling out at the tops of his boots, one sportsman cemented a couple of sponge-rubber pads inside each boot as shown. The pads may be cut from a rubber sponge or an old seat cushion.



Car Horn Illuminates Ornament

For something different in the way of illuminated fender or radiator ornaments on your car, wire the ornament to the horn so that it will light up when the horn is sounded. Connect the wire from the ornament to the "H" terminal of the horn relay.

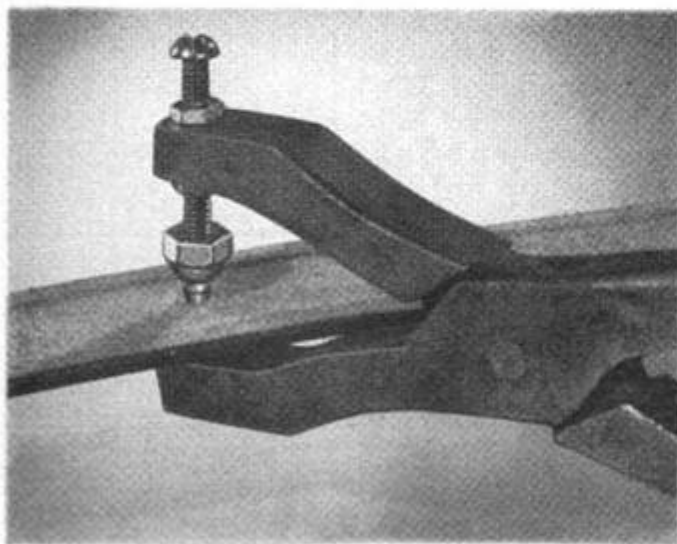
"Table" Support for Coping Work Gripped in Bench Vise



The widely notched board commonly used as a "table" for supporting work while cutting it with a coping saw will be easier to use if it can be gripped in a bench vise. To do this, screw a 2 x 4 block to one side of the board, attaching it at an angle best suited to your particular needs. If the nature of the work requires frequent manipulation of the table, pivot the block to the board with a bolt. Countersink the head of the bolt and use a wingnut on the underside so that the table may be adjusted easily.—Hugh Lineback, Stillwater, Okla.

Old Leather Punch Converted To Provide Eyelet Setter

It's easy to convert an old leather punch into an eyelet setter by first unscrewing or knocking out the drive tube. Then run a nut down on a stove bolt and insert the bolt in the drive-tube hole. Run another nut



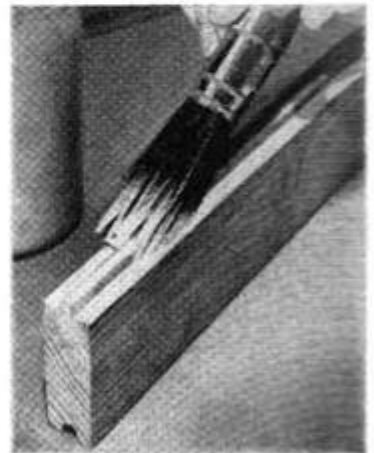
onto the bolt so that the latter can be adjusted to correct height and held securely in position by tightening the nuts on the jaw. Screw a cap nut tightly on the end of the bolt to serve as a flaring die. By filing or grinding bevels on the end of the bolt to form a cutting edge, the tool also can be used as a slitting punch in leather work.

Ken Murray, Colon, Mich.

Paint Applied to Edges of Boards Seals Porch-Flooring Joints

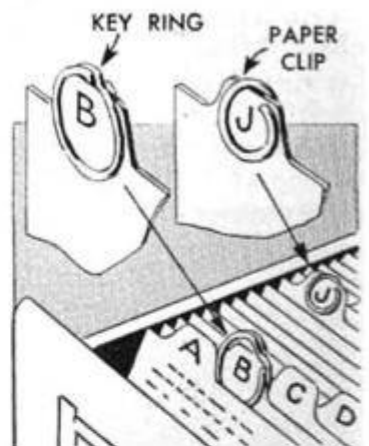
Tongue-and-groove porch flooring which is exposed to the weather will resist warping and rotting much longer if the joints are sealed by painting the edges of the material as each piece is laid. Paint leftovers, regardless of color, can be used for this purpose. When the flooring job is completed, allow the paint in the joints to dry before applying the primer coat to the porch floor.

R. F. Donovan, Guttenberg, Iowa.



Key Ring Reinforces Worn Tab On File-Index Card

If the tab on a file index card becomes bent or torn from frequent use, a split-type key ring can be used effectively to reinforce and stiffen the tab. Although somewhat smaller, a circular paper clip may be used similarly.

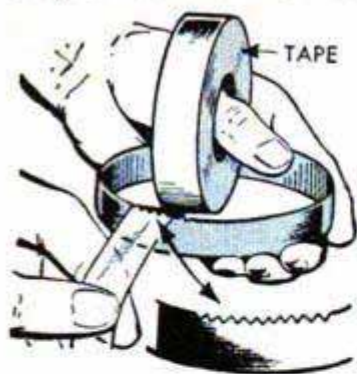


Cleaning Soot From Chimney

A soot-filled chimney can be cleaned quickly by filling a burlap bag with excelsior and weighing it down with a couple of bricks. Then tie a length of rope to the top of the bag and drop it down the chimney, working it up and down against the sides to loosen the soot. If no excelsior is available, stuff the bag with crumpled newspaper, or wadded pieces of burlap. If you have sufficient quantities of steel wool on hand, however, use it in preference to the paper or burlap.

Blanche Campbell, Las Vegas, Nev.

Tape Container Used as Dispenser



By serrating a short section of the cover, you can convert a cellulose-tape container into a handy dispenser. The serrated edge is formed with a small three-cornered file, filing a section a little wider than the width of the tape. In use, the tape is held by the thumb in the manner indicated and then pulled downward against the serrated edge.—Abraham Tucker, Belcourt, N. D.

Clothespin Screwed to Side of Boat Keeps Bait Can From Spilling



To prevent a can of fish bait from being upset in a small boat, screw a spring-type clothespin to the side of the boat and grip the can in it. Mount the clothespin near the gunwale so that the can may be removed easily.

Simple Center-Line Marking Gauge

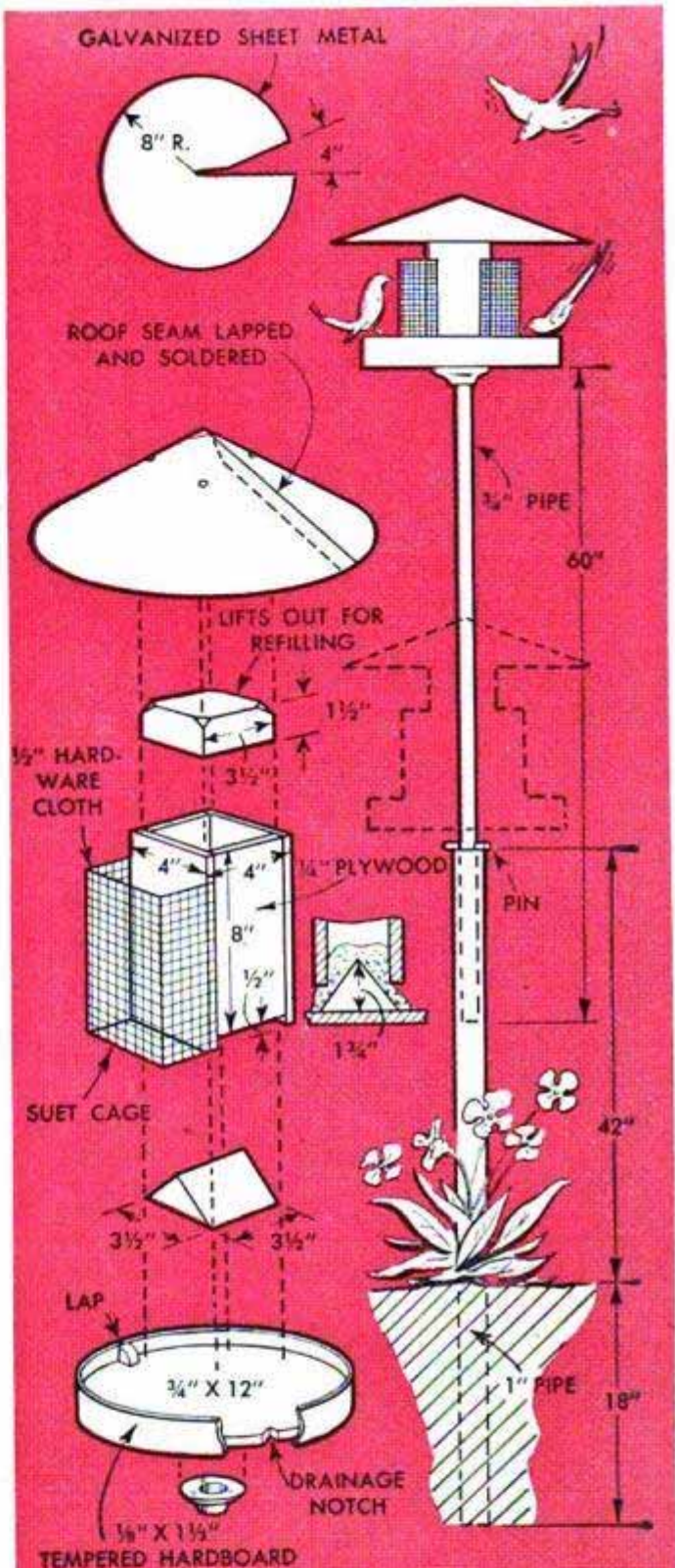
Improvised quickly from a strip of wood and three nails, this simple tool permits speedy and accurate marking of center lines on work of any width. A nail is driven through the center of a wooden strip to project about $\frac{1}{8}$ in. and serve as a scribe. Other nails, driven into the strip from the opposite side at equal distances from the center, serve as guide pins.



In use, the pins are placed against the edges of the work which parallel the desired center line. This automatically centers the scribe, and the line is made by drawing the tool along the work.

G. E. Hendrickson, Argyle, Wis.

☞ When washing sweaters, add a few drops of perfume to the rinse water. This will give the sweaters a sweet odor.



BIRD FEEDER

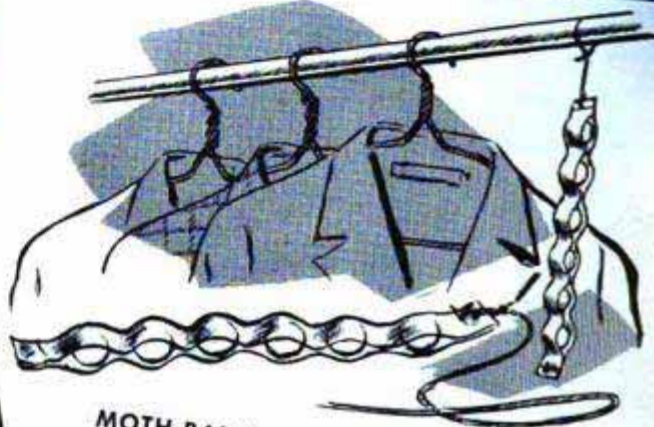
This sheltered feeding station is mounted on a telescoping standard which is lowered to a convenient height for refilling the feeder and then is raised well out of the reach of cats. The feed dispenser consists of a plywood box fastened to a triangular block as in the center details, the top of the feedbox being capped with a wooden block which also supports the sheet-metal roof. Solder the roof seam first, sealing the peak, and then nail to the corners of the block. Hardware-cloth suet cages are attached to opposite sides of the feedbox, and a floor flange holds the feeder on the standard.—Hi Sibley, Nuevo, Calif.

Solving

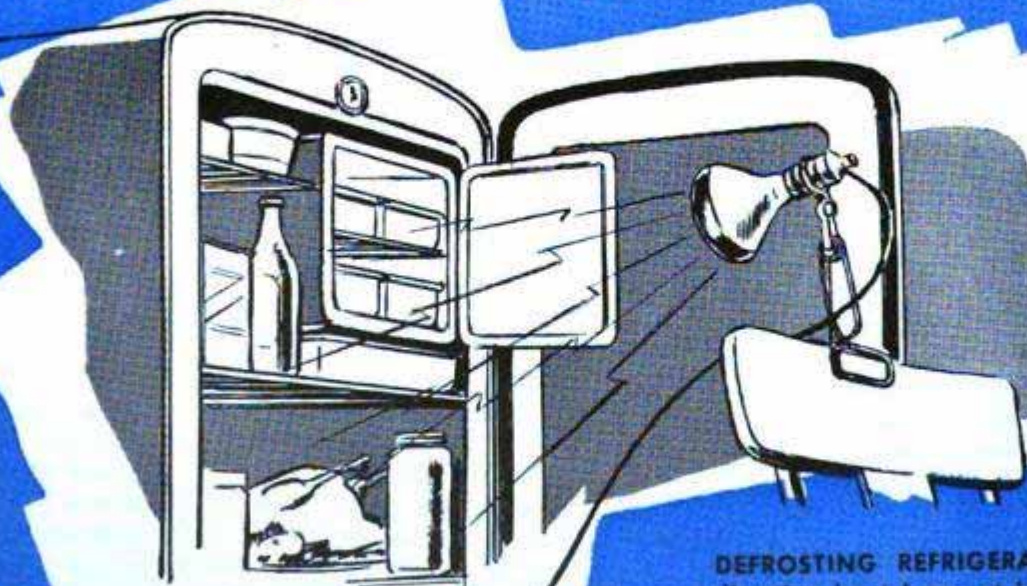
HOME PROBLEMS



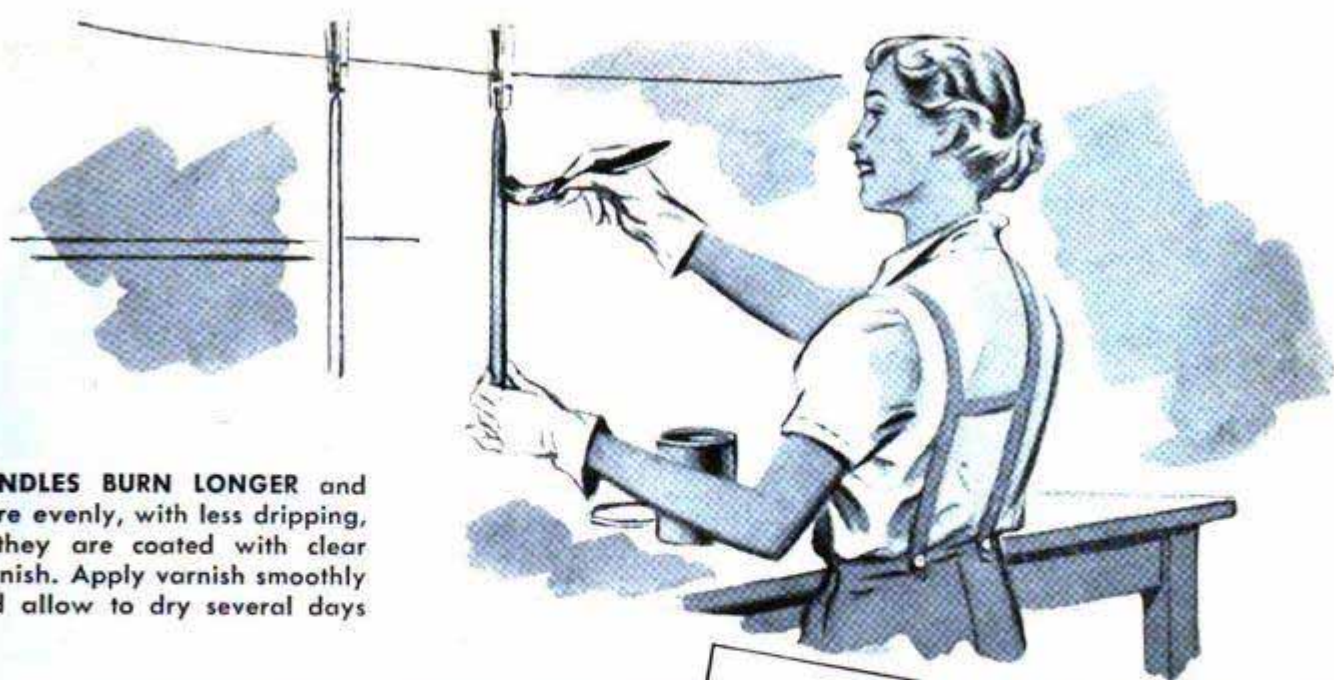
STRAIGHT PINS are easier to select from a dish if a powder puff is placed in the bottom and the pins dropped on top of it. The softness of the powder puff allows the fingers to grasp the sides of the pin



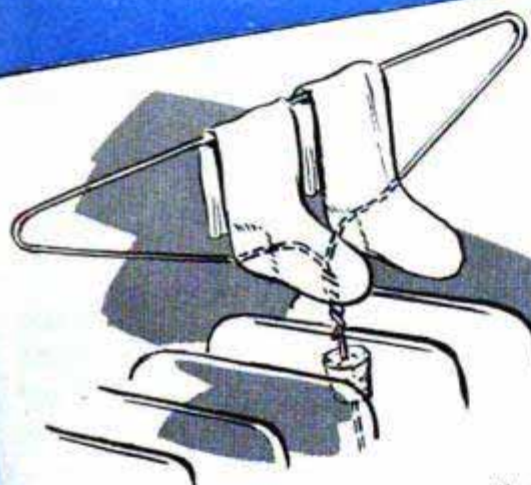
MOTH BALLS may be hung from a closet clothes pole if they are sandwiched between strips of adhesive or cellulose tape. A length of string fastened to one end of the tape is tied to the clothes pole



DEFROSTING REFRIGERATOR is speeded by directing heat lamp at ice-cube compartment. Heat lamp is held in photographer's clamp-on reflector holder which is fastened to chair back



CANDLES BURN LONGER and more evenly, with less dripping, if they are coated with clear varnish. Apply varnish smoothly and allow to dry several days



RADIATOR DRYING RACK for small articles of clothing is improvised from a wire coat hanger and a large cork. Hanger hook is straightened and cork is impaled on end of wire. Then the cork is wedged between sections of radiator



BRUSHING CLOTHES with adhesive tape quickly removes lint particles and small hairs which usually are difficult to brush off. Wrap tape strip around hand, adhesive side out, and brush garment lightly

NONSLIP HANDLE for small paint cans is made from band of sheet metal and handle from discarded coffeemaker. Cut band to grasp sides of can tightly and fasten both ends of band to sides of the handle with small bolts and nuts

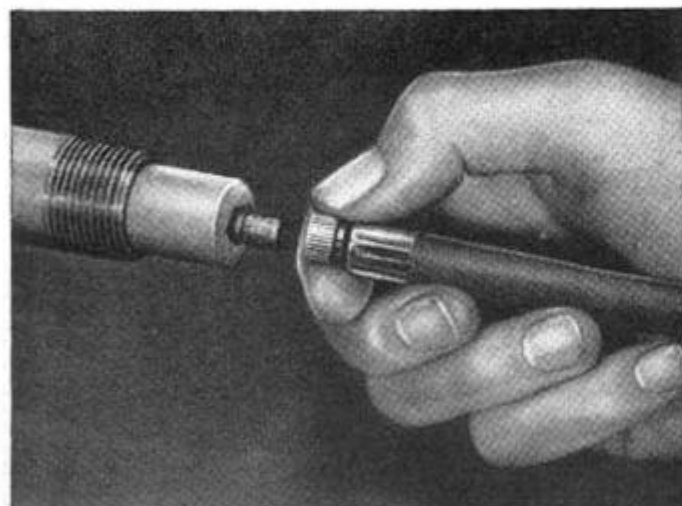


Holes in Closet-Shelf Support Accommodate Clothes Hangers



Making use of a few pieces of scrap lumber, I recently completed the construction of a shelf in a small closet which also serves as a means of support for clothes hangers. First I assembled 1 x 4 endpieces, joined together by a long crosspiece spanning the entire width of the closet as shown, to provide supporting members for the shelf itself. Then I drilled $\frac{1}{4}$ -in. holes along the lower edge of the crosspiece, spaced 2 in. apart for insertion of the hangers. This spacing allows plenty of room for storing or removing the garments while at the same time preventing the possibility of garments being pushed to one side and crushed against one another. If it is customary for both the hanger and garment to be removed at the same time, larger holes should be provided to simplify removal of the hanger hooks.—Paul Corey, Sonoma, Calif.

Tire Pump Used to Drain Pipes Of Summer Residence



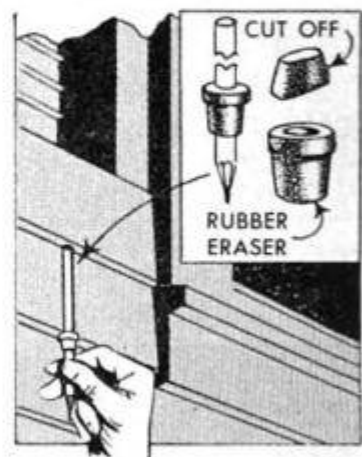
If water pipes in a summer cottage lack sufficient pitch for draining the system completely, disconnect a section of pipe at

a union and fit the end with a tapered wooden plug that has been drilled to take an inner-tube valve stem. It's then a simple matter to connect a tire pump and force the remaining water from the pipes.

Henry Hanscom, Elmhurst, Ill.

Gauge for Installing Siding Made With Pencil and Eraser

A simple, adjustable gauge for quickly placing bevel siding at the correct weather exposure may be improvised easily from a pencil and a slip-on eraser. Cut off the top of the eraser so it can move up and down on the pencil.

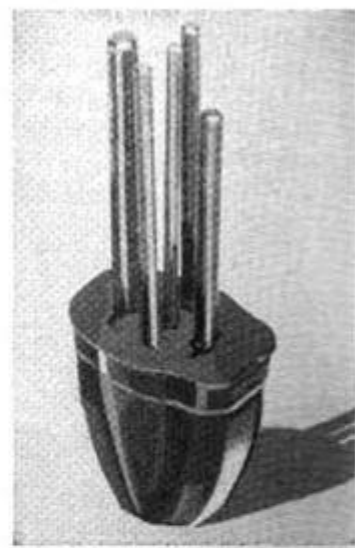


Smoothing Small Scratches on Car

Before touching-up fine scratches or chipped spots on a car finish, smooth the blemishes with an emery board. The size and texture of the grit are just right for feathering the finish around each spot before applying touch-up enamel. When the enamel has dried thoroughly, rub the spots with a car-body rubbing compound to blend them with the rest of the finish.

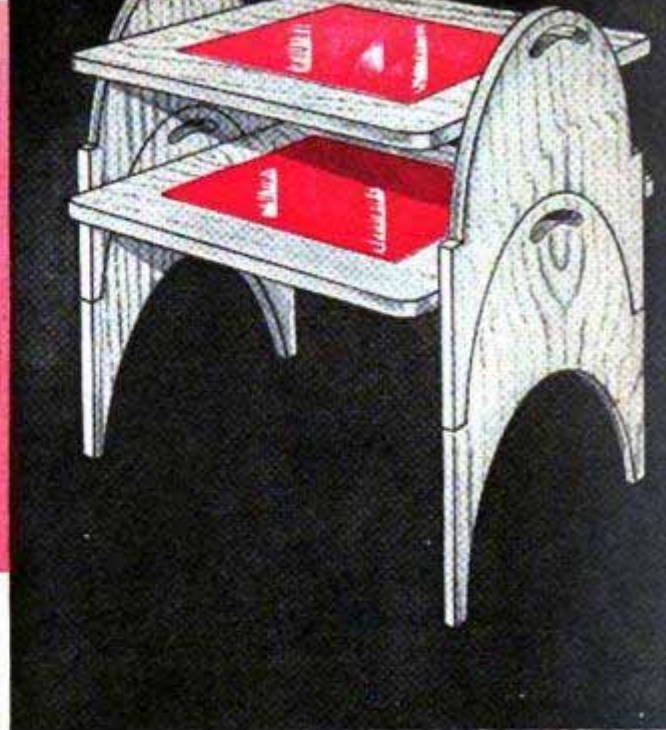
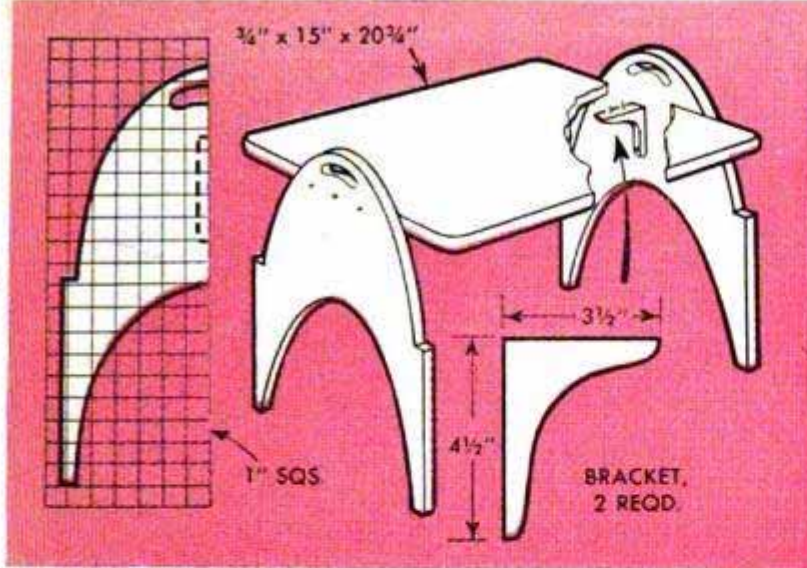
Protecting Drill Bits

With few alterations, a soft-rubber light plug will provide a sheath for small drills that are to be stored in a toolbox or workbench drawer. After removing the metal prongs, form additional holes in the plug with a hot nail. Each bit will be cushioned in the rubber and fully protected.



Antenna From a Car Radio Serves as Extension Rule

Needing an extension rule to take an important inside measurement, with nothing at hand from which a suitable inside rule could be improvised, one man thought of the telescoping radio antenna on his car. With this he was able to take the measurement accurately and transfer it to the work.



STACK TABLES

By Elmer W. Ferris

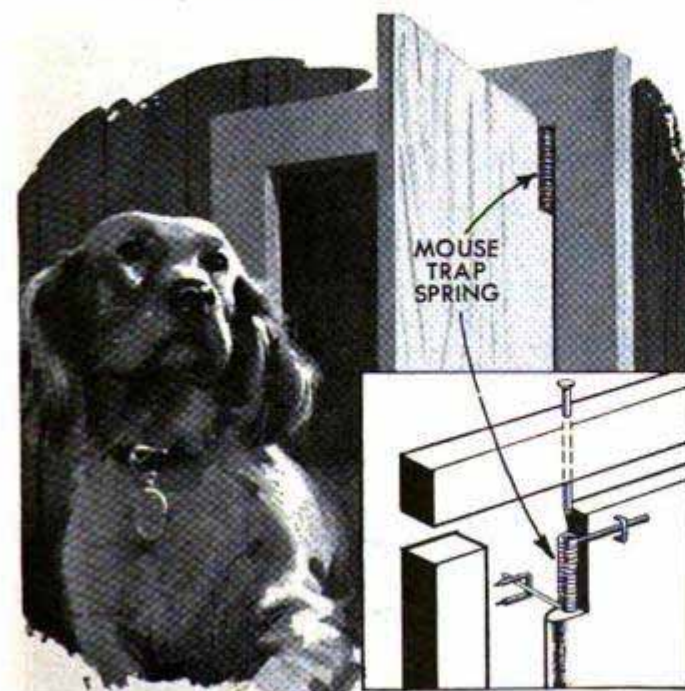
When stacked together, this pair of matching tables forms an attractive lamp or chairside unit. When guests arrive, the top table simply is lifted off and both tables are used for individual serving. The ends of the tables are jigsawed from $\frac{1}{2}$ or $\frac{5}{8}$ -in. plywood, with each pair of matching ends laid out and cut from one piece to make the grain continuous through both members. Both sets of endpieces may be cut at the same time by tacking the two pieces of stock together. It is best to use a cardboard

template to lay out the work if the ends are not cut simultaneously, as it is important that all curves match. The table tops are joined to the ends with wooden brackets as well as with two extra screws driven through each endpiece and into the end grain of the top. In addition, all joints are glued. Countersunk screw holes on the outside surfaces are plugged or filled with wood putty before finishing and, if desired, imitation leather, leather-grained plastic or plastic veneer may be applied to the finished table tops.

"Private" Entrance for Pets Features Spring-Hinged Door

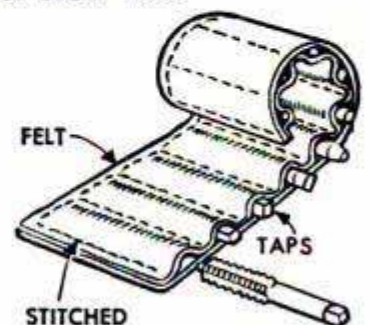
This self-closing pet entrance allows your dog or cat to enter and leave the basement or porch as it pleases. Hinged on nails and returned with half a mousetrap spring, the door swings closed as soon as the pet has

passed through it. The hinged side of the door is drilled to pivot on a nail at the lower corner. Several washers are slipped over the nail to keep the door from binding. The upper corner is notched and drilled for the end of a second nail driven through the top frame, the spring being placed over this nail and stapled to the panel frame so the tension will hold the door in closed position.



Taps Kept in Felt-Roll Kit

A piece of felt folded over and stitched to form pockets will provide a useful roll-type kit in which taps may be stored. Besides protecting the cutting edges, the kit also prevents the taps from being misplaced. Drill bits, punches or other small tools also may be stored in such a kit.



Paul Fryar, Long Beach, Calif.

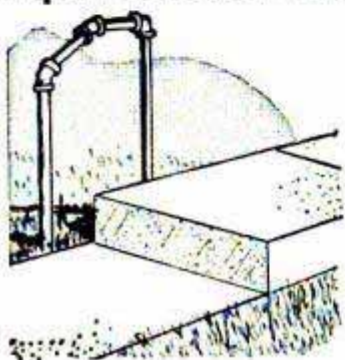
Leatherworker's Pricking Wheel Perforates Sandpaper



To make it easy to tear sandpaper into the narrow strips needed for sanding curved surfaces, one craftsman perforates the sheet by drawing a leatherworker's pricking wheel along a straightedge as in the detail. The

fine perforations made by the wheel permit tearing the paper into the narrow strips required.—John J. Rea, Urbana, Ill.

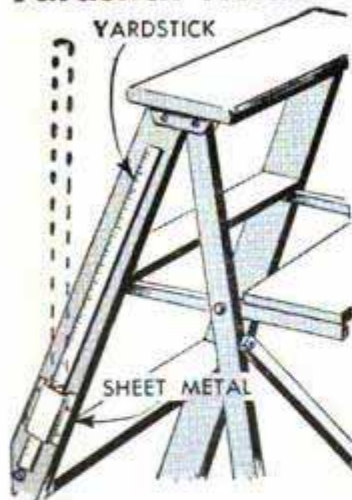
Pipe Handrail Warns of Step



Desiring to warn pedestrians of a single step in the long, sloping walk in front of his house, one homeowner erected a pipe handrail at one side of the walk as shown in the illustration.

Assembled from short lengths of pipe and elbows, the railing practically eliminates any possibility of the step being overlooked by a pedestrian. Ends of the pipe are set in concrete in the ground to assure a steady support.

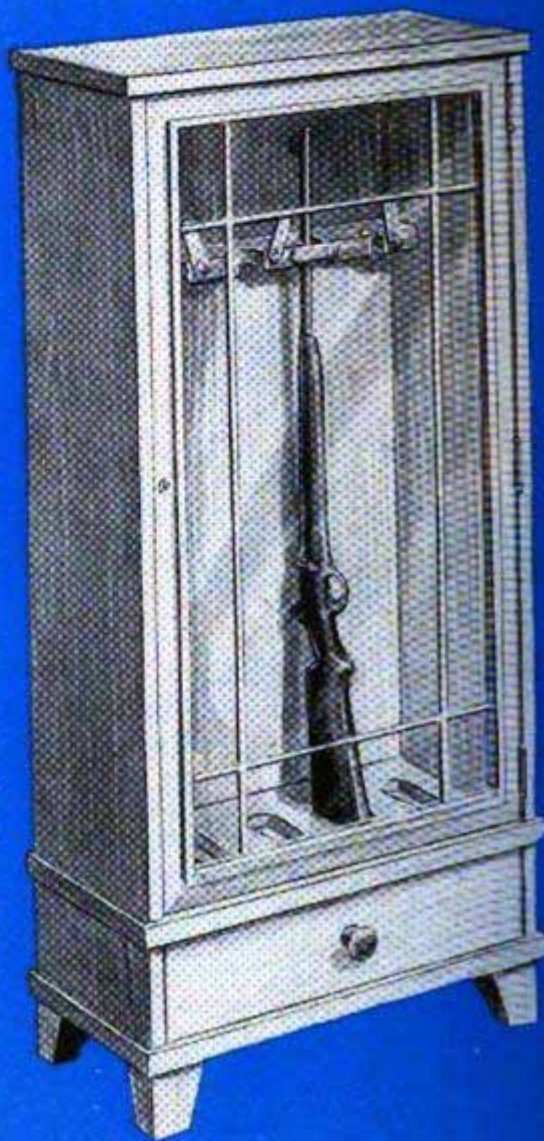
Yardstick Holder on Stepladder



If you frequently have occasion to use a yardstick while standing on a stepladder, nail a metal holder to a leg of the ladder so the yardstick not only can be kept readily available at all times but also may be stored along with the ladder itself if desired. Shape the

holder from a scrap piece of sheet metal which, when attached, forms a channel that allows easy insertion or removal of the yardstick from almost any position on the ladder. Then drive a wood screw part way into the leg of the ladder, directly beneath the holder, to keep the yardstick from slipping through.

PLAN of the MONTH



MATERIAL YOU WILL NEED

Plywood

- 1 pc.— $\frac{1}{4}$ " x $22\frac{3}{4}$ " x $57\frac{3}{8}$ "—Back
- 1 pc.— $\frac{1}{4}$ " x $8\frac{3}{8}$ " x $21\frac{1}{4}$ "—Drawer bottom
- 1 pc.— $\frac{1}{4}$ " x $3\frac{3}{8}$ " x $20\frac{1}{4}$ "—Tray bottom

Cabinet Wood

- 2 pcs.— $\frac{3}{4}$ " x $9\frac{3}{4}$ " x $57\frac{3}{8}$ "—Sides
- 1 pc.— $\frac{3}{4}$ " x $10\frac{3}{4}$ " x $23\frac{1}{2}$ "—Top
- 1 pc.— $\frac{3}{4}$ " x $10\frac{1}{2}$ " x $22\frac{3}{4}$ "—Shelf
- 1 pc.— $\frac{3}{4}$ " x $9\frac{3}{4}$ " x 22 "—False shelf
- 1 pc.— $\frac{3}{4}$ " x $6\frac{1}{2}$ " x 22 "—Drawer front
- 2 pcs.— 1 " x 2 " x 48 "—Side doorframe
- 2 pcs.— 1 " x 2 " x 22 "—Top and bottom frame
- 1 pc.— $1\frac{1}{4}$ " x $2\frac{1}{4}$ " x 22 "—Rest rail
- 4 pcs.— $\frac{1}{4}$ " x $1\frac{1}{4}$ " x 10 "—Side overlay
- 1 pc.— $\frac{1}{4}$ " x $1\frac{1}{4}$ " x 24 "—Front top overlay
- 2 pcs.— 1 " x $1\frac{1}{4}$ " x 24 "—Front-rail facing
- 2 pcs.— 1 " x $1\frac{1}{4}$ " x 10 "—Bottom facing
- 4 pcs.— 3 " x 3 " x 4 "—Legs
- 2 pcs.— $\frac{3}{8}$ " x $1\frac{1}{2}$ " x $4\frac{7}{8}$ "—Glass molding
- 2 pcs.— $\frac{3}{8}$ " x $\frac{1}{2}$ " x $18\frac{3}{8}$ "—Glass molding

Lumber

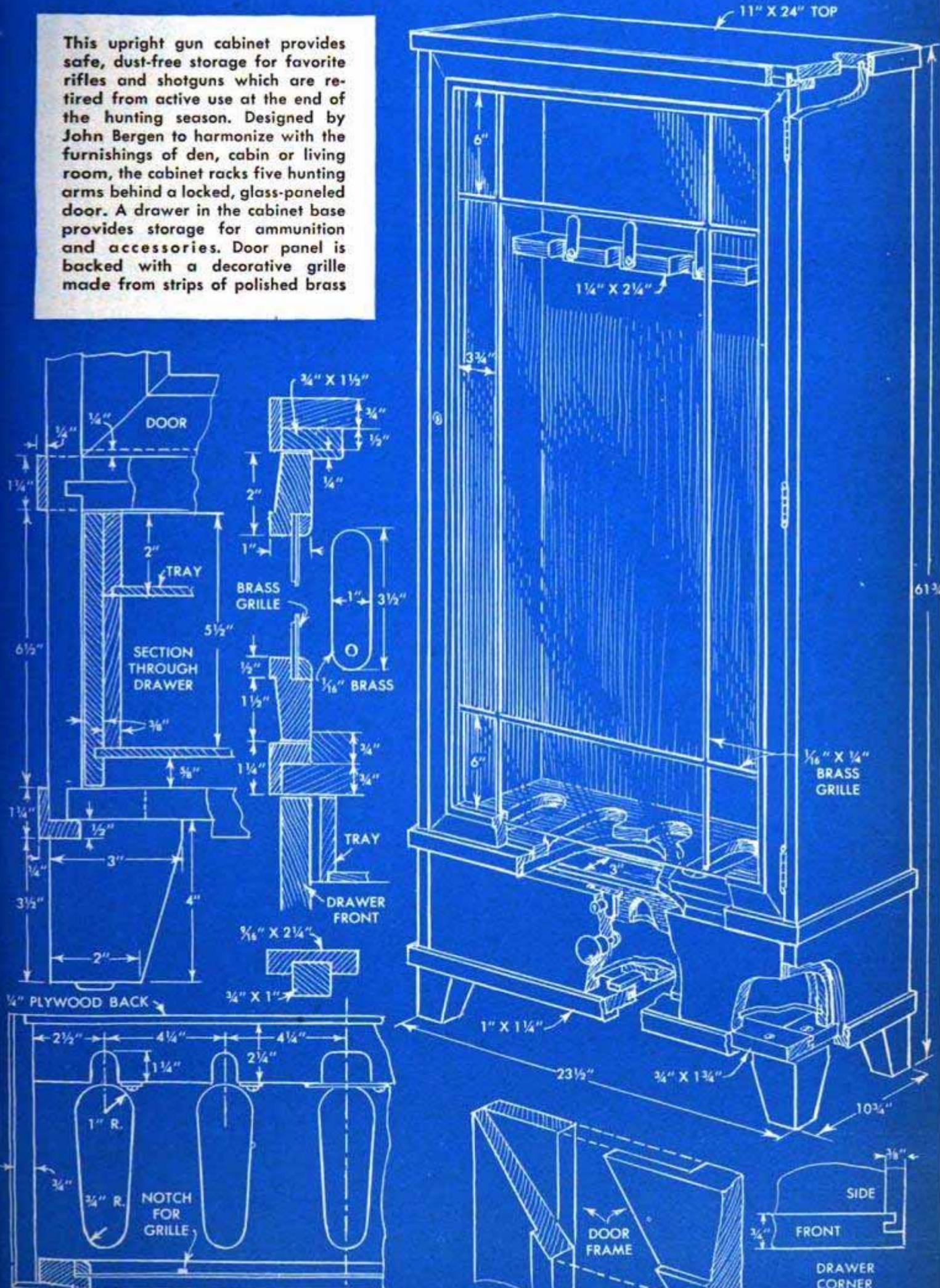
- 2 pcs.— $\frac{3}{8}$ " x $6\frac{1}{2}$ " x 9 "—Drawer sides
- 1 pc.— $\frac{3}{8}$ " x $6\frac{1}{4}$ " x $21\frac{1}{4}$ "—Drawer back
- 2 pcs.— $\frac{3}{8}$ " x $3\frac{1}{2}$ " x 8 "—Tray rails
- 2 pcs.— $\frac{3}{8}$ " x $3\frac{3}{4}$ " x 2 "—Tray ends
- 2 pcs.— $\frac{3}{8}$ " x 2 " x $20\frac{3}{8}$ "—Tray sides
- 2 pcs.— $\frac{3}{4}$ " x $1\frac{3}{4}$ " x $22\frac{3}{4}$ "—Front and back drawer rails
- 2 pcs.— $\frac{3}{4}$ " x $1\frac{3}{4}$ " x 7 "—Side drawer rails
- 1 pc.— $\frac{3}{4}$ " x 1 " x $8\frac{3}{8}$ "—Drawer guide
- 1 pc.— $\frac{9}{16}$ " x $2\frac{1}{4}$ " x $8\frac{3}{8}$ "—Drawer slide

Miscellaneous

- 3—butt hinges, $1\frac{1}{2}$ " x $1\frac{1}{2}$ "
- 2—locks
- 1—2" dia. brass knob
- 2 pcs. brass, $\frac{1}{16}$ " x $\frac{1}{4}$ " x $44\frac{7}{8}$ "
- 2 pcs. brass, $\frac{1}{16}$ " x $\frac{1}{4}$ " x $18\frac{3}{8}$ "
- 5 pcs. brass, $\frac{1}{16}$ " x 1 " x $3\frac{1}{2}$ "

Modern Gun Cabinet

This upright gun cabinet provides safe, dust-free storage for favorite rifles and shotguns which are retired from active use at the end of the hunting season. Designed by John Bergen to harmonize with the furnishings of den, cabin or living room, the cabinet racks five hunting arms behind a locked, glass-paneled door. A drawer in the cabinet base provides storage for ammunition and accessories. Door panel is backed with a decorative grille made from strips of polished brass.



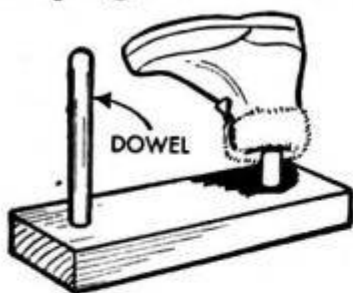
Engine Hoods Welded Together Provide Neat Boat Hull



Utilizing mainly leftover parts from the shop in which he works, one craftsman welded together two identical automobile engine hoods to form the hull of a boat measuring over 11 ft. in length. Before welding the hoods together, a 10-in. strip was removed from the center of each hood to make it narrower, thus providing a trim hull when completed. Wood from a shipping crate was used in constructing the seat and flooring of the boat, while a discarded automobile gas tank was installed under the seat to serve as a ballast tank. Gunwales were made from cypress stock and a radiator ornament was used to provide a bow figurehead suitable for attaching mooring lines.

C. Winn Upchurch, St. Petersburg, Fla.

Drying Rack for Overshoes



With the coming of winter, when children play in snow well over the tops of their boots and galoshes, it's a good idea to provide racks that will speed drying

of the inside of the footgear. I made several drying racks which were nothing more than dowels driven in drilled blocks of wood. The boots are placed upside down on the dowels, thus permitting them to drain and dry more quickly.

N. J. Metlka, Manitowoc, Wis.

Toothpaste Tube Anchors Screw In Masonry or Plaster

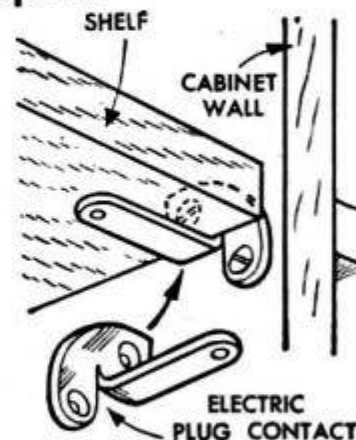
Old toothpaste tubes provide excellent packing material for anchoring screws in concrete floors and plaster or masonry walls. After slitting the tube lengthwise, clean it of labels and residue, and flatten it into a sheet. Then drill a hole in the ma-

sonry or plaster, remove all loose particles and pack it with strips of the pliable metal cut from the sheet. When the screw is driven in, the threads engage the lead, which swells and fills the hole.

Charles Niehuis, Phoenix, Ariz.

Electric-Plug Contacts Furnish Shelf Supports

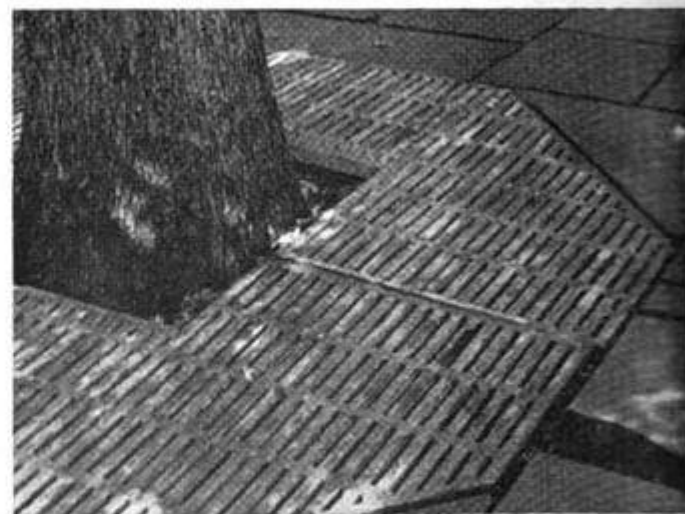
Contacts that have been removed from broken electric plugs can be adapted easily for use as shelf supports. All that's necessary is to remove the tiny brass rivet which may be done quickly by filing it. The supports are attached to the cabinet wall with wood screws in the manner shown.



Frank Shore, New York City.

Wooden Grating Protects Tree From Surrounding Stonework

In laying a stone terrace around several large trees, one landscaper installed a wooden grating around each tree to permit water to enter the ground around the trunk and to prevent possible damage to the stonework by the roots. The gratings, which are made of redwood, cypress or other decay-resistant wood, extend out from the trees approximately 3 ft. on all sides.—Walter E. Burton, Akron, Ohio.



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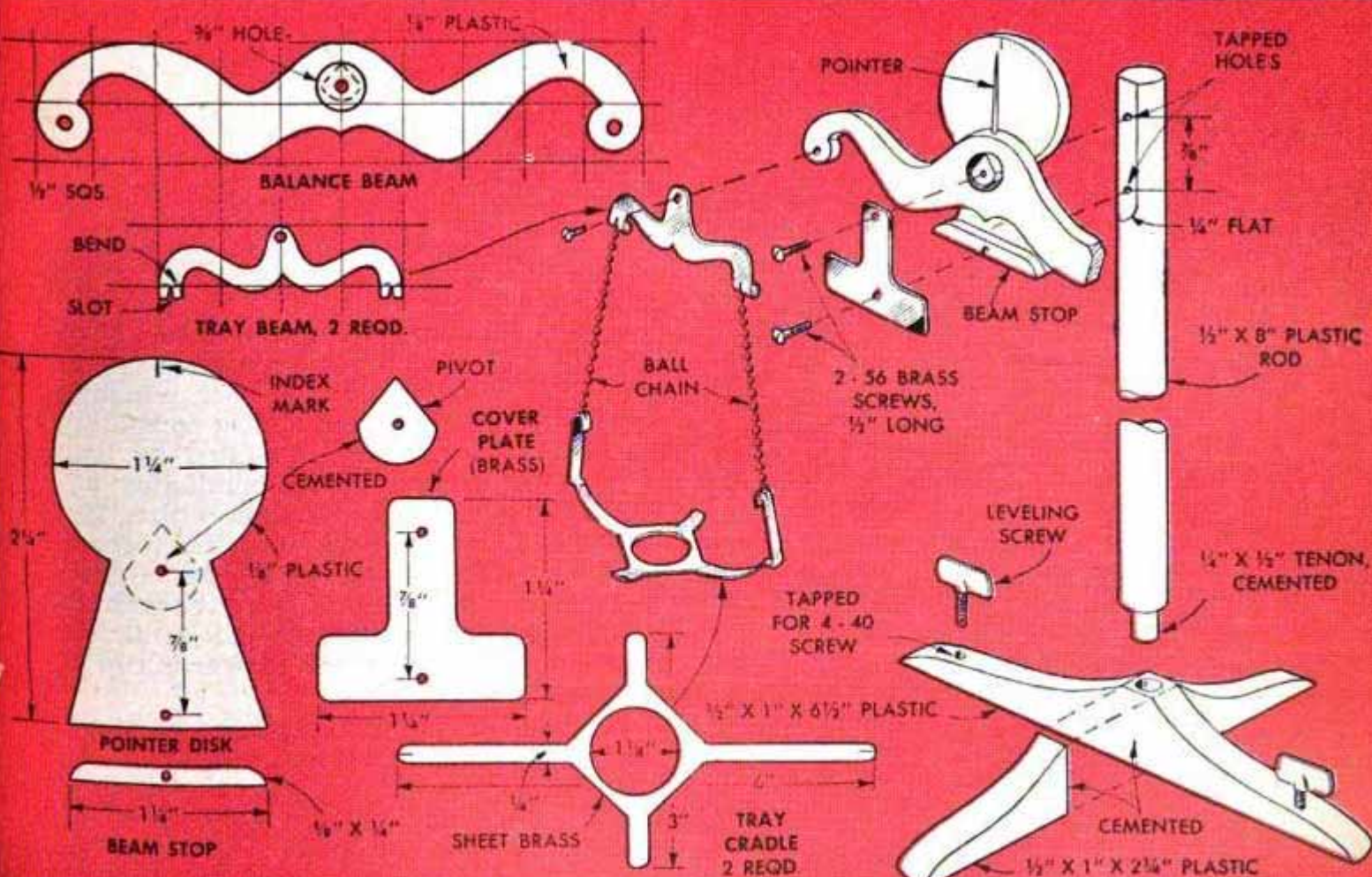
PLASTIC BALANCE

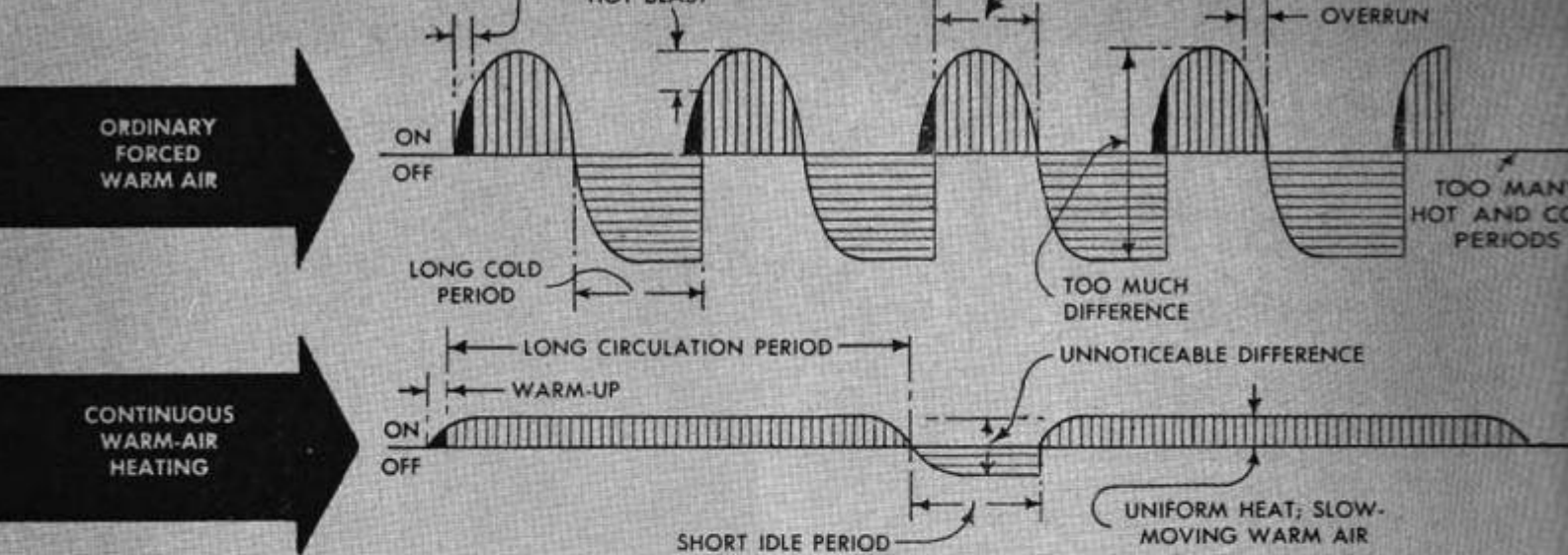
By E. Peter Smith

ALTHOUGH designed primarily as a decorative piece to be built from metal and plastic in attractive combination, this balance also is useful for weighing letters, photo chemicals and ingredients of certain kitchen recipes. Before selecting the plastic, note that the tray beams and the cover plate over the balance-beam pivot are of polished brass. If colored plastic is used for other parts, select colors which harmonize. Cut the parts for the base and assemble them, then cut the column to length and cement it in place. Cut all other parts to the shapes and dimensions given, smoothing and polishing the edges. Make a trial assembly of the balance beam and the tray beams and adjust the pivots so that they work freely. The trays on the original balance were made of plastic covers obtained from cosmetic containers and are about 4 in. in dia. Any similar trays may be used, but they must be of the same size and weight. The



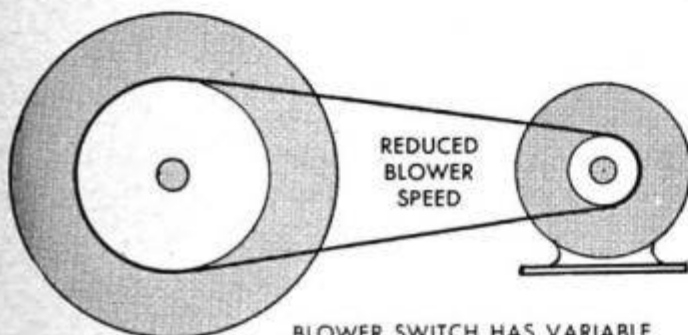
trays are supported in holders made as in the center detail below, and then attached to tray beams with ball chain. Usually the simplest method of attaching the supports to the trays is to slot each tray near the edges and pass the ends of the support arms through the slots. Suitable counterweights can be made from plastic as shown in the lower photo. They should be checked with weights of known values.



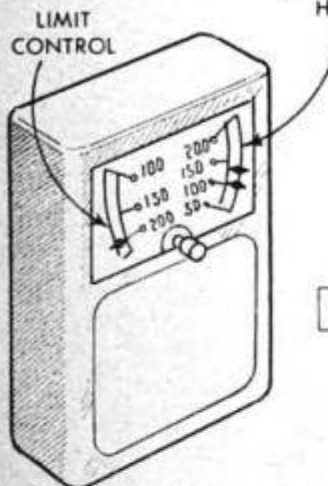


More Warm-Air Heating Comfort

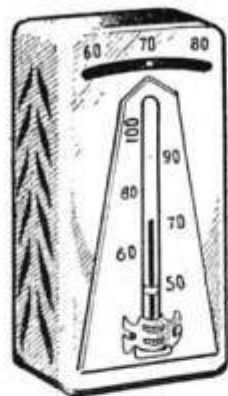
with **CONTINUOUS**



BLOWER SWITCH HAS VARIABLE HIGH AND LOW SETTING



BLOWER SWITCH AND LIMIT CONTROL SET LOWER



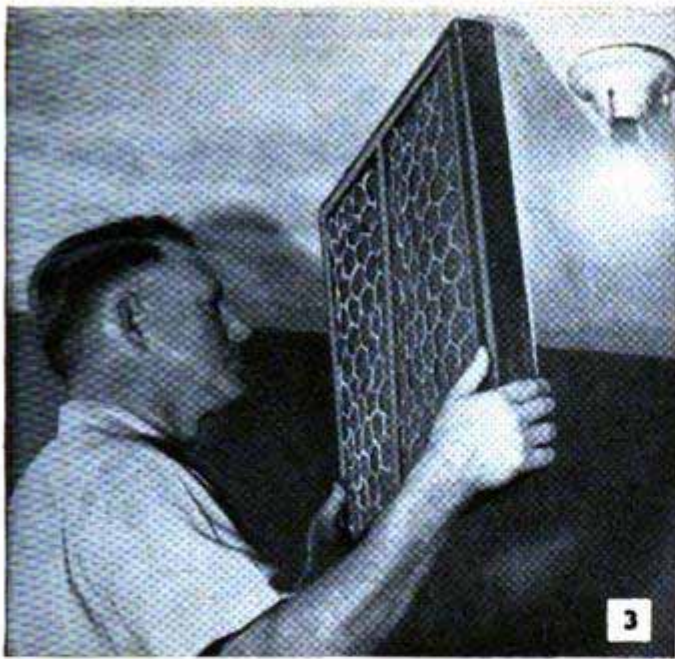
ROOM THERMOSTAT SET FOR 1½° DIFFERENTIAL

BY SWITCHING over to continuous air circulation it is possible to obtain surprising added comfort from forced warm-air heating systems of the type fired by automatic burners. As developed by the National Warm Air Heating and Air Conditioning Association at the University of Illinois, continuous air circulation maintains a more uniform temperature throughout the house and from floor to ceiling. It prevents cold pockets and drafts at ankle level while eliminating hot blasts and excessive heating from overruns. Any homeowner can make the change by himself as it is primarily a matter of adjusting the blower, the room thermostat, the blower switch and the limit control, all of which are shown in Fig. 1.

How continuous circulation differs: The basic idea of continuous circulation is that the heat lost through walls, roof, windows and doors is replenished almost constantly instead of at intervals separated by long nonheating periods. This eliminates noticeable fluctuations of temperature. Return air is drawn back into the furnace before it cools off perceptibly, the circulation being stopped only long enough to avoid overheating. Because of its almost continuous operation, the blower is run at reduced speed.

Furnace operation: To better understand the changes necessary for continuous circulation, it is worth-while to review how the furnace functions at present. When room temperature drops to a certain point, the room thermostat starts the burner. After the furnace warms up, during which time the room temperature may drop be-

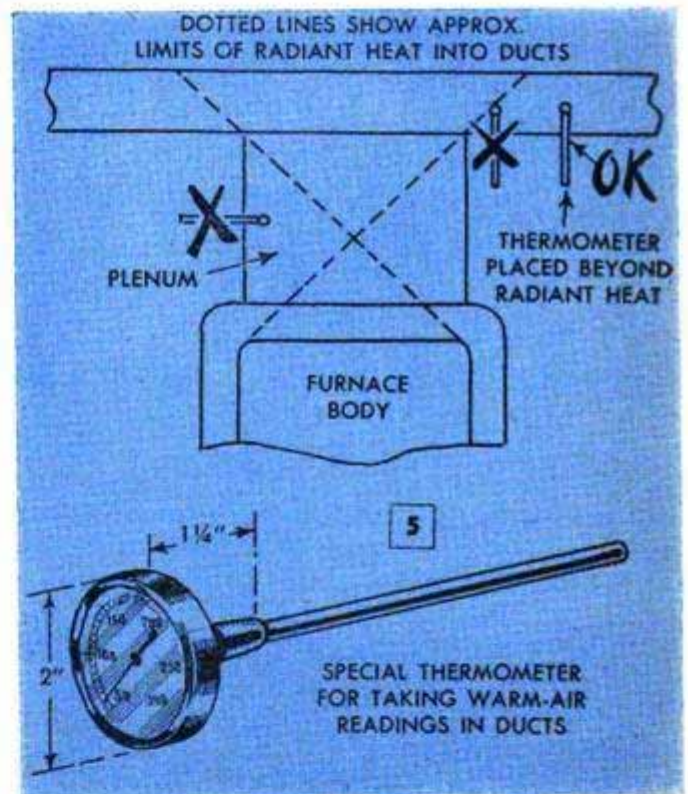




CIRCULATION

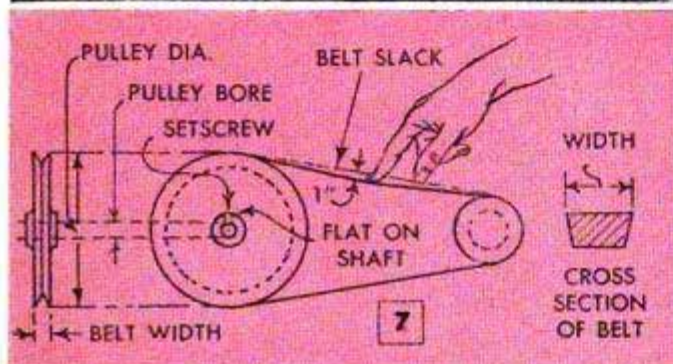
low the comfort point, the blower starts. Heat-anticipating thermostats are designed to correct this lag by starting the burner a little earlier than the actual thermostat setting. The blower is turned on by a thermostatic switch when the air in the furnace plenum reaches a predetermined temperature, the plenum being the chamber to which the warm-air ducts connect. The blower switch is attached to the plenum wall with the thermostatic element extending inside the chamber. The blower discharges a relatively large volume of warm air through registers, thus restoring room temperature quickly. When room temperature is reached, the thermostat shuts off the burner but the blower continues to run until the air in the plenum cools off to a predetermined degree. This overrun generally brings the room temperature higher than desired. With the blower inoperative there is practically no air circulation, resulting in stratified air which is usually much cooler at floor level than just below the ceiling.

The room thermostat would keep the burner operating until room temperature is restored, but as continuous operation of the burner could then heat the air in the plenum to a hazardous temperature, a limit control is provided. This control usually is set for a temperature of 200 deg. F., at which point it shuts off the burner or reduces it to a slow fire. When the plenum temperature drops substantially, the burner again goes on automatically. These on-and-off cycles continue until the room temperature is restored and the room thermostat stops the burner.



Changing to continuous circulation: Any forced warm-air heating system can be converted to continuous circulation. It is essential, however, that the blower switch and limit control are of the type that can be adjusted independently, even though they may be combined in a single unit, and that the room thermostat is of the modern, sensitive type.

Steps of conversion are as follows: (1) Warm-air registers, return-air grilles and furnace filters are checked to assure unimpeded air circulation. (2) Temperature rise of the furnace is checked. (3) Blower



speed is reduced. (4) Blower switch is set lower and with a 15-deg. differential. (5) Location of room thermostat is checked and thermostat is adjusted to a small differential. (6) Dampers in warm-air ducts are adjusted to balance the system. Satisfactory results may be possible by omitting the temperature-rise check on the furnace, in which case the blower speed is reduced so that there is adequate delivery of warm air through the duct having the greatest resistance caused by turns and offsets. However, the more accurate method of doing the job is by checking temperature rise and reducing blower speed accordingly.

Checking registers, grilles and filters: See that all warm-air registers and return-air grilles are open. If they are choked with lint and dust, vacuum them thoroughly as in Fig. 2. Also clean the return-air ducts at the elbows under the floor level where dirt tends to accumulate. Examine the furnace filters to be sure they are reasonably clean. If light cannot be seen through them when they are held toward a lamp or window, as in Fig. 3, they are completely clogged and should be replaced. Clogged filters introduce too much resistance to air flow. Do

not alter the position of the dampers in a system that has been balanced previously, but open any dampers that might have been closed afterwards.

Checking furnace-temperature rise: To check the temperature rise of a furnace, punch or drill a small hole in the main warm-air duct, about a foot from the plenum. The hole must be large enough to permit insertion of a 0 to 200-deg. thermometer without binding, as in Fig. 4. The thermometer should be inserted outside the zone of radiant heat from the interior of the furnace, as shown in Fig. 5, to avoid getting a higher, inaccurate reading. Another hole to take the thermometer is made in the return-air duct near the furnace and both holes are plugged later with sheet-metal screws.

Set up the room thermostat and adjust the blower switch to its lowest point to assure continuous operation of the burner and blower while making the check. If the furnace has not been operating, wait from 20 to 30 min. to assure that warm air in the plenum will have reached its maximum temperature. Then insert the thermometer a few inches into the return-air duct and allow a full minute to elapse before reading it. Repeat the same process at the warm-air duct. For continuous circulation the difference between the readings should be 100 deg. However, the difference usually will be less than this, which means that the air is moving through the furnace too fast and must be slowed down so more heat can be imparted to it.

Reducing blower speed: The air flow through the furnace is slowed by reducing the blower speed. To do this, first turn off the main switch controlling the furnace circuits so that the burner and fan will not operate while you are changing the pulleys and belt, as in Fig. 6. If, for example, the temperature rise in the furnace is only 50 deg., the air must absorb twice as much heat. Moving it one half as fast by reducing the blower speed 50 percent should accomplish this.

Blower speed is decreased by using a smaller motor pulley, a larger blower pulley, or both. However, the motor pulley must not be smaller than $3\frac{1}{4}$ in., as smaller sizes cause excessive belt wear when subjected to continuous operation. To determine blower-pulley speeds, use the following formula: R.p.m. of drive pulley multiplied by its diameter equals r.p.m. of driven pulley multiplied by its diameter. Thus, doubling the diameter of the blower pulley reduces its speed 50 percent; reducing the diameter of the motor pulley one half gives the same result. Increasing blower-pulley size 25 percent and decreasing motor-pulley size 25 percent also reduces

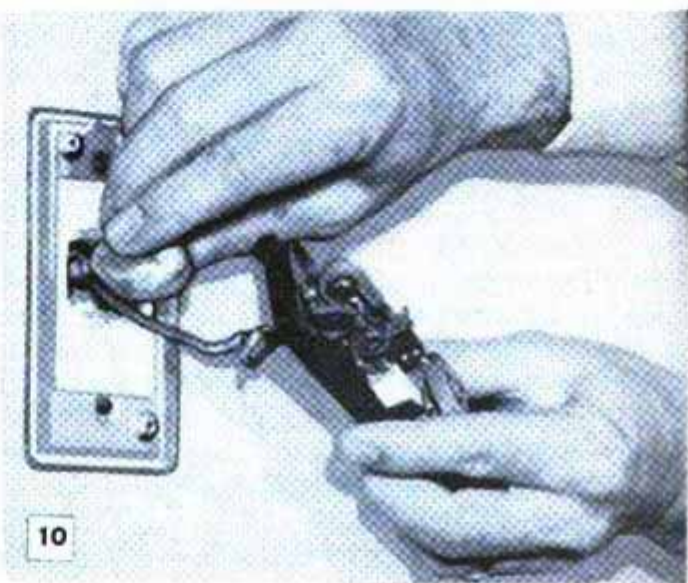
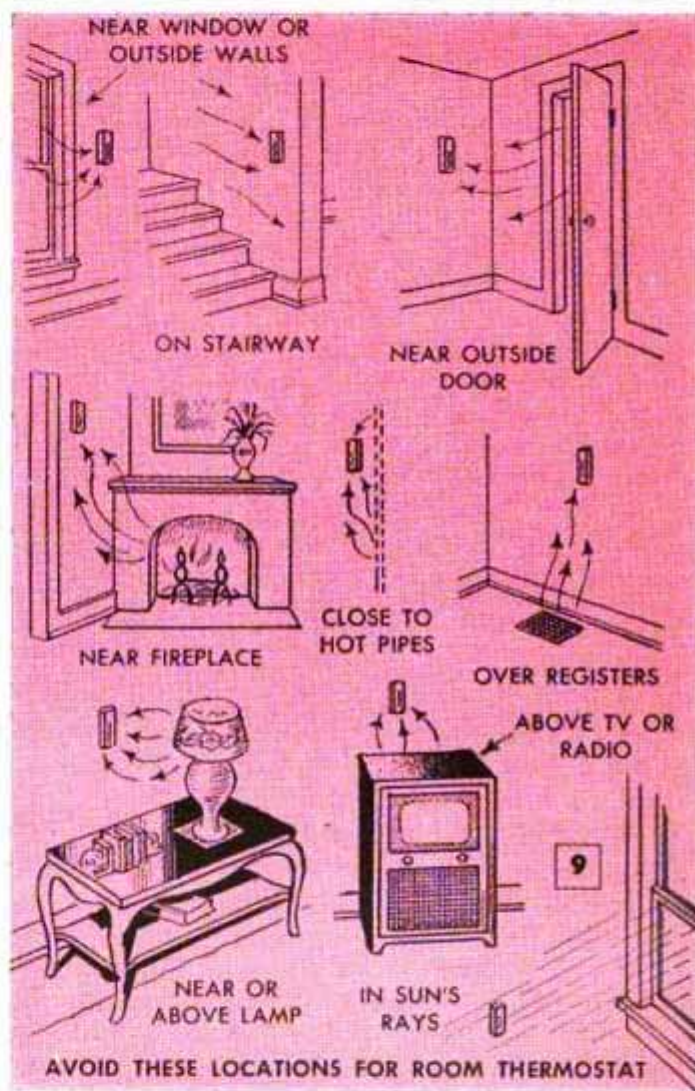
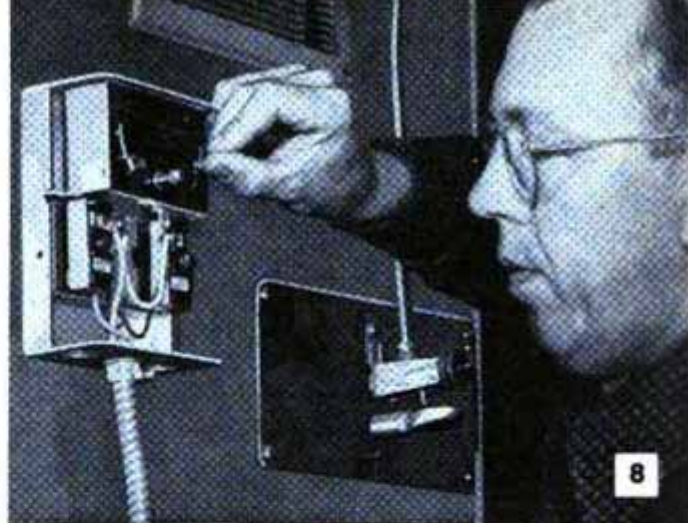
blower speed 50 percent. Other similar proportional adjustments will give the desired results.

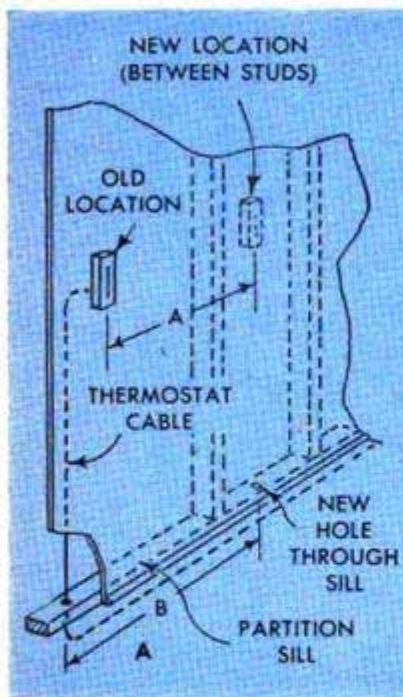
V-pulleys and belts: V-pulleys and belts are practically always used for driving furnace blowers. Motor pulleys may be the split, adjustable type, which can be varied in effective diameter by increasing or decreasing the gap between the flanges. When ordering fixed V-pulleys, specify the pulley diameter, bore size and groove size, Fig. 7. If the pulley is keyed to the shaft, give the key size also. When ordering a V-belt, specify its length and width as measured on the outside. To find correct belt length, use a flexible tape to measure around the edges of the pulleys—not in the grooves. When installing a V-belt, don't pry it over pulleys, which may damage it, but loosen whatever adjustment is provided for taking up belt slack, and slip on the belt. Tension on a belt is correct if it can be depressed about 1 in. at midspan, as in Fig. 7. The pulleys should be in perfect alignment to prevent excessive belt wear.

Slowing air flow with damper: Sometimes it is impossible to reduce air flow sufficiently by reducing blower speed. In such cases a locking-type damper can be installed in the return-air duct. The damper should be smaller than the cross section of the duct so that when fully closed it does not cut off the air flow completely.

Adjusting limit and blower switches: For continuous circulation, set the limit control at 175 deg. F. Only in rare instances is a higher setting necessary. This adjustment prevents overruns of heating especially where a furnace is oversized or the heat input too great. Also adjust the blower switch, Fig. 8, to cut in at 100 to 110 deg. for high wall registers, or 110 to 120 deg. for low wall registers, and to cut out again at 15 deg. less in either case. This adjustment results in longer periods of blower operation. In setting the controls, use the thermometer in the air duct and disregard the visual scales of the instruments since they may be affected by radiant heat from the furnace or they may be out of calibration. As previously mentioned, these instruments must be the type that can be adjusted independently. While the blower is operating, check the registers to see if the air temperature is comfortable at the time just before the blower stops. It should be only a few degrees above the room temperature—as low as can be tolerated for comfort. If it is too cool, set up the blower-switch adjustments a trifle.

The room thermostat: Before adjusting the room thermostat, check its location, Fig. 9. It should not be exposed to temperature fluctuations other than those that should normally control it. Therefore it

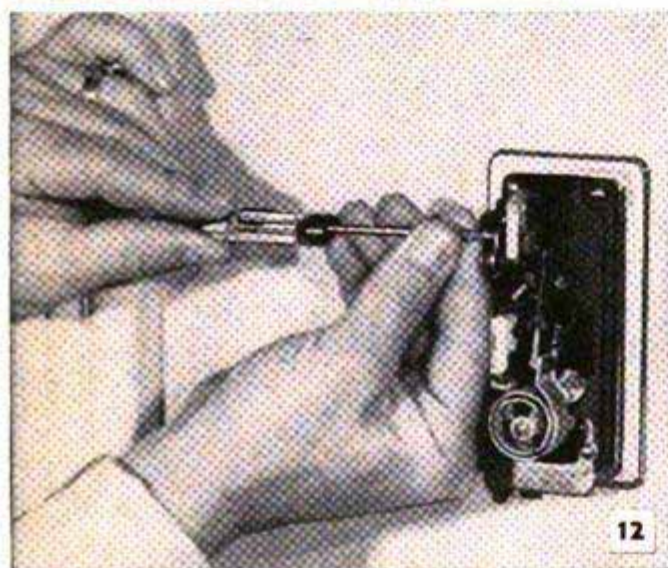
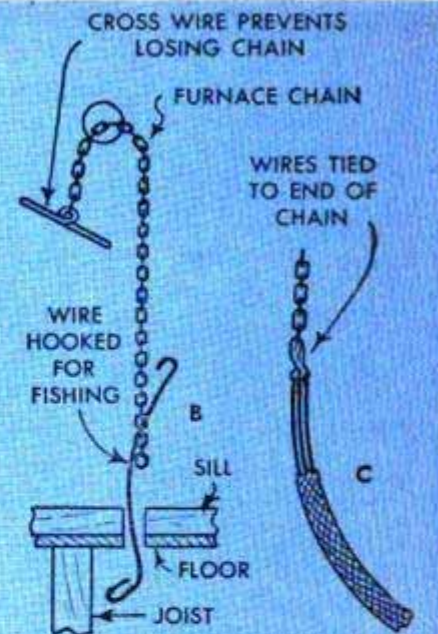




HOW TO MOVE A THERMOSTAT

- 1—Turn off main furnace switch or disconnect thermostat transformer
- 2—Remove thermostat, noting wire colors and corresponding terminals
- 3—From basement, pull thermostat cable out of its present location
- 4—Drill $\frac{1}{2}$ -in. hole through floor and partition sill, working from basement. Note in detail A that distance A should equal distance B
- 5—Pass 6-ft. length of furnace chain through new hole in the wall
- 6—Fish the chain down through hole in the sill, as shown in detail B
- 7—Tie cable to the chain, detail C
- 8—Pull cable up through partition and reconnect thermostat
- 9—Fasten the thermostat to wall

11



12

should not be located on an outside wall, near an outside door or window or on a stairway wall where it is exposed to cool downdrafts. It never should be installed in a kitchen, bathroom or bedroom where temperatures frequently are higher or lower than desired for the living room. Also, it should not be located near a fire-place, over a warm-air register, near a hot-water riser in a partition, above a lamp, radio or television set, or any device or appliance that produces heat.

If there is a hole in the wall behind the thermostat where wires enter, plug the hole with mineral wool or calking compound, Fig. 10, as the thermostat may be influenced by cool air in the partition escaping through the hole. When any of these undesirable conditions is found, either remove the source of the trouble or change the thermostat location. Fig. 11 shows the step-by-step process of making this change.

With the room thermostat properly located, adjust it as in Fig. 12 to a differential setting of $1\frac{1}{2}$ deg., or even 1 deg. if possible.

Older thermostats which do not permit the close adjustment necessary should be replaced with newer models. The differential setting, however, should not be so close that the firing periods of the burner will be shorter than 3 or 4 min. for oil burners or stokers, and 2 min. for gas burners.

Balancing the system: If some rooms heat faster than others, the system requires balancing. This is easier to do with continuous circulation than with intermittent heating because long ducts do not tend to load up with cool air during idle periods of the blower. Dampers in warm-air ducts serving rooms that tend to overheat should be partly closed; those serving remote rooms having greater heat loss should be opened entirely. Most dampers are of the locking type, one of which is shown in Fig. 13. Registers should be adjusted so that air will be deflected from rather than discharged into spaces normally occupied by people at rest. Adjustable deflecting registers enable you to control the air stream and reduce air velocity. Where such registers cannot be installed at critical locations, special diffusers or shields may be provided.

Motor and blower lubrication: Bearings of both motor and blower should be kept lubricated with No. 10 or 20 S.A.E. motor oil or light machine oil. Blower bearings usually are fitted with oil cups which should be kept filled as in Fig. 14. Motors having oilholes over bearings should be oiled with not more than two drops of oil per bearing, per month. The general tendency is to overoil motor bearings. Excess oil may cause such trouble as dirty commutators and sparking brushes, resulting in loss of motor efficiency, and may even cause the motor to stop functioning.

General maintenance suggestions: Furnace filters should be renewed at least

once annually and sometimes more often. Furthermore, the blower blades should be cleaned off at regular intervals (after turning off the furnace switch) as an accumulation of dust on the blades may throw the blower out of balance and then cause vibration. Also check periodically to see that the blower pulley is set snugly against the bearing. The clearance should equal the thickness of a piece of writing paper. Sometimes the blower-pulley setscrew works loose, permitting play and knocking.

For oil burners, keep the fuel screens clean by washing them in kerosene before the heating season commences. Oil filters should be replaced each year. Atomizing nozzles are cleaned in kerosene and a stiff bristle—not a wire—is used to clean the orifice. Remove the ignition head from the burner to unscrew the nozzle. These chores usually are included in the annual check and maintenance service provided by many heating concerns.

On gas-burning furnaces, a yellow pilot flame generally indicates a clogged air passage due to carbon formation, which eventually puts out the flame. To remedy this, turn off the gas supply to the furnace and run a pipe-stem cleaner through the small air-intake hole at the bottom of the pilot tube. Another frequent trouble is failure of the burner to light even when the pilot is burning. Usually this is caused by a loose connection between the thermocouple tube from the pilot to the control valve that supplies gas to the burners. The remedy consists of tightening the nut that holds the thermocouple tube to the control valve.

In coal stokers, improper combustion often is caused by clogged air holes in the air-feed tuyeres of the combustion chamber. This usually results from using the wrong kind and size of fuel. Clean out the encrusted holes and get the manufacturer's advice on fuel. Also keep the gearbox and bearings lubricated. The timer, air supply, rate of fuel feed and other details should be adjusted by a heating engineer. If the stoker suddenly becomes inactive, check either for a broken shear pin (for which a replacement should be kept on hand) or for a disconnected drive clutch, which serves the same protective purpose. First turn off the control switch, then re-



move the cause of the stoppage, which usually is a piece of coal wedged between the housing and the feed screw, but it may also be caused by back pressure of a clinker. Then replace the shear pin or reconnect the drive clutch. Flues to chimneys should be replaced when they become defective. If your humidifier has evaporator plates in the water pan, which is located in the plenum, these should be checked annually, and the broken or crumbled ones replaced. The degree of humidity is controlled by the number of evaporators used. When water runs out of the humidifier drain, the float valve should be repaired or renewed. ★★ ★

"Pin Up" Towel Rack Mounted With Rubber Suction Cups

A pair of suction cups and a broomstick or piece of dowel are practically all you need to make a "pin up" towel rack. Whether attached to the side of a cabinet sink for holding dish towels, or to a bathroom wall for guest towels, the rack may be hung without marring the surface. The suction

cups must be of the type having the heads of small bolts embedded in the rubber. To accommodate a large bath towel, two dowel spacers about 2½ in. long may be added, the ends being drilled to thread onto suction-cup bolts. The towel bar is then screwed to the ends of the spacers.

Cardboard Arrows Held by Canes Aid Volunteer Traffic Directors



Occasionally when boy scouts and civilians assist in directing traffic at large public gatherings, arm and hand signals frequently are misinterpreted and result in traffic confusion. To avoid this, one civic group provided each traffic director with a cane having a 4 x 10-in. piece of cardboard marked with an arrow slipped over the end. Slots were cut 1 in. from both ends and cut just wide enough to fit snugly.

W. S. Head, El Cajon, Calif.

Drippings From Heated Crayons Used to Decorate Candles

Candles may be decorated easily in the home by melting the tips of colored crayons and allowing the soft wax to drip on them



in various designs and formations. Simply heat the base of a candle to be decorated over the flame of another and press it into a dish or holder so that it is held firmly when the base hardens. The extra candle is used then to heat the crayons. For best results, use only crayons of complementary or contrasting colors.

Ivan Grosvenor, Indian Rocks, Fla.

Method for Removing Moldings Without Damaging Walls

To avoid damaging a wall or baseboard when first attempting to loosen a strip of molding so it can be pried off, drill a small hole near the nail at one end of the strip and drive in a screw part way. The screw will provide a grip for a pliers or claw hammer, thus making it possible to pull one end free. The operation may be repeated if desired wherever a break threatens.

George Hatch, Edmonds, Wash.

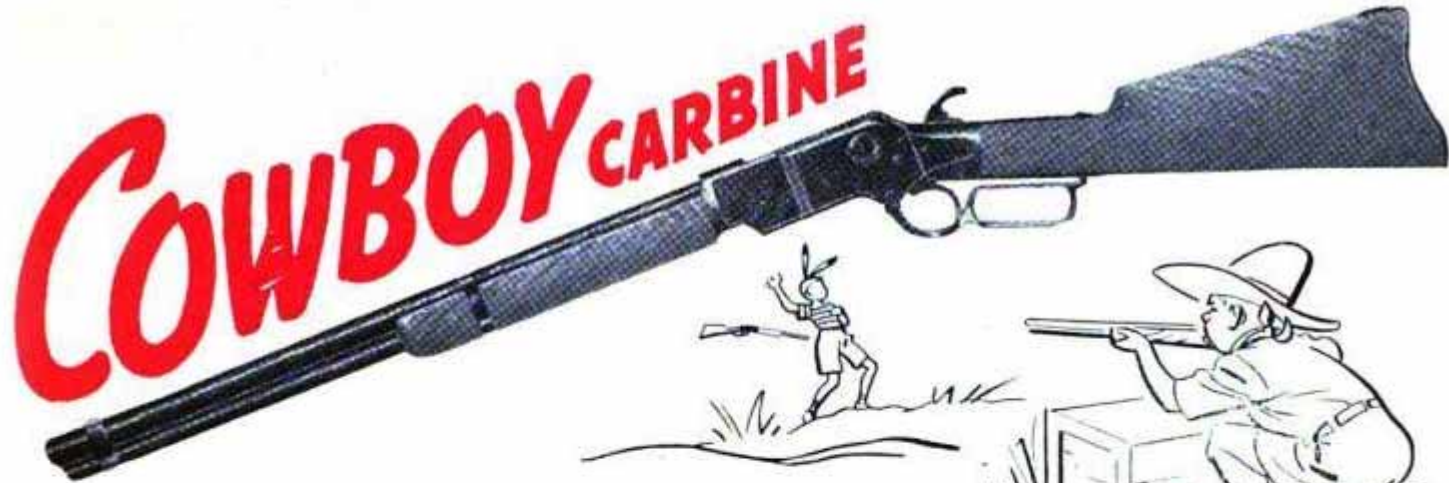
Soldering Iron Excels Burner When Flaring Glass Tubing



It frequently is possible for soft laboratory-glass tubing of fairly small diameter to be flared more easily or a lip formed to closer tolerances with an electric soldering iron than with a Bunsen burner. Large sizes of tubing may require preheating over a burner, depending upon the wattage of the iron, before the iron can be used to form the glass to the exact shape desired.

Right in the groove!

The dado head, that versatile attachment for the bench saw, comes in for a close examination in a special Shop Notes feature next month. These small blades and chippers can buzz through an amazing variety of jobs to add a really professional touch to the work of the home craftsman. Complete step-by-step photos and instructions show how to use the dado head to cut blind and duplicate dados, rabbet joints, grooves, angular notches and tenons. It's a real know-how story for anyone who ever uses a bench saw. Don't miss it

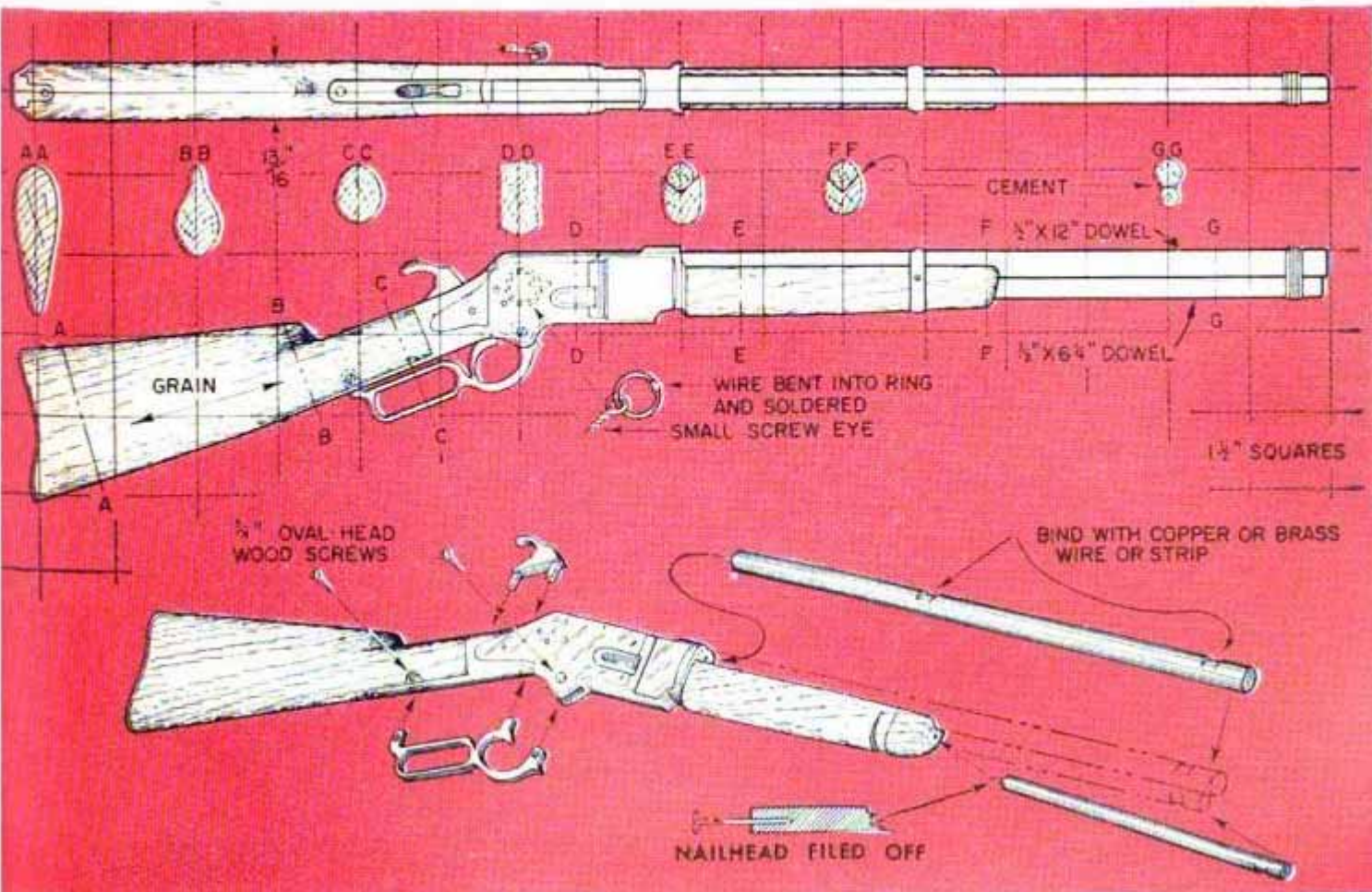


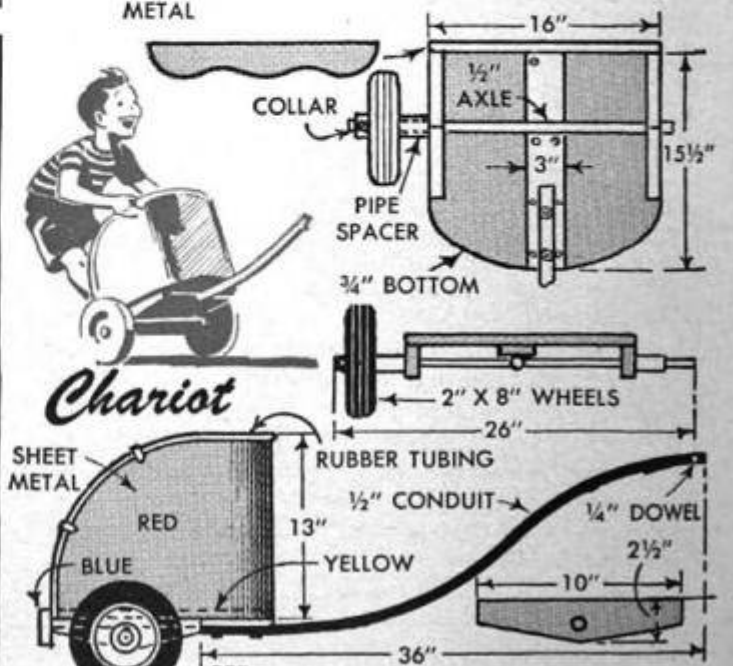
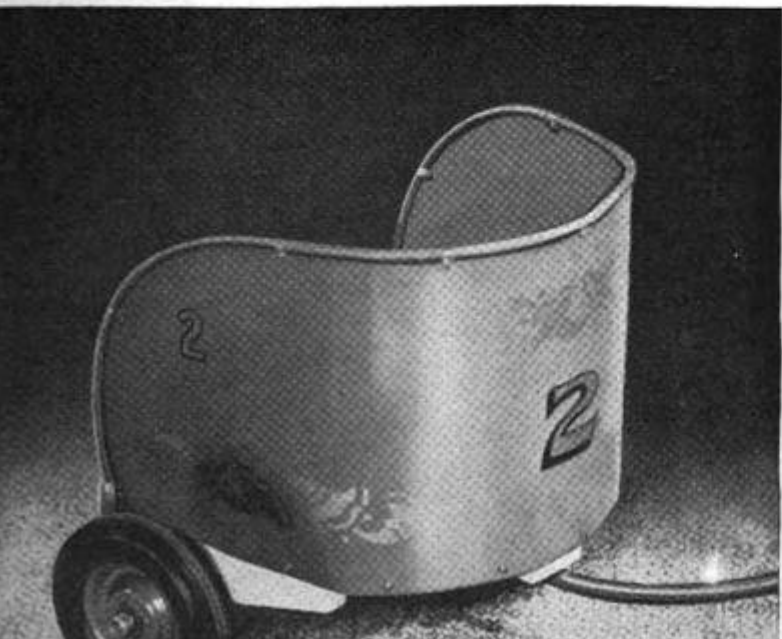
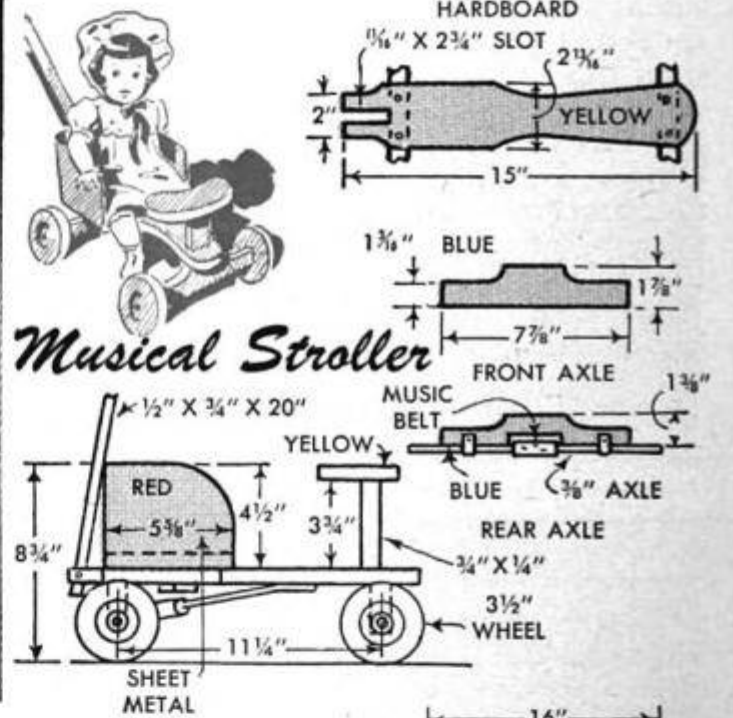
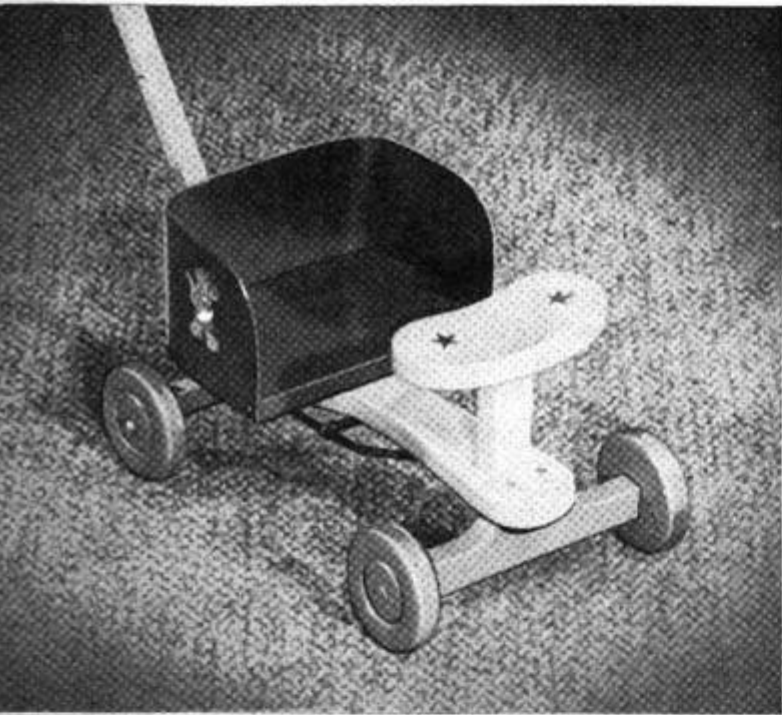
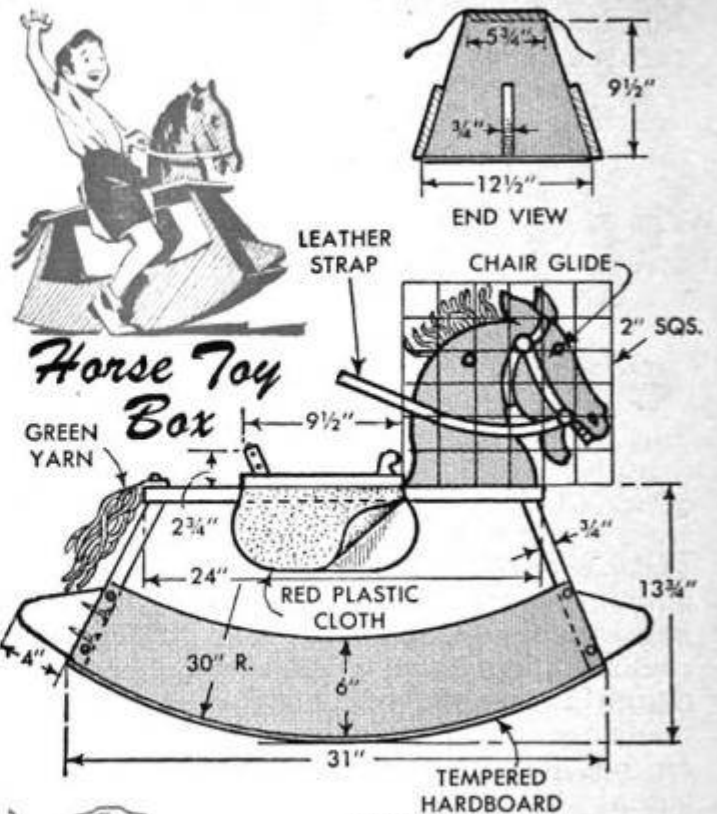
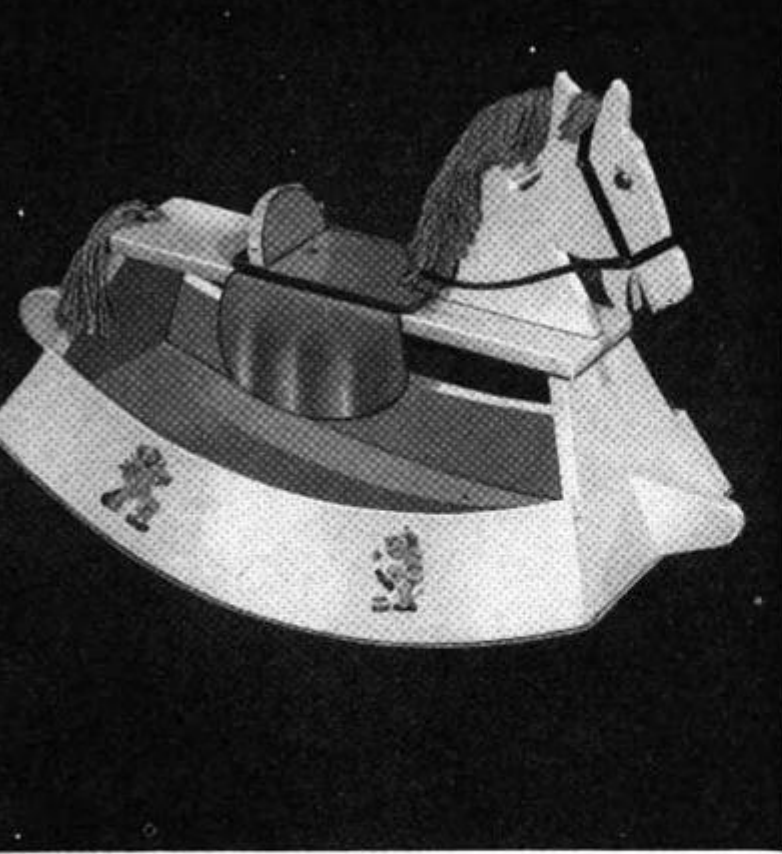
By Stanley Stearns



FOLLOWING the general lines of a carbine which was a favorite of hunters, trappers and cowboys during the late 1800s, this realistic play gun will bring whoops of delight from your young TV Westerner. If made according to the squared pattern given below, the finished rifle will be $\frac{1}{10}$ actual size—just about right for the average four to seven-year old. However, if you want the gun to be larger, simply increase the size of the squares. The stock, receiver and forearm of the carbine are made of basswood or other soft, easily carved material. Hardwood dowels are used for the barrel and the magazine, while the hammer, trigger and trigger guard are formed from $\frac{1}{8}$ -in. sheet brass or copper. Note that the barrel bands are of wire or sheet metal.

The stock, receiver and forearm are carved in one piece and sanded carefully, the left side of the gun being made the same as the right side except that it does not include the loading gate. As the gun will have to withstand considerable abuse, select straight-grained dowels for the barrel and magazine. The metal parts are sawed and filed from sheet metal and the edges well-rounded to prevent cut fingers; or the parts can be built up by soldering together strands of copper wire. All joints are cemented or glued and the trigger guard is anchored with wood screws. Use walnut stain to finish the stock and forearm and blue-black paint on the simulated-metal parts. The ring, attached to the left side of the receiver, is formed from wire and a screw eye.





TOYS

By
Marvin Reid Hartley

for CHRISTMAS

THE FINE tradition of surrounding the tree with toys on Christmas morning brings as much pleasure to the parents as to the children — but there are few things quite so gratifying for dad as the knowledge that he built the best-looking and most-appreciated toys himself. Whether you build just one or all four of the toys described in this story, you are sure to convince the children that Santa Claus took a personal interest in them this year and gave them something really special. You will find that these toys are surprisingly inexpensive and easy to make, common 1-in. lumber being used for most of the construction. The sheet-metal work included in two of the projects requires only simple cutting and involves no complicated bends.

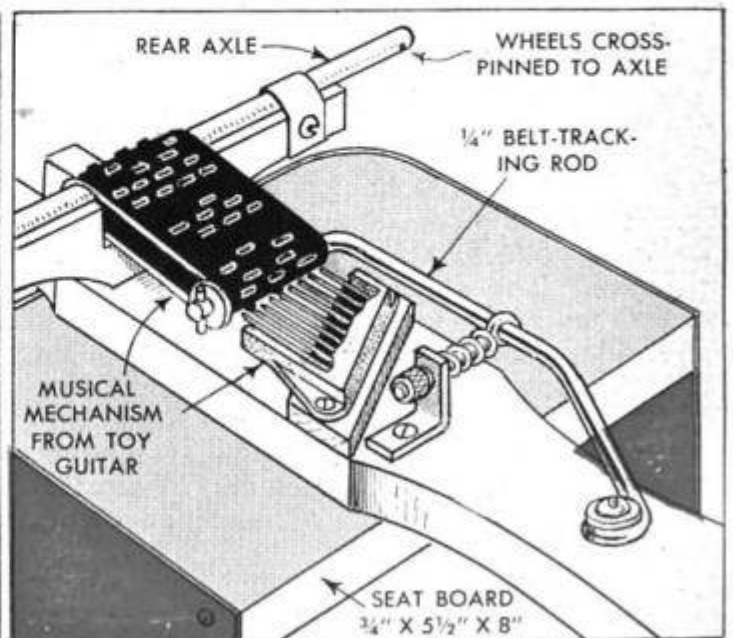
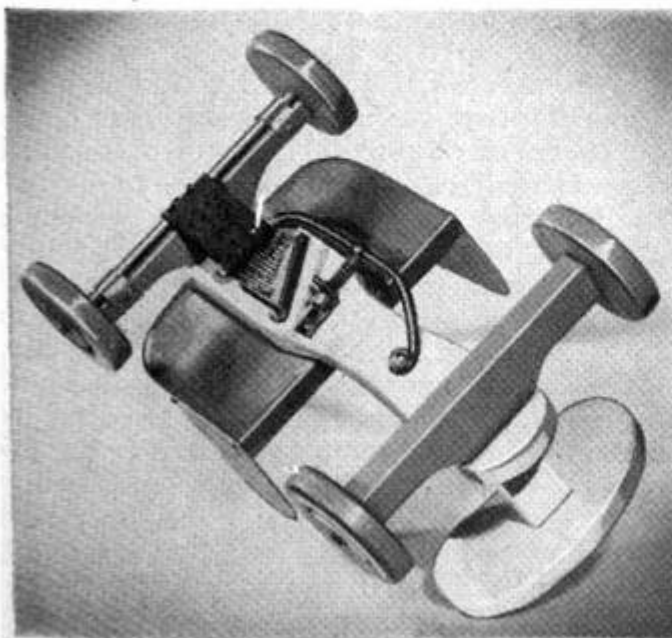
Horse toy box: This two-in-one toy, which satisfies every child's desire for a rocking horse, doubles as a roomy toy box for storing the endless accumulation of small playthings. The rockers, endpieces and saddle board are cut from 1 x 12, as shown in the detail, and assembled with glue and countersunk screws. The tempered-hardboard bottom panel is nailed and glued in place, and then cut flush with the edges of the sides and endpieces. The stops, which pro-

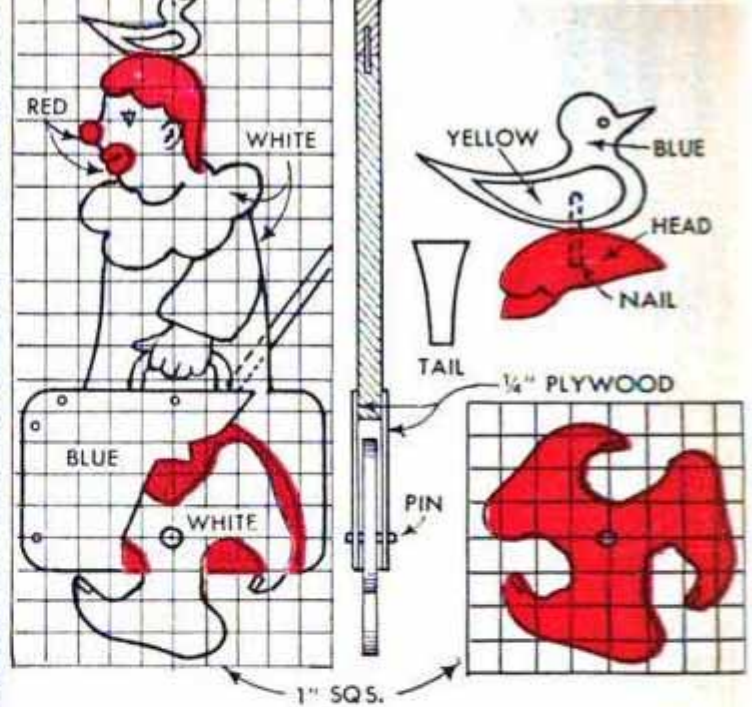
Musical mechanism taken from a toy guitar is fitted to the doll stroller as pictured below. Note in the detail how a 1/4-in. tracking rod guides rubber belt



A colorful mane is tacked to the head of the toy rocking horse as above. Strands of yarn which form mane are tied to overhang both sides of horse's neck

ject from both front and back of the horse, are added next. The jigsawed horse head is mounted with long wood screws driven up from the underside of the saddle board. A sheet-plastic saddle skirt is draped over the board and held in place by mounting the wooden saddle directly over it. Green yarn is used for both the tail and mane, the tail being anchored with a screw and washer around which the yarn is looped and tied. The mane consists of a number of pieces of yarn tied together with strands of the same material and tacked to the horse head. The bridle is made by fastening strips of leather to the horse head with furniture nails, and





Walking Clown

Plywood sides of walking clown form simulated suitcase and hide upper portion of revolving-feet cutout. Cutout is suspended on a pin between sides

a 5-in. length of $\frac{1}{2}$ -in. dowel is added to the head to provide a handhold for the rider.

Musical stroller: When little sister pushes her favorite doll in this pint-sized stroller they are accompanied by a merry tune which is played by a musical mechanism taken from a toy guitar. The stroller is built from 1-in. stock as shown in the detail on page 196. The front wheels are mounted loosely on a fixed wooden axle with wood screws and washers, but the rear wheels are crossspinned to the rear axle. The revolving axle drives the rubber belt of the musical mechanism. A length of $\frac{1}{4}$ -in. rod fastened to the underside of the stroller keeps the belt from slipping beyond the spring-steel comb. Note how a washer pinned to the outer end of the rod provides a stop for the belt, and that the rod can be adjusted sideways by means of a spring-loaded eyebolt. The bolt is passed through a drilled angle iron, the tension being adjusted by turning a nut on the end of the bolt. Use a 2-in. bolt having an eye large enough to take the $\frac{1}{4}$ -in. rod and, of course, thread the bolt on the rod before bending the latter. The handle is hinged to the rear of the stroller frame with a stove bolt. Back and sides of the stroller are a single piece of sheet metal which is screwed to the edges of the seat. Corners of the sheet metal are rounded and filed smooth. The stroller is painted red, blue and yellow and decorated with appropriate decals or gummed-paper geometric designs.

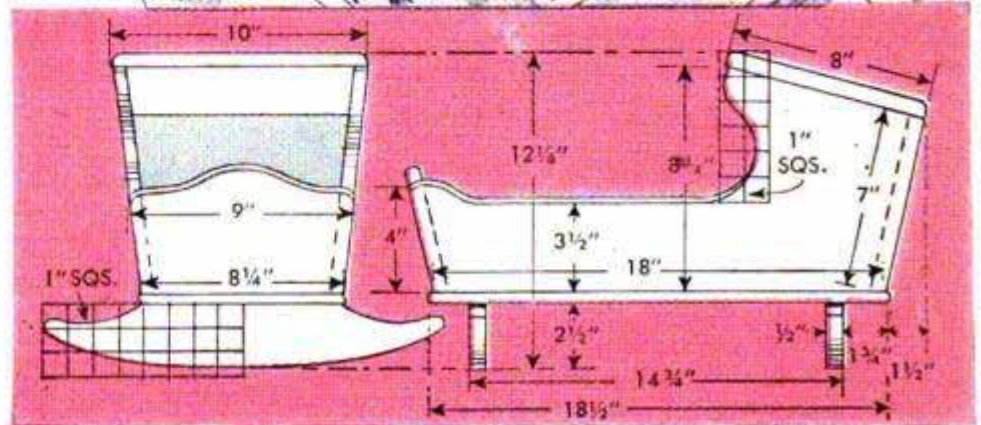
Chariot: The front sidewalk becomes the Appian Way when little Johnny hitches this

Roman chariot to his tricycle and finds a friend to supply the motive power. The bottom of the chariot can be of $\frac{1}{2}$ or $\frac{3}{4}$ -in. plywood or two lengths of 1-in. stock edge-glued together. A 1 x 3 x $15\frac{1}{2}$ -in. brace fastened lengthwise to the underside of the bottom, and two wooden bearing blocks for the axle, provide the frame. A scrolled crosspiece is screwed to the rear edge of the bottom panel. The front and sides of the chariot consist of a single piece of sheet metal. This is screwed to the edges of the bottom piece and its exposed edges are covered with a length of rubber hose which is held in place with small sheet-metal clamps. The clamps are bolted to the sheet-metal sides. A tongue, or handle, made of $\frac{1}{2}$ -in. thin-wall conduit is bolted to the center frame member. The wheels are secured to the $\frac{1}{2}$ -in. axle with collars and held away from the sides of the chariot by short lengths of pipe slipped over the axle. Numbers, figures, or other decal designs may be applied to the painted sides.

Walking clown: With his big feet paddling along beneath an oversize suitcase, and a bird perched precariously on top of his head, this comical clown doll is sure to delight the youngsters. The body of the clown is of 1-in. stock with a semicircle cut out at the bottom to provide clearance for the revolving feet. The latter are cut from $\frac{3}{8}$ or $\frac{1}{2}$ -in. plywood. Overlays of $\frac{1}{4}$ -in. plywood form the sides of the suitcase and also hold the pin around which the feet revolve. To prevent binding, slip a washer over the pin on each side of the feet cutout and, before assembly, wax the surface of the pin where it will come in contact with the revolving cutout. Finally, drill the back of the doll to take a handle of $\frac{1}{2}$ -in. dowel. ★ ★ ★

Doll Cradle Is Ideal Christmas Gift for Child

A few simple tools are all you will need to transform scrap pieces of wood into an attractive doll cradle that will make an ideal Christmas gift for a little girl. Following the dimensions given, first lay out scrolled portions of the sides and rockers on squared paper to provide patterns for cutting the shapes from wood. All pieces, except the $\frac{3}{8}$ -in. bottom, are cut from $\frac{1}{2}$ -in. stock. The footboard and adjacent curving ends of the sides are shaped similar to those illustrated. After cutting the pieces with a coping saw, sand them thoroughly and then assemble with glue and screws. A suitable finish is determined best by the stock used.—A. E. Fenn, Chicago.

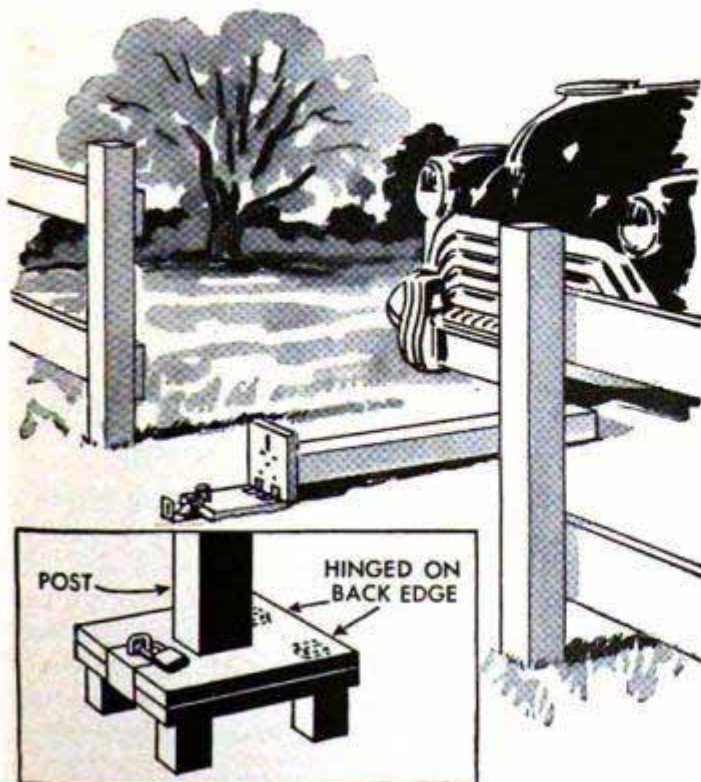


Post Barricade Hinged at Base Tipped Over to Admit Cars

To provide a gate arrangement that allows pedestrians and automobiles to pass, but which also may serve as a barricade against the latter if desired, install a post hinged to a wooden base set in the ground. A square piece of 1-in. stock is used for the base, and is fitted with legs nailed to the underside. Another piece matching the

base is nailed to the bottom of a 4 x 4-in. post and then hinged to the base. Opposite the hinged edge, a long staple is driven near the edge of the base plate to fit through a slot cut in the upper plate. Attached to the underside of the base plate, a hasp is bent so that when the two plates are brought together it fits over the edges of both as well as over the staple, thus making it possible to lock the post in an upright position.

Richard L. Baldwin, Avon, Conn.



Releasing Stuck Thermostat

When the thermostat in your car radiator sticks, here's a simple trick that may save you the trouble of removing it. Cover the radiator with newspapers or a blanket and let the engine idle until the temperature rises 20 to 30 deg. above normal. Then stop the engine and permit it to cool before operating again. The wide variation in temperature generally will cause the thermostat to release and operate normally.

Stephen Varnecky, Johnstown, Pa.

When sweating threadless valves to copper or brass water lines, remember to remove the valve stem and washer before applying heat with a blowtorch. If the washer is not removed, it may become burned or warped.



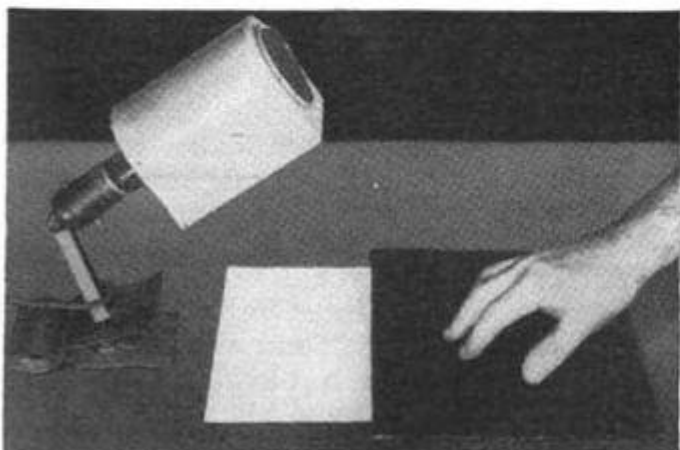
Wooden-Type Print Frame Serves as Copying Easel

A large, wooden print frame, measuring 5 x 7 in. or larger, will serve very effectively as a copying easel. The copy is held securely in place by pressure from the spring back of the frame. When placed on a flat surface, the frame will stand without any need for additional support.

Testing Darkroom Safelight

It's wise to test your darkroom safelight at regular intervals, as the colored filter paper which forms the "shade" fades to such an extent that in time it may cause the white areas on prints to come out gray. To test the light, place sensitized paper directly under it and cover half of the sheet with masking paper, or the black envelope in which the sensitized paper comes. Expose for three minutes and then develop for the normal time. If the light is "safe," there will be no noticeable difference in color tone between the exposed and unexposed parts of the paper.

Robert Hertzberg, Jackson Heights, N. Y.

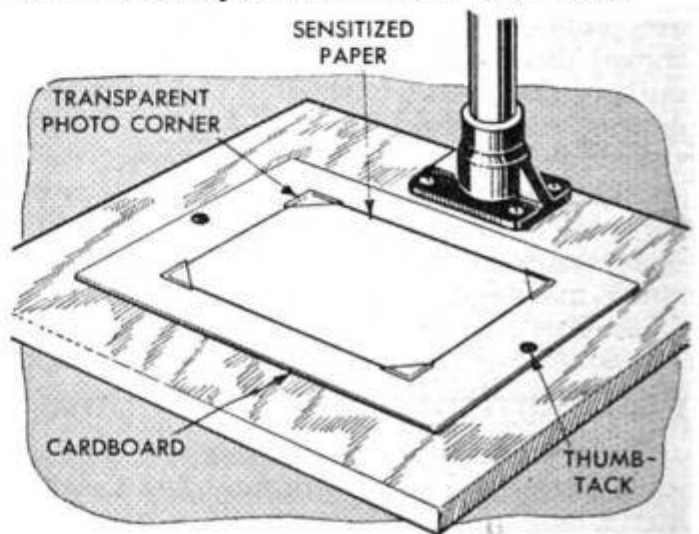


Renewing Lines on Photo Trimmer

If the ruled squares on the top of your photo trimmer have become worn to the point where they are hard to see in the glow of the darkroom safelight, you can save time and eyestrain by renewing the lines with white chalk. Simply rub the chalk into the rule-line grooves, and wipe the chalk from the surface of the top with a damp cloth. For a more permanent repair, use white paint instead of chalk, flowing the paint into the grooves with a small brush. Carefully wipe up the excess before the paint has had time to dry.

Herman Klein, Pittsburgh, Pa.

Paper Held for Borderless Prints With Transparent Photo Corners



Sensitized paper can be held flat on the enlarger easel when making borderless prints by means of four transparent photo corners and a sheet of stiff cardboard. Stick the corners to the cardboard, positioning them to take the printing paper which is to be used. Then slip the paper in place and print as usual. The portions of the print under the photo corners will show no appreciable variation in density. If multiple prints are to be made with the same enlarger setting, the cardboard backing can be held stationary with two thumbtacks pressed into the easel.

Clifford T. Bower, London, England.

Crushing of Chemicals Simplified When Placed Under Screening

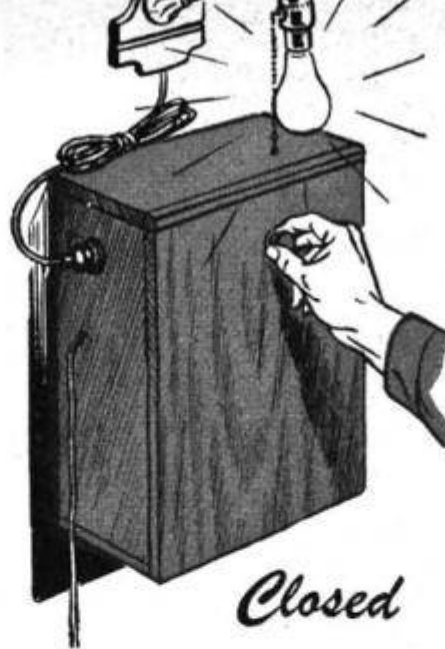
When the need arises for crushing chemicals to make them dissolve more rapidly, one amateur photographer speeds up the job by placing them on a board and covering them with a small piece of screening. A bottle then is rolled back and forth over the screen, which helps crush the chemicals and also prevents the crushed bits from scattering about.

DARKROOM SAFE

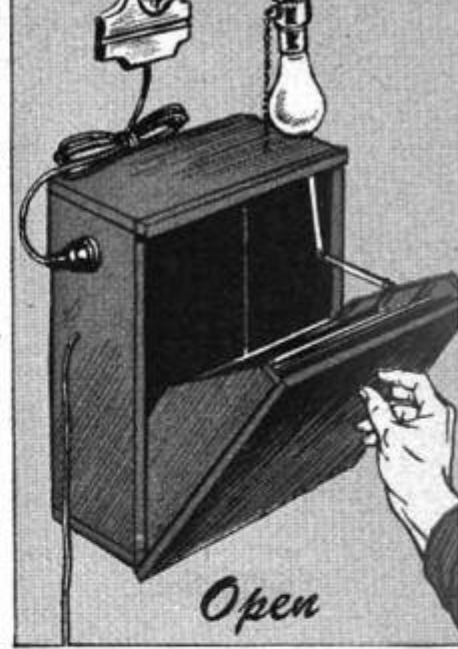
turns out light

By Louis Hockman

IN CASE you forget, this darkroom safe automatically turns out the white lights when it is opened, thus preventing fogging of sensitive printing papers. The light is wired to a sensitive switch of the normally open type which is placed inside the safe as in the detail below. Lowering the hinged tray, or drawer, opens the switch by releasing the button which one edge of the drawer depresses when closed. Although shown directly above the safe, the light may be located anywhere in the room and the cord plugged into the convenience outlet mounted on the side of the safe. The latter is simply a box made with rabbeted corner joints. The plywood back is rabbeted and joined to the box with brads, or screws, and glue. Both sides of the drawer are cut at an angle, grooved for separators and the two front paper compartments are fitted with false bottoms so that all four compartments will be of a uniform depth. Cut the drawer front slightly oversize, hinge it as indicated in the detail below and then plane the overhanging edges flush. Attach the drawer brace at the points indicated. Select

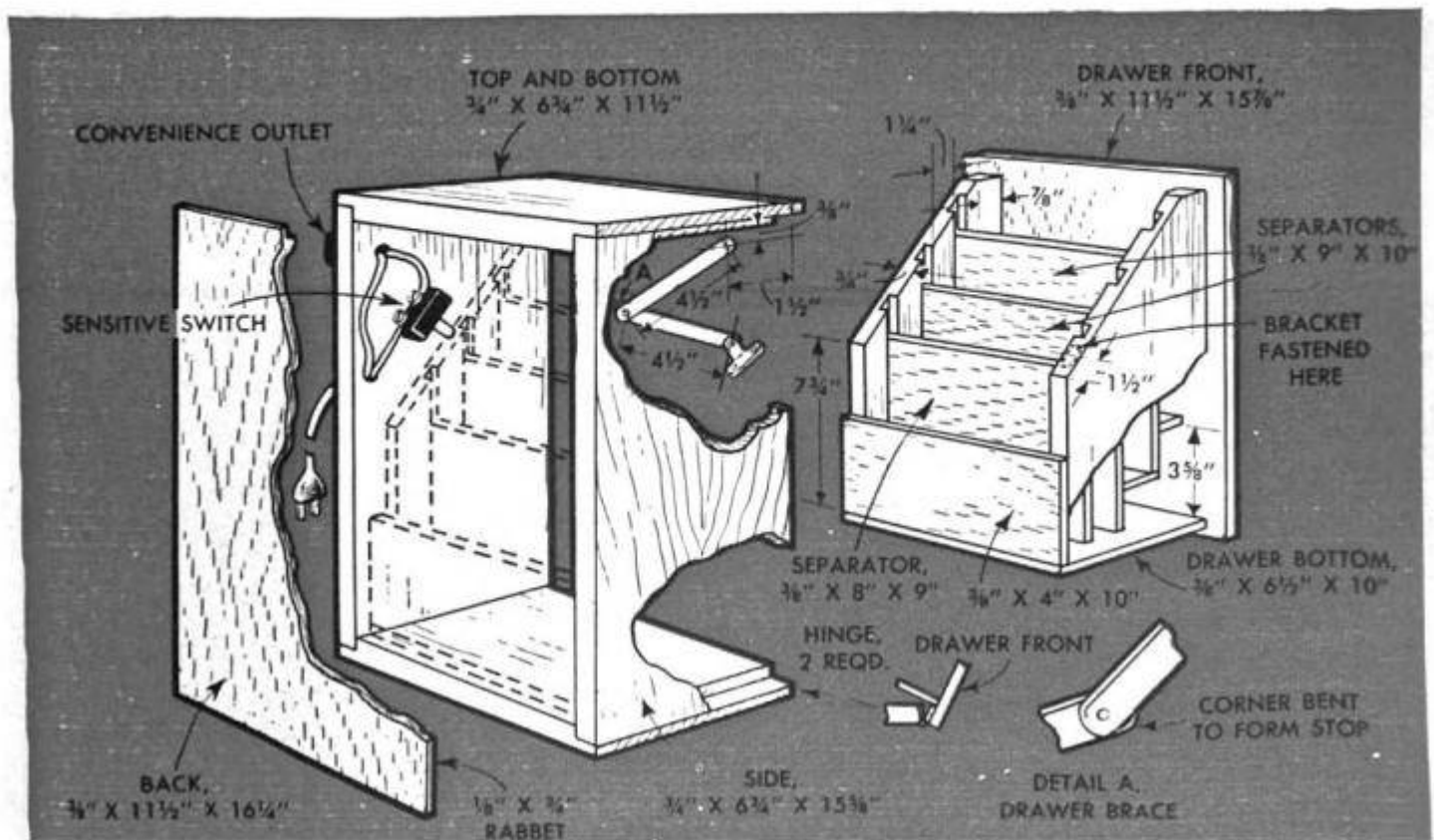


Closed



Open

a brace of the proper length so that when the drawer is lowered it will serve as a combined stop and support to hold the drawer in a position slightly above horizontal. This tends to prevent papers in the compartments from sliding out. Folding braces of the type shown are available with a built-in stop, but plain folding braces can be adapted to the purpose by bending the edge of one member to form a stop as shown in detail A. In this case, the purpose of the stop is to prevent the brace from swinging past center when opened and folding in the opposite direction when the drawer is closed. Although the exterior of the cabinet may be finished in the natural color of the wood, or enameled in any color, it's a good idea to coat the interior with a flat-black photographic enamel.





SHOOTING WILDLIFE with FLASH

By Tom McHugh



Above, grazing elk caught unawares in flash photo which often records poses obtainable in no other way. Below, beaver obligingly trips cord and takes his picture while about the business of dam building



FLASH-SHOOTING unsuspecting animals and birds generally catches them in natural poses otherwise unobtainable, especially birds and animals of nocturnal habits such as the fox, beaver, owl, skunk and others. Note the beaver in the lower left-hand photo who obligingly took his own picture at night by tripping a flash trap set on top of the dam he was engaged in building. Or study the expression of Mother Robin in the daytime photo above, who seems less dismayed by the flash than by the open mouths of her hungry fledglings. Of course, the photographer's biggest thrill comes when developing flash-trapped nighttime pictures for he never knows what will turn up on his print. An example of this is shown in the upper right-hand photo on the opposite page. Here the flash setup was baited for another animal, but a sly fox was flash-photographed in the act of purloining the bait. Note that the guilty expression of the bait thief is faithfully recorded. Note also the clarity of detail in this nighttime shot.

Any camera with a shutter equipped for flash will serve the purpose. A prime requirement is a sturdy tripod which can be adjusted to support the camera firmly on uneven ground. Some wildlife photographers attach a heavy weight to the tripod to prevent it from being upset by rising

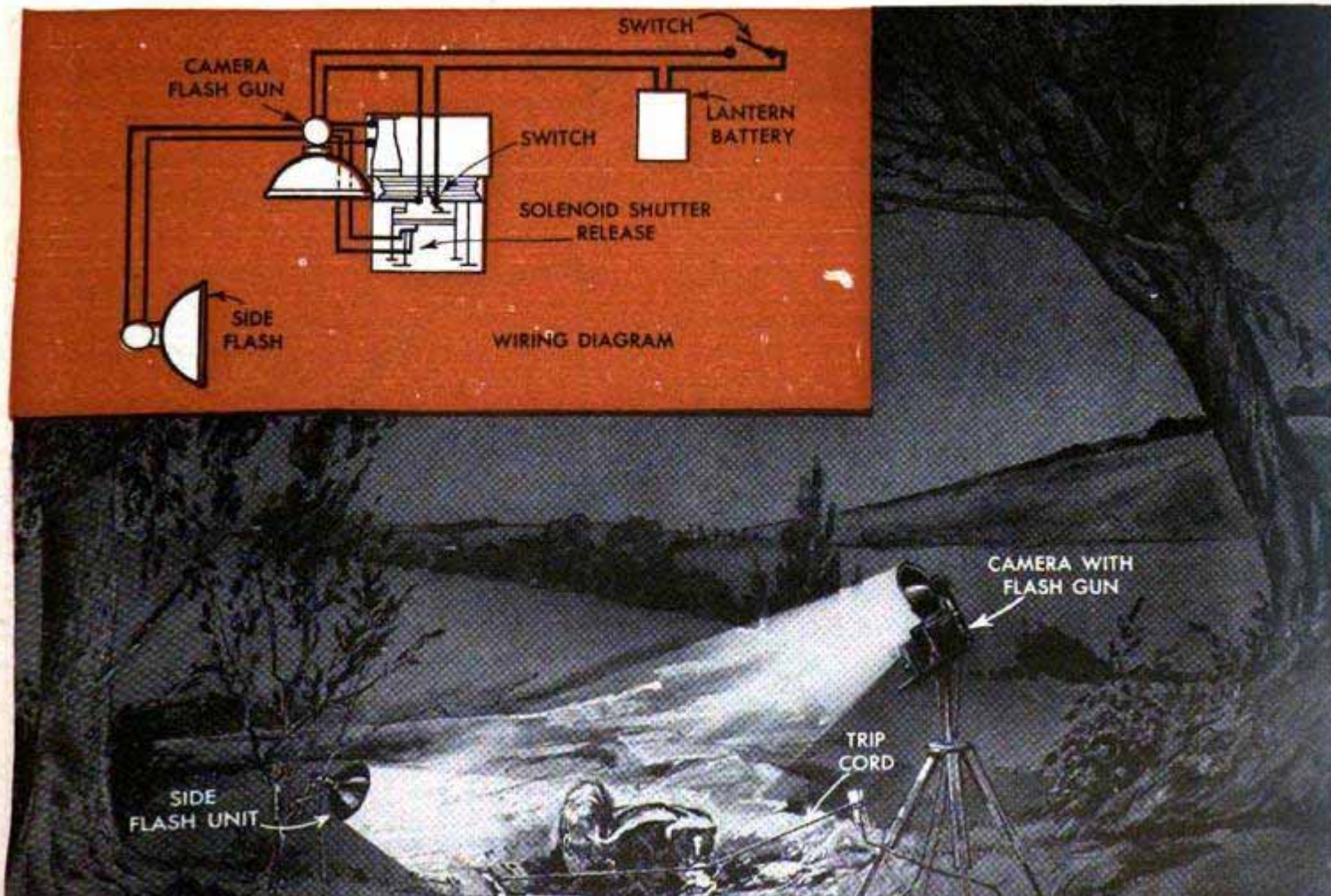
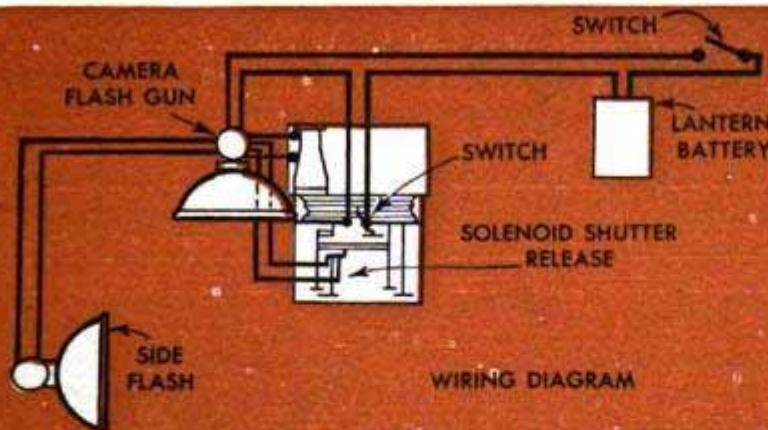
winds or small animals that may pass near by. The camera always should be protected from dampness by a tight-fitting waterproof covering. Usually it is possible to avoid accidents and damage to the equipment by careful selection of the spot to make the setup. For night shots with flash, trailside sets generally give the best results. Baited sets may be used effectively to lure shy animals or nocturnal birds within range of the camera. Before the set may be made properly, the photographer must know the animals common to the locality, the areas they frequent and the trails they follow. Fresh tracks along the regular trails and along stream banks generally indicate that the animals frequently pass in the search for food. Flash traps set near dens known to be occupied often produce novel flash photos. The drawing and detail below show a typical nighttime flash setup for skunk with a baited trip cord and single side flash unit. The inset detail shows a typical wiring diagram using a lantern battery as the power source. Note also the lower left-hand detail on the following page showing how a switch is mounted on the camera to open the circuit after the flash is fired.

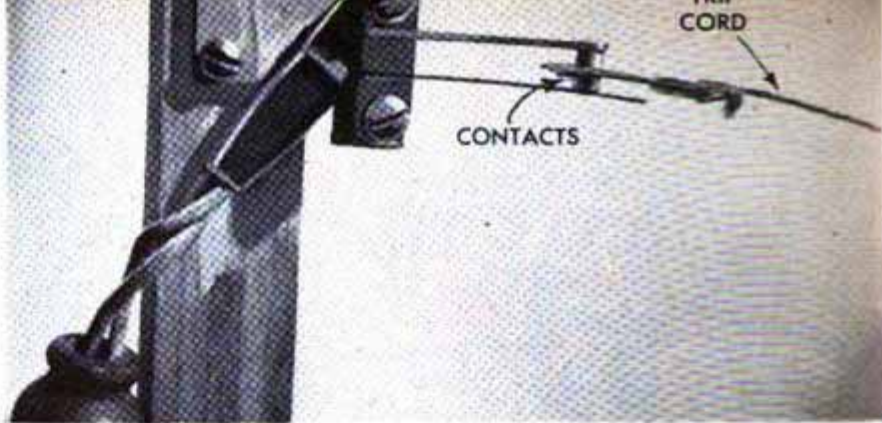
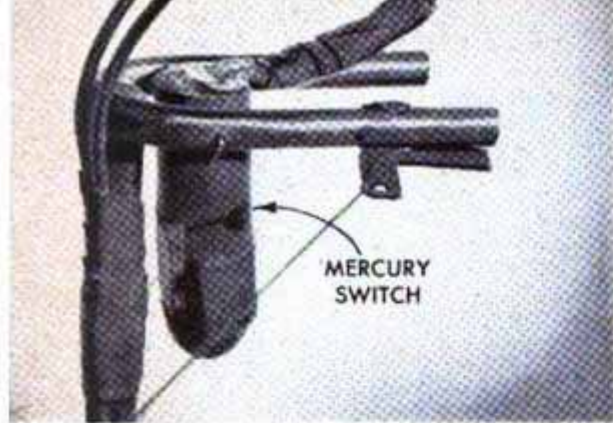


Sly Reynard, the fox, caught in the act of purloining bait from a nighttime flash setup made for another animal. Note clarity



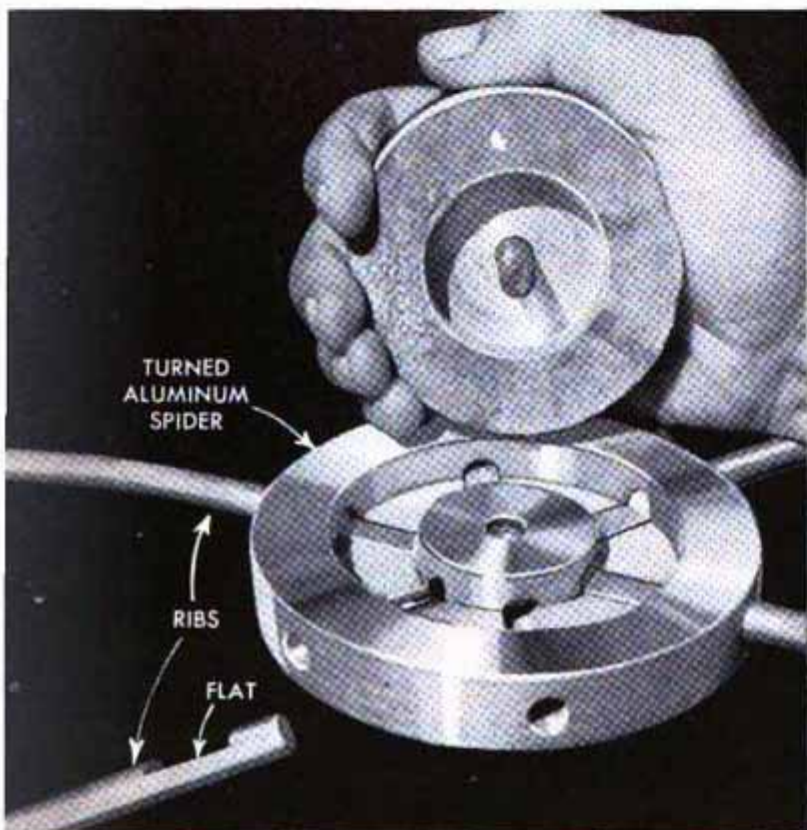
In daytime bird photography, flash units are controlled manually from a blind. Camera is set up and hidden near the nest





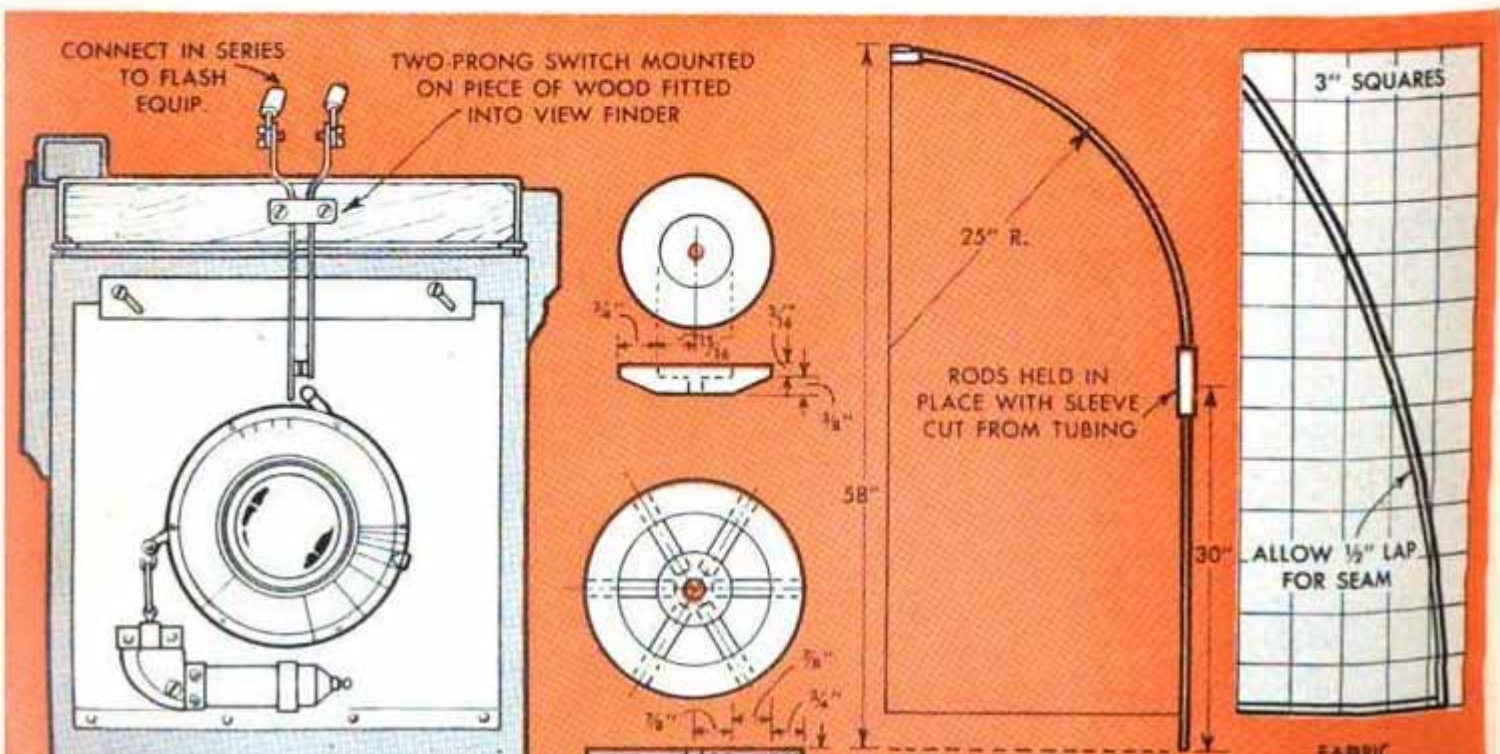
Two types of switches used for automatic operation of flash units which are set up to be fired by trip cord

The photos above show two types of switches which can be used to close the circuit and fire the flash units whenever trip cord is moved by the animals. In the left-hand photo an L-shaped bracket is positioned to hold a mercury switch in the horizontal, or open, position. When the cord is pulled, the pivoted bracket releases the switch, permitting it to swing downward and close the circuit. The switch pictured at the right is simple and effective. A piece of thin fiber is taped to one end of the trip cord and placed between the contacts. When the trip cord is pulled, the insulating fiber strip is drawn out of place, permitting the contacts to close.



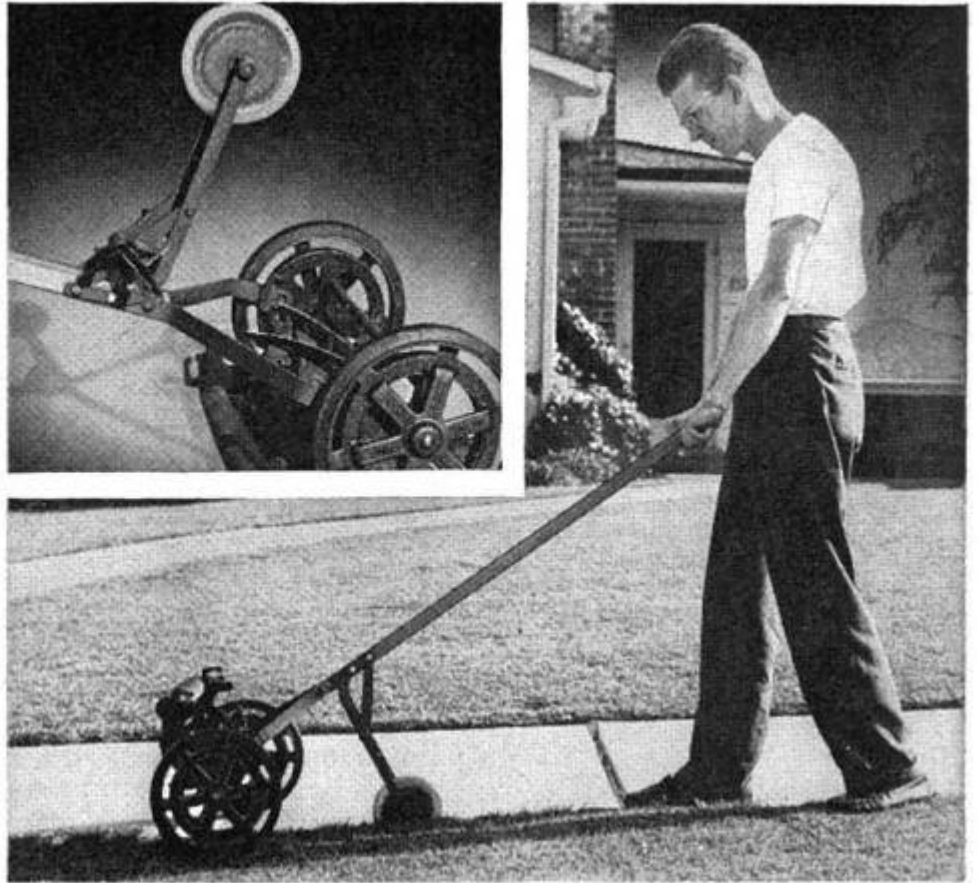
The collapsible blind consists of a number of metal ribs inserted in an aluminum spider and locked in place with a clamp ring. Ribs are covered with fabric

For bird photography in the daytime, the camera setup is much the same except that the flash is controlled manually. In some setups a blind will be needed to conceal the photographer at a point where he can observe the action and determine the proper time to fire the flash. The center photo on the preceding page, the center photo at the left and the details at the right, below, show how to make a blind that is effective and easily moved from place to place. In use, the fabric covering can be disguised with artificial grass to make the blind blend with its surroundings. ★ ★ ★



When mowing and edging large lawns as well as trimming shrubbery nearby, extra trips to the garage or tool shed can be eliminated by permanently attaching an edger to the mower handle. Hand clippers may be carried along by storing them between the frame and the frame brace of the edger as shown in the upper detail. To use the edger, which in no way interferes with cutting the grass or the use of a grass-catcher, the mower is inverted and its weight utilized to force the edger into the sod. The frame consists of two lengths of $\frac{3}{16} \times \frac{3}{4}$ -in. flat steel which are heated and bent flat-wise to 90-deg. angles at one end, and then drilled to fit over long bolts replacing those used to connect the mower brackets to the handle. Two shorter lengths of flat steel serve as braces. If a regular edger wheel cannot be purchased, one can be improvised from a 6-in. circular-saw blade having the teeth ground off, after which it is sharpened. The blade is mounted between washers and pipe spacers through which a bolt is inserted to serve as a shaft.

Lawn Edger Assembled From Scrap Parts Is Always at Hand on Mower Handle



The bolt is mounted in holes drilled in the ends of the frame, and the nut locked in position by using a punch to spread the end of the bolt. When finished, the frame is coated with a rust preventive and then finished with a coat of enamel.

Myrlin Wieder, San Gabriel, Calif.

Multiple Mounting of Razor Blades Provides Useful Paper Shredder

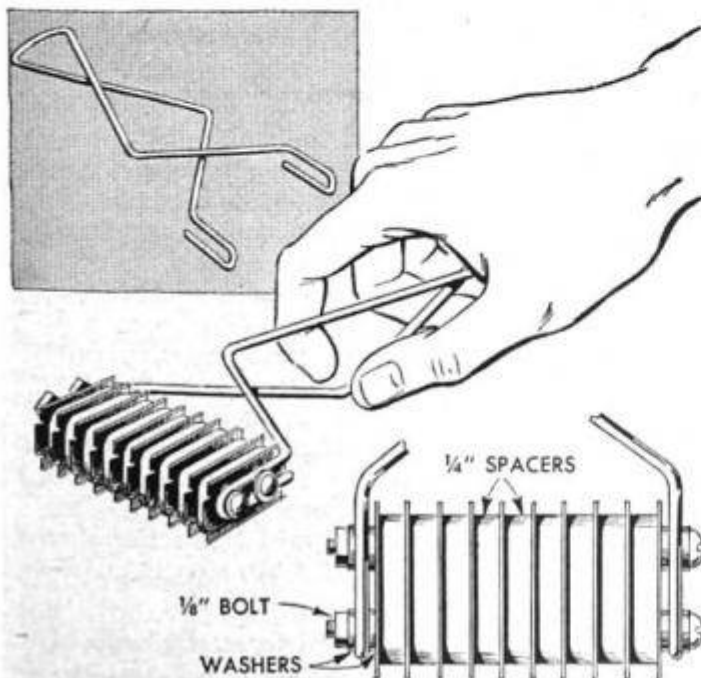
If you have frequent need for shredded paper, make a paper shredder for producing it easily and quickly from old newspapers. This handy device not only should supply most normal requirements but also

should eliminate the necessity for keeping any of the flammable material on hand. The cutting head of the shredder is made of 10 double-edged razor blades separated with $\frac{1}{4}$ -in. wooden spacers and assembled with $\frac{1}{8}$ -in. bolts. The handle, which is formed from a 2-ft. length of heavy wire, is turned back at the ends as shown in the upper detail in order to fit over the protruding ends of the bolts. Washers are placed on both sides of the wire before tightening nuts on the bolts.

Frederic B. Leach, Nutley, N. J.

Tape Holds Sanding Strips In Vibrating Sander

Folded over the ends of a strip of sandpaper being readied for use on a vibrating sander, strips of friction tape will help keep it in place during sustained usage until such time when regulation strips can be used. The tape is placed over portions of the sandpaper where the ends come in contact with the clamps.



Basket Strapped to Baby Carriage Holds Bundles When Shopping



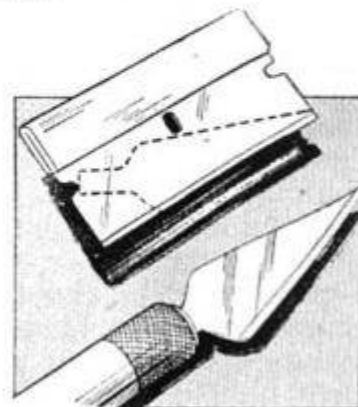
By fitting our baby carriage with a detachable basket under the handle, I made it possible for my wife to take the baby along when shopping and carry bundles home without stacking them in the carriage. Two storm-window hangers were screwed to the frame of the carriage and the slotted end bent so they extended up-

ward within easy reach. All she has to do to attach the basket is to take the ends of straps inserted through the wicker sides, pass them through the hanger loops and buckle them. If desired, the basket may be fitted with a leather or cloth handle so that it may be carried easily into the store or house without difficulty.

LeRoy Herbert, Arlington, Mass.

New Blades Cut From Razor For Modeler's Knife

An inexpensive method of fashioning replacement blades for stencil and modelmaker's knives requires nothing more than a single-edged, safety-razor blade. Mark the outline of the knife blade on the razor blade, and grind it roughly to shape, leaving the cutting edge intact. Providing a blade of the finest steel, this method also can be used to make new blades of special shapes, provided the outline of the shank is first scribed from an old blade and the required new design then drawn in.—George Kapitan, Bronx, N. Y.



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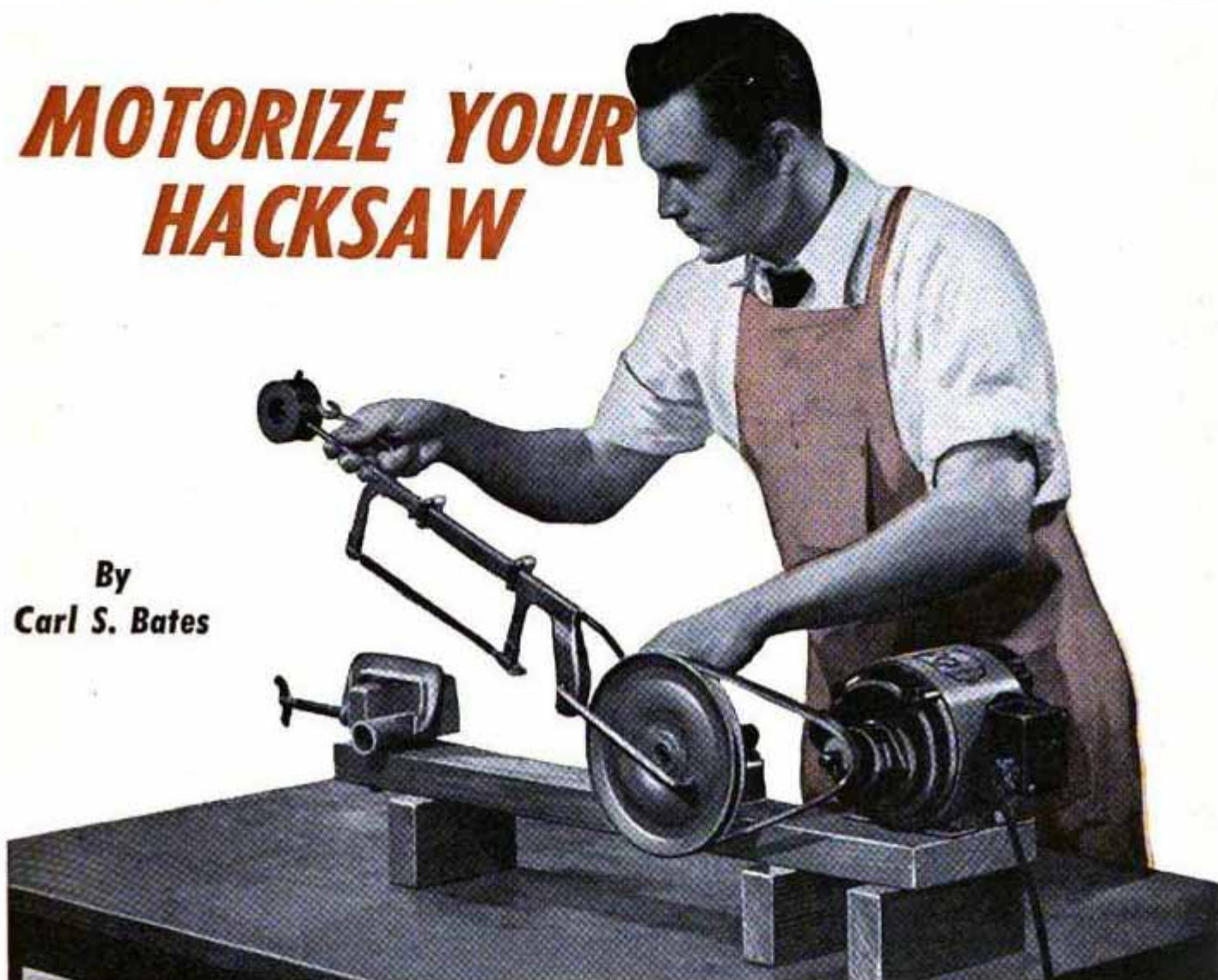
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SHOP NOTES

MOTORIZED YOUR HACKSAW

By
Carl S. Bates

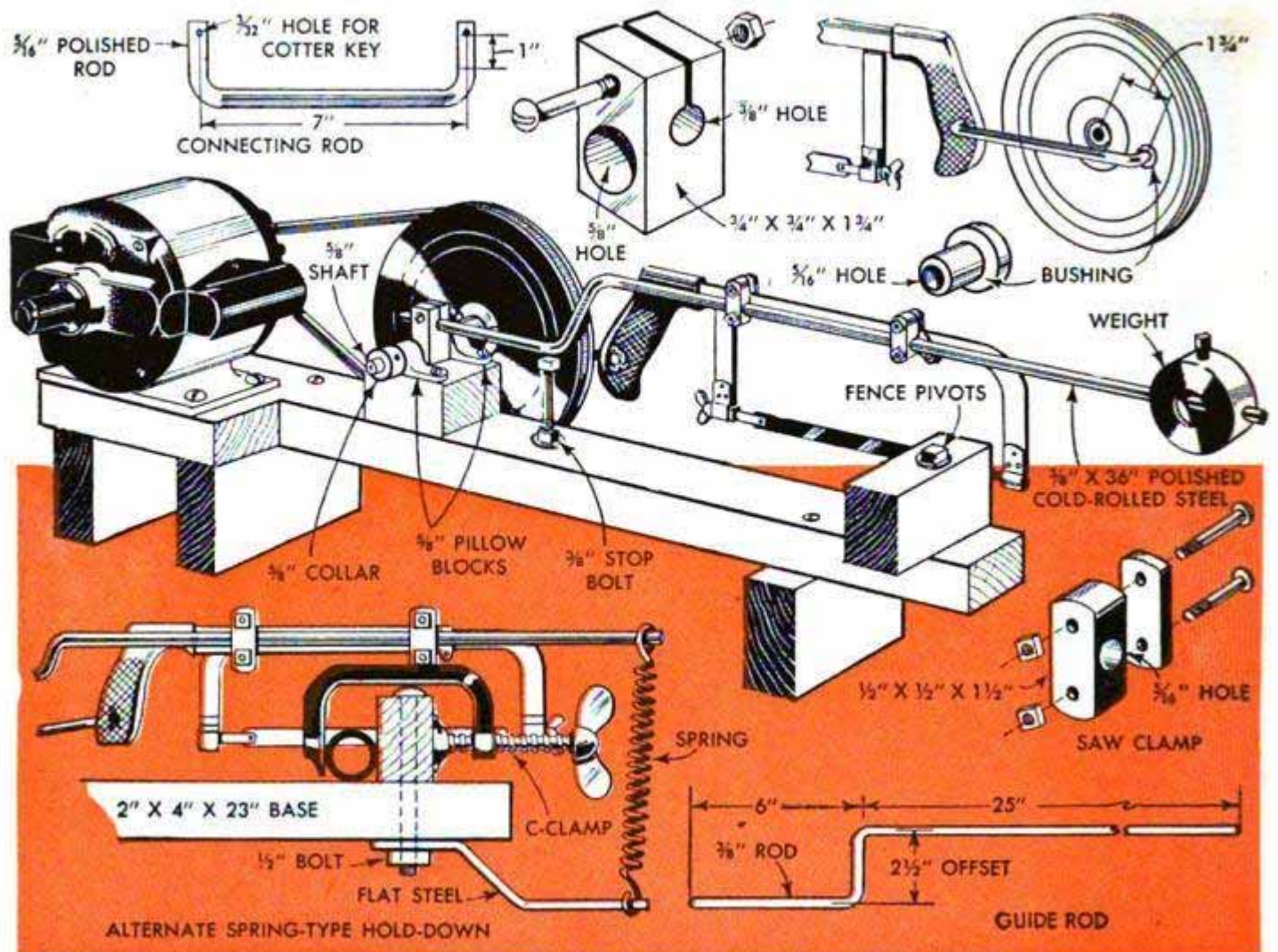


IF YOU HAVE a small metalworking shop or use steel bar or shafting to some extent in your home workshop, motorizing a hand hacksaw will save hours of work and can be done at a fraction of the cost of a commercial power hacksaw. The inexpensive drive unit consists of an 8 or 10-in. V-pulley and shaft, a connecting rod and a guide rod, a vise or clamping arrangement to hold the work and a suitable wooden base. When needed for handwork, the saw can be removed from the unit in a few minutes. As pictured above, a separate motor may be used to drive the saw. However, to cut costs, the saw also may be driven by means of a pulley and shaft chucked in a metalworking lathe, or for light work, even by a $\frac{1}{4}$ -in. electric drill.

The detail on the following page shows the drive unit mounted on a portable wooden base which, of course, will vary depending upon the particular installation required and the means by which the unit is

driven. An 8-in. cranking pulley is recommended if the saw is driven by a low-speed motor or by lathe power. In the latter case, a 2 or 3-in. pulley is mounted on a $\frac{1}{2}$ -in. shaft which is chucked in a metalworking lathe, and the wooden base is bolted to the lathe bed under the chuck. If a $\frac{1}{4}$ -hp., 1725-r.p.m. motor is used, it is best to drive a 10-in. cranking pulley with a $1\frac{1}{2}$ -in. pulley on the motor shaft. Should you use a 10-in. cranking pulley, increase the connecting-rod length to 8 in.

When mounting the pillow blocks for the cranking-pulley shaft, space them far enough apart to allow clearance for the anchor block of the guide rod. The shaft also should clear the top of the wooden mounting block sufficiently to allow the anchor block to rock back and forth as the saw is raised and lowered. Dimensions given in the detail are for a steel anchor block. This part also can be made of hardwood, but the $\frac{3}{4}$ -in. thickness then should be increased



to 1 in. to leave heavier walls after drilling the $\frac{5}{8}$ -in. shaft hole.

The two saw clamps are made of steel or hardwood and should slide smoothly along the guide rod. Saw pressure is brought to bear on the work by means of either a movable weight or a spring-type hold-down. Adjusting the weight or using springs of different tension will vary the pressure to suit the thickness and hardness of the work. Too much pressure as well as speed may draw the temper and quickly dull the teeth.

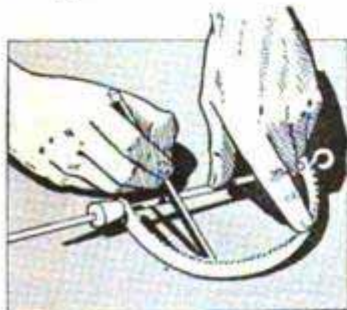
Both the pulley and the hacksaw handle are drilled and bushed to receive the ends of the U-shaped connecting rod which are held in place with cotter keys. A short length of tubing will do for the saw-handle bushing. When drilling the pulley for the bushing, be careful to drill the hole parallel with the shaft hole, as the connecting rod

will bind if the bushing and pulley shaft are not parallel. To prevent vibration, counterbalance the pulley with a 4-oz. piece of flat steel fastened to the inside of the pulley, locating the weight 2 in. from the center of the pulley and directly opposite the connecting-rod bushing.

The guide rod should be set square with the pulley shaft to prevent binding, and because of the $2\frac{1}{2}$ -in. offset in the rod, squaring is done easily by turning the rod in the anchor block and reclamping. The work to be cut is held in a drill-press vise or a simple vise improvised by bolting a wooden block to the base and clamping the work against the block with a C-clamp. Note that this block can be set at various angles.

Best results are to be had by setting the blade to cut on the pull stroke, the length of stroke being about $3\frac{1}{2}$ in. ★ ★ ★

Adjustable Curve for Home Shop Improvised From Hacksaw Blade



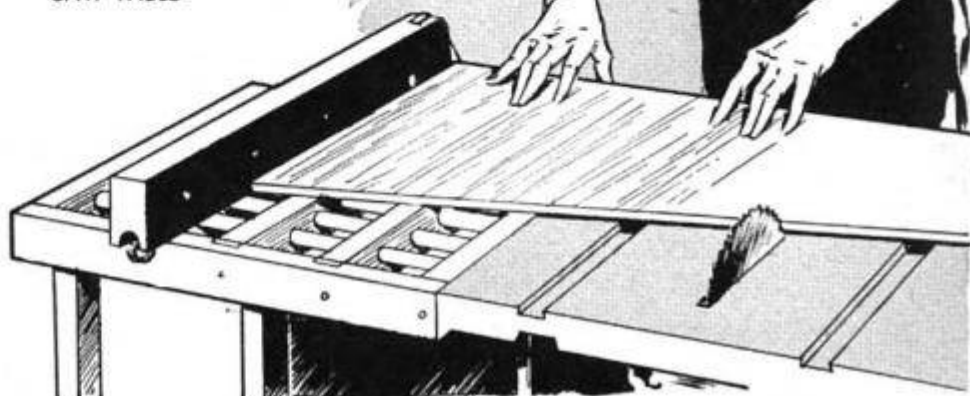
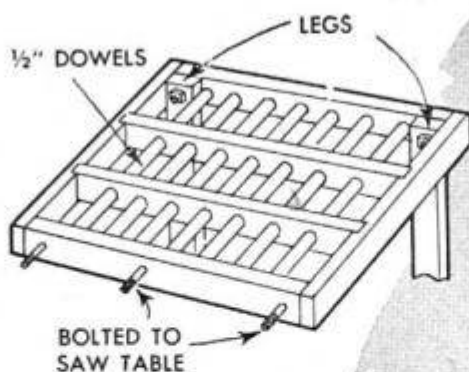
Having several short arcs of different radii to scribe on a sheet of plywood, I found that an adjustable curve for this type of work could be formed from a

standard hacksaw blade and a length of stiff wire. The wire was bent at one end to keep the blade from slipping off, and then passed through the holes in the ends of the blade. By sliding a cork, which was impaled on the wire, against the end of the blade, I was able to change the arc as necessary for the particular layout work.

G. E. Hendrickson, Argyle, Wis.

Saw-Table Extension Supports Large Work

By making an extension for your circular-saw table, you not only can increase the capacity of the saw but you also can simplify the handling of plywood and wide boards. Dimensions for the unit, which is constructed with dowels mounted in a frame made from 1 x 2 stock, are determined both by the size of the saw and the type of work to be undertaken. After cutting two endpieces, which together with the total thicknesses of two sidepieces are equal in length to the width of the saw table, drill holes for the dowels, spacing them about 2½ in. apart. When assembled, these pieces will form two sides of the frame. Now place one of the endpieces over the other supporting members



and use it as a jig when drilling dowel holes in them. After cutting the dowels to uniform length, insert them in one of the endpieces and slip the other members over them one at a time, tapping them into position with a mallet. This done, fit ends of the members into grooves cut in the two sidepieces and secure with glue and nails. Next, in order to bolt the extension to the saw table, drill three holes in one of the endpieces as shown, to align with holes usually

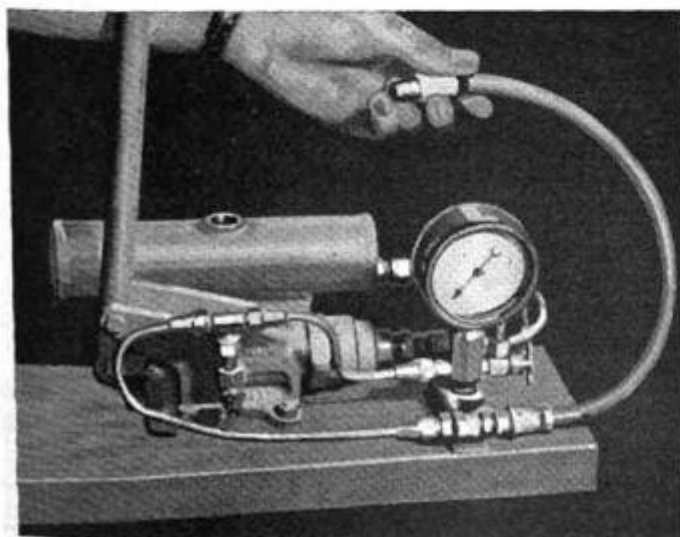
found along the edge of the table. If these do not exist, drill a hole in the center and one about 2 in. from each end of the table edge. Care should be taken when drilling to make sure that the top of the extension will be even with the top of the saw table when bolted together. Finally, cut legs from 1 x 2 stock and bolt them to the outer side of the extension to provide the necessary support for heavy work.

Don Murphy, Springfield, Mass.

Simple Unit for Testing Hydraulic Brakes

A surplus hydraulic hand pump, combined with a reservoir, pressure gauge, shut-off valve and a hose that can be coupled into the brake line, will provide an

inexpensive pressure-testing unit for hydraulic-brake systems. Assemble the parts as shown in the accompanying illustration and mount on a wooden base. After pressurizing the brake system, the shut-off valve may be closed to hold pressure in the system, thus providing a means for checking a system for even the slightest leaks.



Rubber Band on Ruler Prevents Slipping

Stretched over a ruler or scale lengthwise, a 1/8-in. rubber band not only will help prevent it from sliding off a drawing table, but also will help prevent it from slipping when being used. In addition to this, the thickness of the band will cause one edge of the ruler to be raised slightly, thus making it easier to pick up.

N. C. Darling, Orleans, Mass.

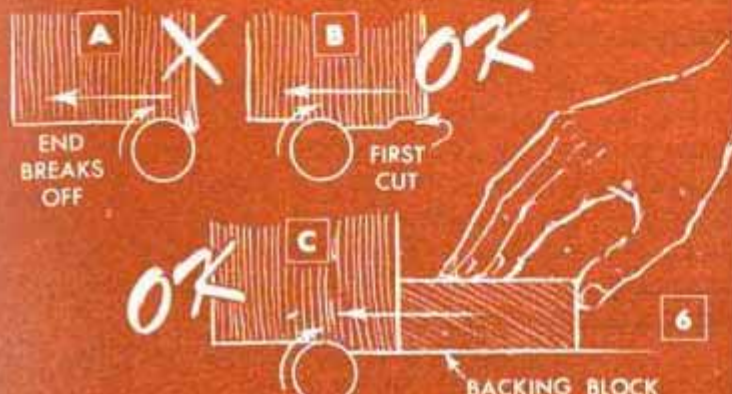
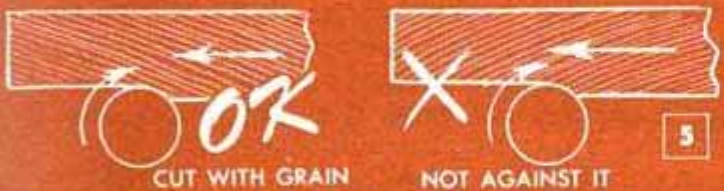
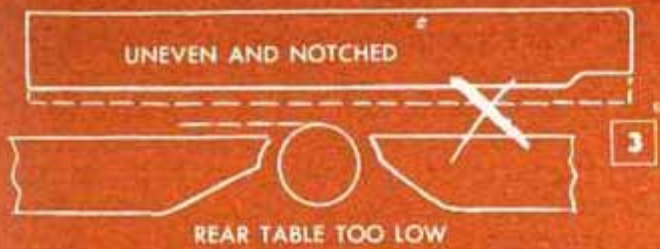
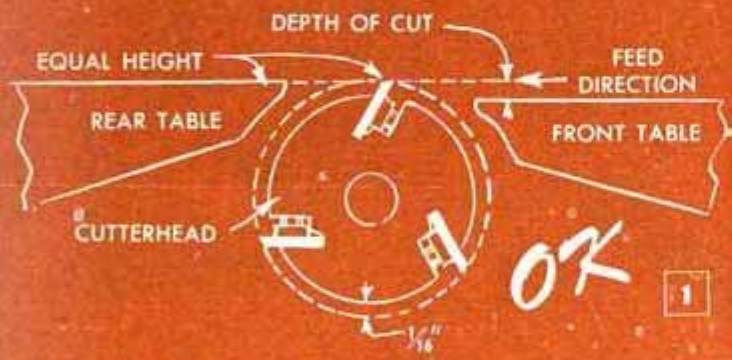


JOINTER KNOW-HOW

Shows how to cut moldings, tenons, tapers, round and polygon-shaped work, stopped chamfers and recesses

By E. R. Haan

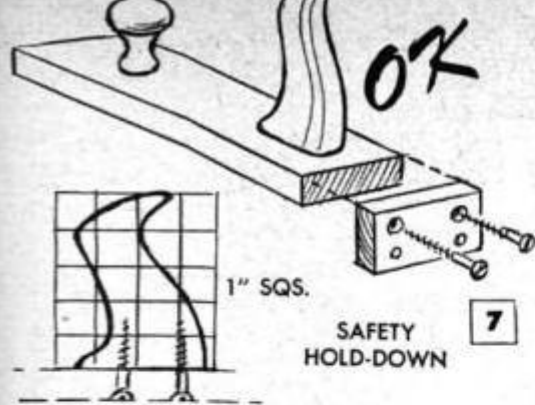
Photos by Frank P. Fritz



IF YOU HAVE LOOKED upon your jointer as a machine strictly for planing, take note that there's much more to be had from this versatile workshop power tool. In addition to mere edge and surface planing, your jointer can double as an efficient shaper; in fact, some of the jobs it performs cannot be accomplished on any other machine.

Table alignment: Before a jointer can produce accurate work its tables must be in perfect alignment. For most work, the rear table must be set at exactly the same height as the blades in the cutterhead, Fig. 1, but for all work it is most important that the tops of both tables be in perfect alignment, crosswise as well as lengthwise. Fig. 2 shows how to make a five-way check of table alignment. When the rear table is set too high or too low, notched and tapered surfaces result similar to those pictured in Figs. 3 and 4.

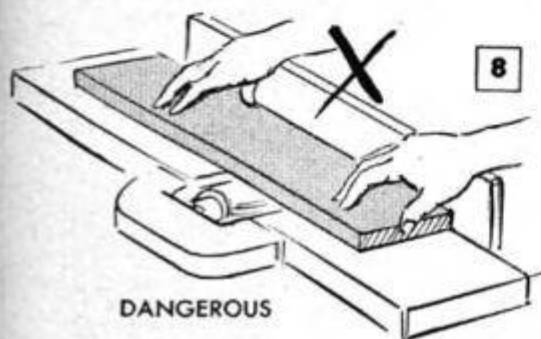
Cut with the grain: Whenever possible, cut with the grain of the wood, not against it, Fig. 5. Where the grain direction changes, especially in the case of birch, beech and cherry, take light cuts and feed slowly. Dull knives cutting against the grain produce a rough surface and require much more pressure on the work than when knives are sharp. Fig. 6 shows the correct way to cut end grain with a jointer. To prevent the wood from splitting at the end of a cut as in detail A, Fig. 6, make it a practice to start the cut at one edge and then reverse the work and cut toward the starting cut as in detail B. Another method



SAFETY
HOLD-DOWN

7

When planing thin stock on a jointer, make it a habit to always use a work hold-down as pictured in Fig. 7. Holding the work by hand as in Fig. 8 is a dangerous practice which invites serious injury to operator

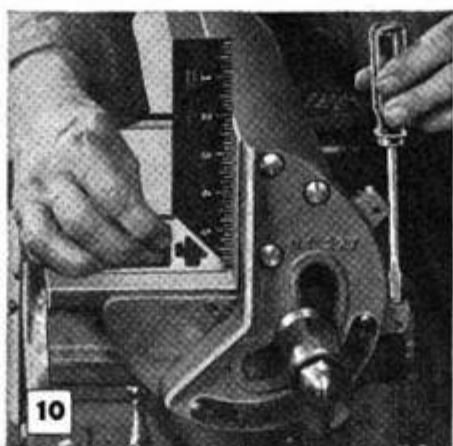


8

DANGEROUS



9



10

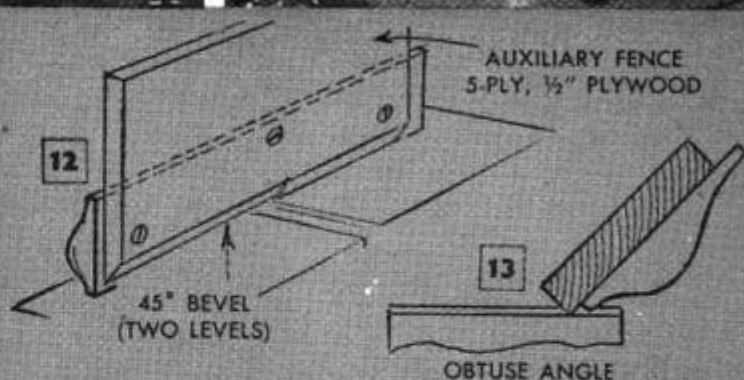


11

often used to prevent splitting is to back up the edge of the work with a scrap block, as pictured in detail C.

Edge planing: For accurate work in edge planing, the pointer on the fence scale should be set at zero when the fence is at an exact right angle with the front table, Fig. 10. When feeding stock as in Fig. 11, apply just enough side pressure to hold it firmly against the fence, and enough downward pressure to prevent chattering, especially on hardwood. Chattering often indicates dull knives. Always make it a practice to keep the cutter guard in place except for certain operations that require its removal.

If the regular fence does not provide sufficient support for wide stock, or stock held edgewise when planing end grain, screw on an auxiliary fence of plywood, Fig. 12. Bevel the bottom edge of the auxiliary fence at a 45-deg. angle, making it conform to the lower edge of jointer fence to provide clearance when cutting acute angles.



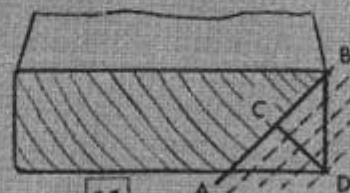
12

45° BEVEL
(TWO LEVELS)

AUXILIARY FENCE
5-PLY, 1/2" PLYWOOD

13

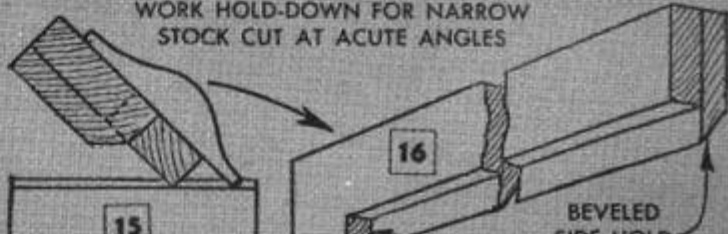
OBTUSE ANGLE



14

LINE AB: INTENDED CUT,
LINE CD, PERPENDICULAR
TO AB, IS DIVIDED INTO
EQUAL NUMBER OF CUTS

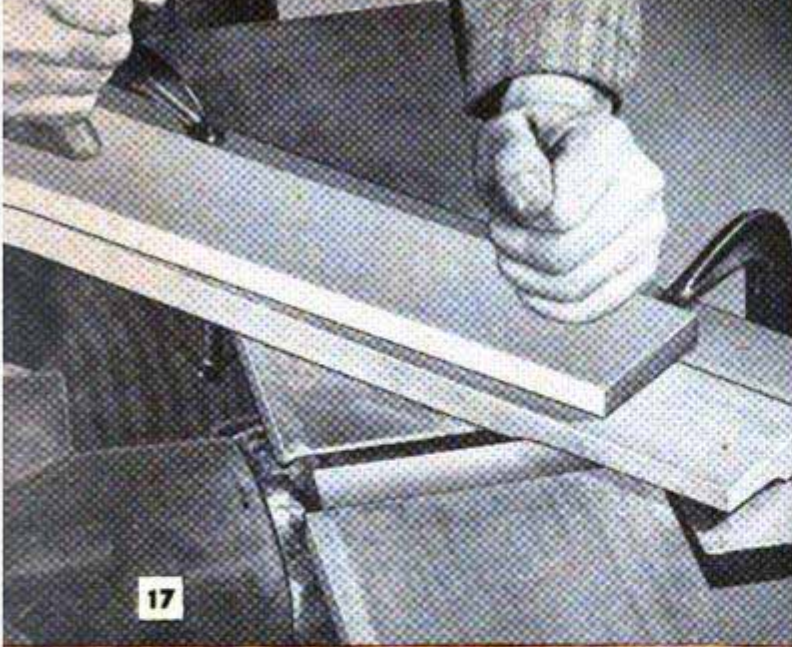
WORK HOLD-DOWN FOR NARROW
STOCK CUT AT ACUTE ANGLES



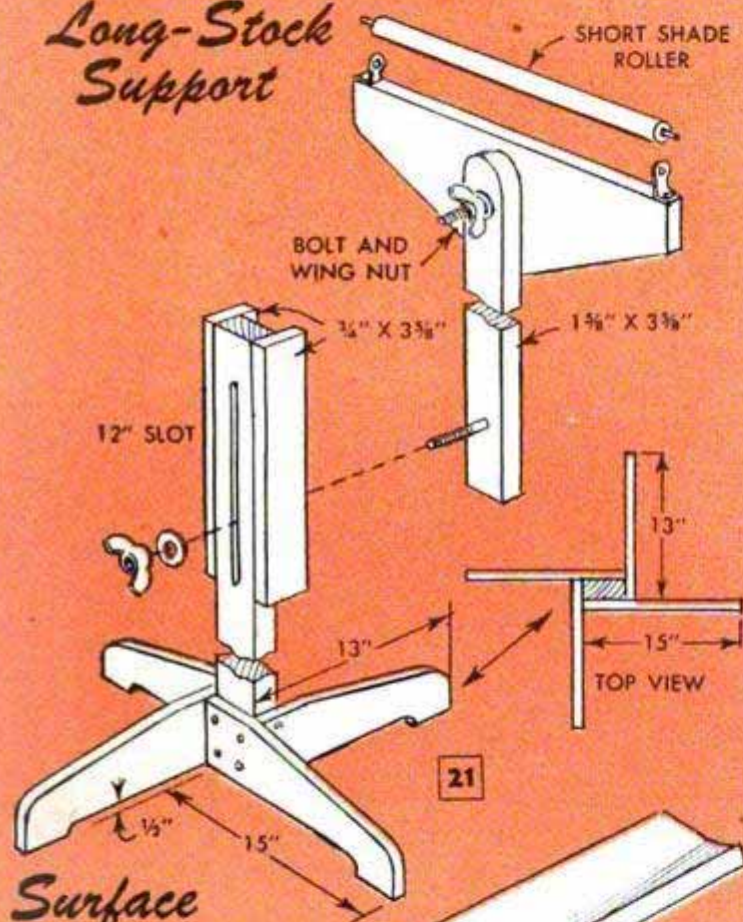
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16

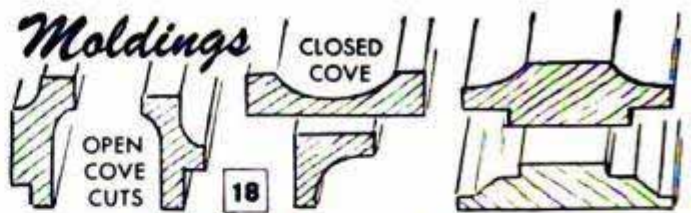
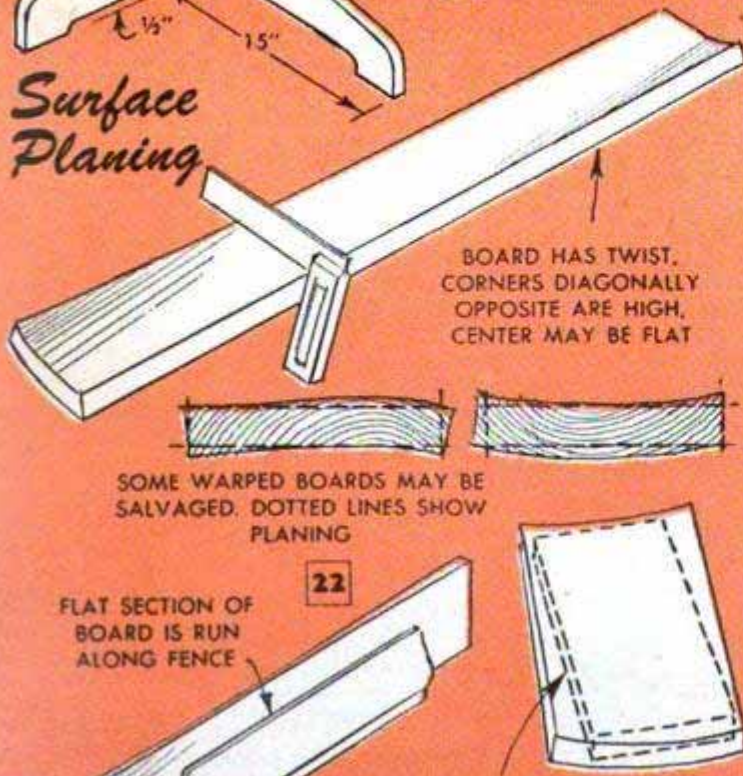
BEVELED
CUT ANGLE



Long-Stock Support



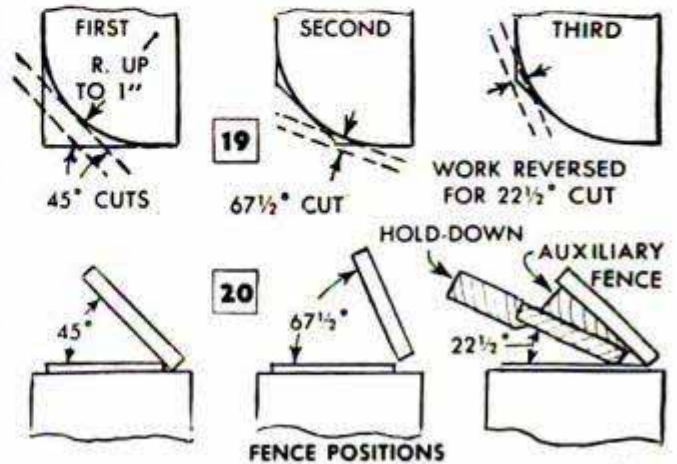
Surface Planing



6 EXAMPLES OF MOLDING MADE ON JOINTER

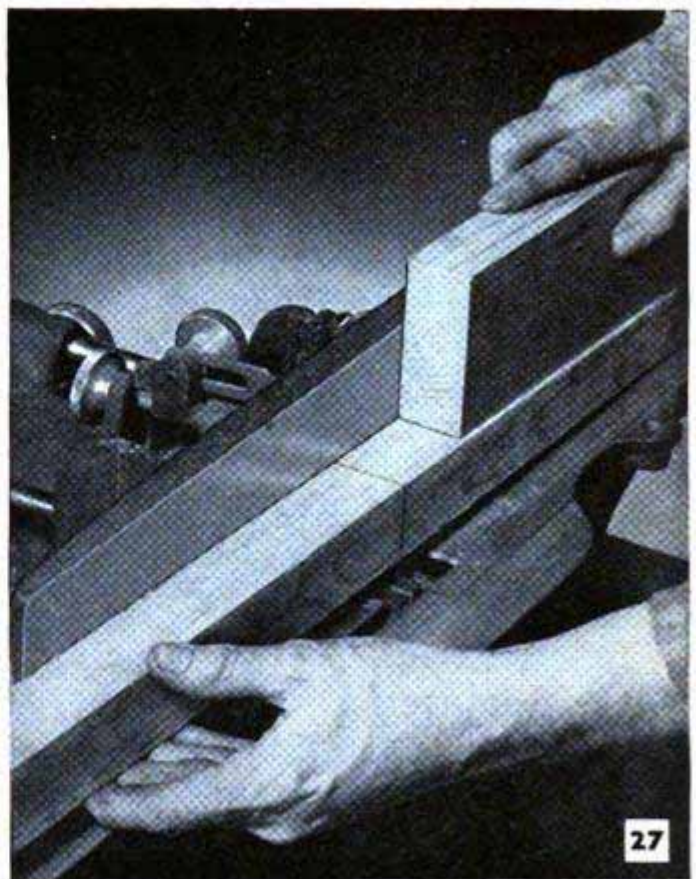
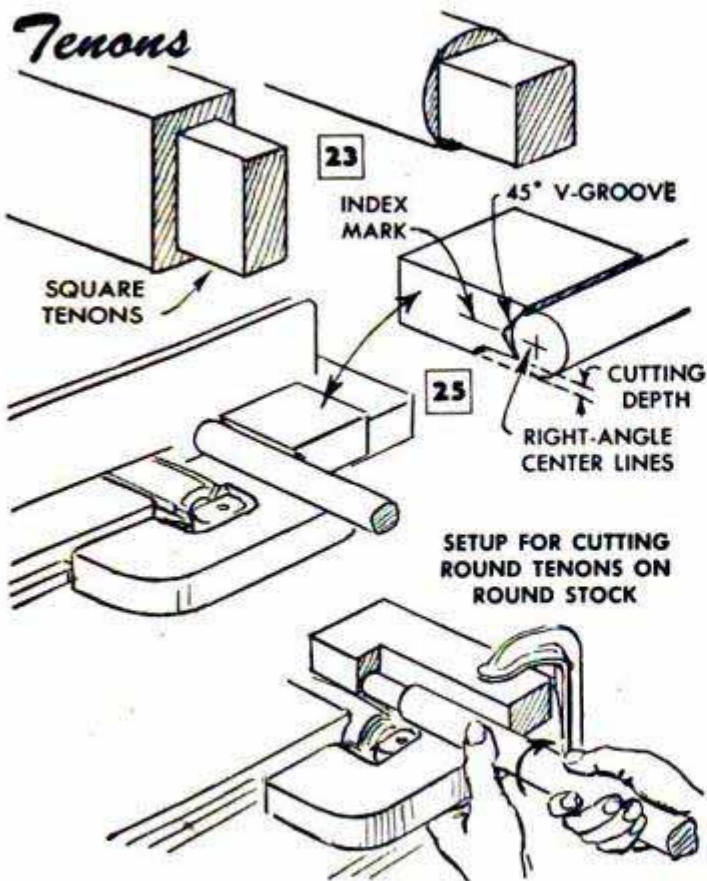


PICTURE-FRAME MOLDING MADE BY 5 CUTS



Most jointer fences tilt both ways. When the fence is set at an obtuse angle, Fig. 13, downward pressure on the work is apt to move it away from the bottom of the fence, causing inaccurate work. Therefore, many operators prefer tilting the fence in the opposite direction, Fig. 15. However, this position brings the hands closer to the blades, requiring extreme care, and narrow work should not be planed in this manner without using a work hold-down, Fig. 16, which grips the work at both the side and the end. Whenever angle cuts are made, you can get accurate results by first marking the intended cut on the end of the stock, then marking a perpendicular from this to the corner and dividing this line from corner to curve into equal divisions, Fig. 14. Set the cutter depth to equal one division. Before making the last cut check the remaining stock with the cutter depth.

Moldings: Six examples of moldings having straight and cove cuts are shown in Fig. 18. Fig. 19 shows a picture-frame molding formed with five cuts. To make cove cuts, remove the cutter guard and fence as in Fig. 17. Then clamp a straight wooden guide across the front table so that the work may be fed diagonally into the cutter. The work also can be fed parallel to the cutters, in which case each bite can equal only the distance from the blade edges to the cutterhead. When cutting open coves diagonally, the work crosses only part of the cutter. If the straight part of a cove cut is wide enough, it may ride on the rear table which is kept at cutter height. When

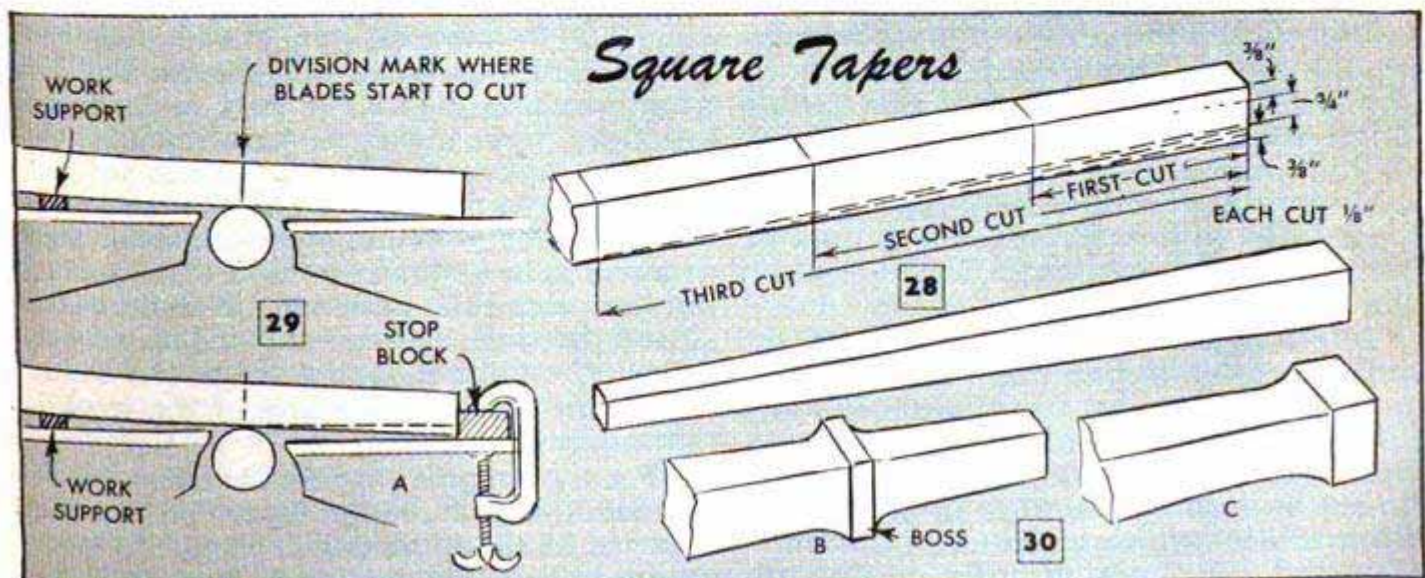


a cove cut is enclosed, Fig. 18, the stock passes over the entire cutter, in which case the rear table must be lowered to the same level as the front table. An enclosed cove will be part of a circle if the work is fed parallel to the cutter blades, but the center of the cut will be flat when the stock is fed at an angle. The width of the flat portion of the cove increases as you approach a right-angle feed. For diagonal cuts particularly, a slow, steady feed is necessary to produce a relatively smooth surface which requires only sanding. The ends and edges of all the cutter blades must be lined up perfectly for best results. Always feed against the cutter, never with it.

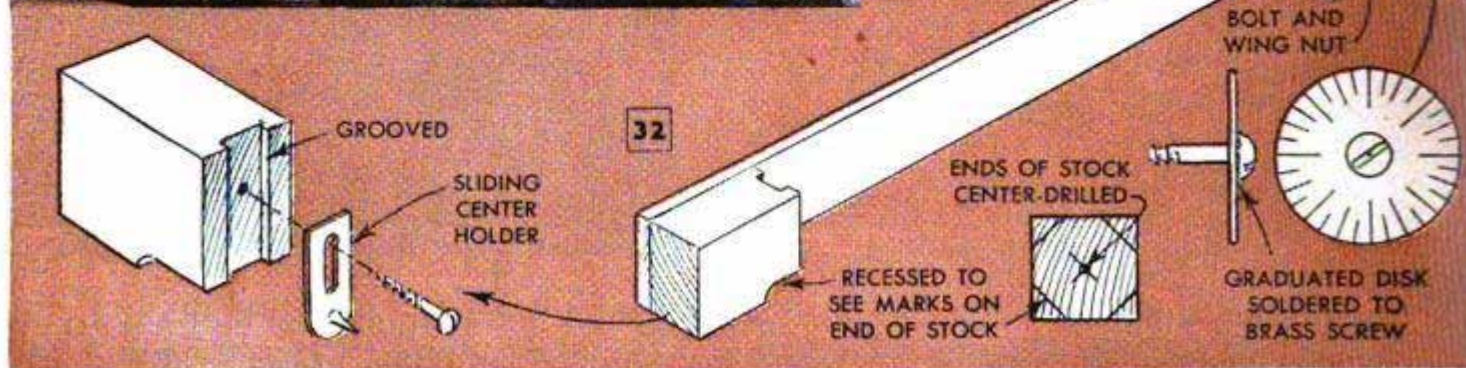
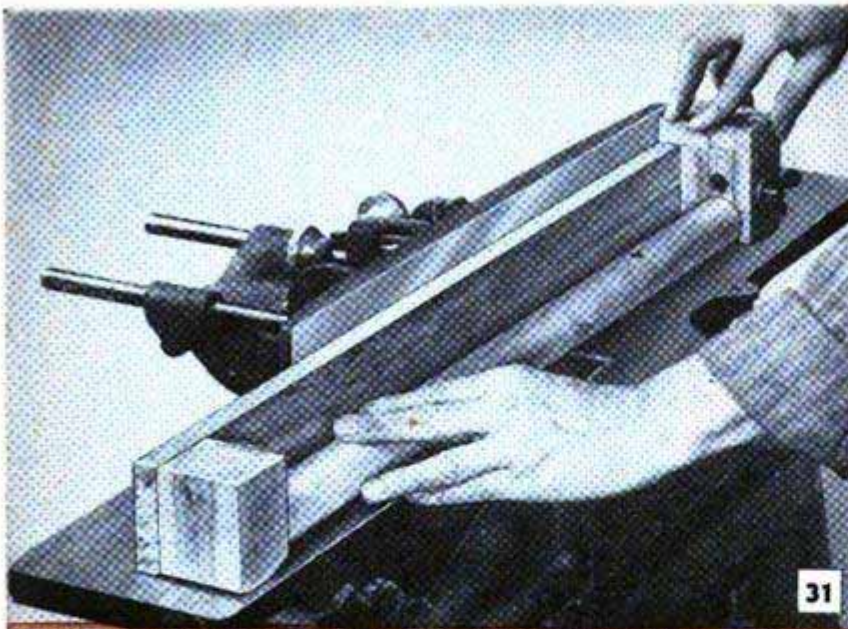
Figs. 19 and 20 show the three steps in rounding an edge at a radius up to 1 in. First scribe an arc on the end of the stock.

Then take 45-deg. cuts, followed by a $67\frac{1}{2}$ -deg. cut. For the last cut, screw an auxiliary fence to the regular fence, the auxiliary fence being beveled to $22\frac{1}{2}$ deg. on your circular saw. Then set the fence for an acute angle of 45 deg., reverse the work and feed it, using the safety hold-down, Fig. 16. Remove perceptible edges with a block plane and fine sandpaper.

Surface planing: For surfacing long stock and also for edge planing, a pair of roller supports as shown in Fig. 21 is very convenient. They lessen effort and increase accuracy in planing long stock that is so difficult to hold down properly at the beginning and end of a cut. Surface-planing straight stock is relatively easy. Several light cuts always give the best results. If thin stock is wider than the hold-down,



Round Work and Polygons



back it with a thicker piece of the same width. Warped and twisted stock are best surfaced on a regular planer as it is difficult to dress squarely on your jointer. Generally it's best to true one edge first if the sides are not extremely uneven. But sometimes dressing down high spots on sides precedes edge planing. Locate the high spots by sighting with a try square and dress them down with light cuts before planing the entire width. Keep the trued edge firmly against the fence in order to prevent rocking, particularly if the underside of board is rounded. Sometimes badly warped or twisted pieces can be brought down to thinner and narrower pieces that are usable, as shown in Fig. 22.

Rabbets and tenons: For cutting rabbets, set the fence the required distance from the ends of the blades near the rabbet ledge, removing the cutter guard. Deep, narrow rabbets may be cut in one pass, wide ones in several passes, lowering the front table with each pass. Stock may be held vertically against the fence or flat on the table.

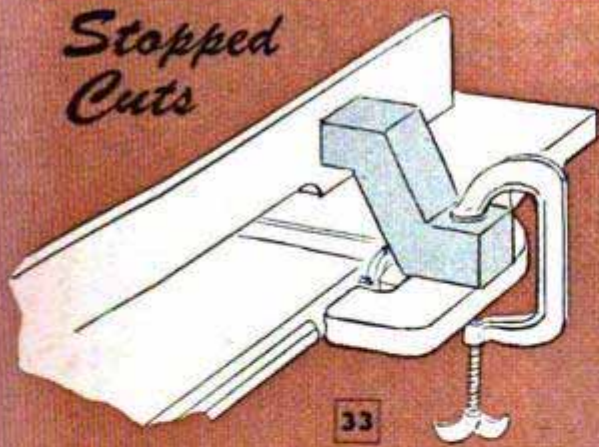
To cut square tenons as in Fig. 23, set the fence to correct cutting width and then rest the stock against the squared end of a wide piece which is slid along the fence. Square tenons on round stock, Fig. 24, may be cut by holding the stock in a V-groove cut in a block which is slid along the fence. Centered crosslines at right angles are

marked on the end of the stock and should line up with the index mark on the block as in Fig. 25. To cut round tenons on round stock, follow the method shown in Fig. 26.

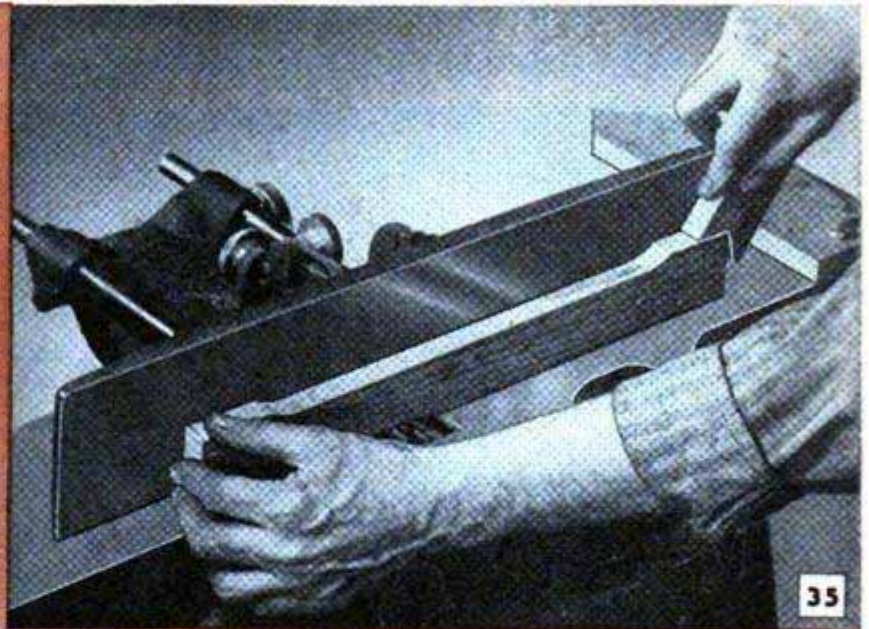
Square tapers: In planing a square taper, as in Fig. 27, first mark the start and the end of the taper and also its depth. Then divide the length into equal parts, each being less than the length of the front table of the jointer. Mark the divisions on all sides of the stock as shown in Fig. 28. The piece illustrated is $1\frac{1}{2}$ in. square and is to be tapered to $\frac{3}{4}$ in. Therefore, a $\frac{3}{8}$ -in. thickness must be removed from the end of each side. As the piece is marked off in three divisions, three equal cuts of $\frac{1}{8}$ in. each are made. If only the first and second sections were to be tapered, you would take two $\frac{3}{16}$ -in. cuts. The first cut starts at the division mark between the first and second sections, with the work just touching the cutter blades as in Fig. 29. A thin support block between the work and the rear table is slid along with the work until the first section gets on the rear table. The second cut is started the same way at the division mark between the second and third sections; the third cut is started at the end of the third section. Each side of the stock is similarly planed.

For short, square tapers use a stop block, detail A, Fig. 30, to get tapers on all sides started at the same point. Stopped tapers, forming a raised portion or boss as in de-

Stopped Cuts

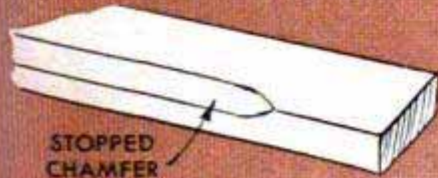


33

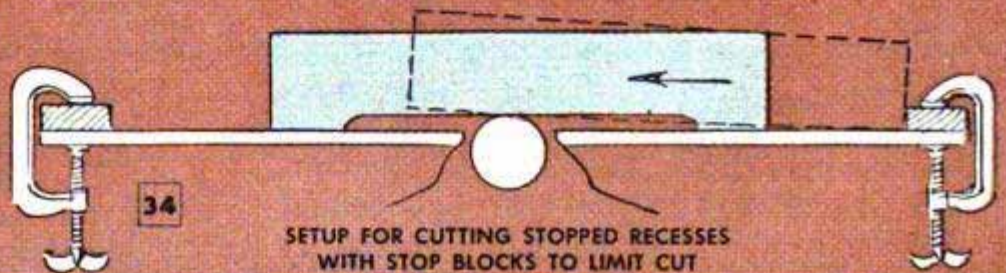


35

ROUND STOCK BEING TAPERED TO CLUBFOOT BY USING STOP BLOCK



STOPPED CHAMFER



34

SETUP FOR CUTTING STOPPED RECESSES WITH STOP BLOCKS TO LIMIT CUT

tail B, can be made by first tapering the short end on all sides, using a stop block. For successive cuts which form the curved underside of the boss, both tables are lowered the same distance, maintaining their difference in height. When laying out the boss before cutting, remember to make allowance for successive cuts that will reduce the width. Then the rear table is returned to cutter height and the long tapers are made as in Figs. 28 and 29, setting the front table lower to allow for the boss. In this case, a stop block is used at the rear table to limit the travel of the work, so that cutting will stop at the boss. Here, also, successive cuts will narrow the space left for the boss. You can also form club feet on square, tapered legs as in detail C.

Round and polygon shapes: For planing pieces round or to any polygon shape, use a fixture like the one shown in Figs. 31 and 32. Each end block has a sliding center holder to accommodate different sizes of work and to make adjustments for tapering. Center holes are drilled or punched in the ends of the stock. The side member slides against the fence. The adjustable block does not ride on the front table but the stock projecting beyond it slides on the tables. The center point of the adjustable head is a long screw, the point of which projects through a hole in the sliding center holder so that the screw can turn. A vertical slot permits the screw to be ad-

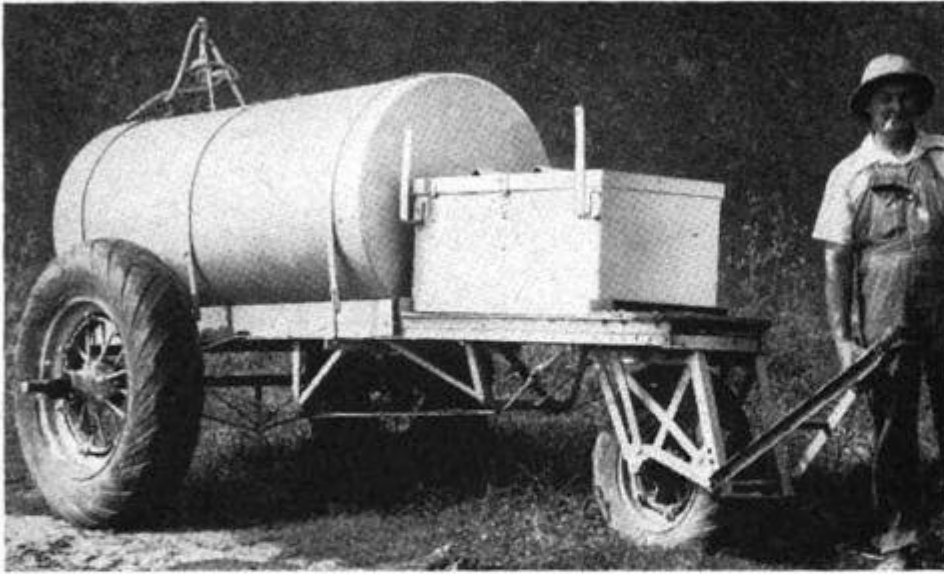
justed to various heights. When the screw is driven into the work and tightened, the work is drawn snugly against the block so it will not turn freely, yet can be turned by hand. The cross-sectional shape to be cut is marked on the end of the work. This end goes onto the fixed block, which is undercut to make the marks visible. As an alternative to marking the end of the stock, an indexing disk may be used.

One of the unusual operations on a jointer is the planing of a tapered, round furniture leg having a club foot. First plane the piece round, using the fixture in Fig. 32. Then arrange it for taper planing, but instead of cutting entirely to the end, use a stop block, Fig. 33, to limit the cut and form the club foot.

Stopped chamfers and recesses: You can use your jointer to plane stopped chamfers and recesses. See Figs. 34 and 35. Lower both tables equally to cutting depth. For chamfers, set the fence at a 45-deg. angle. Pencil marks on the fence will serve as guides for starting and ending the cuts, or stop blocks can be used. The latter method is preferable for cutting stopped recesses since the blocks also prevent the work from kicking back when lowered on the cutterhead as indicated by the dotted lines in Fig. 34. To prevent a rough surface at one end of a stopped chamfer or recess where the cutting stops, make two cuts, one from each end to the center

★ ★ ★

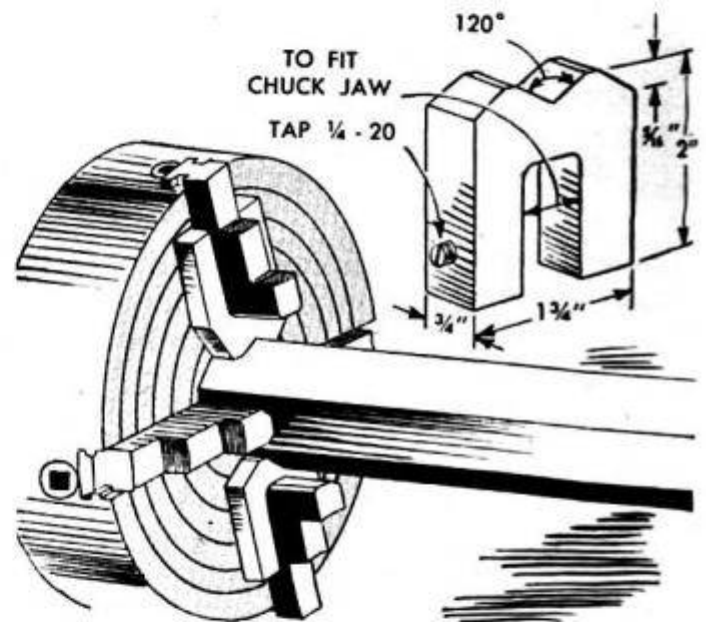
Farm Trailer Mounted on Three Wheels To Provide Maximum Maneuverability



The outstanding feature of this three-wheeled oil and gasoline trailer, designed and built by one farmer for use in the field, is its single front wheel which makes possible extremely sharp turns. The "fifth wheel" on which the front wheel pivots was made in the farm shop, as were all fabricated parts, with the exception of the tank and various old parts that were used. Tread of the rear wheels is adjustable to straddle various row crops. The box in front is used for carrying tools.

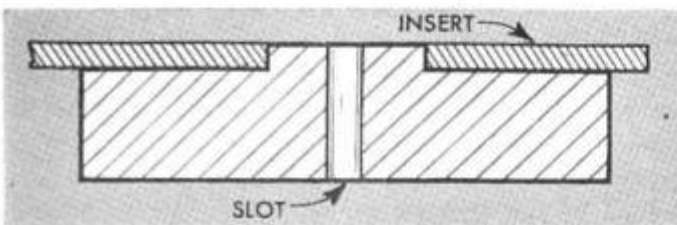
Auxiliary Jaws Hold Hexagon Stock in Four-Jaw Lathe Chuck

The difficulty of accurately chucking hexagon work in a four-jaw chuck can be overcome by using two auxiliary jaws which fit over opposite jaws of the chuck. A deep slot is cut in one end of each auxiliary jaw to fit over the chuck jaw with a firm push fit, while the opposite end is grooved to fit one corner of the work. With these jaws mounted on the chuck jaws, the work can be centered accurately and held securely without damage to the surface or corners of the work. If the chuck-jaw slot is machined to a firm push fit, the clamps will remain on the jaws when chucking the work, but a setscrew can be inserted in one side if desired to hold the jaw in place. Ends of the auxiliary jaws, if made from cold-rolled steel, should be hardened if they are to be used extensively.



Wooden Strip Reduces Size Of Circular-Saw Insert Slot

Rather than attempt to devise a makeshift insert when the slot in your circular-saw table is too wide for cutting thin stock, fill the opening with a slotted, wood strip. Rabbet the strip to fit flush with the top surface of the insert and mount it in place with model-airplane cement. Then lower the saw blade, screw the insert in place and slowly raise the blade to cut a slot in the strip.



Nonspillable Water-Pail Holder

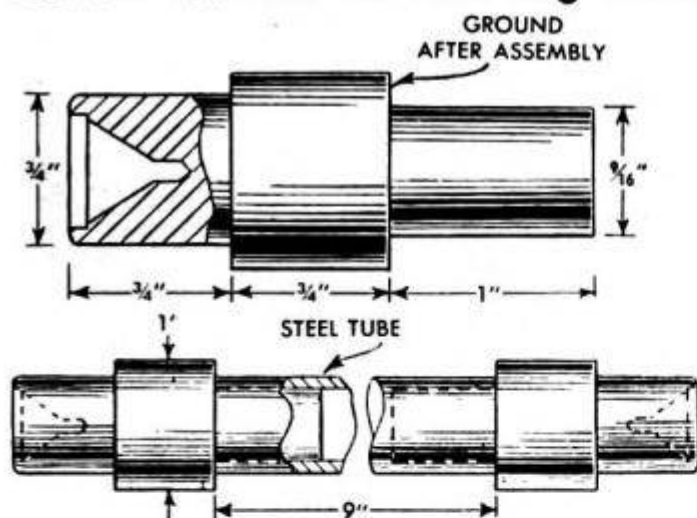
Instead of discarding an old pail that leaks, nail it in a corner of a calf's stall or wherever livestock are watered. This will provide a holder for another pail containing water and will prevent it from being upset.
Joe Mileska, Mattituck, N. Y.

When unloading small grain into an elevator hopper or dumping sand for cement work from a trailer bed, a hand-operated hoist has several distinct advantages. When unloading grain, the rate of flow from the endgate port can be controlled closely. When unloading other materials the entire load or only a small part of it can be dumped. The hoist frame is made from steel angles and is mounted on the forward end of the stationary bedframe. Steel cable from the winch drum passes through a single sheave mounted at the top of the hoist frame, while the free end is attached to the pivoted bedframe. The winch, which is equipped with a ratchet, is mounted on a flat-steel bracket and is fitted with a crank having a 12-in. throw. — A. M. Wettach, Mt. Pleasant, Iowa.

Hand-Operated Hoist Mounted on Trailer Bed Permits Controlled Dumping of Loads



Hollow Test Bar for Checking Lathe-Center Alignment



Careful toolroom machinists always check alignment of the lathe centers before setting up precision work, and many of them use a hollow test bar like the one detailed. Tool-steel plugs are shouldered at each end and one projection on each plug is turned to a press fit in the end of a short length of Shelby tubing. Both ends of the tube are faced before the plugs are inserted, and the outer ends of both plugs are center-drilled before insertion. The collars on the plugs are rough-turned .002 to .003 in. oversize, then hardened and the temper drawn. After pressing the plugs into the ends of the tube, the assembled bar is mounted between centers and the

collars are ground to 1 in. in dia., the dimension being held within plus or minus .0005 in. In use, the bar is mounted between centers and a dial indicator of the tool-post type is run up to one of the collars and adjusted to read zero. Then the indicator is moved to the second collar and the reading checked. If the indicator still reads zero the lathe centers are precisely in line. The careful machinist always wipes the work to remove dust and oil and also cleans the contact points before taking readings.

Easy Way to Drive Ground Rods

Instead of trying to drive a long ground rod for use in electric wiring, telephones etc., simply push the rod into the ground with the aid of a little water. First, start the rod into the ground, then remove it and fill the hole with water. Again push down the rod as far as it will go and raise it. This will allow more water to run into the hole so that the ground can be softened and the rod again pushed farther into it. Doing this repeatedly will enable you to drive an 8-ft., 1/2-in. rod into the ground very quickly. If you have a garden hose available to supply the water, the job can be done much more quickly than when using a bucket or other container to carry the water.

I. R. Hicks, Centralia, Mo.

TIP YOUR TOOLS WITH

SEND TO SALES PROMOTION (VR)

TOOL SERVICE REPORT



Customer Tool Specialist (Name of Customer) W. H. Miller Date 10-18-48
 Machine Air Cylinder Arm (Make)
 Condition: Excellent Good Fair
 Part Name Spur Gear
 Operation Name Burnishing Bronze Bushing (What Does Customer Call This Operation?)
 Material Bronze Specification _____ (SAE No. or Composition)
 Forged Cast HR CR Other _____ Heat Treated
 Hardness _____ Material Remarks _____
 Bn or Rc

COMPARATIVE DATA

DEPTH OF CUT _____
 CHIP PER TOOTH _____
 CUTTING SPEED (SFM) _____
 FEED (INCHES-MIN. OR INCHES-REV.) _____
 PIECES PER GRIND _____

V-R METHOD	PREVIOUS METHOD
187,000 pcs. Before regrinding was necessary	1,500 pcs (chrome plated H.S.S.) Before it had to be chrome plated again.

Interrupted
 Continuous

V-R METHOD	PREVIOUS METHOD
187,000 pcs. Before regrinding was necessary	1,500 pcs (chrome plated H.S.S.) Before it had to be chrome plated again.

this tool for 1000...
 over \$1,500 on this tool.

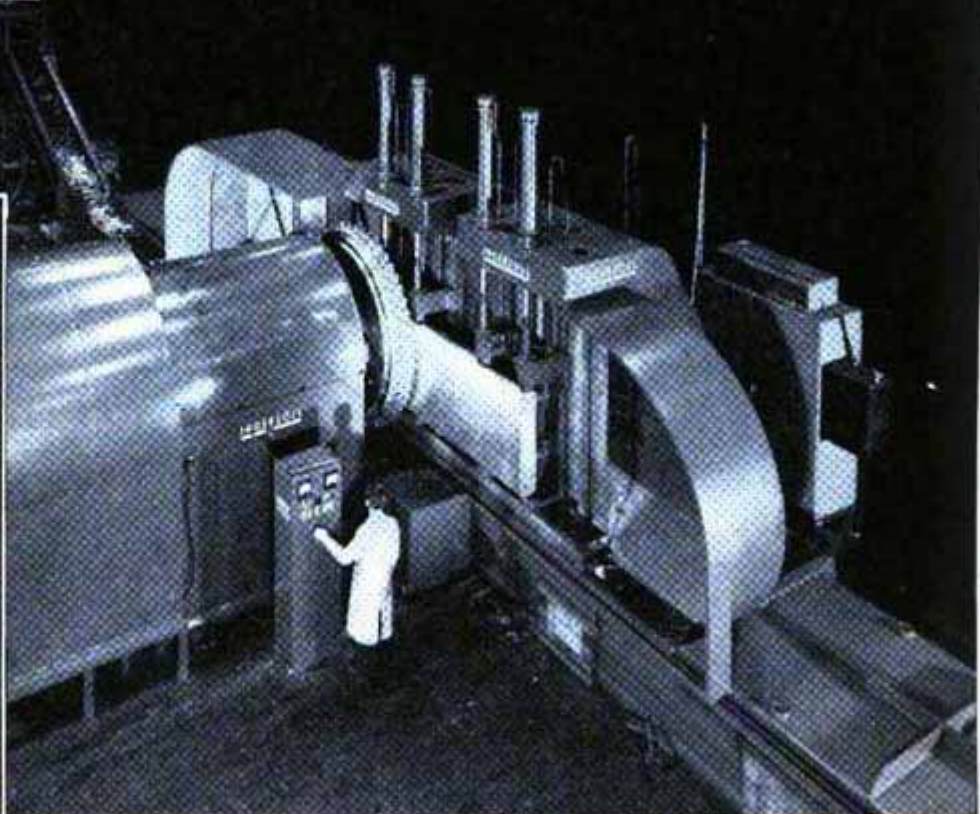
F. J. Roy
 (Name of Operator)

SEE REVERSE SIDE FOR SKETCH AND REMARKS

Form V-R 452

Comparative report between high-speed steel and carbide offers graphic illustration of advantages in mass production. Photograph shows work that was burnished

CARBIDE



Photos courtesy Ingersoll Milling Machine Co.

Part III

THE OUTSTANDING qualities of carbide, the wonder cutting metal of industry, and methods for fitting various metal and wood-cutting tools with cast-alloy and cemented-carbide tips, were discussed in Parts I and II of this series. In this, the last part of the carbide story, you will see a few of the results of an extensive survey conducted by one of the carbide manufacturers—factual production reports that tell the reason why carbide is one of the prime factors in America's fabulous industrial output. The report on the opposite page is typical of many.

No small achievement of carbide is its ability to cut threads of minimum interference and a quality comparable to those formed by grinding. The result of this finding was the development of a special automatic engine lathe capable of high production, which performs the functions normally accomplished by the lathe operator. This lathe feeds the tool into the work by a predetermined amount on successive cuts until the desired thread depth is produced. Then the lathe is automatically stopped for unloading and chucking of the following piece and the cycle resumes.

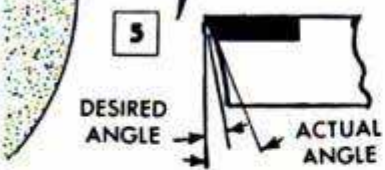
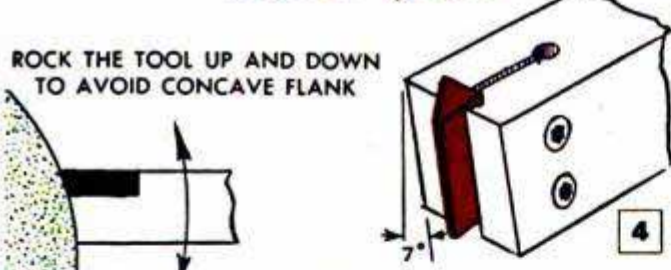
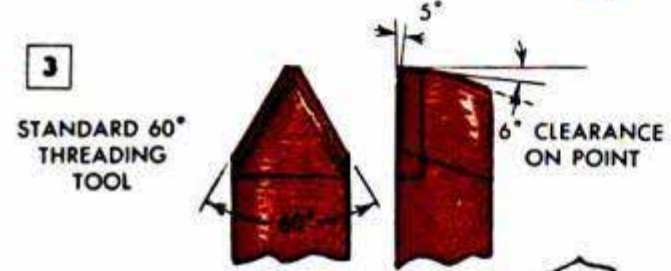
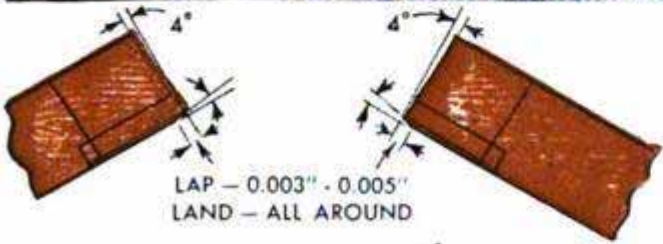
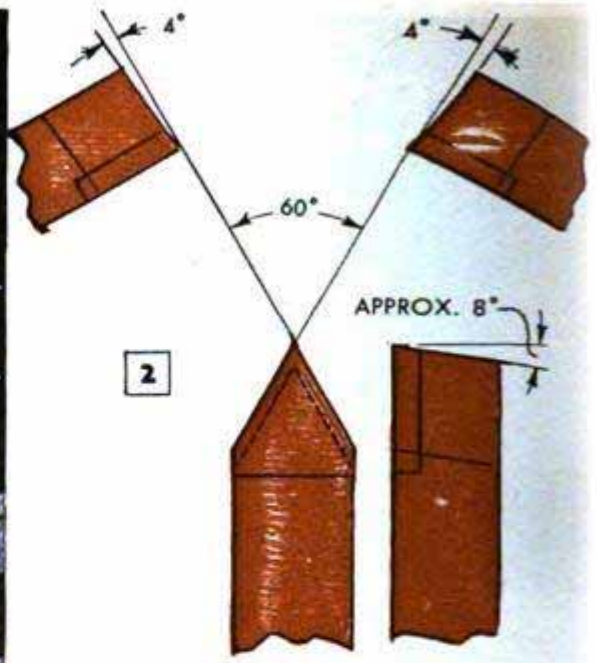
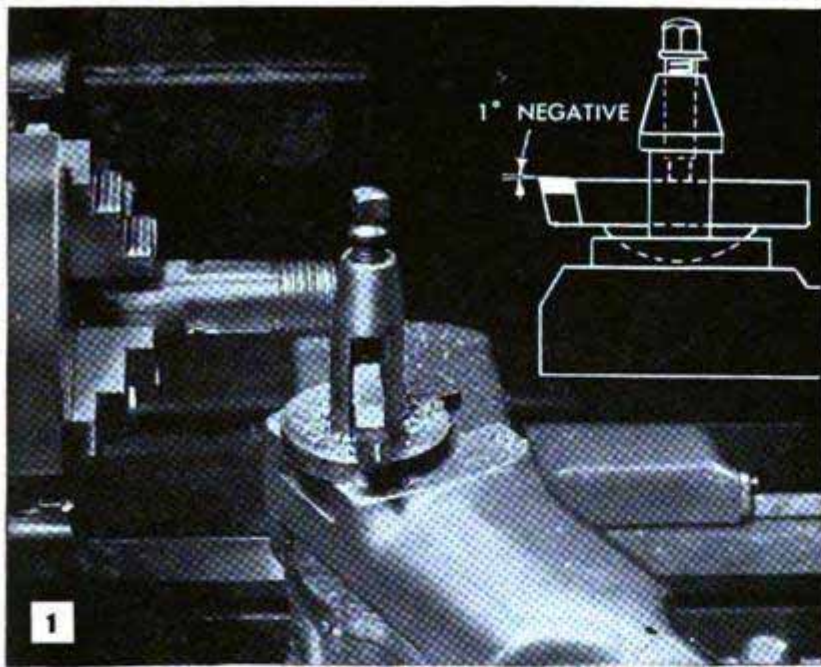
Standard carbide-tipped tools designed for threading are available in a variety of sizes and in grades of material suited to cutting plastics, brass, bronze, cast iron, aluminum, steel and other metals. How-

Photos above picture giant aluminum scalping machine and its 91-in., 9-ton face mill. Carbide blades of huge cutter take a $\frac{3}{8}$ -in. bite from the surface of 7 x 12½-ft. ingots at rate of 360 i.p.m. Machine removes impurities before ingots are sent to rolling mills

ever, the successful operation of carbide threading tools is dependent to a considerable extent upon the preparation of the tool before mounting it in the lathe. Remember that carbide, although it is extremely hard and has a tremendous compressive strength, is comparatively brittle when placed in shear.

Fig. 2 shows a 60-deg. threading tool which is ground on the face of a grinding wheel so the clearance faces are flat. Note how two 4-deg. angles ground on a 60-deg. angle provide an 8-deg. clearance at the tip of the tool. Grinding the side clearances on the periphery instead of the face of the wheel will increase this angle beyond the recommended 8 deg. due to the concavity formed by the wheel. See Fig. 5. However, this can be corrected to some extent by rocking the tool up and down while grinding. Note in Fig. 3 how an extra 6-deg. clearance angle is ground on the end of the tool and a flat on the tip. Then a land is ground all around the edge of the tool and clearance and rake angles lapped.

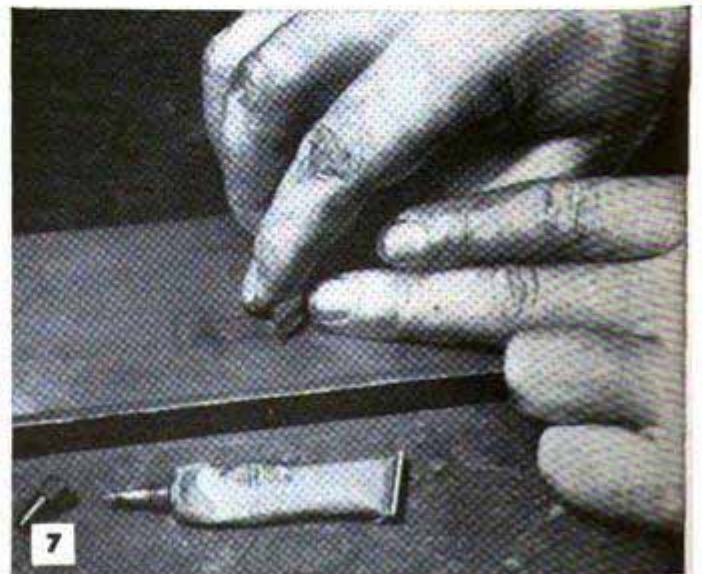
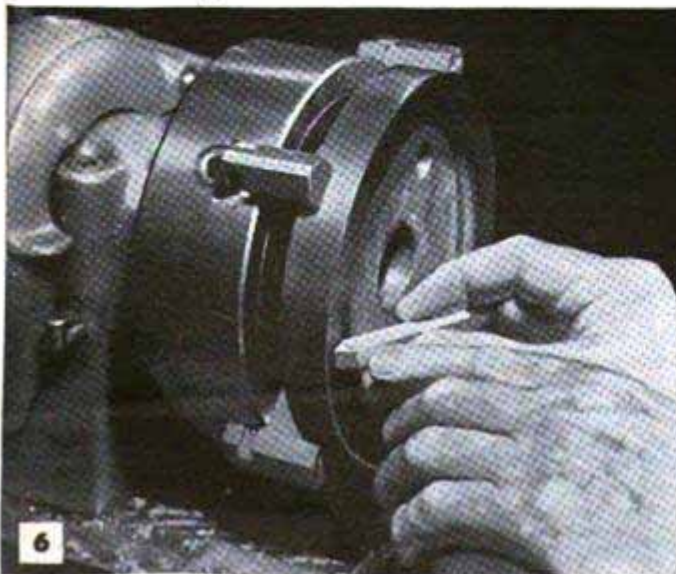
The ordinary bench grinder is satisfactory for producing these cutting edges, using silicon-carbide grinding wheels in order to prevent checking of the carbide tip. These wheels are usually of a green color



and are identified by the designation SiC on the plate. As some manufacturers produce black or gray silicon-carbide wheels there is a possibility of confusing them with aluminum oxide. When in doubt, use the green color for identification. Silicon-carbide wheels may also be used for grinding the steel shank of the tool, but they must be cleaned to prevent glazing.

Use a coarse-grit (60) open-bond wheel for the first rough-grinding operation. This wheel will wear rapidly, continually exposing clean, sharp, cutting edges. For the second grinding to reduce the depth of the scores caused by the coarse wheel, use a 120-grit close-bonded wheel, but do not attempt to remove large amounts of stock with this wheel as serious damage to the carbide may result. Do not force the tool into the grinding wheel. A slight pressure combined with rocking of the tool, as in Fig. 5, produces more efficient grinding. Keep the wheel clean, dressing it fre-

Carbide-tipped threading tool is finish-lapped on revolving disk or flat plate, using diamond powder as abrasive. Disk is cast iron, steel or hardwood



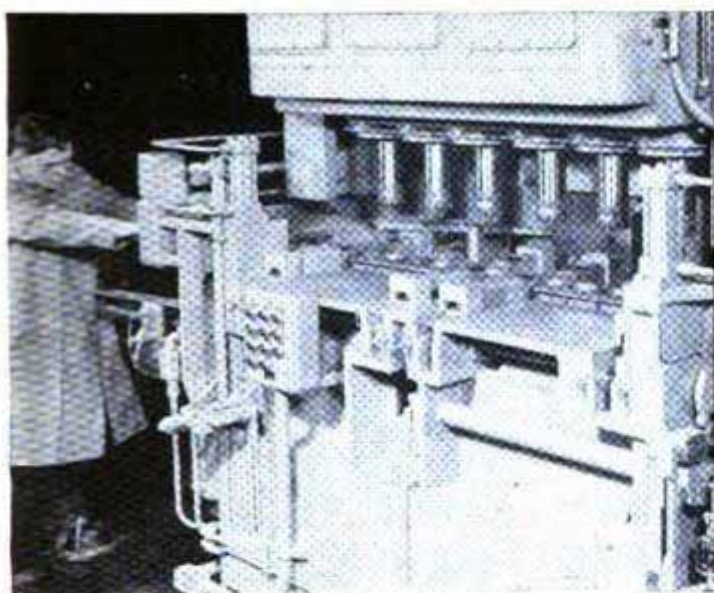


Photo courtesy Ingersoll Milling Machine Co.

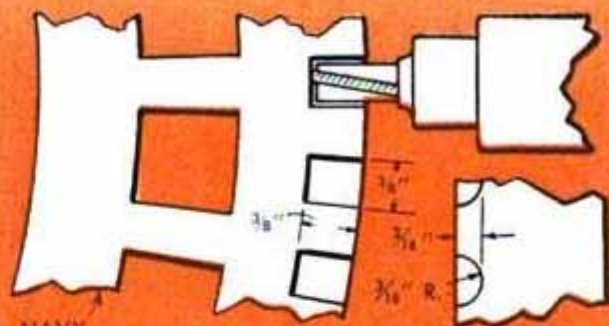
Another application of carbide cutters in heavy industry is demonstrated by multiple cylinder-block boring machine. The cutters are of the close-blade type

quently. Fig. 4 shows a simple holder for carbide triangular inserts, the 7-deg. negative angle providing sufficient clearance for even 12-pitch threads.

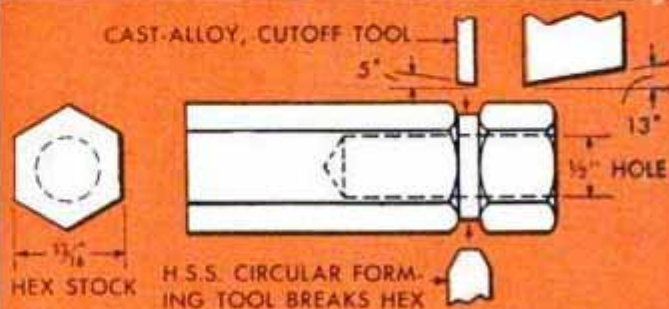
The ground bit can be lapped on a cast-iron, mild-steel or hardwood disk impregnated with diamond powder. Use a No. 4 or No. 5 powder blended with a carrier, or blend a plain diamond powder with olive oil to serve as a carrier. Fine-grain boron-carbide particles (220 grit or finer) may be used as a less-expensive substitute for diamond powder. Chuck the disk in the lathe and hold the tool against the revolving surface as in Fig. 6. If you prefer, the bit can be lapped by hand, Fig. 7.

Actual cutting of the threads differs slightly from the practice used with carbon or high-speed-steel tools, the position in which the bit is set in the tool post being of utmost importance. It must be set on the centerline, or slightly above, so that a slight negative back rake results, as in Fig. 1. Never position the tool at an angle that produces a positive back rake. Light feeds are recommended—.0025 to .003 in. per pass—and because of this, power requirements are not excessive. The standard small metal lathe with a 1/3 or 1/2-hp. motor can be operated at relatively high surface speeds when machining common steel. Cast iron, plastics and aluminum permit even higher speeds. For best results, don't use a lubricant when threading and remove the bit from the work before stopping the spindle. ★ ★ ★

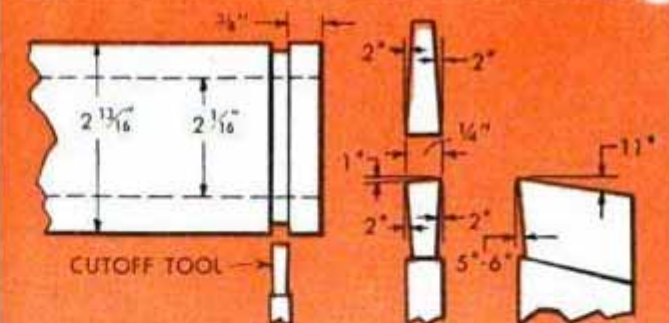
COMPARATIVE PERFORMANCE



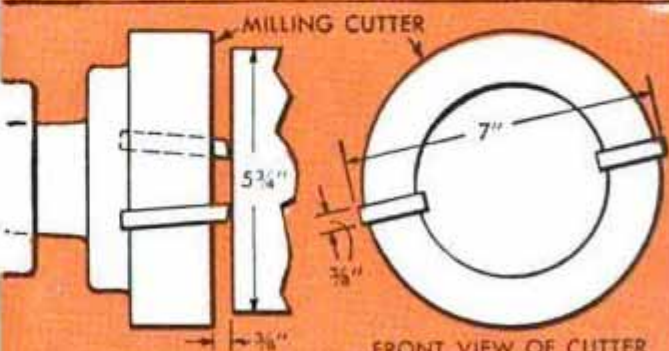
	CAST-ALLOY CUTTER	H.S.S. CUTTER
PIECES PER GRIND	26,250	3750
S.F.M.	260	140



	CAST-ALLOY CUTTER	H.S.S. CUTTER
PIECES PER GRIND	1680	480



	CAST-ALLOY CUTTER	H.S.S. CUTTER
PIECES PER GRIND	154+	3



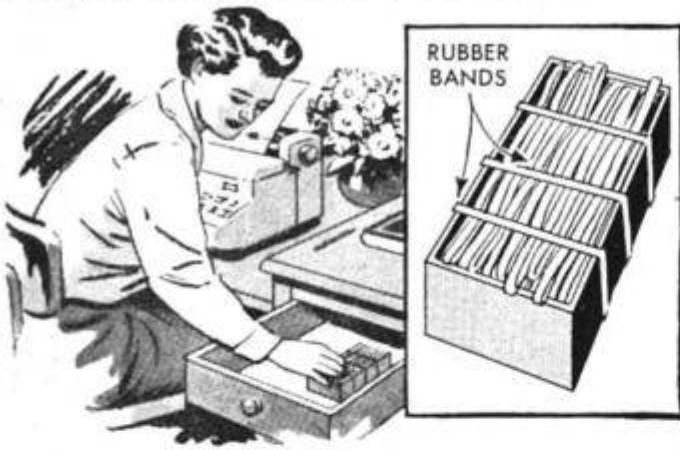
	CAST-ALLOY CUTTER	H.S.S. CUTTER
S.F.M.	1800	
TIME BETWEEN GRINDING	12 HRS.	

HIGH-SPEED SLAB MILLS WORE RAPIDLY. SIX WERE USED IN EIGHT-HOUR SHIFT

Information courtesy Firth Sterling Steel & Carbide Corp. and Vascoloy-Ramet Corp.

Performance chart at the right compares the number of parts turned out by cast-alloy (carbide) cutters with the number produced by high-speed-steel cutters before grinding of bit is necessary. Drawings show the type of work and cutter used in each case

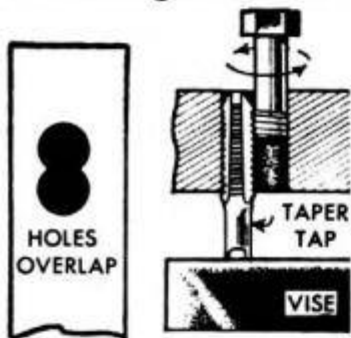
Handy Rubber-Band Container



To overcome the tendency of rubber bands stored in a desk drawer to spill easily from an open container, or to fall out in clusters when one is removed from a pack, keep them in a small box secured with several bands as shown. Either a cardboard or wooden box may be used and, preferably, should have approximately the same length as the bands to be stored in it.

Charles H. Hardy, Los Angeles, Calif.

Cutting Left-Hand Threads With Right-Hand Tap

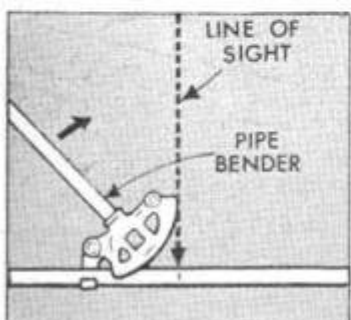


This trick will work in an emergency when the job requires a left-hand thread and there is no regular die available with which to cut it. Drill two overlapping holes in a

block of hardwood, using a bit of the same diameter as the rod or bolt to be threaded. Then make the setup shown in the detail for threading a short bolt. When threading a rod in this manner it will be more convenient to place the tap in the horizontal position. A slight flat filed on the rod or bolt will often aid in starting the thread.

L. M. Lefler, Abilene, Tex.

Bending Conduit "By Eye"



When measurements between outlets permit some latitude in directional bends in conduit, electricians often save time by placing the bender on the conduit and then

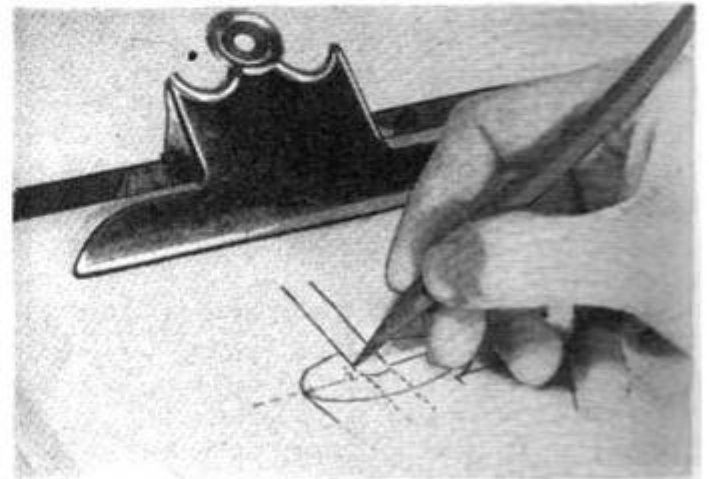
locating it by sighting straight down over the up end of the bender to the dimension mark. When the bend is made the portion

bent at right angles will be approximately on a line with the original line of sight. This trick often saves considerable time consumed in making individual measurements and separate calculations.

B. Franklin, Azusa, Calif.

Clipboard Aids in Tracing Work

You will find a clipboard of the type shown in the photo ideal for holding tracing paper over work that is to be copied. In use, place the work to be traced on the board and put the transfer paper over the top of it. The clamp on the clipboard will

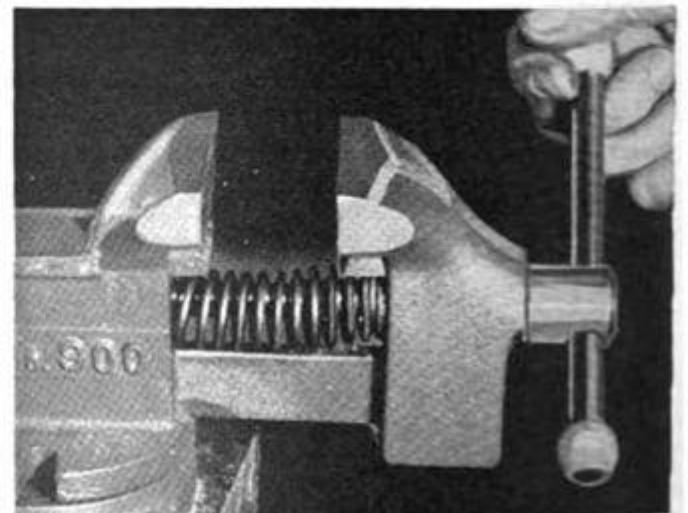


hold the tracing paper in position, permitting it to be removed several times if necessary and then reregistered quite easily. In addition to holding the tracing and the work in register, the clipboard also provides a "desk" on which to work.

Positive Action for Vise Jaws From Auto-Valve Spring

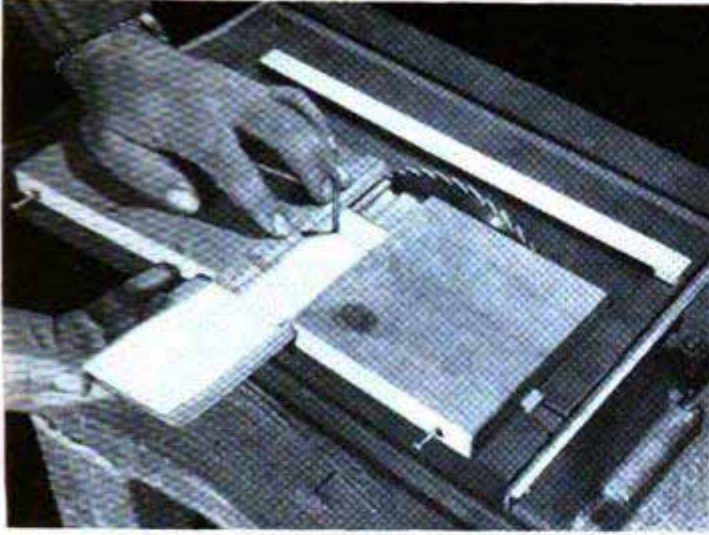
The action of a bench vise can be made much more responsive if a spring is used to take up the slack that ordinarily exists in the lead screw. After the screw has been turned out and the vise taken apart, slip an auto-valve spring, or any other spring similar in size, over the screw as shown.

J. W. Rocke, Atkinson, Neb.



Circle-Cutting Fixture

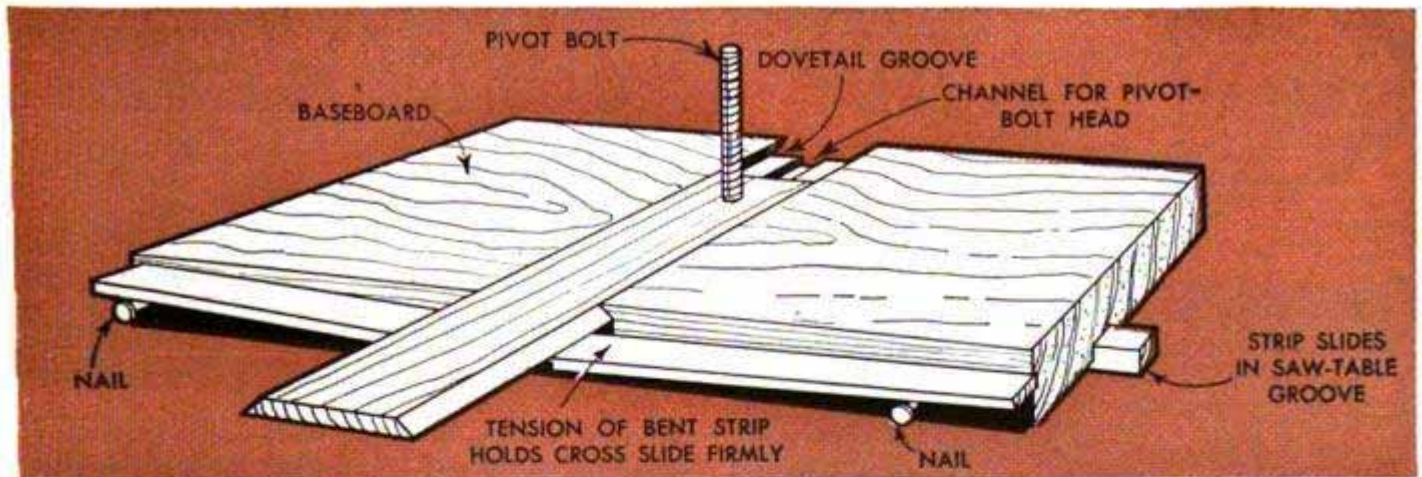
By Louis Hochman



Radius of circle is measured from pivot bolt to saw blade, above, and cross slide is clamped in dovetail groove with wooden strip as in detail. To make cut, work is held steady while baseboard is toward blade



WITH THIS easily made fixture, a circular saw can be used to cut wooden disks of any reasonable diameter. The fixture, which consists of a baseboard and an adjustable cross slide, holds the center of the work at a distance from the saw blade equal to the desired radius of the circle. The drilled work is held stationary while the entire fixture is moved back and forth to make the cuts. After each pass, the work is rotated slightly in a clockwise direction on the pivot bolt. Several passes will remove most of the excess stock from around the circle, leaving a rough edge. This is cut off by holding the baseboard so the saw blade comes in contact with the edge of the work and then rotating the stock by hand. A cleat glued to the underside of the baseboard slides in the saw-table groove, and a bowed wooden strip presses against the cross slide to hold it in position.



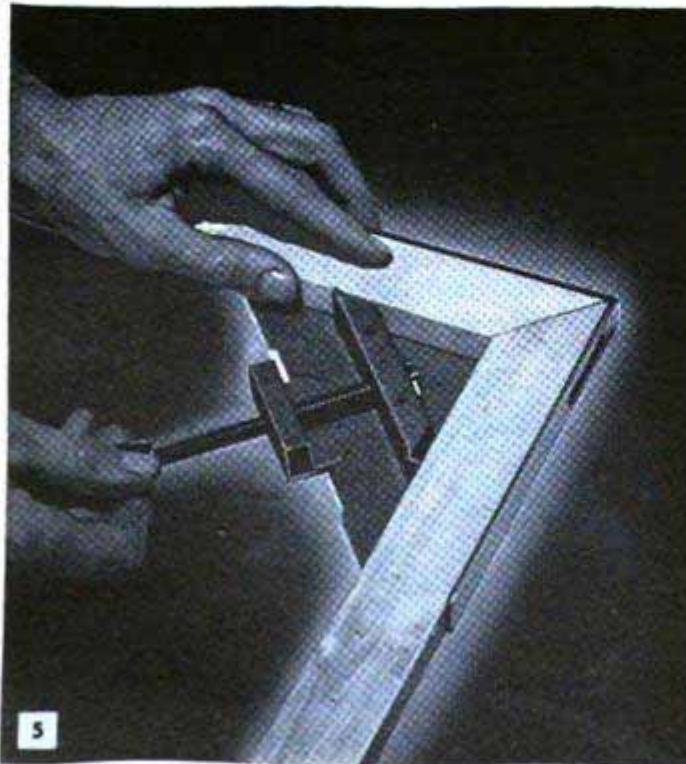
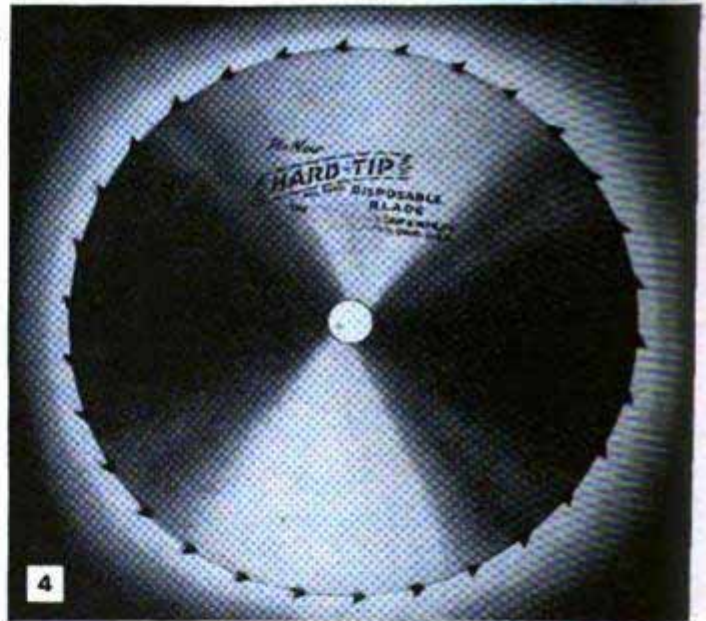
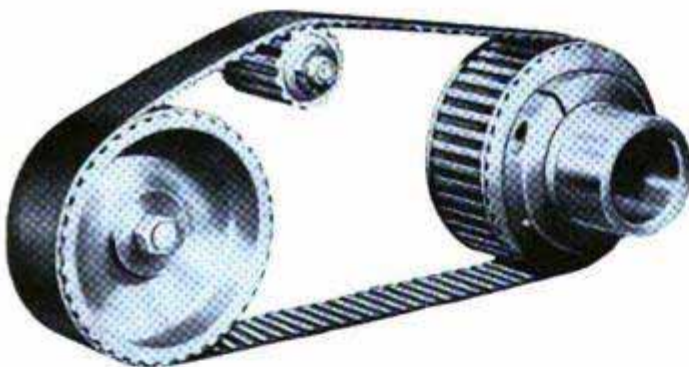
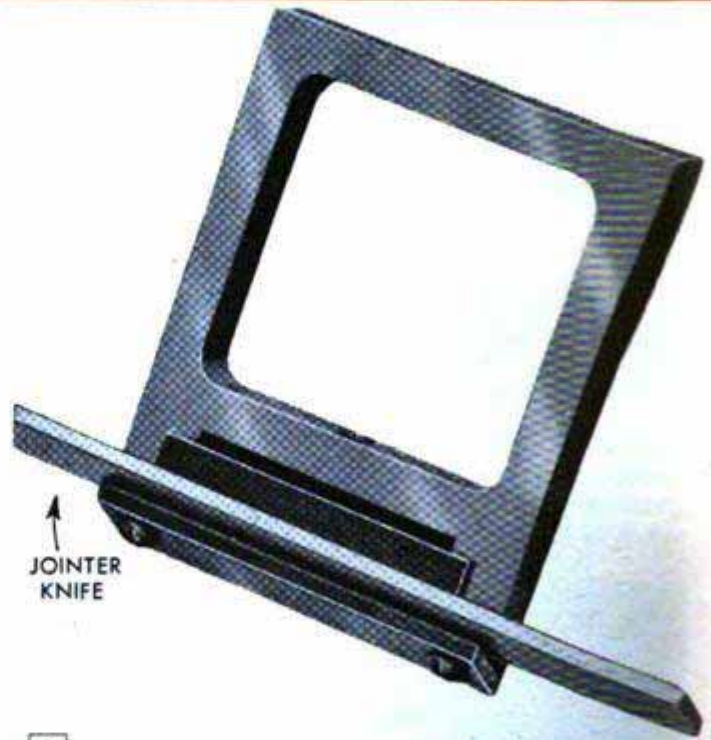
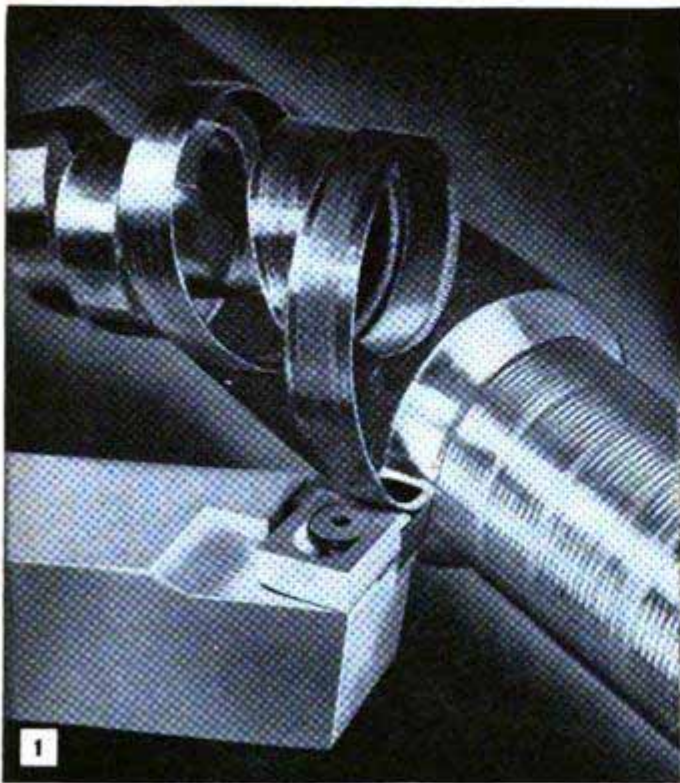
Worn Plane Iron Too Short for Regular Use Makes Ideal Scraper

When a plane iron has been ground down so many times that it no longer can be used for planing, don't throw it away. It still will serve as an excellent cabinet scraper. Sharpening differs somewhat as compared to a regular scraper blade in that the beveled edge is burred by simply rubbing it back and forth on an oilstone in a manner normally used to hone the edge of any cutting tool. Here, however, instead of removing the burr by finally stroking the plane iron flat on the stone, the burr is left intact.

Frank M. Butrick, Jr., Alma, Mich.



SHOPPING FOR TOOLS



1. HEAVY-DUTY TURNING TOOL consists of special alloy steel shank with a clamping device designed for holding carbide blanks. Shape and weight of the shank achieve maximum rigidity and at the same time provide for utilization of 50 to 60 percent of carbide blank for effective work on heavy roughing cuts

2. KNIFE-SETTING GAUGE for use on small jointers simplifies the job of resetting the knives after grinding. Sharpened knife is clamped in a holder located at the end of the gauge frame, where it is held securely at proper angle. Then gauge is placed on rear jointer table and moved back until knife enters slot in head

3. NONSLIP BELT running on notched pulleys transmits power with the positive action of a gear drive. Widely used in industrial applications where power must be delivered at high speeds without vibration and excessive noise. Helically wound cable embedded in synthetic-rubber body of belt eliminates stretch



6



8

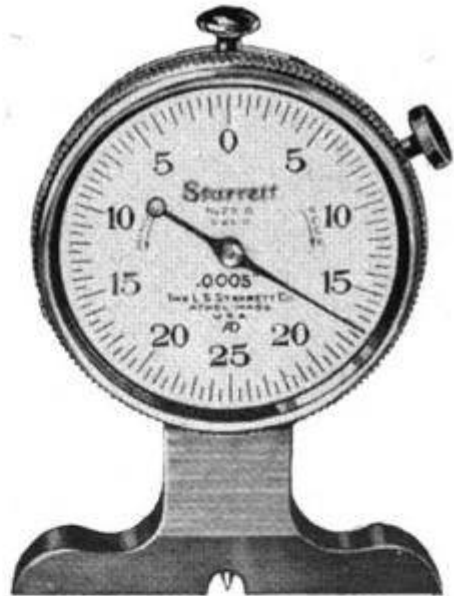
4. DISPOSABLE CIRCULAR-SAW BLADE eliminates setting and filing as blade is discarded when dull. Blade has hardened, spaced teeth which cut exceptionally fast, smoothly and quietly in both hard and soft woods. Stays sharp many times longer than conventional blades. Available in 6 to 16-in. dia. at low cost

5. CORNER CLAMP provides a simple, sure means of clamping mitered picture frames, screen frames, right-angle butt joints and mortise-and-tenon joints in a wide variety of work. Takes stock up to 2½ in. wide and any standard thickness. Angle frame has slots in flanges to allow for nailing joints, as in picture frames

6. WHEEL PULLER removes pulleys, gears and bearings, without breakage, from shafts on motors, refrigerators and washing machines as well as light industrial equipment. Has a dia. capacity of 5½ in. and a reach from the end of the shaft of 3 in. Forged from alloy steel and heat-treated for maximum strength



7



9

7. BUILDER'S LEVEL has a colored plastic frame and exceptionally large glass vials designed for easy reading from a distance of several feet above eye level. Vials are permanently cemented into plastic frame. Liquid in vials will not freeze and will remain fluid through extremely wide temperature variations

8. ALIGNING JIG permits accurate freehand work with a portable electric drill in either wood or metal. Held in one hand and placed flat on the work, the jig guides the drill bit into work on a line perpendicular to surface. Supplied with bushing holder and five drill bushings ranging from ⅛ to ¼ in. by 32nds

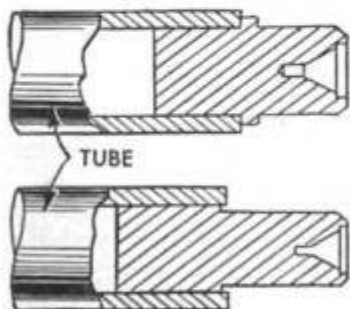
9. DIAL DEPTH GAUGE simplifies accurate depth measurements in small, blind holes, recesses and slots. Dial is mounted on a knife-edge base and needle is actuated by an anvil which can be positioned relative to surface of work by viewing it through opening cut in base. Parts are hardened, ground and lapped

Scraper Fitted Over Broom Handle Loosens Paper Stuck to Floor



One janitor who found that doing a thorough job of sweeping corridors was slowed by bits of paper that stuck to the floor, now saves time and work by using a rubber scraper to loosen the paper. The scraper, which is fitted to the top of the broom handle, is made from a short section of garden hose. One end of the hose is serrated, as shown in the detail, and the section is pressed over the handle so that the serrations project beyond the end. If the scraper tends to be pushed up the handle when in use, one or two carpet tacks driven through the hose will anchor it to the wooden handle.

Tubing Turned Between Centers



Short steel plugs turned to fit the ends of tubing and drilled accurately for the lathe centers allow the outside diameter of the tube to be machined concentric with the bore. If

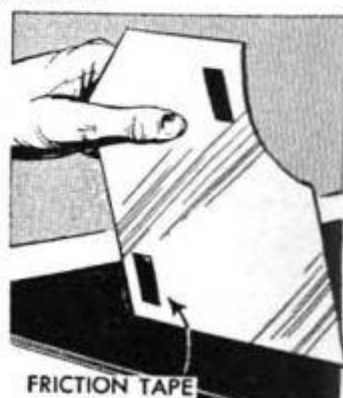
the ends of the tube have been turned square, a shoulder can be added to each of the plugs as in the upper detail. This will limit the distance that the plugs can be

pressed into the tube. However, if the ends of the tube are to be machined, turn the plugs straight or with a reduced diameter on the exposed portion, as in the lower detail. This will permit the lathe tool to be fed to the end of the work. To keep shoulderless plugs from being pushed completely into the tubing by pressure of the centers or the cutting tool, insert a spacer inside the tube between the plugs. The spacer may be simply a wooden dowel having a diameter slightly less than the inside diameter of the tubing. In either case, the lathe dog used to drive the work should be clamped to the tubing itself rather than to one of the center plugs.

C. W. Woodson, Chicago.

Tape Keeps Sheet-Metal Template From Shifting on Work

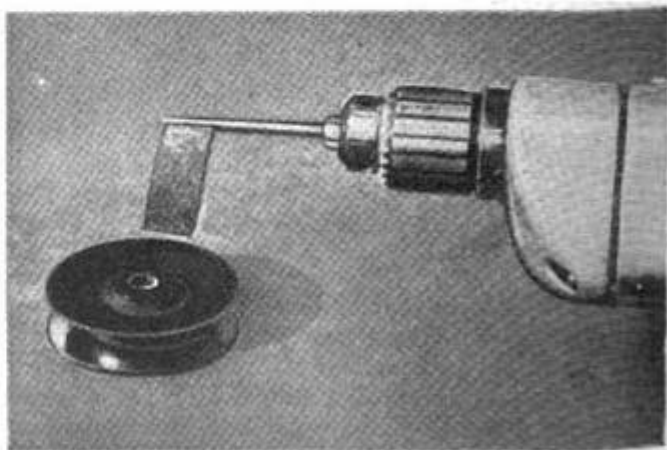
When a sheet-metal template is being used to lay out identical units, the difficulty of keeping it from shifting on the work is overcome easily by sticking tabs of friction tape to the underside of the template. The stickiness of the tape does the trick and, in addition to helping hold the template in place, raises the template slightly to allow it to be picked up more easily. A couple of tabs usually are sufficient, depending upon the size and shape of the template. In some cases, it may be better to place a tab at each corner.



Making Abrasive Polisher

To make a high-speed abrasive reamer for smoothing inside holes in small parts, slot the end of a 1/4-in. brass rod to take a strip of abrasive cloth. If a hacksaw is used to slot the rod, be sure to wedge the abrasive cloth firmly in place.

Clinton R. Hull, Costa Mesa, Calif.

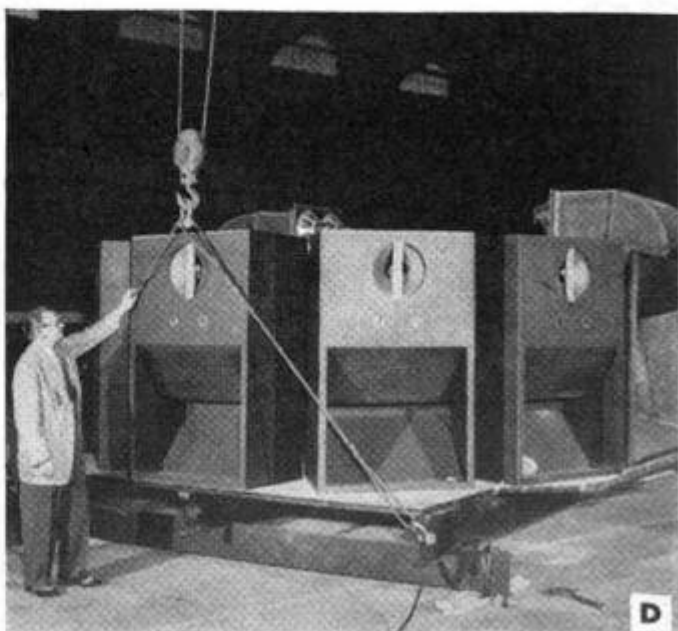
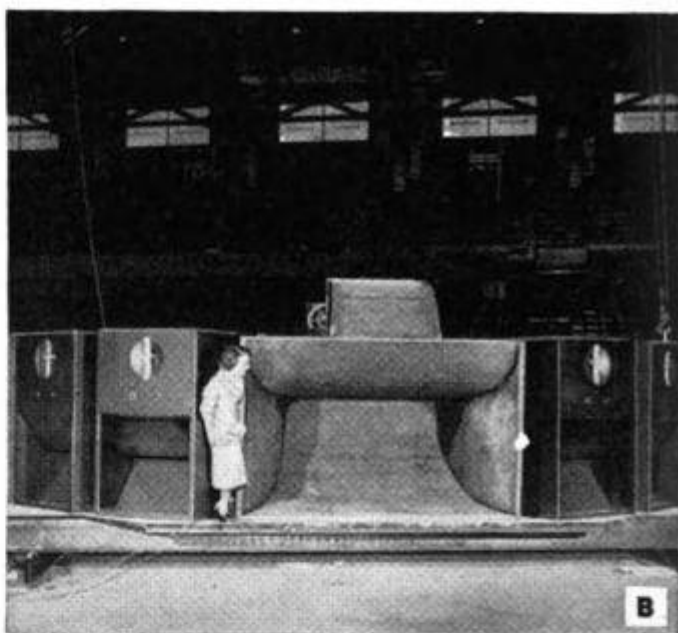


Small Electronic Organ Produces "Big" Music

MUSIC in the "grand manner" is produced by the small all-electronic organ illustrated in photo A. When the organist goes into action on this comparatively small Connsonata console, gigantic amplifiers, a number of large speakers housed in special cabinets and two mammoth horns suddenly become tremendously alive.

This system was installed by the C. G. Conn Ltd. engineers for the nominating conventions at the International Amphitheatre in Chicago. It was designed to anticipate unusually high noise level and the large size of the building. Power from these speakers and horns was estimated to equal the output of 3000 home-size radios.

The small electronic console produces powerful organ tones from many tiny vacuum tubes—one individual tube for each pitch note. A view of the generator units and ranks of amplifiers is shown in photo C. The gigantic size of the speakers and horns can be appreciated by comparing them with the dwarfed figures of the lady and man in photos B and D. They were inspecting them just before the horns and speakers were hoisted into position 10 feet below the 80-foot ceiling.



NESTED LOUDSPEAKERS FOR

By Dr. R. C. Hitchcock



THESE TWO loudspeaker enclosures nest to make a single unit, photo B, approximately 10 x 28 in., about the size of a suitcase, and weigh 29 lb. Separated, they make two excellent-quality speaker units for portable public-address (PA) work. Single, extended-range 8-in. loudspeakers adequately reproduce the high treble tones, and a specially designed back-loaded enclosure provides solid bass tones. Note particularly that no absorbing material is used in this type of enclosure. This method of construction makes the output nearly twice as loud in the low-tone region as if completely enclosed.

Many desirable features are built into the units illustrated in Figs. 1, 2, 3, 4 and 5. The cables are attached to the jacks. These closed-circuit jacks are installed on each enclosure; and the wiring (Fig. K) takes care of phasing. These electrical connections must be followed exactly. Connect a 1½-volt dry cell plus terminal to the phone-plug tip, the negative terminal to the plug shank. When so connected, the speaker cone should move out. This is important as it allows series operation of both speakers without any "dead" spots. Merely connect one speaker plug to the 8-ohm output of the amplifier to use the No. 1 speaker alone. To use the No. 2 speaker in series, plug the No. 1 speaker into the 16-ohm amplifier output (or the 8-ohm output if the amplifier does not have a 16-ohm tap) and then plug the No. 2 speaker into the No. 1 speaker jack. During construction, it is a good idea to try No. 2 plug in No. 1 jack, and test the No. 1 plug with a 1½-

MATERIAL LIST

Item	Req'd.	Dimensions in.	Name or Use	Sketch Ref.
1	4	19½x28x¾	Sides	J
2	2	99/16x27¾x¾	Back	
3	2	99/16x12¾x¾	Bottom deflector	H
4	2	99/16x14¼x¾	Bottom	
5	2	8½x8½x¾	Speaker plate	E
6	4	7¾x8½x¾	Speaker-en- closure sides	G
7	2	7¼x9¼x¾	Top deflector	H
8	2	7¾x9¼x¾	Top	
9	2	1¾x9¼x¾	Speaker frame bottom	E & F
10	2	10¼x5¼x¾	Top of top	
11	2	9¾ (99/16)x 9x¾	Front baffle	H
12	2	99/16x2x¾	Cable stor- age strips	
13	2	Jensen P8RX 8-in. speakers (extended-range type)		
14	2	¾-in. pipe nipples, 2½ in. long		
15	2	¾-in. pipe caps		
16	2	¾-in. pipe floor flanges		
17	12	Domes of Silence (3 sets of 4 each)		
18	1	Carrying handle		
19	1 pr.	Suitcase catches		
20	2	Closed-circuit jacks		
21	2	1¾x3½x42	Central post	Q
22	4	¾x12x20	Tripod legs	O & P
23	4	¾x12x20	Tripod legs	O & P
24	2	1¾x1¼x1½	Top spacer	Q
25	2	1¼x1¾x1½	Spreader	N
26	2	1¾x1¼x1½	Bottom spacer	Q
27	4 pr.	3-in. light strap hinges for tripod legs		
28	2 pr.	2-in. light strap hinges for spreader		
29	3 pr.	1-in. caster wheels		

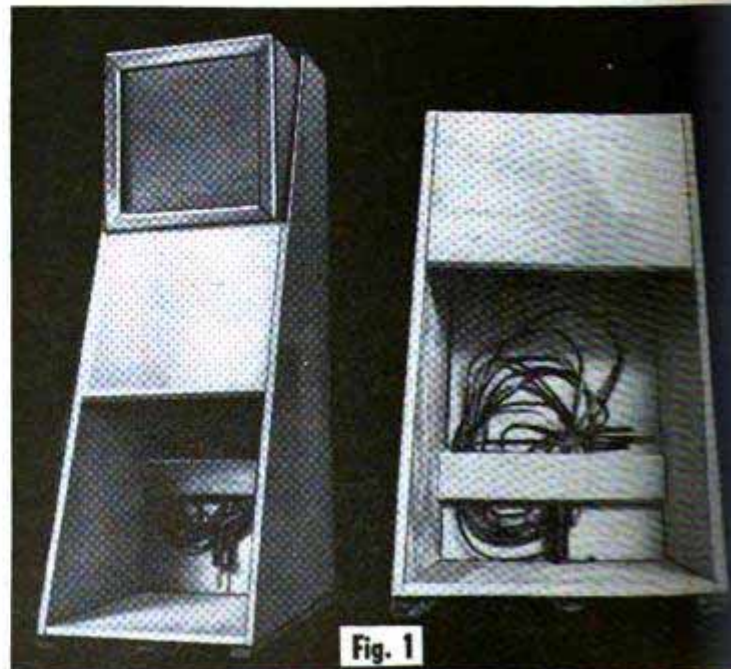


Fig. 1

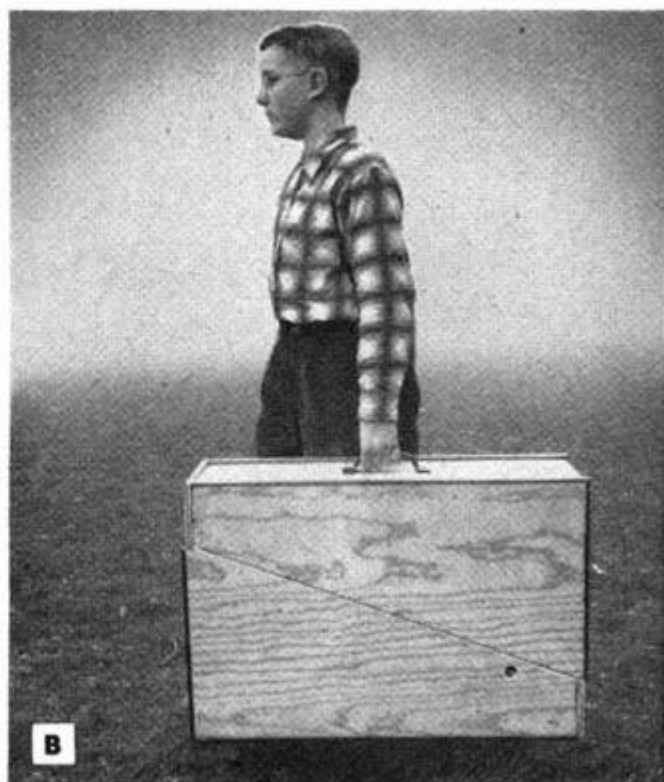
PORTABLE PA SYSTEMS ★ ★ ★

volt dry cell. Both speaker cones should move the same way (*in* or *out*). In addition, try the No. 1 plug in the No. 2 jack and test the No. 2 plug with a dry cell. If you have followed diagram K, the cones will move in the same direction, and they will be phased correctly. Use closed-circuit jacks of a reliable make and, since jacks vary in size, mount them so that they will not strike the speaker chassis.

Ordinary rubber-covered cord of the type used for table lamps may be used for cables. You may wish to have the No. 1 speaker with a 10-ft. cord, and the No. 2 speaker with a 20-ft. cord, for use in different locations. Cables up to 50 ft. long will work satisfactorily. When in use, the cable enters through the opening between the baffle, item 11, and the bottom, item 4. When stowing the cable for transporting, coil it up and tuck it behind the strip, item 12, which is spaced $\frac{3}{4}$ in. from the bottom deflector, item 3. The phone plug at the end of the cable is held in a fuse clip screwed to item 3.

The speaker units are front-mounted as shown in Fig. D, the hole in the speaker plate being made large enough for the speaker frame to drop through to the rim. The rim is held securely in place by $\frac{1}{4}$ -in.-mesh wire cloth, which is fastened by washers and roundhead screws. The bass-tone opening at the bottom is $\frac{1}{16}$ in. wider than the top structure which houses the speaker unit—to allow for nesting. Note that item 11 has a double width dimension, $9\frac{1}{4}$ in. at the top (at the 70-deg. angle) and $9\frac{1}{16}$ in. at the bottom of the opening, Fig. H.

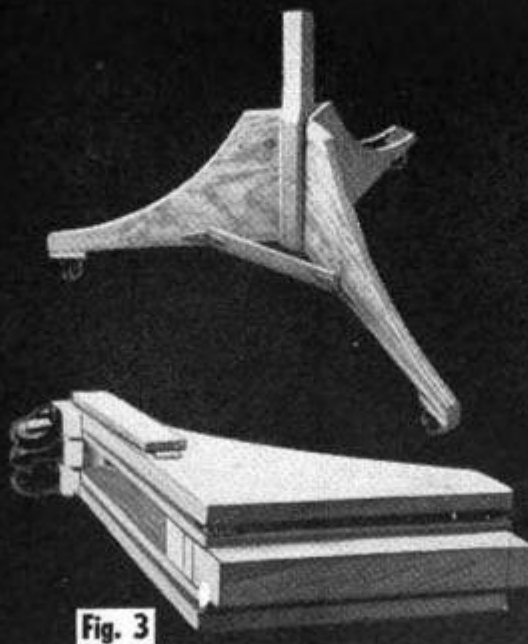
Three sets of glider feet, item 17, are shown in Fig. D. One set is used on the

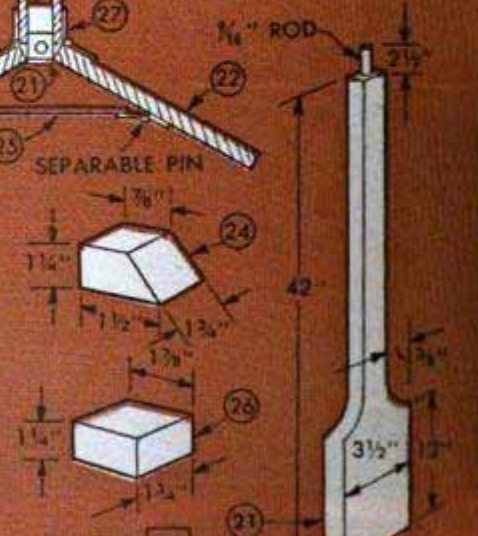
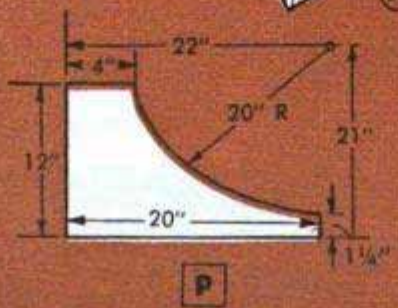
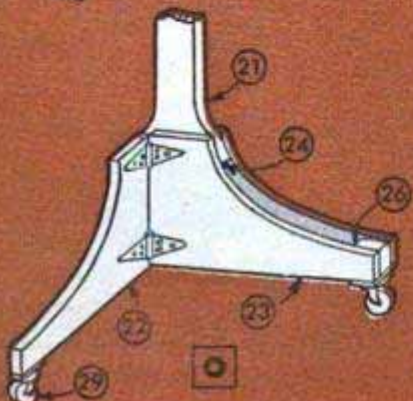
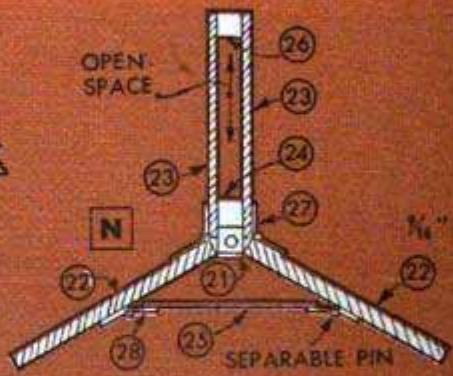
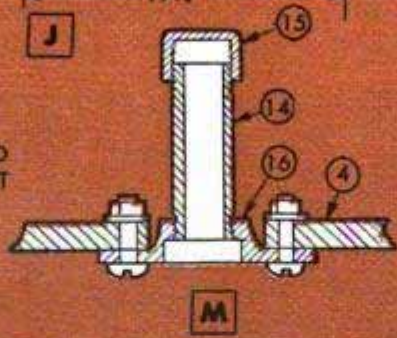
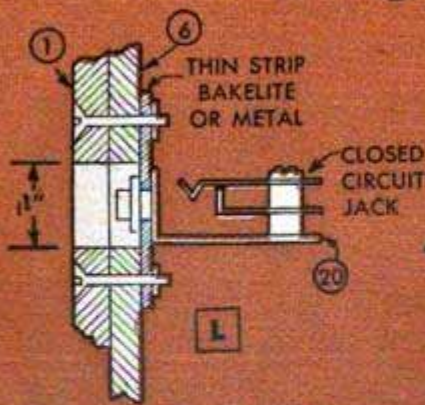
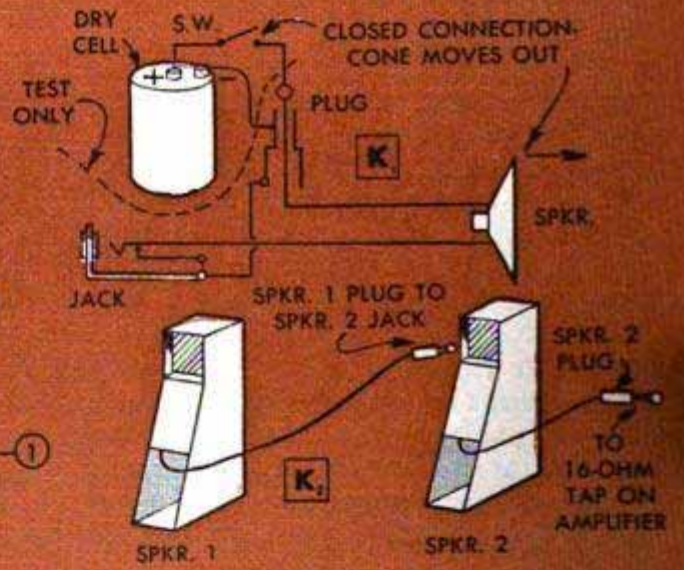
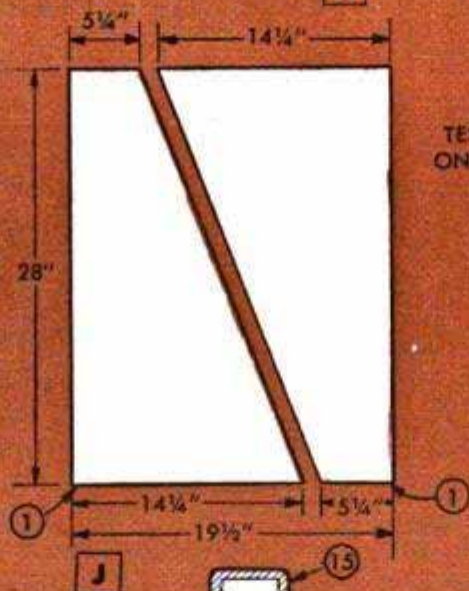
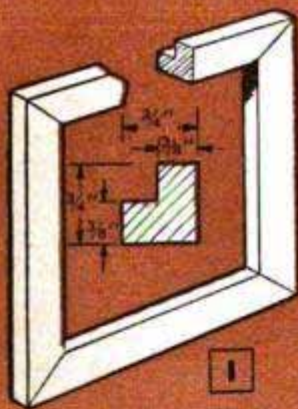
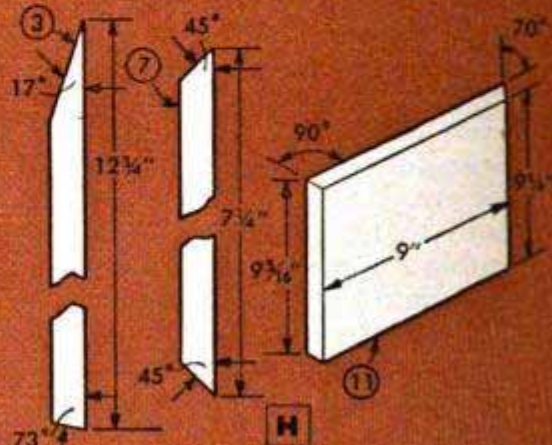
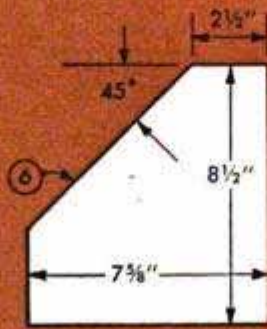
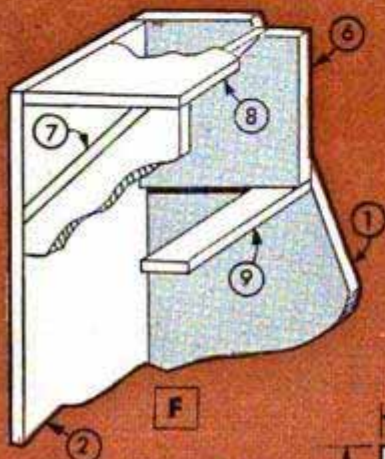
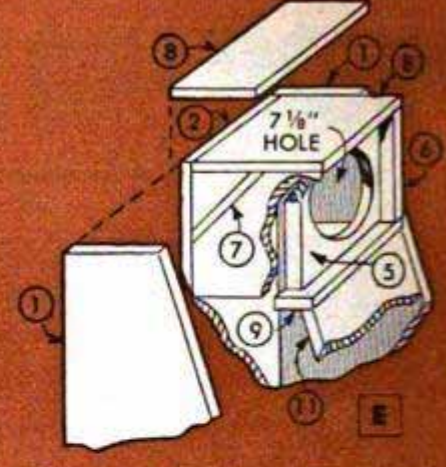
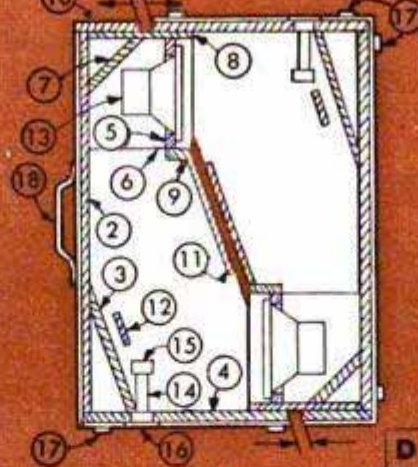
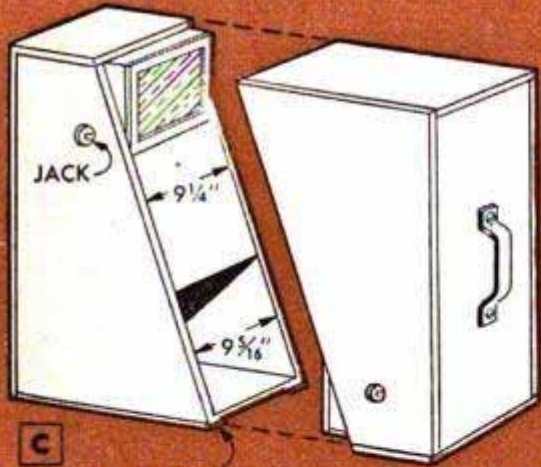


bottom of each speaker enclosure and the third set is mounted opposite the carrying handle, so that the complete unit may be set down on them as in Fig. D. Suitcase catches, not shown, hold the two units together for carrying.

For PA work it is essential that the high tones, which come on a beam from the speaker cone, be directed to the ears of the audience. A table or stool may be used, but a much better idea is to employ the large, easily positioned tripod stand, shown in Figs. 3 and 4. This stand folds compactly and when set up moves readily to any desired location on its casters.

(Continued to page 236)





RADIO and TELEVISION TODAY

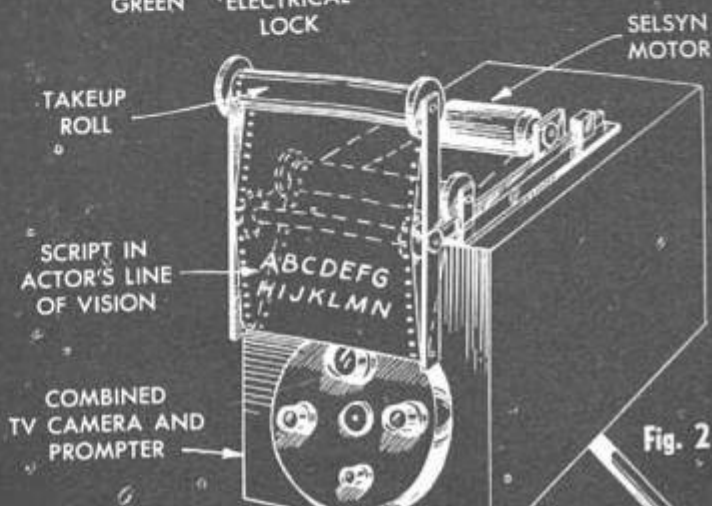
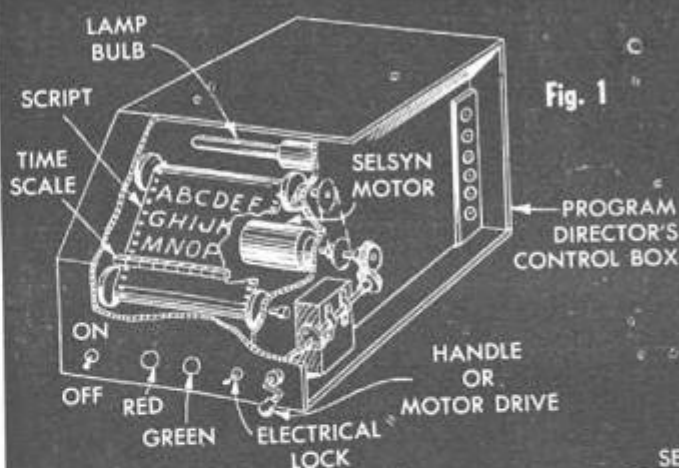
TELEVISION-broadcasting techniques employed by the various networks during the past few months, especially at the recent conventions, caused much favorable comment from TV-set owners. For example, CBS introduced a method of covering major news events by using its newly perfected wedge-wipe amplifier device illustrated in photo A. The special switching device, operated by a technician, enables the home audience to watch simultaneously not only the main picture but any other picture the director wishes to cut into the main picture.



Photo B, and the diagrams in Figs. 1 and 2, show a device that helps forgetful TV actors remember their lines. A patent on this combined TV camera and prompter was recently granted to Mary M. Thielen. It is both a prompter and a method of controlling the rate at which the program progresses. The script is printed on a continuous roll and only the portion to be read at a particular moment is visible. The program director, on whose control box a duplicate shows, regulates the speed. A diagonal time line across the moving script indicates the progress of the program.



An interesting piece of equipment was the NBC portable walkie-lookie unit shown in photo C. The parabolic receiving unit above picks up signals from walkie-talkies.



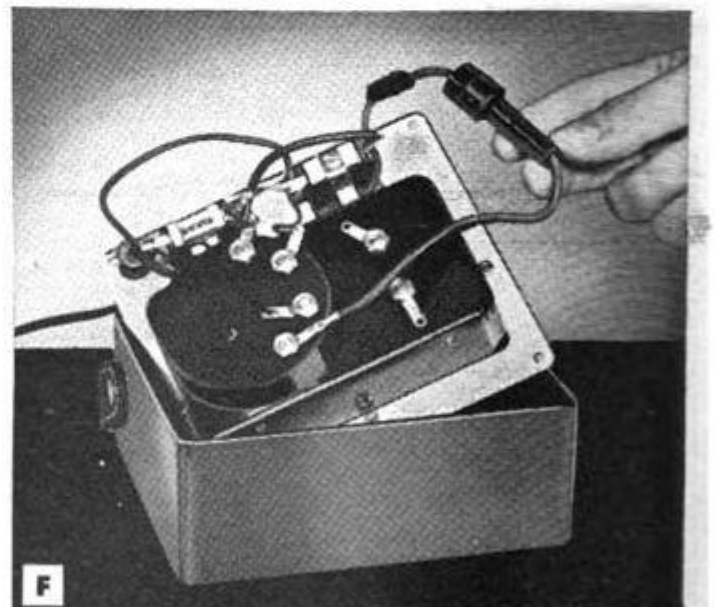
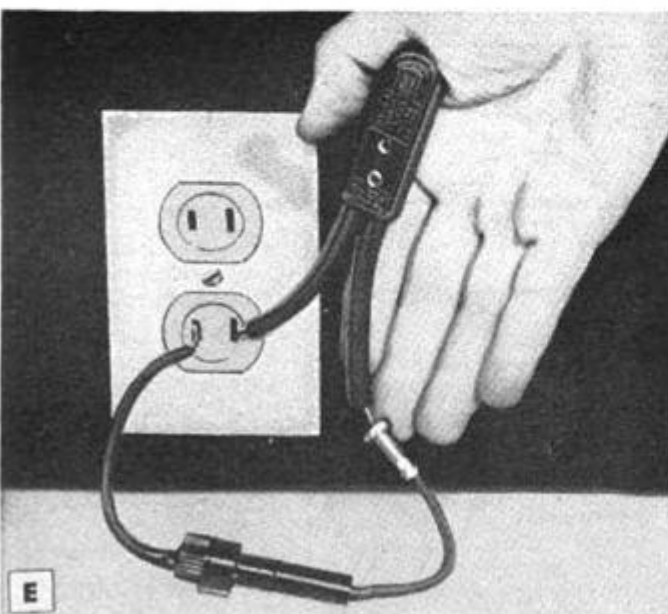
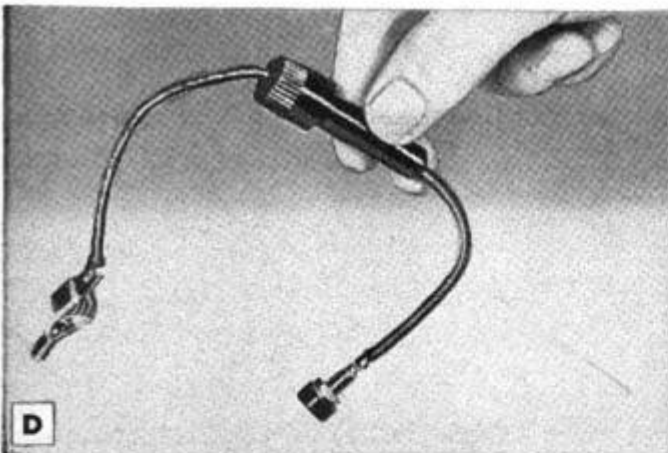
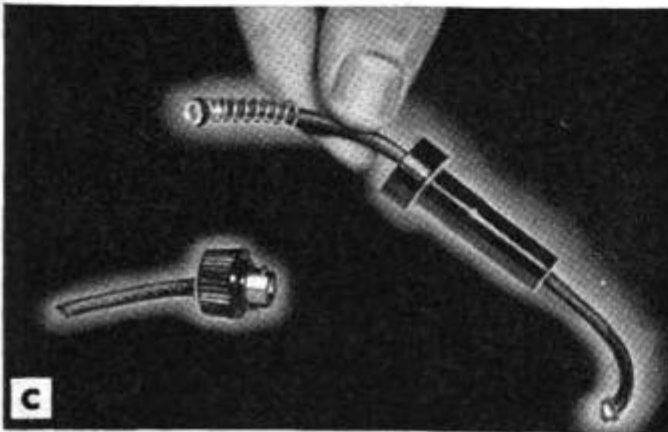
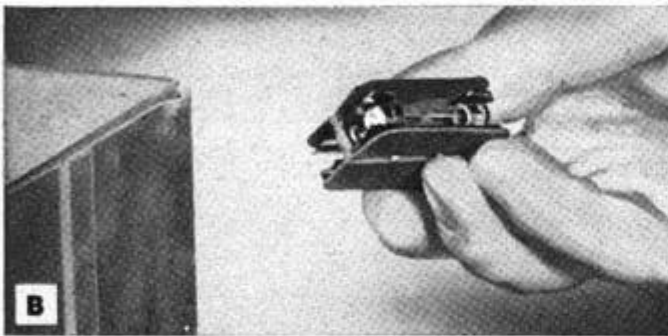
SAFETY FIRST—WITH FUSES

By H. F. Leeper

FUSES are used in many TV receivers, test instruments, audio amplifiers and similar equipment to protect parts from overheating and damage when short circuits or overloads occur. A fuse is therefore an intentionally weakened part of an electric circuit. They are of definite voltage and amperage rating as specified by the manufacturer of the particular device in which they are used.

In most cases fuses are installed at convenient points on the chassis for easy replacement. The voltage and amperage ratings are clearly stamped on the ends of each small glass-enclosed fuse. Never replace a blown fuse with one of a higher amperage rating.

TV receivers may have line or power fuses in spring-clip holders of the type shown in photo A. The same set may have another fuse in its high-voltage circuit as low as $\frac{1}{4}$ amp. These types often are soldered directly in the circuit by means of pigtail leads. In replacing these soldered fuses, time and trouble may be saved by slipping a fuse adapter of the type shown in photo B over the blown fuse. One section of the adapter, available at radio stores, makes contact at the terminals of the defective fuse. The replacement fuse fits into the top part of the adapter. Always disconnect the TV set, amplifier or test set from the power line before making any fuse replacement. Another type of fuse holder is shown in photos C, D, E and F. This Bakelite holder clips together with the fuse inside. For low-rated fuses of short length, it may be necessary to extend the spiral spring, shown in photo C. Such an assembly may be arranged with a pin jack and clip or terminal lug, for use with test leads as indicated in photos D, E and F.





and Reflex Cameras—Kodak Tourist Adapter Kit, \$13.25 (*left*), for deluxe model "Tourists," and the Kodak 828 Adapter for Kodak Reflex cameras, \$4.59 (*right*), let you take pictures in full color on Kodachrome or Kodacolor 828 Film. "Tourist" kit also permits economical half and square pictures on all Kodak 620 films.



Get in the picture yourself with a Kodak Auto-Release (for any camera equipped with cable release). Delays shutter action. \$3.86.

New, dependable battery-condenser flash system—The revolutionary new Kodak Ektalux Flashholder gives positive flash performance. Secret: condensers store power from 22.5-volt photoflash batteries until needed . . . fire lamp in a single surge far more powerful than the force of the usual battery. With Standard Bracket, \$29.75; with Press Bracket, \$33.85; with Bracket for Polaroid Land Camera, \$30.60.



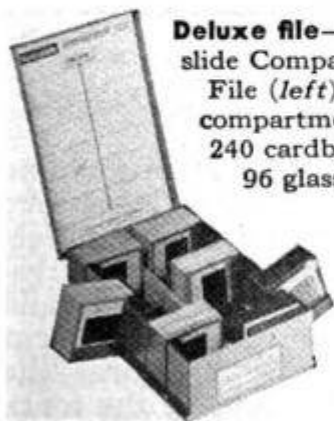
For deluxe small-group showings—The Kodaslide Table Viewer, Model A (*left*), combines projector, screen, slide changer in one unit. Takes 75 cardboard or 30 double glass slides. \$97.50. Carrying case, \$27.50.

Inexpensive table viewer—Kodaslide Table Viewer, 4X (*right*), enlarges slides more than four times on built-in screen. Images are bright and clear even in a lighted room. \$49.50. Carrying case, \$15.50.



Budget-priced slide projector—Kodaslide Merit Projector (*left*) features new jar-proof slide feeding. Brilliant 5-inch *f*/3.5 Lumenized lens; built-in elevation device; cool operation. \$26.10. Carrying case, \$9.50.

King of them all—1000-watt Kodaslide Projector, Master Model (*right*), delivers screen images of unprecedented brilliance. Ideal for large-group showings. Choice of 4 lenses. From \$169.00. Carrying case, \$50.



Deluxe file—Kodaslide Compartment File (*left*) has 12 compartments for 240 cardboard or 96 glass slides. \$3.94.



Inexpensive protection for slides—Kodaslide File Box (*right*) keeps them organized. Holds 150 cardboard or 53 glass slides. \$1.57.



For mounting transparencies in glass—Kodak Slide Kit contains everything you need—glass for covering transparencies, masks, binding tape, and tabs for 50 slides. \$3.63.

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Care and Feeding of Engines

BY S. P. CORP

PRESSURE COOLING

To increase the efficiency of the modern car cooling system, a pressure-type radiator cap is often used, making it a closed system. Each four pounds of pressure will increase the efficiency of the cooling system ten per cent. Each pound of pressure also raises the boiling point three degrees.

PRESSURE VALVE
SPRING



PRESSURE VALVE
AND SPRING

VACUUM
VALVE

Keep these points in mind: (1) Various pressures are used, from four to nine pounds. Never use any cap but the one made for your radiator. Too much pressure will cause radiator damage. (2) Be sure the overflow pipe is always open; a restricted pipe will damage radiator or hose. Keep hose free of leaks. (3) Do not be alarmed if your instrument panel shows a high temperature; it means greater engine efficiency.

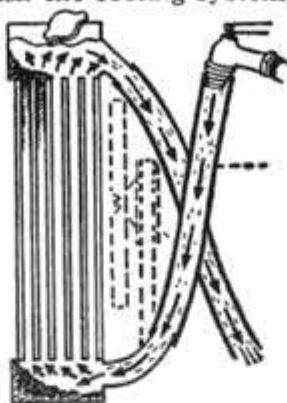
Above all, be sure to know the pressure used on your car, and be sure you are using the radiator cap which is made for your system!

CLEANING COOLING SYSTEMS

If your engine overheats, inspect the cooling system to make sure that water passages are not clogged. First, use a reputable solvent to clear passages in the cylinder block. Then reverse-flush the cooling system by removing hose connections and installing long hose as shown. Do not remove radiator cap.

Then connect a water hose to the lower radiator connection and turn on pressure so water flows from top hose. Flush until water leaving the radiator is clear.

For efficient operation of car heaters, the heater core may be flushed in the same manner.



WRITE FOR HELPFUL FREE BOOKLET

You'll find useful help on car care in the new free booklet, "MORE POWER, Less Gas, Less Oil," which is fully illustrated. It tells you all about Sealed Power KromeX Ring Sets, which fight heat, friction, corrosion, and abrasion in late-model cars and trucks, to give you double mileage. Write for your copy now! Sealed Power Corporation, Dept. G-11, Muskegon, Mich.



The pipe fittings, Fig. M, provide a steady support for the speaker housing when set on the tripod stand. The pedestal post has a $\frac{9}{16}$ -in. rod or hardwood dowel to position the housing. The floor flanges are set as shown in Figs. D and M with the "floor" side down and the curved side up. Bolts, washers and nuts are recommended to hold the flanges to the bottom, item 4. The exact position of the flange is not critical; put it just ahead of item 3, as shown in Fig. D.

One of the tripod legs is made from two $\frac{3}{8}$ -in.-plywood pieces, item 23, fastened securely to the central post, item 21. The other two tripod legs, item 22, are $\frac{3}{4}$ -in. plywood, held in position with strap hinges, item 27, Fig. N. Two smaller strap hinges, item 28, Fig. N, fasten the spreader to the two $\frac{3}{4}$ -in. tripod legs. Remove the pin from one of the hinges and replace it with a finishing nail. This nail can be removed when the tripod is folded. When folded, the legs can be held with a leather or cloth strap, or a length of stout cord.

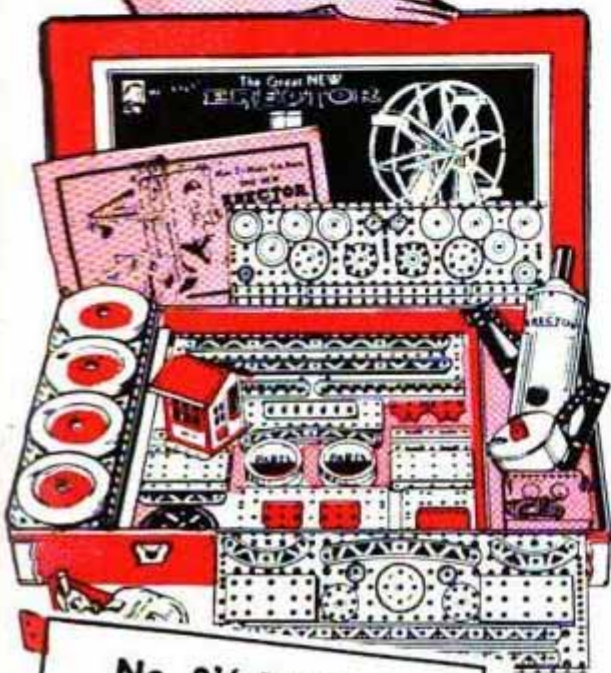
It is suggested that the speaker housing, items 6 and 7, be put together first, then item 5 followed by item 4. Next, glue and nail item 6 to one of the sides, item 1. Water-resistant casein glue, plus $\frac{3}{4} \times 19$ "no head" brads are excellent for construction. Trim may be added and, if nailed and glued, strengthens the complete housing. Mahogany strips, $\frac{1}{4} \times \frac{3}{4}$ in., make a nice contrasting edge when white pine is used for the main structure. Clear varnish is applied, see sketch A, after all glue has dried, and this first coat is allowed to sink in and dry overnight. Then rub with No. 00 sandpaper, and revarnish all over. Do not use steel wool for rubbing, particles may get into the PM-speaker air gaps. Detailed student material list R-414 is available from Popular Mechanics Radio-TV and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

Atomic Research Increases Life of Cutting Tools

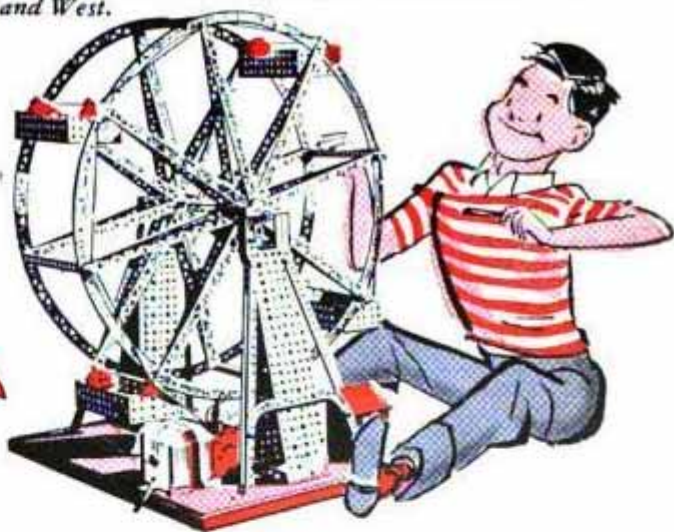
Radioactive cutting tools are providing engineers with the data needed to improve machine-shop operation and increase effective life of tools. Cutting tools are irradiated by neutrons in a nuclear reactor and used on metalworking machines to cut metal. A Geiger counter measures the radioactivity of the chips cut by the tools, providing a direct measure of the amount of tool wear. Such tests provide, in a brief time, an accurate estimate of the tools' entire usable life.

Hey, Gang! Get an **ERECTOR**[®] and you have your own **TOY FACTORY!**

Open your new Erector Set and feast your eyes on the dazzling array of precision-made parts! What thrilling times you'll have building dozens of gigantic engineering marvels! There's more excitement when you turn the switch of Erector's powerful electric engine and your models come alive. Only an Erector Set makes possible models that blaze with lights—whistle—puff smoke—go choo-choo-choo—operate by remote control. Christmas is just ahead—so show this ad to Dad. Erector prices start at \$2.00. \$2.10 Denver and West.



No. 8½ ERECTOR
All Electric Set. Over 15 POUNDS of parts—including electric engine with 4 speeds — lights — electro-magnet — Flex-O-Matic coupler. Makes over 100 action models. Price \$23.50. \$24.50 Denver and West.



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As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Checked Varnish

Q—I recently bought a grand piano on which the finish is quite badly checked, and I would like to know if there is some way of smoothing the finish without removing it entirely. The checks are very fine and irregular over nearly the whole surface. Will sandpaper do it, or should I use pumice stone and water, or oil?—N. Y., Ark.

A—Don't use sandpaper. Rather try what is known to the trade as an amalgamator. This material, made especially for the purpose, is a "slow" solvent that softens the varnish film as it is applied with a soft cloth or brush. Usually a cloth is best as it gives better control. After applying the material to a small area, rub until dry. The softened surface of the varnish film will flow into the tiny checks and obliterate them quite effectively. The surface will be rather dull and spotty after this treatment, but as a rule an application of furniture polish or paste wax will brighten it and produce a uniform luster. If not, then it will be necessary to polish with rottenstone and oil. This procedure will efface fine checks satisfactorily but will not entirely remove deep checks or pits. A surface in this condition must be completely refinished.

Preventing Ice Dams On Roof

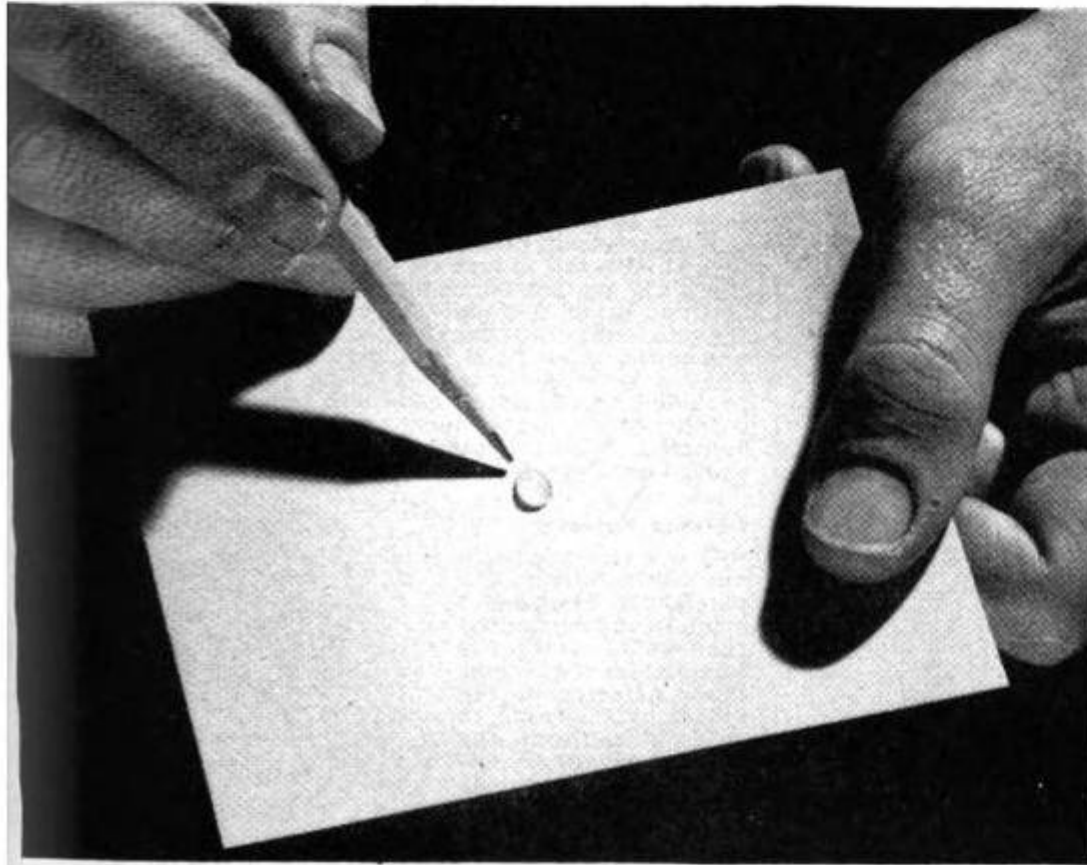
Q—Is there any way to prevent ice from forming on a low-pitched roof just above the gutter? We have a new ranch-type home and ice has formed on the roof all along the north side during two winters. Several leaks have developed just above the cornice board. I've heard about an electrical device which can be used to melt the ice. Is this available?

O. S., Mich.

A—This is a common trouble in colder climates and precautions against leaks should have been taken when the roof was put on. It's a regular practice on low-pitched roofs to lay two widths of smooth roll roofing above the eaves before laying the shingles. Three widths of the roll roofing are sometimes laid over wide cornices. Thus water trapped above the ice formation, which acts as a dam, is prevented from seeping through the roof boards and into the attic. In your case it is possible to remove the lower courses of shingles and install two widths of roll roofing, although this would involve considerable labor, of course. There are electrical units available which are said to be effective. Inquire of your building-materials dealer.

(Continued to page 240)

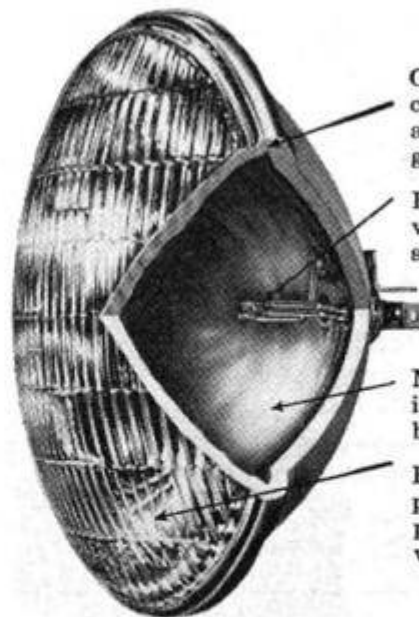
There is a difference in sealed-beam headlamps



...and this is it

All-Glass sealed-beam headlamps do not grow dim

When moisture collects inside a headlamp and deteriorates the reflector, it cuts light output. Unless your headlamps are All-Glass, you may be able actually to see traces of moisture inside. But there's one way to be *sure* your headlamps are not growing dim. Replace them with G-E All-Glass headlamps. Because they're *All-Glass*, all one big bulb, there's no way for water to get in. Tests show that General Electric sealed-beam headlamps average 99% as much light after years of service as when new. Be sure to specify G-E All-Glass headlamps.



One-piece All-Glass construction. Dirt and moisture can't get in.

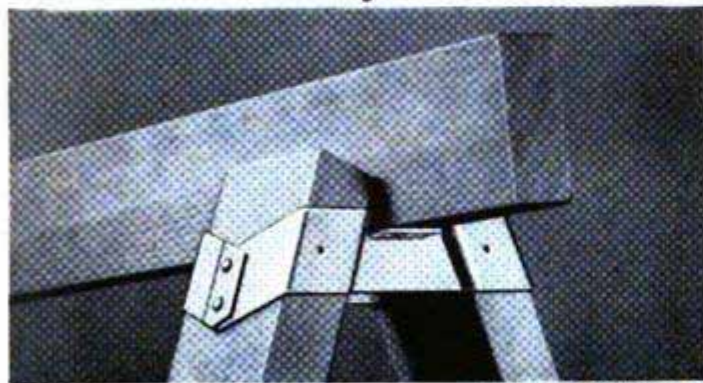
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Mirror-like, built-in reflector. Stays bright.

Rugged, hard-glass precision lens to put light where you want it.

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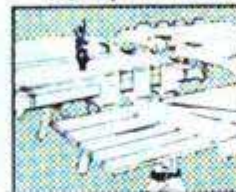
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Anchoring Rafters On Masonry Walls

Q—I'm building a concrete-block home and I want to know how to anchor the rafters to the wall. The house is L-shaped with a low-pitched gable roof. I want to anchor the roof securely to the walls as we have high winds in this locality and the house is being built in an exposed area. The rafters will overhang the wall about 12 in., that is, the cornice will be 12 in. wide. Is this much overhang advisable?—M. S., Kans.



A—The first thing to do is check the local building code, as it may recommend or require a reinforced-concrete beam at the top of the wall. If not, then one procedure that is followed quite generally by builders is to insert strips of metal lath under the top course of blocks as they are laid, the strips being placed directly below the openings in each block. The purpose of the lath strips is to hold concrete in place as it is poured into the openings in the top course of blocks. Anchor bolts for the plate are placed in position as the concrete is poured. After the plate is bolted in position we suggest that you consider attaching the rafters and joists to the plate with metal framing anchors. We see no objection to a 12-in. rafter overhang provided the building code will permit it. A wide cornice offers protection to walls both winter and summer. When exposed directly to high winds it should be of the box type and strongly constructed.

Plaster Failure

Q—In two rooms in our new home the plaster is breaking away in the corners of the rooms. Only the last plaster coat seems to be affected as the undercoats appear to be solid, without any cracks or other defects. What is causing this and will it continue to occur in all the rooms?

A. T., Ohio.

A—It is not possible to say definitely whether or not the plaster will continue to break in all the rooms as you describe. However, we think it likely that the breaks will be confined to the rooms where they have appeared. There are several causes of this type of plaster defect, but we believe that your plasterers, working against time as they so often are, failed to provide an adequate mechanical bond for the white coat. Plasterers use a special tool to scratch the plaster surfaces between coats, but it is important that this job be done while the material is still in a plastic state, as otherwise the white coat may fail to bond properly to the scratch coat. Probably your contractor will be glad to repair the defect if you call it to his attention.



Removing Rust Stains

Q—How can I remove rust stains from older-type porcelain-enameled plumbing fixtures?

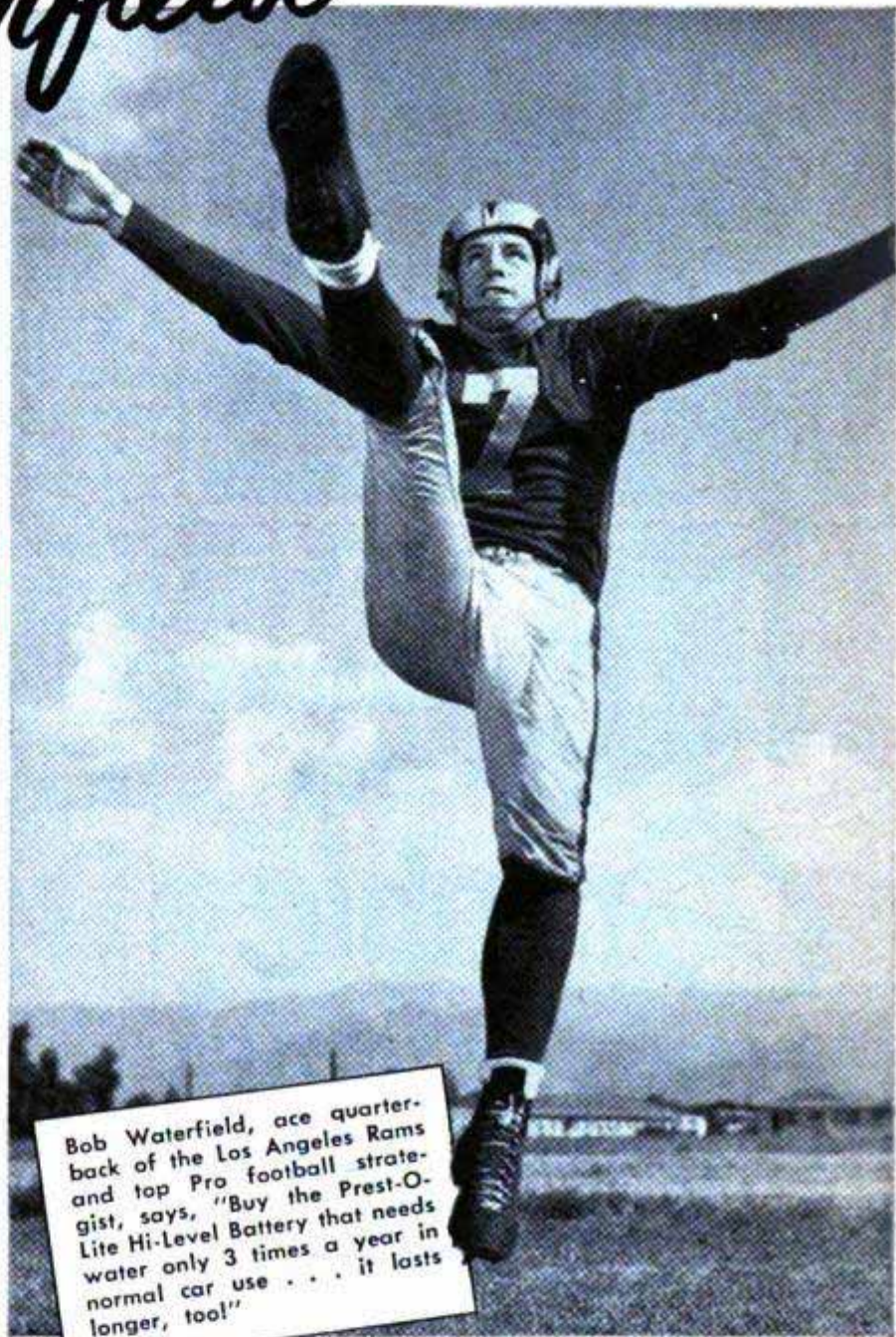
G. D., Kans.

A—Obtain a small quantity of muriatic-acid crystals (also obtainable from your local plumber ready-mixed in mild solution) and mix with water to make a very mild solution. Apply to the rust stains with a swab and rub lightly for a few seconds, then wash off with a soda-water solution. Repeat if necessary, until the stains are eliminated, but be sure in succeeding applications not to leave the acid on the enameled surface more than a few seconds at a time, as otherwise damage may result. **Caution:** Never handle muriatic-acid crystals with the bare hands. Do not permit either the crystals or the solution to come in contact with the bare skin. Use a cloth swab for application and wear rubber gloves. Destroy both the crystals and the solution after use.

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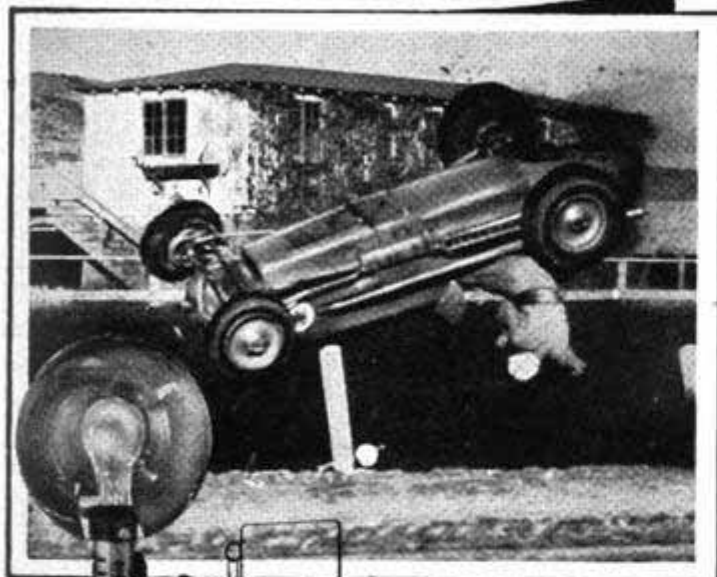


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(Continued from page 136)



Graflex Prize-winning Photo by Don Downie

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is scattered and wasted and manure handling is made easier.

Feeding silage means more milk production—and more work. But H. C. Hohstadt of Union County, Ore., has his silo handy inside the lounging shed. The silo came first, then when Hohstadt built a lounging shed, connecting with the milking parlor, he constructed the shed around the silo.

Robert Laughlin of Clark County, Wash., hasn't a silo quite that handy but he has his own system for fast handling of silage. He built a carrier track from the silo to mangers in the dairy barn. The carrier rolls along with 450 pounds of grass silage—enough to feed 10 cows.

Another Washington farmer—Gerald Perkins of Bow—has constructed giant wooden "wheelbarrows" to get the silage to his cows on a fast schedule. The wheelbarrows, six of them, are loaded at the silo, then trundled out to the feed lot by two men. But the men don't have to unload the wheelbarrows. The cows do that. Lined up, the barrows become an outdoor manger.

For a quicker and cheaper method of putting up silage, many dairymen are turning to the open pit. F. J. Koppel of Pullman, Wash., doesn't even bother with a pit. He stacks his pea-vine silage right on ground level. Through use of power equipment, he has pretty much eliminated the pitchfork in the operation. Most of the work is done with a tractor and manure loader. Koppel took off a standard dozer and built a light, skeleton frame . . . "so I can see what I'm doing."

In stacking, three-foot extensions are put on the tines of the loader. With two trucks hauling, Koppel puts up a hundred tons of silage a day. The tractor does all the leveling, except on edges of the stack. Then the tractor is run back and forth for packing.

"Winter wastage is small—about six inches on the sides," said Koppel.

In hauling out the silage, the tractor again goes to work. Loads up to 1500 pounds are lifted onto a truck. It takes just 15 minutes to load enough silage to last 35 cows three days.

Becoming standard installations in milking parlors now are grain chutes from the mow with cranks to dole out feed in the stanchion boxes. James Subert at Cottonwood, Idaho, built double-barreled chutes so he can crank feed for two cows at once. If one of the cows is on a nonstandard ration, grain is permitted to flow through only one opening at a time.

Now, if someone will just invent a system so that cows will have to be milked only every other day. . . .

★ ★ ★

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Save space, time, money with this compact combination of the most-used individual power tools—**not a group of attachments, no time-wasting adjustments**

NEVER BEFORE A COMBINATION SHOP LIKE THIS . . .

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- Delta accessories—the only combination tool with the advantage of the world's biggest and best line of accessories that multiply the usefulness of every tool many times over

Your Deltashop will pay for itself in no time—and even with no experience you'll be able to "do it yourself" with the best of them. Fix things and make things you've wanted—items you've put off buying because of high costs.

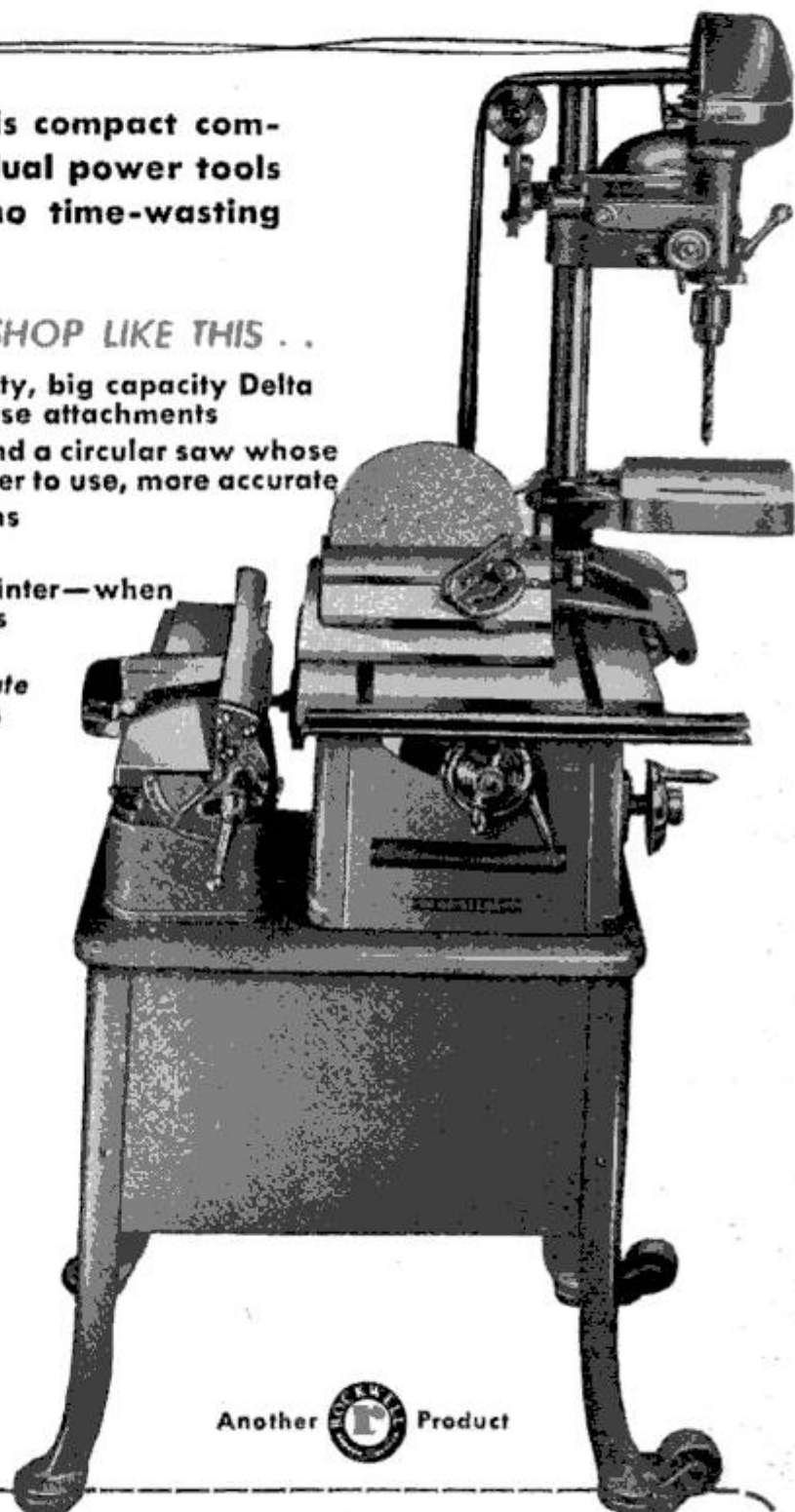
See this remarkable combination tool. Look at its rugged strength. See how easy it is to handle and operate. Ask your Delta dealer to demonstrate it. Also send for the new Deltashop Book—tells the whole story of this remarkable new tool development. Use the coupon.

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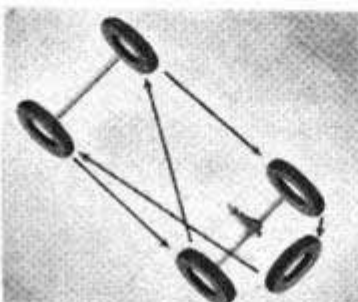
How to get more mileage out of your motoring dollar



CHECK PLAY IN STEERING GEAR

Move steering wheel back and forth when car is at rest. Lack of play may indicate binding. Too much play may indicate worn steering parts that need servicing or replacement to prevent undue tire wear and to avert any possibility of accidents through faulty steering.

Shift tires every 5,000 miles for maximum service. Tires wear differently at each "corner" of the car; they should be switched regularly every 5,000 miles. (See diagram for proper rotation that includes spare.) Thus you will get maximum traction, riding comfort and mileage.



CRISS-CROSS TIRES



CHOOSE THE FINEST FILTER REFILL

Protect vital engine parts from abrasive grit and gummy sludge—keep a fresh oil filter refill on the job. Any filter "loads up" in about 5,000 miles of normal driving—becomes so clogged it can't trap any more contaminants out of the oil stream. Before that happens, put in a Purolator* Refill—the finest money can buy. Matchless accordion-pleated, plastic-impregnated element gives up to 10 times more filtering area than ordinary filters. Yet a Purolator Micronic* costs as little as \$1.60.

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Check your oil filter every time you change your oil

PurOlator
(ENGINEERED FOR EVERY MAKE OF CAR)
Micronic OIL FILTER



HSR Talks Ships Through Fog

(Continued from page 154)

data could be collected at a master information center where, once set in order, it might be shot by radio, microlink or phone to pilots of the fleet still a distance out at sea. Knowing when to move or not, each shipmaster would be talked inside in a master funneling operation. A painstaking process, true, but a whopping improvement on the usual situation today when ships are bogged down en masse, confused, fearing one another for two, ten or more days at a time.

Consider a dozen cargo ships due tomorrow morning at the port of New York, which averages 21 completely enshrouded days yearly. If fog held the vessels at bay only until the following dawn, they would suffer a collective operating loss of about \$24,000. Portland, Me., is crippled for an average of 29 days a year; New Haven, 26; Newport's crowded Navy docks, 18; Boston, 14; Providence, 11. The major foreign ports of Liverpool, Halifax, Hong Kong and others equally clustered with ships are fogbound up to 38 days annually.

Then the cost of an HSR setup—presently \$250,000—may not seem so out of proportion to the need. Take Le Havre, berth of France's luxury liners, where the first HSR system was put to work in late 1951. Costs always have been doubled or tripled for fogbound, inoperative passenger vessels in comparison to oil or coal freighters.

"By the way," you may ask at this point, "isn't radar radar? So why should radar's brother HSR get so much hullabaloo?"

For this inclusive fact. Science actually saw shipborne radar as a fill-in, the best available safety instrument until the day when something like HSR might be created. Few ports in the world were cut by nature or man to permit sight of all potential dangers even on the brightest day.

Although HSR's predecessors couldn't see around corners or long-arcing bends, the new unit can. Let it rain, snow or sleet its heaviest, HSR continues to see every object within range, while its smaller brother often blacks out under adverse conditions, including dense fog. Because of its limited scope, shipborne radar presents an especially crowded harbor as an indistinct blob, which sometimes bewilders a steerer and may invite him to make a gambled run inshore with resultant tragedy. HSR pulls that blob apart to discern the tiniest channel marker.

HSR is focused by using shorter or longer radar pulses for near or far obstacles. In order to see buoys immediately ahead,

(Continued to page 248)

YOU *Save* WHEN YOU DRIVE *By* MILE-O-METER

Reg. U.S. Pat. Off.

Save
Save

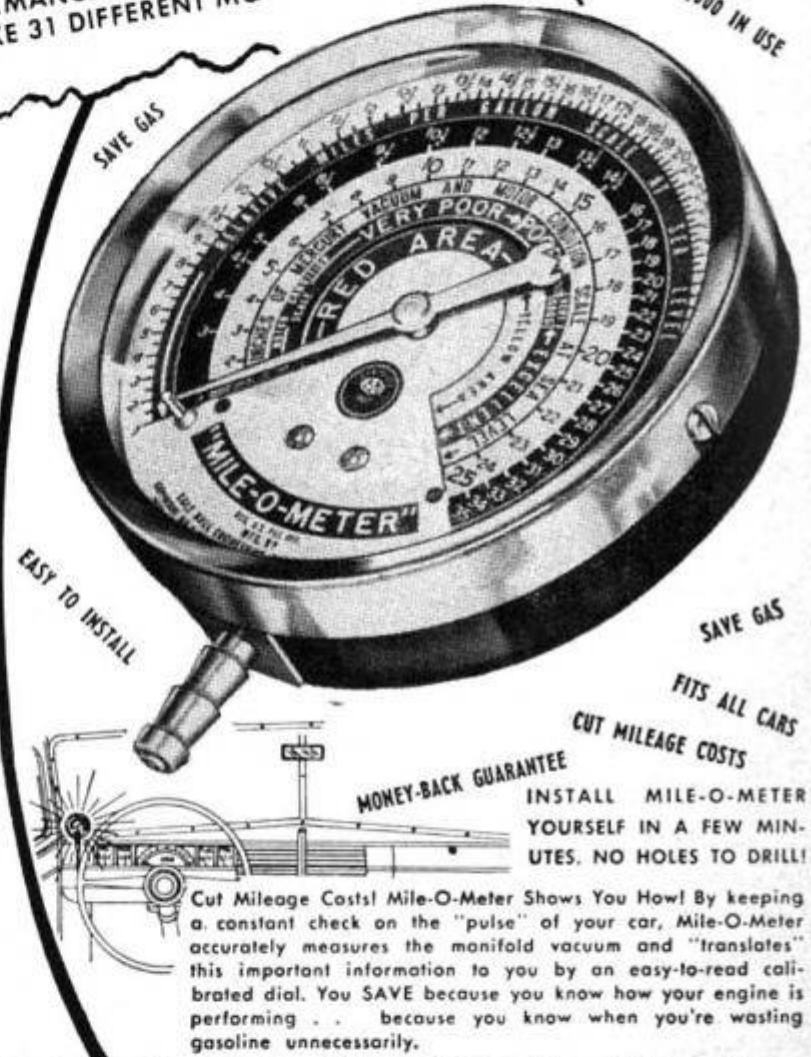
ON GASOLINE — UP TO 1 GALLON IN EVERY 4 — BECAUSE MILE-O-METER MAKES IT EASY TO DRIVE ECONOMICALLY

ON REPAIRS — BECAUSE MILE-O-METER REGISTERS PERFORMANCE OF YOUR ENGINE — SHOWS YOU HOW TO MAKE 31 DIFFERENT MOTOR ADJUSTMENTS

FITS ALL CARS
EASY TO INSTALL
CUT MILEAGE COSTS
SAVE GASOLINE
MONEY-BACK GUARANTEE
DELUXE MODEL ILLUMINATED
MAKES THE PERFECT GIFT
OVER 1,000,000 IN USE

Mile-O-Meter is a quality-designed gauge with a highly calibrated dial that faithfully registers miles-per-gallon at every speed and driving condition. Mile-O-Meter also serves as a constant check on motor condition, warning when minor adjustments are necessary to prevent costly repair bills . . . adjustments and tune-up jobs that you can do yourself with Mile-O-Meter! It's the most important investment that you can make for overall driving economy . . . Mile-O-Meter pays for itself over and over again! Installation is simple . . . fits all cars . . . no holes to drill . . . takes only a few minutes.

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"Mile-O-Meter is great! I endorse and recommend it to every motorist," Lee Wallard . . . "Mile-O-Meter makes a perfect gift," William Holden . . . "I would say that anybody who is interested in economy (and who isn't these days!) is foolish to be without a Mile-O-Meter." C. Gordon Bennett . . . and thousands of other satisfied users throughout the world!

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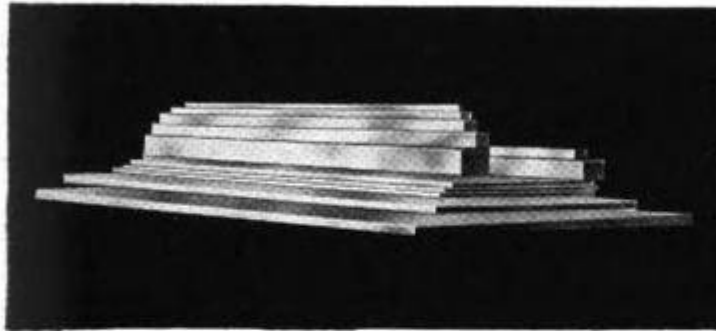
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Starrett Metal Cutting Band Saws are especially adapted for precision sawing and contour cutting. For best results, use Starrett Band Saws.

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HACKSAWS, BAND SAWS and BAND KNIVES

pulsations that last only six ten-millionths of a second are switched on. To view an oncoming tanker and lighthouse beside it, a pulse length of two ten-millionths may be used. And, only with HSR, an unimportant land mass can be pushed into the corner of your picture screen, or entirely off it, allowing greater concentration on some more specific menace.

Another advantage is promised for rescue workers. The most tragic element in sea disasters often is the nerve-shattering, unsuccessful search for sinking survivors. Fog, snow or rain can prevent boats and airplanes from entering the hunt, or at sea, a suspected scene may be too obscure to examine and may cost too much time in relation to the hunch. These precious hours might be conserved with certainty by HSR through its double action: not merely scoring-in the helpless victims but guiding their rescuers unhesitatingly.

In the event of war, HSR and its innovations would offer a score of benefits to the mass shipment of men, machinery and munitions to bases where the shortest dock delay could mean a battalion's loss at the front.

As harbor-surveillance radar begins to prove its worth in peacetime, eventually all harbors on U. S. coasts are expected to enlist its help in cutting down fog's never-ending toll of lives and money. Within the next two years, Raytheon plans installations all over the world. The earliest will be at New York, Halifax, Vancouver and Auckland.

With almost clocklike regularity, fog shoves itself from the Pacific as a thousand-foot wall through San Francisco's Golden Gate, plaguing all commercial and pleasure craft. From the Atlantic it invades unpredictably and inevitably, whenever enough air heated over the Gulf Stream brushes along the Labrador Current. San Francisco, therefore, blushes before its sunshine claims have died down. Ships' navigators along the Atlantic seaboard are frequently caught with their hourly forecasts down. HSR's uplifting answer to fog may not solve red faces but it will lift more shipmen out of the red. ★ ★ ★

Plastic Resembles Foam Rubber

Material similar to foam rubber — but more resistant to flames and chemicals and easier to fabricate—is made by a new process of expanding Vinylite plastisol. The compound is poured into a metal cylinder and expanded by 400 pounds of gas pressure. After the cylinder has been agitated by a hand crank, the gas forces the foam out with a consistency of thick whipped cream.

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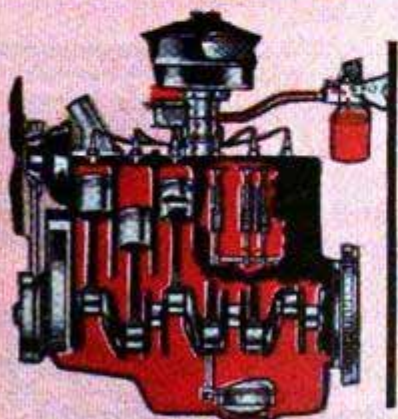


Drivers in the know . . . know Marvel is the finest lubricant you can put into your crankcase and gas tank.

And that goes for both new cars and used cars. Age doesn't matter. What does matter is the way Marvel registers — in the lower service charges you shell out at inspection intervals.

Try a can of Marvel in your engine today. See if your car doesn't run better, longer . . . right from the start!

**MARVEL MYSTERY OIL—
THE MECHANIC'S CHOICE
FOR THIRTY YEARS**



Marvel in the crankcase lays a strong, heat-resistant film of oil on all moving parts . . . eliminates hydraulic valve clatter . . . provides ring seal . . . cleans, cools and protects bearings and vital upper cylinder regions. The car runs for many more engine miles per dollar.

Install a Marvel Inverse Oilier for direct lubrication to the heart of the engine. Feeds in direct proportion to horsepower curve through inverse ratio to manifold vacuum. No other oiler works on this principle! Fully adjustable. Easy to install. Fully guaranteed.

For more information, write:
EMEROL MANUFACTURING CO., INC.
Dept. 123, 242 W. 69th St., New York 23, N. Y.



Hollywood's TV Bug Eradicator

(Continued from page 85)

trying to sell the show, was calmly leaning back in his chair, using the equipment rack for a footrest, and had kicked off the breaker, causing the trouble!

Then there was the time back in radio when Lew held a program on the air literally with his two bare hands. "Old tired thumbs," the fellows tagged him after that well-remembered episode.

Twenty seconds before air time, an engineer gave a desperate call for help over the "SOS" system. The main power switch had become defective, intermittently opening up. Lew dashed to the rescue but found a clip lead was too small to fit over the cables, so he pressed it across, clamping it down with his two thumbs, actually holding the show on the air for the broadcast. He was standing on a rubber mat, so he was in no danger.

"Lucky for me," he laughs, "it was only a five-minute insert. My fingers were so cramped I could hardly move them, as it was, and I don't know what they'd been like if it had been a 15-minute program."

Sometimes he uses measures not recommended by the textbooks. In those split seconds when a picture's coming up and the camera suddenly goes temperamental,

he gives it a quick blow with his hand. Gambling on a long chance, he either shocks it back into operation or loses it altogether!

"Once a film chain started oscillating," he stated. "That's when weaving lines make a distorted picture. There was a commercial coming up in 10 seconds, so I didn't have time to change tubes. I just gave it a hard bat with my hand, and it settled down. Never did act up again, so I won't ever know what happened."

Lew became interested in electricity back in high school in Nebraska, but it was many years before his hobby could become his profession. When he finished school, he went to work in a bakery and had little time for outside interests. But one day in 1929, he chanced to pick up a technical magazine on a newsstand and built a radio set from a diagram in it.

"It worked, too, after a fashion," he chuckled, "but I had to learn the hard way."

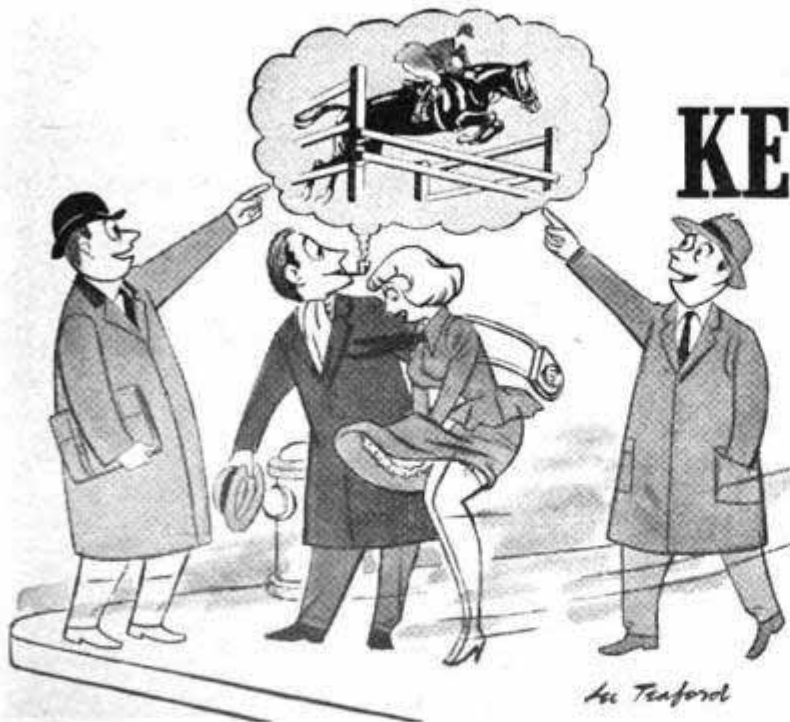
This brief brush with electrons and ohms renewed his interest so much that he took a correspondence course and kept on studying until finally he could wipe the flour off his fingers once and for all and go into radio service as his profession. That was in 1941. During the war, he taught an Army training program for seven or eight months,

(Continued to page 252)

DO IT TODAY! SWITCH TO

MILD

KENTUCKY CLUB



"Look! Another man switched to Kentucky Club—the thoroughbred of pipe tobaccos."

Notice how much better your pipe tastes—how much fresher your mouth feels when you switch to Kentucky Club.

Look for the blue tin with the picture of the red-coated rider. Send for free catalog showing fine pipes and how to get them at big savings. Mail Pouch Tobacco Co., Wheeling, West Va. Dept. 95



Give it a whirl



**...MARFAK
holds together!**

Even the whirl test can't pull *Marfak* apart! When ordinary grease would come apart, extra-stretchy *Marfak* stays together — sticks to the job! This test shows how *Marfak* clings to points of wear and friction longer, resists jar-out, squeeze-out and wash-out. So when your car's chassis gets *Marfak* lubrication, you get that *cushiony* ride — for 1,000 miles or more! Drive in for longer lasting *Marfak* lubrication. See your Texaco Dealer, *the best friend your car ever had*.

THE TEXAS COMPANY
TEXACO DEALERS IN ALL 48 STATES

Texaco Products are also distributed in Canada and in Latin America



Faithfully yours
50
for Fifty Years

TUNE IN: Tuesday nights on television — the TEXACO STAR THEATER starring MILTON BERLE. . . .
See newspaper for time and station.

OLDSMOBILE'S

FAMOUS 160 HORSEPOWER

"ROCKET" ENGINE



Olds engineers wisely protect every working part of the Rocket engine with an AC Oil Filter and Aluvac Element. Here's why—

- 1 ALUVAC keeps oil clean . . . removes particles as small as 1/100,000 of an inch
- 2 ALUVAC has greater filtering area . . . it's ten times greater than ordinary elements
- 3 ALUVAC has no harmful chemicals . . . won't destroy detergents in heavy-duty oils
- 4 ALUVAC is dependable . . . resists harmful acids, gasoline, water

There's an AC Aluvac Element made to fit the oil filter on most every car!

AC SPARK PLUG DIVISION  GENERAL MOTORS CORPORATION

and then in 1943, he went to work in NBC's radio-maintenance department, then to television in 1948. His life has been full of split-second emergencies ever since.

Recently, trouble landed with a *wham* because of a device the power company uses to level the load condition of their lines. It is a carrier control which superimposes a signal of 720 cycles per second on their lines to govern the turning on and off of electric water heaters. It usually comes on just as the street lights switch into operation. As soon as it happens, the sync generator goes out of cahoots with the power-line frequency and the television picture starts to separate, or jiggle sideways. Lew decided the difficulty was external to the circuits and traced it to the carrier control. Proving that a touch of inventive genius is born in every engineer, he then built a low-pass filter (electrical circuit) which allows the regular 60-cycle power frequency to come through but rejects the 720 cycle.

Lew has a one-track mind when it comes to his job. Just recently, following a big TV show, when the star, Jimmy Durante, had turned in a knockout performance, and the producers were pounding each other on the back in triumph, someone asked the tall, quiet man, busily turning off circuit breakers over at the power panel, "How'd it go, Lew?"

"Fine," he said. "Just before the broadcast, someone stumbled over a co-ax-cable outlet, stopping four stage-picture monitors, but we haywired it together so the show opened O. K. Then 22 minutes after 5, the big-screen projector went yellow, but we decreased the beam current and corrected that in a hurry. Five minutes later, we lost one of the trailing equalizing pulses, so we had to adjust the sync generator to take care of that. Everything turned out just fine."

"Sure," they persisted, "but didn't you think the bit where they tore up the piano was terrific?"

Lew scratched his head thoughtfully. "I don't know," he said slowly. "Who was on the show tonight?" ★★★

Radioactive Needles Aid in Fight Against Cancer

Hollow needles filled with radioactive cobalt and inserted in cancerous flesh promise to make similar radium intertissue treatments obsolete. Needles having a variety of lengths and intensities can be inserted in the tumor so that the area is uniformly treated. Even the needle itself may contain different intensities.

Only Sears Sells an

8 in. Tilting Arbor Bench Saw-Jointer-Planer Combination



What your Bench Saw will do!

It crosscuts, rips and miter wood or plastics. With proper accessories, it will dado, groove, sand, sharpen or grind. And with a special cut-off wheel, it can cut brick, stone, metal, concrete, etc. Gives your work a professional look.

Both CRAFTSMAN Power Tools have Sealed Precision Ball Bearings

Both CRAFTSMAN Power Tools for One Low Price!

Complete Outfit

\$165⁰⁰ Cash

\$16.50 Down on Easy Terms



What your Jointer-Planer will do!

Performs some types of edging and surface work as a hand plane, but does the work faster and more accurately! Makes perfect rabbeting cuts for doors, window frames, tables, drawers, cabinets, etc. Ideal for making square tapered cuts on chair legs, etc., and for accurate beveling work. Makes accurate glue joints.

We know of NO finer Saw and Jointer Combination in America . . . so complete . . . so accurate . . . so low priced!

Now . . . this combination gives you Double Utility . . . make all saw cuts with lumber in level position AND plane and joint without moving to another bench. NOTHING LIKE IT—the most useful, space saving combination we've ever seen! Saves you money, too . . . both tools work from one motor! No need to buy a second motor and bench.

Here's what you get at this sensational low price:

Big, CRAFTSMAN 8-in. Tilting-Arbor Bench Saw. Has "Floating-Drive" . . . smotheres vibration, permits easier tilting and controls belt tension. ONE wheel controls BOTH angle and depth of cut. 20x17-in. table of cast semi-steel. Precision ground; sides machined. Grooved on both sides of blade for miter gauge. 9 1/2-in. in front of blade at full depth of cut. Use fence on either side of blade. Double-row sealed ball bearings NEVER need lubrication. 8-in. combination blade (1/2-in. bore) gives up to 2 1/2-in. depth of cut; tilts any angle to 45°. With miter gauge, rip fence, machine pulley, motor pulley, V-belt.

CRAFTSMAN 4 3/8-inch Jointer-Planer. Massive, cast semi-steel base extends full length of tables. Over-all length 29 7/16 in. Precision ground tables. Steel cutter head has three 4 3/8-in. high speed steel knives. Maximum depth of cut 3/8-in.; rabbet depth 3/8-in. Fence tilts up to 45° in either direction. 2-in. machine pulley supplied.

Outfit also includes: (1) CRAFTSMAN 1/2-H.P. Capacitor Motor; 3450 R.P.M.; for 110-120-volt 60-cycle A.C. (2) Steel Power Tool Bench; 30 in. long; 16 1/4 in. wide. Adjustable for any height from 22 to 32 in. (3) Jack Shaft Kit; shafting, pulley, belts, shaft hangers and attachment plates. See this combination at your nearest Sears Retail Store TODAY! Complete outfit only \$165.00

Jack Shaft Kit only. For Bench Saw, Jointer-Planer combination \$18.50.

The Sears Retail Store nearest you will furnish you with exact selling prices which will not exceed O.P.S. ceiling prices.

CRAFTSMAN Hand and Power Tools by **SEARS, ROEBUCK and CO.**

Famous for fine quality . . . precision performance . . . low price!

Strait Jackets for Ol' Man River

(Continued from page 130)

One of the purposes of the Mississippi basin model is to study the river system as it exists today with all dams, floodways, levees and other improvements in place, then to learn what happens when other improvements are added. Downstream effects as well as local results can both be studied at once. If it's thought that an additional floodway at a certain point would relieve high water in the main channel, a miniature floodway is installed in the model for study. The value of levees built to certain heights, the effects of new dams, and a dozen and one other river control problems can be solved easily and quickly with the model.

On the model a 24-hour day is compressed into little more than five minutes. This is a valuable asset and allows the engineers to study the effects of a flood while the water is still away upstream. That is, real floodwaters require weeks to travel all the way down the river to the mouth, while on the model the whole sequence can be run off in less than a day.

From Weather Bureau information the engineers can "set up" on the model the upstream conditions that threaten to create a flood, then they can measure the

heights of the water as it makes its way along the model's channels. Areas that will be endangered can be spotted in plenty of time to take remedial steps. If bypasses and floodways exist in that part of the river system they can be operated in different combinations, in miniature, to provide different solutions so that the engineers can select the best answer.

The model will be even more valuable as a working tool when all the major upstream dams are completed. At that time it will be vitally necessary to know, in advance, how best to manage the water in the different reservoirs. Rain-and-water conditions in each part of the basin will have to be correlated with conditions in the rest of the area. By running off trial solutions with the model the engineers will be able to pick the best answer to each set of conditions, before the conditions themselves become critical.

No one knows, yet, exactly how many dams will be needed to tame the Mississippi river system. A total of some 80 reservoirs ultimately are contemplated for the Ohio, more than 100 are planned for the Missouri portion of the watershed. The Missouri program, in fact, is well under way under the comprehensive Pick-Sloan development plan. This plan will not only prevent

(Continued to page 256)



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to own the best**

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Winchester rifles are such *fine* firearms that people sometimes overlook another very important Winchester advantage... their extra years of service without costly repair. For pride of ownership, shooting excellence, balance, beauty... for every reason, buy a genuine Winchester 22.

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MODEL 61. Fast, smooth slide-action Winchester repeater. Hammerless. Tubular magazine holds 20 Shorts, 16 Long, or 14 Long Rifle cartridges. Cross lock safety. 24" barrel; 5½ lbs.

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PROTECT YOUR CAR WITH PEAK® ANTI-FREEZE

There's no need to worry when the mercury drops if your car is protected with Peak . . . the all-winter, all-weather anti-freeze. One filling is all you need for complete winter protection. You avoid the fuss and bother of check-ups after every warm spell . . . Peak won't evaporate or boil away even on the warmest day. What's more, an exclusive combina-

tion of anti-rust ingredients keeps the cooling system clean all winter . . . prevents rust and corrosion and clogged radiators. Why not see your serviceman today? Let him clean the cooling system and put it in tip-top shape. Then, let him install Peak and your winter worries will be over. PEAK ANTI-FREEZE is a product of Commercial Solvents Corporation.

LOOK FOR THE BLUE AND SILVER CAN

... \$3⁷⁵
GALLON



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Rust? NEVER! NEVER!



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IS ALL
YOU NEED

PEAK... THE ALL-WINTER... ALL-WEATHER ANTI-FREEZE

New TOMLEE BOOK

Shows "How To Do It"
in Your Home Workshop



Get Your Copy for a Quarter!

It's a must for every beginner as well as the skilled craftsman. Tells how to arrange your workshop. Shows the proper speed and use of all the Tomlee power tools and accessories. Illustrates wood joints, dadoing, planing, mortising, routing, sanding, lathe turning as well as 50 handcraft patterns. 28 pages in all, chuck full of information. Use coupon below.



TILT ARBOR SAW

8" and 10". Rips, cross-cuts, mitres as well as dadoing.



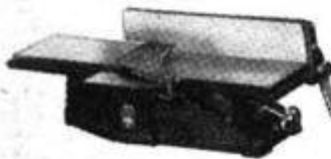
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Grinds or sands difficult angles in wood or metal.



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4" and 6" sizes take the hard hand work out of planing and jointing.



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The quick, easy way to give that professional look to your work.



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With simple accessories, seven tools in one.



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For straight or irregular wood cutting.



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Will do heavy turnings, in-board or outboard.

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Please rush the new Tomlee Book. Enclosed find 25c (stamps or coin)

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destructive floods by means of hold-back reservoirs, it will provide water for irrigating five million acres of land in the upper part of the basin, create a tremendous amount of hydroelectric current for farm electrification, and perform other benefits including a navigable channel of nine feet depth up the river to Sioux City.

Up toward its headwaters, the Missouri already is spanned by Fort Peck Dam, the largest earth fill structure in the world. This dam is almost four miles long, stands 250 feet above the stream bed, and contains a total of 130,000,000 cubic yards of earth, gravel, and rock. Its reservoir has a capacity of 19,500,000 acre feet.

Downstream from Fort Peck Dam, two additional giant earthen dams are under construction now. Garrison Dam in North Dakota is to be two miles long, will contain some 70,000,000 cubic yards of rolled earth fill, and will hold back some 23,000,000 acre feet of water in a reservoir that runs 200 miles upstream. It is estimated that it would require the entire flow of the Missouri for one year to fill the reservoir.

Also under construction on the Missouri, in South Dakota, is the Oahe Reservoir, designed for a 23,600,000-acre-foot capacity. Several smaller works including Fort Randall Dam with a capacity of 6,300,000 acre feet are under construction on the river and others are contemplated for the near future, all being built by the U. S. Army Corps of Engineers. ★ ★ ★

Power Edger and Trimmer



Backaches and much time-consuming labor are eliminated when a new power edger and trimmer is used. The unit, which weighs only 75 pounds, may be adapted for all types of lawn edging, trimming around trees, buildings, or flower beds, cleaning around sprinkler heads and even scalping if required. The cutting head is controlled from a normal standing position.

EAVESDROP BEHIND THE IRON CURTAIN

WITH THE **Mighty Midget** SENSATIONAL 4-BAND TABLE RADIO

Have you ever listened to the news — Moscow version? What does the Politburo think of the U. S. Presidential Election? Hear English-speaking announcers straight from Radio Moscow! Plus exciting programs from all over the world! Plus the standard broadcast band! All on this table radio by the makers of radio equipment for Kon-Tiki and the U. S. Navy!



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Booklet tells what you can hear — when and where — on shortwave radio. Yours for the asking at any of the dealers listed below.



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J. G. Bowman Co., 515 E. 75th St., Chi.
Newark Elec., 223 W. Madison St., Chi.
Hudson-Ross, 111 W. Jackson Blvd., Chi.
Montgomery-Ward & Co., Chicago, Ill.

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World Radio Laboratories, Inc., 740 W.
Broadway, Council Bluffs

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Hairy & Young, 811 Boylston St.
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NEW

16-OUNCE machine shop



with 40 most
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in see-thru case

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Only Loyd Scruggs Gives You All These Features

- 110 V., A.C.-D.C.; U. L. approved.
- 25,000 r.p.m.—all the power you'll need.
- Compact (6" long, 1½" diam.), balanced for easy handling.
- Efficient fan, aluminum housing for cool operation.
- Positive switch tested for 100,000 operations.
- 7-bar commutator (not 3) increases performance.
- Ball bearing construction, sealed-in lubrication.

TRY IT at your Hardware Store, Department Store or Hobby Shop

Not until you use this palm-size powerhouse — and see for yourself the sweet way it performs countless jobs — will you know why the new **LOYD SCRUGGS PRECISION POWER TOOL** IS YOUR MOST PRACTICAL BUY! For the name of your nearest dealer and interesting free folder, write The Loyd Scruggs Co., 1022 N. Sixth St., Dept. PM-1055, St. Louis 1, Mo.

Loyd Scruggs
PRECISION POWER TOOL

The Owners Report on the Willys

(Continued from page 114)

It is a pleasure to own and drive."—Topeka, Kans., farmer.

"I like my Willys so well I'm buying a second one for my son. I'd like to see chrome strip on side to prevent marring by doors of other cars when opened in a parking lot by inconsiderate drivers, and heavier rear fenders."—Chicago carpenter.

As in all our surveys, the questionnaires asked owners to list their specific dislikes about their cars. Most frequent complaint concerning the Willys was lack of sufficient



Overdrive is engaged by a knob below dash. Of owners polled, 94 percent stated they have overdrive

legroom in the back seat. (More room has been added in recent weeks.) This also led the list of "specific improvements" desired in the owners' next cars. Owners in Louisville, Ky., Alexandria, Va., and High Point, N. C., were among a group that complained that the Willys' hub caps kept coming off. (The factory says this defect was on only a few hundred of the first cars and has been corrected.)

A Port Arthur, Tex., engineer and a Bethpage, N. Y., movie technician were among a few who protested that the radio controls on the dash are too far from the driver. Other notations included:

"I don't like the pull-type door handles because a child might lean against them and unlock them by mistake."—Alexandria, Va., secretary.

(Continued to page 260)



The wings of a hummingbird beat 80 times a second. Transistors, developed experimentally by RCA, oscillate electrically 300 million times a second.

300 million times a second!

Now science has discovered a magic new tool—a major development in electronic research—the *transistor*. Tiny as a kernel of corn, this speck of germanium crystal embedded with wires in plastic can perform many of the functions of the more familiar electron tube.

Because it has no heated filament, no vacuum, requires no warm-up and little power, the transistor is a device long needed in electronics. It is also rugged, shock-resistant, unaffected by dampness and—properly made—it will serve for many years.

Despite these advantages, the transistor, until recently, was limited to a frequency region below 50 million oscillations a

second. Experimentally RCA has now increased this to *300 million times a second* and even higher goals are sought—to increase the transistor's uses.

Higher frequencies for transistors point the way to their use in television, radio, communications and better electronic controls for airplanes. The small size, long life, and low power requirements of transistors suggest entirely new electronic devices—as well as use of transistors as working partners with electron tubes.

* * *

Expanding the research in electronics of solids and the possibilities of transistors is another example of RCA pioneering at work for your benefit. This leadership means finer performance from any product or service of RCA and RCA Victor.



RADIO CORPORATION OF AMERICA

World leader in radio—first in television

SELF-CONTROL STARTS HERE



AND TO RESTORE
CAR PERFORMANCE

OIL-CONTROL STARTS HERE

To stop oil-pumping, replace worn engine connecting rod bearings

It's the level truth, proved by exhaustive engineering research — **WORN ENGINE BEARINGS CAUSE OIL PUMPING!**

Here's how: Normally, main and connecting rod bearings "meter" lubricating oil in the exact amounts the engine needs. *Worn* bearings let excess oil reach the piston assembly, over-burden the piston rings. The rings were not designed to cope with this situation for very long. **Result:** The oil burns to carbon, which cakes spark plugs, valves, pistons and rings. *Performance goes up in smoke!*

Give the rings a chance to do their own job! Check for worn engine bearings, too. Replace with genuine Federal-Mogul bearings, *engineered* for the job of oil control. *Ask your mechanic!*

FEDERAL-MOGUL SERVICE

(Division of Federal-Mogul Corporation)
DETROIT 13, MICHIGAN



CONTROL OIL-PUMPING
WHERE IT STARTS—REPLACE WITH

FEDERAL-MOGUL

OIL CONTROL BEARINGS

"Short wheelbase (108 inches) is wonderful. Car is very easy to park, turns short and 'scats' through traffic with little effort. It's a sensibly sized car, performs with any of the higher-priced cars and has a great future."—Chicago insurance man.

"The design of the car is good, but why did Willys cheapen the looks by placing the letter W on the car no less than seven times?"—Jackson, Miss., commercial artist.

"Not enough weight in the rear. When

1952 AERO WILLYS SPECIFICATIONS

ENGINE

	Aero Ace Aero Wing	Aero Lark
Type	6-cyl., F-head	6-cyl., L-head
Bore and stroke	3 1/8 in. x 3 1/2 in.	3 1/8 in. x 3 1/2 in.
Piston displacement	161 cu. in.	161 cu. in.
Brake horsepower	90	75
Compression ratio	7.6:1	6.9:1
Transmission	3-speed conventional. Overdrive optional on all models	

GENERAL

	All Models
Steering ratio	23.7:1 over-all
Steering wheel, lock to lock	3 1/2 turns
Turning radius	19 ft.
Brakes	Conventional hydraulic with riveted linings
Tire size	5.90 x 15
Recommended tire pressure	24 lb.
Shipping weight (2-dr. sedan, unladen)	Ace—2585 lb. Wing—2570 lb. Lark—2487 lb.
Wheelbase	108 in.
Tread, front	58 in.
Tread, rear	57 in.
Height over-all (unladen)	60 in.
Width over-all	72 in.
Length over-all	180 7/8 in.
Road clearance	9 in.

CAPACITIES

Oil	5 qt.
Water	11 qt.
Gasoline	18 gal.

INTERIOR DIMENSIONS

Front-seat width	61 in.
Rear-seat width	61 in.
Headroom, front	35 1/2 in.
Headroom, rear	34 1/2 in.
Legroom, front	42 1/2 in.
Legroom, rear	36 1/4 in.

large trucks or busses pass going in the same direction the wind pressure almost blows the car off the road."—Memphis, Tenn., factory employee.

It is interesting that 73 percent of the owners said they would prefer the F-head valve arrangement in their next cars and that 87 percent desired no increase in horsepower over the Willys' present 90 or 75 horsepower. Although V-8 engines are gaining in popularity, only 26 percent of Willys owners who answered want a V-type engine in their next cars. Seventy-eight percent want six cylinders, and 74 percent want them in line, which does not indicate that the V-6 has many followers, as the new

(Continued to page 262)



THE NEW PHAETON is a Chrysler-built custom automobile. Powering it is the Chrysler FirePower Engine. It has a wheelbase of 147½" and is distinguished

by full-time Power Steering, Oriflow Shock Absorbers, Fluid-Torque Drive and other Chrysler engineering exclusives. Tonneau top is concealed.

STYLING THAT INFLUENCES YOUR CHRYSLER-BUILT CAR

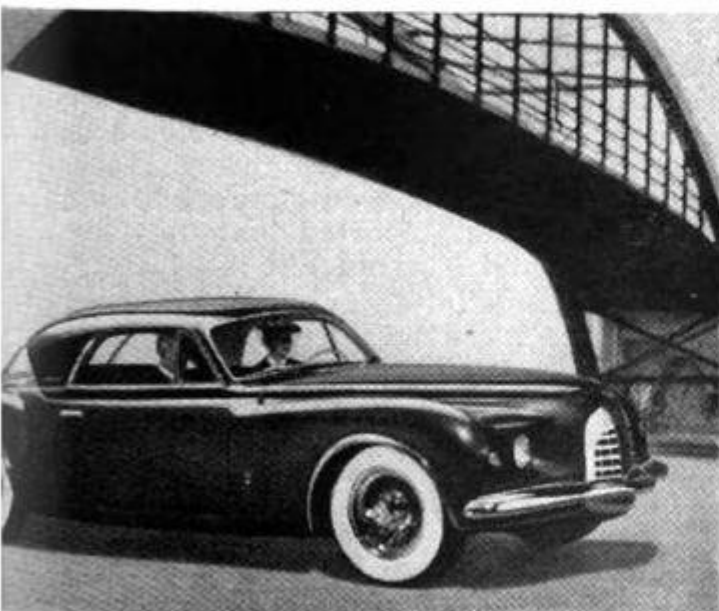
From the dramatic cars on this page — each an example of creative styling and engineering — come advances that appear in every Chrysler Corporation car.

Chrysler designers and engineers developed the K-310, the C-200 and the new Chrysler Phaeton to express certain ideas of construction and styling—to put to the test of steel and fabric their newest, most promising automotive developments. A superior motor car evolves; it does not suddenly come into being: these graceful, pleasing designs, and the lessons learned perfecting them, are reflected in the creation of your Plymouth, Dodge, DeSoto or Chrysler.

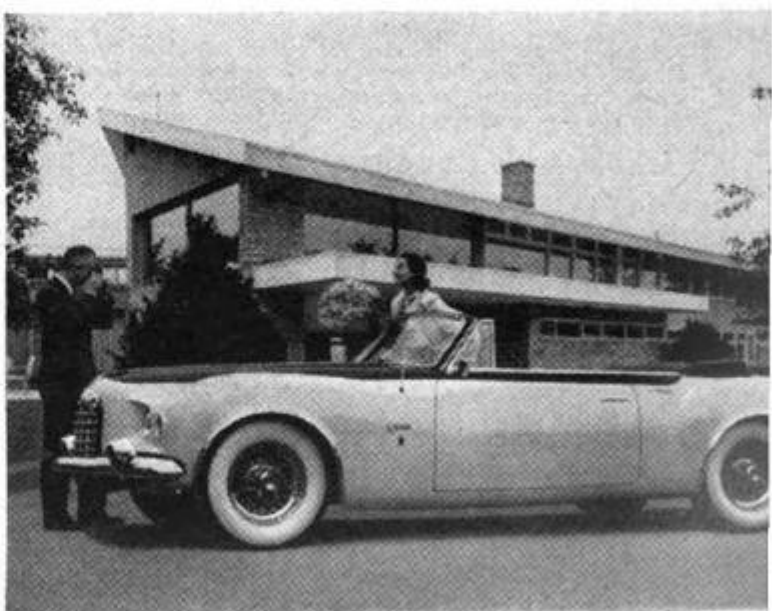
These, therefore, are "idea cars" — expressions in line and in form of the imagination always at work at Chrysler Corporation. Exciting outside and inside, they reflect continuing Chrysler principles—that beauty, in an automobile, follows function, and that car designs can best be created by designers *and* engineers, working together.

CHRYSLER CORPORATION engineers and builds PLYMOUTH, DODGE, DE SOTO, CHRYSLER CARS & DODGE TRUCKS

Chrysler Marine & Industrial Engines • Oilite Metal Powder Products • Mopar Parts & Accessories
Altemp Heating, Air Conditioning, Refrigeration • Cycleweld Cement Products



THE K-310, designed and engineered by Chrysler and handcrafted by Ghia of Turin, Italy. Only 59" high,



The C-200, designed by Chrysler and handcrafted, like the K-310, by Ghia of Turin, Italy. It is powered by the

New Tools from Millers Falls

Most Versatile Power Tool You Can Buy

Sand, polish, drill, grind, wax, wire brush, mix paints — you can do them all with this powerful new 6-inch Millers Falls No. 966. And it's the only rotary sander-polisher that can be equipped with an orbital attachment for fine finishing.



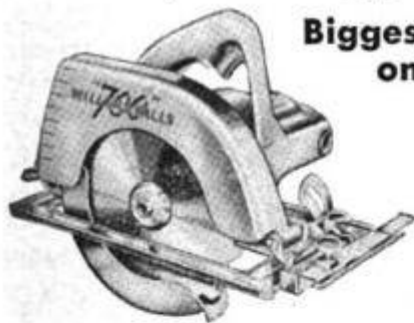
A Rugged Husky for Tough Cutting

Razor sharp — with large, palm-fitting handle that lets you really bear down, this new No. 333 Utility Knife belongs in every tool kit. Unexcelled for heavy cutting in wood, linoleum, leather, cardboard, etc. Complete with 5 blades.



Biggest Saw Value on the Market

Big enough to cut finished 2x4's at 45° mitre, yet weighing only 11 lbs., this new 7-inch Millers Falls No. 700 packs a full 1/2 h.p. wallop. It's sturdily built, compact, safe to use. Easy to handle and control—with all the capacity you need for practically any sawing job.



See these great new Millers Falls tools at your hardware dealer's soon. They'll save you time and work on countless jobs — and they're priced to give you top value for your dollar in every way.

Millers Falls Company, Greenfield, Mass.



The Mark of Superiority

Italian V-6 Lancia has in Europe. A surprisingly small number of owners seemed interested in automatic transmissions and only 17 percent wanted an automatic-transmission unit next time. An amazing 94 percent who reported own cars equipped with overdrive.

One of life's bitter moments came to light in this survey, although the make of car had nothing to do with it. A Chicago man wrote: "I was unfortunate enough to get hold of a 'lemon.' Through no fault of Willys, I have spent more than \$200 trying to make my car run right, due to a cork from a Thermos bottle being left in the intake manifold. The best mechanics in the

ACCELERATION TEST

1952 WILLYS AERO ACE WITH OVERDRIVE

1/4 mile from zero 20.8 seconds

1/2 mile from zero 33.2 seconds

0 to 30 m.p.h. 5.1 seconds

0 to 60 m.p.h. 17.9 seconds

Top speed by speedometer.....98-100 m.p.h.
Actual top speed about 8% less (speedometer variation)

country couldn't find it until I milled .36 off the head and discovered a little thing that can drive you crazy."

And now for my own test: I drove the 1952 Willys Ace test car from Toledo to Denver, 1479 miles, including some side trips for testing in the Rocky Mountains.

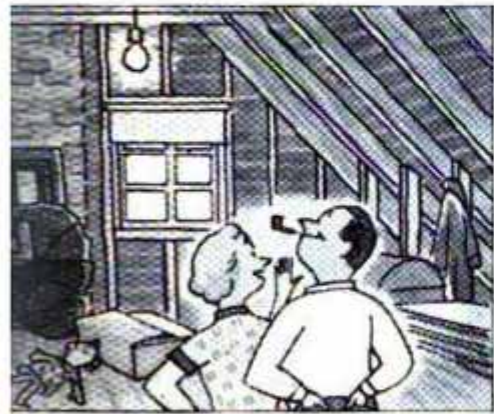
The Ace model is equipped with the new 90-horsepower, 6-cylinder Willys Hurricane F-head engine, which has 161-cubic-inch displacement. The 7.6-to-1 compression ratio is higher than in other cars in the lower-priced field. There is a little tendency for the car to ping with regular gasoline when accelerating in high gear for a short period and in climbing steep hills at slow speed with wide-open throttle, especially on a hot day. Seventy percent of the owners, however, reported that they use regular gas and I consider it satisfactory.

The engine definitely is one of advanced engineering, inasmuch as it has overhead intake valves of 1.750-inch diameter, which is larger than those in the seven lowest-priced cars built in the United States. While this overhead intake-valve design isn't new, it does develop more horsepower than the same size L-head engine. Engine balance is excellent; it is free of vibration.

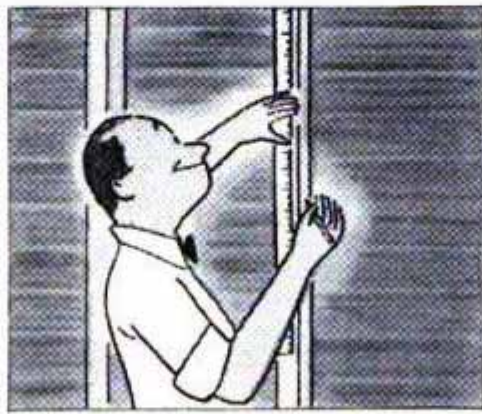
(Continued to page 264)

HOW TO "TRADE-IN" YOUR OLD ATTIC!

It's easy with Gold Bond Insulation Board!



Clear the decks for action! Find someplace else for all the trunks and "heirlooms" that are cluttering up your future attic room.



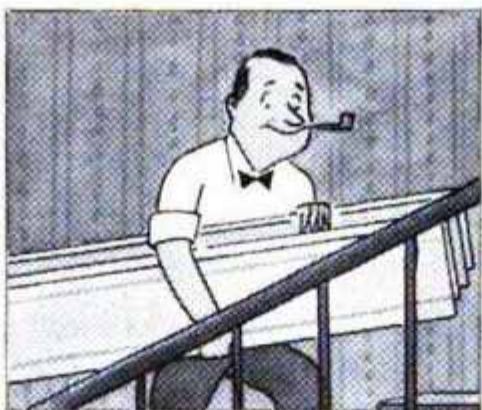
Measure attic walls and ceilings. This will tell you how much material you'll need... also determines where to nail furring strips.



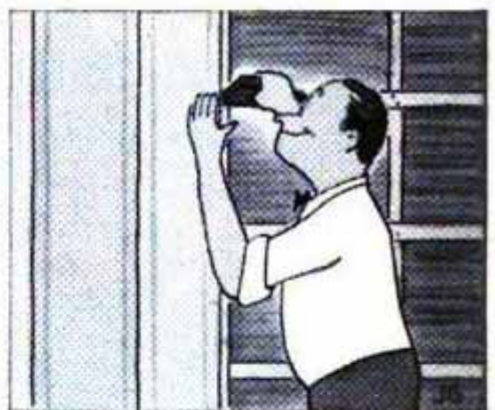
Take measurements to your Gold Bond Dealer. He'll show you factory-finished Gold Bond Insulation Plank and Tile in harmonizing colors.



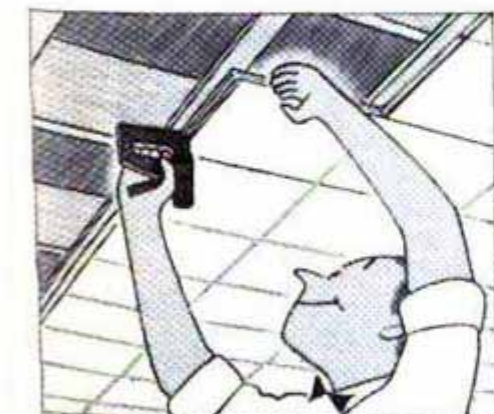
Nail up furring strips—ordinary 1" x 3" wood strips that anybody can handle. This gives you a stapling surface for Gold Bond Plank and Tile.



Gold Bond Insulation Plank and Tile are lightweight. The Plank comes in four widths starting at 8". The tile is packaged in several sizes.



Interlocking beveled edges fit together quickly and easily—hide staples or nails to give a neat, good-looking job.



Even the ceiling job is a cinch... when you use Gold Bond Insulation Tiles. There's no heavy lifting—anyone can do it.



Before you know it, a brand-new room! Pre-painted Gold Bond Insulation Board builds and decorates—insulates and quiets noise, too.

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BUFFALO 2, NEW YORK

ADD-A-ROOM NOW!
with **Gold Bond**



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- I am enclosing \$1.00. Send me Workshop Dispenser and Wards free Power Tool Catalog.

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Route and Box No.

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This new Willys surprised me with its acceleration and the way it handles on the highway. The test car I drove had overdrive and for mile after mile the speedometer needle could be held at 100—80 to 90 mile-an-hour speeds were easy to maintain on any good highway. The speedometer was fast by about 8 percent.

Starting at daylight, I drove from Kansas City to Dodge City, Kans., 402 speedometer miles, in 6 hours, 35 minutes—an average of 61.2 miles per hour, which included three short coffee stops. So you can understand why I say it is a fast road car.

The steering assembly is not of the conventional type. However, it is excellent and suspension is good, giving an especially soft front-end ride. The front shock absorbers are placed at an angle, which helps maintain stability. Front springs could be somewhat heavier for the hard driver, as several times the front end hit bottom when going over bumps at high speed.

After I had finished my cross-country test, I drove another Ace around southern California for about 200 miles and I made one test on a 32-percent-grade, 150-yard hill. From a standing start, the car would do 24 miles per hour at the top, and I have tested only three other stock cars, regardless of price, that exceeded this performance on that hill. Many other popular makes top the hill at 10 to 20 miles per hour. (All tests were made in low gear.)

Why should this be so? Because Willys has one horsepower for every 28.5 pounds of weight, giving it excellent performance.

I drove the car several times on high banks and on a steep slope slowly, just to see how it felt when nearly ready to overturn. The center of gravity is only 23 inches above the road. It would be harder to overturn this car than many other makes. The front tread is 58 inches and the rear tread is one inch narrower.

After driving the car a few miles there is no feeling of being in a small automobile. Steering is exceptionally easy. The outside diameter of the full-circle turn was 38 feet. One desirable safety feature is that, from the driver's seat, my eyes could see the ground over the hood only 10 feet in front of the bumper as compared to about 17 feet for the average car.

The riding position is very comfortable. Both seats are 61 inches wide, which is wider than in five other cars in the low-priced field. Headroom is ample. The Ace has a wrap-around rear window which gives excellent vision. All four fender tips can be seen from the driver's seat, which makes it handy for parking or maneuvering.

The metal used in the body is light and

(Continued to page 266)

AMAZING TESTS PROVE



SYNCRO SANDERS DO MORE WORK PER SQUARE IN. OF SANDING PAD SURFACE THAN SANDERS COSTING TWICE AS MUCH.

Material removal tests for portable electric sanders conducted in the SYNCRO lab—on most of the leading medium priced sanders on the market today—it was proven conclusively that sanders manufactured by SYNCRO Corporation remove more material per square inch of sanding pad surface than sanders costing more than twice as much. This is your proof that SYNCRO sanders are your best buy.

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No. 504
\$19.95
At Dealers
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"Best sander I've used in 40 years of decorating!"



Need we say more about this dependable Syncro Sander when you read what Henry S. Jokela, famed decorator says about it—when you read the Laboratory Test results regarding performance? Of course, Syncro Power Units are also the ONLY such type guaranteed against burn-out during owner-

ship or replaced free! And—Syncro's platen is designed to do ALL finish sanding—not just large flat surfaces. Syncro is BEST for dry wall constructions. NOT an orbital sander. Buy this durable GUARANTEED, powerful but amazingly LIGHT sander at dealers or postpaid from factory. \$19.95.

MOST POWERFUL SAW of its kind!

Finest, most powerful saw of its kind made today! QUIET for apartment use. Portable. SAFE—even children can use. POWERFUL for home shop use. Any length cuts. Stroke adjustable. Complete with BUILT-IN REACTANCE ELECTRIC MOTOR, at dealer or postpaid. **\$24.95**



No. 201
\$24.95



No. 504-D in Metal Carry Case
So handy to carry or keep "504" in. Holds sander, 10 Sandpapers, lamb's wool and fabric/polish pads, cord. Sturdy all metal, 9"x5"x5". At dealers or postpaid!

\$22.95

NEW, SAFE RED ROCKET JIG SAW for Children!



Only **\$14.95**

No. 801 safely cuts 1/2" wood, thin metal, etc.

Table top is solid casting — won't bend. Portable. CUTS SO SMOOTH NO SANDING NECESSARY. A REAL tool for kids. SAFE! Complete, at dealers or postpaid. **\$14.95**

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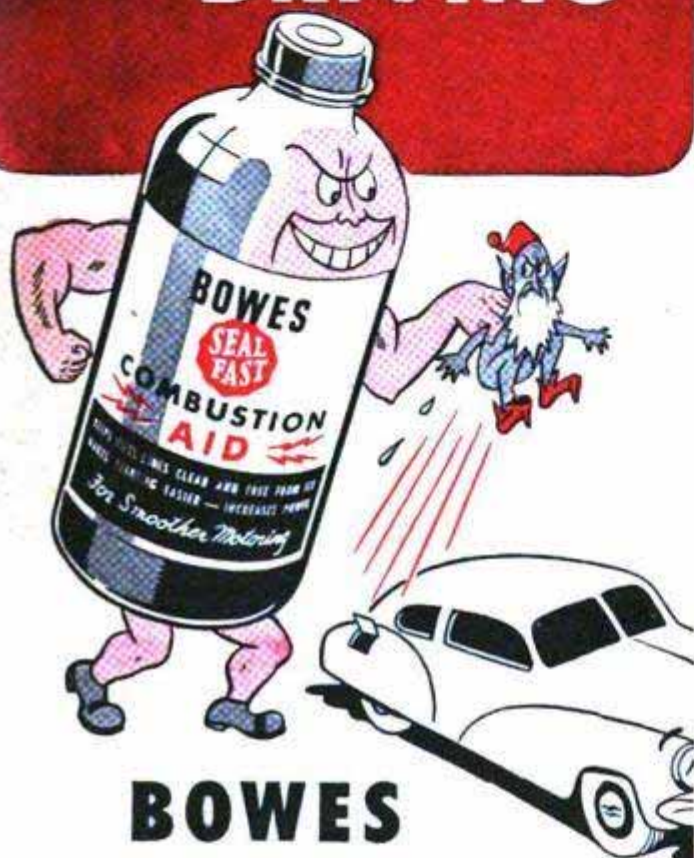
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BOWES COMBUSTION AID

**KEEPS JACK FROST
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MAKES STARTING EASIER,
INCREASES POWER**

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**DRIVE IN
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SEE THIS EMBLEM**



BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, INDIANA

Revolution in the Test Tubes

(Continued from page 122)

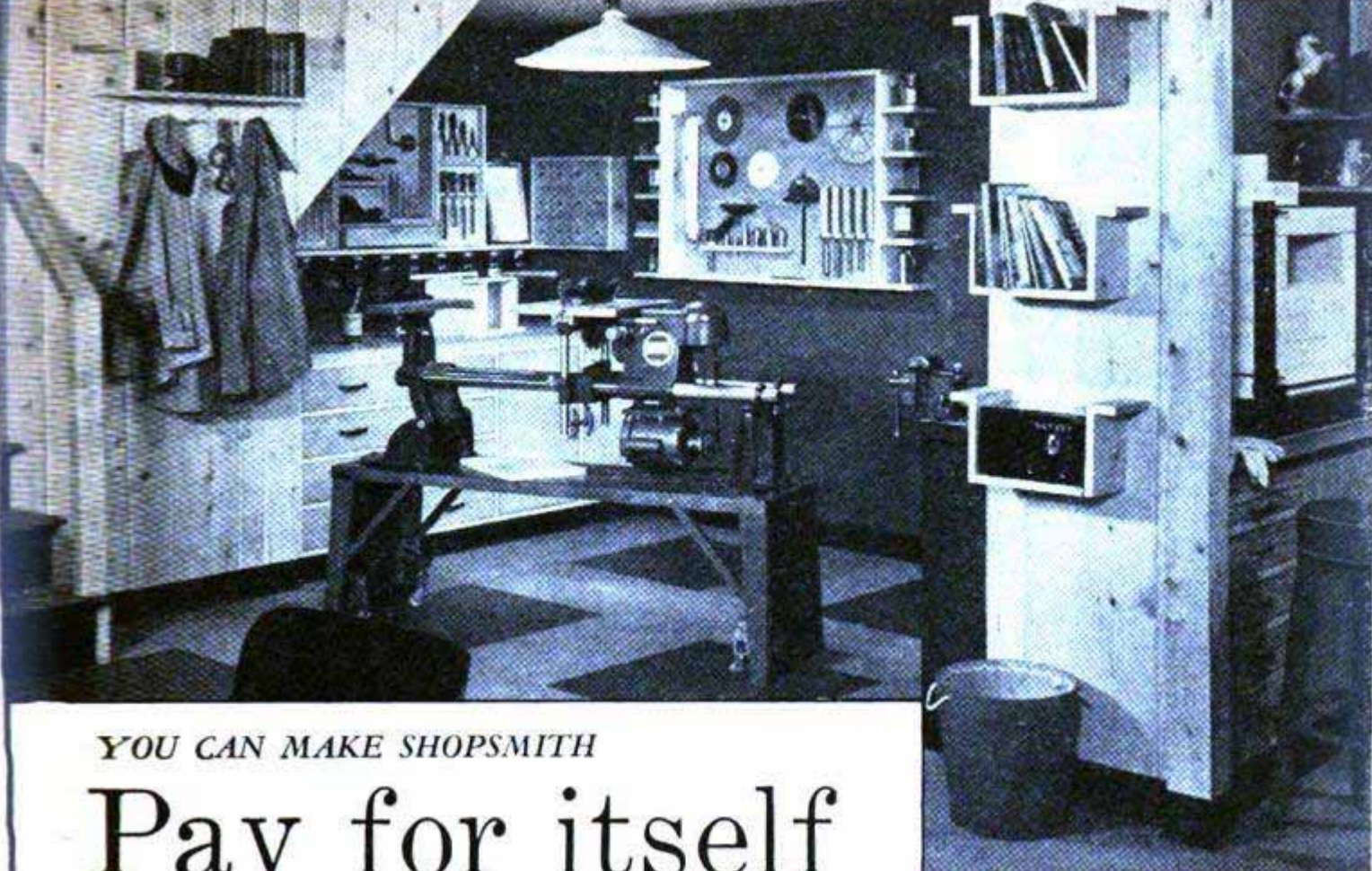
grown for several years. Today with 2,4-D, 2,4,5-T and similar materials we can kill weeds in growing crops, control broad-leaf plants in lawns, make apples stick on the trees, make tomatoes set their bloom, produce seedless fruit and cause fruit to ripen earlier than formerly. All this can be done without damage to the flavor or keeping qualities of the crop. Even the soil itself which harbors wire worms and harmful grubs can be treated with chemicals so that crop yields are improved and more tons of needed food can be grown on our land than were grown before.

Fifty years ago certain plastics were known but were not exploited at all as commercial materials, but today plastics play an ever-increasing part in the automobile and home-appliance industries. The first to be exploited was Bakelite which is still used in large quantities in molded articles, but it had serious drawbacks where speed of production was necessary since it had to be heat-hardened. To improve on this, cellulose acetate, ethyl cellulose, acrylates, polyethylene, polyvinyl chloride, Saran and Styron have come into being. These resins or polymers are thermoplastic and can be softened so they can be forced into molds of intricate design to make many of the objects of everyday use—combs, hair-brushes, refrigerator containers, radio and television parts, toys and a host of other objects too numerous to mention. These plastics can be cast into film for use as a wrapping which is moistureproof and verminproof. These resins and others form the base of our modern paints and varnishes.

We should not forget that the manufacture and use of glass have expanded tremendously in the last 50 years with the invention of Pyrex glass and Fiberglas. In fact, the invention of Pyrex glass, which is almost unbreakable by ordinary heat shock, has been the greatest boon to laboratory work that has been invented. And who would have dreamed 50 years ago that we would see glass spun into cloth and a whole industry built-on glass fiber?

While we are talking of fibers we might as well consider what has happened in the synthetic-fiber field. Fifty years ago people dreamed of fibers made from chemicals without the medium of a plant, animal or insect but no one dreamed that we would have what we see today. Rayon, cellulose acetate, nylon and other polyamide fibers, acrylonitrile and its derivatives, and polyesters have all come into use in large quantities as everyone can testify, but the end is

(Continued to page 270)



Photograph by the makers of
Armstrong Asphalt Tile

YOU CAN MAKE SHOPSMTIH

Pay for itself

ON A REMODELING JOB LIKE THIS

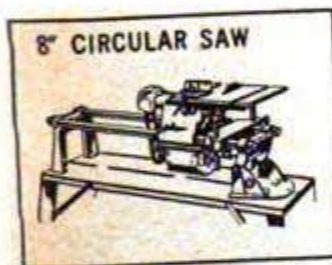
Take a closer look at this attractive basement shop. Notice the fine workmanship . . . the beautifully fitted drawers and doors . . . the accurately mitered shelf joints . . . the expertly paneled walls.

Notice the SHOPSMTIH, too! For this is the versatile power tool that makes it possible for *you* to do remodeling jobs like this! SHOPSMTIH's high precision accuracy and its simplicity of operation make it easy to turn out work of exceptional quality. And, in addition to the fun of doing it yourself, you can save \$200-\$350 on

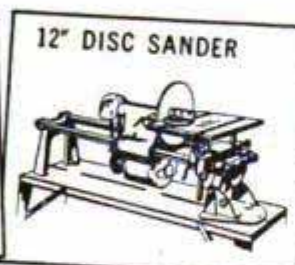
a project such as this—more than enough to pay for your SHOPSMTIH.

You can do more jobs with SHOPSMTIH—in less space—than with any setup of individual tools. Furthermore, in each of its five basic positions, SHOPSMTIH exceeds most individual tools in accuracy, capacity, quality!

To prove all this to your own satisfaction, just see SHOPSMTIH demonstrated and *compare*—at leading hardware and department stores or any Montgomery Ward store!



8" CIRCULAR SAW



12" DISC SANDER



33" WOOD LATHE



15" DRILL PRESS



HORIZONTAL DRILL

YOUR COMPLETE POWER WORKSHOP IN 2' x 5' OF SPACE

\$189.50

3/4-hp., capacitor, 120-volt, 60-cycle motor, \$34.50



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Please send me a free copy of the SHOPSMTIH catalog and the name of my nearest SHOPSMTIH dealer.

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not yet in sight. The only disadvantage these fibers have is lack of dyeability but this will disappear as time goes on.

But of all our advances in this 50-year span nothing is more spectacular than that in medicinal chemistry. In 1902 we had a host of naturally occurring drugs—quinine, ipecac, morphine, digitalis, iodine—and several synthetic materials such as aspirin, ether, phenacetin, salol, antipyrine, phenolphthalein, phenol and a few others, but today the number has been multiplied by 10. We have the sulfa drugs—sulfanilamide, sulfathiazole, sulfadiazine, sulfapyrazine, sulfaguanidine and others—which are specific for coccus infections. The discovery of the antibiotic penicillin in 1929 led to the discovery of several others such as streptomycin, aureomycin and the synthesis of chloromycetin. These antibiotics can all be prepared by extraction of mold growth followed by purification and have been with us for centuries bound up in many ordinary molds found in nature. These antibiotics have a wide spectrum of activity against bacterial and virus infections as everyone knows—pneumonia, tuberculosis, typhoid, typhus, streptococcus, influenza virus and spirochetes. In addition to these we have a large number of external antiseptics and cleansers unknown in 1902. Nor can we forget the new antihistaminic drugs which can

relieve our allergies so well that we do not fear them as formerly.

In addition to the drugs which medicinal chemists have provided for our ills, they have not been unmindful of the old adage that "an ounce of prevention is worth a pound of cure." They have developed the vitamins which all of us know are so important for proper growth and food utilization. Indeed, even today new vitamin factors are being discovered in the endless search to explain the functioning of the animal body. Long before 1902, the proteins were recognized as bodybuilders and the essential chemical structure of proteins was known, but since 1935 we have known that certain amino acids from which proteins are made were just as essential to our well-being as the vitamins. We are just starting to find out how these amino acids can be used to supplement food and cure certain nutritional deficiencies not touched by drugs or vitamins.

We have reviewed briefly the part chemistry has played in the saving of life and the cure of disease, but we still must consider the part chemistry has played in war. World War I saw the introduction of gas warfare which was not revived in World War II. It saw the introduction of TNT as a powerful explosive, which was also used

(Continued to page 272)

**Here's a motorcycle that's packed
with exciting new features...**

it's the sensational **1953**

HARLEY-DAVIDSON MODEL K

Check these advanced features that give zooming performance

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| NEW swinging-arm rear suspension | NEW hydraulic front fork |
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| NEW sleek, smooth lines | NEW twin seatposts |
| NEW rugged, double-loop frame | |



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SHOES FOR MEN

"Fortune-Aire"

... like walking on air—
cushion-cork insole from
heel to toe

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It's an "All-American" beauty . . . a streamlined flash of color that begs to be ridden. Straddle the "K" and you'll marvel at the comfort of the cushioned twin-post saddle . . . the hydraulic telescopic fork . . . and the swinging arm rear suspension. You'll smile big and bright when you "kick 'er over" and this all-new power plant responds with that steady, smooth throb that promises more thrills to come. And when you flick it into gear and give it the power — you're off and away on the most exciting ride you've ever had. Ride it! Try it at your dealer's today. Bring a buddy along. Or send 25¢ for illustrated literature and a copy of the *Enthusiast* magazine, filled with action pictures and stories. HARLEY-DAVIDSON MOTOR Co., Dept. P Milwaukee 1, Wisconsin.



CEILING CRACKED? NEED MORE ROOM?

WANT TO Modernize YOUR HOME?

Do the job easily,
quickly at low cost with

UPSON PANELS

or CEILING TILE

For Cracked Ceilings:

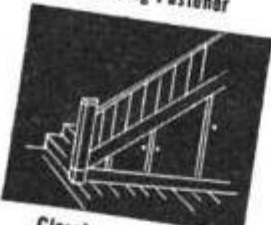
No messy replastering! No ordeal of housecleaning! Apply **Upson Kuver-Krak Panels** on furring strips right over old plaster. Unique floating fasteners eliminate face nailing. Waterproofed and washable, **Upson Ceiling Tiles** are 12-in. sq., applied with matching color pins! Both give you a beautiful new crackproof ceiling in a matter of hours!

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Upson Panels saw like wood. Take screws, nails, fixtures. Available in a variety of widths, thicknesses and surfaces—at your lumber dealers! **Strong-Bilt Panels** for new construction, $\frac{3}{8}$ " panels for lighter work. Pebbled or smooth surfaces—plus new **Striated Panels** for a modern look! Trademarked for uses.



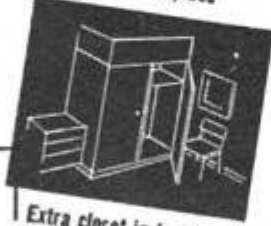
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in World War II along with several other new explosives. However, the greatest weapon of all was the atomic bomb. The physicist got the greatest credit for this development, but the chemist and chemical engineer, as well as other engineers, were as responsible for it as the physicist.

We must assume, of course, that all these accomplishments of chemistry were not possible without trained scientists. Before World War I most of our chemical research was done in Germany where our own chemists went for final education. However, since World War I our own colleges and universities have offered training equal to anything abroad and will continue to do so. Our economy needs these men and women chemists.

What does the future hold? We look forward only on the basis of our knowledge, but it is certain that the fight against certain diseases will continue and one of these days cancer will be conquered. How and when is not known. Infantile paralysis will not be the dread disease it is today in the future. In the line of nutrition we can look forward to food utilization unknown in the past. Food supplementation by vitamins and amino acids will take away the fear of starvation for millions of people even if enough natural food by today's standards is unavailable. The use of atomic energy as a source of useful power can be looked forward to with certainty not only in the generation of heat and electricity but also in the field of transportation.

Chemistry is remaking the world but is remaking it for the better. The area of knowledge is large but the boundaries of the unknown are ever-expanding. ★ ★ ★

Stylus Forecasts Weather Changes

Electrical activity generated by weather changes as slight as shifting winds is gauged by an extremely sensitive photoelectric recorder. Less costly than radar, the machine, perfected by General Electric, ferrets out isolated showers and disturbances not otherwise detectable at ordinary weather stations. A tiny stylus on the apparatus is moved by charges received through an antenna containing radium-impregnated gold foil. It swings left when negative charges reveal the outbreak of showers within a radius of 450 miles. An approaching cold front is indicated by positive charges that move the stylus to the right. Lightning flashes reverse the pen's course, making it possible to count them by the number of strokes marked across the chart. Even variations in the intensity of light reflected from clouds sometimes register noticeable changes in the recording mechanisms.