

REPORT ON THE '55 PLYMOUTH

POPULAR MECHANIC

MAGAZINE

WRITTEN FOR YOU

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APRIL 1955
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"ZIPPER" TOWER—page 110

A large-scale industrial scene showing the hull of a ship, painted black on top and red on the bottom, being lifted out of a dry dock. The hull is supported by a tall, white, lattice-structured tower known as a 'zipper' tower. At the base of the tower are two yellow crawler cranes. The background shows a yellow sky and a concrete wall of the dry dock.

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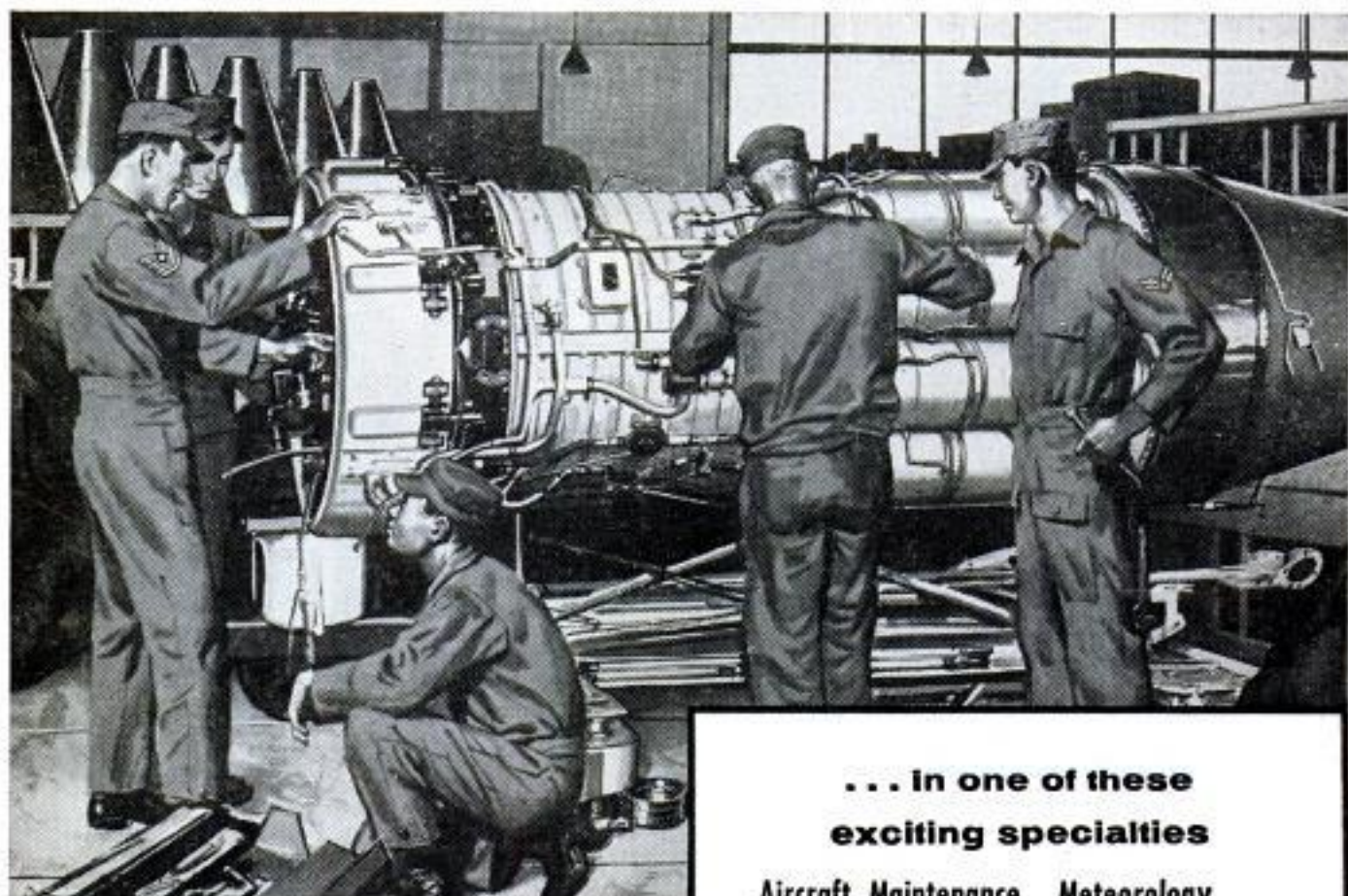
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Next Month

JUST HOW HARD is that man working as he paints the ceiling? Is he putting forth more energy than his wife, who is ironing a shirt nearby? As a matter of fact, who works harder, day in and day out, a man or a woman? And does your wife really work any harder than that pert stenographer down at the office? These questions, which have been debated for decades, now are being tagged with scientific answers at a DuPont laboratory. Machines, instruments and brains are combined in a project to find out what causes fatigue and what can be done about it. You'll find some surprising answers to the above questions in "Why Do You Get Tired?" in May issue

Information not listed on articles in the index, starting on page 72, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy may be obtained by writing to the Bureau of Information, Popular Mechanics, 200 E. Ontario, Chicago 11, Ill.

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Other items, and manufacturers of available products described, are listed on pages 72, 74 and 76

New central heating system has a thermostat in every room

Steam turbine operated fan in each room heater circulates filtered warm air. Thermostats are non-electric

Why didn't someone think of this long ago? Once in many years a new idea is born; one so simple, so logical, and so practical that it wins immediate and wide acceptance. People constantly tell us that the SelecTemp heating system is just such an idea.

Home comfort beyond anything you've ever known. SelecTemp is the ultimate in modern heating—every room a zone, with its own thermostat. Every member of the family has just-right warmth, from 65° or so in mother's busy kitchen to tropical warmth for grandmother. Each room has a separate steam-fed heating unit, which constantly circulates filtered warm air. There is no wiring; fans and thermostats are non-electric. (See diagram at right.)

Economically installed. Fuel cost low. SelecTemp heating is very economically installed in new or old homes or buildings, since small flexible copper tubing carries steam to room units. SelecTemp eliminates *overheating* and *unnecessary* heating. Rooms not in use can be kept cool and quickly reheated when wanted. SelecTemp boiler with immersion coils will provide plenty of hot water, winter and summer, at low cost.

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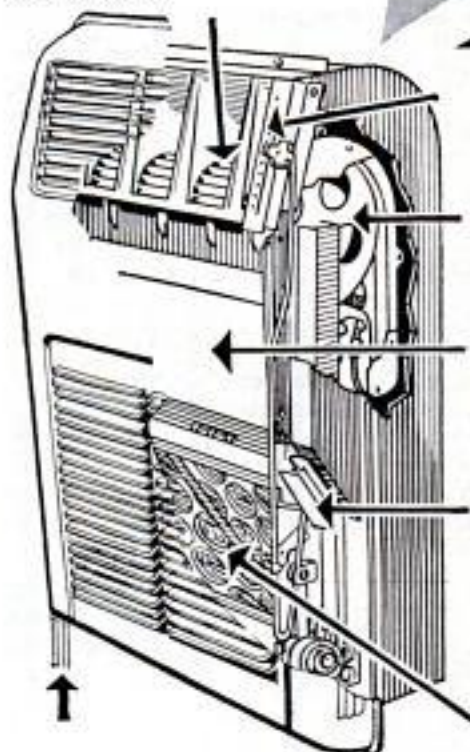
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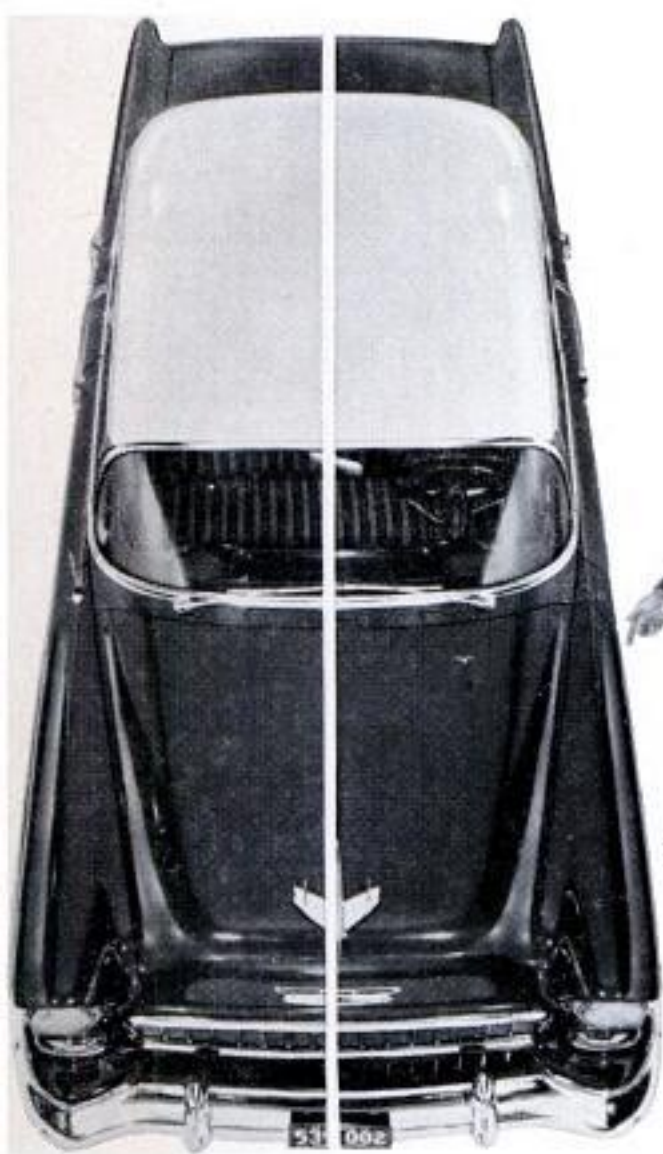
POPULAR MECHANICS

Here's what



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The reason: All the Car-Plate wax stays on your car—you don't rub wax off as when polishing paste wax. The Hertz test car shown here was driven 3 months, then simply washed and photographed. If you can't tell the Car-Plate side (left) from the paste side, why waste hours rubbing? Next time wax with Car-Plate!



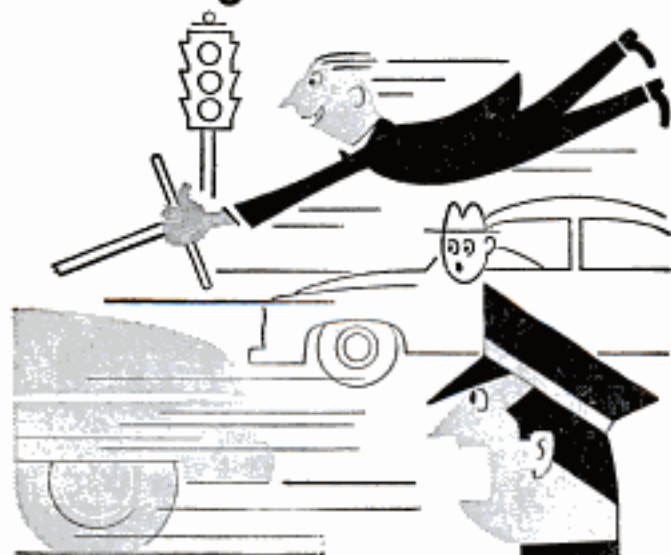
Before waxing use Car-Plate Cleaner. Wax will bond perfectly in a brilliant, long-lasting finish.



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ACROSS THE DESK



To the Editor

Popular Mechanics is a highly factual and exceedingly accurately written magazine and I am one of its most avid readers, with most attention given to the automobile section. Your article "They Also Ran" (February 1955) was read with interest. I

would like to point out an inaccuracy in your story. It concerns the paragraph which begins "Take the car designed by Uriah Smith of Utah." Well, it so happens that gentleman was my grandfather and never lived in Utah. His home was in Battle Creek, Mich., and he did not design a car—he only devised the horse's head to attach to it. In fact, he never rode in a car, for the reason that my grandmother wouldn't let him. She was afraid he'd be killed in one of those "fool contraptions," so the report goes.

Mark L. Bovee,
Battle Creek, Mich.

To the Editor

There have been many fine articles about Monticello, home of Thomas Jefferson, appearing in various magazines, but I can say with all sincerity that none has created so much favorable comment from visitors, nor kindled so much interest in Monticello, as has the article by Mr. Clifford Hicks in your August 1954 issue.

We have received letters mentioning your article and requesting our brochures from not only all over the United States, but we are today answering a request from Rosario, Argentina.

The hostesses report that almost daily visitors come in with specific questions in mind prompted by your article.

Our congratulations go to you, the editor, and to Mr. Hicks for a splendid job.

Curtis Thacker,
Superintendent of Monticello,
Thomas Jefferson Memorial Foundation,
Charlottesville, Va.

Letter From a Ranch-House Owner

Enclosed are some pictures of our PM Ranch House, recently completed. My wife

(Continued to page 8)

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(Continued from page 6)

and I, with the help of one carpenter, built the house in about nine months. The exact detail of your blueprints, along with the step-by-step instruction book, made the job possible. Before I read the book, I certainly would never have thought of building a house myself.

We followed your plans with a minimum of changes. The house has too beautiful lines to make drastic changes. In fact, the only changes were an inside basement stairway made possible by removing three feet from the guest bedroom; a half bath in one corner of the utility room; a



screened-in breezeway which later will be glassed-in and the walls are plastered instead of wood paneled.

Our carpenter who helped us was most surprised at the very small amount of scrap lumber. This certainly proves it is a well-planned house.

We used the best of building materials—had the louvered windows custom-built in Chicago—have a full basement under the house—yet we saved over \$5000 by building the house ourselves, compared with a contractor's estimate.

We would like to say we are extremely happy in our new ranch home and certainly enjoy the fine compliments we've had from everyone who sees it. Many thanks to your magazine for printing the pictures and floor plan. It is truly a "Dream House."

John E. McNeil,
 Wheatfield, Ind.

To the Editor

With reference to the splendid article "Title Tricks for Home Movies" which appeared in *Popular Mechanics*, February 1955 issue, please allow me to make an observation anent the effect produced in rear projection, as described on pages 100-101.

This method of using a projector to supply a moving background for the title on the ground-glass screen is likely to be unsatisfactory for this reason: There will be times when the projector shutter is closed while the camera shutter is open.

(Continued to page 10)

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(Continued from page 8)

The camera and projector in this setup are not electrically or mechanically interlocked, therefore they will not run in perfect synchronism. The camera can photograph only that which it "sees," and when its shutter shifts out of phase with the shutter of the projector, it will be "seeing" only the title mounted upon the screen surface; there will be no background to photograph during the eclipse period.

This will result in the background appearing and disappearing at regular intervals when the finished product is projected.

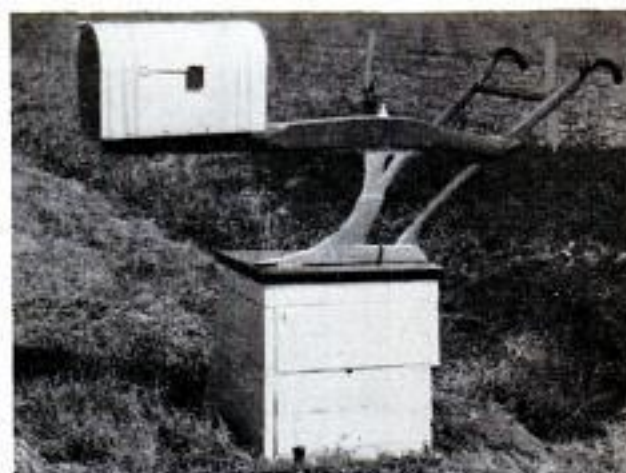
There is a remedy, however it is too intricate and probably too expensive for the average home-movie enthusiast. The camera and projector should be interlocked mechanically so that when the camera shutter is open, the film is at rest in the projector gate and the shutter of the latter also open. Further, the flicker blade or blades of the projector should be removed in order that more light will get to the screen. Of course, there will be quite a flicker. However, the camera will not record this since its own shutter will be closed at the same instant as that of the projector.

I have been a theater projectionist for nine years and have made quite an extensive study of this matter.

Allan P. Mulcahy,
Rossland, B.C., Can.

Plowman's Mailbox

In this imaginative day and age it really takes some doing to come up with a mailbox that's different. This one has a mounting made from an old one-horse plow and



is painted red, black and silver. It was discovered by Walter E. Richardson, Bloomington, Ill., and stands on the grounds of the Illinois Soldiers and Sailors Children's School, a state-operated orphanage at Normal, Ill.

Good Pay-Security-Promotions for You



RADIO-TELEVISION BROADCASTING 3000 Radio broadcasting stations operating day and night provide interesting jobs with good pay to tens of thousands of operators and technicians. 200 Television stations on the air now, hundreds more under construction and still more authorized, creating job demand and bright future for men who qualify.



RADIO-TELEVISION SERVICING 115 million home and auto Radios plus 25 million Television homes (with total growing rapidly) mean increasing opportunities for qualified servicemen. Many NRI students make \$10, \$15 a week extra fixing sets in spare time while training. Many NRI graduates start their own full-time business or take good jobs with dealers.



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Television Growth Making More Good Pay Jobs, Prosperity

Radio is bigger than ever and Television is still growing fast. Government, Aviation, Police, Ship, Micro-wave Relay, Two-way Communications Systems for buses, taxis, trucks, railroads are other growing fields providing good job opportunities and bright futures for men properly trained in Radio-Television.

Start Soon to Make '10, '15 a Week Extra Fixing Sets

You can start to cash in fast. Many men I train fix neighbors' sets, make extra money, starting soon after they enroll. Multimeter built with parts I send helps locate and correct set troubles. Read at left how you build actual equipment that gives you practical experience with circuits common to both Radio and Television.

Mail Coupon—Find Out About Tested Way To Better Pay

Act now to enjoy more good things of life. Take NRI training for as little as \$5 a month. Many NRI graduates (some with only a grammar school education) make more in two weeks than the total cost of my training. Mail coupon today for Actual Lesson and 64-page Book—BOTH FREE. J. E. SMITH, President, National Radio Institute, Dept. SDA, Washington 9, D.C. OUR 40TH YEAR.

I Trained These Men

Extra Money Spare Time
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—WILLIAM WEYDE, Brooklyn, New York.

Got Laid Off, Good Thing
"Got laid off of my machine shop job which was the best thing that ever happened to me as I opened a full-time shop. Business has been picking up every week."
—E. T. SLATE, Corsicana, Texas.

Engineer with Station WHPE
"Thanks to NRI, I operated a successful radio repair shop. Then I got a job with WPAQ, later with WBOB and now I am an engineer for WHPE."
—VAN W. WORKMAN, High Point, North Carolina.

Owner of Appliance Store
"I own a third of the Graniteville Appliance Co., Inc. in my home town with a branch store in Spencer, West Virginia. Things look very good for the future."
—BERNARD STERS, Graniteville, West Va.

Practice Broadcasting or Servicing with Kits of Parts I Send You



Nothing takes the place of practical experience. That's why NRI training is based on LEARNING BY DOING. My training includes kits of parts which you use to build equipment and get practical experience on circuits common to both Radio and Television. Shown at the left is the low-power Broadcasting Transmitter you build as part of my Communications Course. It gives you experience putting a station "on the air," learning procedures required of broadcast station operators. Shown below is the modern Radio you build as part of my Servicing Course. You use it to conduct tests, get experience locating and correcting set troubles. My book shows other specially designed equipment you build to get practical experience, to bring to life things you learn from my illustrated lessons. All equipment is yours to keep.

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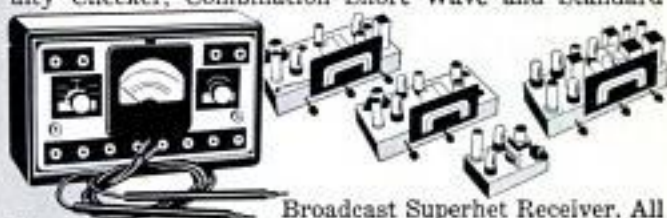
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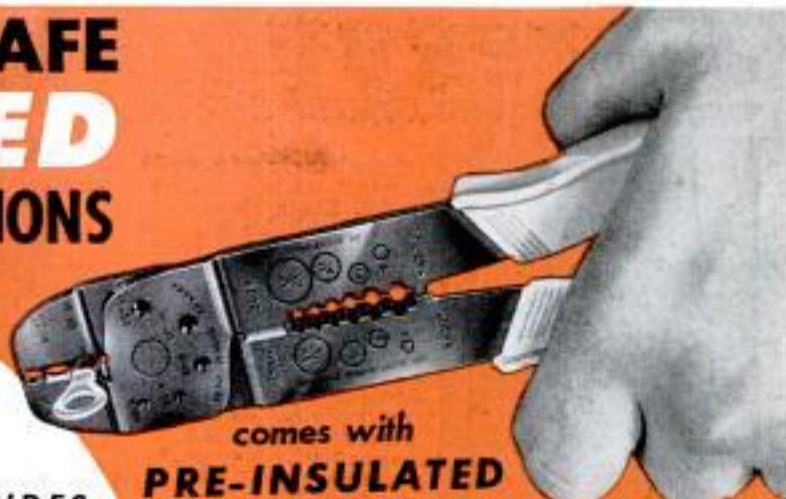
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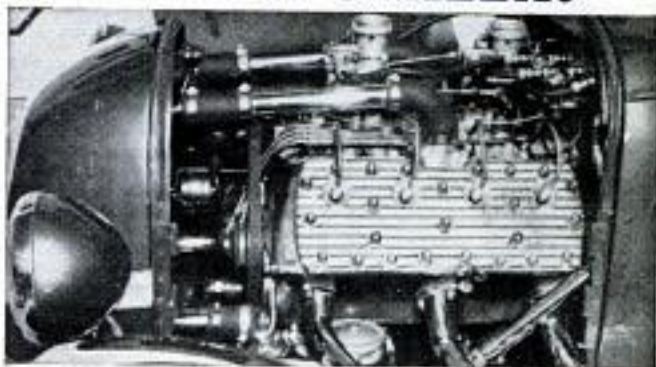
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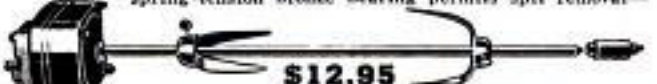
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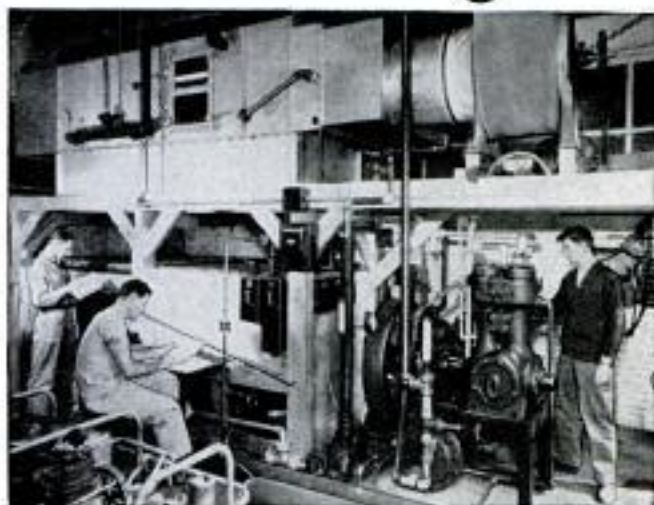
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750-16(6)	7.52	800-15	5.92	800-20	9.02	1000-20	17.92
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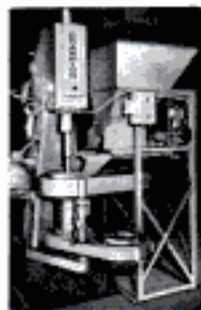
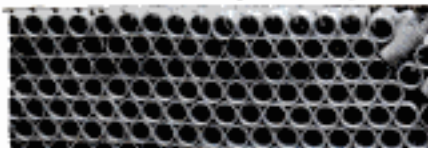
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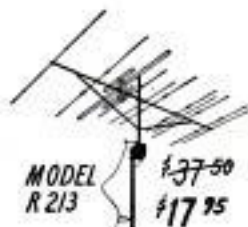
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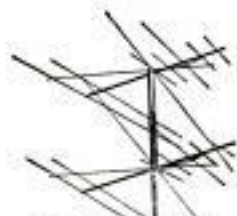
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U.S. Commemoratives only, 100 different 50c. Hudson's, Box 556, Pinedale, Calif.

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I want to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. Include literature if possible. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

"TIMELY Tips Magazine," Paulding 3, Ohio, publishes moneymaking ideas, plans, opportunities, formulas, each monthly issue. 30th year. \$2.00. Sample copy 25c.

BRUSH Plating outfits connect to a battery, no tanks necessary. Your opportunity to make good income silvering mirrors, plating articles in the shop and home at low cost. Free particulars. Gunmetal Co., Ave. H, Decatur, Illinois.

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MONEY In sparetime fixit shop at home. Repeat cash business. Experience unnecessary. No selling. Free booklet explains. Victor Foley Company, Columbia Heights, Minnesota.

BOOKKEEPERS, increase earnings operating sensational bookkeeping service. Korn, 5632 Lankershim, North Hollywood, California.

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LIQUID Rubber. Make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

MEN—Income from local information. No selling. Neherco, LaVerne, California.

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IMPORT-Export mailorder opportunity! Details. Warner, Box 6, Fort Scott, Kansas.

MAKE Flexible molds. Cast figurines, plaques. Free sample. Tooker, 630-R Chestnut, Hamilton, Ohio.

NATURAL Molding rubber, extra thick. Free sample. Flock, W. Wooley, 115-A Donald, Peoria, Ill.

ELECTROPLATE Auto parts, novelties, mirrors, baby shoes. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-MM, Houston 19, Texas.

BOOKKEEPERS. Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 405, Youngstown 1, Ohio.

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

SCHEMER Magazine. Canfield 1, Ohio, monthly mailorder ideas, plans. Year \$1.00. Sample 20c.

GROW Mushrooms. Cellar, shed, and outdoors. Spare, full time, year round. We pay \$1.50 lb. We paid Babbitt \$4,163.00 in few weeks. Free book. Washington Mushroom Ind., Dept. 172, 2934 Admiral Way, Seattle, Washington.

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BUY It wholesale! Manufacturers, distributors offer 350,000 items. Literature free. Olsen, 1231-A East Third St., Du-luth 3, Minn.

\$25 WEEKLY Working two hours daily at home. Lycke, Box 2471-A, Cleveland 12, Ohio.

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SEE Our display ad on page 50. E-Z Way Tool Co., Barrington, Ill.

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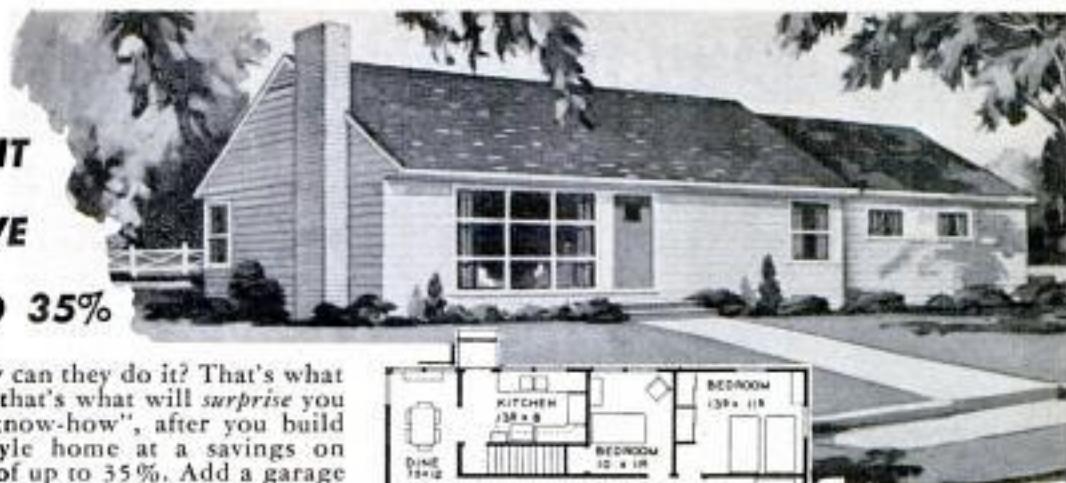
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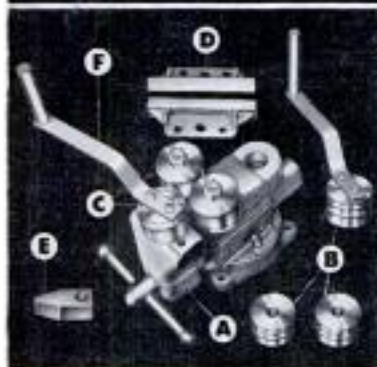
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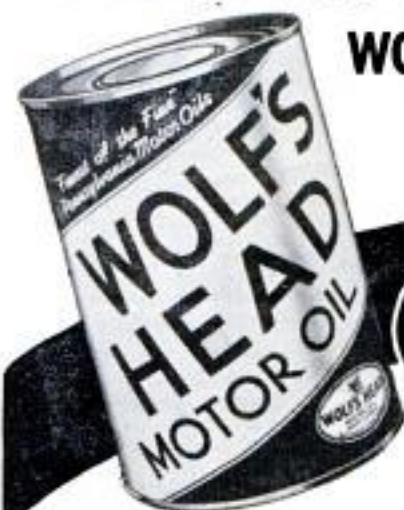


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When it's necessary to use a round-shank drill in an ordinary hand brace, try this trick: wrap a small piece of Medium Emery Cloth by CARBORUNDUM around the shank of the drill, grit side in, to keep it from slipping.

What good short-cuts have YOU discovered that other folks could use around the home or workshop? Send 'em to me on a postcard — a separate card for each idea — and I'll pay you \$5.00 right away for every one I can use in later columns. Even if I can't use 'em (on account of duplicates and such), I'll send you a worth-while little gift for your trouble.

Better send me a postcard anyhow and ask for your FREE copy of a fine new booklet called "HOW TO SAND" which the CARBORUNDUM people have just printed. Gives lots of useful information on refinishing furniture, and sanding in general. Just address your card to me...



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After adhesive becomes tacky, snap the tiles into place. Do not slide tiles or adhesive will push up between the tiles.

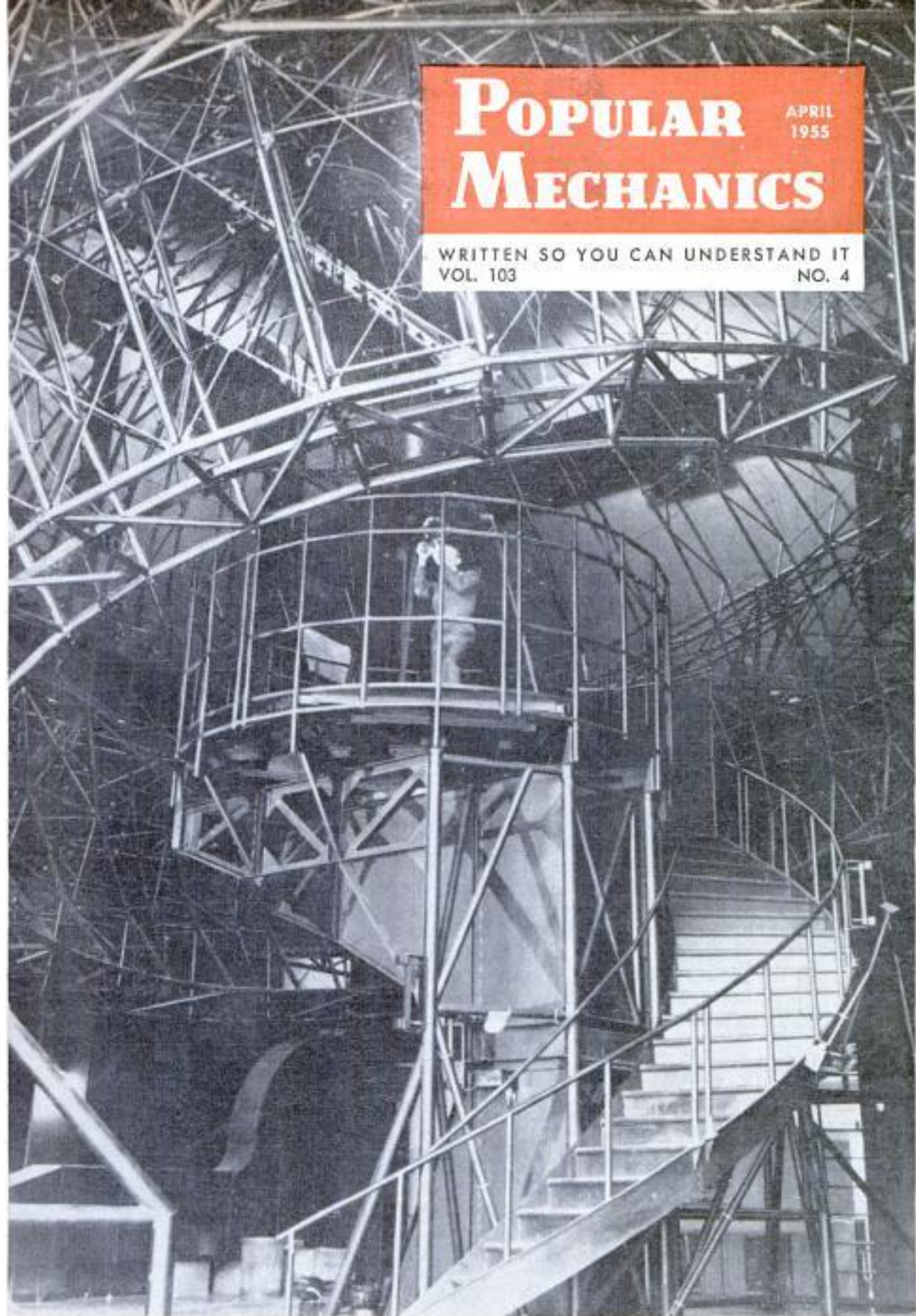


Here's the best part! Show your wife your handiwork. (Don't tell her what a cinch it is with MATICO's easy-to-follow instructions).

POPULAR MECHANICS

APRIL
1955

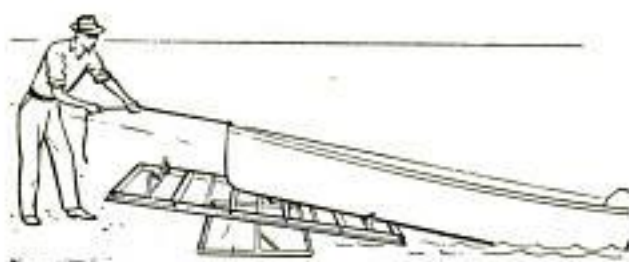
WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 103 NO. 4



Navigators "Fly" at 100,000 Feet in Polar-Training Sphere

STUDENT NAVIGATORS at Mather Air Force Base, Calif., learn art of high-speed polar-celestial navigation without leaving an ingenious 22-ton tubular-steel sphere developed by Link Aviation under an Air Force contract. The 37-foot interior dome of the trainer displays more than 500 tiny

lights, representing the major stars of the 30 Northern Hemisphere constellations. Navigators inside the dome take their fixes on the stars with sextants and plot their courses on a map of the earth. Speeds of 1750 miles per hour and altitudes of 100,000 feet can be simulated.



Aquatic Teeter-Totter Beaches Small Boats

Beaching a boat is easy with a new teeter-totter placed at the water's edge. The boat owner pulls the boat onto wooden rollers which form the platform. As the boat's center of gravity moves forward, the platform tilts, lifting the stern out of the water and thrusting the prow onto the beach. The roller rack is eight feet long and is equipped with six hardwood rollers. The platform is adjustable in height and has chocks which can be altered to conform to the cant of the boat.

Paint Remover Ends Sanding

Up to 14 coats of paint, varnish or shellac are removed in a single operation by a unique creamy substance. It's designed to save hours of rubbing and sanding when furniture is to be refinished, and does the job in five minutes. Suitable for wood, metal or other surfaces, it expands the oil and resin film of the paint so that the old finish loses its adhesion. It won't harm the finest antiques, according to the manufacturer. One pint will remove all finish from an average-size table.

Bell XV-3 Convertiplane Mounts Tilting Rotors on Stubby Wings

No landing field is necessary for Bell's XV-3 convertiplane, recently unveiled by the Army. Three-bladed combination rotor-propellers on the tips of a stubby 30-foot fixed wing face straight upward for the craft's vertical take-off. Once the plane is in the air, the rotors tilt forward in a 10 to 15-second operation and function as propellers to drive the plane at 175 miles per hour in level flight. The four-place plane,

which can be used for observation, reconnaissance, evacuation and liaison, is powered by a single engine located in the aft section of the fuselage. It can hover, move backward, sideward, up, down and forward. The rotors maintain steady flight in any intermediate position. The medium-range convertiplane is one of three different models commissioned in 1951 by the Department of Defense.





Machine Packs Ice Cream in "Squeeze Cups" of Paper

When a paper container is squeezed, out pops an individual serving of ice cream molded into an attractive cylinder. A new machine packages the ice cream in the "squeeze cups" and immediately presses on a foil lid to produce a sanitary closure similar to the "hoods" on milk bottles. The machine also prints any desired informa-

tion on the foil lid. The containers give the housewife individual servings, eliminating the need to spoon bulk ice cream. To remove the ice cream, she peels off the lid, pulls on the pleated rim of the cup and squeezes out its contents. Sundaes and other ice-cream specialties can also be packaged in the cups.

No Explosives Necessary When Jack "Blasts" Rock

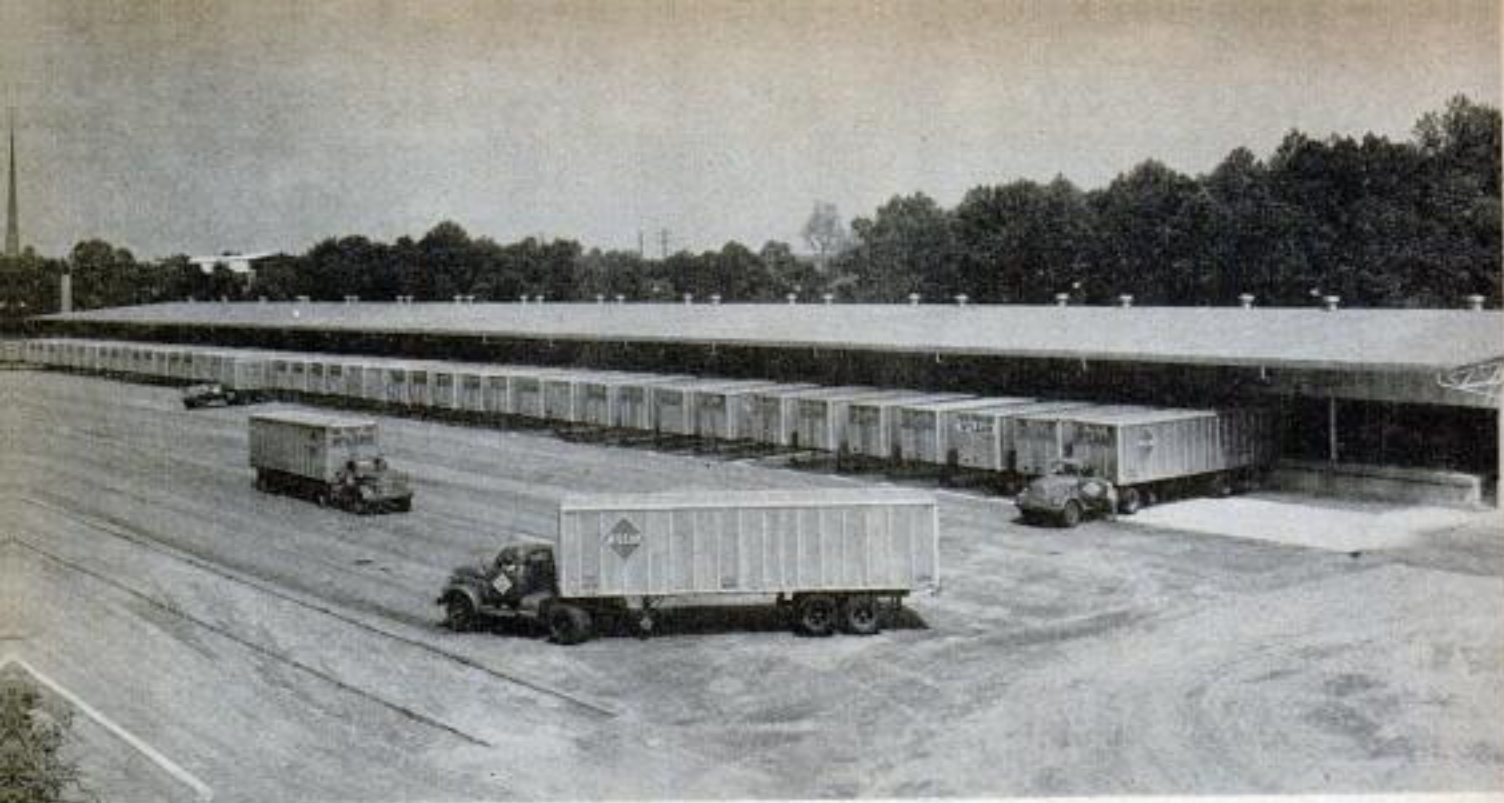
Faced with the problem of breaking up rock in a building excavation without using explosives that might endanger nearby structures and electronic equipment, a Nashville, Tenn., builder turned to the Duncan Rock-Jac, a hydraulic jack capable of exerting great lateral pressure. The jack is a steel tube with 10 steel cylinders whose pistons push outward along one side, exerting a combined pressure of 150 tons. The jack is lowered into a hole drilled with a pneumatic drill, and a hand hydraulic pump provides pressure great enough to split rock. The jack "blasts" rock effectively but so gently that its action is not noticeable a few feet away.



Rocket Can Be Throttled

Throttle control of speed and power has been incorporated into a new rocket engine developed by Curtiss-Wright Corporation, for the U.S. Air Force. Other rocket engines consume all of their fuel within a relatively short time and provide a short, fixed thrust.

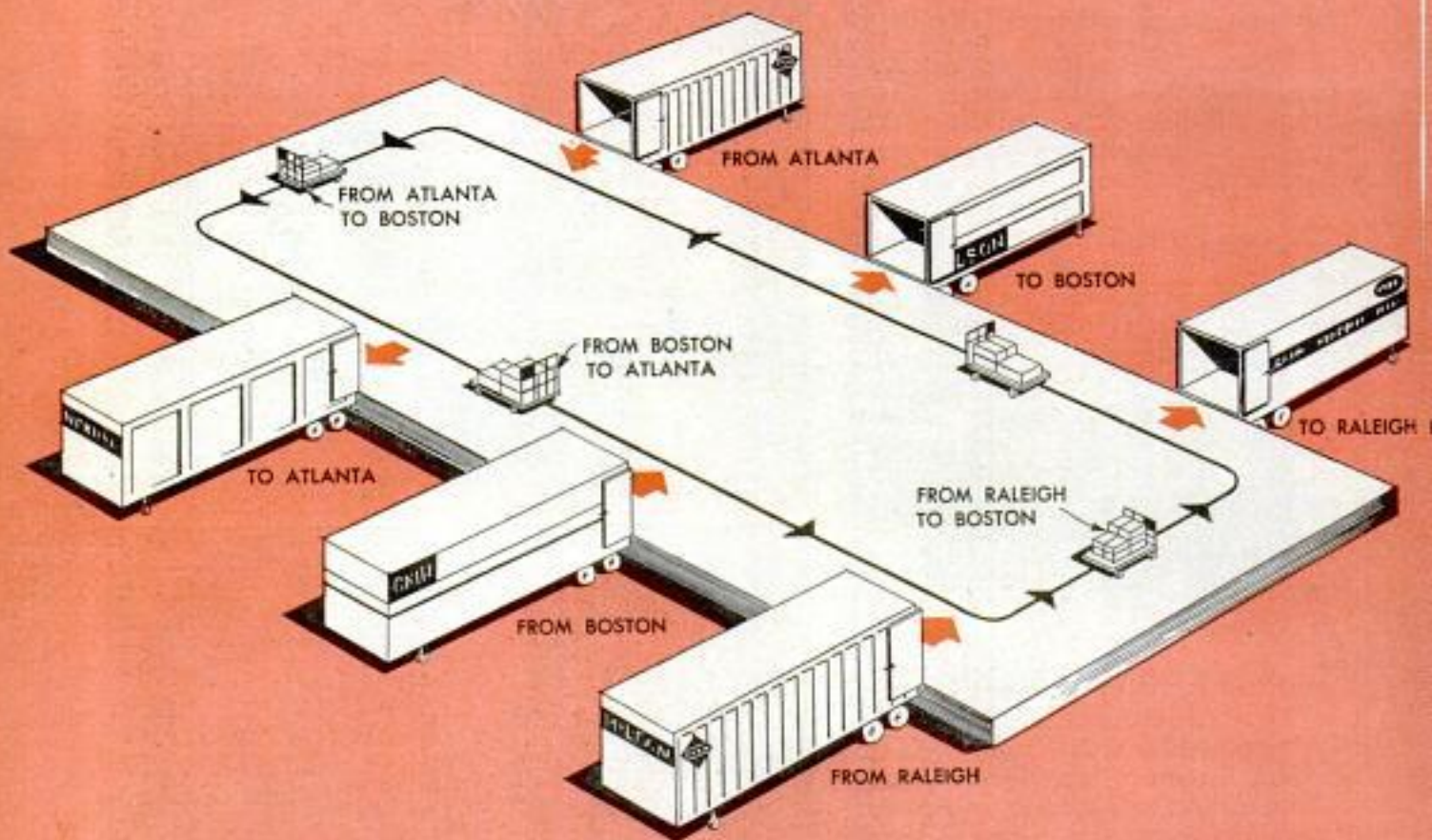




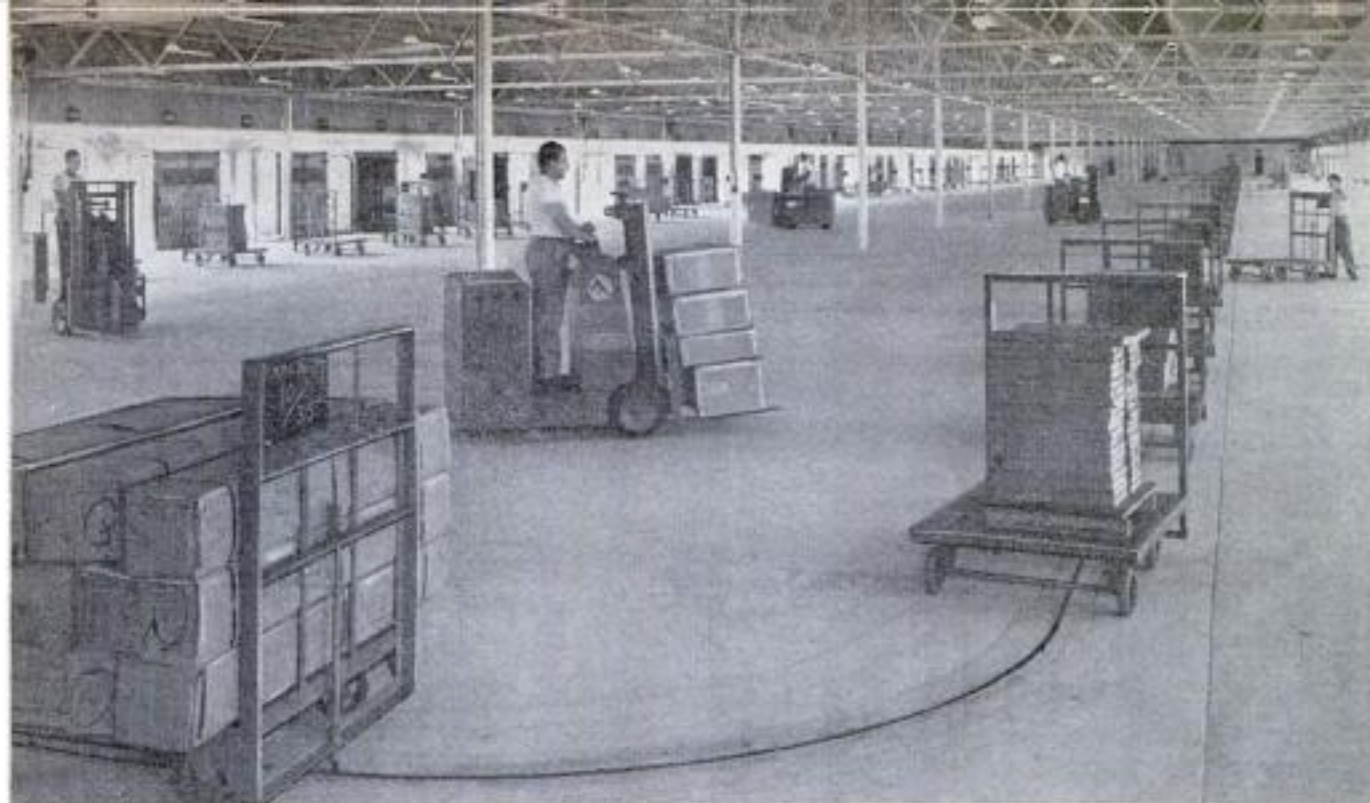
Huge new terminal is a trucker's paradise. Ingenious machines take over heavy work of unloading the rig

Switchyards for the Freight Trucks

By Walton M. Rock



Cargo for transfer to outbound trailers is stacked on freight carts which are moved by dragline in a circle. Carts are unhooked at proper loading berth



Loaded cart circles continuously. If workers don't pick it off as it passes, it will be around again

THE AMERICAN trucking industry has outgrown the stage where all a man needed was a rig and a "hole in the wall."

Trucking is big business now. Statistics will show it, but if you're not statistically minded, there are solid, three-dimensional demonstrations of the fact in the new, ingeniously equipped truck terminals in almost every city.

The typical new terminal is built on the edge of town at a strategic location that provides easy access to all major traffic routes as well as to the downtown area.

Terminals may range in size from half an acre to areas covering three or four city blocks. Some of them contain berths for 100 or more of the huge behemoths of the road. They may cost anywhere from \$25,000 to \$1,000,000.

Depending on size and location, truck terminals may serve several purposes. Usually they are collection centers for locally originated freight, and breakup points for incoming cargo. Many of the larger installations also serve as transfer stations for incoming less-than-truckload shipments that require reloading and consolidation for forwarding elsewhere.

Some of them include elaborate maintenance facilities to keep big fleets of the massive tractor-trailers moving.

Cargo-handling facilities range from two-wheel hand trucks to automatic dragline systems. A



In the maintenance shop, even brand-new tractor units are given a thorough check before they're sent out on the road. Below, scales tell whether load is within the legal limits

Morton Taddler photos



Right, as soon as a driver enters the yard he checks in over a two-way intercom system. Below, dispatcher in the platform office tells him where to berth his rig. Some companies are considering use of TV cameras to enable dispatcher to spot trucks and berths

Morton Taddler photos



favorite item of equipment is that jack-of-all-work, the fork-lift truck, which can pick up a better-than-man-size load and drive right into a trailer with it.

A dragline-cart system serves the enormous, \$720,000 "ton a minute" freight terminal of the McLean Trucking Company at Winston-Salem, N. C. The system, known as the "Towveyor," is simply an endless chain moving around the terminal floor. Four-wheel carts are stacked with freight, given a designated track number at which an outbound trailer is being loaded, and hooked to the moving dragline.

The Towveyor pulls the cart along the dock until it reaches the designated station. There it is unhooked and the freight loaded into the waiting trailer.

McLean's Winston-Salem terminal, said to be the largest independently owned motor-freight terminal in the world, has truck berths for 118 vehicles on a 600 by 130-foot platform. Company spokesmen say it can handle 3,000,000 pounds of freight a day—an average of more than a ton a minute.

In New York, the \$1,000,000 terminal of the Yale Transport Corporation, uses belt, gravity and live-roller systems to supplement its fork-lift trucks and handcarts in receiving and moving a large amount of cargo over its platform.

Both McLean and Yale use electronically controlled pneumatic-tube systems to move

freight bills, bills of lading, manifests and other necessary papers between dispatching offices and truck-loading berths.

Many companies use two-way-radio systems to control city pickup and delivery operations as well as the spotting of trailer units within the terminal yard. Some are even considering the use of television. A TV camera spotted at an entrance would enable a dispatcher to see instantly any unit entering the yard and direct it to its proper loading berth.

Other companies, such as the Baltimore Transfer-Motor Freight Express, accomplish the same purpose with an intercom system that connects vital stations in its sprawling establishment at the edge of Baltimore. A two-way unit at the entrance gate enables a driver to report and receive berthing instructions without leaving his cab.

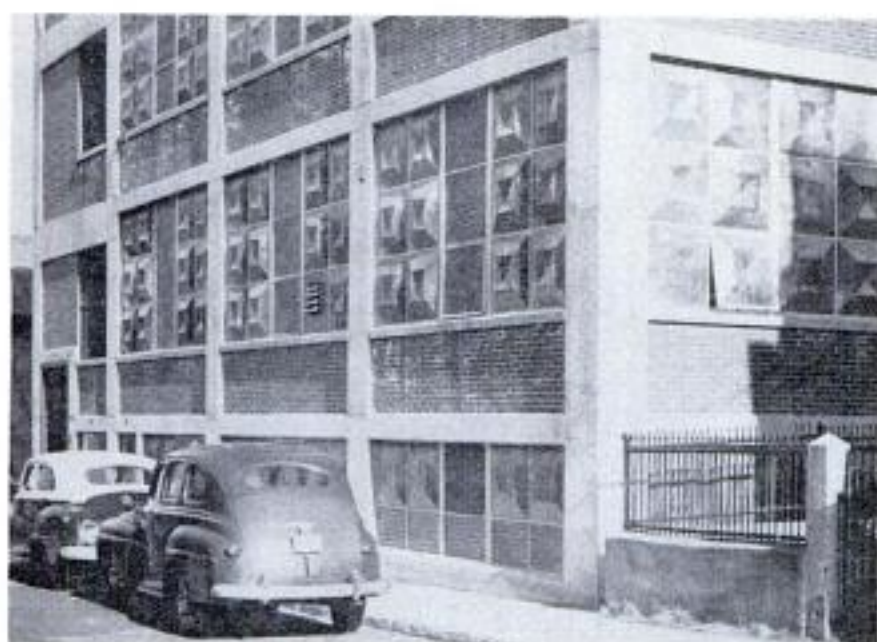
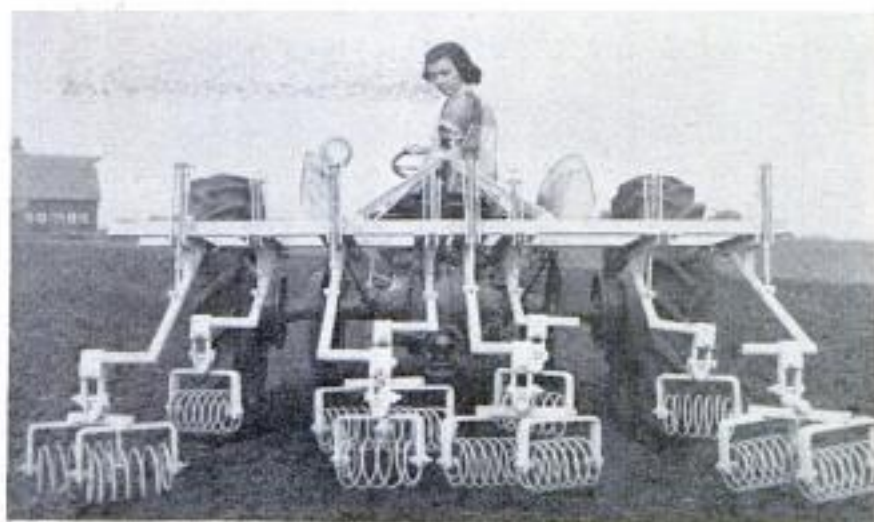
The trailer-maintenance section in this terminal is equipped not only to repair and maintain but to alter, enlarge and even—as it has done on occasion—fabricate its own trailers.

The tractor and truck section at the other end of the shop is similarly complete, containing all necessary inspection, testing and repair facilities as well as a big stock of spare parts. The company is indebted to no outsider when it comes to

(Continued to page 278)

Coil Springs of Cultivator Pull Weeds Without Disturbing Soil

Coil springs which rotate as they are pulled through the soil are featured in a new tractor-mounted cultivator. The springs are designed to pull weeds when row crops are being cultivated. They leave no furrow, don't expose the moist soil beneath the dry top layer and don't damage roots of crops being cultivated. When used for open-field weeding and cultivation prior to seeding, it breaks up clods.

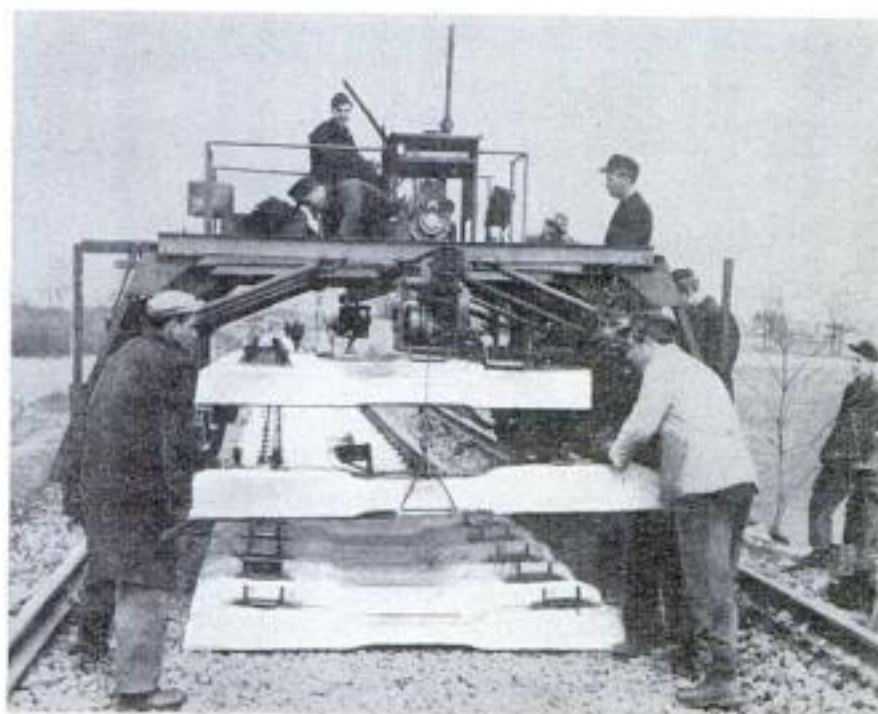


Plastic Windows

Plastic windows that bulge outward for strength and to catch sunlight are being produced for industrial and public buildings. One type is made in various sizes to fit all standard casement frames, is installed from inside, snaps into place and needs glazing on one side only. The other style is a square window. The bulge molded into both types causes wind to tighten the pane against the windowframe and increases the cleansing action of rain.

Gandy Dancer, Modern Version

Up to 820 yards of railroad track can be laid in eight hours by a new machine being used between Neustadt-Holstein and Bad Schwarten, Germany. The machine deposits the ties, then lays the rails on them. Special rails 131 yards long are used. They are positioned beside the roadbed before they are laid. The machine travels along the rails which it later places on the ties. Operators ride atop the tracklayer while the road workers position the ties which are lifted by the big machine.



Armed with radar guns and rocket "ash-cans," the Navy's new class of destroyer escorts is ready for fast action if war comes

THE POUNCER CHALLENGES THE SUB

By Comdr. W. D. Brinckloe, USN
(Head of Battleship-Cruiser-Destroyer Branch, Bureau of Ships)



Navy photo with artist's conception of the missile

Rocket depth charge streaks toward position of enemy sub (X) and leads the target with pinpoint accuracy

THE HUGE CONVOY, dwarfed by the vastness of the sea, steams steadily through the twilight. It carries food for a beleaguered nation, or weapons, or perhaps that most precious of cargoes—troops. The ocean is a football field in a game played without bands or spectators, but played for keeps; and the convoy has the ball.

In the Combat Information Center of his

flagship, the screen commander, quarterback in this lethal game, looks at the disposition of his players on the radar display and checks his strategy. The ball carriers are compactly grouped, their spacing delicately balanced between a spread so wide that the escorts can't screen them all or so close that a random torpedo can't fail to find a target. On the flanks the pickets



Official U. S. Navy photos

USS Dealey, first of the new destroyer escorts, bristles with armament and radar. It's longer and faster

maintain their stations, ready like players in the line to run their prearranged plays and take out any foe in their path. And roving menacingly inside the screen, armed with the most powerful antisubmarine weapons in the formation, the deadly Pouncers wait like blocking backs to throw their weight wherever the play develops.

The signals are on. A play is about to begin.

In Underwater Battery Plot of a destroyer escort on the port flank, the sonarman on watch sees a little pip that wasn't there before—a little pin point of luminescence that scintillates and is gone. Intently he stares at the spot. It comes again. This time there's no mistake.

"Contact!"

The ship springs to life. In the underwater plotting room, where the fire-control team waits tensely to feed the problem into complex computing machines—in combat, where the search team snaps to the alert to plot the suspicious object—on the bridge, where the skipper is poised to launch the attack if contact is confirmed—on deck, where weapons are readied for instant use. The ship is a coiled spring, awaiting the signal to release.

Every man knows that this is when seconds are matters of life and death.

The signal comes: "Submarine!"

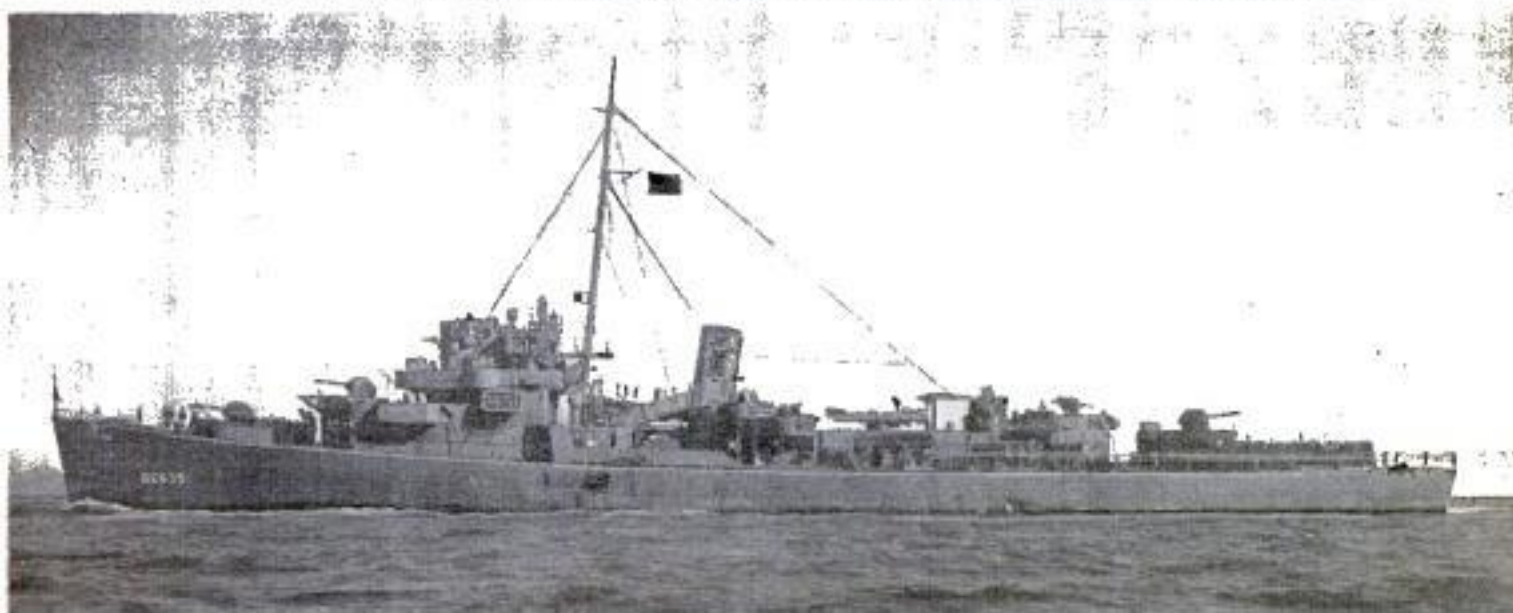
The skipper wheels his ship sharply to port, toward the sub. The ship's pulse quickens, all nerves attuned to the knock-out blow. This is the first swift block that knocks the tackler off stride, upsets his plans for the tackle. Later (to shift the metaphor) comes the precise surgeon's scalpel, probing the vital nerve of the foe. This is the butcher's poleaxe, swung wildly to jam the torpedo in the sub's tube, derange his firing mechanism, throw out his diving planes—anything to stay the enemy finger depressing the firing key and gain time for the hunter-killer tactics that will follow. This is the urgent attack!

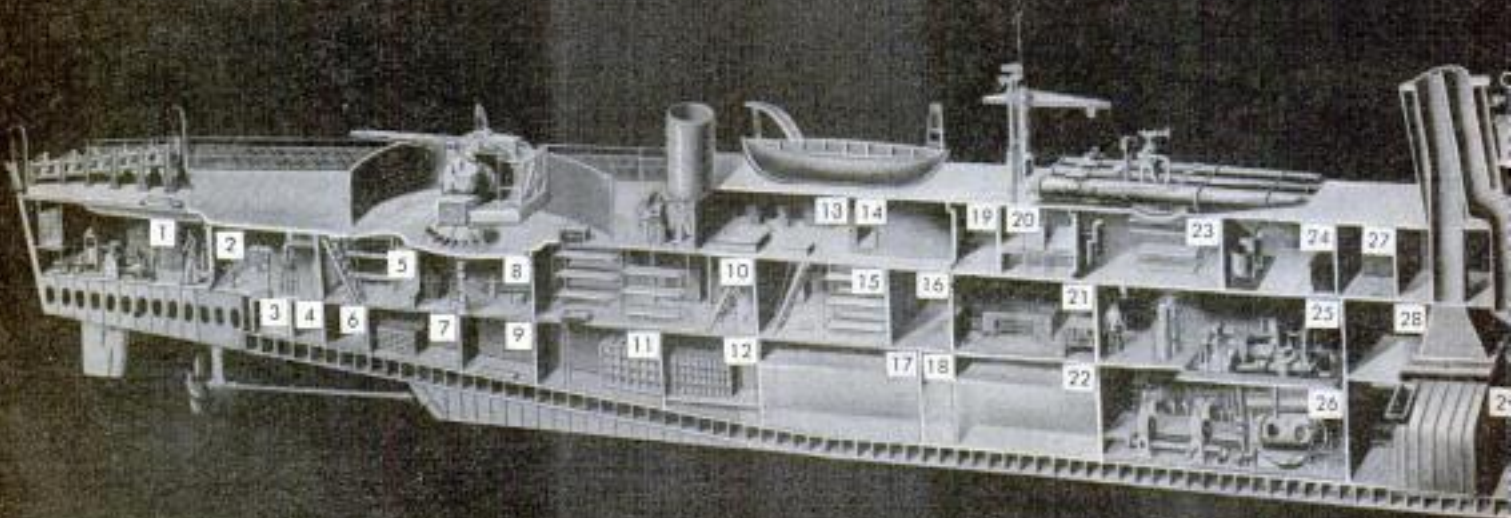
The captain of the attacking escort, left tackle of the convoy team, flashes the terse report to the quarterback on the flagship:

"Submarine contact, bearing 0300, range 2500 yards! I am attacking!"

Instantly, with the precision born of countless drills, the screen commander dispatches a Pouncer to join the attack, and regroups the remaining screen swiftly to fill in the gaps in readiness for the wolf pack's next blow.

This famed DE of World War II, the USS England, bagged six subs in one battle, but is outmoded by new ship

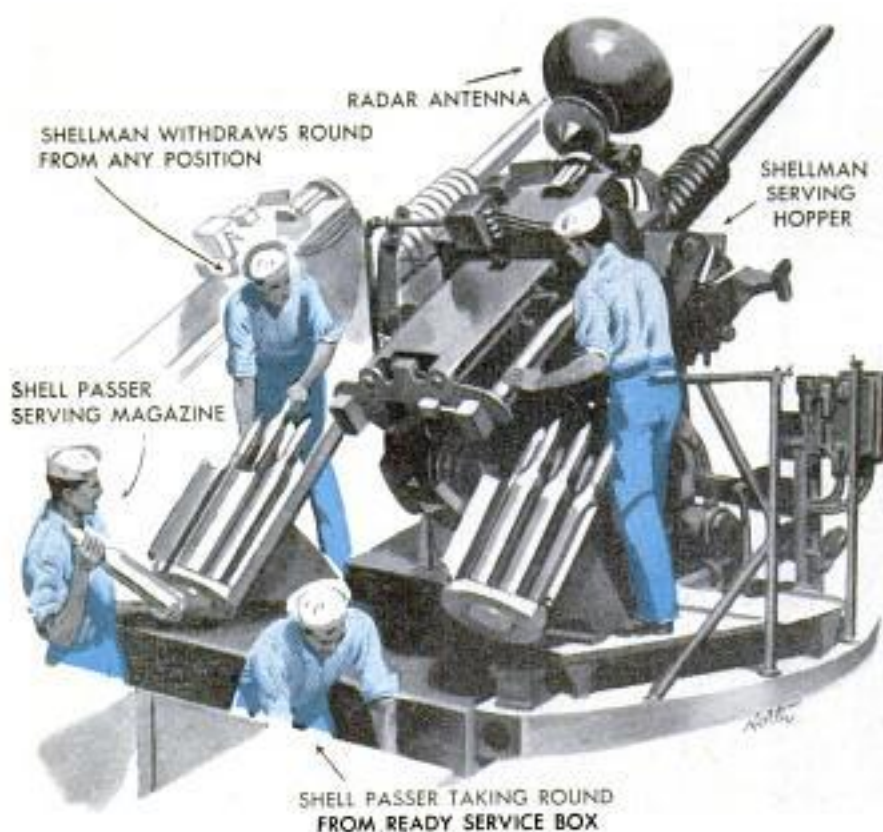




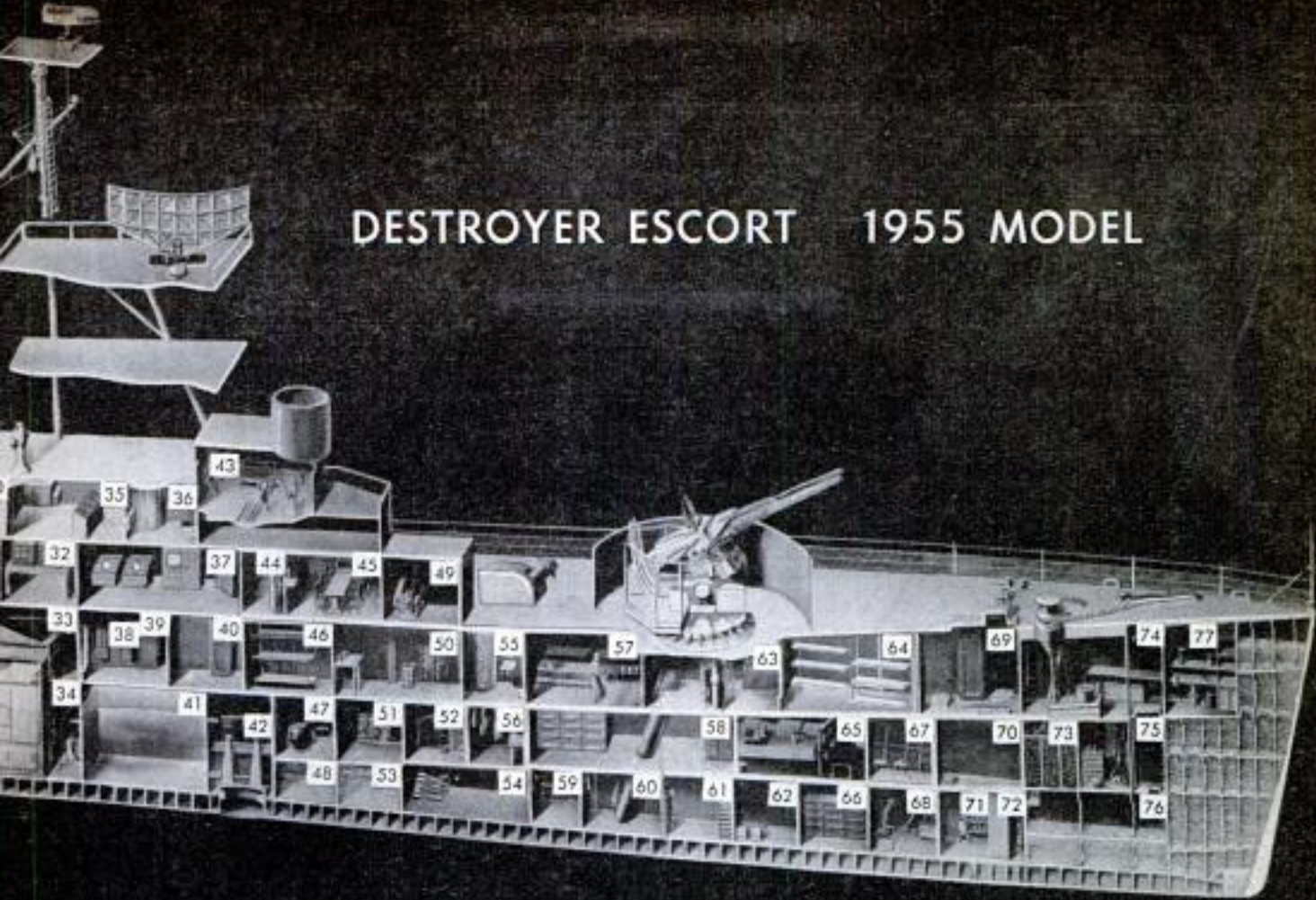
Aimed by radar, these swift-firing 3-inch twins are part of the armament on the new destroyer escorts. These guns are primarily anti-aircraft weapons but could murder a surfaced sub

1, Steering-gear room; 2, Workshop; 3, Depth-charge magazine; 4, Passage; 5, Crew's berthing; 6, Electronics storeroom; 7, 8, 9, Magazine and handling rooms for 3-inch guns; 10, Crew's berthing; 11, Depth-charge magazine; 12, Storeroom; 13, Atomic-defense decontamination space; 14, 15, Crew's washroom and berthing; 16, Damage-control

repair locker; 17, Water tank; 18, Fuel-oil overflow tank; 19, Battery-charging room; 20, Scullery; 21, Officers' room; 22, Fuel-oil tank; 23, Crew's mess hall; 24, Crew's galley; 25, 26, Engine room; 27, Engineering office; 28, 29, After boiler; 30, Underwater-battery-plotting room; 31, Boiler uptake space; 32, Radio room; 33, 34, Forward boiler; 35, Combat-information center; 36, Captain's cabin; 37, Radar room; 38, 39, Officers' quarters and passage; 40, Officers' washroom; 41, Fuel-oil tank; 42, Sonar-transducer room; 43, Navigating bridge; 44, Atomic-defense collecting area; 45, Officers' wardroom; 46, Crew's berthing; 47, Gyro room and fire control; 48, Fresh-water tank; 49, Air-conditioning room; 50, Rocket depth-charge equipment; 51, 52, Provisions and vegetable chill rooms; 53, Fresh-water tank; 54, Rocket depth-charge magazine; 55, Chief petty officers' messroom; 56, Meat room; 57, Chief petty officers' messroom; 58, Ordnance storeroom; 59, 60, 61, 62, 63, Storage, magazine and service for 3-inch guns; 64, Crew's berthing; 65, Emergency generator; 66, 67, Storerooms; 68, Pump room; 69, Equipment room for 3-inch guns; 70, Electronics storeroom; 71, Paint locker; 72, Underwater log room; 73, Chain locker; 74, Anchor-windlass room; 75, Bosun's storeroom; 76, Peak tank; 77, Bosun's locker



DESTROYER ESCORT 1955 MODEL



The Pouncer digs its screw into the churning waters and darts toward the contact—the blocking back heading for the play. The sonarman, alert at the scope on the reported bearing, picks up the pip.

“Contact—submarine!”

Our burly lineman, slogging in for the urgent attack, has heaved heavy depth charges primed to fire when they reach the preset depth—anything to rock the ocean and shake up the submarine. But the Pouncer, coming up fast from the side, is ready with the weapons that think: Rocket charges that lead the unseen target as a hunter leads a duck, torpedoes with underwater eyes that seek out the sub through every twist and turn. These weapons don't churn up the ocean blindly; they pursue the tackler with ominous silence, soundless until they strike.

His urgent attack delivered, the lineman streaks across the probable position of the submarine and wheels in a tight turn for the next assault. As he passes over the sub, he loses the contact momentarily in the boiling waters. During this interval the undersea craft maneuvers radically to escape while the hunter's underwater eyes are blinded. But the Pouncer, ready at the flank, holds sonar contact and waits until his teammate regains contact before he bores in for the kill.

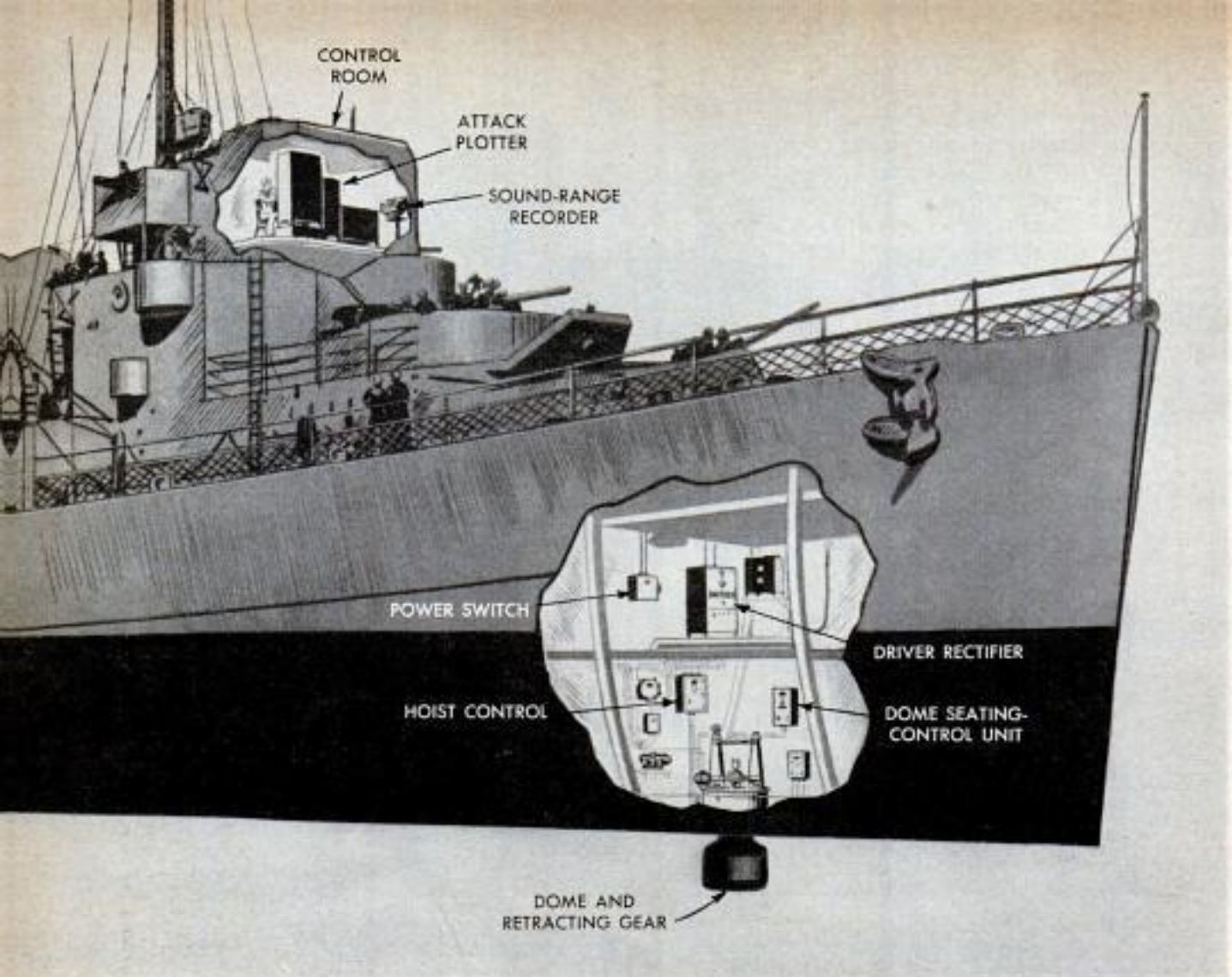
Back and forth they pass the attack, turn by turn, until no sign of the sub remains

on the sonarscopes, or until the debris of the kill boils up from the depths.

Similar action is taking place on the other flanks of the convoy, as other linemen grapple with the tacklers trying to claw down the ball carrier. Doctrine calls for breaking off the attack, successful or not, when the convoy is safely past—but in this league the boys like it best when they play for keeps.

The ship that clears out the tacklers so our convoys can carry the ball is the tough little destroyer escort. Smaller, slower and more lightly gunned than the sinewy destroyer that guards our task forces, she packs a murderous antisub punch. Spawned in World War II to counter the U-boats that nearly choked off Britain's lifeline, 467 of these mighty midgets were built by war's end, and their exploits rank high in the annals of Navy great.

Most renowned of the DEs was the famous *England*, which annihilated an entire six-sub picket line of Admiral Toyada's combined fleet, blinding at one stroke the scouting eyes that were to tell Toyada whether the United States Fleet was striking at Palau or the Marianas, and denying him the vital intelligence that could have changed our victory to defeat in the Battle of the Philippine Sea. High also on the roster of heroes were *Dennis*, *Butler*, *Raymond* and *Roberts*, who plunged fearlessly into battle against fearful odds when, with



Cutaway of combat ship shows installation of sonar equipment typical of that being used on new escort ship



Engine room on USS Dealey has less machinery than old DEs but increased horsepower from 12,000 to 20,000. Left to right, talker, chief engineer and throttleman. Below, gun crew at enclosed 3-inch



three destroyers, they flung themselves at the enemy battle line off Samar and gained the precious time needed for heavies to come up and bar the way into Leyte Gulf. There were *Brownstein*, who made three kills on her maiden voyage—*Buckley*, who ramed *U-66* and, in a blazing hand-to-hand battle that raged at the rails in the tradition of John Paul Jones, bested the sub's savage crew with rifles and hand grenades—*Pillsbury*, who boldly boarded the scuttled *U-505* and brought her back alive. These and others blazoned the name of destroyer escort on the nation's scroll of honor.

These were the wartime DEs, and mighty ships they were. But the new escorts now joining the Fleet pack a punch never dreamed of by their forebears.

USS *Dealey*, lead ship of the postwar escorts, recently joined the Fleet. Thirteen of these deadly sub-hunters are built or building, and it is safe to assume that many more are in the cards. Although little larger than their predecessors—314 feet versus 306 for wartime escorts—they are far fleetier. The World War II DEs developed 12,000 horsepower; *Dealey* delivers 20,000 with the same weight of machinery. The wartime DEs were twin-screw, so they

could "turn on a dime and get nine cents change" for close-in submarine work; this new escort is single-screw, which greatly simplifies wartime mass production, but her novel stern and rudder design gives her the tightest turn of any DE ever built. Another big advantage of the single-screw design is the reduction in machinery space; there's plenty of space left below to insure that no future war will see young reservists consigned to quarters akin to the *Caine Mutiny's* infamous "clip shack."

These things are fine enough, but it is the new sub-hunting gear that makes one of the new commanding officers, with service on three previous DEs under his belt, say reverently, "She is the finest destroyer escort ever built!"

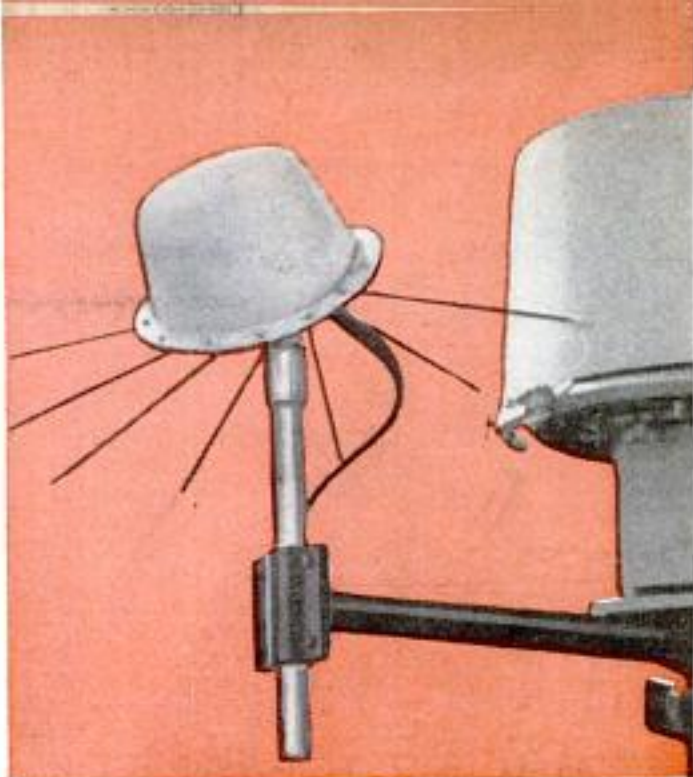
Before you can kill the foe, you've got to find him. And for this, although the old sub-hunting gear is still useful, it has found some mighty allies. First of these is radar, the invisible eye that pierces darkness and fog, its ubiquitous echo bouncing off any object on the sea or in the air and flashing back to mark its telltale glow on the radar-scope. *Dealey's* radar array makes the equipment that fought World War II look like the horse-and-buggy days.

Second of the foe-finders is ECM, the electronics countermeasure gear. The sub, prowling hungrily athwart the sea lanes, must find the convoy before he can try for a kill—so despite all precautions he too must make occasional swift searches with his radar. And his radar beam, which must hit the convoy and bounce back, makes a very weak pip on the sub's scope when the range is great. So *Dealey* mounts a duplicate of the sub's radar receiver, tuned to pick up the signal after only a one-way trip. Thus the sub's first weak signal shows up on the escort's scope while the range is still too great for the sub to get a reading. Armed with this advance warning, the convoy commodore can give the unsuspecting sub a wide berth. If the sub should sneak within range, the jamming equipment that goes with the ECM bag of tricks is designed to make the enemy's radar-scope unreadable.

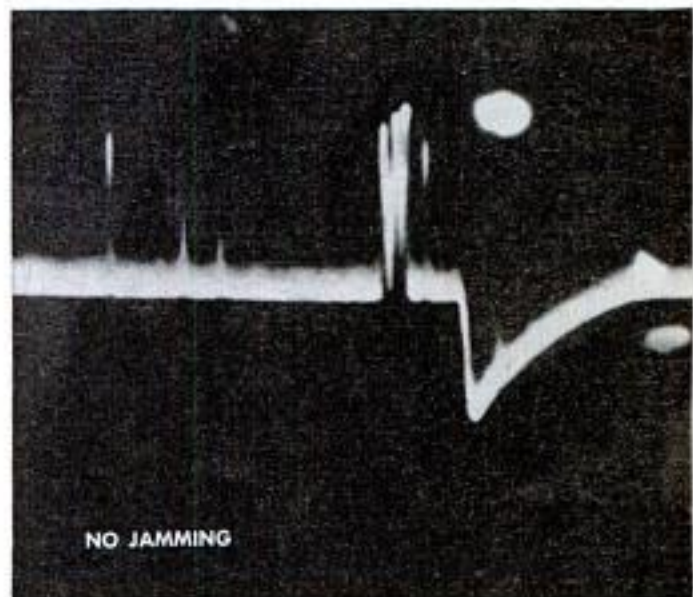
The third search device, built to probe the ocean depths, is sonar. *Dealey's* sonar, vastly improved in range and accuracy, feeds continuous precise data into complex fire-control computers and automatically sets the weapons to chase the elusive target.

Once the sub is found, this new

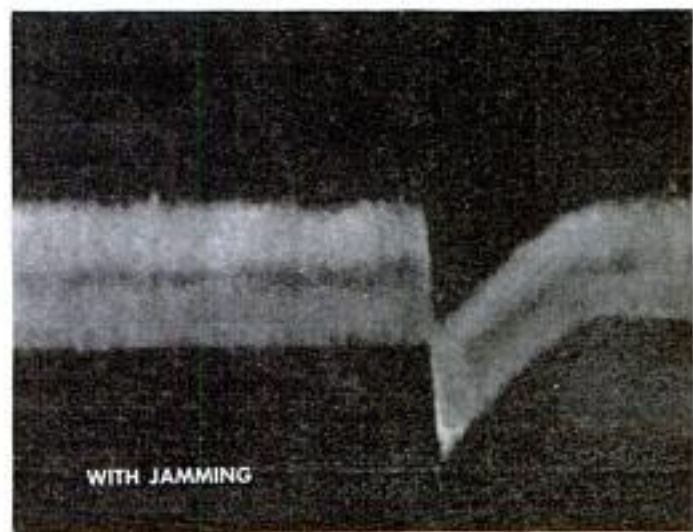
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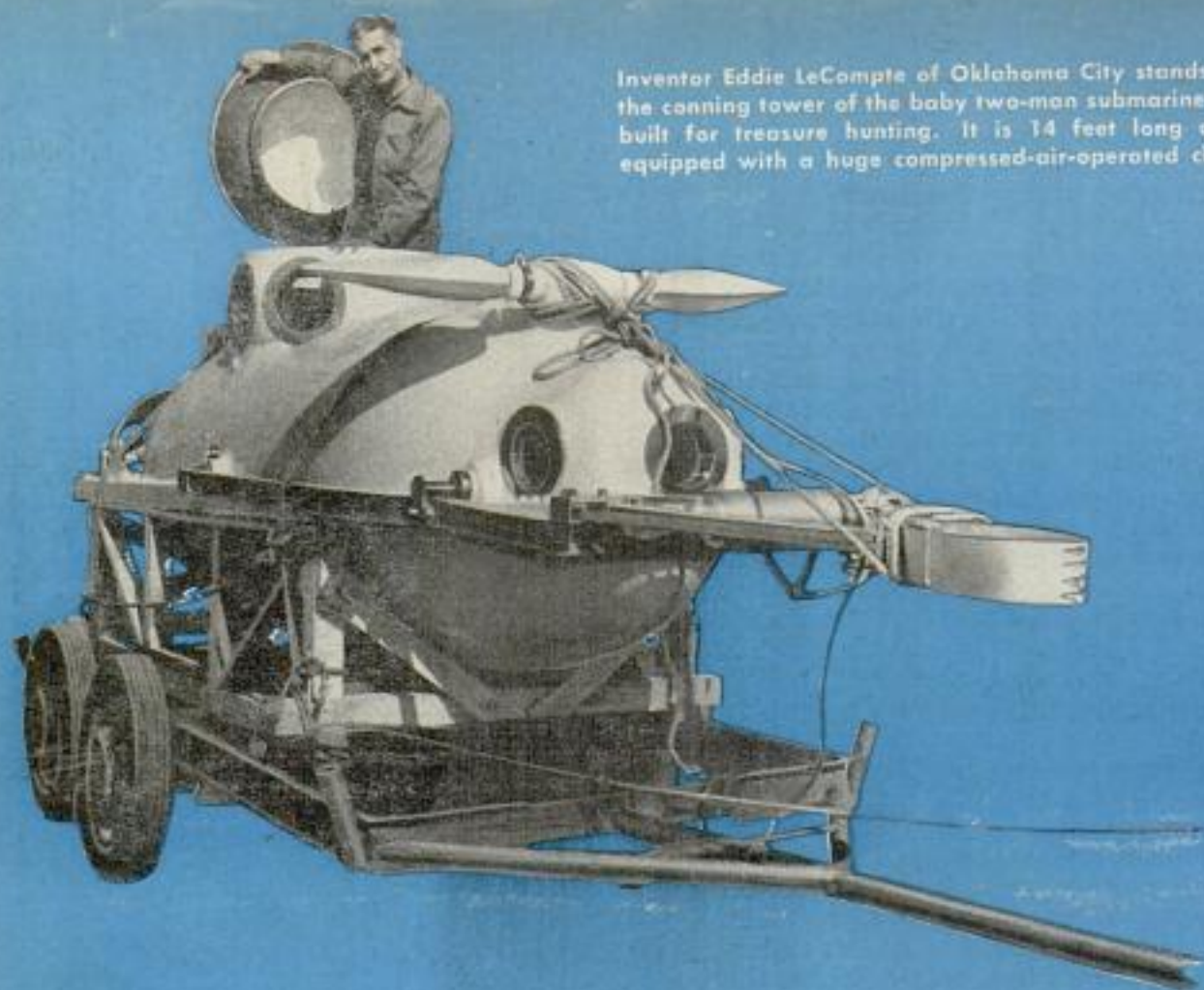
This ECM (electronics countermeasure) antenna used for jamming enemy signals is called the "derby hat" by crew



Without jamming, the enemy's radarscope would present the above picture. When ECM, such as is installed on the *Dealey*, goes into operation the signals are blurred as shown below, making it impossible to locate any target

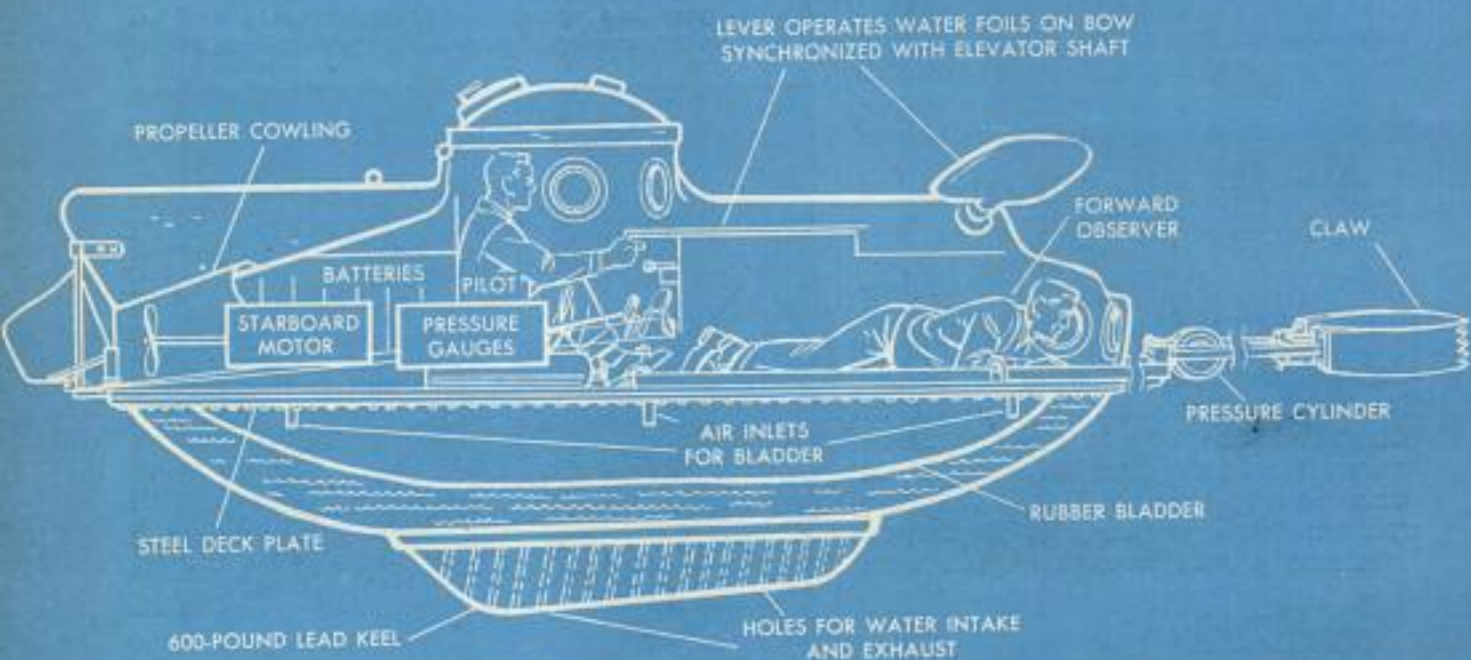


Inventor Eddie LeCompte of Oklahoma City stands in the conning tower of the baby two-man submarine he built for treasure hunting. It is 14 feet long and equipped with a huge compressed-air-operated claw



TREASURE HUNTER BUILDS MIDGET SUB

By Martin McAfee





Five minutes after launching on Lake Texoma, the baby submarine almost rammed one of the attending boats

WHILE many scientific eyes are focused on the moon and outer space, an Oklahoma City inventor has turned his attention to the ocean floor and how to get there. He is 48-year-old Eddie LeCompte, a retiring man who has made a study of submarines and lost treasure.

LeCompte has built a two-man submarine—the RX-101—and launched it in inland waters. The launching took place in early January in Lake Texoma, 15 miles north of Sherman, Tex. The 14-foot vest-pocket craft took to the water like a thirsty trout and handles herself in that element with considerable skill.

The sub's hull is molded of glass fiber and a cold-setting plastic. Its 70 laminations are $1\frac{1}{4}$ inches thick and stronger than steel.

LeCompte says he believes the midget sub will withstand a depth of 3000 feet, or a pressure of 1332 pounds per square inch. Oklahoma Testing Laboratories, Oklahoma City, reported the hull stood up under 1900

pounds' pressure during laboratory tests.

The RX-101 differs from other deep-diving craft, such as the bathysphere, in that it will do work at great depths. It is also independent of a mother ship and can move freely about the ocean floor. A telephone line was attached during tests.

LeCompte, during the Lake Texoma trials, had it fitted with a huge compressed-air-operated claw. The claw can grasp an object up to four feet thick with a gripping pressure of over 3000 pounds. It is operated from inside the sub.

Crew for the RX-101 consists of the pilot, who sits in the conning tower and handles the controls and a second man who lies prone in the bow and operates the claw. Three ports, one on either side and one in front, provide good visibility. The craft is powered by Edison batteries, which must be recharged by a unit to be carried aboard the mother ship. Its power supply will last eight hours under ordinary operating

(Continued to page 262)

With its two "eyes" above water, the sub moves under own power. Telephone line leads to the mother craft





Insulation Blanket Applied Outside of Wall Studs

After exhaustive tests in hundreds of houses in the Minneapolis-St. Paul area, a new insulation blanket designed for application in a revolutionary manner is being introduced by the Kimberly-Clark Corporation. The insulation is attached outside the wall studs where it does not interfere with duct work, electrical wiring or plumbing. It can be used with any method of frame construction from the conventional (using sheathing lumber) to tilt-up wall construction that makes use of

standard four-by-eight sheathing. When sheathing lumber is used, the insulation, known as Kimsul "48," is fastened directly to the outside of the studs. When sheathing board is used, the blanket is stapled to the board before it is nailed in place. Builders report great savings in labor with this system, usually from eight hours to one or less for the job. Kimsul is precut to the proper size and compressed for easy packaging. This reflective-type insulation also provides its own vapor barrier.



Vacuum Cleaner for Cattle Grooms Penitentiary Herd

Cattle at the South Dakota penitentiary farm enjoy frequent vacuumings with a cleaner designed for that purpose. The cleanings keep calves, cows and bulls cleaner and happier. The 2200-pound prize herd sire likes the treatment so much he will usually stretch his neck or offer a leg to be vacuumed when the buzzing machine is brought to his stall.

Extreme-Temperature Metal

Bronze, tin and lubricative pigments in a thermosetting resin are combined in a new bearing material designed to withstand temperature extremes. The material, Sinite, has extremely long bearing life where oil is available as a lubricant, but can operate in bearings without a separate lubricant when necessary. Sinite bearings work in temperatures ranging from minus 120 to plus 500 Fahrenheit.

KEEPING UP WITH THE ATOM

WEATHER SCIENTISTS are gathering valuable data on high-altitude air currents by tracing the flying radioactive debris across the sky after atomic explosions. Not only can they use this atomic debris as a tracer to check on the accuracy of their predictions on wind patterns, but they can also measure the effectiveness of cloud seeding by rain makers far from the seeded area. To gather data on the radioactivity overhead, planes flew at 8000 to 30,000-foot altitudes through clouds moving eastward from atomic-explosion sites in Nevada. Filter papers were exposed for 30-minute periods to the air and the radioactivity collected on these papers was measured by Geiger counters.

☆☆☆

Gamma rays from radioactive cobalt have been put to work vulcanizing high-temperature oil-resistant rubber and synthetic-rubber compounds. The Air Research and Development Command developed the gamma-ray method when an experimental rubber could not be bonded by conventional methods. No dangerous radiation was detected in the vulcanized product.

☆☆☆

Eight midwestern universities have formed an organization to build a \$25,000,000 atom smasher—a giant proton accelerator four times as powerful as any in existence. Preliminary designs call for a doughnut-shaped accelerator 600 feet in diameter and nearly a half mile around, capable of whirling atomic particles up to an energy of 20,000,000,000 to 30,000,000,000 electron volts. A comparable machine is in an early stage of construction at Brookhaven National Laboratories on Long Island.

☆☆☆

To check for radioactive contamination on the floors of the Los Alamos, N. Mex., Scientific Laboratory, a portable monitor has been developed. Battery-operated, it is pushed around the floor like a

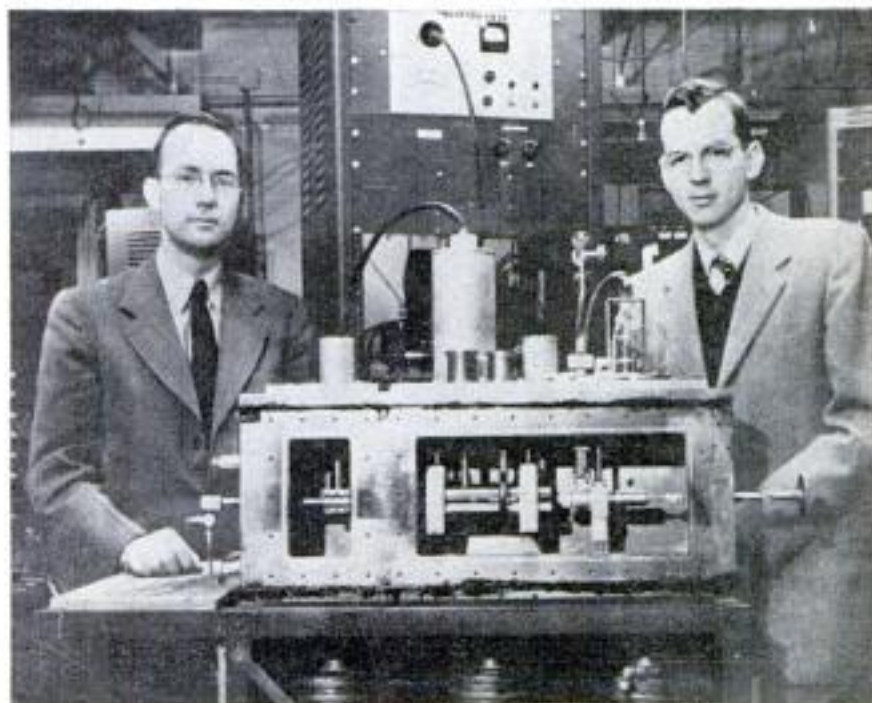
vacuum cleaner. A loudspeaker provides a signal when alpha rays are detected.

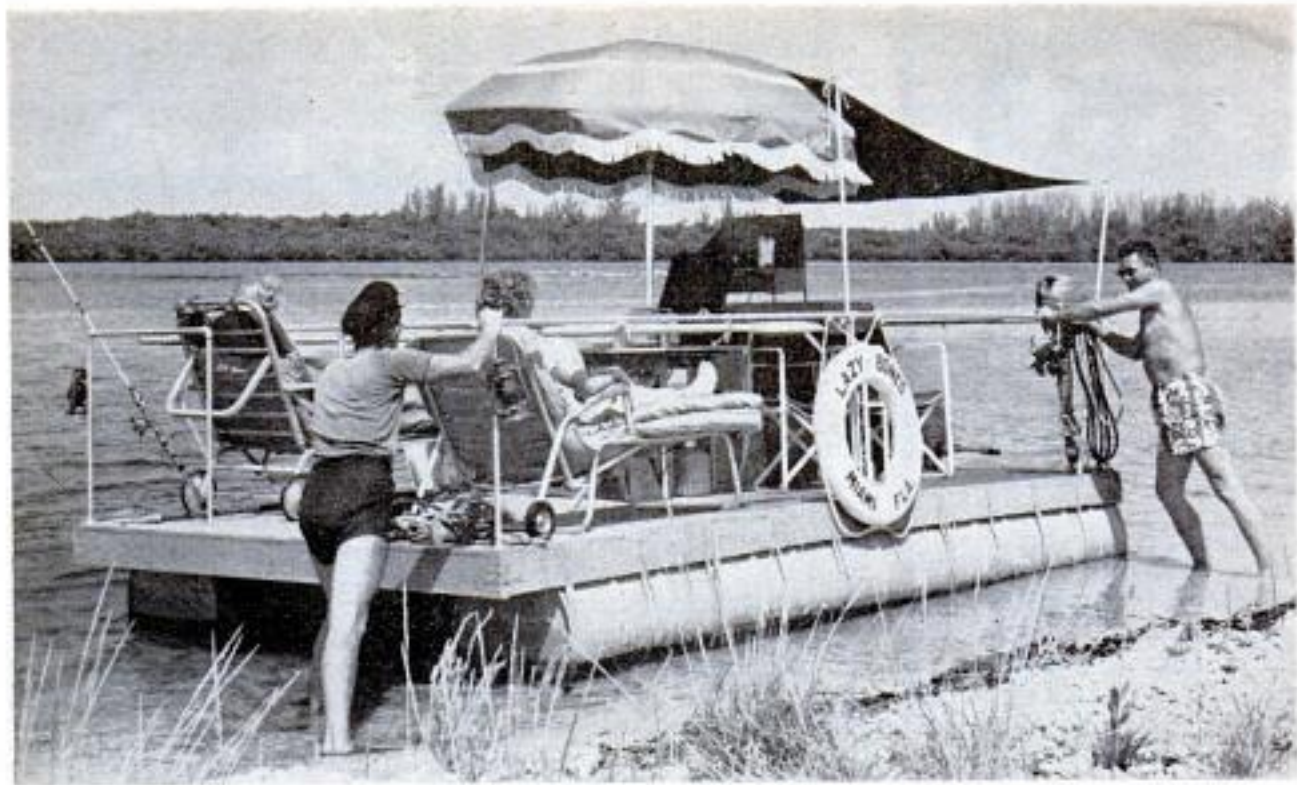
☆☆☆

The most powerful atom smasher in the world, the University of California's bevatron, is transforming energy into matter at the highest manmade energies ever produced: 4,000,000,000 electron volts. Hurling protons at nearly the speed of light, physicists reproduced in the bevatron the disintegration of atomic particles previously known only from cosmic rays bombarding the earth from space. The tremendously high energy was that of a 4,000,000,000-electron-volt-pi meson smashing into a proton. Some of the energy of the nuclear particle was transformed into mesons.

☆☆☆

Bearing no resemblance to a timepiece, an "atomic clock" (below) invented at Columbia University is described as the world's most accurate timing device—indefinitely more precise than the time we measure by the slightly irregular rotation of the earth. Called the "maser" (Microwave Amplification by Stimulated Emission of Radiation), its energy is radiated by molecules of ammonia gas. The maser gives promise of greatly increasing the range of microwave-radio transmitters and of helping to keep radio and TV transmitters precisely on frequency.





A couple of healthy shoves starts the *Lazy Bones*. Ten steel drums act as pontoons to keep deck high and dry

RAFT OF FUN

By Ed Dickson and Max Hunn

HUCKLEBERRY FINN got no more fun from his raft than do Charles and Jean Gossin of Miami Beach from *Lazy Bones*, a modern version of Huck's carefree means of travel.

It took the Gossins, with help from another couple, only four evenings of work and \$100 to build the 8 by 16-foot "floating patio." With a \$300 outboard motor and \$100 worth of lawn furniture, the raft was ready to sail.

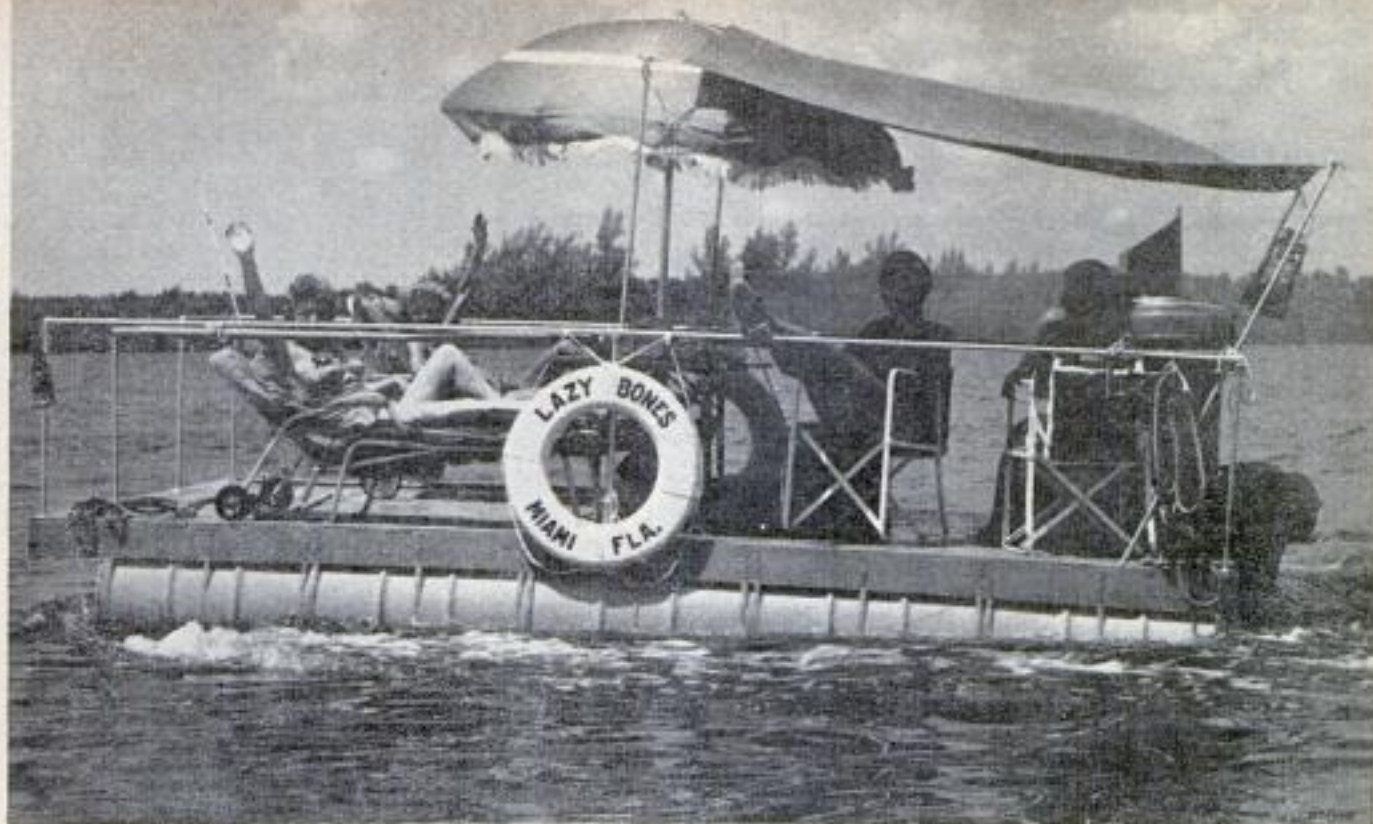
Far cheaper and roomier than a boat of comparable length, the raft also offers few maintenance problems. And, although it doesn't go very fast, its leisurely pace is just right for restful vacationing, the Gossins find.

Basically, the craft is nothing more than a wooden platform floated by two rows of 55-gallon steel drums. With a 12-horsepower outboard, the raft's top speed is about seven knots. It is equal to any currents the Gossins have encountered, including the swift-running tide at the entrance to the ocean. Charlie and Jean have cruised up and down the inland waterway, fishing, lolling, exploring canals and swimming. They have fished near the Florida Keys and have even been outside in the Atlantic



Guest pilot John Costello steers the outboard motor by foot. Everything is designed to avoid exertion

Ocean where the *Lazy Bones* handles well in the rougher water. The raft's speed is fine for trolling, they report. Its outboard motor can be steered with the foot while the pilot lounges in an aft-deck chair and reads or watches scenery. Red and green lanterns, one on each side, serve as running lights.



Raft, propelled by 12-horsepower outboard, has top speed of seven knots. In motion, bow is higher than stern

A railing of half-inch steel pipe extends around the edge of the decking. Two chaise longues and an umbrella-shaded table are anchored to the decking. An icebox, a food cabinet, a gasoline cookstove, a portable radio, a spring-wound phonograph and a spare outboard motor are part of the equipment.

Construction of the raft was simple and inexpensive. The drums, which cost \$2 apiece, were rust-treated with red lead and painted with gray deck paint. Three pieces of plumber's strap went around each drum and were anchored to the frame with screws. The platform, made of fir, consisted of a frame of two-by-sixes covered with one-by-eight planking. The lumber bill was \$52, screws and bolts were \$4 and the pipe sections for the railing were \$21.

At the stern, to attach the outboard to the *Lazy Bones*, the Gossins put a two-by-six on the end piece of the frame, experimenting with it to obtain the right height. This piece, Gossin says, should rise a few inches above the decking, but the exact place can best be judged after trying the outboard in the water. If children were carried on such a raft, a wire netting attached to the railing would prevent them from tumbling into the water. ★ ★ ★



Mrs. Gossin fishes from a comfortable chaise longue on board the *Lazy Bones*. Below, since there's plenty of room on the raft, the Gossins often invite friends to share it with them



Detroit Listening Post



By Leo Donovan

SOMETHING'S GOT TO GIVE! The way production lines are disgorging new cars, somebody's going to get hurt. If the rate keeps climbing as it has in recent weeks, by the time you get this magazine the industry will be producing at the rate of 10,000,000 cars a year. Look for the "sell-iest" summer in history if that keeps up!

Production may be interrupted, though, by a strike over the guaranteed annual wage. That issue may be making news about the time you read this.

All the big boys are claiming record production and sales, and some of the not-so-big fellows too. However, the bitter struggle among the Big Three continues to make it tougher than ever for the Little Three (Hudson-Nash, Studebaker-Packard and Kaiser-Willys). These so-called independents got off to a late start. They finished 1954 with a total of about four percent of the market and, in the early weeks of 1955, they have slipped below that figure.

Speaking of independents, racing fans are watching to see what the 1955 Hudson V8 can do on the circuit without the step-down design. Hudson's only problem is to get a hand-shift transmission to go with the V8 engine. Packard sells the engine and automatic transmission to Hudson as a package, with no hand-shift transmission available. For racing, the hand-shift gearbox is essential.

Thunderbird and Corvette

Now that it's spring and the season for "sports type" cars like the Thunderbird or the Corvette, a do-or-die sales race should be developing between them.

Ford says it can't build enough of the low two-seaters to meet demand, even with a production rate of 65 Thunderbirds a day. It claims a backlog of 75 days' orders.

Chevrolet makes no such expansive claims (not now, that is, but it did make equally optimistic claims when the Corvette was first put on the market). Corvette production is a mere 50 a month (February). That's fewer than Thunderbird builds in a day. But the 1955 Corvette is going to

be pushed by Chevrolet. With its 192-horsepower V8 engine plus power windows and top, it may be a comer. This race could be described with the fable of the Hare and the Tortoise—you cast the actors in the roles you wish!

The Continental Division of Ford Motor Company is beginning to lay down a barrage of publicity preparatory to launching the new Continental.

Important personnel are making speeches about this "living dream" car that will be produced in limited quantities with a price tag of somewhere between \$8500 and \$10,000, which should be a limiting factor in itself! Introduction date is set for October.

The new version will feature styling more than performance—as did the original. However, it should be no slouch, as it will probably boast a modified Lincoln V8 engine of 250 to 300 horsepower.

But its big appeal will be its looks. Advance releases by Continental spokesmen emphasize "honesty of line" and "elegant simplicity" as being properly descriptive.

Continental's Spare Tire

It is not expected to differ radically from the basic dimensions of the first Continental, although it will have to be somewhat lower than the original's 62 inches. One of the few styling tricks that the company spokesmen are free to discuss is the spare-tire mount, for which the car was famous.

"If there is a tire mount on the rear of the new Continental, it won't be like anything you can buy in a kit or install yourself," said a Continental official recently. **That can be translated to mean there will be an unusual spare-tire mount at the rear!**

Don't look for any circus colors on the Continental. Its color schemes will steer clear of the "lilacs, magentas and orange sherbets" says stylist John M. Reinhart.

Daytona Speed Records

Stock cars get a chance to prove their top speeds at Daytona Beach during Speed Week. Here are the results of the 1955 trials, these being the fastest speeds for each of the following stock models regardless of category:

- Chrysler 300—127.580 m.p.h.
- Ford Thunderbird—124.633 m.p.h.
- Cadillac—120.478 m.p.h.
- Buick Century—116.345 m.p.h.
- Chevrolet—112.877 m.p.h.
- DeSoto—112.295 m.p.h.
- Studebaker—111.855 m.p.h.
- Dodge—107.597 m.p.h.
- Mercury—105.069 m.p.h.
- Ford—103.692 m.p.h.
- Chevrolet Corvette—103.528 m.p.h.
- Lincoln—102.163 m.p.h.
- Plymouth—100.910 m.p.h.



Folding canvas top protects child from rain or sun



Wheels off the ground, the carriage makes a bed



Not limited to infant use, the carriage can be made into a shaded beach chair for children or adults



With the wooden framework and wheels removed, the canvas webbing can be utilized as a baby hammock

Versatile Baby Carriage Serves Many Purposes

FROM FRANCE comes a folding baby carriage that can assume numerous useful shapes, from bathtub to easy chair. The carriage, developed by Andre H. Beaudet, is of canvas on a hardwood frame, and can be converted into any of its various shapes without tools, as only thumbscrews are used for assembly and disassembly.

The versatile go-cart can grow up with a child, as it makes a lounge chair, adjustable to four positions, for older children and small adults. With its parasol it even can be used as a sun-deflecting beach chair.

When not in use, the baby-carriage chair folds flat for easy carrying, for storage or for transportation in the luggage compartment of an automobile.

Waterproof quality of the webbing makes it possible to convert carriage into a portable baby bathtub



PLYMOUTH HAS POWER, STYLE and HANDLES WELL, SAY OWNERS

By Plymouth Owners

PLYMOUTH OWNERS can't seem to make up their minds about what they like best. This Plymouth V8 survey was about as close as a survey can be.

Usually one or, at the most, two features are standouts in our Owners Report. This time there were three: 1. Ease of handling; 2. Styling; and 3. Performance. Only a fractional percentage point separated them.

Because Plymouth is a much bigger car this year (10 inches longer than 1954), it is surprising that ease of handling should place so high. It is evidence that Plymouth has not sacrificed any of its excellent handling characteristics on the altar of styling and over-all size.

"I am on the road most of the time. I practically live in my car. Yet I do not feel tired, thanks to its easy handling and ride. I do not need power brakes and power steering."—New Jersey county employee.

"I think that Plymouth is really the car for women. It is so easy to handle."—Michigan housewife.

"Sweetest driving car I ever owned. It is wonderful in traffic. On rough roads it rides real smooth."—Michigan factory worker.

"Very easy to park even without power steering."—Ohio truck driver.

Few cars have changed styling so drastically in one year as Plymouth did for 1955. And the change was for the better, say the owners. Exterior styling ranked a whisker behind handling ease in the list of best-liked features.

"The admiring glances of those who stop to look when I drive by have more than paid the price in pride of ownership."—New Jersey insurance salesman.

"This is the first time I have owned a car that has caused strangers to ask if I would

CLYMER ROAD TEST:



By Floyd Clymer

THE ROUTE over which I drove the test car was from Los Angeles, over the Ridge Route to Fresno via Bakersfield, then across the mountains to San Luis Obispo and return to Los Angeles via the Coast Route. Including some off-road testing, the distance was 710 miles, all in California. The test car was the Belvedere Sport Coupe powered by the new V8 engine developing 167 horsepower.

The car gave excellent performance under most conditions, on the highways, the mountains and over desert back roads. It has the feel of a big car and, despite some

front-end softness and corner roll (which previous Plymouths have had), it handled well on the corners and gave an excellent ride over the bumps. The weight with V8 engine (3246 pounds) is up 240 pounds over the 1954 six. Cornering stability and ride are well controlled. There is a feeling of security even at high speed or in fast cornering. It has the best roadability of any Plymouth I have ever driven.

Tubeless tires, now standard equipment, have less squeal on the corners than tires with tubes. Plymouth continues the use of

(Continued to page 270)

OWNERS REPORT: PLYMOUTH V8



mind if they looked at the car and its interior."—New York publicity director.

"Long, low lines give the car a feeling of movement when stopped."—Michigan spring coiler.

"Best-looking car in its field. Size is a good compromise between the ideal for city and highway driving. Grille easy to clean."—Illinois chemist.

Owners rated the new V8 engine's power and performance right alongside styling as a best-liked feature.

"I like its ability to get-up-and-go. Wouldn't again have a six. The V8 doesn't idle as quietly, but I am amazed at its oil economy after bad oil experience with other V8s."—Michigan salesman.

"Road test for high speed showed 115 miles per hour on speedometer."—Michigan inspector.

"I have two Plymouths: A six with Powerflite and a V8 with hand shift. My wife and I both prefer to drive the V8. Its performance is wonderful."—New York veterinary.

"The best-starting engine, regardless of temperature, that I have ever owned. Most cars in this country require headbolt heaters or a warm garage. Not Plymouth."—Montana inspector.

Best-Liked Features:

"I like the quick way it responds to slightest touch of the toe on the gas."

Florida carpenter

"I like its ease of handling in city as well as in country, plus the admiring looks it gets."

Michigan salesman

Most-Wanted Changes:

"Move temperature and oil-pressure gauges to driver's side of dash."

New Jersey engineer

"Change dashboard so instruments don't reflect in windshield at night."

Virginia farmer

Oil-pressure and water-temperature gauges should be closer to driver, say 19 percent of Plymouth owners



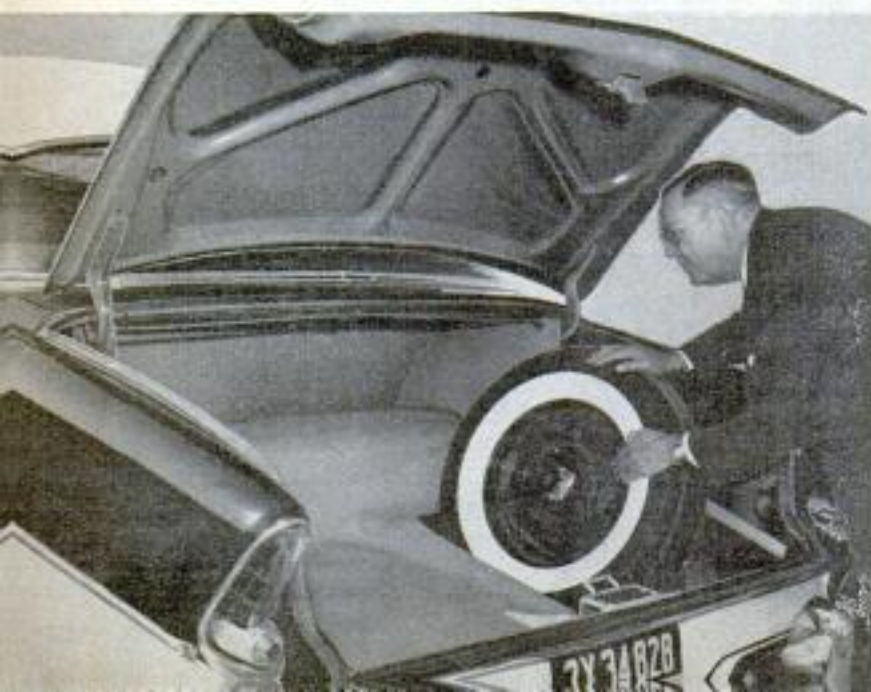


Clymer reports that "despite some front-end softness and roll . . . the Plymouth handles well on the corners"



Plymouth, like other Chrysler-built cars, keeps the push-up cowl vent. Clymer likes it. Some of the Plymouth owners don't

Below, everyone praises the roomy trunk. The gasoline-filler tube goes down in the usually wasted space behind the spare



"It's a good engine from my point of view as a mechanic. Easy to work on. Not noisy. Has a flat spot in carburetion at about 30 miles per hour in high."—Ohio truck and auto mechanic.

"Maintenance costs should be very low. Real easy to work on."—Ohio aircraft inspector.

There Are Complaints, Too

Although Plymouth owners couldn't agree on a best-liked feature, they did agree on a top complaint: Windshield reflections from the dashboard in night driving.

"Panel lights cast some bad reflections on the windshield. I had to cover the chrome ring around the speedometer to overcome them."—North Dakota farmer.

"At night, dash lights reflect off the windshield and have to be turned down."—Tennessee college teacher.

"Must ride with panel light off at night due to tilted panel. Speedometer puts glare on left side of wrap-around windshield."—New Jersey machine operator.

"Reflected glare of instrument panel can be killed by inserting a six-inch-wide dark plastic shade over panel. This is easily accomplished by removing decorative-trim screws and inserting plastic between trim and top of panel."—New Jersey engineer.

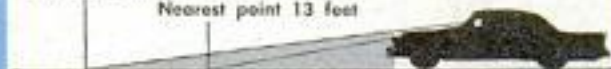
The second most-frequent complaint also involved the instrument panel. It looks as though Plymouth will restyle its dashboard for 1956,

TEST DATA

1955 PLYMOUTH V8
Sport Coupe with PowerFlite

Driver's Blind Spot

Farthest point 21 feet
Nearest point 13 feet



Driver's blind spot on a Plymouth is smaller than on most cars because of a low hoodline

Acceleration Test

1/4 mile from zero	17.6 seconds
1/2 mile from zero	30.4 seconds
0 to 30 miles per hour	5.2 seconds
0 to 60 miles per hour	14.1 seconds
Top speed by speedometer	107 miles per hour
Actual top speed about	99 miles per hour

Economy Test

Constant-Speed Mileage

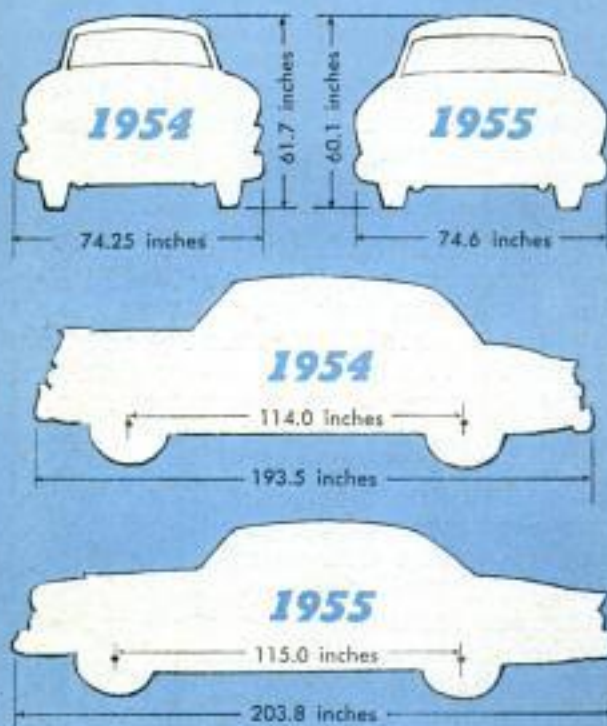
At constant 30 miles per hour	20.1 miles per gallon
At constant 50 miles per hour	17.2 miles per gallon
At constant 60 miles per hour	15.7 miles per gallon
At constant 75 miles per hour	13.4 miles per gallon

Cross-Country Mileage

Los Angeles, Calif., to Fresno (via Ridge Route)	18.7
Fresno to San Luis Obispo (some winding hills)	17.4
San Luis Obispo to Los Angeles (considerable traffic)	16.6
(Both premium and regular gasoline used)	

Comparison with 1954 Plymouth

Plymouth for 1955 is a lower, wider and longer car than it was in '54. Wheelbase is longer, too



Each month, *Popular Mechanics* looks over one of the new cars to help you decide which car is the one for you. In the Owners Report, frank statements of car owners provide data on the day-by-day operation of the car. In the Clymer Road Test, you get performance data from a driving expert

have more headroom."—Connecticut college professor.

"Radio speaker should be somewhere else and shouldn't have such sharp edges."—Michigan tree trimmer.

"PowerFlite should have parking gear of some kind to take strain off hand brake on steep hills."—Utah statistician.

"Tone down the interior."—New Jersey policeman.

"Do away with old-style air vent in the cowl."—Illinois telephone worker.

"Put oil filter in place that would be easily serviced."—Illinois manufacturer.

What Car Did You Trade?

Most of the Plymouth V8 owners in the survey traded in a Plymouth when they bought their new cars—55 percent of them. Another 12 percent traded some other Chrysler Corporation product (Chrysler, DeSoto or Dodge).

Other Best-Liked Features

The following quotations were selected as representative of the best-liked features of the Plymouth V8 owners.

"Rides very easy. Drives and looks like a big car. Good-sized trunk space."—Illinois sales representative.

"Excellent vision. Seats enable a short person to drive without neck strain."—New Jersey businessman.

"I like the interior colors and fabrics."—Michigan tool worker.

"PowerFlite transmission gives a new driving thrill."—Illinois machinist.

"On trip to West Virginia averaged 16.5 miles per gallon driving at 85 to 90 miles per hour. Average is 18 miles per gallon on trips at normal road speed."—Michigan supervisor.

"No sway or heavy feeling on turns at high speed. Does not wander like old models. At 70 miles per hour it handles like a feather and will still give a sudden burst

(Continued to page 266)

Some owners said the push-button latch is awkward to use because it is recessed deep inside the handle





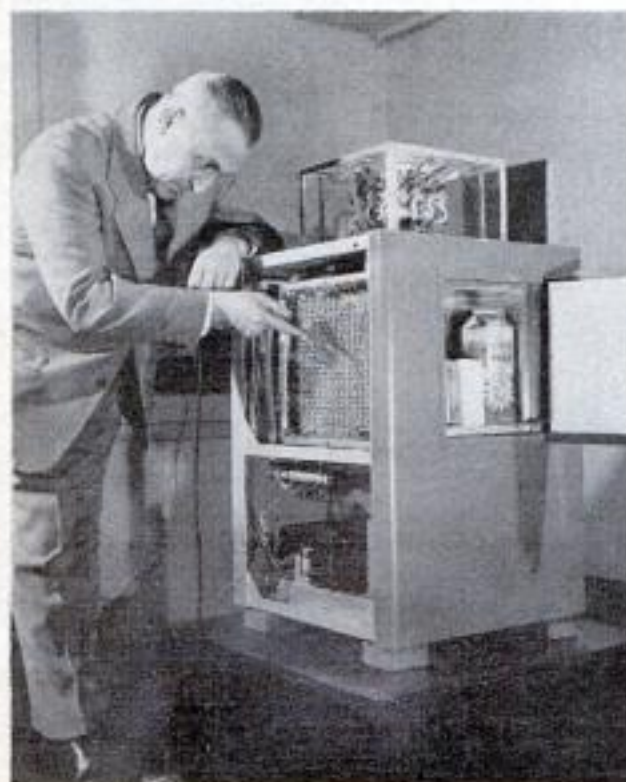
Developments in research at RCA include an electronic light amplifier which may make possible thin, flat TV screens and improved radar and X-ray instruments



Brig. Gen. David Sarnoff holds a section of magnetic tape which will record TV pictures in color. It may result in a television-picture recorder for the home

RCA Looks Into the Future

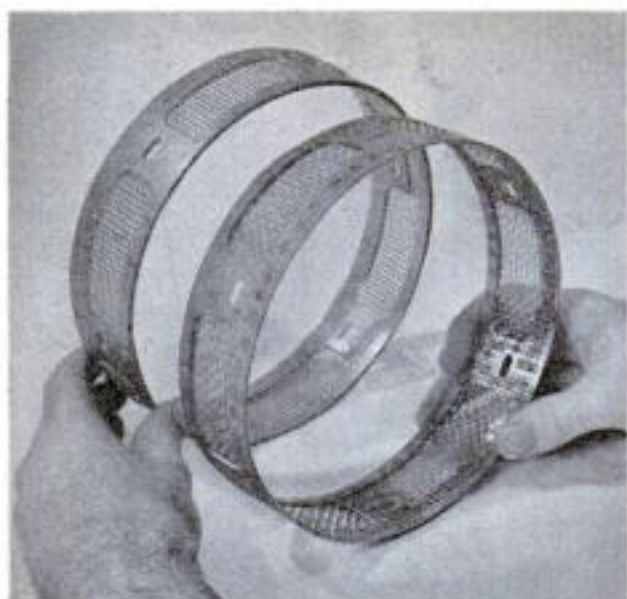
Electronic refrigerator is noiseless, has no moving parts and depends entirely upon electronic effects to achieve food-storage and freezing temperatures



APRIL 1955

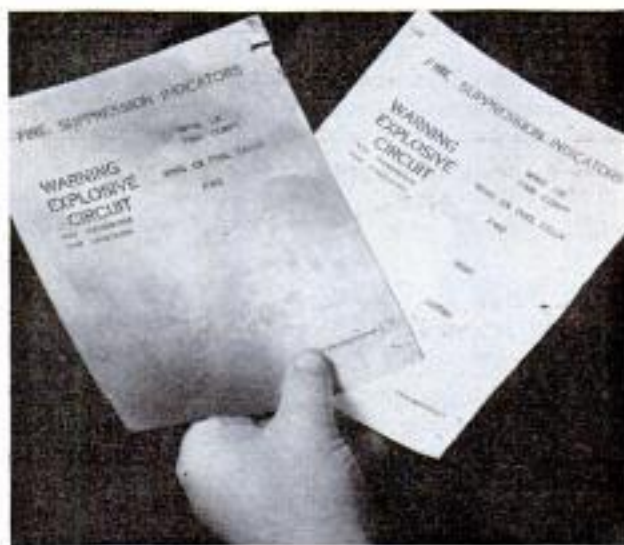
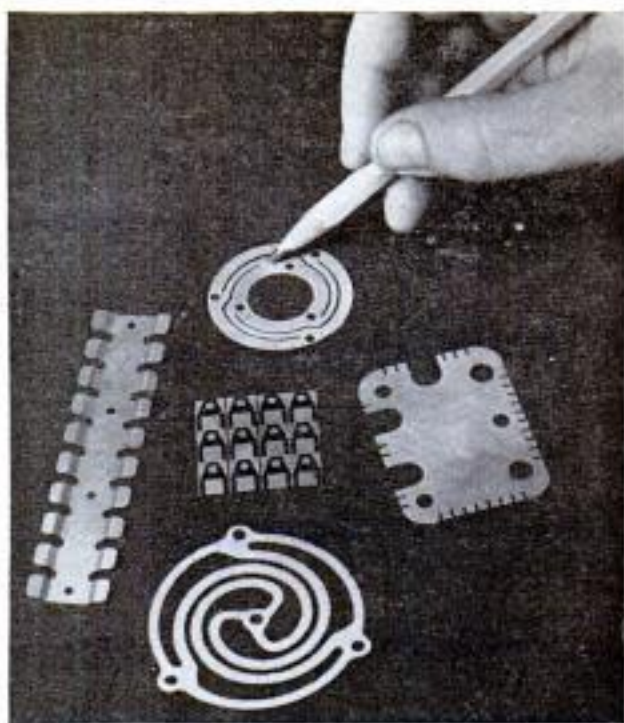
Music synthesizer is able to produce any tone of human voice or any musical instrument as well as countless tones that have never been produced before





Acid-Etched Metal "Stampings" Cut Plane Production Costs

Cost savings of as much as 80 percent over conventional stamping methods are effected by an etching process for producing sheet-metal parts developed by Chance Vought Aircraft, Inc., Dallas, Tex. The process, known as Chemi-Cut, etches unwanted parts of thin metal sheets away, eliminating such metal-removal methods as drilling, routing, blanking or piercing. In Chemi-Cut, a black-and-white master drawing of the piece to be made is transferred to the metal to be worked by photo-engraving, lithographing or silk-screen printing. A special acid-resisting ink is used. Acid is then applied to complete the etching process. Chemi-Cut has been employed successfully on various metals without affecting their physical properties.



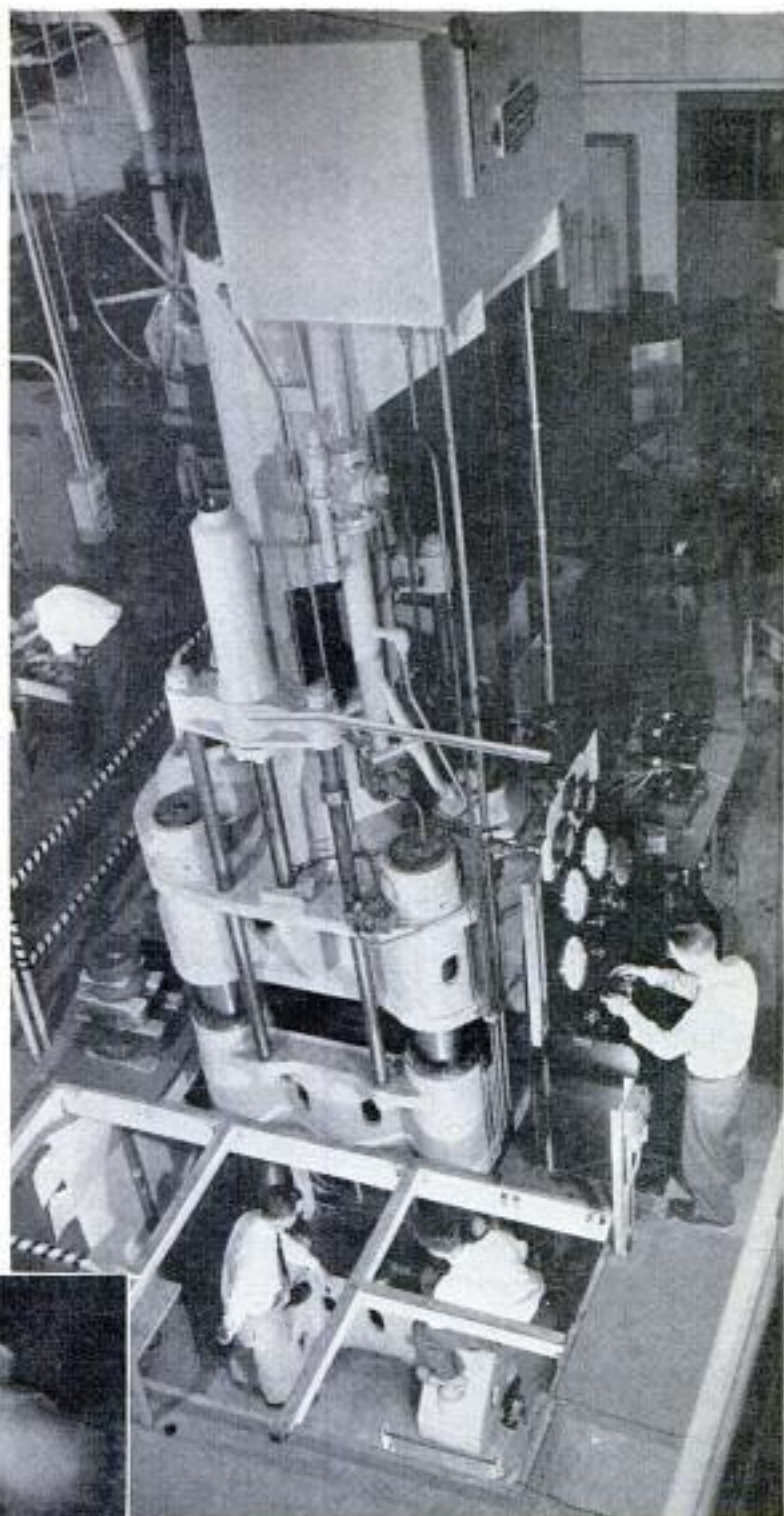
Test Panel Checks Appliances

Almost any type of electrical appliance in the United Nations buildings, from coffeemakers to tiny motors, can be checked on a test panel. The panel was designed specifically for this job, but it could be used for checking electrical machines for industry. The panel is wired for immediate testing of motors, relays, fluorescent starters, heaters, lamps, clocks, batteries, condensers, fire detectors, thermostats and fuses and switches of all types.

High Heat and Pressure Form Manmade Diamonds

Manmade diamonds produced in General Electric's recent milestone achievement resulted from terrific heat and pressure. A temperature of 5000 degrees—half that of the sun's surface—was generated in a laboratory press which exerted a pressure of 400 tons per square inch on a carbonaceous compound. This pressure was equivalent to that existing 240 miles beneath the earth's surface. The diamonds produced in over 100 GE experiments duplicate the features of natural diamonds, but are suitable for industrial use rather than gem settings in rings. The largest crystal was $\frac{1}{16}$ inch long. In a typical year, the United States uses more than \$50,000,000 worth of imported industrial diamonds. General Electric hopes to reduce its cost of production enough to break into this vast market and free the United States from dependence upon foreign sources. Practically all diamonds now come from Africa.

Laboratory press at right produced the diamonds. Below, a magnified view of the largest diamond produced shows its size as compared to that of a diamond phonograph needle. It is $\frac{1}{16}$ inch long



Aircraft Direction Finding Now Aural as Well as Visual

Supplementing the internationally adopted VHF Omni-Range System (VOR) of direction finding now used by aircraft, is a new aural bearing generator which adds a voice signal to the needle direction indicator on an aircraft's instrument panel. The aural bearing generator is designed to work in conjunction with any VOR ground station. It consists of a voice signal sent out on a rotating beam. A plane flying due east of a station would hear the voice announcement "90" (for 90 degrees) each time the beam rotated.

THE BEAM THAT ZIPS UP



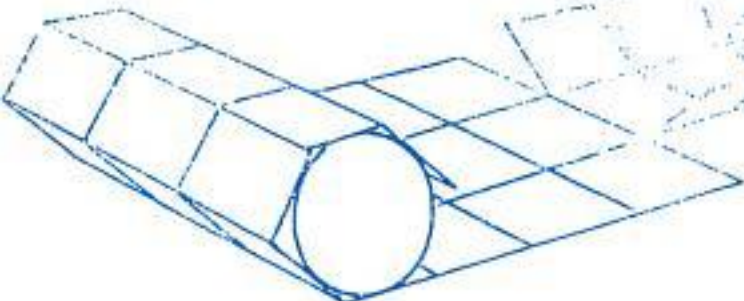
This rolled-up beam with work platform on top can be extended to 79 feet in minutes with electric motor



Drawings show varied uses of the retractable beam. It can serve as a mobile but stable platform for fire fighters, carry airplane-maintenance workers to the topmost tip of a transport's tail, or replace scaffolding during repair of a dry-docked ocean liner



FROM A WINCH

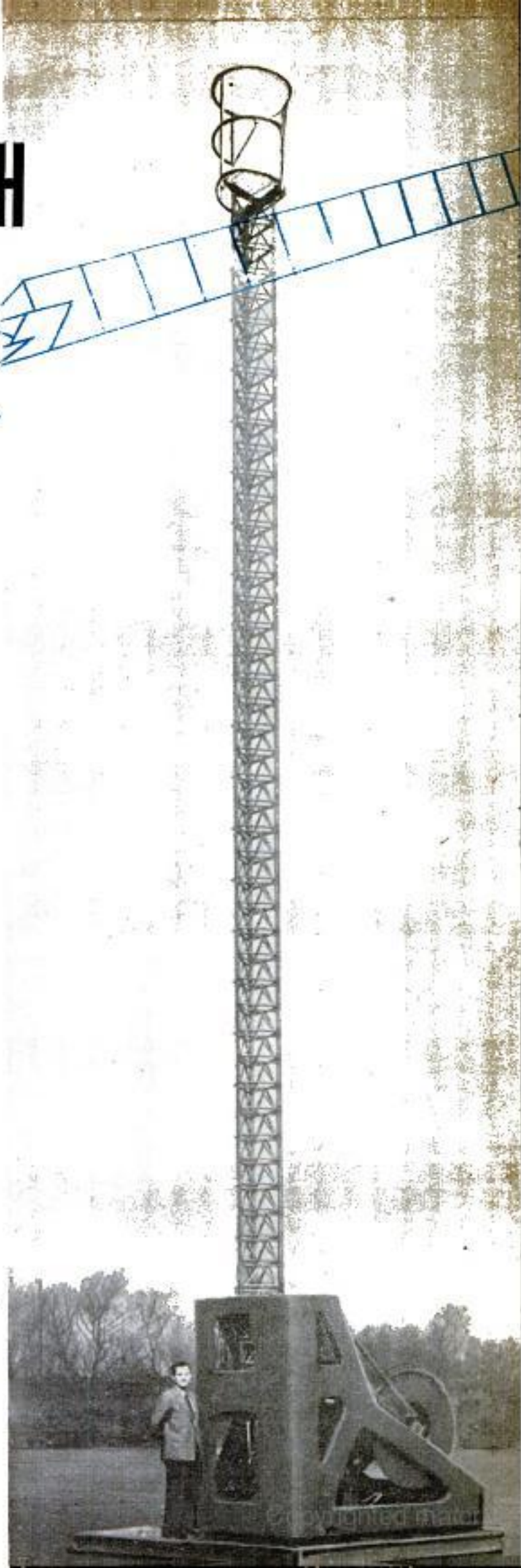


A RETRACTABLE GIRDER invented by Frenchman Michel Le Roy has brought the Indian rope trick up to date. The girder is composed of jointed links that lie flat on a drum when not in use. A small motor unrolls the links which travel through a curved guideway that joins them in the manner of a slide fastener. A triangular, rigid girder shoots up into the air at the rate of 25 feet per minute.

Once up, a 50-foot girder takes 1100 pounds of weight and withstands winds up to 50 miles per hour. It is as easily retracted and "unzipped." Raising a tower by manual cranking takes about twice as long.

The United States Air Force in Frankfurt, Germany, is testing the beam as maintenance scaffolding for construction and for mechanics working on planes. The French Air Force will use it for a portable radar antenna. Mounted on tracked or wheeled vehicles, the beams could be used as portable fire-fighting towers, as heavy-cargo loaders for aircraft and as scaffolding for the repair of ships in dry dock. Army engineers could quickly throw a bridge across a stream by using "zipped" beams for supports. ★ ★ ★

Extended girder at right will support 1100 pounds. Temporary bridge below is supported by two girders.





Kitchen of Tomorrow Features 12-Foot Refrigerator Wall

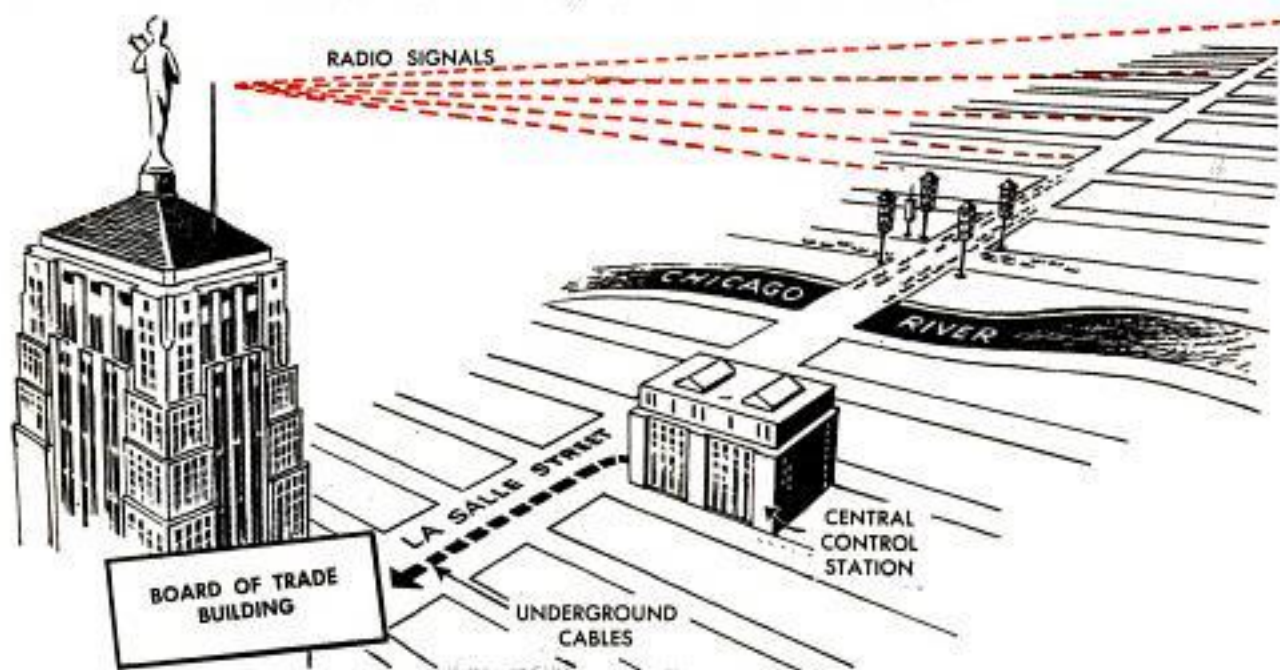
Every refrigeration appliance the housewife could desire is packed into the 12-foot wall of the Frigidaire Division of General Motors' Kitchen of Tomorrow. At one end is a beverage cooler, with shelf for glasses. Next comes a white-enamel water cooler that dispenses ice water, crushed or cubed ice. The combination refrigerator and freezer, with doors that slide up or down,

follows, and the cooling wall is finished by a damp-cold drawer for meats, butter, cheese or vegetables. Added features of the kitchen are a square island sink in the middle of the room and a television screen that can observe front door, nursery, play area or commercial program. Some of the features of the dream kitchen are not beyond the prototype stage.

Radio Beam Changes Chicago's Traffic Signals

Chicago soon will have traffic lights controlled by radio. The electronic system will automatically change the traffic signals in an area just north of the city's Loop. A control station will be located in the city hall. At predetermined times, a master mechanism will activate a tone signal

which will be carried by cable to a transmitter atop the Board of Trade Building. Here a transmitter will broadcast the signal to traffic lights. A receiver at each intersection will select its own signal and ignore those signals that are intended for other street intersections.



The largely unexplored world beneath the surface of the earth's waters offers the adventurous or the curious a new and comparatively safe frontier for exploration. With today's equipment—

ANYONE CAN BE A FROGMAN

By Richard Garnett



YOU NEED not rocket to the moon or outer space to discover a new world. There is one at the doorstep, the world under the sea, and every year more men and women, and even children, discover it for themselves. Anyone in good health can be a frogman, an underwater explorer. All it takes is a little practice.

At Cannes, on the French Riviera, a club of frogmen has been exploring the Mediterranean since 1946. Similar clubs have been formed in the United States, Italy and Britain. The Mediterranean, however, with

its warm, clear, tideless water, almost free of sharks, is an ideal training ground.

I arrived at Cannes one Sunday and was met by Henri Broussard, vice-president of the *Club Alpin Sous-Marin* and one of the most experienced amateur divers and undersea photographers in the world. On land he is a lean, schoolmasterish man. Underwater he seems a superman.

When we reached the water front, the other members of the club were waiting to go on their daily dive.

"Come and watch us," Broussard said,



Women as well as men enjoy aqualung swimming. This coral-collecting couple floats weightless beneath the surface. Below, frogmen inspect a jumbled pile of wine jugs, once cargo of a sunken Roman galley



and we chugged out on his little boat to an undersea cliff they were about to explore.

I had already mastered the technique of goggle-fishing. It is not difficult; to see underwater one wears goggles over the eyes—or better still a mask covering the nose as well. Since the lens of the human eye is suited only to seeing in the air, direct contact with the water makes everything out of focus. A short snorkel tube in one's mouth makes it possible to breathe with one's face submerged. And with rubber fins one can swim underwater for as long as one's breath holds out.

Broussard's boat was full of people putting on aqualungs, their cylindrical tanks of compressed air clanking against the cabin as they prepared for the dive, so I pulled on my mask and fins and dropped into the sea to leave more space on board. The water was about 40 feet deep where we had anchored, and I could see no bottom. All around was a clear, deep-blue void. The surface looked from below like a ruffled ceiling of mercury. A small boy splashed in the water near by, his suntanned body very bright and brown against the universal blue backcloth of the sea.

Then suddenly divers started appearing around the boat, their faces obscured by masks, their feet deformed with fins, and with shining aluminum cylinders on their backs. Some of them wore foam-rubber suits to keep out the cold, which made them



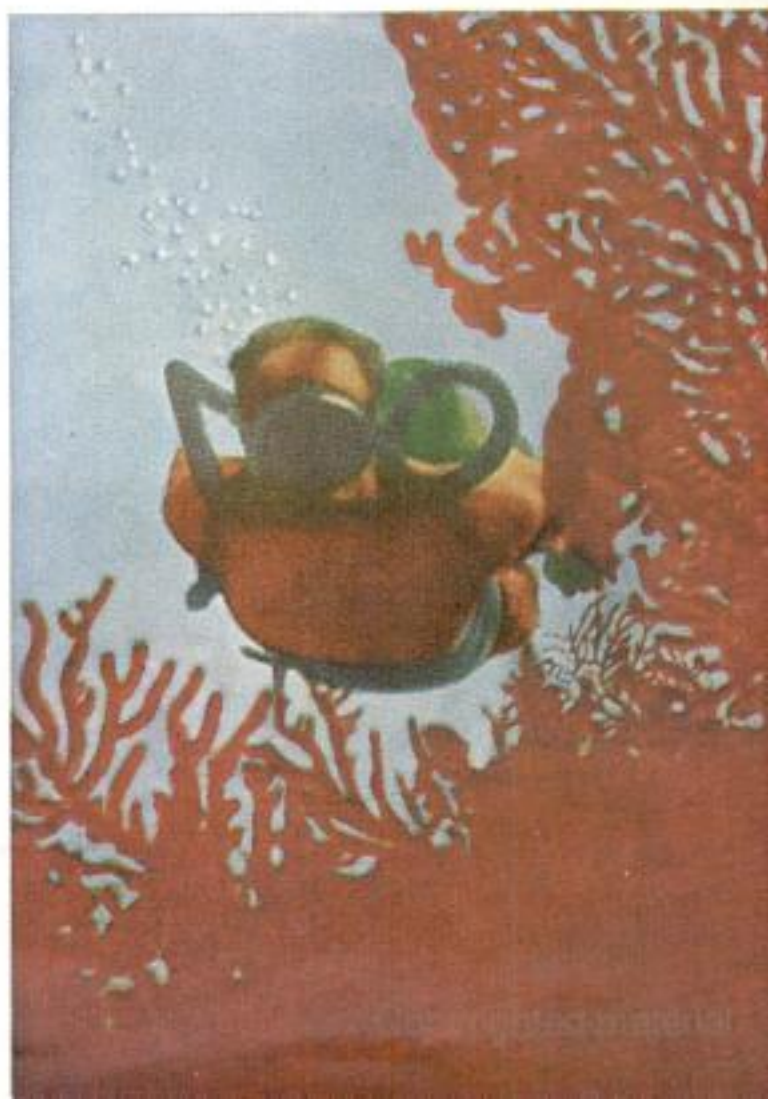
look like space men. One by one they turned head downwards and began to swim into the gloom. At each breath they released, a plume of silver bubbles wobbled slowly to the surface. And I could now hear, above the crackling of the small waves, a faint mewling sound—like a baby in a distant bedroom—made by the air escaping from their exhaust valves. Soon they faded into the blue, having reached the bottom and gone over the edge of the cliff to the deeps beyond.

Twenty minutes later they started returning with their finds, pieces of scarlet coral, a starfish, yellow and red branches of Gorgonia and somebody's lost lead line.

Next day I had my first lesson. Broussard gave me my "baptism" in the use of an aqua-lung, the self-contained compressed-air breathing apparatus invented by Jacques Yves Cousteau and Emile Gagnan in 1943. He strapped the air tank to my back and explained how the highly compressed air was supplied at the same pressure as the surrounding water.

I crammed the large rubber mouthpiece into my mouth and found I could breathe without the slightest hindrance. Then I fastened an easily detached belt of lead weights round my waist—to counteract natural buoyancy and make me exactly the same density as the water—while Broussard explained about pressure. This increases with depth, but your body is not

Jean Broussard guides the leaden stock of a Roman anchor as it is lifted toward the surface. Wooden parts have long since decayed. The red "branches" below are Gorgonia, a variety of colored coral





J. P. Charvoz plays with an octopus. Aqualung divers say octopuses are timid and not dangerous at all

affected by it except where there is a pocket of air isolated from the compressed-air supply as in the Eustachian tubes of the ears.

"When you feel pressure on your eardrums," said Broussard, illustrating his words in vivid pantomime, "you must swallow a gulp of air. Or hold your nose and blow hard into it."

He reminded me that when the air was exhausted I must turn on my reserve supply and return to the surface. Then I pulled on my fins and mask, tucked my snorkel into my belt in case my air ran out before I got back to the shore, and dropped into the sea.

At once I was in a new world. It was a delightful liberation to be free from weight and to move freely up and down in space. I sailed a few inches off the bottom, staring at weeds and small fish just in front of my nose. Owing to refraction they seemed even closer and, therefore, larger than they really were. (For this reason it is very hard to judge size, and undersea fishermen have a better excuse for exaggerating than most.) It took a little concentration to keep gulping, but I had no difficulty in equalizing the pressure on my eardrums. After half an hour or so my air ran out and I returned to the surface. It had been a satisfactory first dive, though hardly an exciting one, except for one moment when a veteran diver plunged down and held a squirming octopus under my nose.

On my next dive I went down 75 feet, and then was allowed to go to 120 feet.

Below this there is a danger of being intoxicated by nitrogen poisoning — what Cousteau calls "the rapture of the deep" — and only very experienced divers may exceed this depth. When I came up from my first deep dive — rather too fast, perhaps — I found that the water in my mask was mixed with blood from my nose. But I was reassured by Wlandi, a charming Egyptian with uneven gold teeth and an ability to stay down, breathing hardly any air, long after everyone else had come up.

"A little bloodletting is good for you," he said.

I also asked him about the "bends." This unpleasant reaction afflicts helmeted divers coming up out of high pressures. Air consists of only one part of oxygen to four of nitrogen, and the high pressure causes excess nitrogen to be dissolved in the blood. When the diver returns to low pressure the nitrogen starts coming out in bubbles which may cause paralysis or even death.

"Why don't we get 'bends' with an aqualung?" I asked him in halting French.

"Everyone always asks that," he replied, and then, breaking into emphatic English: "Get that right out of your head!"

He went on to explain that you can spend a certain amount of time down before you begin to be in danger of getting the "bends," and that this time decreases with the depth. But the air in your tank lasts a shorter and shorter time as you go deeper and breathe it at higher pressure; so that if you use

(Continued to page 228)

Fish Can't Resist Electric "Bait" Used by Conservationists

Not even champion fishermen can match the catch taken by an electric device used by a California Fish and Game Commission team. It consists of a 220-volt portable generator, two positively charged nets, cables and a negatively charged device. The current affects the nerve endings of approaching fish, forcing them to swim into one of the nets. Then the fish are dropped unharmed into a tank or back into the stream. The conservationists hope to learn what percentage of the catchable trout planted in a stream are caught and what happens to the ones that get away. Only the state agency can legally use the device.

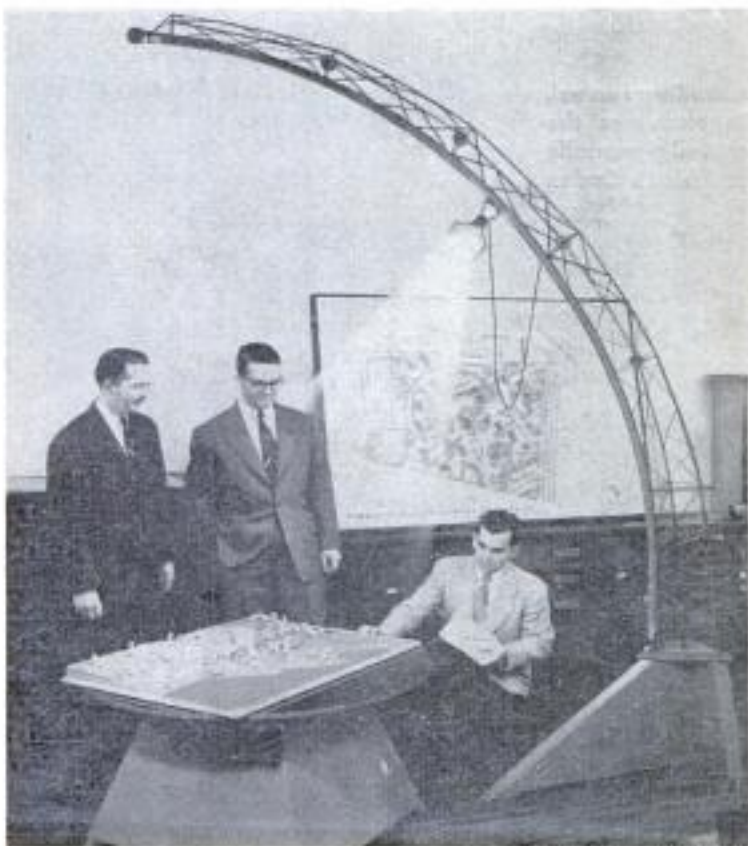


Lock Controls Car Speed

Owners can limit the speed at which their cars are driven by a key-operated stop that controls the movement of the accelerator pedal. The stop is bolted to the floor above the pedal. To set the device at any desired maximum speed you raise or lower a metal arm that slips under the pedal to stop it at the predetermined position. With the key, you can release the stop.

Architects Aided by "Sun" In Planning Modern Homes

Cornell University's College of Architecture uses as a manmade "sun" a high-intensity light bulb running on an arched steel track to help designers visualize the sun's effect on buildings and entire residential areas. Designed by Prof. Frederick W. Edmondson, the simple machine is capable of approximating the sun's position for any latitude, at any day of the year and any hour of the day. It demonstrates visually how a building can take advantage of the low rays of the winter sun to penetrate into rooms through windows or glass walls, and how the direct rays of the high summer sun may be cut off from the same rooms by properly designed overhanging devices. Recognition of the sun's effect on heating and air-conditioning costs forces architects to consider its seasonal position.

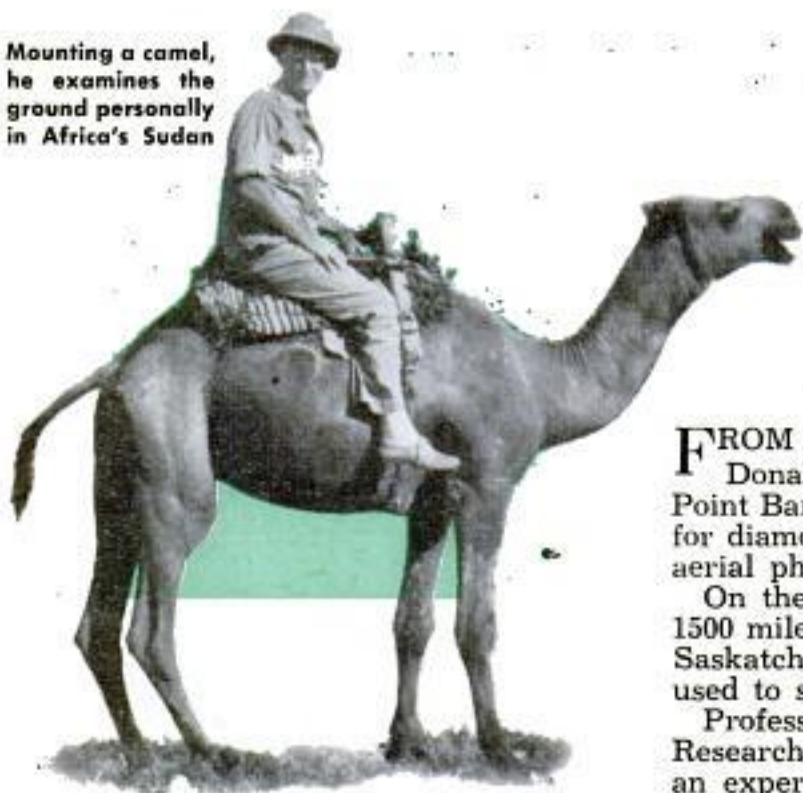


Cornell University photo



Belcher analyzes photos covering 19,000 square miles to locate best sites for Brazil's new capital city

Mounting a camel, he examines the ground personally in Africa's Sudan



From interpreting aerial photos for MacArthur, this professor has turned to prospecting with air maps. He can find you an oil well or anthill

By William Gilman

FROM HIS ARMCHAIR at Ithaca, N. Y., Donald Belcher can prospect for oil at Point Barrow, Alaska, for water in Iran or for diamonds in Africa, using nothing but aerial photos.

On these photos he can spot an anthill 1500 miles west in Wyoming or a stone in Saskatchewan which an ancient buffalo used to scratch its shoulder.

Professor Belcher, head of the Airphoto Research Center at Cornell University, is an expert at reading faraway clues from

photographs. He uses only his bare eyes and unenlarged, nine-inch-square photos taken about 10,000 feet up and showing nine square miles. He works with overlap-stereoscopic photos that bring out depth, and normally prefers up-to-date ones, but can use ordinary air-survey shots 20 years old.

His secret is that he uses simple facts from such sciences as geology and botany, and works over the photos with the skill of a Sherlock Holmes.

For example, disturbed earth can show effects for years, even centuries, so you don't have to see the earth itself if it's covered with vegetation. On the ground you may not notice it, but grass grows greener in damper soil, and it shows up clearly from the air. That's how dark lines in English air photos were revealed to be remains of prehistoric ditches dug by natives before the Celts. A pedestrian would never notice them.

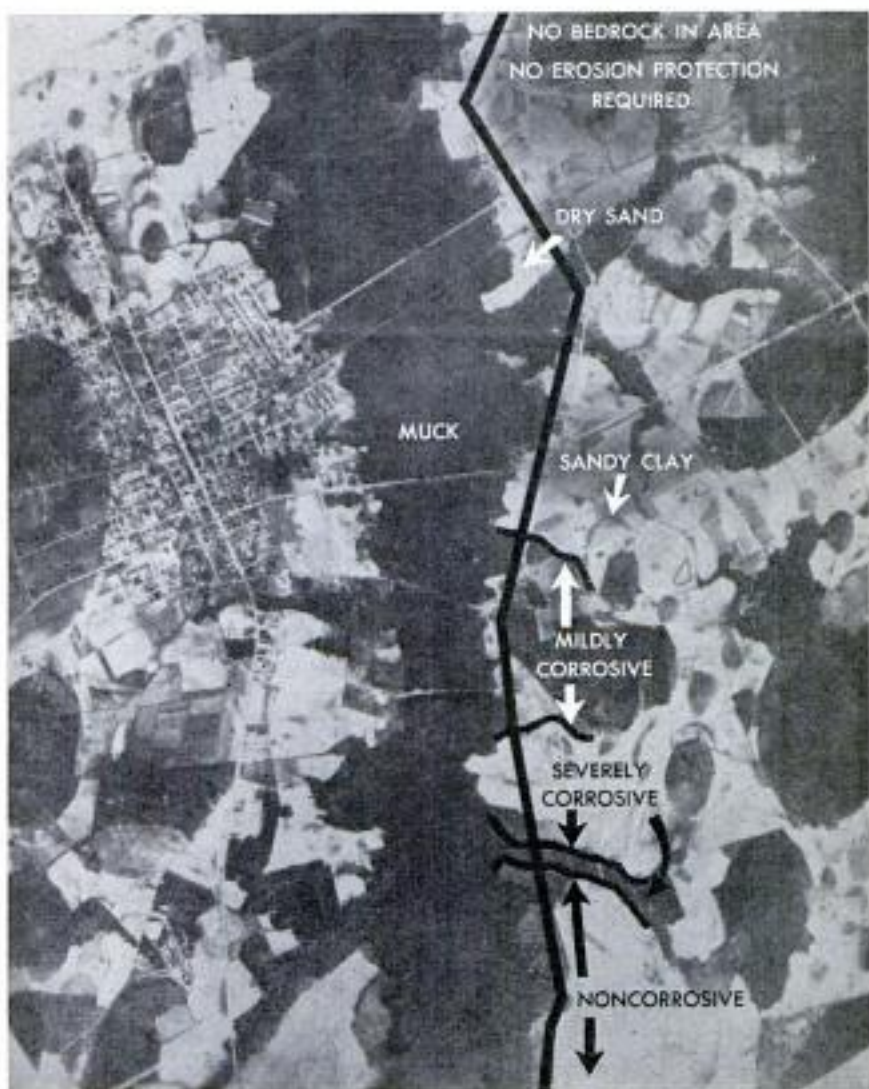
One of Belcher's special jobs has been to locate dangerous land mines left underground in World War II. The man afoot does not notice it, but the replaced soil over the mine remains slightly drier. And Belcher spots that lighter-colored soil or vegetation.

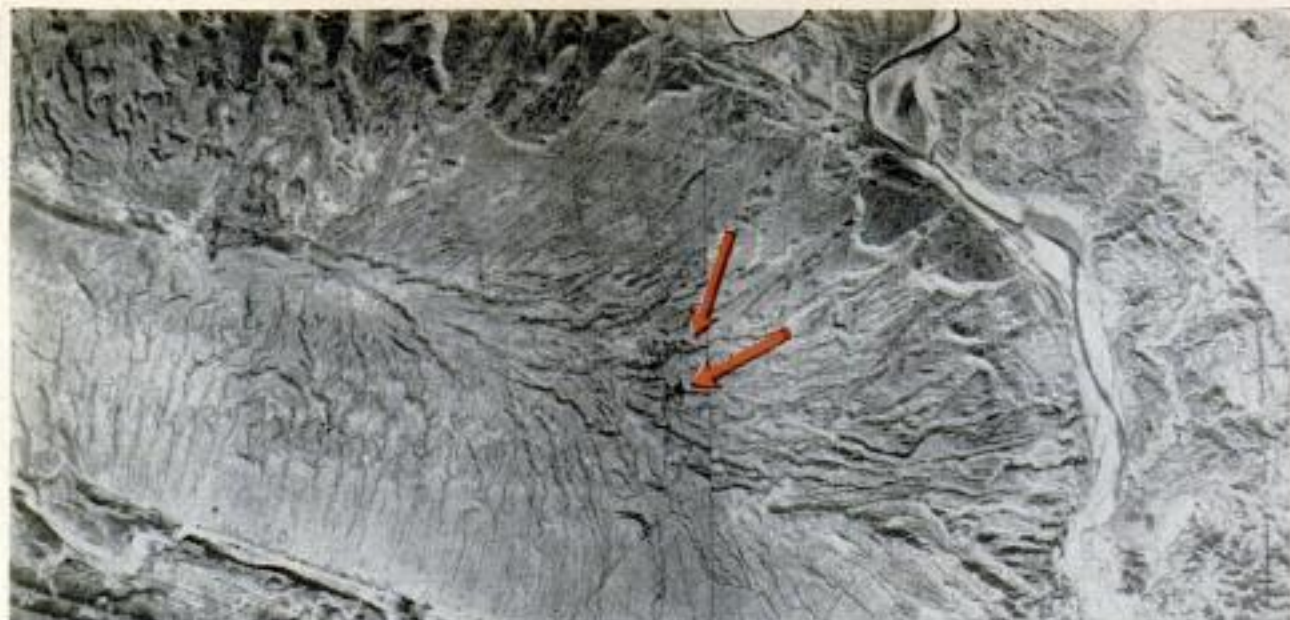
One of his photos shows a puzzling pattern of thin white lines. They're nothing but ordinary clay drain tiles buried four feet underground. Above them the ground is drier, and the grass and corn grow a lighter green.

About that anthill in Wyoming: Belcher explains that it may be only the diameter of your finger, but around it is a clear area of sand a few feet across. This whiteness is outlined by a deep-green ring of grass. Result



White arrows indicate natural erosion that might destroy old Canadian road. As result of study, new straight road was built as shown at left. Dark line (below) indicates Belcher's recommendation for pipeline route to reduce costs and repairs. Corrosive areas may cause trouble in future





Oil find was made from thousands of miles away. Arrows show cracks through which oil flows to the surface

is a distinctive small dot in the photo. Belcher filed this item away in his memory 16 years ago when he was choosing airport sites for the CAA. His mind is full of such nuggets of information.

If he notices something he can't explain, it bothers him until he finds out what it is. In Saskatchewan air photos two years ago, he easily spotted large boulders on the ground. Some were very shiny with dark

rings around them. They were a puzzle even to Belcher.

Next time one of his men was in western Canada, Belcher had him detour to the region. He found the rocks polished smooth. Around some were circles of very hard-packed ground which had shown as the dark rings. Local history explained the rest. Back in buffalo days, the beasts had rubbed their itchy hides, stomping round and

Middle East oil dome is easy to recognize—a long, upturned rock structure that resembles a whale on the sea





From air photo at left, analysts made land-use map at right. Lowest numbers indicate the best farm land

round the rocks in the area.

In Belcher's African work, a dark circle about two miles in diameter can mean a "pipe" of blue clay—the kind extending to depths where diamonds are found. Ordinary prospectors plow furrows across the land in hopes of uncovering telltale clay. Belcher can spot the darker vegetation that grows over impervious clay at a glance.

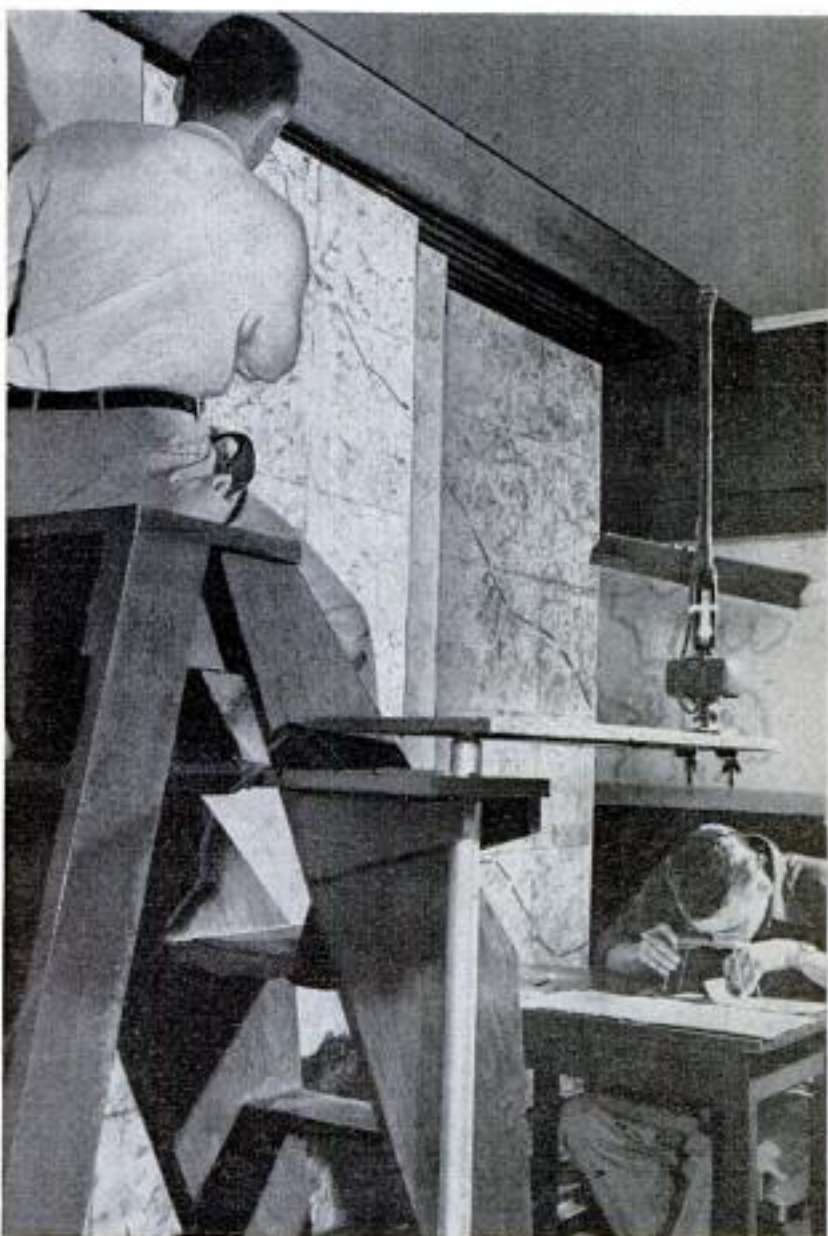
That's a special case. For most work, Cornell's expert has developed a list of 32 standard land forms which he calls "familiar faces"—sand dunes, rock formations, gravel terraces and other features.

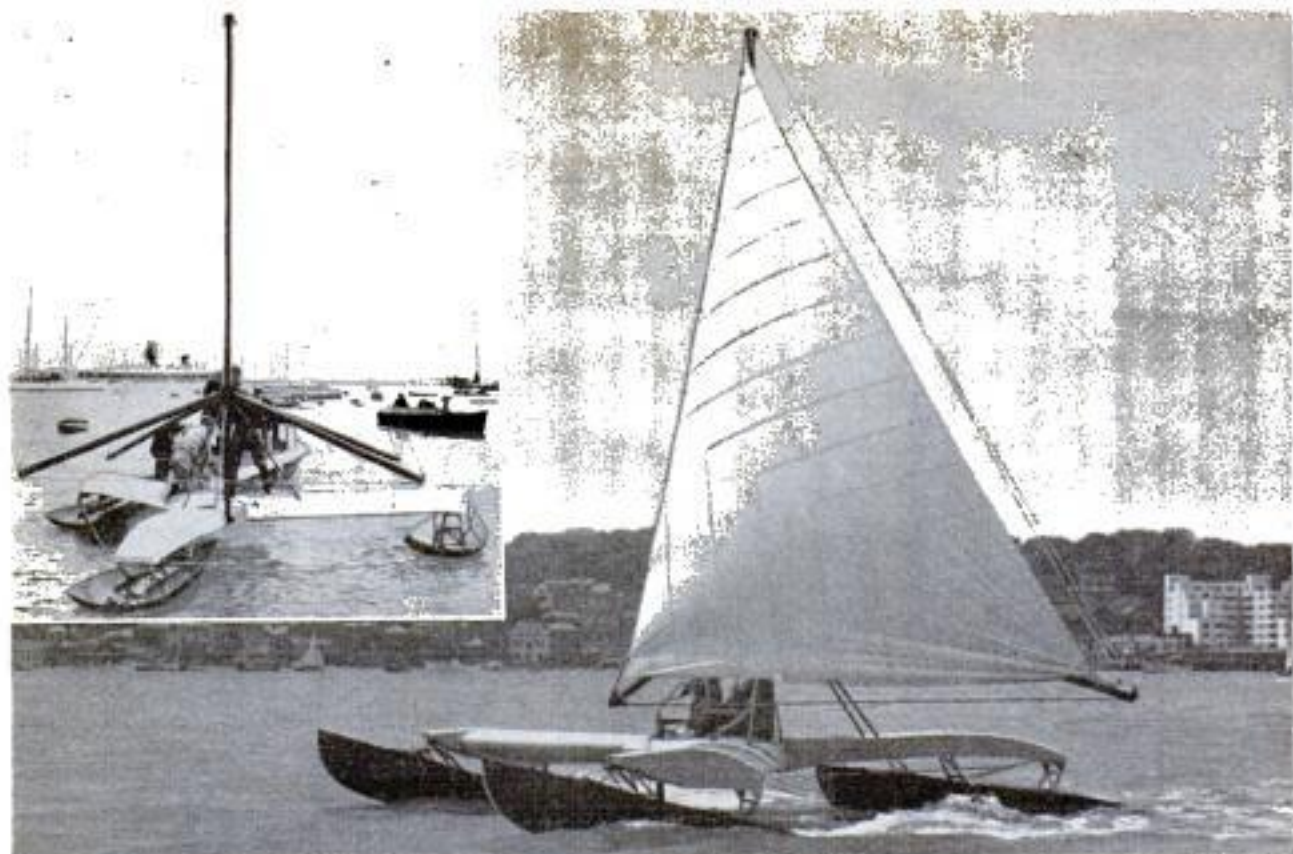
In addition to his Cornell work, Belcher now has his own consulting firm, D. J. Belcher & Associates, for private jobs. These run all the way from \$300 to locate gravel for a township's roads to a \$500,000 fee from Brazil to have Belcher's outfit pick the right place in the wilderness for that country's new capital city.

Yet 11 years ago he was still trying desperately to convince the Pentagon that his air-photo interpretation methods were needed in the war. He was then 33, a junior-grade professor of civil engineering at Purdue.

(Continued to page 240)

Sliding panels are covered with mosaic of Brazil wilderness. One analyst studies stereoscopic prints, another transfers findings to mosaic





Exceptional Speed Expected From Novel British Sailing Craft

Teamwork of a physicist and an aeronautical engineer has developed one of the most novel sailing craft ever seen in British waters. The *Trion*, designed by physicist Hugh M. Barkla and engineer John Touche, consists of three floats connected by a Y-

shaped plywood fuselage that has an air-foil section. Twin staysails are mounted on a single mast in such a way that they can rotate, to be kept at the same angle to the wind. Barkla expects that tests will show the *Trion* capable of exceptional speed.



Machine Tests Spark Plugs

Capable of checking four plugs at once, a new spark-plug tester has been developed by United Air Lines. The air-actuated machine's carriage holds all 36 plugs for an 18-cylinder engine at one time, and fires four of them at once in glass-topped inspection chambers. Combustion conditions are simulated by introduction of inert nitrogen into the chamber under 200 pounds' pressure. The new tester makes possible inspection of 400 plugs in 22 minutes.

High-Strength Power Line

Combining the strength of steel and the electrical conductivity of aluminum, a new aluminum-clad steel wire is now being produced on an experimental basis. The wire is compact, easily worked and self-supporting. Proposed uses include lead-in wires from power lines to buildings.

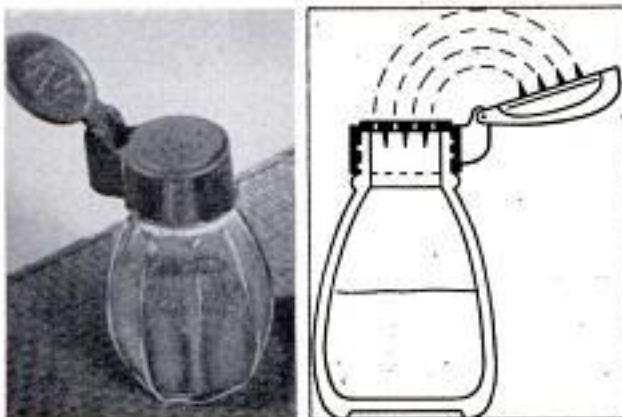


Electronic Speed Gauge Slows Cars With Siren

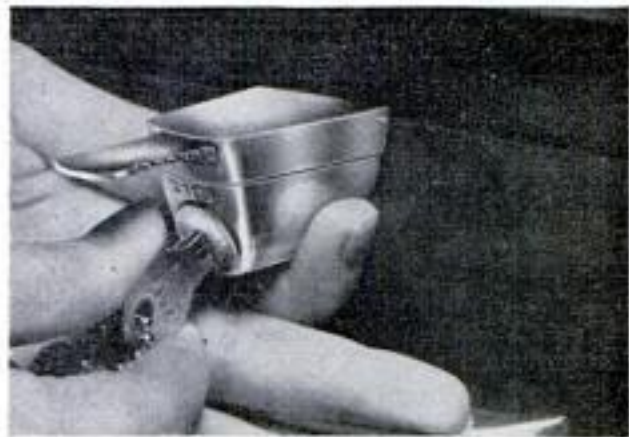
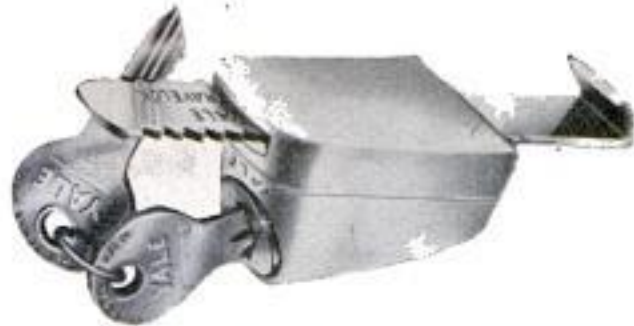
If you break the speed limit near certain Cleveland schools, an electronic device sets off a screaming siren that alerts school children and warns you to slow down. The automobile's speed is gauged as it passes over two measuring hoses laid across the street. The electronic control and siren unit are some 75 feet down the road. Before a speeding motorist passes the siren, it is blasting a loud, accusing warning. The manufacturer of the system reports that its use during the periods when children are traveling to and from school has slowed traffic in the controlled areas to a crawl.

Spiked Cover on Salt Shaker Keeps Holes From Clogging

Damp salt and clogged holes in the shaker top are eliminated by a covered German salt shaker of ingenious design. The shaker's plastic top is fitted with a hinged cover into which are molded short spikes that exactly fit the salt holes in the top. In addition to keeping out moisture, the spikes break up lumps in the shaker and automatically clean the holes every time the cover is closed.



APRIL 1955



Portable Lock Protects Valuables

Designed primarily to protect the valuables of travelers, a new portable lock can be fitted to unlocked closets, dresser drawers or other storage places for clothes and valuables. The mechanism consists of a cylinder lock in a small housing and a flat, case-hardened-steel locking bar on to which the housing fits. The bar has a hook on one end that holds it flat against a door or drawer opening, and the housing slips onto the bar to be drawn up tight in a locked position.

Tractor Lays Pipe or Cable

Capable of laying as much as 300 feet of pipe or cable a minute, a new tractor attachment eliminates laborious hand or machine trenching. The Ferguson Pipe and Cable Layer is essentially a subsoiler, to which is attached a guide tube for the pipe or cable to be buried. As the subsoiler knives through the ground, it automatically buries the pipe or cable 18 inches deep.



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The World's Hottest

By Rafe Gibbs

ALL HOMEOWNERS and communities have garbage problems, but none like those of atomic-energy plants, which have the world's biggest and most expensive garbage headache. Primarily it is the problem of the Atomic Energy Commission and the firms which operate plants for the AEC, but it is a problem that can directly affect you—and, more important, your children and grandchildren.

At an international congress of nuclear engineering held at the University of Michigan, Dr. W. A. Rodger of the AEC's Argonne National Laboratory said of atomic-energy wastes:

"Even the oceans are not big enough to hold the activity which conceivably may be produced."

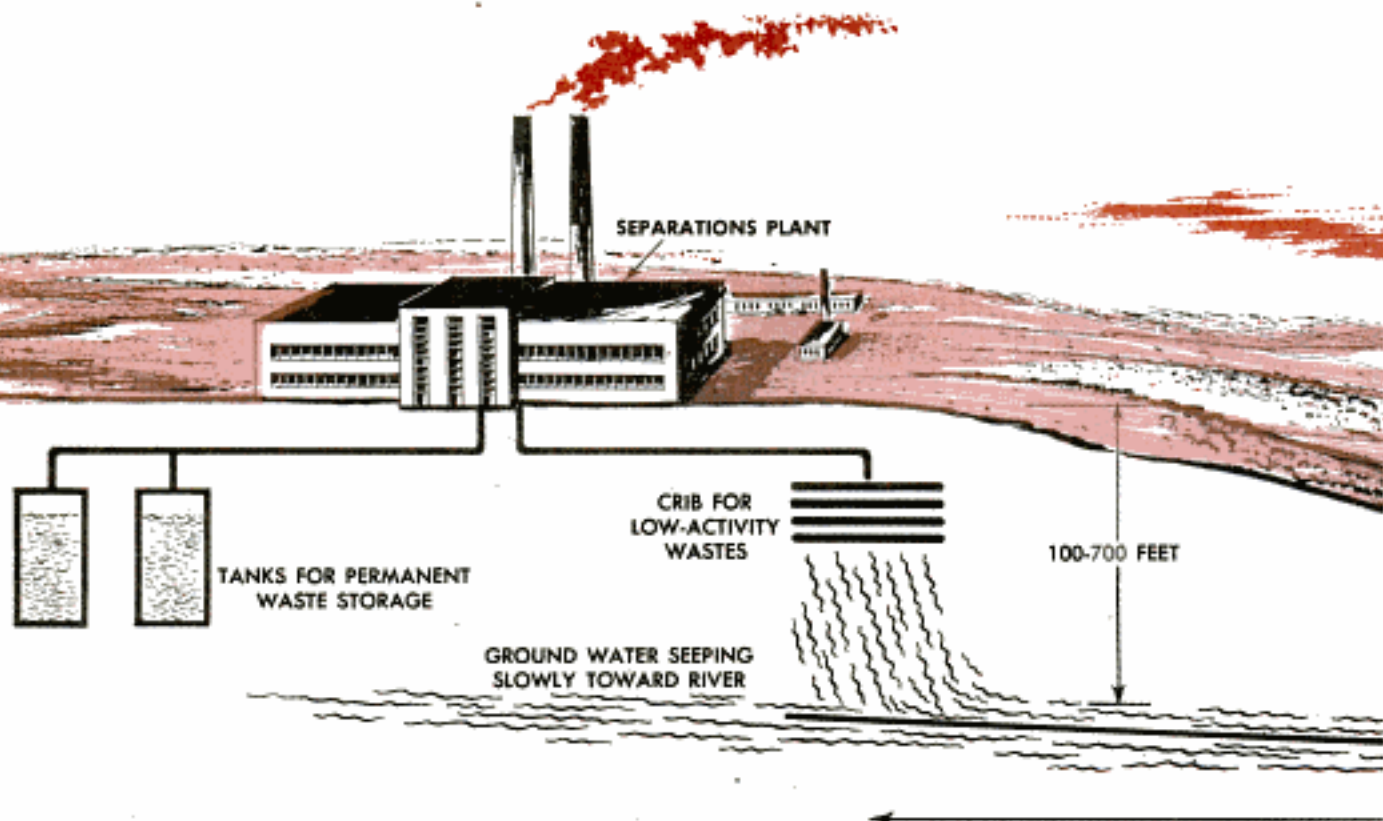
Doctor Rodger added that none of the present or proposed means of disposal—from water or air dispersal to desert burial—can offer a completely satisfactory solution for the tons of radioactive waste the world will be piling up in about A.D. 2000.

The lethal brew cooked up by the witches in Shakespeare's *Macbeth* was relatively

mild stuff, and it was only one kettleful. With the Atomic Age still in rompers, many millions of gallons of deadly waste materials are already stored for safekeeping in huge tanks—some of 1,000,000-gallon capacity. The Hanford Atomic Works in Washington alone has waste-storage tanks with a total capacity of 67,000,000 gallons.

And, if you have bemoaned the weekly cost of having your kitchen garbage toted away, you should consider the cost of handling radioactive garbage. The bill for purchasing those storage tanks at Hanford, for instance, came to \$27,000,000. Or take an ordinary plant in your town and turn it into one producing atomic energy. Disposal of the waste generated—safely for both plant workers and residents of the surrounding areas—will multiply operating costs 16 times.

Fortunately, the 384,000-acre Hanford reservation has a unique soil situation which permits some waste from plutonium plants to be run off into discharge pits instead of storage tanks. The desert soil soaks up the deadly wastes with sponge-like rapidity, and earth particles trap and



"Garbage"

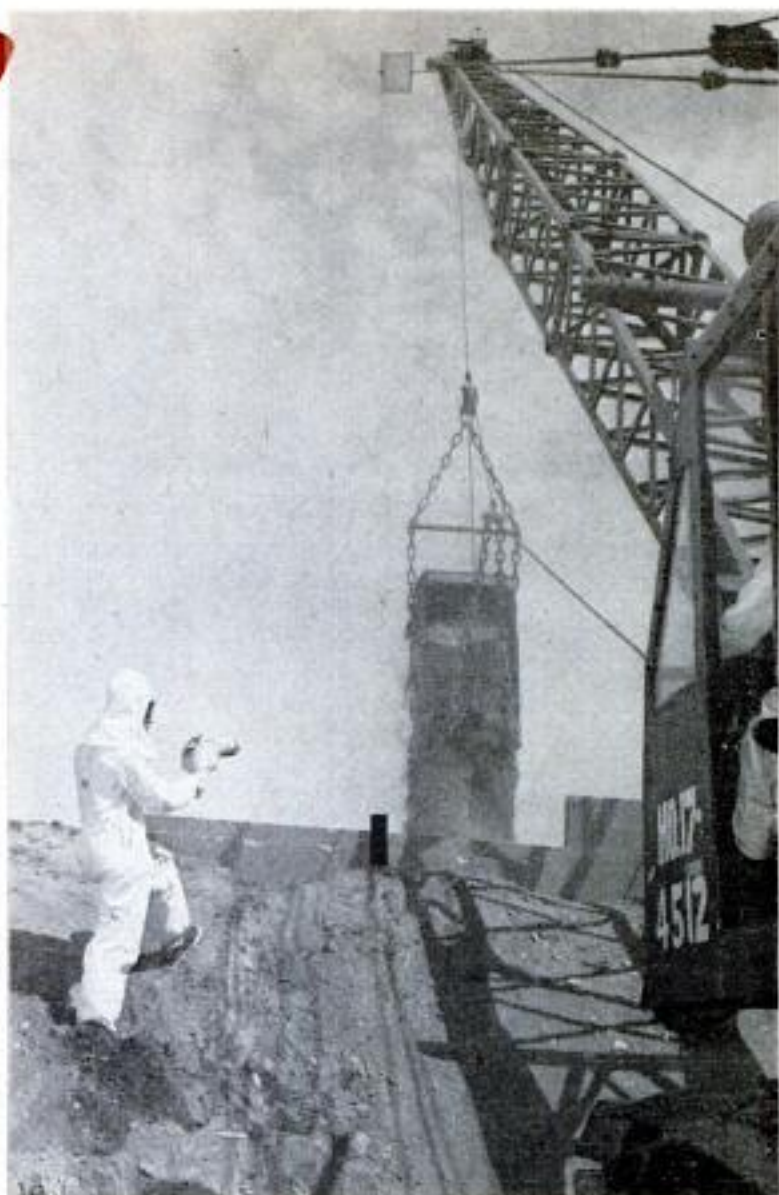
filter much of the radioactive material on its way down. The subterranean water table lies deep—200 to 300 feet—and here the underground streams move slowly toward the Columbia River.

"Any waste material that may get to the river—in 100 to 1500 years—will have its ray emission diminished far below maximum safety levels," said Hanford scientist R. E. Brown.

Use of the pits has saved \$75,000,000 to date in tank costs, but there are not too many places in the United States with such an ace in the hole—or ground.

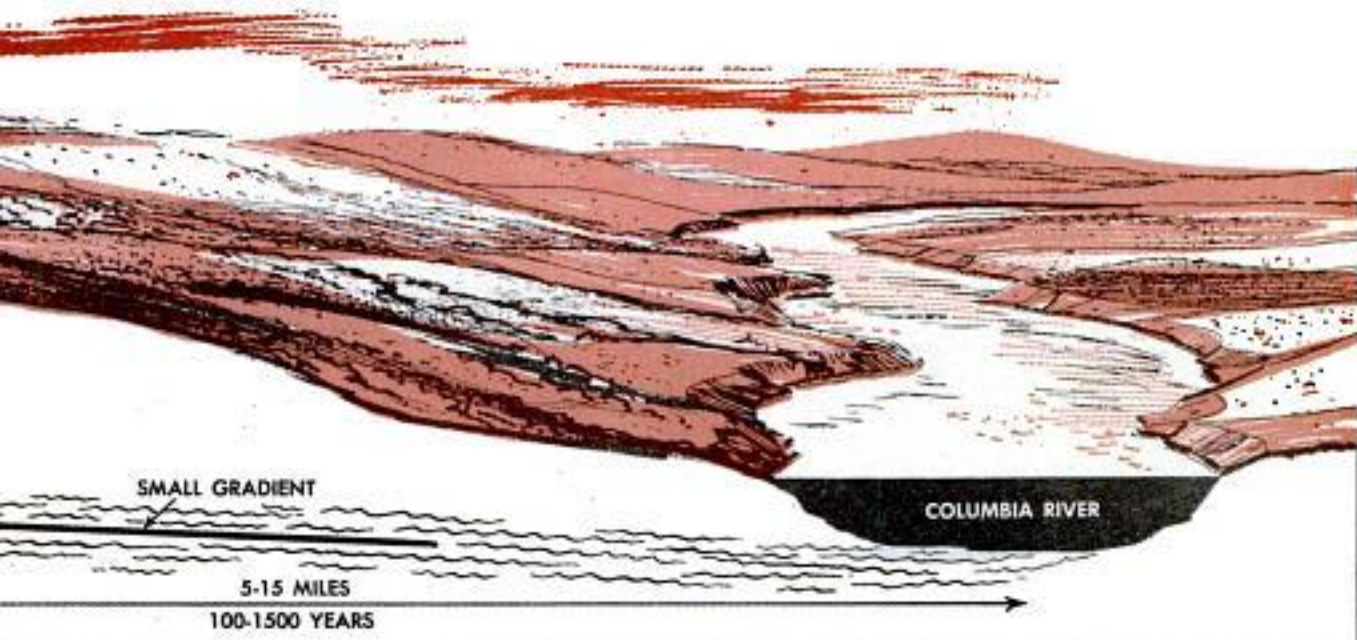
Hundreds of top scientists in the nation today are concentrating their brains and energies on the atomic-garbage problem. The Hanford Atomic Works, dealing in wholesale radiation, has, as far as is known, the biggest operation of its kind on earth. And, as might be expected, a large share of atomic-waste studies are being conducted there. Its scientists hope to learn enough about atomic-waste disposal to aid the planning of future atomic plants.

The General Electric Radiological Sciences department (GE



Photos by General Electric

Ominously precise are the rites of burying radioactive equipment too "hot" to decontaminate. The crane operator works with a mirror while radiation monitor checks. Protective clothing guards against radioactive-dust particles. Drawing, below and left, shows how hot wastes are disposed of at Hanford plant. Some wastes go up stacks



is the prime contractor at Hanford for the AEC) has shown that waste products from the plant, because of the costly steps taken to safeguard them, are not causing any harm. But suppose changes are made at the plant . . . more or different plutonium-producing facilities added. Or suppose another plant is built someplace else in the country where wind currents would scatter the particles to the ground instead of scattering them out into the atmosphere as at Hanford?

One of the waste products dispersed from the towering stacks of the Hanford separations plants is I-131, radioactive iodine. That is why there is a flock of sheep at Hanford. The sheep, purebred Suffolk,

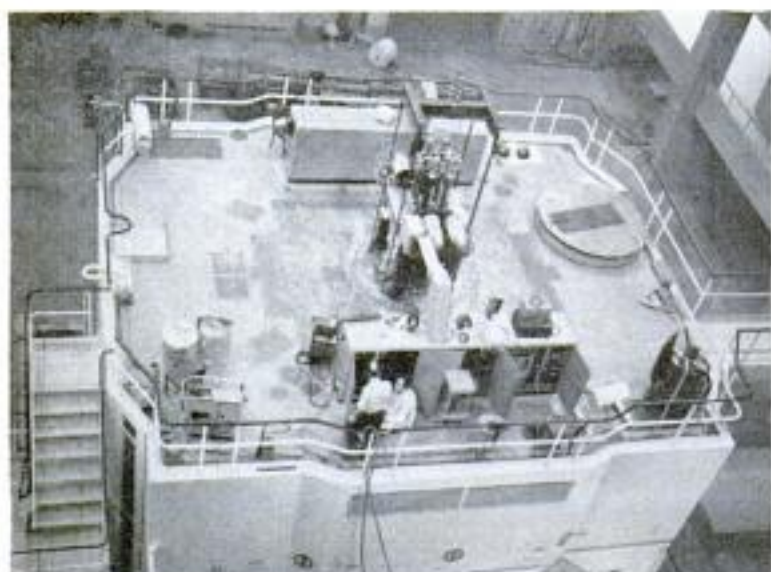
couldn't get better treatment at a de luxe hotel. Their quarters are immaculately clean, their food of the best. But, in addition to the alfalfa and grain they are served, they are given concentrated food pellets. Each pellet contains a carefully measured amount of I-131.

So far the sheep in all the groups have thrived as well as any rambling on Western ranges free of coyotes—except those in one group, which in the first stage of the experiments were given as much as 240 microcuries of I-131 per day. After weaning, lambs from the 240 group began to show a dull attitude, stiffness in gait, muscular weaknesses and various internal disorders due to radioactive poisoning.

But this was only the beginning. The lambs were tottering magnets for pneumonia and other diseases. Only one—a scrawny but tough little critter—survived as long as a year. The ewes functioned about as well as normal mothers until after their young were weaned. Then they also began to move about like zombies of the animal world. Commented a biologist working with the sheep:

"It is probable that the pregnant ewe concentrated most of her radioiodine in her unborn lamb instead of in her own thyroid."

In the second lambing season for the original ewes in the 240 group, all the lambs were either born dead or died within four days after birth. Now new groups



This giant reactor at Arco, Idaho, is cooled by huge quantities of water which is then processed to remove radioactive particles. Below, plankton and other small plants are recovered from river bottom and studied to see if they concentrate radioactive wastes



are being fed different amounts of I-131 to determine the exact quantity that may be ingested daily without causing either structural or functional changes and how much I-131 waste can be safely permitted to go out those stacks.

The amount that now goes out over the southeastern Washington countryside would have to be increased in concentration by thousands of times before any effect whatever could be detected on the people and animals who live there. But the atomic-energy business is booming, and the scientists are checking.

Another waste problem with stack emission—this one at plants using air-cooled reactors—is that of argon. This gas makes up about one percent of the normal atmosphere and, in passing through reactors—those highly complicated atomic ovens—a very small percentage of the normal argon becomes radioactive.

Because of the tall stacks from which it is blown, with atmospheric dilution and rapid decay, the radioactive argon cannot cause any significant radiation on the ground—unless the air conditions should cause a cloud of stack gas to hover near the earth instead of dispersing high above. Due to this fact, scientists at atomic-energy plants study the weather as no farmer or sailor ever did.

Relatively new on the atomic scene in handling waste materials is a common household material—glass fiber. Disposable glass-fiber filters are proving highly successful at Hanford's "hot" laboratories. They are used for filtration of exhaust air from individual hoods and glove boxes—specialized equipment inside of which research work with radioactive materials is carried on. A filter is simply installed by pressing its face over the exhaust duct, and is removed with tongs.

"This is a great advantage," a GE engineer explained. "The bulk of the airborne contamination is stopped in a small, easily removed package close to the source."

The greatest amount of atomic garbage, however, is not in gas or dust but liquid form. Radioactive liquids come from two main sources, the water used to cool

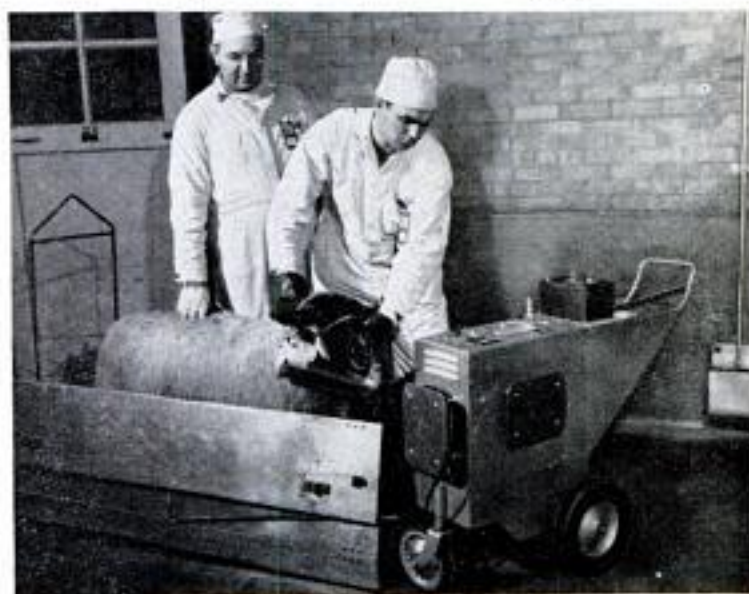
(Continued to page 250)



These rainbow trout would make a "hot catch." Kept in tanks, they are fed a diet of radioactive isotopes and liver. Effect of radioactivity on all forms of life is carefully studied



Irrigation water taken from the river below the Hanford atomic installation isn't harmful to plants, scientists report. Below, portable radiation-detection instruments check sheep fed I-131, found in atomic-plant smoke waste. Most sheep appear unharmed





Electronic Scale Recessed in Highway Weighs Moving Trucks

Trucks are weighed as they speed over scale platforms recessed in a highway near Hubbard, Ore. Two scales, one on either side of the center line, span the road. Enclosed in a vault beneath a three-by-ten-foot concrete weighbridge which rests on four electronic cells, each scale registers individual axle weights of trucks passing

overhead, axle spacings and speed. Changes in electrical currents caused by the weight passing over the concrete slabs are recorded on tape by equipment housed in a small building near the road. The secret scale also records the number of vehicles traveling the highway and their speed, and is now used for highway research.

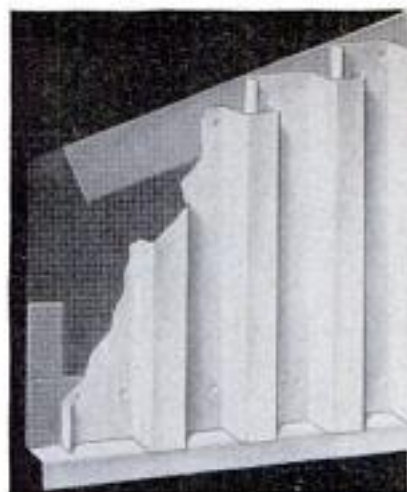
Double-Purpose Sun Visor Mounts Road Map on Rollers



You don't have to fumble with bulky road maps if you install in your car a sun visor containing a map on rollers. The visor is loaded by inserting a map as you would film in a camera and turning the rollers to the desired area. Sliding pointers at top and bottom pinpoint your travel route. A deluxe model is illuminated at night. Supplied with the visors are five sectional maps covering the entire United States. Conventional maps can be trimmed and used in the versatile visor.

Record Number of Hours Logged By Airline Pilot

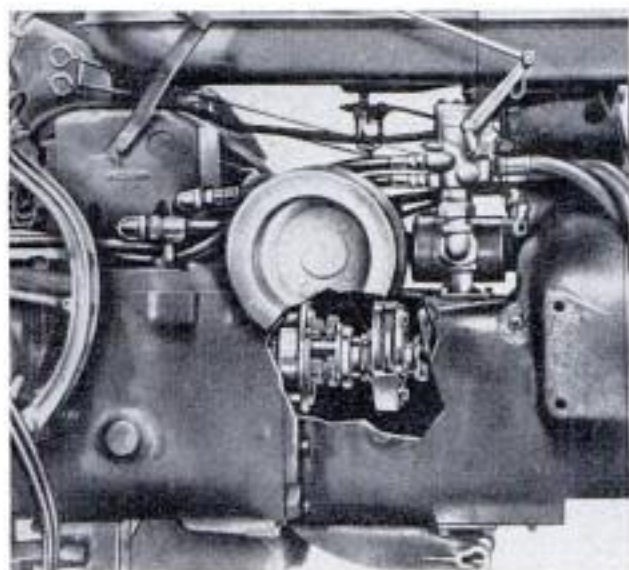
Capt. Walter R. Bullock, 55-year-old veteran pilot, logged his 25,000th flying hour on a recent Stratocruiser flight between Tokyo and Manila. Northwest Orient Airlines, for whom Bullock has worked since 1927, believes that he holds the record for hours logged, although there is no clearing house for such records. Now a grandfather, Bullock was billed as the "Boy Aviator" when he learned to fly in 1916.



Prefabricated Gable End Made of Steel Louvers Comes in Kit

Louvered steel gable ends which give baffle-type venting the entire width of a house from plate to rafter come in kit form. The prefabricated sections, made in three and four-foot widths, are quickly installed by nailing directly through the metal into the rafter. A mesh screen over the entire

inside face keeps insects out of the house. All of the materials needed for a typical small house come in a single compact package weighing 250 pounds. The cost of the quickly erected sections is said to be less than the materials cost of standard gable ends.

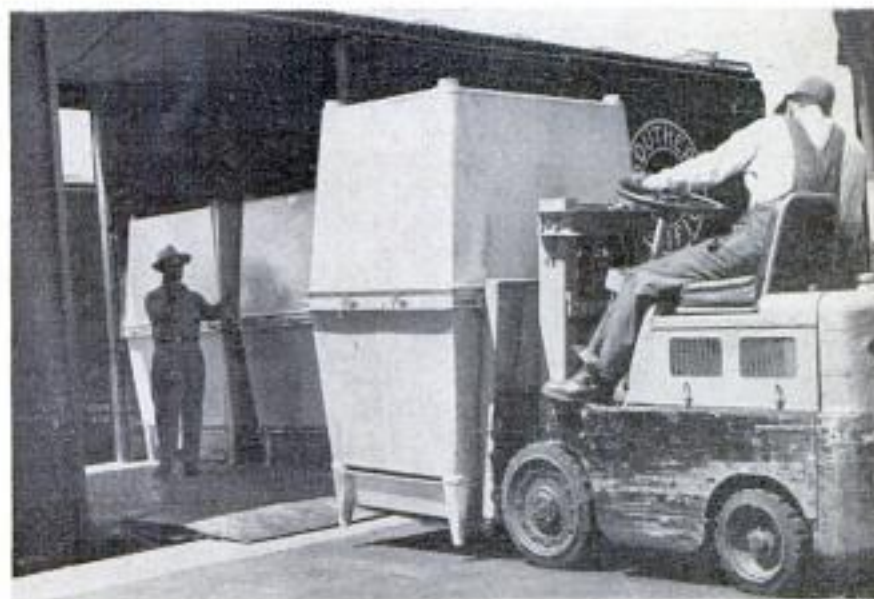


Tractor Has Planetary Gears

Simply by pulling back on a convenient shift lever, the driver increases by 45 percent the drawbar pull of a tractor with a planetary-gear unit built into its five-speed-transmission case. The unit acts as a torque amplifier and requires no clutching, stopping or throttle manipulation. When added power is needed, the driver pulls back on the lever and the planetary gears, which are always in mesh, take over, increasing the number of available gear ratios from 5 to 10. At the same time the unit increases drawbar pull, it also reduces forward speed 33 percent providing a convenient way to slow down quickly for the 180-degree turn at the end of each row.

Aluminum Bins Speed Shipping

Large aluminum bins that can be taken apart and stacked like paper cups after use are cutting storage and shipping costs. A standard freight car will take 22 loaded bins, or 308 disassembled and nested bins. The bins, designed for speedy handling by lift trucks, fill from the top and empty from the bottom through circular doors. Plastic gaskets seal the containers from moisture.





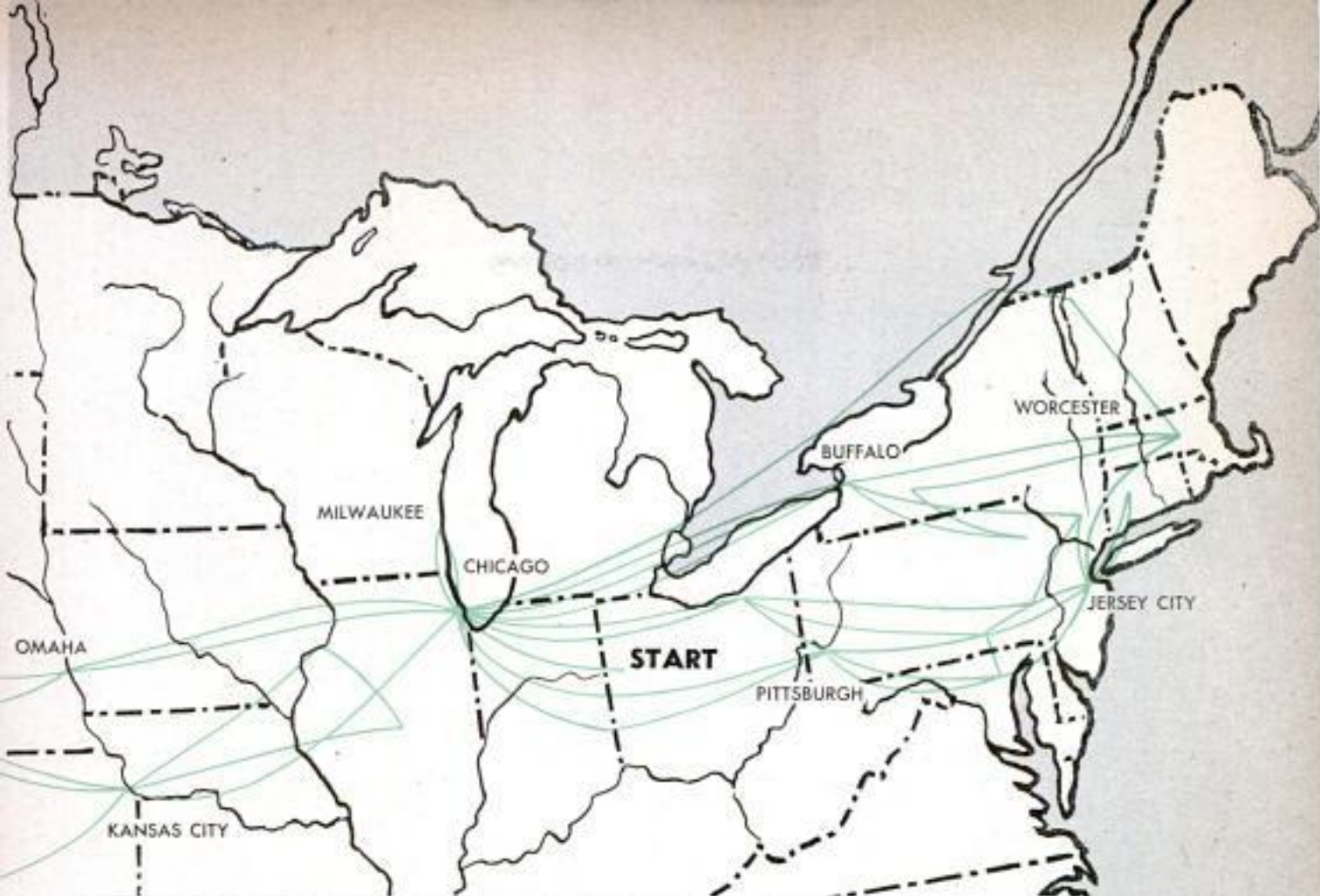
A YEAR IN THE LIFE OF A FREIGHT CAR

EVER WATCH a freight train roll by and wonder how a particular car gets back to its home rails? There are 700-odd railroads in this country with a total of about 1,800,000 freight cars. A long train likely will have cars from a score of railroads scattered across the United States. To the man waiting at the crossing, it's a snarl that never will be untangled. And it never is, yet the whereabouts of every car is known at any given moment.

The map above shows approximately one year in the life of car No. 60007, owned by the Pennsylvania Railroad. Like other cars, this one may be loaded on the East Coast with a destination anywhere in the

country, and it may travel over a good many railroads during the trip. The road which unloads No. 60007 reloads it and starts the car back in the general direction of its home line. On the way it may make a good many side trips. Meanwhile the Pennsylvania Railroad receives \$2.40 a day for each day it is off its own rails. This is paid regardless of whether the car is loaded or empty, rolling or standing in a freight yard. Clerks keep track of the cars.

The simplified map shows the transcontinental wanderings of No. 60007 from the time it left Van Wert, Ohio, on Sept. 16, 1953, until it carried a load across the border into Mexico on Aug. 23, 1954. During



that period it covered the country from New England to California, shuttled many times between Chicago and the East Coast, and made four trips between the Midwest and the West Coast. It arrived at 91 different destinations or terminal points. On Christmas Day, 1953, it was at Oakville, Conn., loaded with steel, and the Fourth of July found it rolling out of Olympia, Wash., with a load of lumber.

During its wanderings No. 60007 carried, among other items, asphalt filler, auto seats, steel, lumber, plywood, assorted foodstuffs, abrasives and tractor parts.

The car left Van Wert, Ohio, bound for Chicago with a load of merchandise. It then

drifted around the Middle West for a short time and arrived at Cumberland, Md., on December 17. It shuttled through the East and back to Chicago, and on January 21 it headed west, bound for Denver. From Denver it went on to Los Angeles, Calif., then up the West Coast for stops in Oregon and Washington. Various railroads sent it back through Cheyenne, Wyo., Kansas City, Mo., and Chicago until it arrived on the East Coast again at Greenville, N. J. After a couple more trips between the East and Midwest it made another trip to California, back to Illinois, then to Mexico.

During this period of almost a year it was on its home rails only 106 days. ★ ★ ★



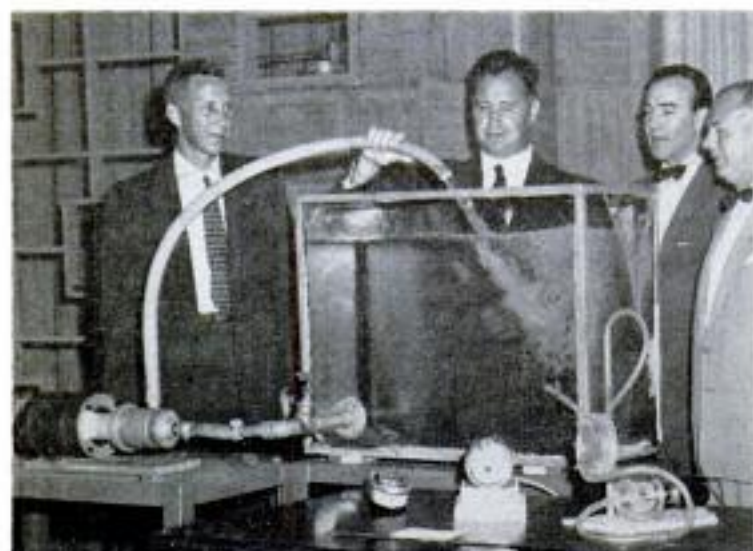
Prefabricated Forms for Pouring Concrete Speed Construction

Forms for pouring concrete foundations are erected in a hurry with the use of sturdy plywood sections. The two-by-eight-foot panels mount steel straps that are locked together with clamps. Inner and outer forms are erected simultaneously

and joined with tie rods that remain in the wall. The plywood forms cut labor costs by more than half. Field tests indicate a minimum life of 100 pours for the forms. Contractors can order the completed forms or build their own with materials furnished.

Lightweight Plastic Pipe Laid in Record Time

Three men laid and connected pipeline at the rate of almost a mile a day when a lightweight-plastic line was installed near Heidelberg, Miss. The pipe layers followed a day behind a mechanical ditch digger that plowed open a two-foot-deep trench. Two of the crew distributed 30-foot sections of the 2-inch pipe along the ditch, shouldering 10 sections—weighing a total of 75 pounds—at a time. The third man, working alongside the ditch, cemented the fittings and joined the pipe together.

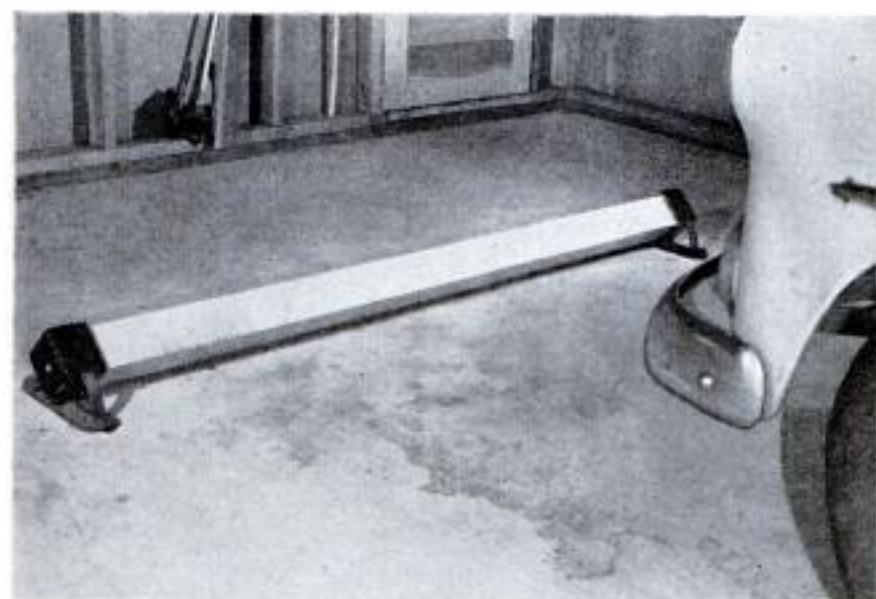


Pump Lifts Liquids, Solids

You can pump almost anything from mud to macaroni using a machine with only three parts. The pump is hermetically sealed and therefore is particularly applicable to medical use and the handling of foods. It consists of an outside casing, an impeller shaped like a spoon, and a rotor. The action of the rotor doesn't rotate the impeller, but gives it much the same motion a housewife imparts to a spoon in stirring batter. Since there is no rotation, no seal or lubrication is required where the shaft pierces the diaphragm.

New Gauges Record Wind Strength and Direction Automatically

Thirty new-type wind gauges are mounted on six 200-foot towers near Santa Barbara, Calif., in an Army Signal Corps study of wind currents and eddies. The new gauges consist of sections of fluted tube (right) mounted so they move sideways when the wind blows against them. Each unit is attached to the core of a differential transformer, and changes in wind force change electrical output of the transformer. The electricity is measured and recorded, so that charts of winds from five miles per hour to hurricane force can be kept. The gauges are also capable of recording the exact direction of each breeze that moves them.



Garage Barrier Glues to Floor

Your car won't ram through the end of the garage when it's stopped by a barrier that is assembled from a kit. Fenders, tires and bumpers are also protected. The barrier consists of a six-foot wooden four-by-four held by two enameled aluminum brackets. The brackets are held to the floor by a special adhesive that comes with the kit, making installation both quick and simple.

Three-Wheel Car Carries Three

Low, small and sleek is a three-wheel car built by Egon Bruetsch of Stuttgart, Germany. Bruetsch says that its plastic body, which he developed, weighs only half as much as a normal metal body. The car seats three persons, doesn't use much gasoline and is ideal for buzzing around or parking in the city.





Texas Beach Equipment Made to Keep Feet Dry and Skins Cool

Beach outings need no longer mean wet feet for fishermen or excessive sunburn for picnickers if a couple of inventions perfected in Corpus Christi, Tex., are employed. Surf fishermen can avoid wading into salt water by casting from a portable tower made up of a canvas seat on four

pieces of lightweight tubing, and a collapsible beach shelter of louvered aluminum screening and canvas top can provide shade when the sun gets too hot. The shelter has walls six feet high, weighs 80 pounds, and can be taken from its seven-foot package and set up in 20 minutes.

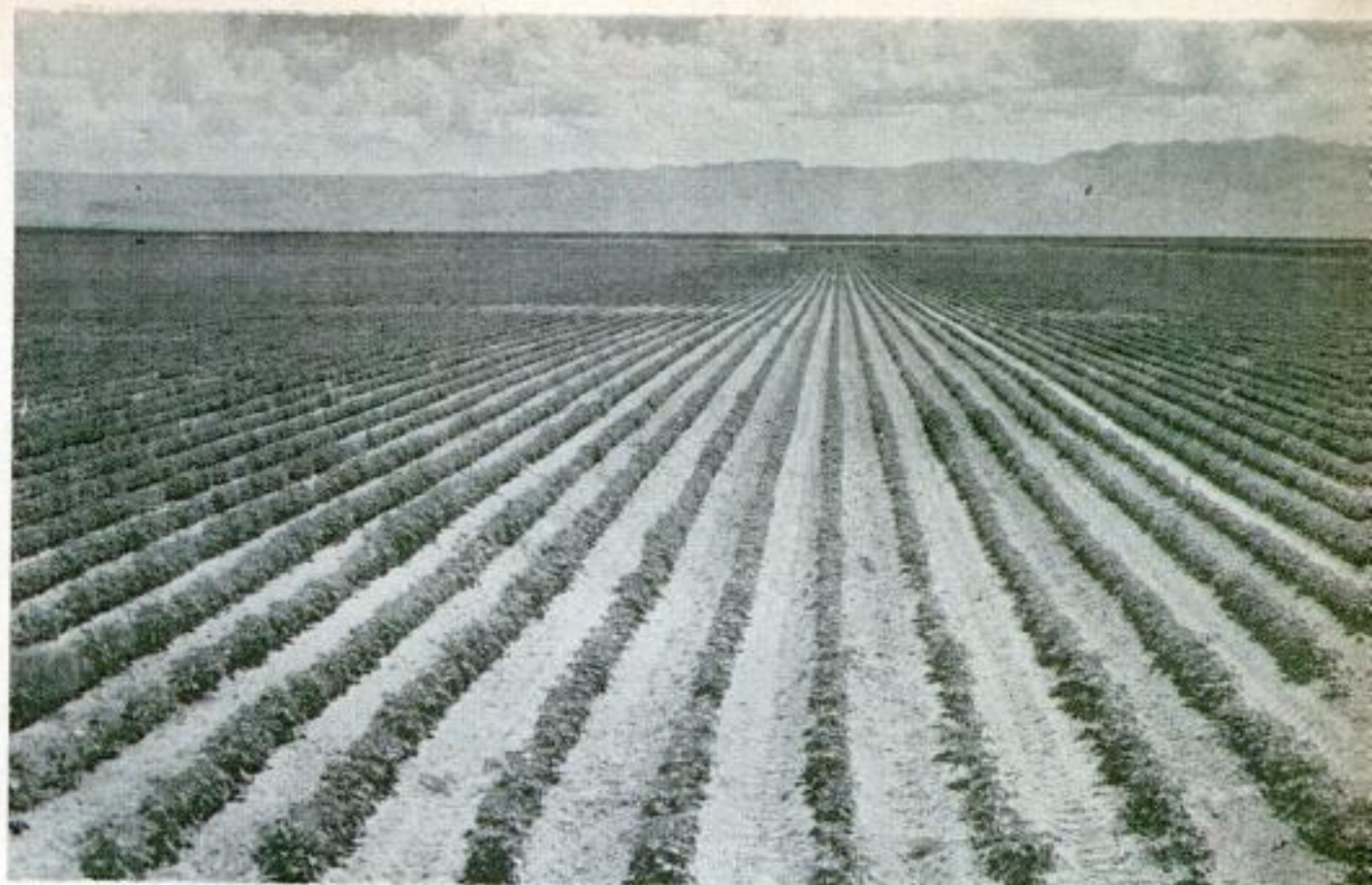
Pick on Clamp Holds Fish For Scaling or Skinning

Fish cleaning and scaling are made easier by a tool that holds the catch firmly. The tool has a long, sharp point, similar to an icepick, attached to a hand clamp. The angler slides the pick down the fish's gullet and fastens the clamp to its nose. He then can hold the fish firmly while he removes the fins and scales and cleans the fish. On larger fish, the pick is inserted at the side of the tail along the backbone, and the tail is caught in the clamp. The tool also holds fish for skinning. A scaler is provided with the tool.

Magnetic Pipe Holder Sticks to Auto Dash

Pipe smokers will welcome a magnetic pipe holder that sticks to the metal dash of a car. The holder consists of a rubber ring attached to a permanent magnet guaranteed for the life of the pipe. The holder keeps pipes in a secure, convenient position and prevents overloaded pockets and glove compartments. By keeping pipes within easy reach of the driver, it promotes safe driving as well as smoking enjoyment. Several holders attached to a pound tobacco can make any factory tin a pipe rack.





The Guadalupe Mountains backdrop an immense field of irrigated cotton, king crop in Deli City Valley

HE IRRIGATES WITH CLOCKS

By Norris Jackson Photos By Author

IF THERE was an easier way of irrigatin' a cotton patch, John Gentry would find it," the grizzled and tanned desert farmhand was saying. "He was a good farmer when he moved out here seven years ago, and irrigatin' just naturally came easy. But now he's got clocks doing that irrigatin' for him. Next thing you know, he'll have a machine to set them, and he won't have to turn a lick except to harvest his crop and count his money."

Wearing a two-day growth of beard embedded with desert dust, the old tractor driver was typical of laborers in this isolated country of west Texas and New Mexico. He liked the idea of clocks that did a man's irrigating chores for him, and the ease with which they helped Gentry accomplish his production goals.

"Gentry will go out at six in the morning, set his clocks, go about his business for the day and return about dark. His fields will

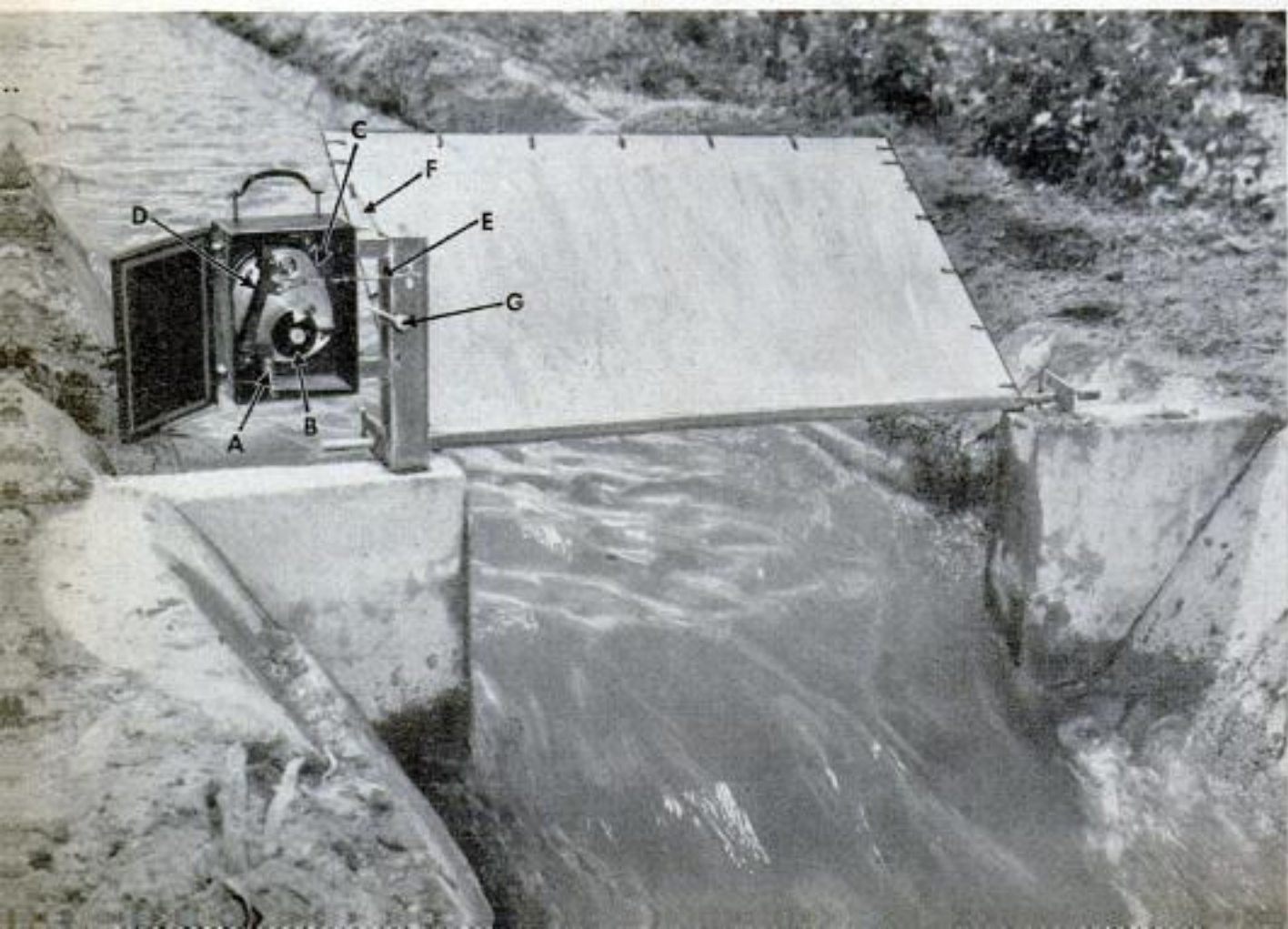
John Gentry sets an irrigation clock, which will drop steel headgate into concrete-lined ditch after a preset interval cutting flow to lower bench and backing water to field above





Headgate dropped by clock backs up water to flow into cotton field through cutouts on side of ditch

When time interval on scale B elapses, lower end of arm C drops into notch, releasing arm D, and compressed spring A forces it back to pull pin E, freeing chain F and dropping gate. G is lock



be irrigated and no one got his feet wet. He resets the clocks on another field and gets a full night's sleep. There's no getting up at all hours of the night to change a water set—those clocks do it for him," he said. "That's the kind of job to have."

Boasting an ability for slicing production expenses, Gentry developed the clocks to offset the high costs of producing cotton in the isolated desert. Located midway between El Paso, Tex., and Carlsbad, N. Mex., the only thought given the broad expanse of sand around Dell City, Tex., before 1946 was to get across it and as quickly as possible.

Today, however, it is one of the most thriving farming communities in the Southwest, even though it has no commercial electricity or telephones. There are no paved roads, except for a narrow strip of asphalt leading to a cross-country highway 13 miles to the south. Its nearest trading center is Sierra Blanca, the county seat, 75 miles south. El Paso is 96 miles west and Carlsbad 86 miles northeast.

"Isolated?" Gentry asked. "It's more a state of mind. Sure, we're 75 miles from the nearest town, as the plane flies, but we don't think about it. Most of us don't have the time."

Gentry and two brothers, Paul and Alvin, moved their families to the Dell City Valley in February 1948, a year after a trio of cattle speculators uncovered a vast supply of underground water beneath the surface of Texas' most arid and desolate country. Word of the strike, made during a quest for stock water, could have spread no faster if a rich vein of uranium or gold had been unearthed.

Experimental planting in 1947 showed the desert country ideal for cotton, and the land boom was on. By the close of 1953, more than 23,000 valley acres were under cultivation, of which 20,900 were in cotton. Production totals reached 20,225 bales, plus



Water flows from pumping unit to fields at 2500-gallon-per-minute rate

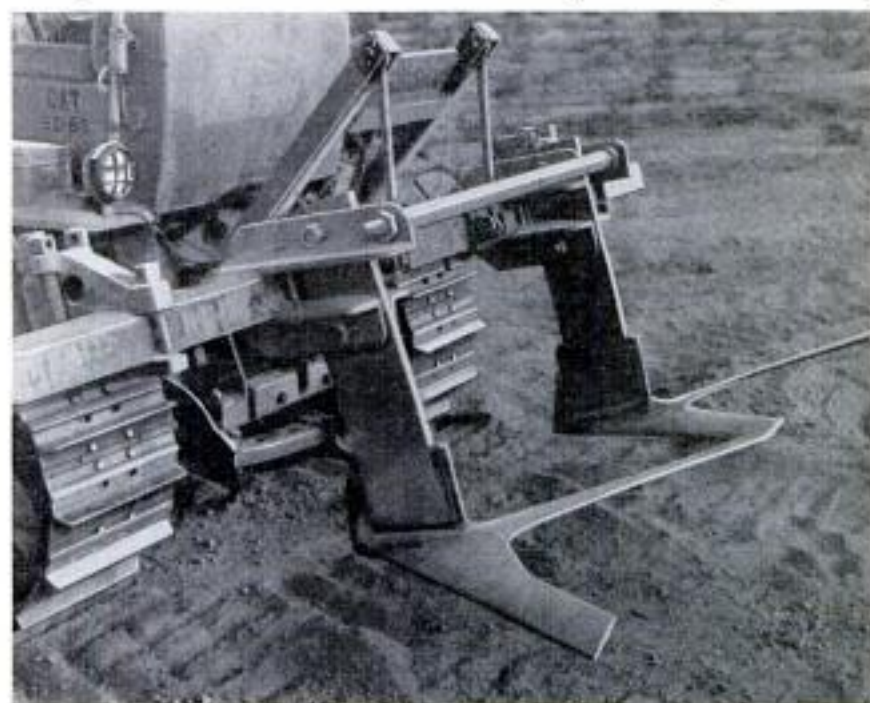
an additional 2369 bales of a new variety which the community's two gins could not handle and which were trucked to El Paso.

Originally, the farmers thought the water was from an underground lake filled by drainage from the nearby Guadalupe, Cornudas and Sacramento mountains and would soon dry up. Later, however, geologists reported that underground rivers merged near the center of the valley, and the supply would last 300 years.

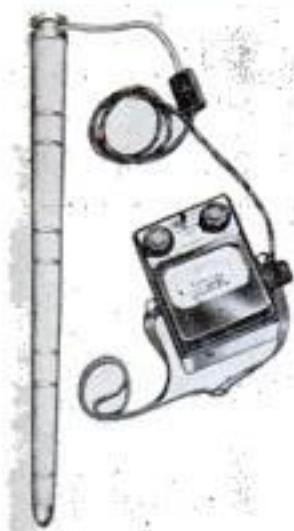
In 1948, the family's first year in the valley, 1200 acres were cultivated. One third was the Gentry's. The family today remains one of the area's largest operators, having acquired 2320 irrigated acres.

(Continued to page 232)

Wild growth is cleared from rich desert land by root-cutting steel sweep



Moisture-Measuring Stake Tells Farmers When to Irrigate Crops



Farmers can tell when and how much to irrigate if they drive a new moisture-measuring instrument into the soil. The stake of the device contains gypsum cells that become as wet or dry as the surrounding soil. Readings of soil moisture are taken from the attached electric meter. For field crops and vines the stake is buried with its top exposed and gives moisture readings from the 6, 12, 18 and 24-inch depths. In orchards the stake is sometimes buried 8 to 12 feet. Various lengths are made. The stakes are left in place during the entire growing season.

Metal Fireplace For Summer Cabins

Easy to install, a new sheet-metal fireplace is designed for use in summer cottages and cabins. The black fireplace simply is connected to a flue like an old-time stove. A damper in the pipe serves as the draft control. The modernistic fireplace can also be used outdoors if the location is sufficiently sheltered. In hunting and fishing cabins it can be used for cooking as well as for heating. It can also be installed on porches, patios and in basements.

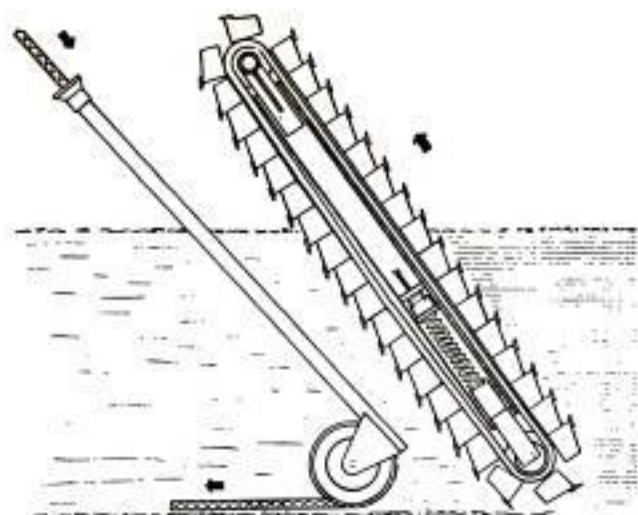


Agricultural Drier Blows Hot Dry Air Through Stored Corn or Hay



Use of an oil-fired agricultural drier ends the need of making hay while the sun shines. The drier blows heated air through stored hay or corn, removing moisture and minimizing danger of spoilage or spontaneous ignition. The blower fan is driven either by an electric motor or small gasoline engine.

More than 1,100,000 pounds of meteoritic material have been identified on earth, according to a report by scientists at U.C.L.A.



Cable Layer Digs and Fills

Up to 25 feet of cable can be laid per minute with a machine that digs the ditch, lays the line and refills the ditch in one operation. The digger is a bucket-carrying conveyor and operates at a depth of five feet or less. Directly behind the digger is the cable layer. The cable is fed through a tube and deposited on the bottom of the ditch. Dirt falls off the rear end of the tilted conveyor and back into the ditch. Each of the rear wheels of the machine can

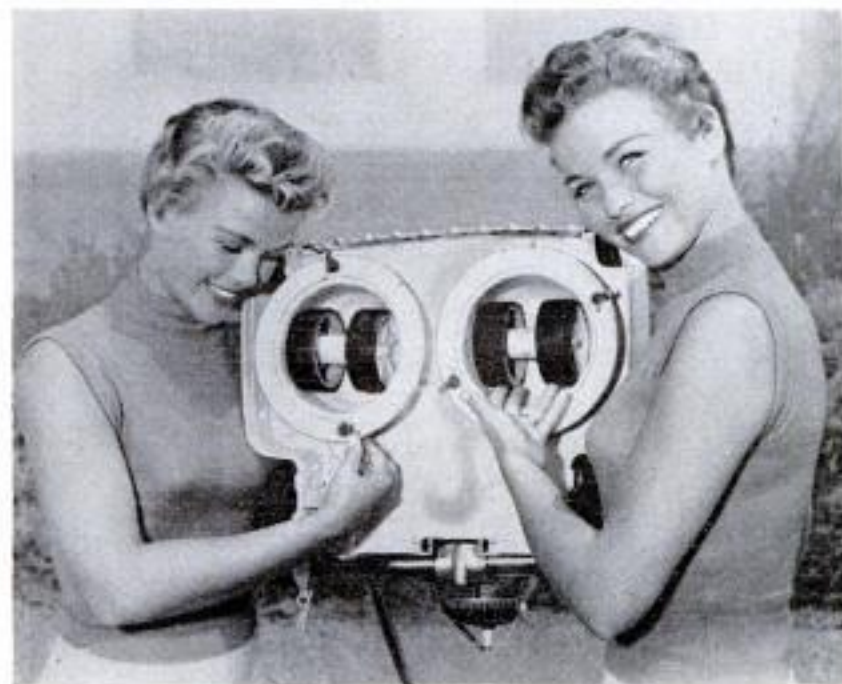


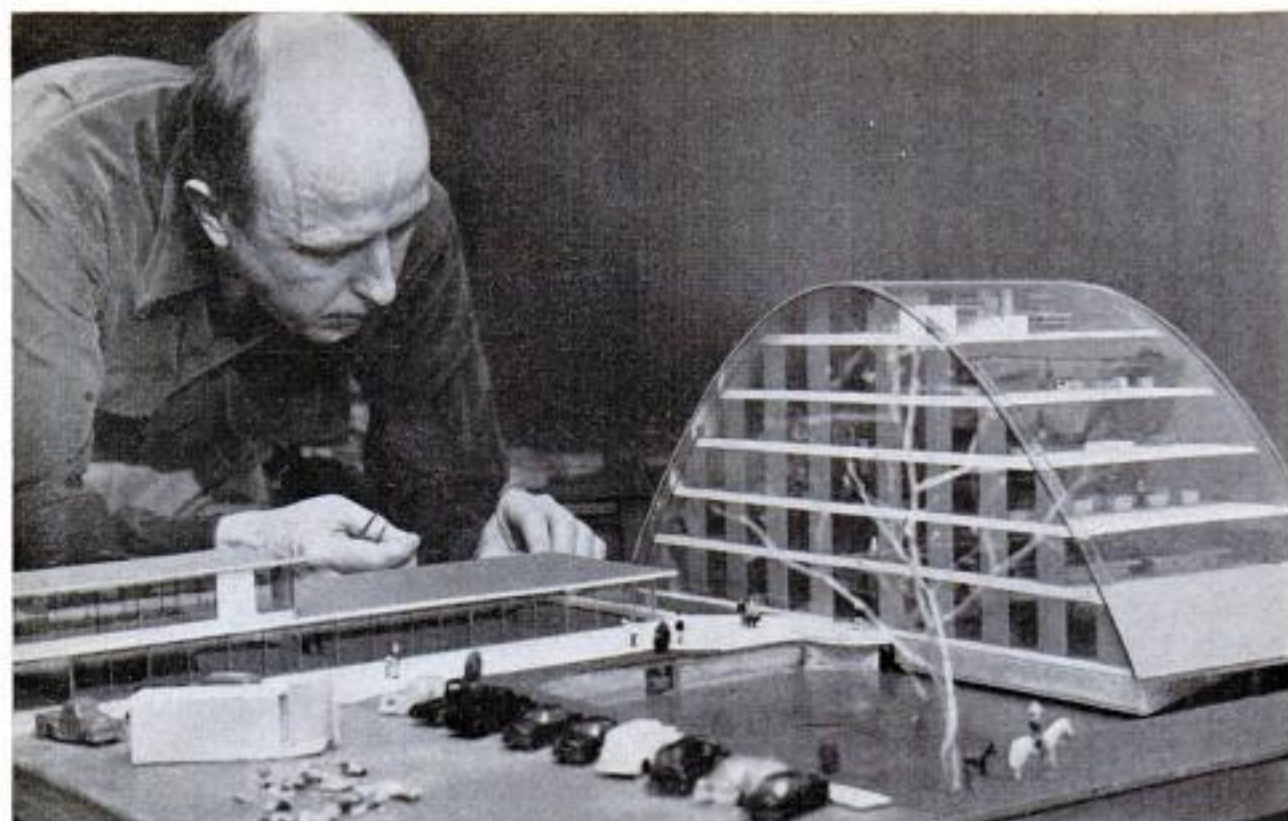
be hydraulically adjusted to allow a maximum difference in wheel height of 14 inches and permit the digging of a vertical ditch on a 30-percent slope. The machine converts into a standard ditch digger.

Whirling Blades on Power Mower Measure Only Half Inch Long

On a new rotary mower the cutting blades are only a half inch long. Beneath the mower are twin cup-shaped cutters, and mounted on the rim of each cutter are two half-inch blades. The cups revolve at 6500 revolutions per minute. Each blade is pivoted so it will swing out of the way if it hits a heavy obstacle such as a rock

or a sprinkler head. Inside each of the whirling cups are two support wheels. These bear the weight of the mower, eliminating wheel marks on the lawn, minimizing the possibility of scalping the turf and permitting the edge of the lawn to be trimmed without losing wheel support. The mower cuts a 20-inch swath.





Denver architect Jared Morse places figures on the model layout of his building designed to turn with the sun, the arched-roof structure at right. Flat-roof building at left is stationary part of Colorado project

Building to Follow the Sun

ROTATING ON A FOUNDATION that floats in a pond of water, a six-story office building planned for Grand Junction, Colo., will turn every day to follow the sun, welcoming solar heat in winter and repelling it in summer.

Denver architect Jared Morse, who designed the structure, has completed a model now on display at Grand Junction.

The model reveals a parabolic roof, like that of a Quonset hut, that touches the foundation on either side and is designed to reflect and repel heat in that section which the building's daily rotation will keep facing the sun at all times during the summer. Morse estimates that the special reflective roofing will reduce interior summer temperatures an average of 20 degrees.

In winter the turning mechanism will allow a maximum of sunshine to enter through the glass areas.

To be built of lightweight structural materials that have proved themselves in aircraft, the building will weigh 2,400,000 pounds and will displace 333,000 gallons of water in its foundation pond. Flotation, Morse explained, simplifies rotation and distributes weight over a large area, eliminating the need for deep piling in loose-soil areas.

Design calls for the structure to float just a mere $\frac{3}{8}$ inch above rollers resting on the bottom of the pond. Weight shifts would cause it to drop the fraction of an inch and rest on the rollers.

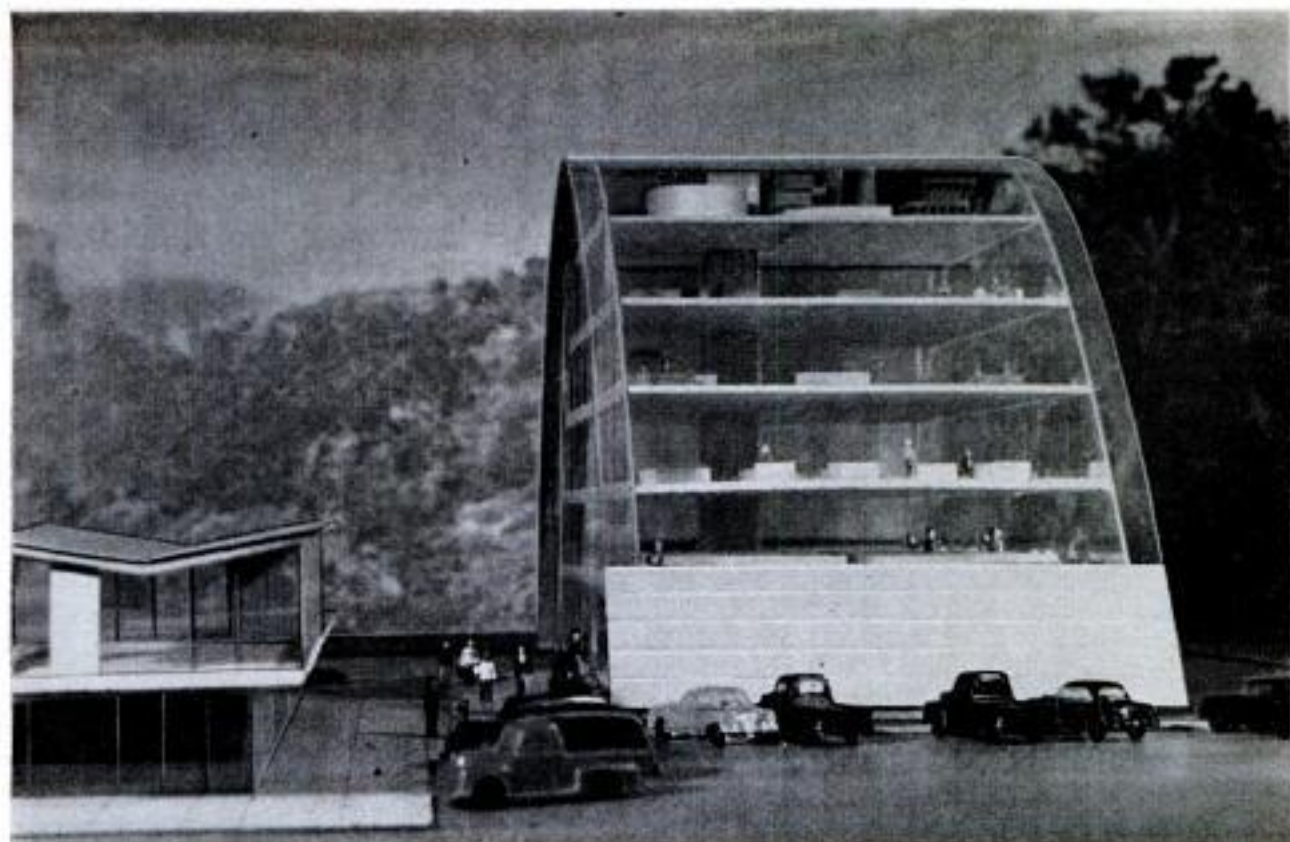
In actual operation the sun building would begin turning about 10 a.m. daily, following the sun's rays until 6 p.m. Then it would remain stationary for eight hours while sewage collected in self-contained tanks would be discharged into the conventional sewage system. In the remaining eight hours it would turn back to its original position.

Water and electricity would be supplied constantly through centrally located pivotal connections.

Movement of the building would be so slow—less than half an inch a minute at the centrally located front door and only three inches a minute at the extremities—that with proper gears it could be turned by a four-horsepower motor.

A water tank and elevator, air-conditioning and heating equipment would occupy the sixth floor, leaving the other five available for rental.

Lucien H. Cullen and Welborn Foreman, Houston, Tex., oil and uranium operators, are backing the project, which will be an



End view of building model. In summer, this transparent roof-wall would face away from the sun at all times

office building and the center of a housing project valued at an estimated \$7,225,000.

If the Grand Junction project works out as desired, and the inevitable "bugs" can be eliminated, Cullen and Foreman plan construction of at least nine more sun buildings throughout the country.

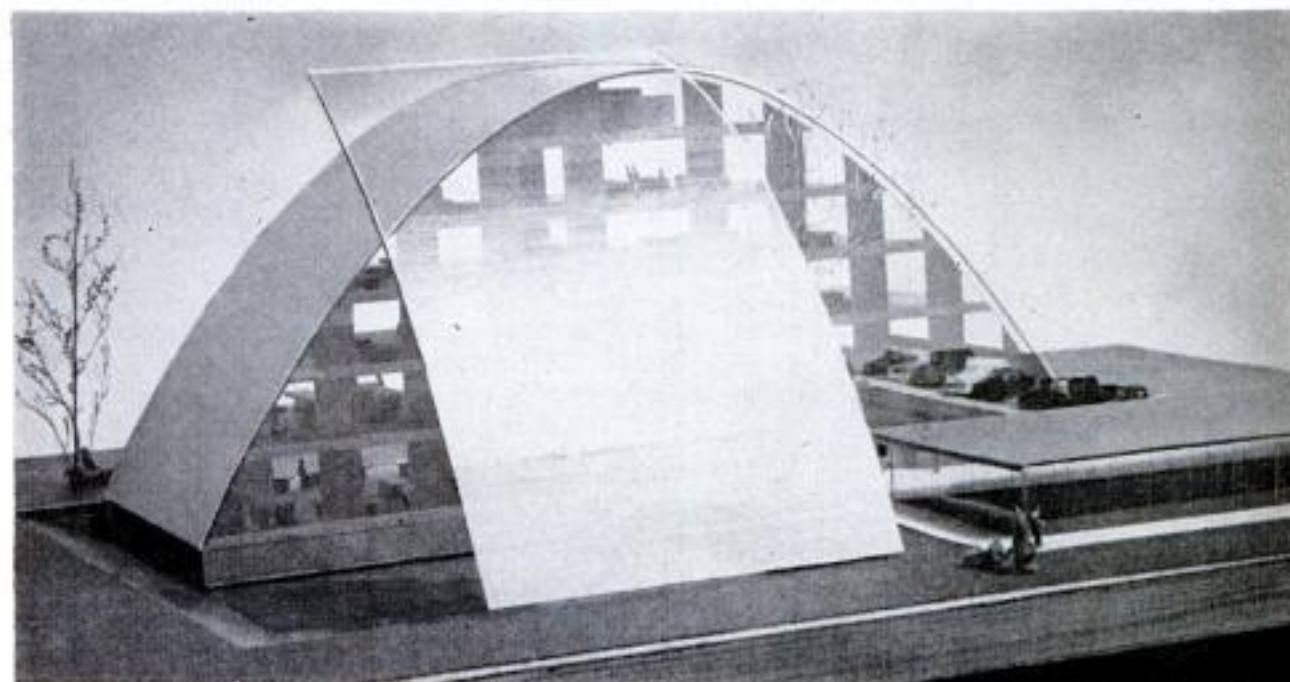
The additional structures would be resort hotels, for which the rotating design is ideally suited. Swimming pools and sun bathing areas could be kept in the sun all

day at all times of the year, and sleeping and storage rooms could be on the structure's shadow side.

The backers also believe that the design is well adapted to department store construction, and the extensive use of glass walls is not unlike many new apartment buildings.

Rotation to avoid the hottest rays of the sun makes unnecessary large eaves found in many glass-walled buildings. ★ ★ ★

Curved plastic sheet is used to show position of roof after building model is rotated a full 90 degrees





1



2



7



3



4

Baseball

Charlie Grimm, manager of the Milwaukee Braves, shows typical secret signs. 1 and 2, open or closed fist may indicate a bunt; 3 and 4, brushing clothes with palm closed may mean nothing, but palm open signifies hit and run; 5 and 6, widespread fingers may signal base runner to steal. In 7, catcher Sam Calderone calls for particular pitch; 8 indicates inside or outside of plate; 9 and 10 are secret signals used if batter picks up catcher's sign to pitcher



5



6

G OING INTO the last inning the home team is one run behind. The lead-off man for the local nine raps out a solid single. He's followed by a heavy hitter, who watches a ball and a called strike sail over the plate. Over in the third-base coaching box, the team's manager fidgets back and forth, nervously jerks at the bill of his cap, kicks heel against toe and stoops over to pick up a handful of dust. On the next pitch the base runner sprints for second and the batter swings.

Somewhere among the nervous movements of the manager was a hidden gesture that tipped off the hit and run to the batter and base runner.

Each team has its own set of secret signs, jealously guarded and frequently changed. These signs and the way they are used are far more important than the batting average of the



8



9



10

Sign Language

By
Clifford B.
Hicks

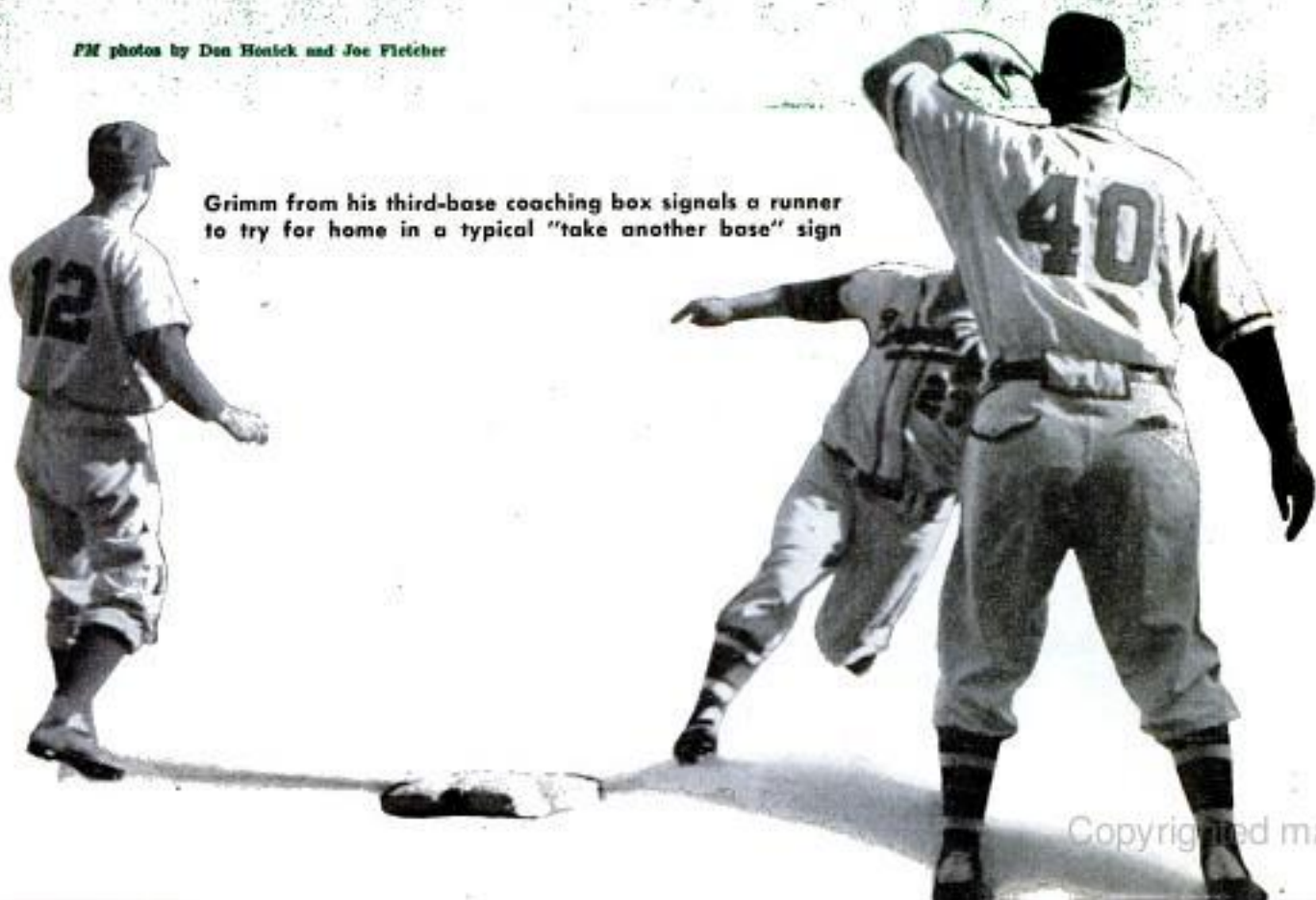
clean-up man, for they weld nine individual players into a team. They have won and lost countless major-league ball games.

Charlie Grimm, pilot of the Milwaukee Braves, agreed to let PM readers in on some of the secret, silent conversation that takes place on the field. Big-league teams have used the signs shown

on these pages in the past, and likely will use them again. But Grimm emphasizes that they are not currently in use by the Braves. They are examples of what the fan can look for as he watches the game. And it's quite possible for the fan to solve the mystery of some of these signs if he studies the third-base coach. Some managers prefer to coach third

PM photos by Dan Henick and Joe Fletcher

Grimm from his third-base coaching box signals a runner to try for home in a typical "take another base" sign



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11



12

base themselves; others to relay their signs through the coach.

Secret signs are used to order the hit and run, the bunt, the steal and double steal. They also may tell the batter to take a swing at the next pitched ball or let it go by, and in some situations they indicate whether the batter should attempt to hit a ground or fly ball.

In defensive play, of course, the catcher uses concealed signs to call for particular pitches. Occasionally



Photo by Niels Lauritzen

Above, manager must be most alert man on field. Bad throw changes sign from "slide" to "take another"



14



15

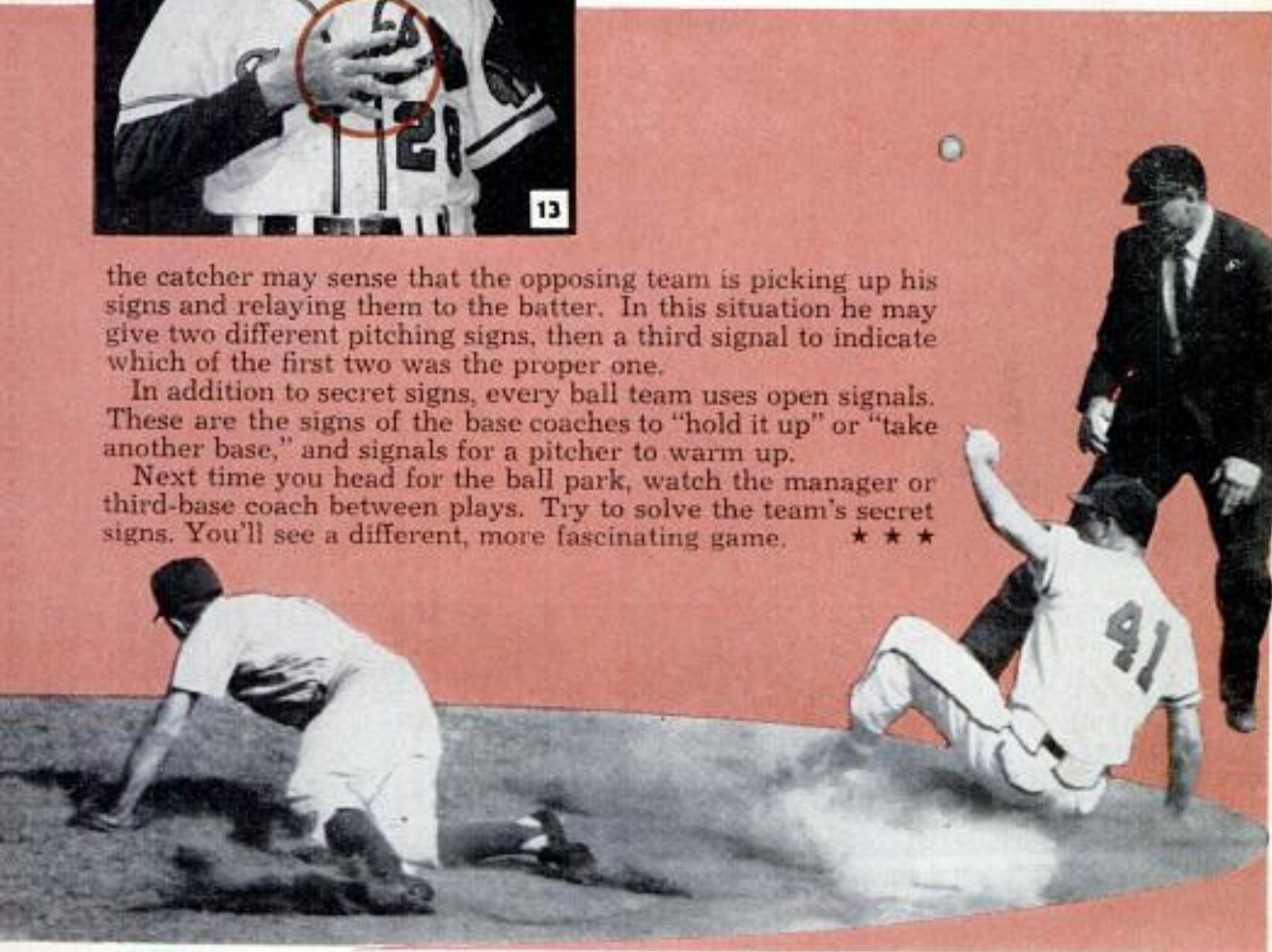


11, is Grimm signaling for double steal, or just knocking dust from spikes? 12 and 13, first-base coach John Cooney relays secret sign from Grimm with palm open or closed. Cooney uses nonsecret signs to indicate which pitcher to warm up. 14 is birdlike signal for Joseph Jay; 15 is sign for James Wilson, a pipe smoker; 16 is call for Robert Buhl, who is tall and thin; 17 is "yak yak" sign for Dave Jelly, who doesn't talk much; 18 warms up pitcher Phillips Paine

the catcher may sense that the opposing team is picking up his signs and relaying them to the batter. In this situation he may give two different pitching signs, then a third signal to indicate which of the first two was the proper one.

In addition to secret signs, every ball team uses open signals. These are the signs of the base coaches to "hold it up" or "take another base," and signals for a pitcher to warm up.

Next time you head for the ball park, watch the manager or third-base coach between plays. Try to solve the team's secret signs. You'll see a different, more fascinating game. ★ ★ ★



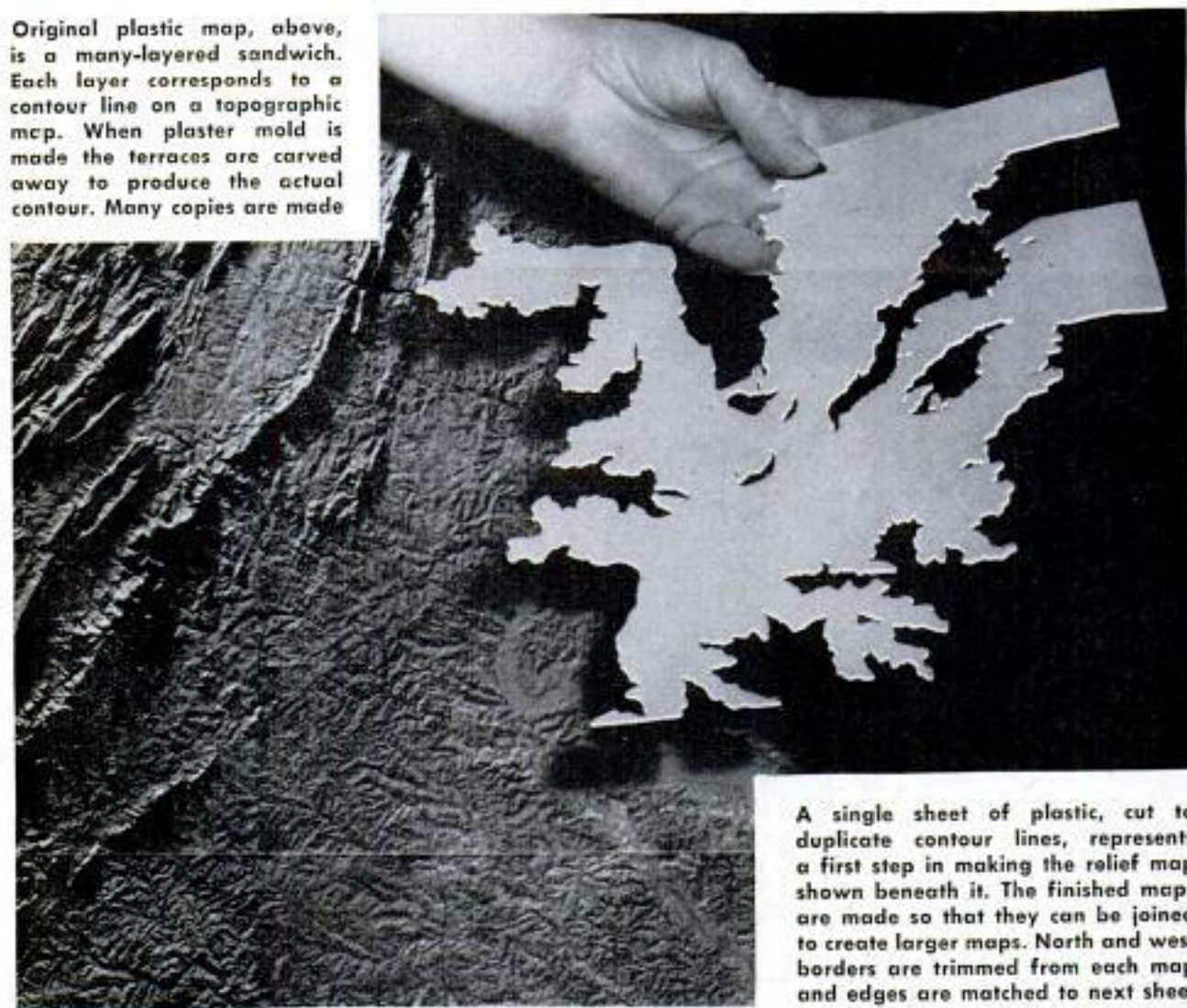
Plastic Sheets Speed Map Making

RELIEF MAPS for Army use are being produced in large numbers by a new method which is fast, accurate and economical. The maps, made of plastic, are more durable than most.

A master model starts with a zinc photoengraving of a contour map. One level at a time, the map maker follows the zinc plate's contour lines with a tracing needle attached to a pantograph. The pantograph cuts the corresponding shapes through successive sheets of plastic. Plaster is poured on the terraced plastic map and a master copy of plaster made from this shell. The sharp-edged steps in the plaster are cut down to duplicate the actual contour of the land.



Original plastic map, above, is a many-layered sandwich. Each layer corresponds to a contour line on a topographic map. When plaster mold is made the terraces are carved away to produce the actual contour. Many copies are made



A single sheet of plastic, cut to duplicate contour lines, represents a first step in making the relief map shown beneath it. The finished maps are made so that they can be joined to create larger maps. North and west borders are trimmed from each map and edges are matched to next sheet

Rubber Strip at Side of Door Protects Children's Hands

Children's hands and fingers are protected from pinching by synthetic-rubber strips that fit on the hinge side of an aluminum door. The strips can also be applied on the opposite side of the door, and the door fitted with locks at the bottom instead of at the side. The rubber also acts as weather stripping.

Atomic Fuel Provides Economy For Remote Army Power Plants

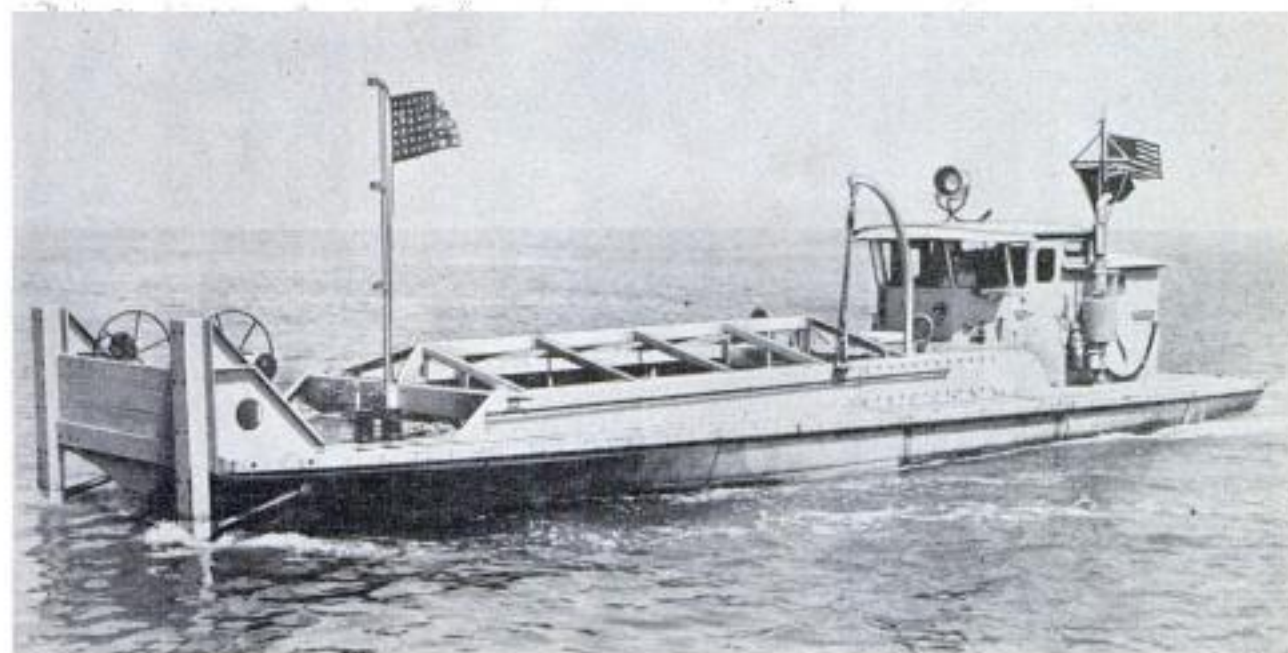
Although high cost is usually considered a major drawback to atomic power and heat production, the Army cites economy as a reason for planning construction of an experimental reaction power plant. Inviting 33 firms to bid on design and construction of a 1700-kilowatt plant, the Army explained that the high cost of transporting ordinary fuel to remote bases might make reaction electricity economical. A pilot plant is to be built at Fort Belvoir, Va., before final decision is made. The Army specifies that the plant, capable of providing heat and electricity for a post of 1700 population, must consist of components small enough to be transported by air.

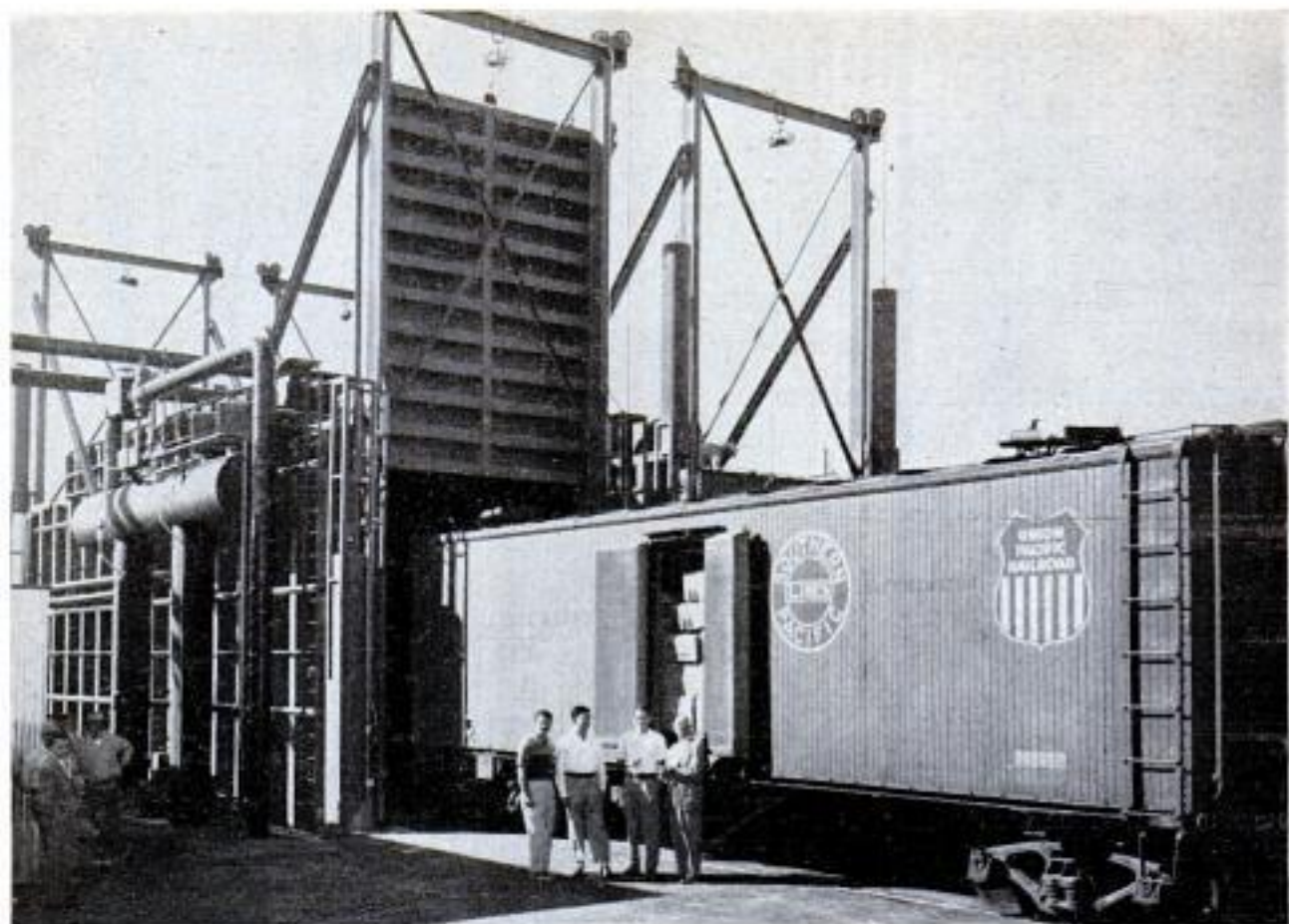


Big Plastic Boat for Army Carries Five Tons of Cargo

Under test by the Army is a boat said to be the world's largest plastic craft. The vessel weighs 10 tons, is 51 feet long and can transport five tons of dry cargo with a draft of only 21 inches. Two 165-horsepower diesel engines provide the power. The hull, only $1\frac{3}{16}$ inches thick, is a "plastic sandwich" consisting of several layers of

different plastic materials. It was molded in a giant plywood form which is reusable. The craft is built in sections and can be dismantled and reassembled in the water. It was built to Army specifications calling for a self-powered, shallow-draft cargo vessel that needs little maintenance and can be easily transported overland.

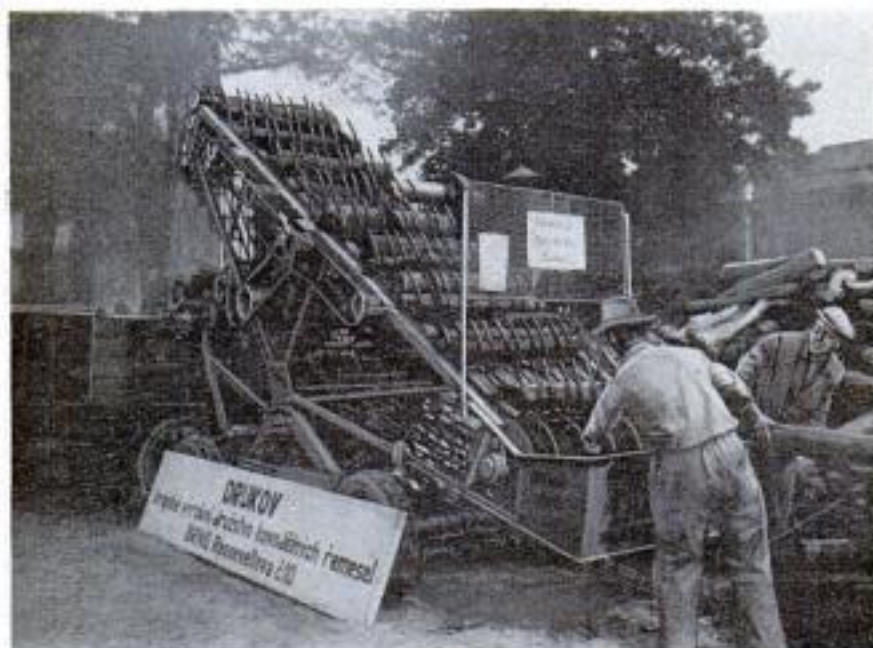




Giant Refrigerator Cools Freight Car Loaded With Lettuce

Carloads of lettuce are chilled by a new vacuum system at Tolleson, Ariz. A freight car filled with lettuce and with door and ventilators open is rolled into a heavily built steel shed sealed by sliding doors. Air is sucked out of the chamber by centrifugal pumps in 15 to 22 minutes. The vacuum causes a violent evaporation of surface moisture on the lettuce, bringing its temperature down to 33 degrees. Then

the vacuum is broken with a hiss like that of steam, the chamber is unsealed, the car pushed out and loaded with ice for the long haul eastward. The new method costs no more than the old system by which lettuce was unloaded from field trucks and chilled in tube coolers before being loaded on the freight car. The extra delay and handling damaged the freshness of the produce and slowed delivery.



Mobile Cutter Saws Firewood

Six times the output of an ordinary saw is claimed for a mobile firewood cutter made in Czechoslovakia. An inclined sectional conveyor carries the logs upward across four staggered and equally spaced circular saws. After the fourth cut, the five pieces drop from the raised end of the frame into a truck below. The saws are belt-driven by a common electric motor. The entire mechanism is mounted on a four-wheel-trailer chassis.



Snow Barriers Guard Village

On Alpine slopes 8000 feet above the Swiss village of Airolo, workmen have erected a series of aluminum barriers which they hope will protect the town from murderous avalanches. The lightweight barriers are expected to hold snow in place, or at least break the impetus of snow masses that tumble down from still higher up. A 1951 avalanche destroyed the village of Tessinger.

Stainless-Steel Cables Form Sides of Chicago Parking Garage



Like a bird cage, a new parking garage in Chicago has outside walls made of a curtain of stainless-steel-wire strands. In 100-foot lengths, each eight inches apart, the strands are anchored at top and bottom by fittings that maintain a tension of 1000 pounds. The seven-wire, $\frac{3}{8}$ -inch-diameter strands are reportedly capable of stopping a car going 40 miles per hour. An economical way to beautify the structure and still meet building requirements, the gleaming wire walls permit the passage of light and the escape of exhaust fumes.

Light Concrete-Block Wall Built With Liquid Mortar

Concrete-block walls held together by a liquid adhesive rather than mortar are made possible by a new block developed at the University of Tennessee. The lightweight blocks, made of expanded shale aggregate rather than gravel concrete, are ground smooth on top and bottom surfaces and a liquid adhesive is applied with an oil can. When the large air cells of the blocks are filled with insulating material, block walls have less heat loss than solid wood. Each block will support a load of 45 tons.

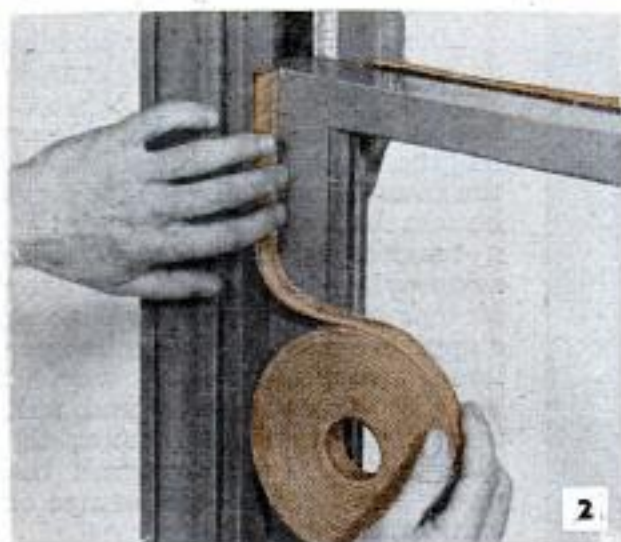




WHAT'S NEW FOR Your Home

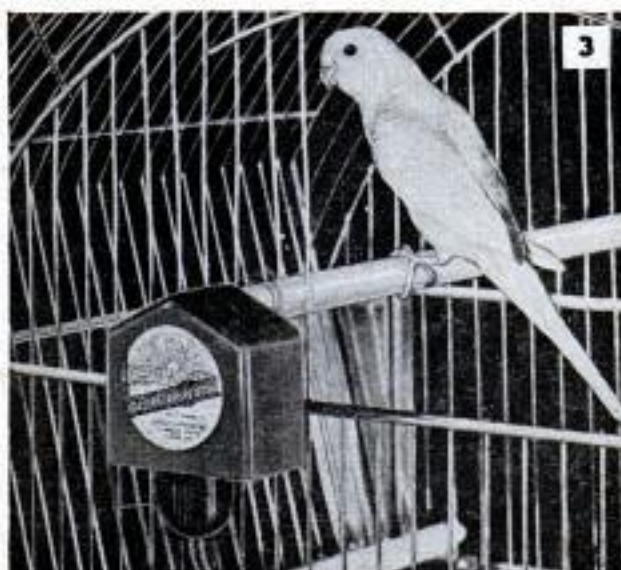
1. LIGHTWEIGHT VACUUM converts from upright carpet cleaner to an upholstery cleaner in seconds. The seven-pound unit cleans by direct suction and signals when its disposable paper dust bag is full. Attachments for it enable you to clean right up to wall, dust Venetian blinds, dry hair or groom cats

2. WEATHER STRIPPING is applied to metal or wood just by pressing it on with the hand. Adhesive backing sticks to any dry, clean surface. It can be used in the home around windows, baseboards and ventilator outlets, refrigerator doors and also on automobile doors, windows and hoods to stop rattles



3. HEATED PERCH for caged birds improves their health and comfort, eliminates the problem of extra care to avoid colds after a bath, when the owner is away or when room temperature drops. The perch is plugged into an electrical outlet at all times, takes little current, lets bird choose heat when needed

4. HEAT CONTROL for top-of-the-stove cooking is achieved by sensing element in the middle of gas burner. It presses against the bottom of cooking utensil, measures its heat and changes the height of the flame to maintain a preset temperature. The unit eliminates need for various automatic cookers



5. RUGMAKER driven by electric motor speeds the job of producing loop carpets. Pressing trigger of the hand-held machine causes it to walk itself along the rows or pattern, stitching 90 loops per minute. A small rug can be made in only three hours

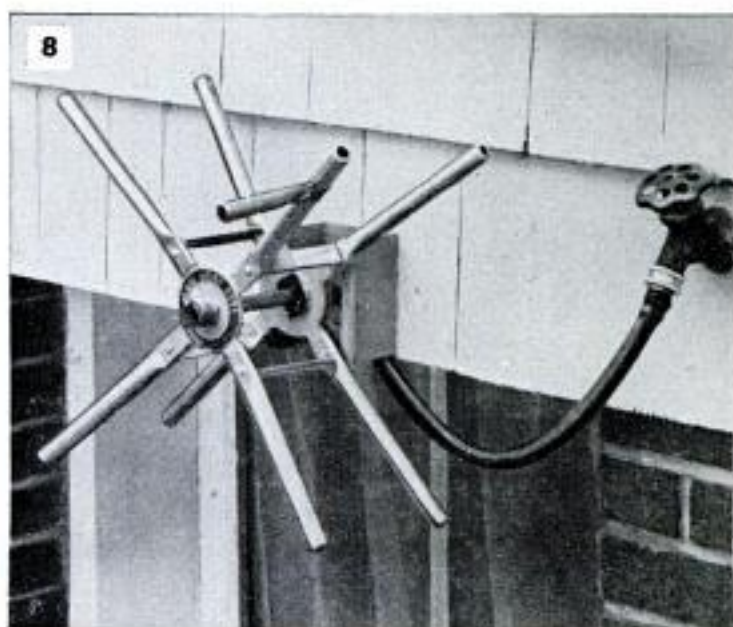


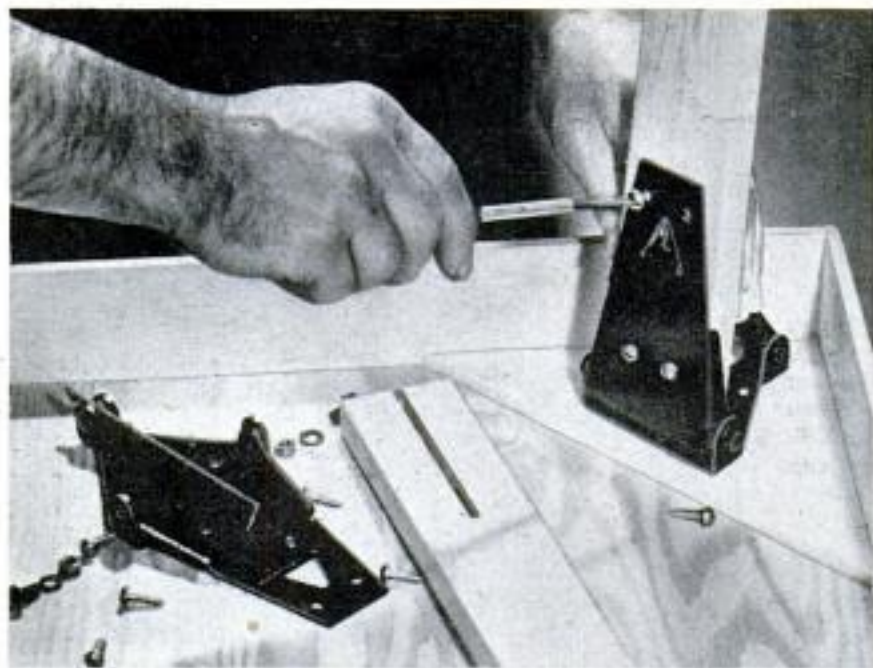
6. EGG OPENER ends burning of fingers caused by handling boiled eggs. The egg is clamped in one half of the plastic opener while the other half, equipped with sharp cutting edge, is revolved to slice through shell. The unit also serves as an egg cup



7. STRAPPING TAPE with a tensile strength of 240 pounds per inch of width now comes in handy rolls for home use. The adhesive tape is made of paper reinforced with glass fiber. It is strong enough to bind packages or repair broken table legs

8. HOSE REEL mounted beside water tap permits use of hose when it is only partly unreeled. Water is carried from the tap to a fitting on the reel into which the hose screws. The reel holds 150 feet of hose, is easily detached from mounting bracket



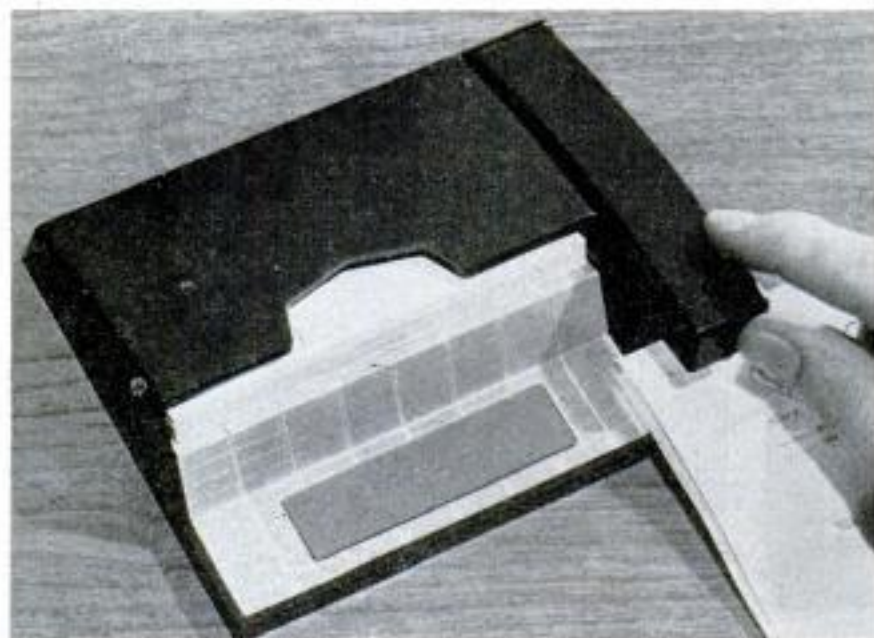
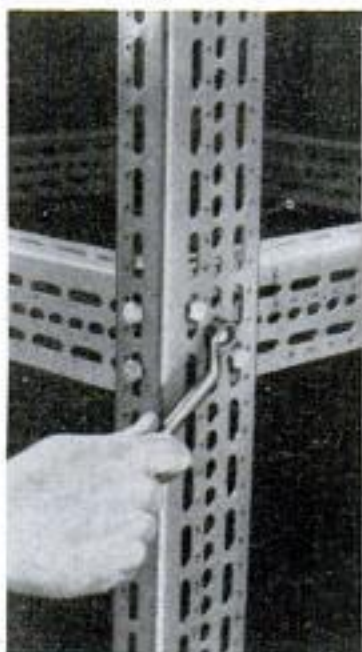


Folding Tables Built With Hinges

With a new locking hinge you can build your own folding furniture. The hinge supports up to 500 pounds without swaying or wobbling when locked in place. It is designed to fasten legs to various home-built tables, benches, ironing boards and swing-out doors. The sturdy hinge can be fastened to round, square or tapered legs with a drill, saw and screwdriver. Side flanges give maximum support at all stress points.

"Erector Set" Units Simplify Building

Slotted steel beams that look like they came from a king-size Erector set make it easy for the amateur to make a building or a bench. Only tools needed are a wrench and a cutter. Drilled with 40 bolt holes to the foot, the 14-gauge sections are marked at $\frac{3}{4}$ -inch intervals for cutting. The sections have unusual strength; a two-foot unbraced span easily supports over 1600 pounds. Compounding the beams gives greater strength.



Stapler and Memo Make Single Unit

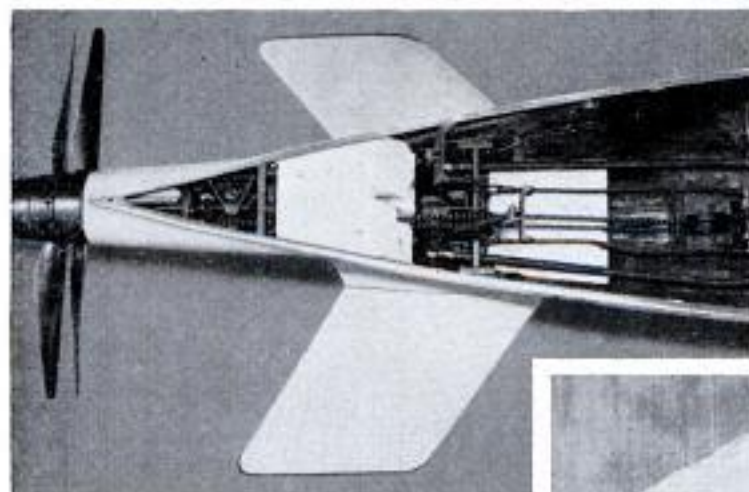
Two functions are combined in a handy paper stapler and a holder for three-by-five-inch memorandum sheets. The stapler lifts out for filling or for use as a tacker by simply tilting the handle to a vertical position. A plate at the front provides space for a name or an advertising message. The unit comes in black and gold or brown and gold. A cutout in the holder permits access to the memo sheets.

Hydraulic Lift Dumps Freight Car

Combination of an electro-hydraulic lifting mechanism and side gates that can be opened selectively makes a self-unloader out of a normal German railroad gondola car. The battery-powered electric motor pumps oil into the car's hydraulic cylinders, and a control stick allows the operator to lift and tilt the car as he wishes. A 24-ton load of coal can be dumped in a few minutes, while hand unloading takes 13 hours.



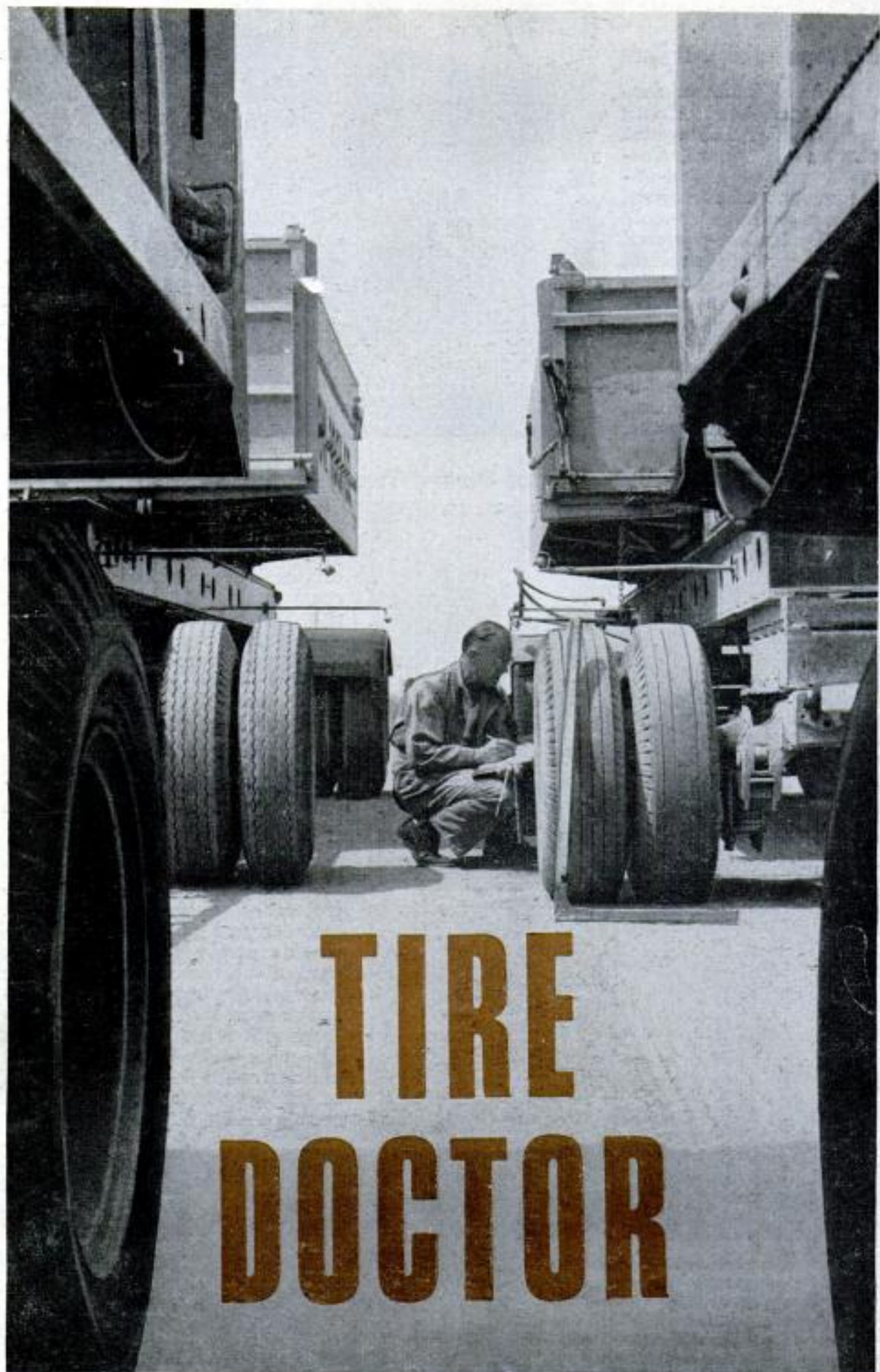
Foot Pedals Turn Propellers of Divers' Two-Man Submarine



Sub operators wear aqualungs, can leave the free-flooding craft when they choose. Control vanes act as legs of parked boat. The two operators sit back-to-back under transparent canopies and rotate pedals to spin propellers. Some models have motors

Latest vehicle for underwater travel is a two-man submarine that you propel by foot power and that carries a carbon-dioxide-gas spear gun in its nose for shooting fish. Two men can drive the craft at five miles per hour or one man can cruise comfortably at three miles per hour. Battery power also may be used to drive the aluminum contrarotating aircraft-type propellers. Four control vanes project from the bottom of the plastic hull and serve as legs when parking the sub on the bottom. The operators wear standard breathing apparatus and can leave the sub at will. A flooding tank provides neutral buoyancy when parked. The control vanes are swept back to shed seaweed and are connected to a single control wheel in the forward part of the cockpit. Any airplane maneuver can be performed underwater by the sub, including loops and rolls. The 14-foot craft fills with water when submerged and can withstand water pressure at 150 feet, about twice the depth recommended for its operators.





TIRE DOCTOR

THE LAST PLACE Charles M. Towner expected to find a gold-plated bonanza was under a truck's chassis.

Yet that's where he found a \$12,000 to \$15,000 annual income and a business all his own.

Skeptical? Then consider the day in 1946 when Towner, an old-time tireman, visited a friend's trucking outfit.

"Tire costs," his friend moaned, "are driving me into bankruptcy."

Curiosity led Towner to the trucker's garage. Crawling beneath the nearest tractor-trailer, he inspected its underframe. Some guys might have seen only massive wheels, mud-splattered axles and tie rods. Towner saw a fortune. Or rather, a fortune going down the drain.

Six months later he had established The Tire Maintenance Engineering Co. of California, home-based in Los Angeles. With \$100 worth of tools and a headful of tire know-how, Towner became general practi-

tioner to ailing and fast "dying" truck tires.

Today he has some 5000 "patients." His patients are the tires entrusted to his care by 10 client-fleets. He inspects each patient twice a month, diagnoses trouble, pinpoints the source. His fees: \$100 to \$300 monthly per fleet, depending upon the number of trucks and tires.

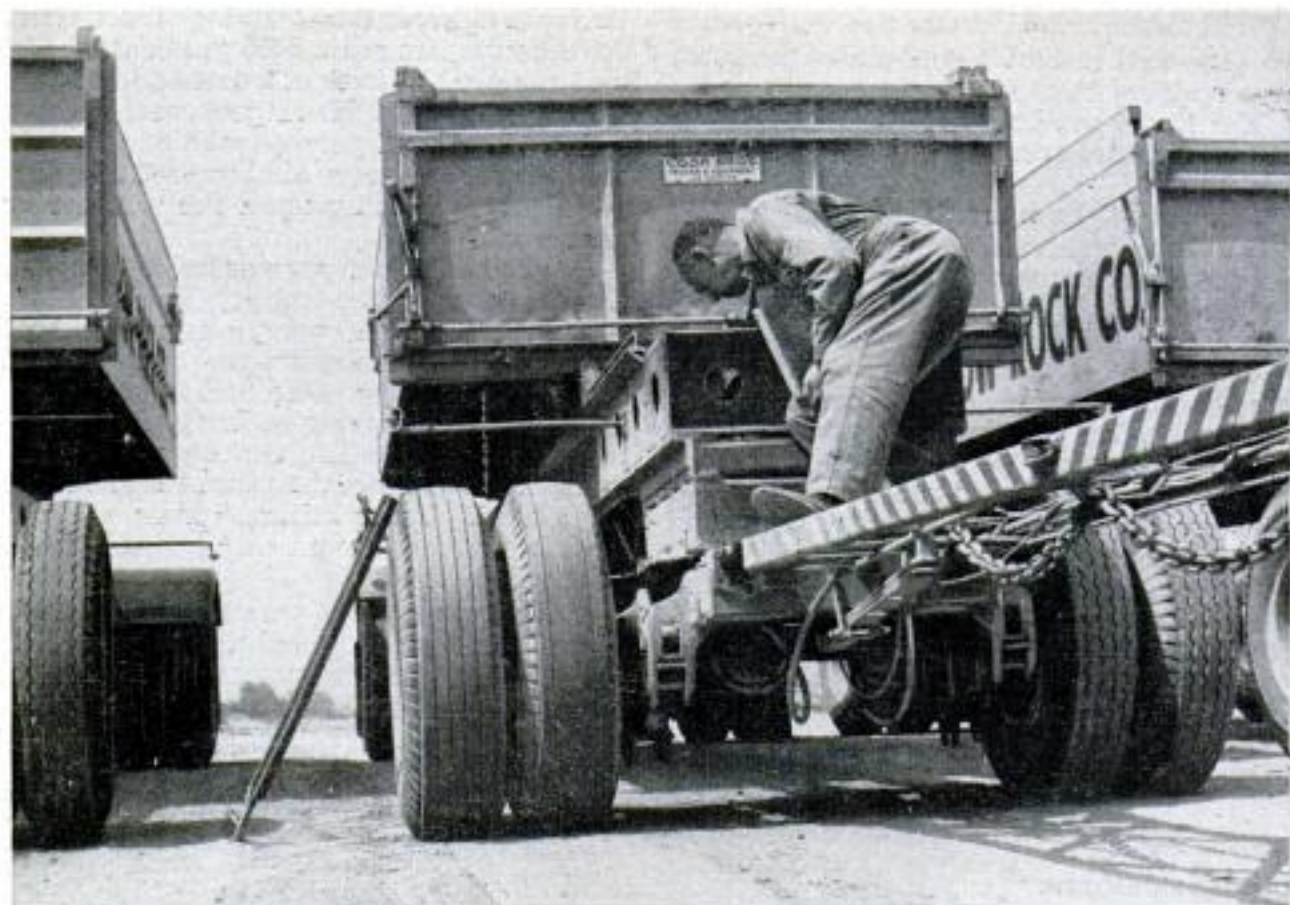
What had Towner seen as he lay beneath that massive tractor-trailer? Plenty. Four of the rig's 14 tires were in terrible shape. A couple of carcasses were rock-bruised and ready to blow. One had a split tread. Another was wearing so badly from misalignment that its life expectancy was already halved. More than that, inflation was haphazard. Some casings were all but bursting from over-pressure, others were nearly flat.

If his friend's fleet was typical, Towner knew he'd hit the jackpot. For there are about 9,500,000 trucks plying our highways, rolling on an estimated 50,000,000 tires.

"Doctor" Towner, right, does a post-mortem on a blown tire so he will know why it failed. In this way, he prevents future blowouts

By
James Joseph





Sometimes the fault is not in the tire. Towner inspects springs and brackets on one of the trucks he supervises

"Sure," his friend conceded, "we hire mechanics who double as tire repairmen. But they merely fix flats.

"Look," he continued, reaching for his ledger. "We're just a little bigger than average. We run 120 rigs. Figuring 8, maybe 10 tires to a rig, that's 1000 to 1100 tires 'on the ground.' That's \$120,000 in rubber. Many large fleets have upwards of \$500,000 in tires. With us, annual tire maintenance runs about \$30,000—the difference between profit and loss."

Towner took the clue, started calling on local fleet owners, concentrating on firms operating 25 to 50 trucks. He chose small fleets because they were more likely to be centrally garaged, more readily accessible. Besides, a small fleet's very existence often depended upon tire life. Fully 52 percent of a trucker's annual maintenance bill involves tires and tubes. The American Trucking Association has estimated that of \$3,043.48 spent yearly to service the average over-the-road tractor, \$1600 goes into rolling rubber. By comparison, overhauling the engine costs but \$392.97. Big fleets can afford full-time tire engineers. Little truckers can't. But, reasoned Towner, even the smallest fleet could buy an expert's services on a part-time basis.

So he outlined his plan. He would inspect every tire twice a month and hand the management a detailed report. He

would also help train the company's regular tiremen.

During the eight years he's been in the business, Towner has made himself indispensable. One small fleet, which pays him \$100 a month, is an example.

"I'm running 15 dump trucks," the fleet manager explained when he hired Towner. "Every week they blow a couple of tires. Each one is a \$100 carcass and a \$10 tube. Blowouts alone cost us \$220 a week, \$900 a month, nearly \$10,000 annually. And I'm not even figuring mechanics' wages or lost loads."

Towner set up a rigid inflation program tailored to the fleet's average loads, speeds and routes. He briefed the company's repairmen, showed them how to spot blowouts before they developed. Within six months blowouts were zero. Towner saved the company \$9000 the first year yet his services cost only \$1200.

Operating within a 100-mile radius of Los Angeles, Towner's is a small outfit. And he likes it that way, although he has a waiting list for his services. Occasionally he hires some help but mostly he goes it alone. First, he looks over the front tires, checking inflation with a hand gauge. Even a five-pound error can shorten tire life. Daily he calibrates his hand gauges with a master.

He keeps a look out for mismatched handholes (outside wheel ports which give

access to inner wheels and their air valves). These are dead giveaways that tiremen aren't gauging for inflation.

"You obviously can't gauge a tire if you can't reach its valve stem," Towner says.

He then looks for mismates. Mismatching occurs when one of two dual-drive tires rides higher than the other. Mismatching—either because of uneven tread wear or improper inflation—throws all the load on one tire, allows its companion to go along for the ride. Result: Reduced tire life and blowouts.

Towner uses a standard mismatch procedure. Holding a large 90-degree mating square flush with the outside casing, he measures the space between square and treads. No more than a 1/4-inch mismatch is permissible for 9.00-series tires; 10.00 and 11.00 series may be mismatched as much as 1/2 inch but never more. Solution: Pull one or both tires and install matched sets.

While he's about it, Towner also looks for excessive wear, particularly from such structural defects as broken kingpins, fractured brackets, faulty turn stops. And, of course, he's the man responsible for having tires pulled at just the right time for recapping.

"Some fleets get but one recap per carcass," he explains. "Mine almost always go through three recaps before discarding. I've tripled average mileage on some carcasses, slashed per-mile tire costs from a high of three cents to less than three mills. Multiply that by 1,000,000 miles (annual average for many fleets) and you're talking big money, big savings."

Not long ago, a driver breezed up, asked "How am I doing?" fully expecting Towner to praise his driving.

Towner, who asks clients to assign drivers permanently to their trucks, thumbed his worksheets.

"You drive rig 056?"

The driver said he did.

Towner studied his worksheet.

"You're doing lousy," he said at length. "You drive too fast. You brake too hard at boulevard stops and you spin your wheels."

"Yeah, and who says so?"

"Your tires," Towner snapped,

(Continued on page 236)



Above, gouged tread is a clue to how driver handles his truck. Below, dual tires must be mates. Towner's square shows they are





Branches loaded with macadamia nuts (left) grow on trees planted in holes bored in lava by machine (right)

Nut Crop Harvested on Hawaiian Lava Wasteland

ON THE SLOPES of Hawaii's famous volcano, Mauna Loa, where a few years ago there was only twisted tropical jungle, a new cash crop, macadamia nuts, is being harvested. The neat rows of nut trees represent a triumph of mechanized farming and recently developed techniques. Only

with war-developed bulldozers and other earthmoving machinery was it possible to clear the mountainside, and only with power drilling equipment could holes be cut in the lava for planting of seedlings. Even the harvest is mechanized. The nuts are picked up by immense vacuum cleaners.

Fully ripe, nuts fall from trees to be harvested by gasoline-powered vacuum cleaner mounted on trailer





Motorcycling Anglers Take Boat and Outboard Motor With Them

Fishing gear, an outboard motor and a boat on a trailer go along with Stanley Agens and Stanley Wheeler of West Orange, N. J., when they motorcycle to a

fishing spot. The trailer tows perfectly at speeds up to 60 miles per hour and the entire unit will turn within its own length. It can travel where a car cannot.

Mobile Rug Beater Goes to Customers

West Berlin housewives can have their dirty carpets beaten and vacuum cleaned by a service that comes right to the door. The rugs are cleaned in a mobile machine that can be operated anywhere. Customers can watch the cleaning process from their windows. The proprietors of the rolling establishment never have to worry about overhead costs like light, heat and rent, and customers seem to be satisfied.



Bike Easy Chair

Pedaling a bicycle can be tiring, believes one German youth who's attached a metal chair to the front of his vehicle. After a lengthy spin he simply props it up and relaxes.

Information not listed on articles in the index often is listed in the WHERE-TO-FIND-IT LIST, available without charge from Bureau of Information, *Popular Mechanics*, 200 E. Ontario, Chicago 11



Men, cars and equipment move at the same speed on the endless conveyor, which handles five cars at once

Two men work on each car as it moves along. They stand on an "endless belt" platform that moves at the same speed as the car. The platform is washed clean of grease on its return trip

Five-Minute Lubrication

IN FIVE MINUTES you can have your car greased at the Jiffy Lube in San Diego, Calif. Designed and operated by Jack Brem, the machine is similar in operation to the popular three-minute car laundries—the car moving continuously as it is lubricated.

Four men work on each car. The machine will accommodate five cars at a time. Two men on top service the battery, generator, starter, distributor and other top-side accessories. The two men on the lower level take care of chassis fittings. They stand on slatted endless platforms that move at the same speed as the car. Tool racks and lubrication equipment move along at the synchronized speed also.

There is no cleaning problem with the grease rack. As the lower platform returns to the starting point, it passes through an automatic washer, fully enclosed, that removes all grease and dirt.

Although there are still a few kinks to be ironed out of the machine, Brem hopes to license its use on a franchise basis.

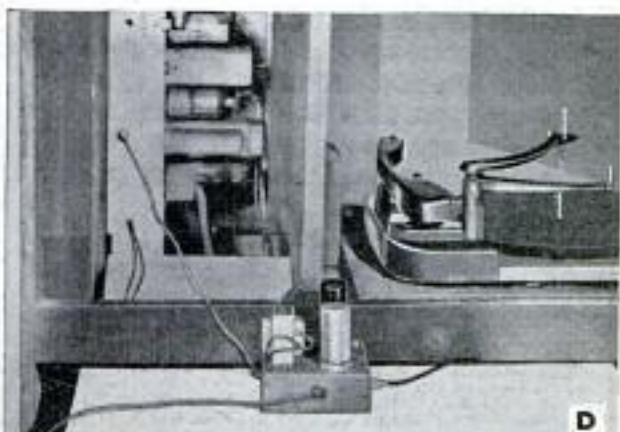


Three-Speed Record-Changer Kit Modernizes Old Phono-Radio Console

MODERNIZE your old radio-phonograph console with its outmoded one-speed record changer. A simple means for switching from the old changer to a new 3-speed replacement diskchanger is provided by a kit of the "do-it-yourself" type. The modernizing switch, photo A, can be made in about one hour, bringing new life and usefulness to a good piece of furniture. This Webcor diskchanger kit consists of a 3-speed diskchanger that plays 7, 10 and 12-in. records, a mounting board to fit the changer, and instructions for removing the old equipment and installing the new.

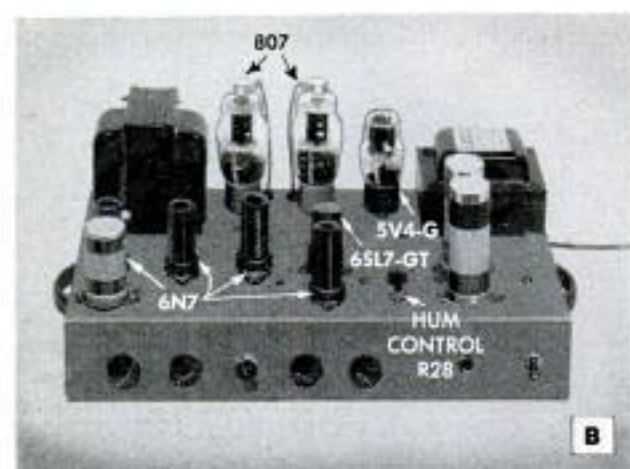
The mounting board, photo B, has precut holes to fit the changer, and the outer rim of the board has enough excess area so that it may be cut to fit into any old-style phonograph. A screwdriver and saw are about all the tools needed for installing the new mounting board and the 3-speed changer. The turntable "floats" on springs seated in countersunk holes as illustrated in photo C. This prevents any possible troublesome acoustical feedback.

After the new changer is installed, the a.c. power line and the audio line from the amplifier are connected exactly the way the old changer lines were connected. You are then ready to play any 33 $\frac{1}{3}$, 45 or 78-speed records. Should you prefer to use a similar type of changer having a variable-reluctance cartridge, you will follow the same procedure except that you will need a separate preamplifier as shown mounted on the rear of the console in photo D. The preamplifier is used to boost the signal before it reaches the regular amplifier.



30-WATT 807 AUDIO AMPLIFIER FOR

By Dr. R. C. Hitchcock



CAPACITORS

- C1 & C2 = .01 MFD. 400-V. TUBULAR
- C3 = 50 MFD. 350-V. IN MALLORY ELECT. FP-420.2
- C4 = 40 MFD. 350-V. IN MALLORY ELECT. FP-420.2
- C5 = .002 MFD. 600-V. TUBULAR
- C6 = .05 MFD. 400-V. TUBULAR
- C7, C9, C10, C15 AND C16 = .01 MFD. 400-V. TUBULAR
- C8 = 25 MFD. 25-V. ELECTROLYTIC
- C11 = 100 MFD. 150-V. IN MALLORY ELECT. FP-215
- C12 = 125 MFD. 150-V. IN MALLORY ELECT. FP-215
- C13 = 40 MFD. 350-V. IN MALLORY ELECT. FP-420.2
- C14 = .0005 MFD. MICA
- C17, C18, C19 & C21 = .1 MFD. 600-V.
- C20 = 160 MFD. 50-V. IN MALLORY ELECT. FP-420.2
- C22 = 50 MFD. 475-V. IN MALLORY ELECT. FP-266
- C23 & C24 = 40 MFD. 450-V. ELECTROLYTIC
- C25 = 80 MFD. 475-V. IN MALLORY ELECT. FP-266

SUITABLE for auditoriums, dance halls, and small outdoor gatherings wherever the necessary line voltage is available, this high-power audio amplifier can be used with practically any audio input for school public-address systems with multiple speakers and similar applications. A major feature is the single-chassis construction, with built-in preamplifiers, using standard octal-based tubes.

It is not intended for home use as a high-fidelity amplifier; it has too much power and too few tone controls. The compelling reason for omitting bass boost, for example, is the possibility of wrecking a speaker—a 10-db bass boost makes a 3-watt tone into a 30-watt one.

As will be noted in photos A and D, the unit is provided with a perforated metal cover. The chassis base is 10 x 17 x 3 inches; the total height of the chassis with the cover is 9 inches. The weight with cover is 30 pounds. While the circuit is not intended for beginners, it makes an excellent class project for schools under the supervision of an instructor, or anyone familiar with tube circuits. The filtering is adequate, but tube hiss when "wide open" is a limiting element in high-fidelity reproduction as referred to above.

The reluctance jack, when used with a GE pickup, is satisfactory for reduced output up to 10 watts. A Pickering magnetic pickup gave good results up to 20 watts.

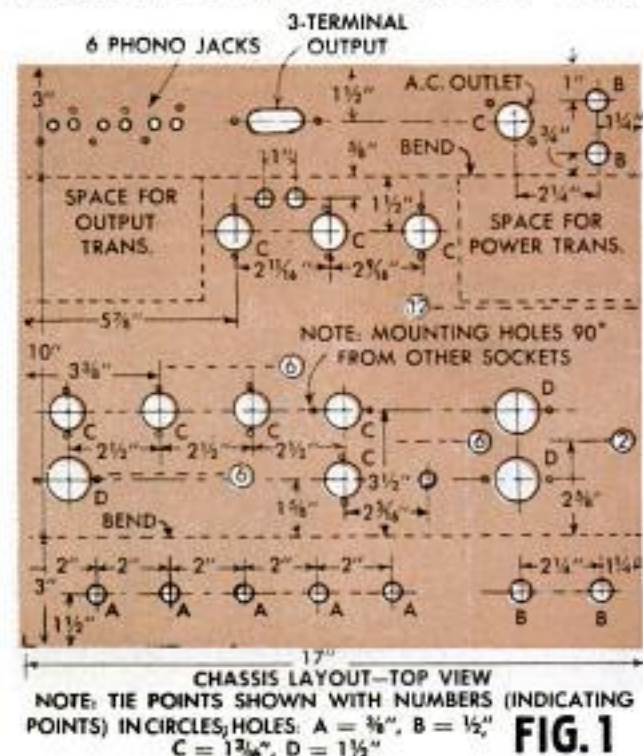


FIG. 1

DANCE HALLS AND AUDITORIUMS

There is no restriction on crystal, phono, microphones or radio—full 30 watts can easily be obtained from these.

The complete drilling details for the chassis base appear in Fig. 1. Photos B, C, E and F show various views of the completed unit. These should be studied carefully by the builder, although the exact layout is not critical. The chart of connections for using up to eight PM speakers, which must be all of the same type, is given in Fig. 2.

The complete circuit diagram appears on page 164. All capacitors and resistors are keyed to correspond to the detailed capacitor and resistor lists that are given in this article. All parts are standard, including the base and perforated metal cover, which is to be found listed in most radio-parts catalogues. Arrange the tube sockets just as shown in photo E with their keys in the same position. An underside view of the completely wired chassis base appears in photo F. Do not attempt to do any wiring from a photo. Follow circuit diagram, Fig. 3, exactly as shown, no changes of any kind are advised.

The circuit is class AB-1 push-pull 807 beam-power tubes driven by a 6SL7-GT phase inverter. One of the 6SL7 cathodes is the special "hum bucker" circuit, the other is a standard negative feedback.

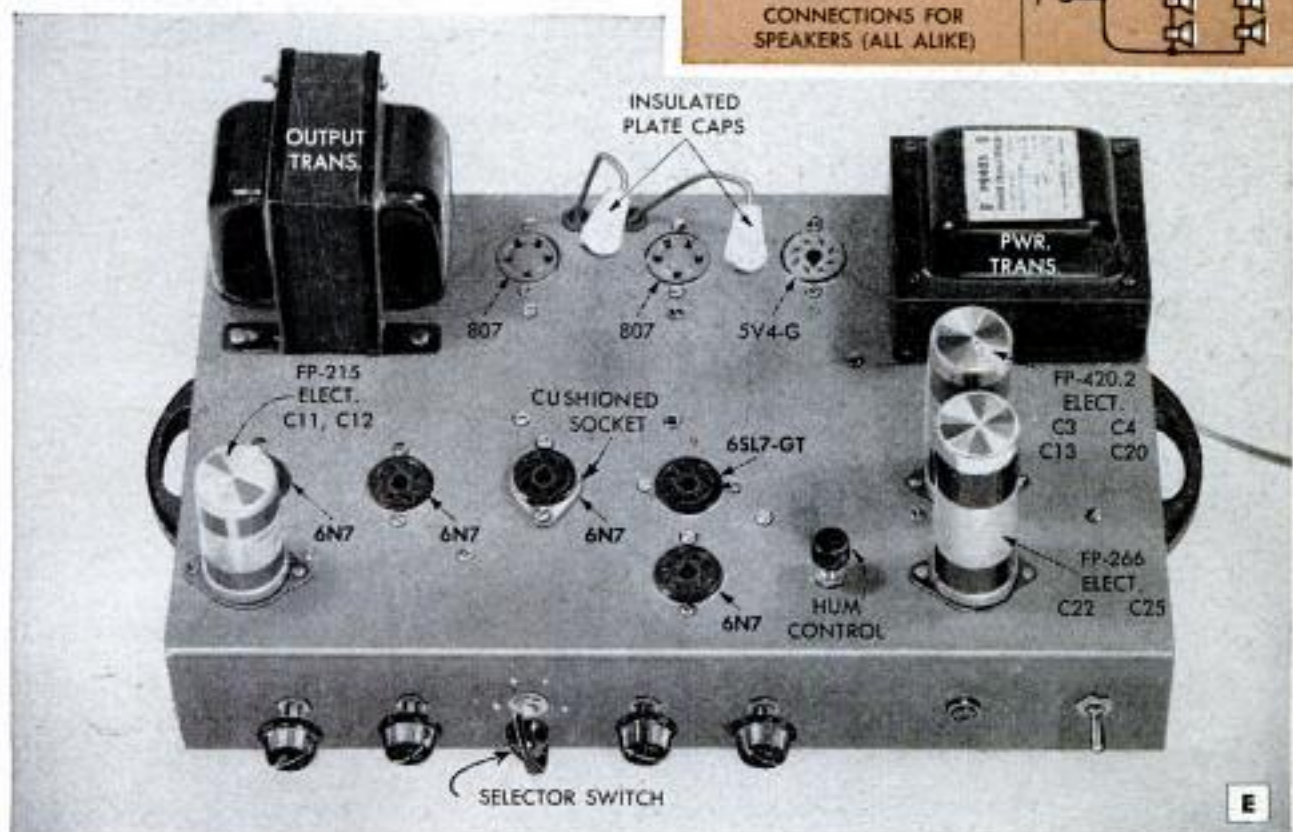
(Diagram Fig. 3 on page 164)

(Text continued to page 254)



NUMBER OF SPEAKERS	OHMS EACH SPEAKER	X TO Y AMPLIFIER OUTPUT	CONNECTIONS
1	16	16	
1	6 TO 8	8	
2	16	8	
2	6 TO 8	16	
2	3 TO 4	8	
2	3 TO 4	16	
4	16	16	
4	6 TO 8	8	
4	3 TO 4	16	
4	3 TO 4	8	
8	6 TO 8	16	
8	3 TO 4	8	

CONNECTIONS FOR SPEAKERS (ALL ALIKE)



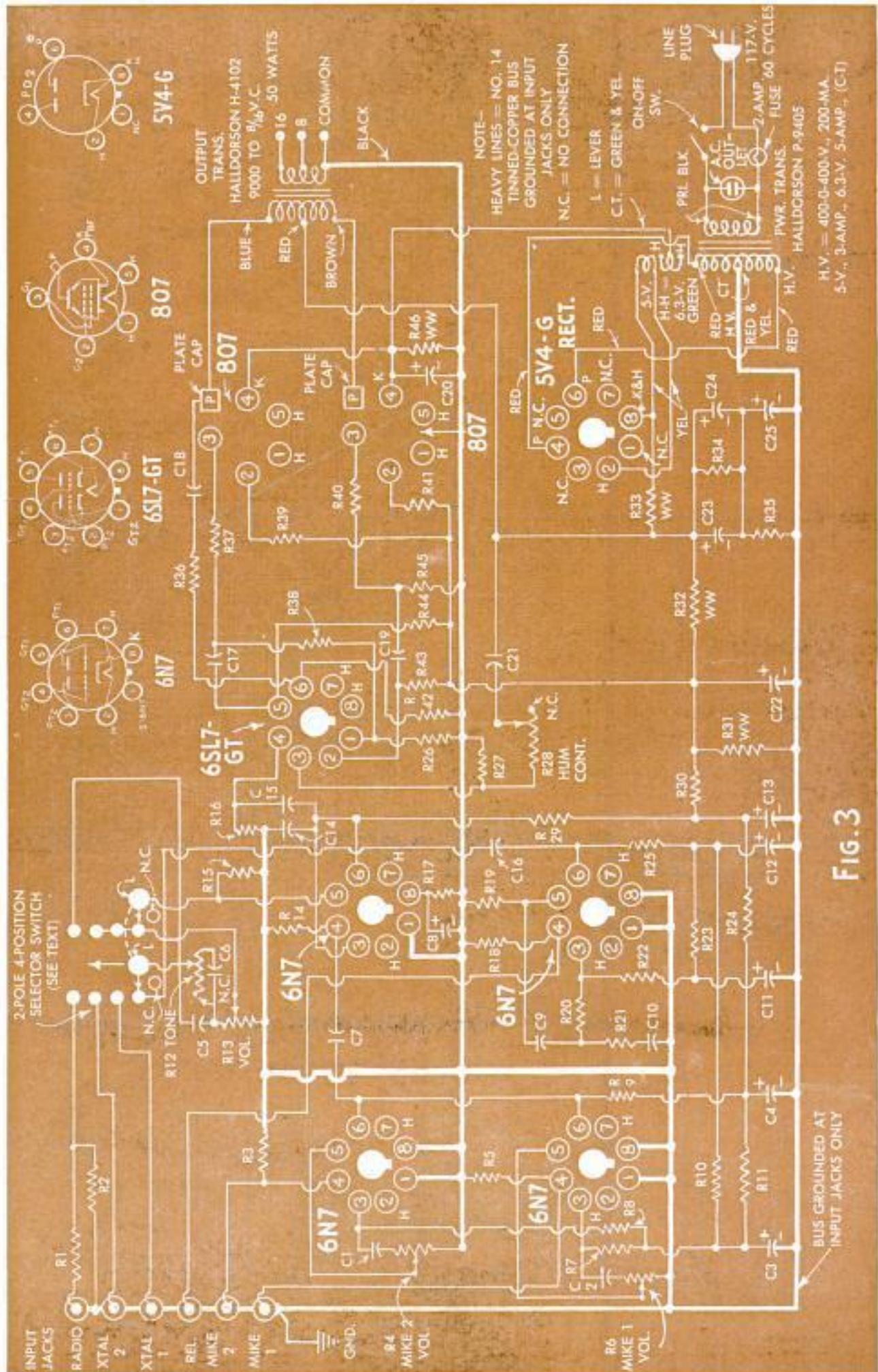
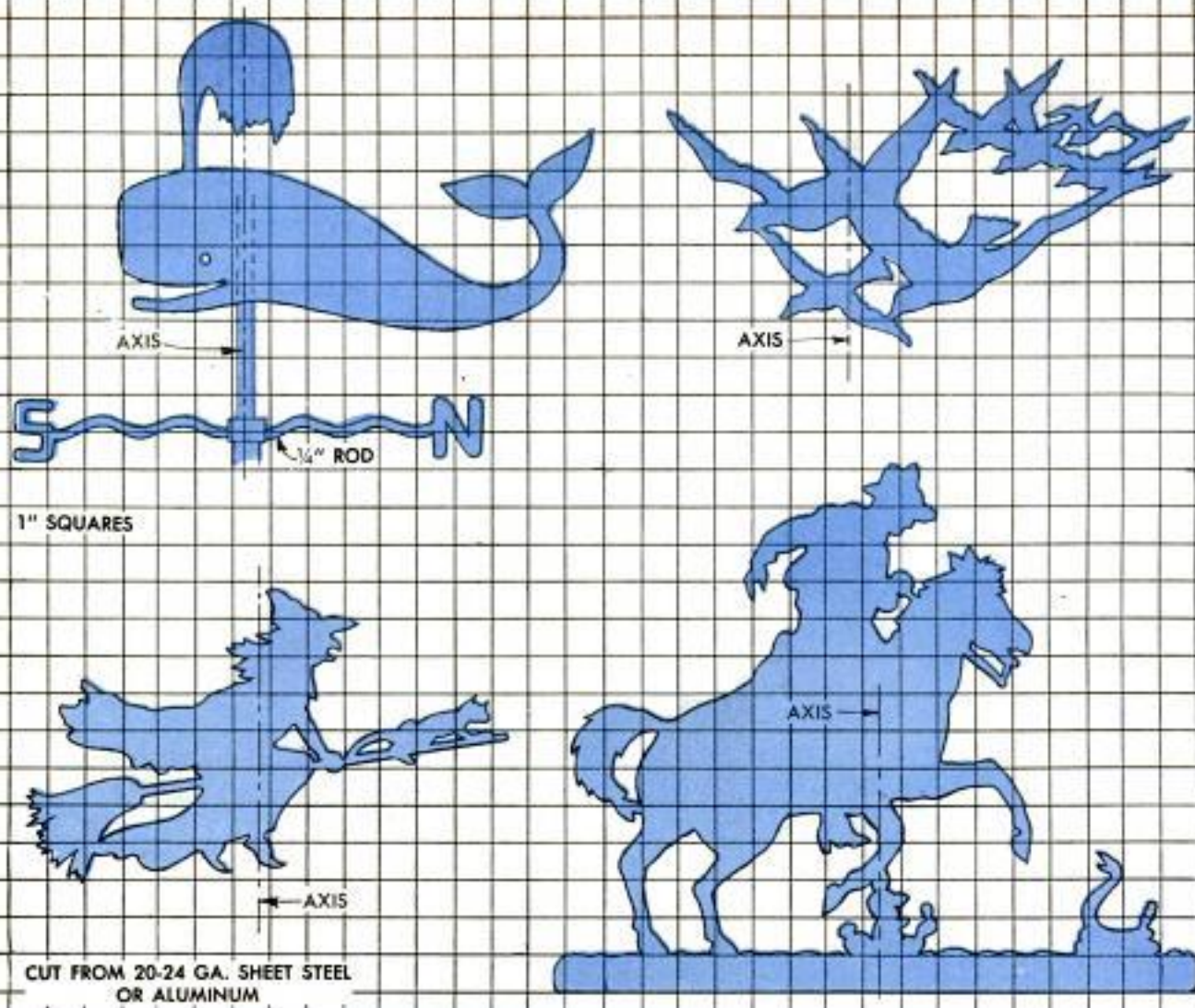


FIG. 3



1" SQUARES

CUT FROM 20-24 GA. SHEET STEEL
OR ALUMINUM

pipe is capped with a pipe cap and the lower end is slit with a hacksaw. The slit sections of pipe are bent outward to match the pitch of the roof. A hole in the pipe cap admits the shaft. Another way of providing a freely rotating shaft is to use a thrust-type ball bearing. Here, as the detail shows, the bearing is supported by a large washer, or collar, which is welded to a steel shaft. A section of tubing to which a cap is brazed and to which the vane itself is brazed, slips over the shaft and rotates on the upper half of the thrust bearing. In the first method, the arms supporting the compass headings are welded or threaded into holes drilled in the pipe. When a ball-thrust bearing is used, the arms are brazed

to a collar which, in turn, is brazed or welded to the shaft at a point below the thrust bearing.

The silhouette and letters can be cut from aluminum, stainless steel or black iron by using a metal-cutting blade in a jigsaw, or with a narrow cold chisel, placing the metal flat on the end grain of a wooden block. The squared drawings suggest five silhouettes, all of which make attractive weather vanes. In each case, the axis point is indicated by a dotted line. The silhouette should be brazed or welded to the rotating shaft along this line. The cutout and letters should be painted flat black rather than a bright color so they will stand out against the sky. ★ ★ ★

Simple Picture-Frame Jig Made With C-Clamps and Wood



When no picture-frame clamps are available a frame can be held in position while the glued corners are setting by using a jig made from four pieces of wood held with C-clamps. The sides of the jig are cut so that the inside dimensions of the jig are a fraction smaller than the outside of the picture frame. As shown, 90-deg. V-notches are cut near the ends of the jig sides for the pads of the clamps.

Ornamental Objects for Farm Home Made With Welder

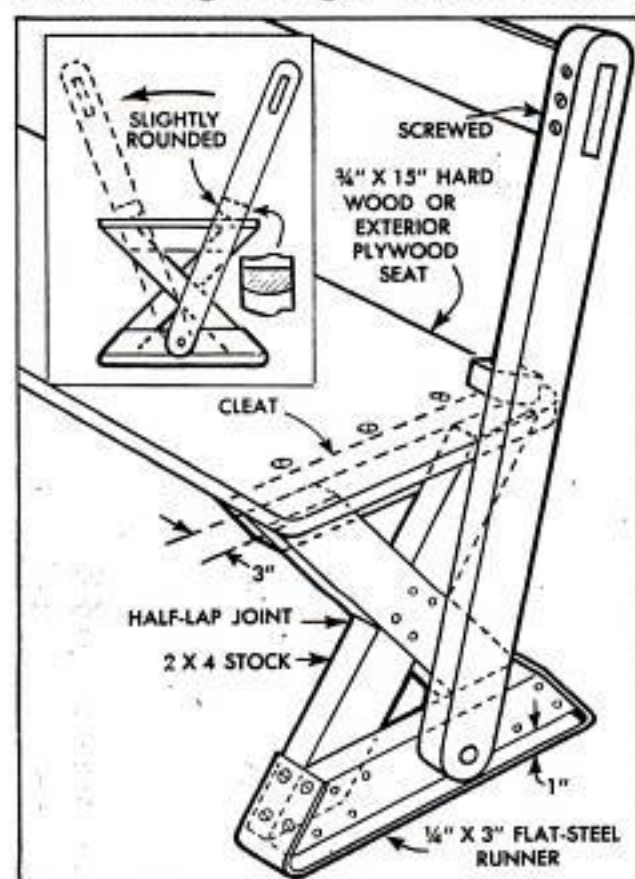
One farmer uses his welder to add a number of ornamental touches around his home. For example, he made an unusual mailbox standard by welding 15 horseshoes together as shown. To anchor it firmly into the ground, he welded a length of pipe onto the bottom horseshoe and welded an old disk-harrow blade to the other end of the pipe. The blade is set in the ground and anchored with concrete. He constructed the "waterfall" flowerpot holder by welding the blade end of four sulky-rake teeth into the end of a pipe standard. The other ends are bent into hooks. In the illustration, flowerpots are suspended by wire from the hooks. Another novel way to do this would be to use old automobile headlights in place of



the pots. The tear-drop shape would lend an attractive touch. To support the holder, a disk blade welded to the bottom of the center column is set in concrete.

Doris Fry Wiley, Maywood, Ill.

Back of Lightweight Lawn Bench Can Be Reversed



The lawn bench illustrated is a strong, lightweight design that not only has the added comfort of a back, but can be reversed without being lifted and turned around. The secret of its quick convertibility is that the back can be swung forward or backward. A stop block on each upright is located so that the back locks at the proper position on either side of the seat. The legs of the bench are cut from 2 x 4 stock and are fitted with flat-steel runners. The seat is a $\frac{3}{4}$ x 15-in. piece of exterior plywood or hardwood, cut to the desired length and fitted with cleats which help brace the legs. The back uprights are mortised to receive the crosspiece which is secured with screws. For an even stronger construction, place another crosspiece just above the stop blocks on the uprights.

Formula Determines Vent Area

There is a definite formula to be used when figuring the amount of ventilation required for unheated attic spaces above an insulated ceiling. The generally accepted working formula is: The total area of unobstructed vents should equal $\frac{1}{500}$ the floor area of the attic to be vented. If the vent openings are covered with 16-mesh insect screen, the vent area should be doubled and, if the vents have louvers and screen, the vent area should be tripled.

☞ To save the labor of cleaning a bowl or can in which paint is mixed, line the container with aluminum foil before use. When the job is done, simply discard the foil.

Tape Provides Safety Factor When Chiseling Rivetheads



One mechanic, as a safety measure, applies a strip of masking tape over rivets before removing the heads with a chisel. When the head is cut off, the tape keeps the rivethead from flying and thus prevents accidents. In use, the tape is peeled back to expose the side of the rivethead where the chisel is to be applied, but the adhesive is sufficient to keep the piece from flying when it breaks away.

Pick Tightened on Handle With Screen Wire



A pick that has loosened on the handle can be tightened by using a strip of screen wire the width of the pick hub. Remove the handle, wrap the screen around the end and then drive it back into the pick. The screen will bite into the wood and stay in place, providing a much

better grip than the wood slivers and cardboard strips often used.

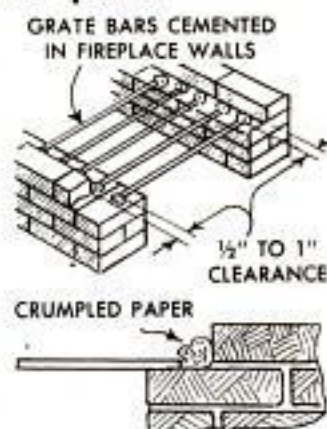
Pineapple Produces Exotic Plant

An unusual and exotic-looking plant can be produced by placing the top of a fresh pineapple in a bowl with about a pint of water. The pineapple will sprout and grow roots and can be kept for some time. An

occasional feeding of water-soluble plant food will aid in the growth.—Mrs. E. C. Lyons, Jr., Wisconsin Rapids, Wis.

Grates in Outdoor Fireplace Require Expansion Spaces

When the steel grate bars in an outdoor fireplace are mortared into the side walls it is important that clearance be provided at their ends to allow for expansion when the bars are heated. To provide this clearance, when building the fireplace stuff balls of crumpled newspaper at the ends of the bars so mortar will not fill the space. Finish building the fireplace right over and around the paper. The crumpled newspaper will compress or burn when the heated grate bars expand against it.



Drill-Press "Dinging" Hammer Removes Small Dents

Dents can be removed quickly from sheet-metal toys, silverware and other light metal objects by using a handmade "dinging" tool chucked in a drill press. For small jobs the tool is made from a 3 or 4-in. length of 1/4-in. steel rod, one end of which is bent at right angles for about 1/8 or 1/4 in. The bent portion then is smoothed with fine emery cloth. In use, the L-shaped tool is chucked in the press and the object to be straightened is held on the table with pliers or clamps. For the sake of illustration, no clamps are used in the photograph. In actual practice, the method shown would be dangerous. For larger jobs, the tool can be bent and filed to approximate the contour of the object being worked on.

Ed Packer, Oak Park, Ill.



MIRROR SILVERING



By E. R. Haan

MIRROR SILVERING offers excellent opportunities for making worthwhile spare-time profits. The process is simple, requiring no training or experience, and the equipment needed involves no appreciable investment. The work can be done in a very small space, as pictured in Fig. 1, and handling the chemicals is entirely safe if you follow the normal precautions given at the end of this story.

Equipment: To begin with, you will need an acid-resistant tray large enough to accommodate the largest pane of glass that you intend to silver. The tray can be made of sheet metal by bending the edges of the sheet upward to form 1-in. sides and leaving one corner open for drainage. Or, the tray can be made from hardboard nailed to wooden rails. In either case, the tray must be acidproofed. One or two coats of asphaltum paint, Fig. 2, applied to both the inside and outside of the tray will acidproof the sheet-metal tray. Melted paraffin serves the same purpose on hardboard and wood, deep penetration being assured if the wood is heated beforehand. Four wedges of rubber or acidproofed wood also are required for leveling the glass to be silvered. Rubber doorstops provide suitable rubber wedges.

General procedure: After the silvering solutions have been prepared, the glass is cleaned thoroughly. Then the solutions are mixed together and flowed onto the glass. Safe handling of the glass is assured

The tray used for silvering can be bent from sheet metal and then set up to permit drainage, as above. The tray is made acidproof by an application of one or two coats of asphaltum paint inside and out



if any sharp edges have been smoothed with an abrasive stick or grinding stone, as in Fig. 5. Glass used for mirrors should not have any defects and, for undistorted image reflection, plate glass should be used.

The tray is placed to drain into an acidproof container or into a suitable drain, remembering that corrosive chemicals drained into the plumbing system should be diluted with large quantities of water to prevent damage to metal pipes and fittings. The chemicals should be of the grade known as C.P.—chemically pure. Successful silvering is possible only when the prescribed chemicals are measured carefully, Fig. 3, and mixed exactly according to instructions. For solids and liquids,



avoirdupois and fluid ounces are used respectively. Distilled water should be used, as tap water often contains impurities that will influence silvering results. For example, the slightest trace of chlorine in the water will cause failure.

Silvering solutions: There are many formulas for the deposition of silver on glass. Three reliable ones for the layman, with complete detailed instructions on procedure, are contained in Circular No. 389 of the U.S. Bureau of Standards. This is available for a few cents from the Government Printing Office, Washington, D. C.

One of these formulas, which produces a thick and uniform coating of silver in 10 to 15 min., consists of two solutions as follows:

Solution No. 1 (Reducing Solution)

	Metric	Ounces
Distilled water	1 liter	33.81
Granulated sugar	90 g.	3.17
Nitric acid	4 ml.	.14

Boil the solution for 5 min. and allow it to cool before using. Boiling can be omitted if the solution is prepared a week or so before using it. This solution can be stored safely.

Solution No. 2 (Silver Solution)

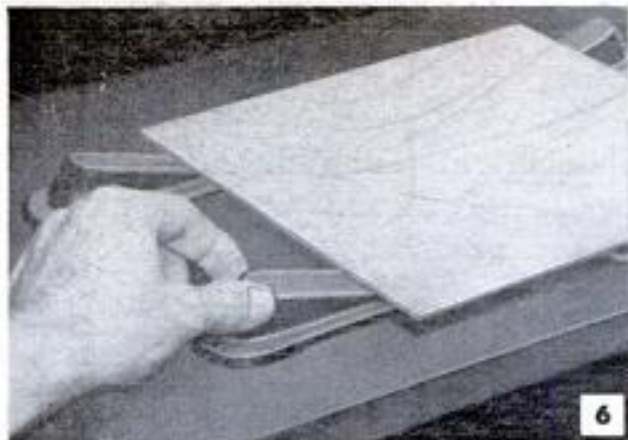
	Metric	Ounces
A Distilled water	300 ml.	10.14
Silver nitrate	20 g.	.71
A ¹ Distilled water	100 ml.	3.38
Potassium hydroxide	10 g.	.35
B Distilled water	30 ml.	1.01
Silver nitrate	2 g.	.07

Add a solution of ammonium hydroxide (full-strength ammonia water) in minute quantities to solution A. This causes a precipitate to form which must be cleared up by continuing to add the ammonia, drop by drop. Ordinary household ammonia cannot be used for this purpose. Do not add more than the final drop needed to just clear the solution. Shake or stir the solution between additions of ammonia to get its full effect. Then, when the solution has been cleared, you add solution A¹, which again causes a heavy precipitate to form. This also must be redissolved by adding ammonia cautiously as before. The correct addition of ammonium hydroxide is highly important. A slight excess of this prevents deposition of silver; too small an amount results in precipitated silver, which should be removed by filtering.

After clearing the solution the second time, add as much of solution B as necessary to produce a slight but permanent darkening. If the correct amount of ammonium hydroxide has been added, very little of solution B is needed. If an excess of ammonium hydroxide was added, a great deal of solution B—perhaps even an additional amount—is needed.

Solution No. 2 is enough to silver approximately 125 sq. in. of glass surface. This solution should be made up only for a day's requirements, and should not be stored overnight. Solutions containing silver nitrate and ammonia produce explosive compounds if left standing.

Cleaning procedure: The glass surface to be silvered must be cleaned thoroughly as follows: Mount it on rubber wedges in the drain tray and rub washing soda or non-abrasive cleaning powder on the glass with a clean, moistened cloth or wad of cotton as in Fig. 4. The glass should not be touched



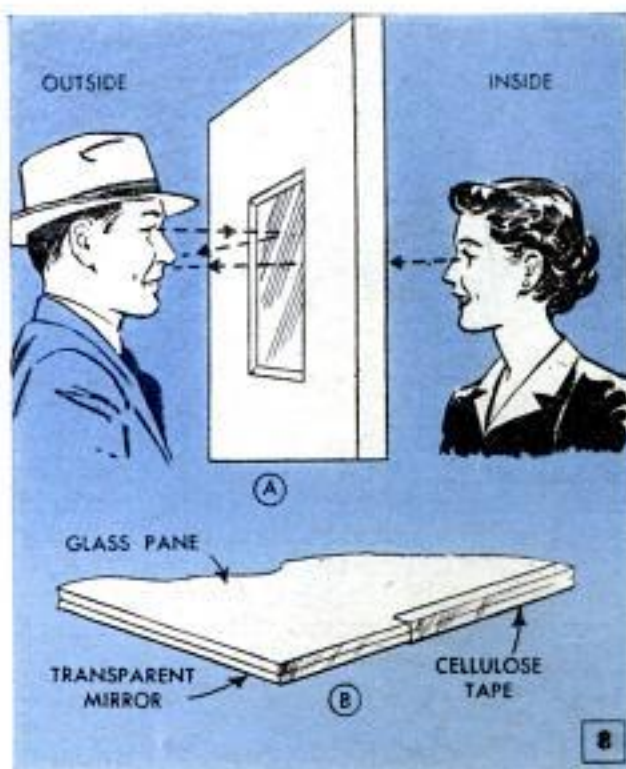
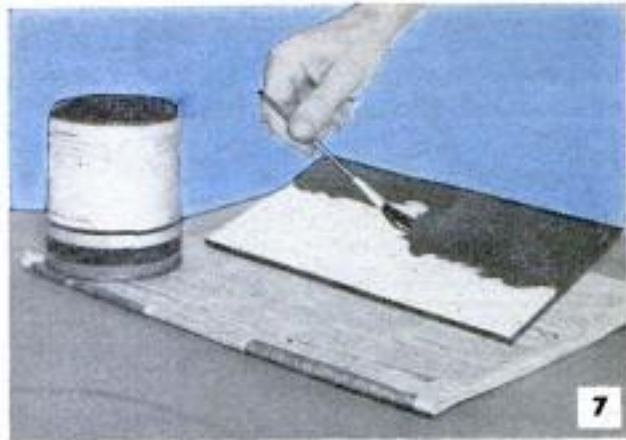
with the fingers unless rubber gloves are worn. After rinsing with water, swab the glass with alcohol or carbon tetrachloride; then rinse and swab again with nitric acid diluted in 3 parts of distilled water. Swab with a cotton wad on a length of $\frac{1}{4}$ -in. dowel so that moderate pressure can be applied. After washing away the nitric acid with distilled water, allow water to stand on the glass until silvering. A film of water from $\frac{1}{8}$ to $\frac{3}{16}$ -in. thick will cling to the glass without running off if the glass is leveled by means of wedges, as in Fig. 6.

Removal of old silver: Use varnish remover to soften the protective coating of paint or varnish over old silvering. Wipe the softened varnish off with a rag or paper towel. Don't use steel wool or any scraper that is likely to scratch the glass. Particles of sand in a rag can scratch glass. Remove old silvering with a nitric-acid solution of the same proportions as that used for cleaning. Then rinse the glass and put it through the cleaning process.

Silvering operation: Solutions Nos. 1 and 2 now are mixed in the proportions of one volume of No. 1 to four volumes of No. 2. You mix them just before flowing the resulting solution onto the glass. The deposition of silver starts immediately after mixing. Drain off water standing on the glass, then pour the working silver solution on the center so that it spreads to all edges, as thick a film as can be held without running off. After 15 min., drain off the spent solution. If a thicker coating of silver is required because of thin spots, a second and even third deposition is made, each following the previous one immediately. After silvering, the glass is rinsed with cold water and set aside to dry.

Protective coating: When dry, the silvered surface is given a coat of protective varnish or paint, carefully applied with a spray gun or with a camel's-hair brush, Fig. 7. Drying should not be forced by heat.

Transparent mirrors: Mirrors that are practically transparent when viewed from one side have considerable utility as door



lookouts, Fig. 8. They are made by depositing less silver on the glass—just enough so you can barely read newspaper print through the glass. Such mirrors are transparent from the side having the least illumination. The protective coating in this case should be transparent varnish. To shield the varnished back against scratches an extra pane of glass is used, detail B.

Handling chemicals safely: Be sure to keep silver nitrate, nitric acid and solutions of these and other corrosive chemicals well away from the skin, clothes and other materials, to prevent burns and deterioration. Wear rubber gloves and goggles for safety. If acid should contact skin, wash away all traces of it under running water. Mix acids and water in glass or earthenware containers, since these are not attacked by most acids. When diluting an acid in water, never add water to the acid, but always add the acid slowly to the water while stirring the latter. Also provide adequate ventilation to carry the fumes outside. ★ ★ ★

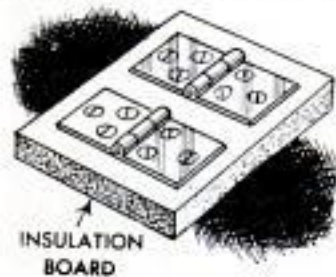
Felt Hat Used in Emergency As Life Preserver



A common felt hat can be made to serve as a life preserver in an emergency. The hat is held upright on the surface of the water and the arms are thrown around the brim. The chest is then rested lightly against the side and top of the crown, exerting only a slight pressure on it. In this manner, air is confined within the crown and will keep the hat afloat. Enough buoyancy is provided to keep a person afloat for several hours.

James K. Hufft, St. Louis, Mo.

Spare Hinges Stored Neatly On Insulation Wallboard



When hinges and screws are removed from discarded furniture, they can be stored together for future use by mounting them on a piece of insulating wallboard. Wood

screws are forced into the board easily but provide sufficient holding power to keep the hinges in place.

Make An Outdoor Thermometer

To make a thermometer for use outdoors, a cardboard-mounted calendar thermometer can be cemented to the inside of a plastic toothbrush container, after which the cap of the container is cemented in place. Nails or screws through the plastic

case hold it in place on the window frame where it is clearly visible from inside the house.—Frank Shore, New York City.

Sheet Metal Cut With Hacksaw By Using "Double Cut"

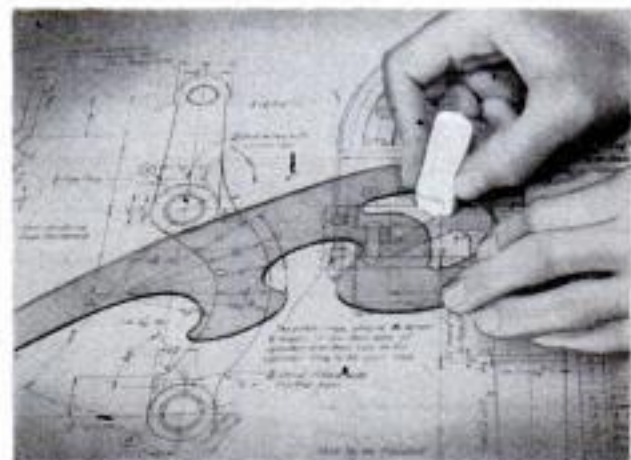
Sheet metal that is too heavy to cut with tin snips can be cut with a hacksaw by using a "double cut" method which provides room for the saw frame. First, mark the line to be cut, then scribe another line parallel to it about $\frac{1}{2}$ in. away. Make



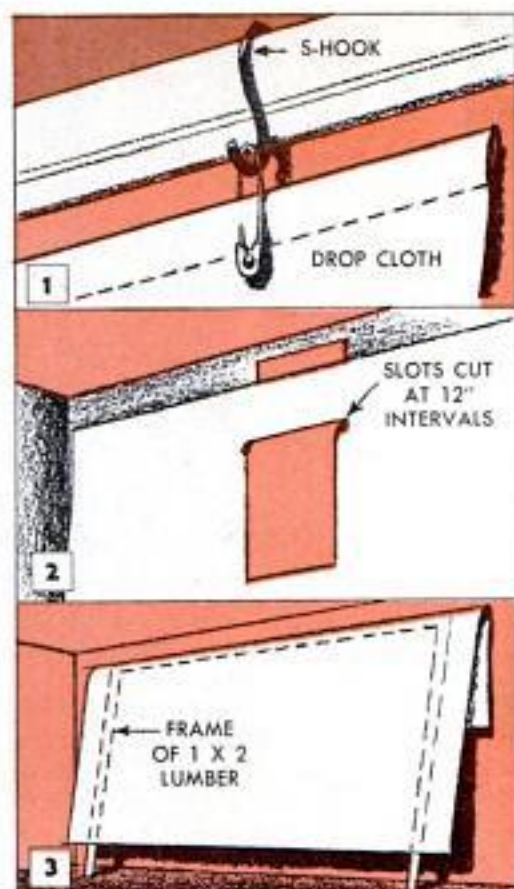
alternate saw cuts along these lines, rolling up the waste metal between the cuts. When the rolled metal accumulates so it interferes with the saw, cut it off and continue the cuts. The saw will tend to drift from the lines, so the blade should be twisted slightly in the frame and the saw held to compensate for the drift. For best results on sheet metal, use a fine-toothed blade.

Transparent French Curve Provides Erasing Shield

When making erasures on mechanical drawings, especially on tracing paper where it is difficult to hold the paper securely, a French curve or triangle makes an ideal erasing shield. The curve will hold a large area of the paper flat while you erase, thus cutting down on the chance of tearing. And the fact that the shield is transparent insures accuracy in erasing, since none of the lines are obscured.



Work clothes hung on a nail that is covered with an empty thread spool will not be torn or snagged as when hung on the nail alone.

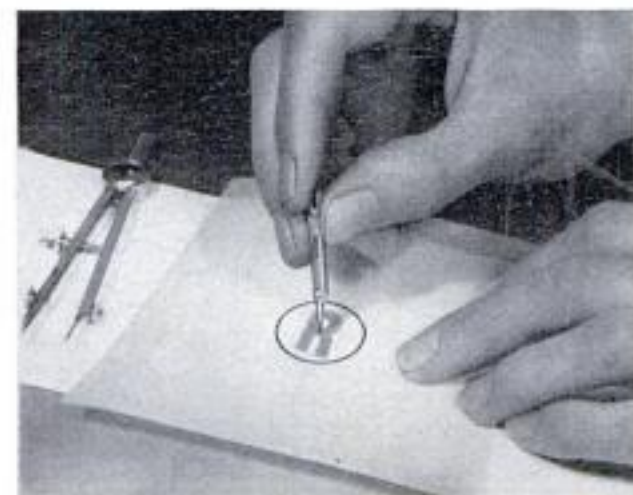


Three Ways to Support Painter's Drop Cloth

When only the ceiling in a room is to be painted, papered or washed, the walls can be protected from damage or stain by covering them with a drop cloth which may be supported in three different ways. The simplest method, if the walls have a picture molding at the top, is to hang wire S-hooks on the molding and suspend the cloth on safety pins slipped over the hooks, Fig. 1. The second method, intended for painted walls where there is no picture molding, is to use wide strips of masking or cellulose tape. These are fitted through slots cut at 12-in. intervals near the top edge of the

cloth, as in Fig. 2. The reason for using the slots is that the upper edge of the drop cloth then can be placed against the ceiling to provide complete ceiling-to-floor protection. After the tape is passed through the slots and fastened to the drop cloth, a strip of tape is pressed horizontally across both sides of the slot to reinforce it. The third method of supporting a drop cloth, Fig. 3, is useful where the walls do not have a picture molding and where tape would cause damage if used. An inverted U-shaped frame of 1 x 2 lumber is nailed together and the drop cloth placed over it.

Center of Letter Located Using Overlay Circle



When it is necessary to circle letters, numbers or figures, the difficulty of locating the point at which to center the compass can be overcome by using an overlay of tracing paper or clear celluloid. The circle is drawn on the overlay, which then is placed over the figure. A needle or compass point can be used to transfer the center point to the figure.—Richard Hanscom, Elmhurst, Ill.

☛ Gasoline that has become mixed with water can be salvaged by straining the mixture through an old felt hat. The gasoline, because of lower surface tension, will pass through the felt; the water will not.



THE PM PRECUT HOUSE

Part II

By Richard F. Dempewolff

ANY HOUSE that can be a summer camp, full-fledged cottage, or year-round dwelling with a dozen possible floor plans at the builder's option, must involve some neat structural tricks. As you read last month, *Popular Mechanics'* Kit Home has been engineered by architects Wilson and Christie to do all those things.

Some of the stunts that make this possible include "switchable," make-it-yourself-type windows that conform to almost any conceivable room arrangement. Remarkably strong but light trusses make bearing walls unnecessary and can be handled with ease by two men. A roomy 12-ft. storage wall loaded with built-ins can be located any place in the house as a living-room-bedroom divider. Special "open end" construction makes it easy to have either a carport or a porch as you wish. How these things work, and how they have been designed so anyone can build them, will be explained in this and the following two articles.

The kit home is designed for any standard foundation — basement, crawl space, slab or piers. Because of prohibitive shipping weight and the variety of individual preferences, the kit home does not include foundation materials. Underpinning is up to you. So, when you have decided on the foundation you want, buy materials from

your local supplier, lay out your building lines and you're set to go.

Piers are cheapest. When built of concrete blocks on 20 x 20-in. footings, they should cost less than \$80 for materials. Building codes often prohibit a pier foundation but, where permitted, it will support the house as well as anything. In years to come, the space between the outer piers can be filled with masonry at leisure. Other types of foundations cost more, but permit conversion of the shell to year-round use without further ado. For the prototype house, I built a crawl-space foundation of concrete blocks as the best compromise. It cost \$202.82, complete with bulldozered hole, required no complicated forms and was simple enough for one man to build.

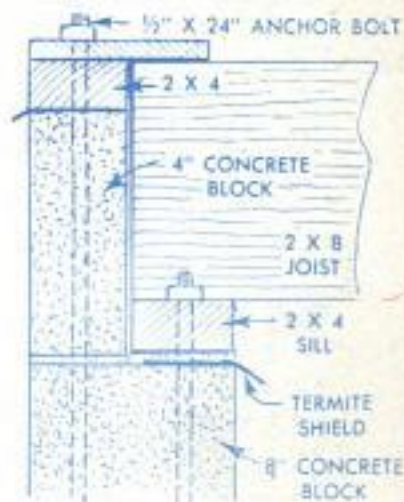
Once the hole is dug, you can lay in the forms for the 8 x 18-in. footings. These are best made with 2 x 4s placed on edge, then leveled and staked in place. Any scrap siding or framing boards 4 in. or more wide will do the job if firmly reinforced with stakes. Soil is dug out between the forms to an additional depth of 4½ in. After the footings are poured and are set, forms are removed and you can start laying block, building up several courses at each corner first. Then, running a chalk line from corner to corner for each course, and making liberal use of a long mason's level, each of



Center girder of spliced 2 x 12s rests on concrete-block piers. Joists are toenailed to sill and girder

the four walls is filled with blocks. At some convenient place in the foundation wall, an access opening is built into the crawl space. The opening is framed with 2 x 8-in. planks, nailed together at the corners, and secured to the concrete blocks on each side and bottom with anchor bolts. A simple plank door can be fitted against stops in this frame if desired, and held with regular window turn buttons.

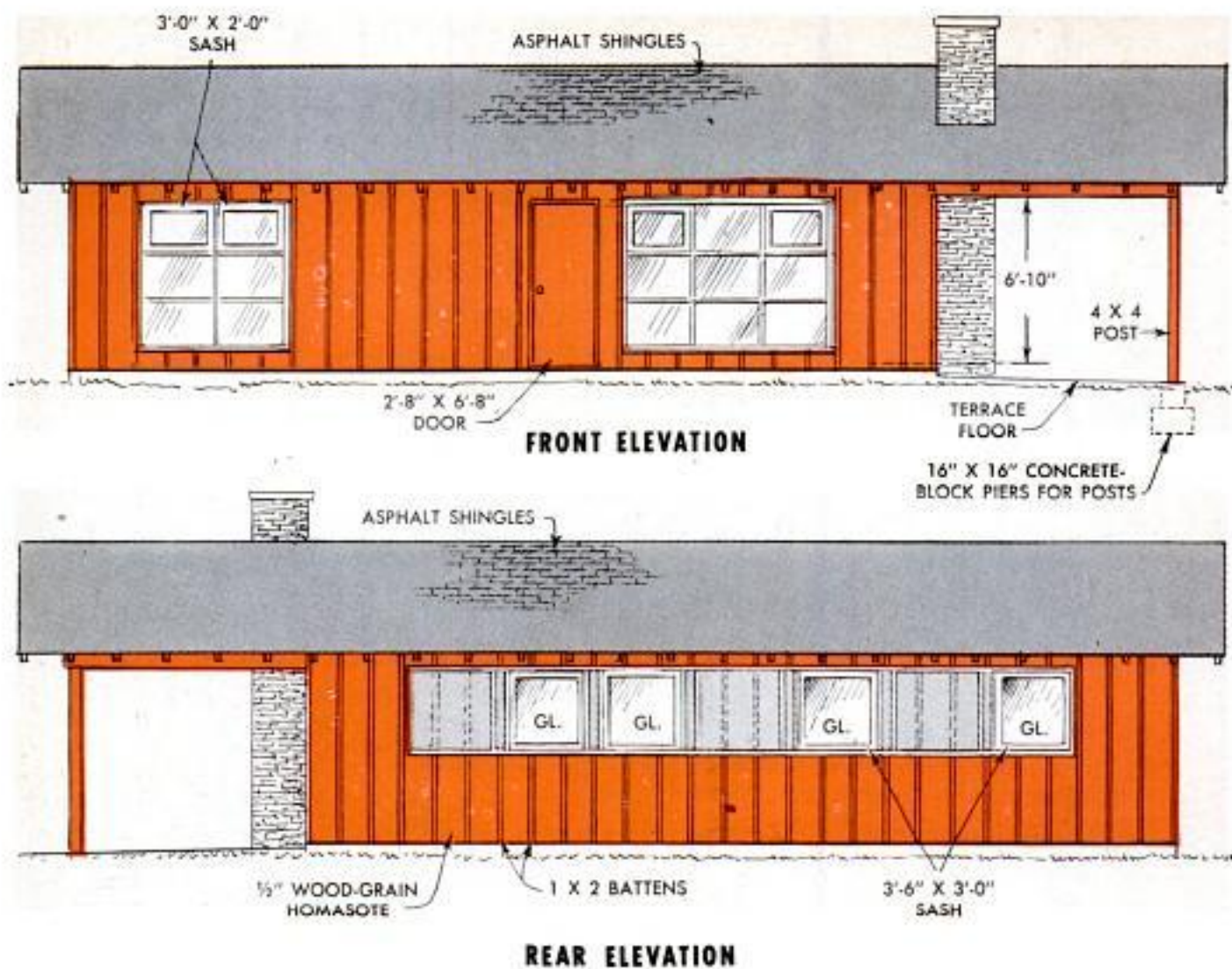
The long, low, ground-hugging lines of the kit house are created by the "stepped" foundation which drops the framed walls of the house within 8 in. of the ground. It has a practical advantage, too. It permits the use of standard, 8-ft. siding panels with no cutting or trimming. To get this effect, the last course of foundation block is the 4-in. variety. When laid in place, a 4-in. ledge is formed around the inside of the foundation wall at the second-course level. This ledge requires a $\frac{3}{8}$ -in. build-up of cement grout to make things come out evenly, and it's good practice to waterproof the back wall and



Blocks turned sideways in wall provide crawl-space vents. Recess to receive screen-covered frames

Long anchor bolts, spaced 4 to 6 ft. apart, are set in mortar when the course of 4-in. block is laid

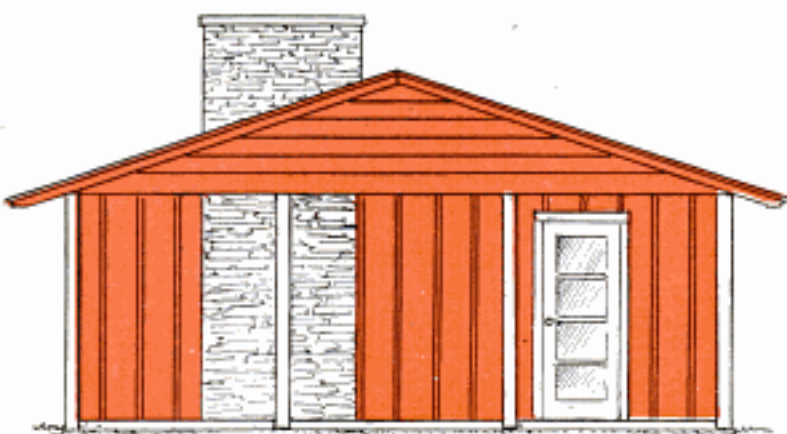




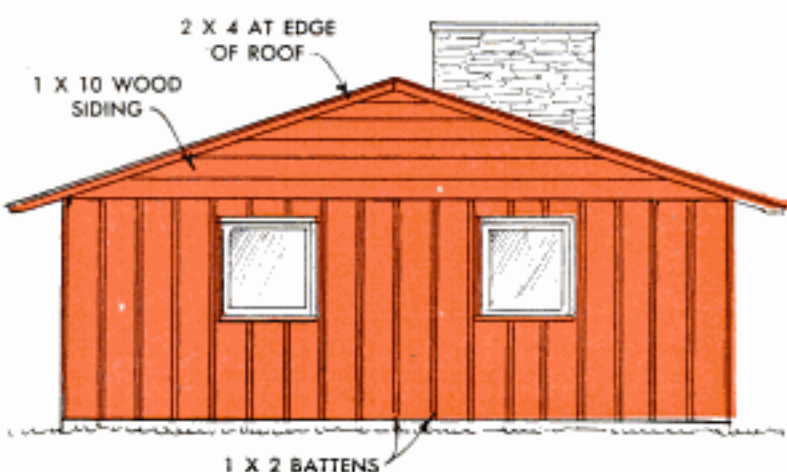
If you plan to build a fireplace now or in future, it's wise to set in footings and foundation pier for chimney before foundation hole is back-filled

Wall sections are assembled flat on floor decking and tipped into place. This is two-man job, one to hold up section while other toenails studs to sill





RIGHT-SIDE ELEVATION



LEFT-SIDE ELEVATION

bottom of the shelf with asphalt. When this is done, your shell kit comes into play.

One 2 x 4 sill, on which the floor joists will rest, circles the foundation wall on the grouted ledge; another, on which flooring and outside shell walls will rest, lies along the top of the 4-in. blocks, secured with anchor bolts that have been previously set in the cells of the wall. In areas where needed, termite shields are furnished in the kit, and inserted under the sills.

The 2 x 8 floor joists lap in the center of the building, where they rest on a laminated or built-up girder running the length of the house. The girder is made by splicing three 2 x 12s together with spikes. It rests on edge, on four concrete-block piers that bring the girder's top surface to the same height as the joist sill. When the beam is in place, floor joists are set on 16-in. centers and toenailed to the sill and girder.

The use of trusses that keep partition walls from carrying any roof weight, make

it unnecessary to double the joists where partitions will come. But it's important to have your particular floor plan firmly in mind when you start, for this is the time to cut in openings for the fireplace hearth (if you plan a fireplace now or later) and the pump slab (if you have your own well). The cut joints for both openings rest on 2 x 4 ledger plates nailed to 2 x 8 joist headers that are, in turn, spiked between adjoining joists.

Since the 4-in. flooring furnished in the kit is the final single floor for the basic shell (and becomes subfloor only when you decide to fully complete the winterized version), the floor should not be laid until the roof is on. I "borrowed" my roofing boards and nailed them temporarily to the joists to provide a working platform. The only flooring members that must go down at this time are the 1 x 8 boards that tie the wall sills to the joists.

The 2 x 4 wall framing for your house goes up with startling rapidity. Corner posts are constructed with 2 x 4 spacer blocks as shown. Then, the sections of the two side walls—in any length you can handle—are assembled flat on the work deck of "roofers," and tipped up into place when completed. Studs and sills are assembled on the floor and blocking is nailed between the studs. Then the entire section is swung up. Sills are spiked and anchor-bolted in place with the walls already firmly fixed on top of them. Heavy 2 x 12 headers may be left off until the walls are in place.

These big headers, running the entire 46-ft. length of the house on each side, are unique structural members that let you span wall openings up to 9 ft. wide.

This means you may have 9-ft.-wide windows at any place along either wall, without need for vertical support. It's the trick that permits you to juggle windows and panels in any possible combination in wall A, so that no matter where your rooms come, each will have its own window properly centered.

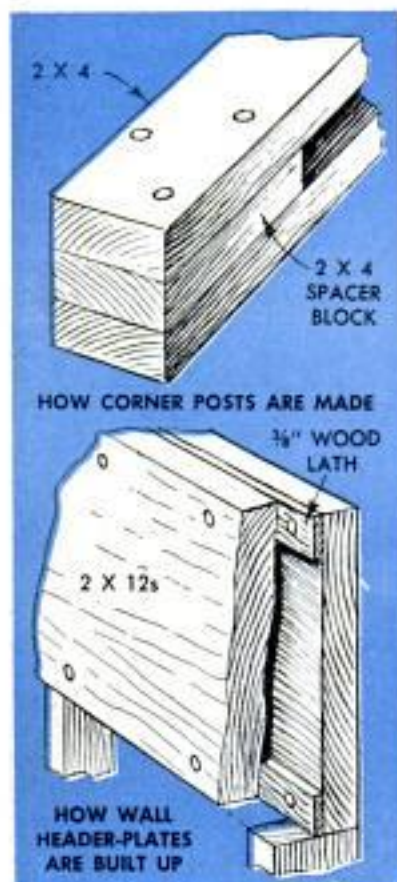
Erected wall sections are braced with roofing-board stays, and Teco fasteners are nailed at opposite corners of each stud top. Between these fastener plates the 2 x 12 headers are set side by side, and spliced with spacer strips nailed between them so they will be flush with the outside edges of the wall studs. The porch end of each "double header" can be temporarily supported with sapling poles until you're ready to set your porch posts on the finished slab. Because of their nature, the gable-end walls are easier to set up rafter-first. The rafters can be fabricated on the ground and, while one man lifts the peak ends into



H-braces of prepunched, heavy-gauge steel make it possible to build flat truss with no lapped joints



Sides of H-brace are nailed to 2 x 4 truss members with barbed asbestos-shingle nails, as above



2 X 4
2 X 4 SPACER BLOCK

HOW CORNER POSTS ARE MADE

3/8" WOOD LATH
2 X 12s

HOW WALL HEADER-PLATES ARE BUILT UP

the air from a scaffold, another can toenail the rafter ends to the doubled header on each side. Graduated studs are spiked under the rafters, on centers previously marked along the sill. A plumb bob is used to properly position their angle-cut ends along the rafter.

Single sills and headers for window openings in the rear wall of the house are spiked in place after the wall is erected. Then blocking is nailed between the studs at the ceiling line and the wall frame is complete. The same general procedure is followed on the porch wall of the house, except that a door opening is substituted for one window. On the prototype house, I chose this wall for my optional fireplace, and made an opening 5 ft. high x 6 ft. wide at floor level, in place of the window opening shown in the basic-shell plan. This can be done in any wall of the house you choose for a fireplace.

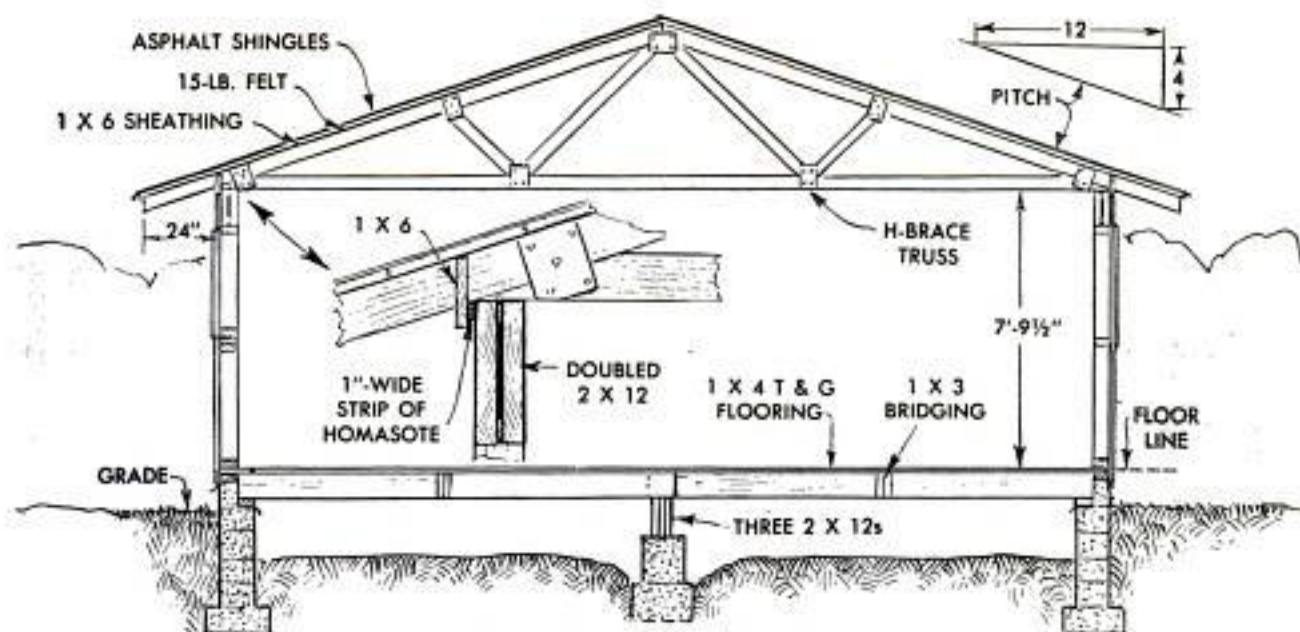
There are several stages during construction of the kit shell where mass-production methods can be brought into play. Making the roof trusses is one of these. If you are cutting your own pieces, a good combination bench saw and jointer, like the Shopsmith I used, will certainly earn its way on this operation. Each truss consists of seven 2 x 4 members with angle cuts at each end. In the kit, these pieces come angle-cut and to size, and the truss production is a matter of assembly.

I built two jigs of 2 x 4 blocks—one under cover in a barn, so I could make trusses on rainy days; the other on the deck of the prototype house. By slapping truss members into

Unless you're lucky and come out even, roofers will lap at peak. Sharp hatchet proves best tool for quickly removing the excess from overhanging boards

15-lb. roofing felt, supplied in kit, is tacked directly to roofers, edges being lapped about 2 in. Get it down quickly so boards don't get rain-soaked





TYPICAL CROSS SECTION

the proper slots, slipping metal H-braces over each joint and driving nails into the holes provided in the H-brace faces, I was able to turn out a complete truss every 25 minutes. H-braced trusses deviate from usual trusses in that there are no lapped joints or clumsy gussets. They're remarkably light, but have passed stress tests far in excess of the most rigid requirements.

Two men can erect the roof easily, but more can do it faster. I held a "roofing party" for the prototype house. Three amateurs—two from *Popular Mechanics*' New York advertising staff—plus my carpenter helper, Lew Bush, and I had the roof trussed and sheathed in two days. Lew and I marked the doubled headers for spacing the trusses 2 ft. on centers the day before. Then, at one end of the house, we cradled all the trusses upside down between the

headers. When the gang arrived, two of us rolled the trusses upright, one at a time, with poles, while one man on a scaffold slid them into place at the header marks. The two others were waiting with hammers to spike them in place.

Roof sheathing goes fast. Ridge boards are quickly chopped to a peak with a hatchet. Then 15-lb. felt is rolled over the

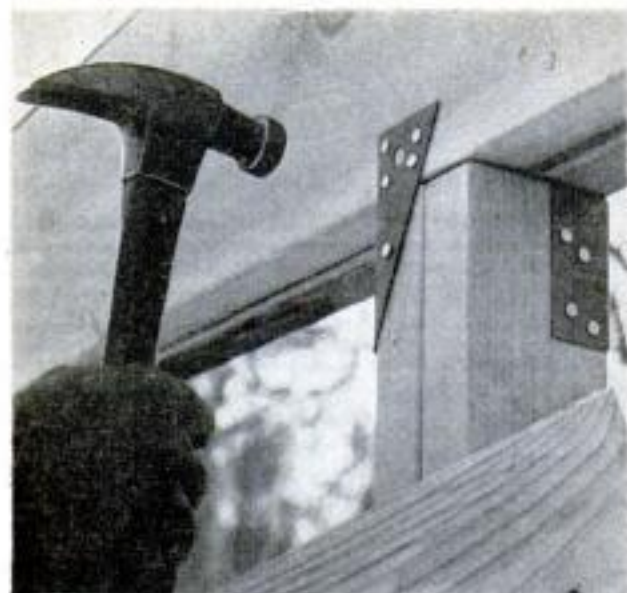
Detailed Book Shows How

In addition to a 128-page instruction book which shows you step by step how to build the precut house, there is a complete set of blueprints available. Write: Blueprint Department, *Popular Mechanics Magazine*, 200 East Ontario St., Chicago 11

Cedar shingles along eaves provide lift for water runoff and eliminate need for flashing at roof edge

Ridge cap is made from asbestos shingles cut into pieces with tin snips. Tack over ridge as below





Metal fasteners are nailed to stud tops before header is set in place, and then are nailed to header

boards. Snapping three chalk lines down the center of the roof, spaced at half the width of your 3-tab asbestos shingles, will give you an accurate "stagger" guide to keep the shingles properly lined up vertically. It's a good idea to snap a horizontal line about every fourth row to keep shingles even all the way as you do the roof.

Once the roof is on, you can lay the floor boards and wrap the outside of the building with 15-lb. building paper tacked right to the studs. This will enclose your building shell, protecting it temporarily from weather, and provide a moisture barrier to back up the siding that is applied later. Now you're ready to tackle the job of cutting and fitting the window frames—according to whatever floor plan you have chosen. But by doing it yourself, you literally save hundreds of dollars. Total material cost of the big 9-light picture window in the prototype house, for instance, came to \$38—less than one sixth the price such a window would cost if purchased assembled.

Actually, construction of these window and door frames is about as simple a fitting job as anyone could wish. How they are made, how you plan and make the adjustable window panel in wall B, how you can plan an inexpensive fireplace, and how you apply the siding to complete your shell are in the next article in this series.

Universal-Joint Lubrication Memo

A reminder to have the universal joints of the car driveshaft repacked with grease at the recommended mileage can save repair bills and insure against unexpected breakdowns. Tape a note, indicating the mileage at which the joints were repacked, to the edge of the door just beneath the regular lubrication record.

Grooves Cut in Checkerboard Simplify Painting Job

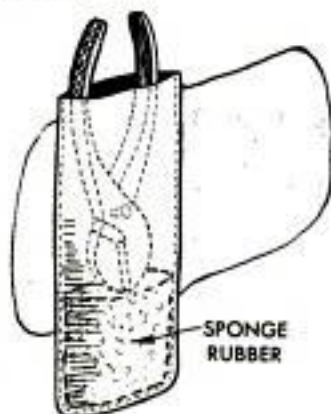
For unique appearance, as well as ease in applying the required two-color paint job for a checkerboard, cut grooves along the lines outlining the squares. Use a sharp knife and a rule or straightedge to score the lines. Make them at least

$\frac{1}{16}$ in. deep. When painting alternate squares a contrasting color, any paint brushed over the edges will run into the grooves rather than onto adjacent squares.



Sponge Rubber in Rule Pocket Aids Removing Pliers

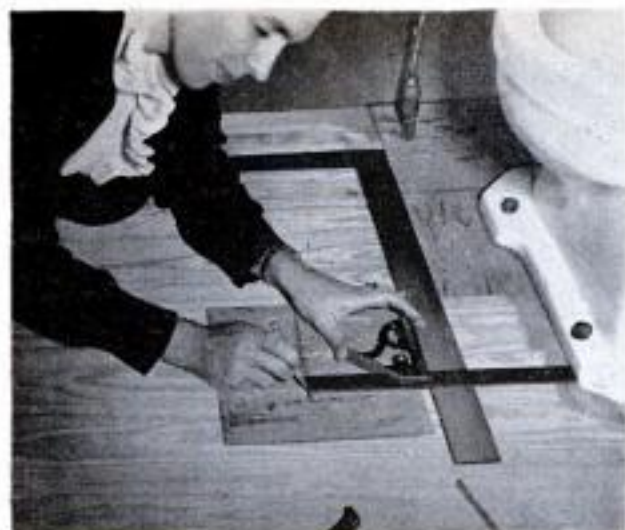
Fishing a pair of pliers from a narrow and deep rule pocket on the leg of a pair of overalls is not a problem if a piece of sponge rubber is dropped in the bottom. The rubber shortens the pocket so the plier handles project.



Strong Sheet-Metal Joint Made Without Rivets

It is possible to make a strong and serviceable sheet-metal joint without using either solder or rivets. As shown in the photo, the tenon member of the joint has a number of tabs cut in it, while the mortise is simply a slit cut in the other member. The tabs are pushed through the slit and bent over alternately to one side and then the other. An easy way to make the slit is to lay the sheet metal over a curved block and cut it with a hacksaw.



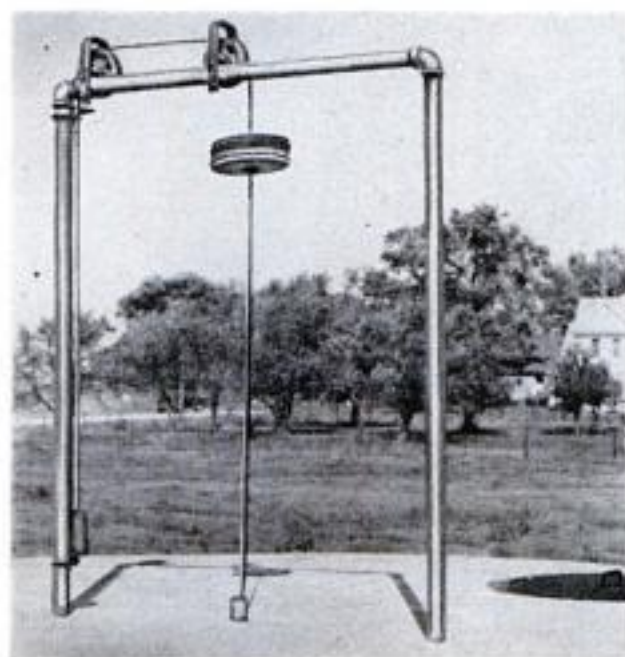


Combination Square Speeds Fitting Floor Tile

A combination square used in conjunction with a straightedge permits irregular shapes to be transferred to floor tile easily and accurately. As shown in the upper left-hand photo, the straightedge, in this case a carpenter's square, is placed on the floor parallel to the joint line of the tile already laid. Then, the combination square, with its blade loosened slightly, is held firmly against the straightedge. The tile to be marked is aligned with the adjacent tile and moved back a distance from the edge of the straightedge equal to the length of the combination-square blade. To plot the line, the end of the combination-square blade is held in contact with the irregular surface and an X is marked on the tile at the opposite end of the blade. Frequently only one corner of the blade will be in contact with the surface being transferred.

In that case, be sure that the corner of the blade at which the X is marked is on the same edge of the blade as the corner contacting the surface. A line drawn through the X marks gives you the shape of the cutout. A circular saw is excellent for cutting the irregular portion of the transferred shape from the tile. It's preferable to use a dull saw blade or one that you are about to discard. Use a linoleum knife to cut away any long, straight sections in the usual manner, and then remove irregular sections of the cutout by moving the tile across the blade. The amount of tile removed with any one saw cut should not be greater than the depth of the saw teeth. Although it has been left out of the upper right-hand photo for the sake of clarity, a saw guard should always be used.—R. B. Shipley, Chattanooga, Tenn.

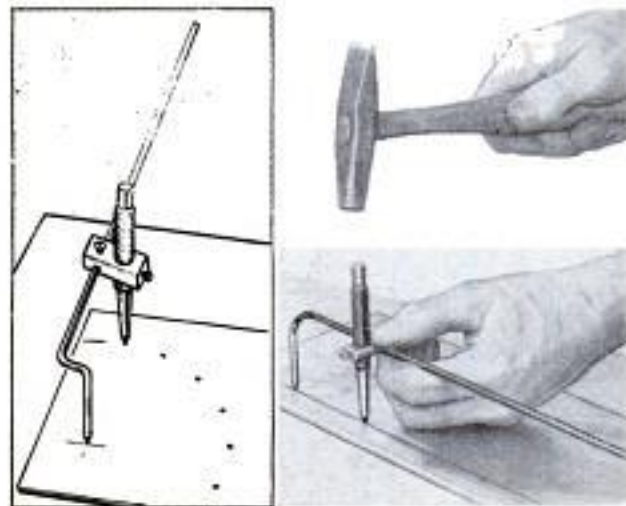
Float Indicator on Tank Visible From Farmhouse



Readily visible from the distant farmhouse, a float indicator suspended from a pipe frame above this storage tank constantly shows the amount of water remaining in it. A float inside the tank is connected to a wire cable that runs over two pulleys on the top pipe of the frame. The free end of the cable is fitted with a weight which keeps the cable taut. A ring on the weight slides up and down the side rail of the frame and keeps the cable end from swinging in the wind. The wooden disks of the indicator itself are clamped to the cable and are painted bright colors for better visibility. If desired, pipe frame could be calibrated to indicate gallons.

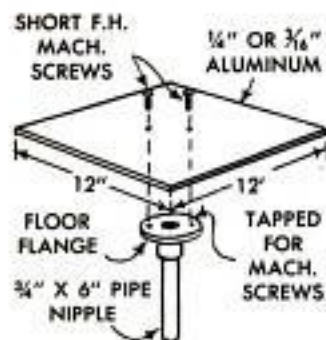
☞ When tin snips are used to cut composition shingles or roll roofing, they can be kept from gumming up if they are dipped in water between cuts.

Jig Speeds Center Punching Locations of Holes

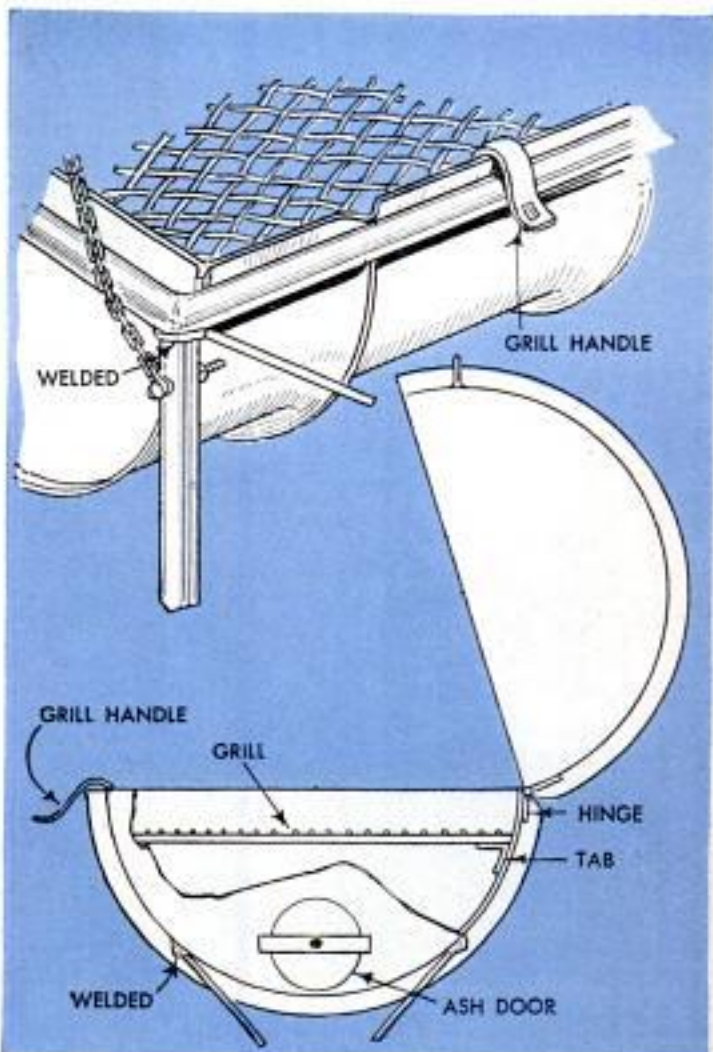


A jig consisting of a small steel block sliding on a steel rod will speed up the job when center-punching the locations of a number of equally spaced holes. A $\frac{1}{4}$ -in. rod is bent to the shape shown in the detail, with the bent-down portion being offset so it is the same distance from the horizontal part of the rod as the center punch. The bent-down portion is ground to a point at the bottom. The dimensions of the steel block will vary according to the size of center punch used. The block is drilled to slide on the rod and, at right angles, a hole is drilled to receive the center punch. Holes also are drilled and tapped for setscrews which hold the block in place on the rod, and the center punch in the block. In use, the block is moved along the rod until the points of the rod and center punch are the desired distance apart. As shown in the detail, the jig can be used as a "center-punching compass."

Hawk for Home Plastering Jobs



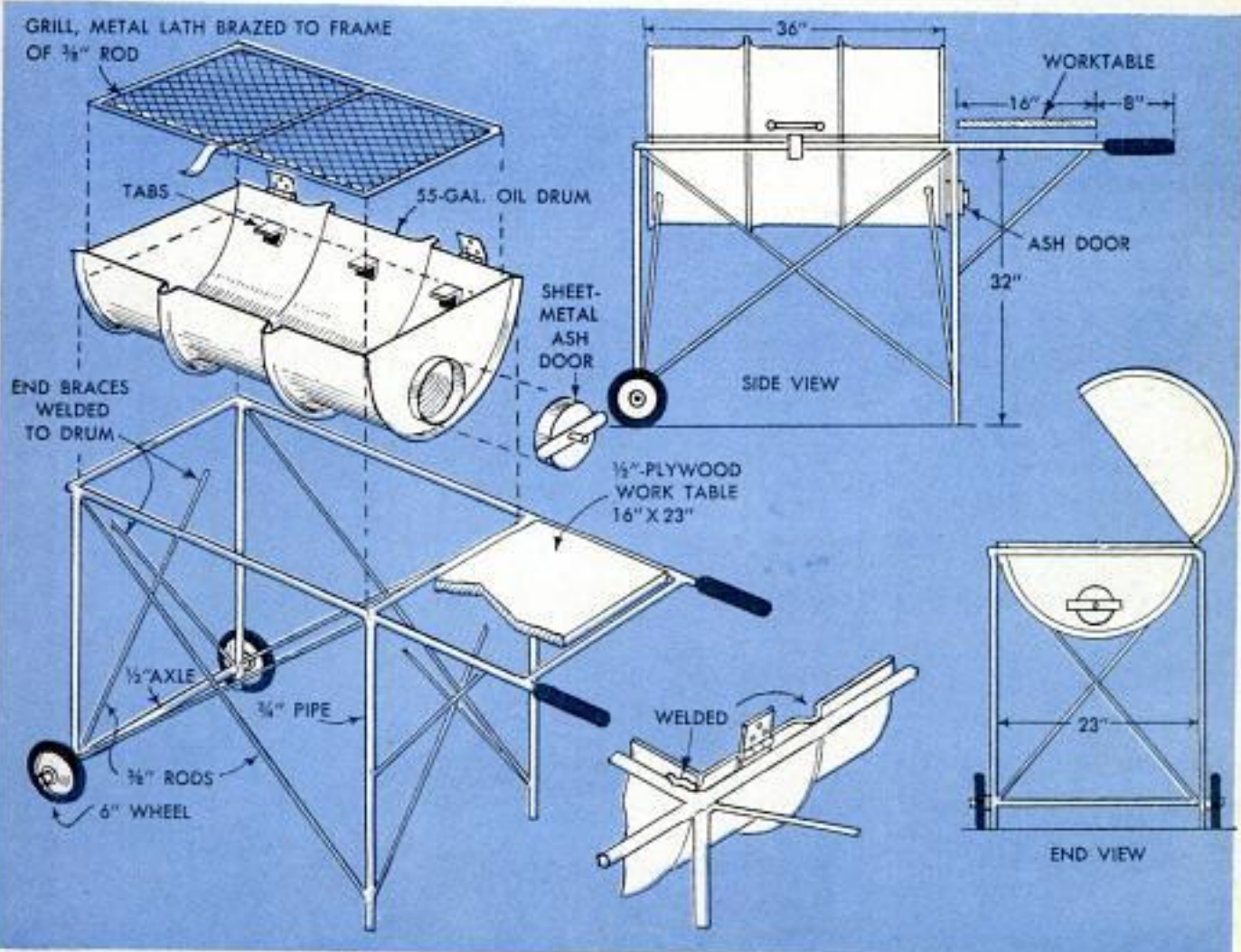
When a plastering or tuckpointing job around the house requires the use of a hawk, one can be made quickly from a piece of sheet aluminum, a $\frac{3}{4}$ -in. pipe floor flange and a $\frac{3}{4}$ x 6-in. nipple. The pipe flange is fastened to a 12 x 12-in. sheet of $\frac{1}{4}$ or $\frac{3}{16}$ -in. aluminum with countersunk flat-headed machine screws. The pipe nipple is screwed into the flange to provide a handle. It can be removed for storage. Light sheet steel also could be used for the hawk, the main objections being that steel is heavier and will rust.

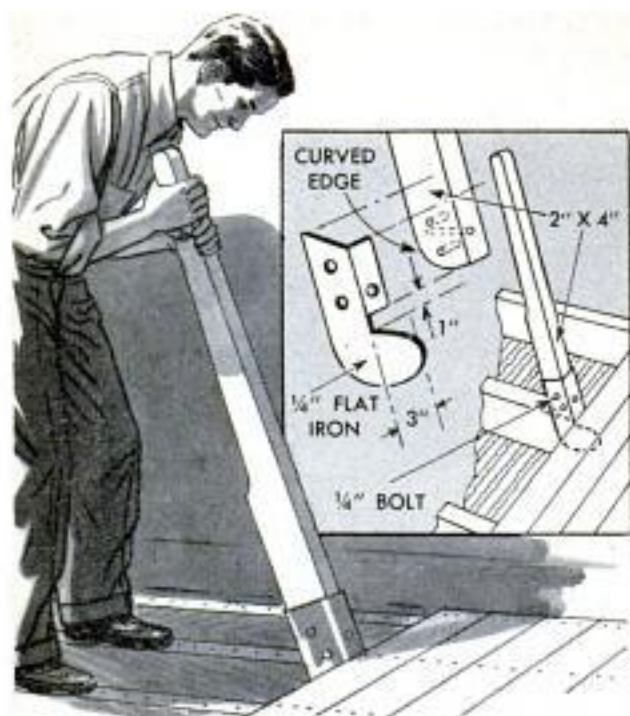


BARBECUE FROM OIL DRUM

By Hi Sibley

MADE FROM an oil drum cut in half lengthwise and welded to a pipe frame, this portable barbecue features a tight-closing lid for sealing in the flavor of the food. The $\frac{3}{4}$ -in.-pipe frame is braced with $\frac{3}{8}$ -in. rods and the end braces are welded directly to the underside of the oil drum. Easy portability is achieved by means of a pair of 6-in. rubber-tired wheels. A grill of metal lath brazed to a rod frame rests on angle-steel tabs welded to the inside of the firebox section, and a flat-steel handle is welded to the front of the grill. The top section, or lid, of the drum is hinged to the lower, firebox, section. A sash lift provides a handle for the lid. For ash removal and draft control, a sheet-metal ash door is fitted over an opening cut in one end of the firebox. A plywood worktable is fitted between the handles for convenience. ★ ★ ★

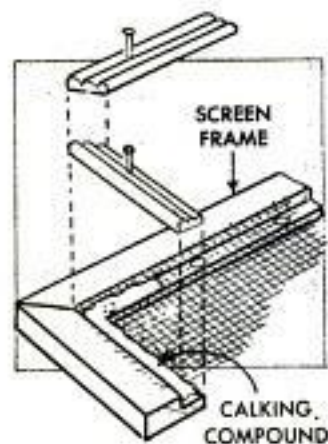




Flooring Removed Unsplit With Novel Pry Bar

A pry bar made according to the detail above will enable you to remove old flooring with a minimum of splitting and cracking. The tool consists of a handle shaped from a hardwood 2 x 4 bolted to a 1/4-in. flat-iron head made according to the pattern. The end of the pry bar is set on the floor joists, and when the handle is lowered, considerable leverage is applied to the floorboards, raising them off the joists.

Calking Protects Wooden Screens



When wood-frame screens are exposed to weather the year around, as are some porch screens, calking compound should be used to protect the screen edges and frames from water damage. The calking is spread on the edges of the screen where they are tacked to the

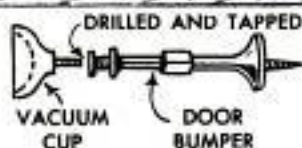
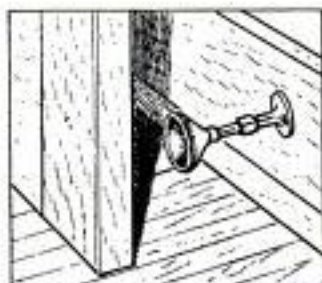
Airboats...

scoot through swamps and marshes and can operate in only 1 in. of water. Yet, when out in open water and "up on the step," they move right along, with a top speed of better than 30 m.p.h. Build one of these versatile boats for yourself from the well-detailed plans in next month's issue

frame. The molding then is tacked over the screen, forcing the calking through the screen and filling any irregularities in the wood. Any excess should be scraped away, and the screen and frame painted. The calking prevents water from settling behind the molding where it would rust the screen and rot the wood frame.

Vacuum Cup on Baseboard Stop Holds Door Against Drafts

A vacuum cup attached to the usual baseboard-type doorstop will hold the door open so it will not blow shut in a draft. The vacuum cup should be one fitted with a machine screw. Remove the rubber tip of the doorstop and drill and tap a hole to receive the



screw. To be effective the vacuum cup should contact the door in an area where the finish is smooth and unbroken.

Spoons Provide Cabinet Handles

Novel and inexpensive handles for kitchen-cabinet doors can be made by using teaspoons purchased at a ten-cent store. Bend the handles in a slight arch to provide finger clearance. Then drill holes for screws in each spoon in the center of the bowl and near the end of the handle. For best appearance, use chromium-plated screws.

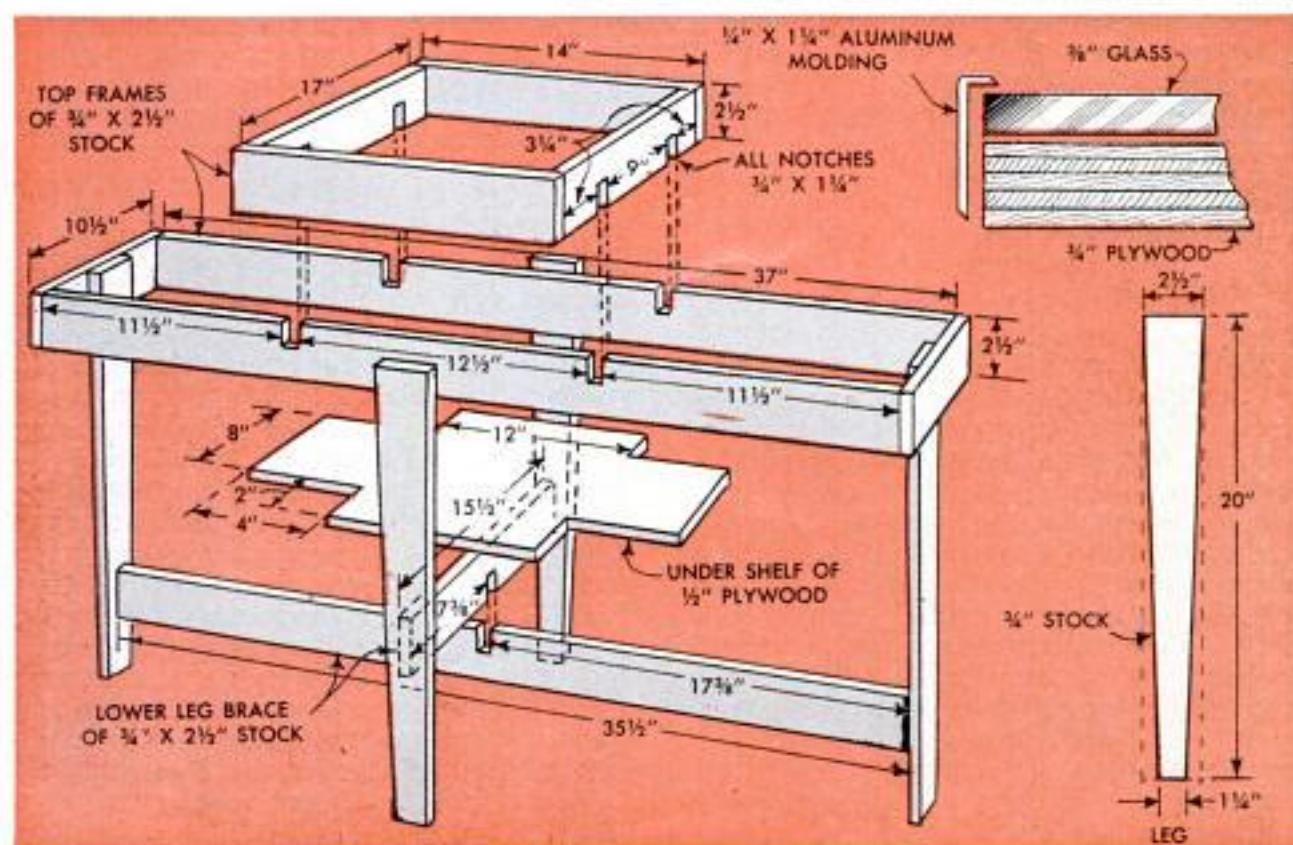
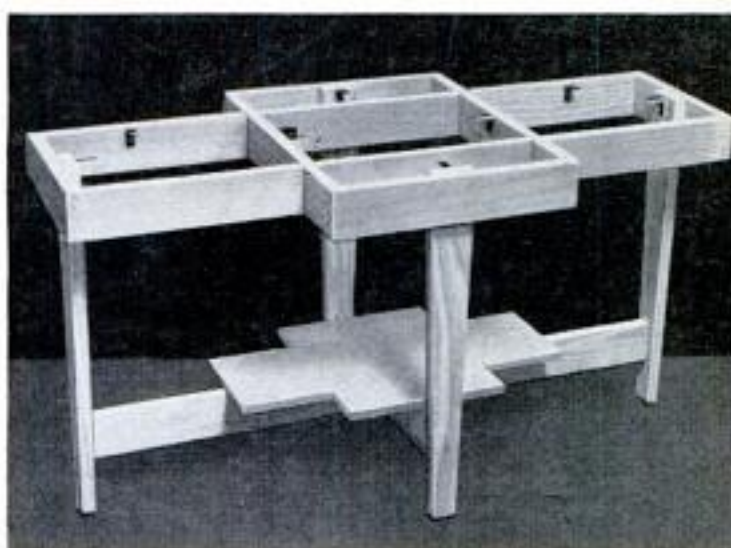
Frank A. Javor, North Bergen, N. J.

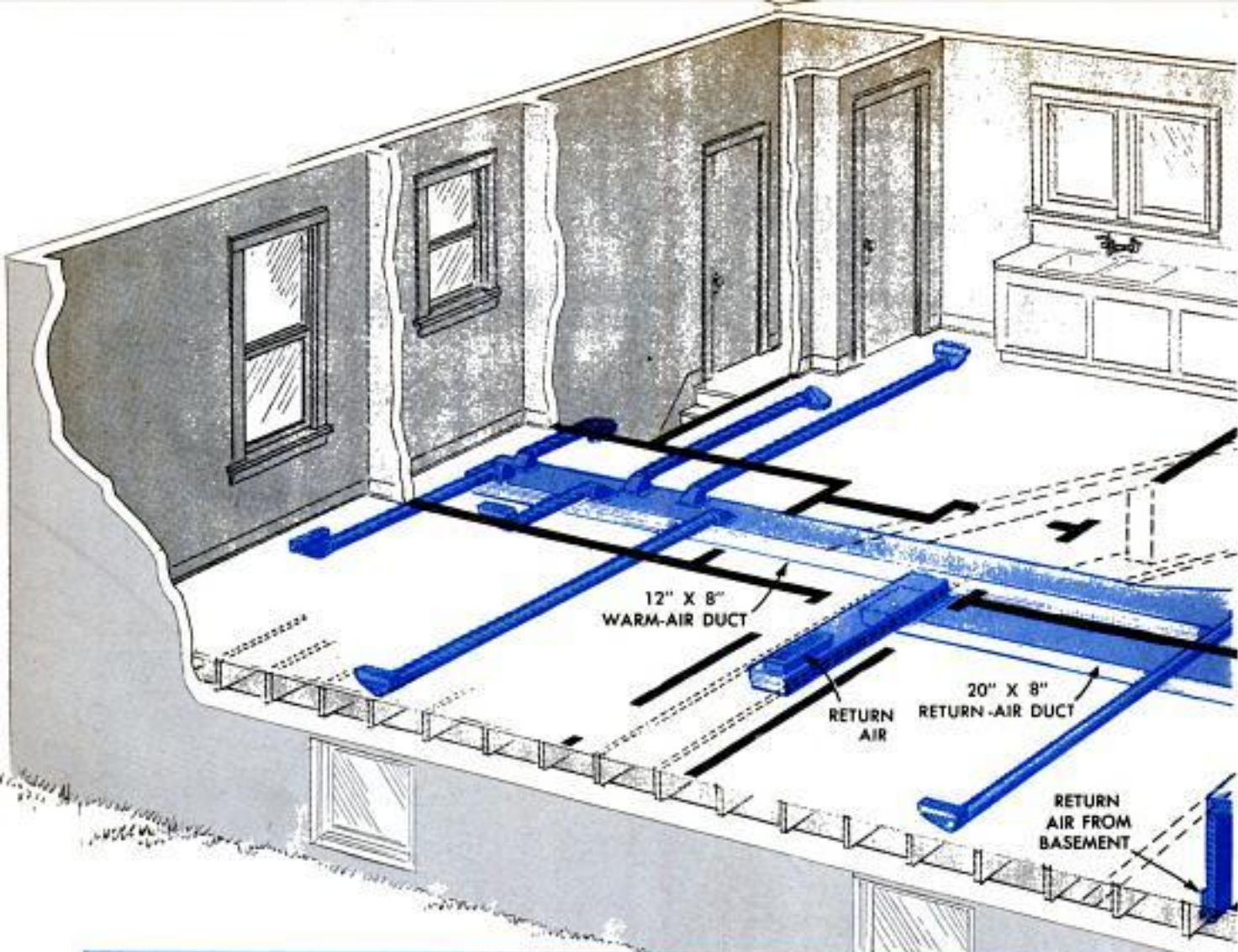


Glass-Topped COFFEE TABLE

By Clark H. Rutter

INEXPENSIVE and requiring no special tools, this attractive coffee table can be built by even the most inexperienced craftsman. The half-lapped frame assembly and bracing result in an exceptionally sturdy piece of furniture without the use of difficult or complicated joints. The glass tops for the table pictured were panels of $\frac{3}{8}$ -in. dark-blue glass salvaged when a glass storefront was remodeled. These were backed with $\frac{3}{4}$ -in. plywood. However, any suitable material may be used for the tops. Plate glass could be laid over attractive photo enlargements, or over an artistically arranged collection of postage stamps. Salvaged marble may be used, too, or imitation-marble tops could be made by covering plywood with marble plastic veneer. Construction details of the table are shown in the detail, below. After the frame is completed, the top is carefully laid upside down on a flat surface and the frame centered over it. The frame then is attached to the top by means of 1-in. angles.





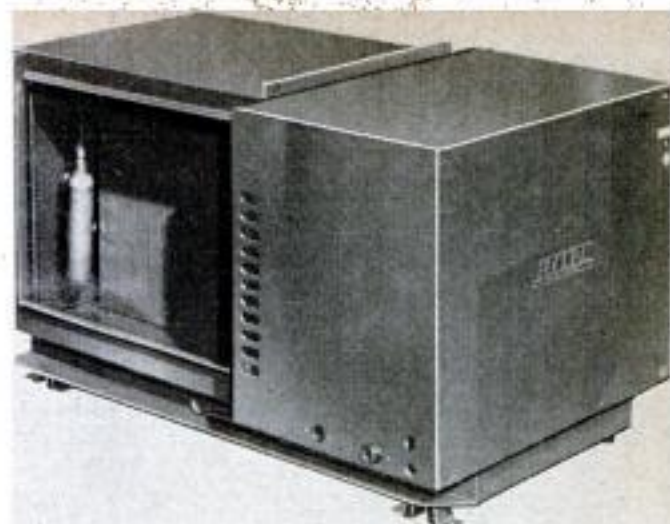
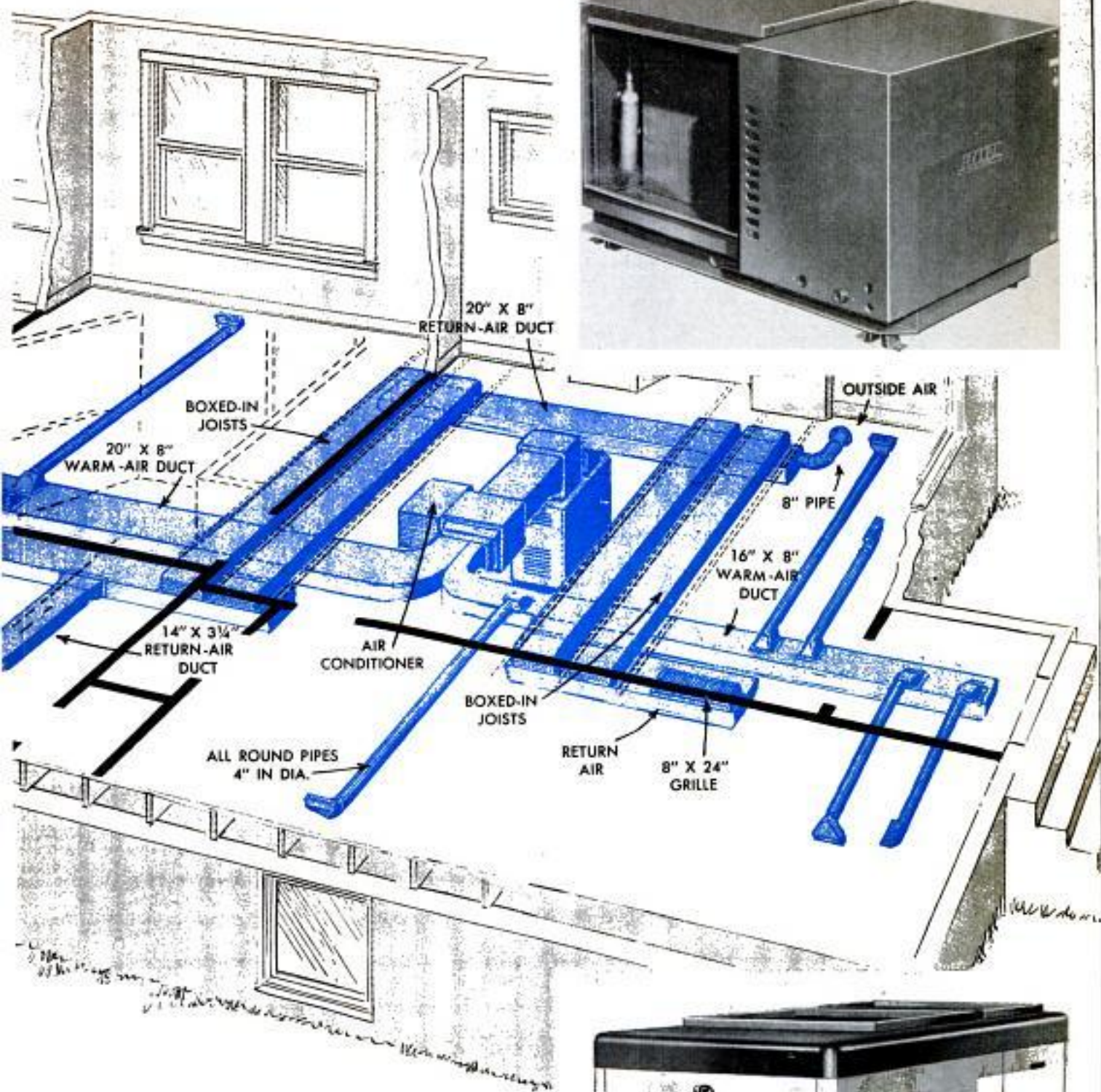
Keep Warm in Winter And Cool in Summer

Let 'er blow cold and blustery, hot and humid or dry and dusty, it will always be clean and comfortable inside your home if you install a modern forced-air furnace teamed with an air conditioner

WORRYING ALONG with an antiquated heating plant, or converting a coal-fired plant to gas or oil in lieu of a new plant is not always the most economical answer to a heating problem. A plant that has not been correctly sized for the home, or haphazardly planned and installed, or not designed for the fuel it is using, can soon "eat its way through" enough extra fuel to almost pay for a new plant; one that will put the heat in rooms where it is needed in a way that leaves no hot or cold spots. A modern forced-air heating plant correctly sized to your home with the ductwork properly laid out will do just that at

a fuel cost considerably less than an old or incorrectly planned job.

A modern heating engineer takes nothing for granted. He works with B.T.U./h (British Thermal Units per hour, a measurement of heat), figures how many it takes to maintain a temperature within your home both for heating and cooling, and then recommends the size of equipment to do the job. The ductwork layout and register location are just as important as furnace size, even more so. Correct furnace sizing is lost if the duct system cannot deliver the heat to the rooms with the least possible resistance and in a location most suitable



to assure draftless warm-air circulation throughout each room.

If you are planning a new home, buying a new one already constructed or installing a new heating plant in your present home, it will pay you to have at least some knowledge of heating installation. And don't overlook central air conditioning. Naturally, the best time to install an air conditioner is when the new plant is installed, as the only additional cost at this time would be for the air-conditioning unit. If the cooling unit is not possible at present, be sure the duct and register layout is designed for installation later.

It is best to have the system sized and installed by a competent heating and air-conditioning contractor. But, if cost of

WARM AIR ENGINEERING DATA

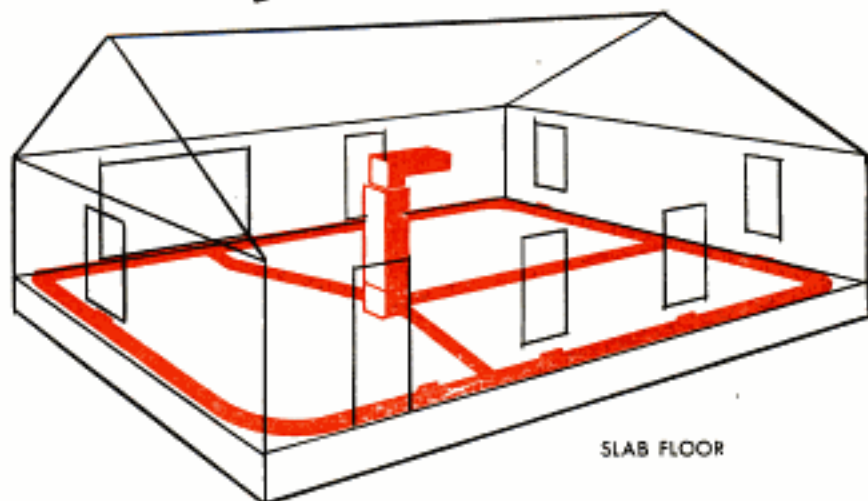
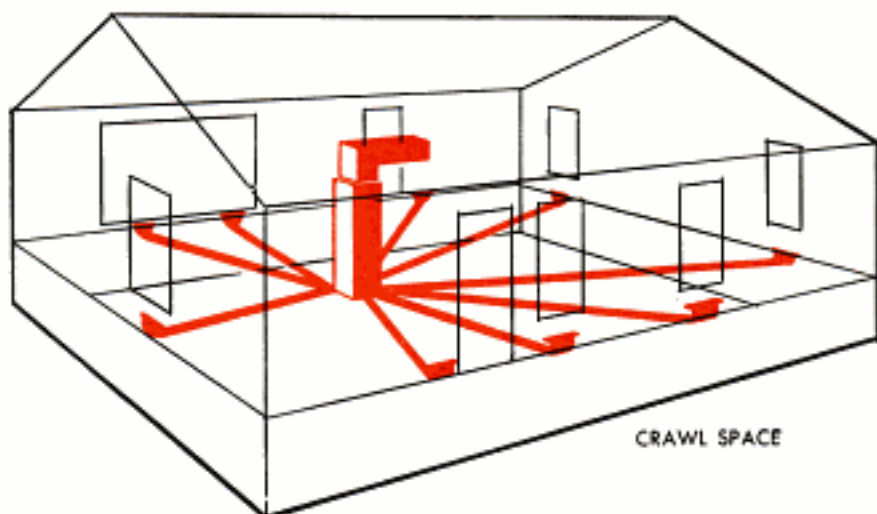
HEATING CONTRACTOR LENOX FURNACE COMPANY AT _____
 NAME OF JOB _____

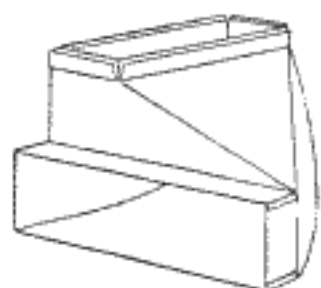
Plan No. FE-
 Date 8-30-54 by RE
 Forced Air Gravity
 Outside Design Temp. 10°
 Inside Design Temp. 70°
 Design Temp. Diff. 80°

1. Room Use and Floor		LIVING		DINING		KITCHEN		REAR EX.		HALL-BATH		MATER. BEDROOM		DAUGHTER BEDROOM		GUEST BEDROOM		RECREA.		EQUIP.			
2. Room Length and Width		12.5 X 14.5		11 X 14		11.5 X 11		4.5 X 10		5 X 12		15 X 9		12 X 10		15 X 9		70		50			
3. Partition Th. Exterior Wall		9"		9"		9"		15"		9"		9"		9"		9"		2.5A-4B		50			
4. Ceiling Height		9'		9'		9'		9'		9'		9'		9'		9'		9'		9'			
5. Exposure		Type	Factor	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS	Area of Curb	BTU LOSS		
6. Exposed Wall				243		99		99		135		45		216		108		216		175		143	
7. Windows		1-A	36	48	1730	30	1080	12	430	21	760			30	1080	25	900	45	1620	36	1300	18	650
8. Doors		16A	39							6	230												
9. Total		5-B	37	175	6480	69	2550	87	3220	144	5330	39	1440	186	6880	83	3070	171	6330				
10. Ceiling		12-C	26																				
11. Total		12-E	5																				
12. Sub-Total BTU					13,750		6,150		5,490		8,050		2,150		9,690		5,580		10,320		10,350		7,240
13. Adjusted BTU													2,580										
14. Gross BTU (see Section 1)																							
15. (SEE BRANCH AREA)																							
16. Required Branch Area*																							
17. Floor Deck																							
18. Branch Pipe																							
19. W. A. Required																							
20. F. A. Branches Required																							
21. R. A. Pipes Required																							
22. R. A. Pipes																							
23. R. A. Pipes																							
Lennox Unit <u>OF 4-80</u>		Capacity <u>95,000</u>		Brush at <u>_____</u>		Motor Required <u>_____</u>		Building Loss <u>82,720+VENT=88,300</u>		Brush <u>_____</u>		Motor H.P. <u>_____</u>											
Fuel <u>OIL</u>		Blower <u>_____</u>		CFM <u>_____</u>		S.P. <u>_____</u>		R.P.M. <u>_____</u>		Motor H.P. <u>_____</u>													

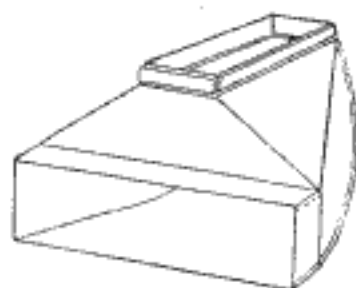
necessary in this particular installation. Other heating and air-conditioning units representative of those available are shown on page 188, both oil-fired and gas-fired.

Selection usually is a matter of the type best suited to your particular home. The detail on pages 186-187 pictures the installation made in a one-story home for this article, while the details on page 189 depict representative installations in a home with a crawl space and slab floor. All three installations use modern perimeter type warm-air heating in which the warm air is delivered to the rooms under outside windows, and the cooler, returned air taken from floor level in a basement installation, or from near ceiling height in a home having a crawl space or slab floor. In perimeter

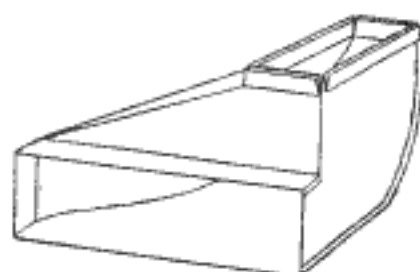




RECTANGULAR BOOT



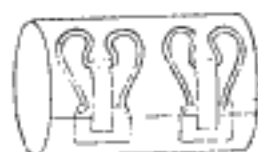
RECTANGULAR BOOT



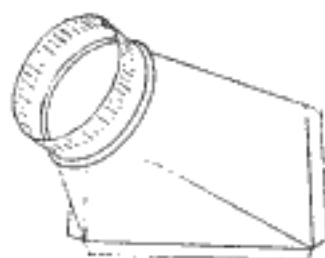
RECTANGULAR BOOT



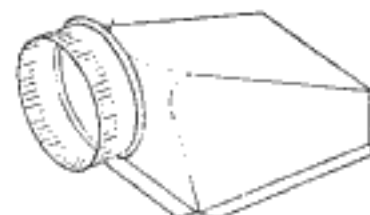
EXPANDER



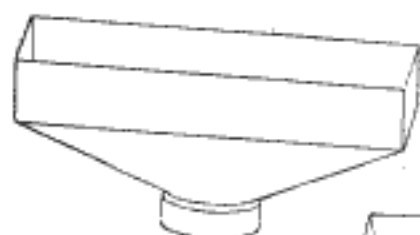
SNAP CONNECTOR



DUCT CONNECTOR



TOP DUCT CONNECTOR

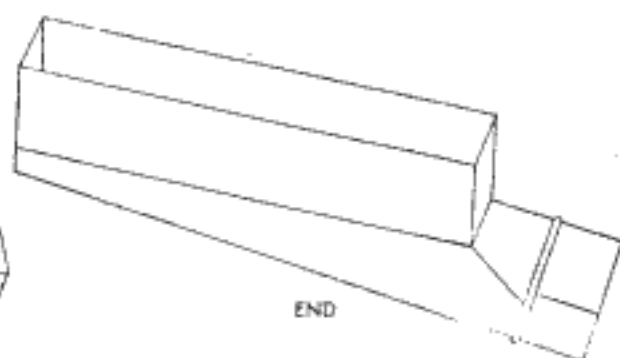


STRAIGHT

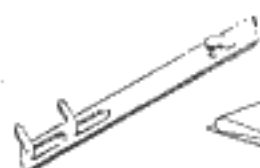
COMBINATION BOOTS
AND FLOOR BOXES



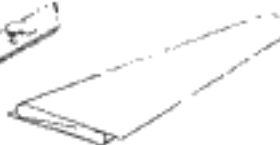
BROADWAY



END



DUCT HANGER



PLAIN



S-STRIPS

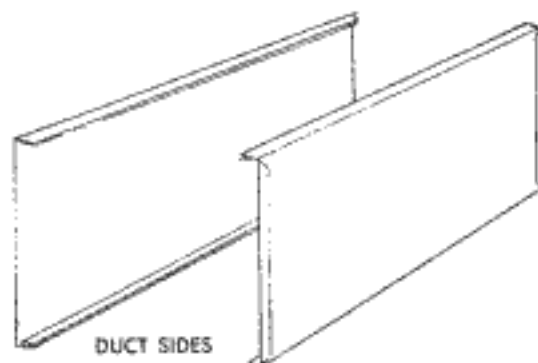
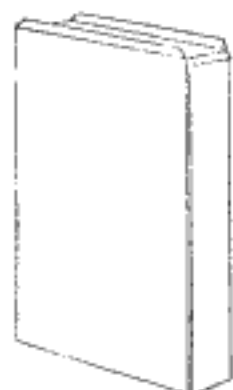
RIGID



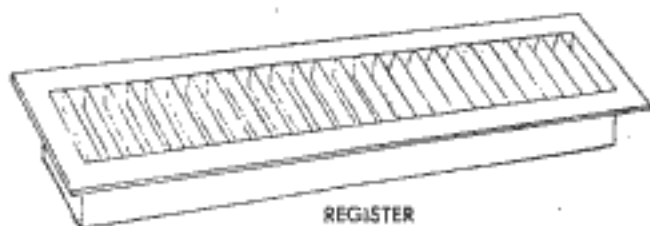
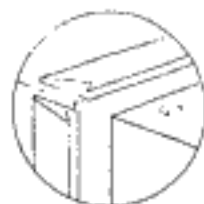
DRIVE CLEATS



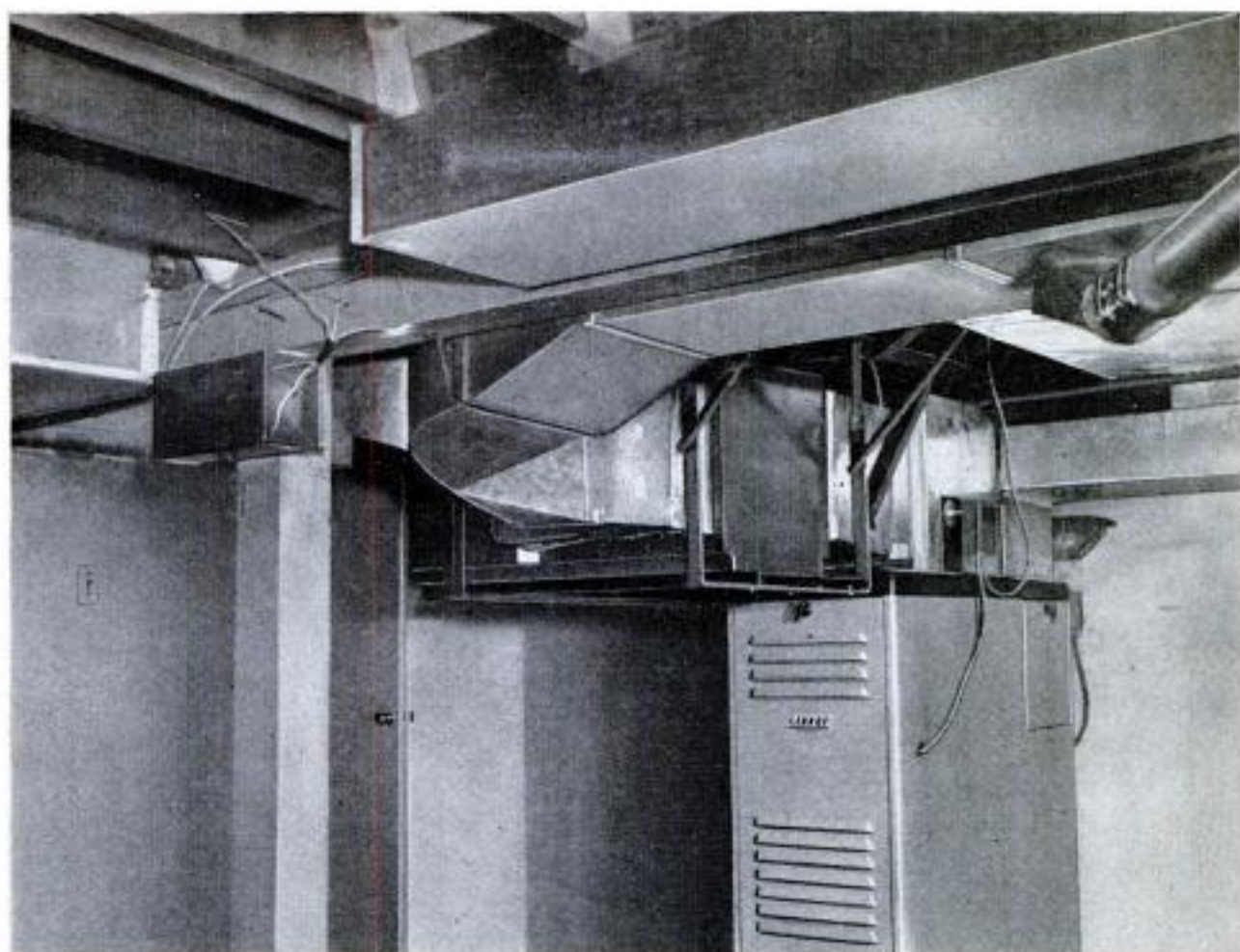
RISER
PIPE



DUCT SIDES



REGISTER



Ceiling-mounted air conditioner is supported in front of furnace in heavy steel cradle bolted to joists

heating, however, the return-air location is not as critical as with some other warm-air systems. Usually, return air is taken where most practical from the installation standpoint. Had the basement installation been made in a two-story home, warm-air ducts from the main duct line would have been run up through partition walls as well as return-air ducts. In this type of installation either baseboard or high side-wall-supply registers on inside walls could have been used.

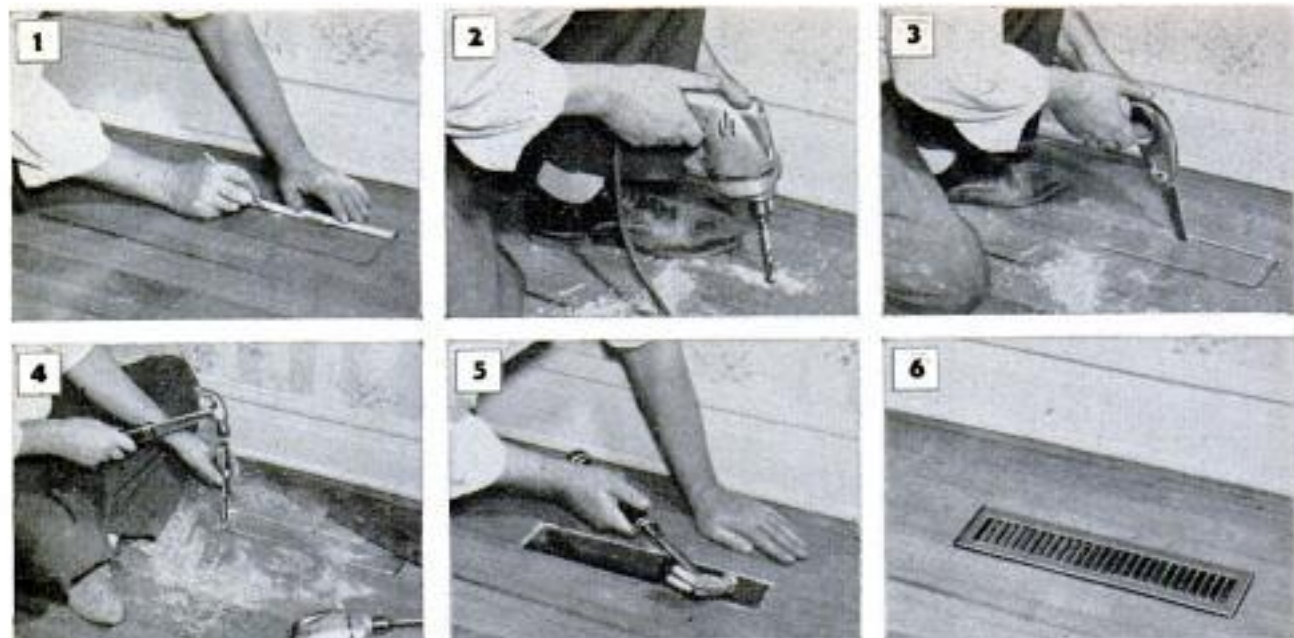
The first thing in planning a heating system is to determine the size of unit in B.T.U./h output required and also the size in tons of refrigeration required for the air conditioner. Since, in most cases, this job should be done by a heating-and-air-conditioning engineer, no attempt is made to describe the procedure in obtaining the data. Engineering data sheets used in sizing the equipment for this installation are reproduced on pages 188 and 189. Notice that the entire house calculation is on one sheet for heating, while a sheet for each room is used for air-conditioning data. Size of furnace is determined by the heat loss in B.T.U./h in a home, and the size of an air conditioner is determined by heat gain in B.T.U./h.

Once the sizes of the furnace and air con-

ditioner have been determined, duct size and layout are next. Duct layouts vary for each home. Sometimes branch lines, in this case 4-in. round pipe, lead directly from the furnace plenum as pictured on page 189 or are fed partly from a main line and partly from the plenum, or furnace bonnet, or entirely from the main line as in this case. The main idea in duct layout is to get the warm air from the furnace to the rooms with the shortest possible duct work and the fewest possible turns. While duct turns, which offer resistance to passage of air, are not as critical with forced warm air as with gravity warm air, they should be minimized as much as possible.

In this installation, the furnace had to be located near one end of the home and the air conditioner had to be set into the duct system near the furnace on the supply side. This layout required the use of two long main duct lines as well as one long return-air duct line and a shorter one. A study of the layout will give you a good idea of how it was done. Notice that wherever possible joist spaces were lined and panned with sheet metal to provide return-air ducts.

Details on page 190 show some of the duct fittings used in this installation. There are standard fittings and piping of many types and sizes for almost any layout.



Diffuser openings are cut in floor 6 to 10 in. from wall under outside window. First lay out opening, taking care to miss joists, drill at each corner to start keyhole saw and then saw along outline markers

Make opening slightly larger than base of diffuser. Fit boot or register box into opening flush with floor surface and then spot nail to hold boot in place. The diffuser should be a loose, sliding fit inside boot

Fittings come assembled, but the pipe must be assembled. Snap joints, pictured in lower details of page 190 make assembling easy, however. Also, there are many types of registers (diffusers) for use in walls at baseboard level, higher up on walls, or for use in the floor as was done in this installation. This diffuser, pictured in the lower right-hand detail on page 190, is small, 2 x 14 in., and directs a fan-shaped stream of air upward. When the diffuser is placed 6 to 10 in. from the wall, the air will clear curtains and draperies on the window above it. With the floor diffuser located under an outside window, cold air dropping to the floor from the window area is pulled into the warm-air stream and mixed with it, thus offsetting the effect of the cold air before it can spread over the floor.

On an installation using small floor diffusers, warm air is forced through them at fairly high velocity. This causes cool air from the floors to move toward them and mix with the warm air. This mixing of air (aspiration) near outside walls is the main reason for the additional comfort of the perimeter type of system. Good air circulation at proper temperatures blankets cold outside walls. This allows return-air grilles to be more centrally located and fewer in number. Total area of return grilles remains the same as with other types of systems.

When planning an installation, make a scale floor plan of the house showing location of all registers or diffusers and location of the heating and air-conditioning units. On this plan superimpose a scale duct plan. From this the duct work required can be estimated quite accurately.

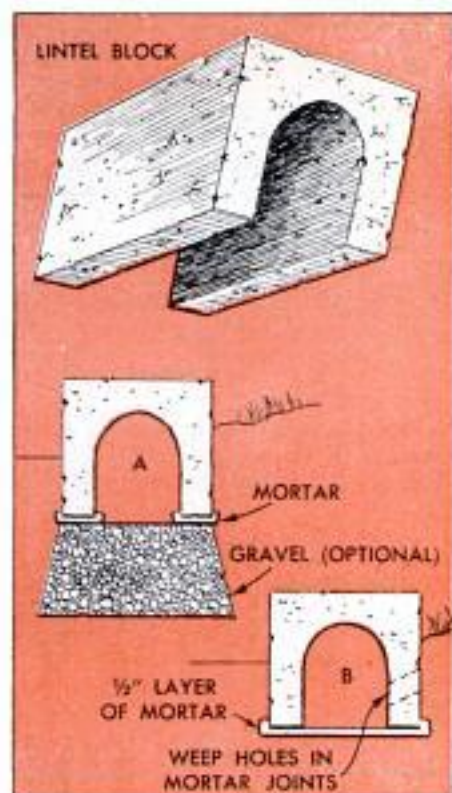
Such a plan also may show up flaws not otherwise apparent.

When starting an installation job set up the furnace, first pouring a level concrete base for it. If the air conditioner is part of the furnace, make the base to accommodate both, or if a conditioner is to be added later, make the base now to accommodate it. If separate units are to be used, as in this installation, set them up, install a plenum and put in the duct to connect them. Flexible duct connectors should be used on both sides of the air conditioner to prevent vibration from setting up a noise in the duct work. This setup is shown on page 191. Notice that the air conditioner is supported on a heavy flat-steel cradle which is suspended from the floor joists.

Next, cut the diffuser openings in the floor as pictured on page 192, Figs. 1 to 6 inclusive. Outline the opening as in Fig. 1, drill at each corner to start a keyhole saw, Fig. 2, and then cut the opening, Figs. 3 and 4. Nail in the boot or floor box, Fig. 5, and insert the diffuser as in Fig. 6.

When laying out the opening, be sure it is located between floor joists and not partly over one of them. Also consider the path of the warm-air pipe to the diffuser. It is best to keep it up between joists out of sight. Keep in mind, too, arrangement of furniture. While it is best to have space above a diffuser clear, high pieces such as small tables could project over the diffuser, but low pieces would definitely obstruct air circulation. However, when using an air conditioner, space above the diffuser should be clear.

(Continued next month)



Lintel Blocks Form Neat Driveway Curbing

Neat and inexpensive curbing for your driveway can be made from standard concrete lintel blocks. These are the blocks that are used to form headers across window and door openings and are reinforced with iron rods embedded in mortar placed in the trough formed by the blocks. In addition to eliminating need for wooden forms, the use of the blocks, of course, saves the job of mixing large batches of concrete. The blocks are simply laid end to end, groove side down, and mortared in place. Where the soil is firm, the blocks may be laid on ribbons of mortar spread in a shallow trench dug to a depth that will bring the blocks 3 to 4 in. above the top of the driveway, as in detail A. In loose

soil, the trench should be dug deep enough to allow it to be backfilled with crushed gravel. This will give a firm foundation or base for the blocks. If desired, every third joint can be left without mortar to permit movement due to any frost upheaval. With some driveways it is practicable to plaster the bottom of the trench with a $\frac{1}{2}$ -in. layer of mortar before laying the blocks, as in detail B. In this way, the channel through the row of blocks can be utilized as a storm drain to carry off excess water. Here you should leave weep holes in the mortar joints. Be sure to use concrete-type blocks and not the lighter-weight cinder-type blocks which would make a less durable curbing.—Tom Riley, Portland, Ore.

Tray on Tape Machine Repaired With Aluminum-Foil Liner



When the water tray of a gummed-paper-tape dispenser rusts through, a watertight repair can be made by lining it with aluminum foil. A foil lining in an undamaged tray will extend its life indefinitely.

Louis Hockman, Sherman Oaks, Calif.

New Plaster Should Age

New plaster should be allowed to age at least 60 to 90 days before finishing. To paint it sooner may give poor results because of the presence of moisture in the plaster, which may cause flaking and peeling of the paint. When the plaster has aged, and dried, sand to remove the rough spots.

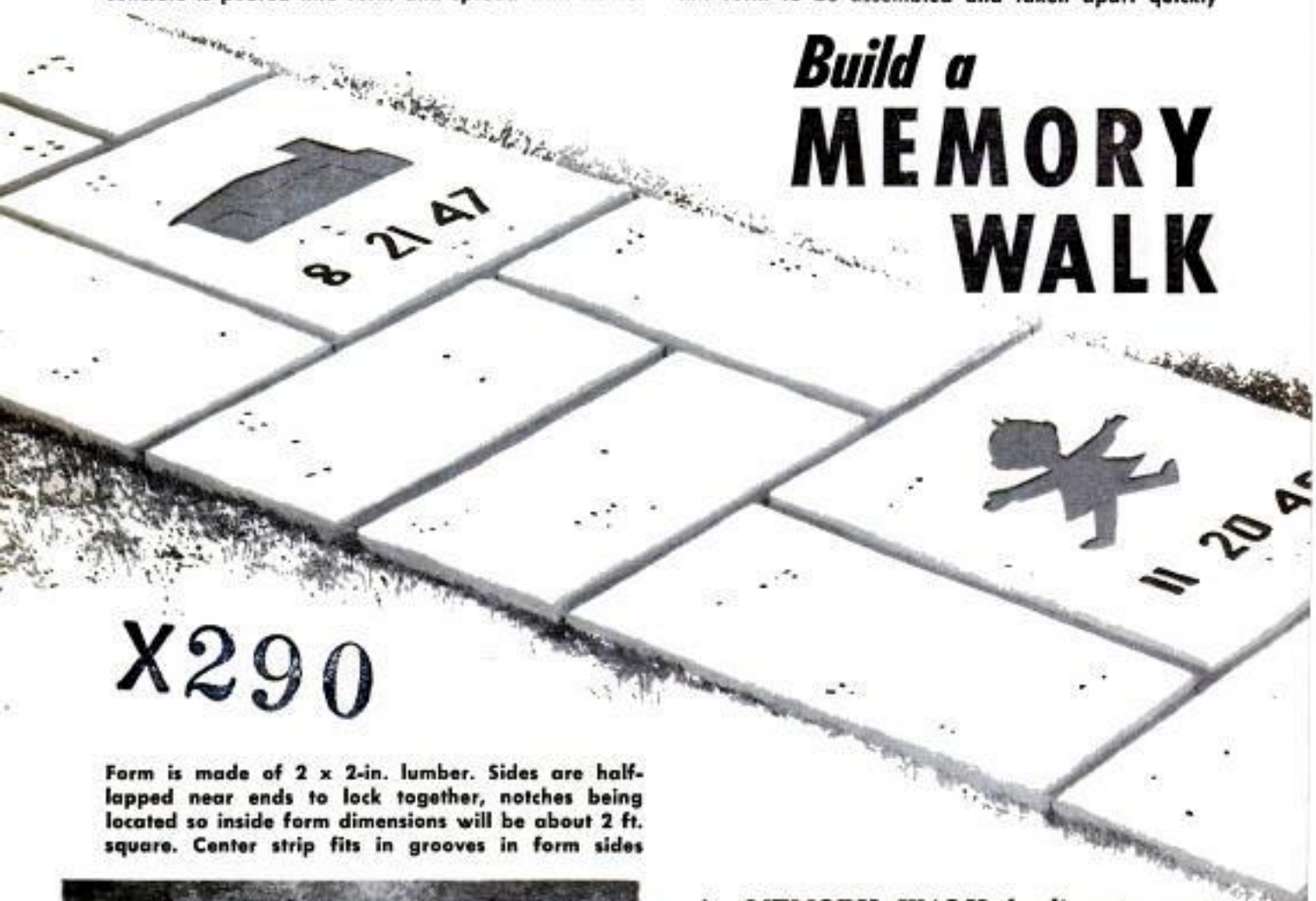


Water is added to dry Sakrete at rate of 1 gal. to 90-lb. bag. This may be done in a wheelbarrow, using garden hoe to mix in the water. Then concrete is poured into form and spread with trowel



After concrete is spread so all portions of form are filled, it is leveled with strike board. Note the half-lapped corner joints of form. These permit form to be assembled and taken apart quickly

Build a MEMORY WALK



Form is made of 2 x 2-in. lumber. Sides are half-lapped near ends to lock together, notches being located so inside form dimensions will be about 2 ft. square. Center strip fits in grooves in form sides



A MEMORY WALK leading to your driveway or curving around the garden can be a source of constant enjoyment to the entire family. Each concrete block forms a permanent record of a family event—your wedding day, the birthday of each child, the day you moved into your home—and blocks can be cast and added as other memorable events occur. Handprints, footprints and other appropriate cutout designs also can be impressed in the concrete. The blocks are cast 2 in. thick in a 2-ft.-sq. form, the form being divided with a center strip if you want to make two blocks. A 90-lb. bag of dry premixed concrete (Sakrete) will fill the form. ★ ★ ★

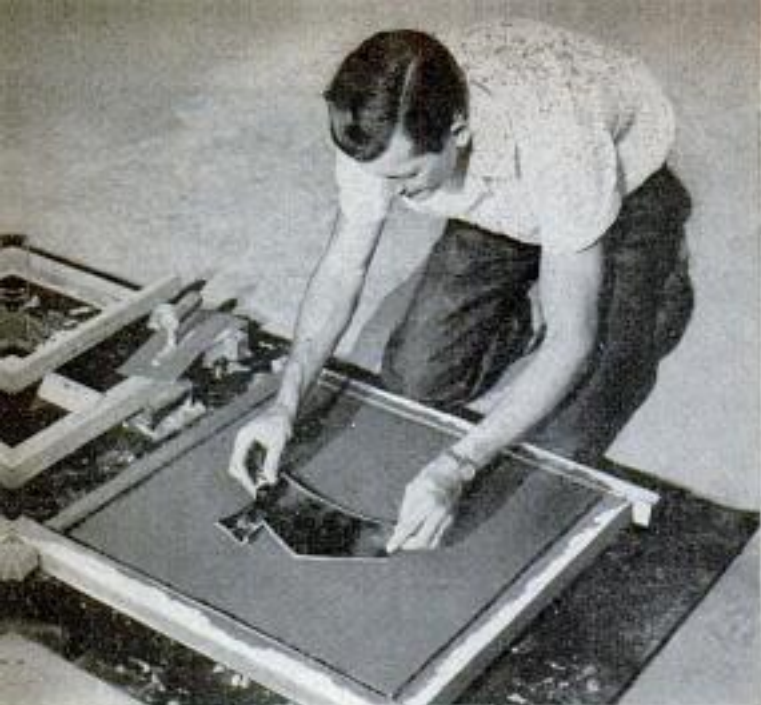
W T M ' 5 7



When water forms sheen on top of concrete, blocks are edged to separate them from form. Then surface of concrete is smoothed carefully with a steel trowel



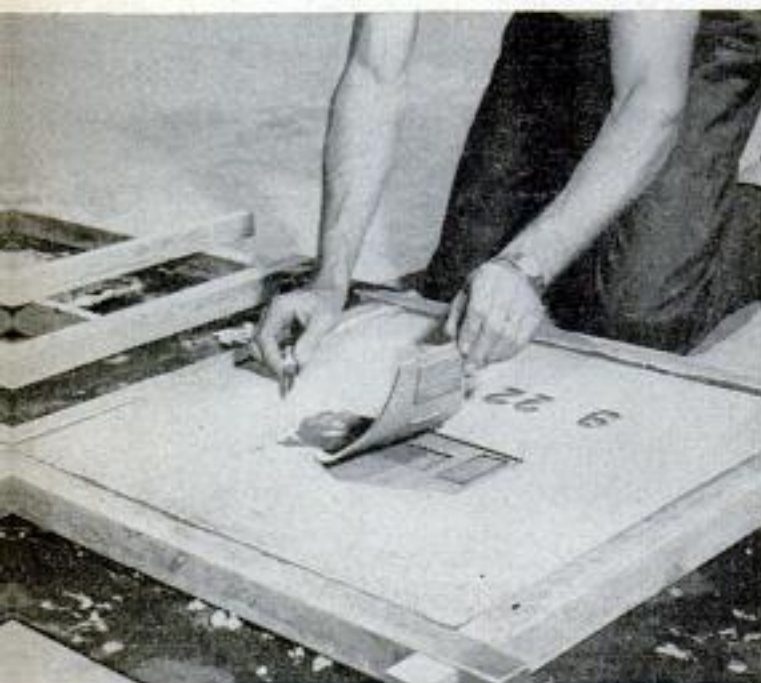
The 2-ft.-sq. block being set in place in photo at left weighs about 90 lb. Smaller rectangular blocks are easier to handle. Cutout designs and impressions are made in concrete as on following page



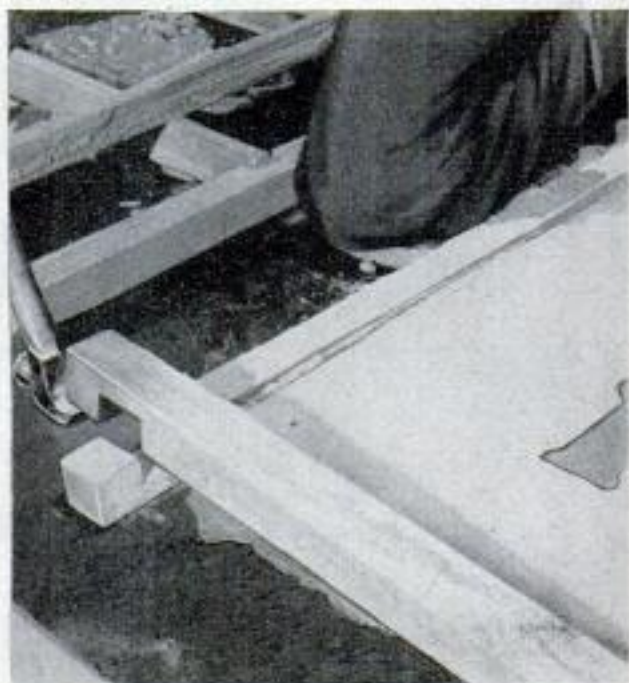
When water sheen disappears, roofing-felt cutout designs or hand imprints are placed in the concrete



After cutouts are set in place, they should be troweled over to set them flush with concrete surface



When block is cured, edges of cutouts are freed with knife blade and cutout is pulled out, leaving impression as above. Photo below shows sand, which is used for the base of the walk, being leveled with trowel

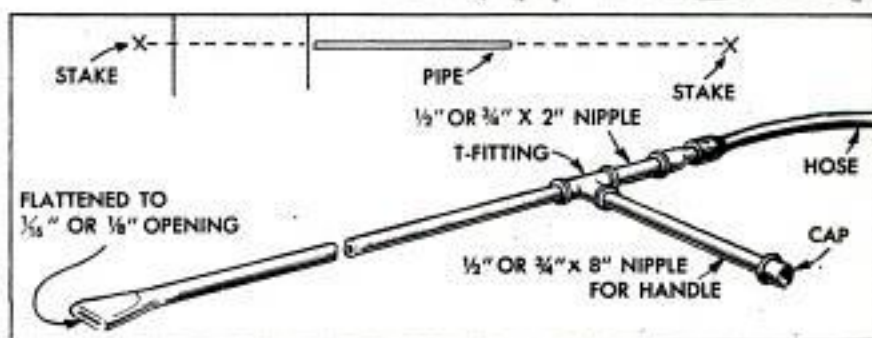


Form is removed from block by pulling apart the half-lapped corner joints with hammer as above. Finished blocks are set in walk about 2 in. apart and sand is swept into joints to prevent frost damage



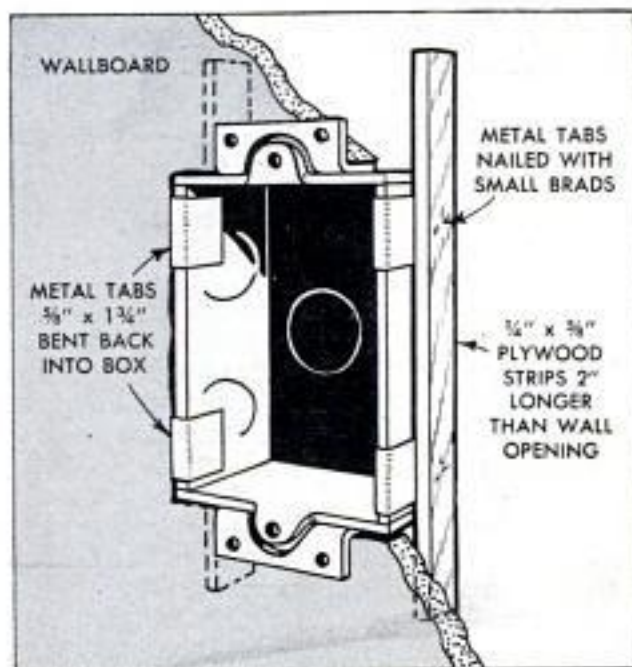
Water Pressure Utilized to Tunnel Under Walk

The home craftsman can utilize hydraulics to aid in laying a water line under a concrete driveway or sidewalk without the necessity of digging a tunnel. A "jet pipe" is made from $\frac{1}{2}$ or $\frac{3}{4}$ -in. pipe and fittings, as shown in the detail, and fitted with an adapter that permits connecting a garden hose to the pipe. When the jet pipe is used under a drive flush with the ground, it is necessary to dig a trench to a depth below the concrete and long enough to accommodate the pipe. If the drive is on a rise of ground, the pipe is simply forced into the soil with the water pressure turned on. A stake is driven into the ground on either side of the drive to assure alignment of the tunnel. If a restricted location permits only a short length of pipe to be used, additional lengths can be screwed on as the length of the tunnel increases. Dig a



small trench along the edge of the concrete to drain the used water into a street or onto a dry part of the lawn.

Metal Tabs Hold Outlet Box in Plasterboard Wall



When it is necessary to install electric outlet boxes in modern dry-wall construction, regular plaster-wall methods of attaching usually will not suffice. To overcome the lack of support in plasterboard,

two pieces of $\frac{1}{4}$ -in. plywood, $\frac{5}{8}$ in. wide and 2 in. longer than the hole cut to receive the outlet box, are used as anchors inside the wall. Two lengths of light sheet metal, $\frac{5}{8}$ in. x $1\frac{3}{4}$ in., are nailed to each piece of plywood. The two anchors are slipped into the wall, the box is installed and the sheet metal tabs bent over into the box, thus holding it securely in the wall.

O. A. Nelson, Seattle, Wash.

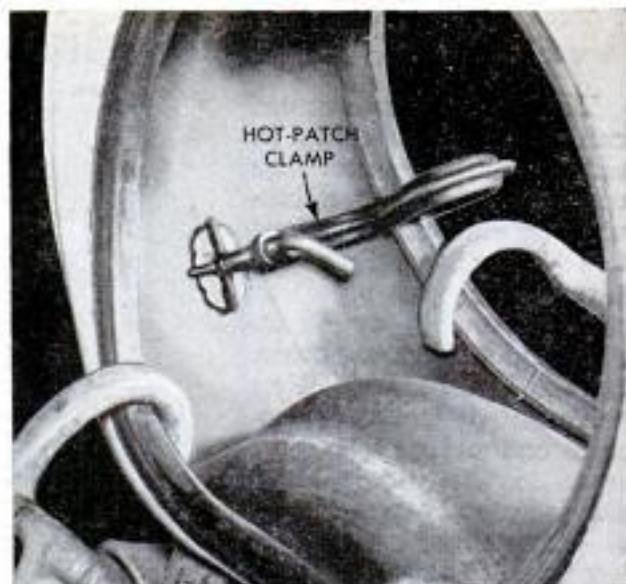
Acid-Bottle Holder Improvised

An easily improvised holder that will prevent a small bottle of soldering acid from being overturned on a workbench consists of an oil can and a wide rubber band. The bottle is placed on the flange of the spout and the band snapped around it.





Small punctures up to 1/16 in. in dia. can be repaired with a gun containing fire-resealing compound



Repair with a hot patch is a preferred method, especially if injury is larger than that made by nail

SERVICING TUBELESS TIRES

REPAIRING CAR TIRES has been simplified. Nowadays, when a leak develops, you have only the tire to check. There's no tube to worry about in the new tires with which many 1955 cars come equipped. Tubeless tires have many other advantages besides

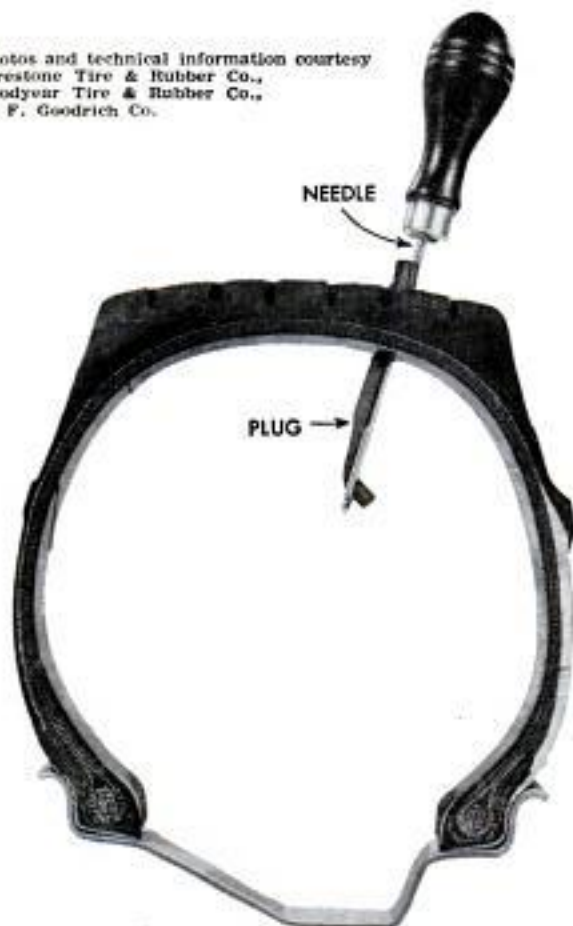
By **Ed Packer**

greater simplicity of repair. For one thing they are lighter, have better roadability due to a wider, flatter tread. The lighter weight reduces the "throw," or "flywheel," effect of the heavier tube-type tire at higher speeds, makes the car easier to stop even under rather difficult conditions. The car rides easier due to a reduction of unsprung tire weight. There is less wheel bounce on "washboard" roads. Most important to tire life is the relatively low temperature rise of the tubeless tire even when operated at comparatively high speeds under adverse conditions. This is due to a lack of friction which takes place in older tires between the casing and the outer surface of the inner tube.

On cars equipped with tubeless tires the valve is attached directly to the wheel rim as in the upper right-hand detail on the opposite page. When correctly installed the valve unit is rarely a source of leaks, unless, of course, it is accidentally damaged. When tubeless tires are installed as replacements on older cars several precautions should be observed to assure satisfactory service. Beginning with the valve installation as detailed on the opposite page, note especially the placement of the rubber washers which form an airtight seal when the valve-stem nut is tightened. Be sure before installing the valve that the seat, that is, the area around the opening in the wheel rim, is smooth. If it is not, go over the surface with a fine-grade abrasive cloth.

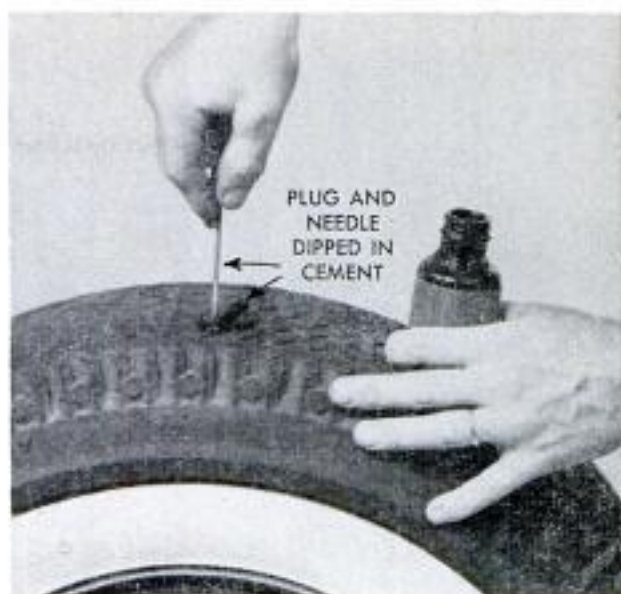
Older wheel rims are sometimes rusty, dented or otherwise out of true. They must be thoroughly cleaned and straightened be-

Photos and technical information courtesy
Firestone Tire & Rubber Co.,
Goodyear Tire & Rubber Co.,
B. F. Goodrich Co.





Small nail usually causes a leak even though it remains in tire. Use care in removing with pliers

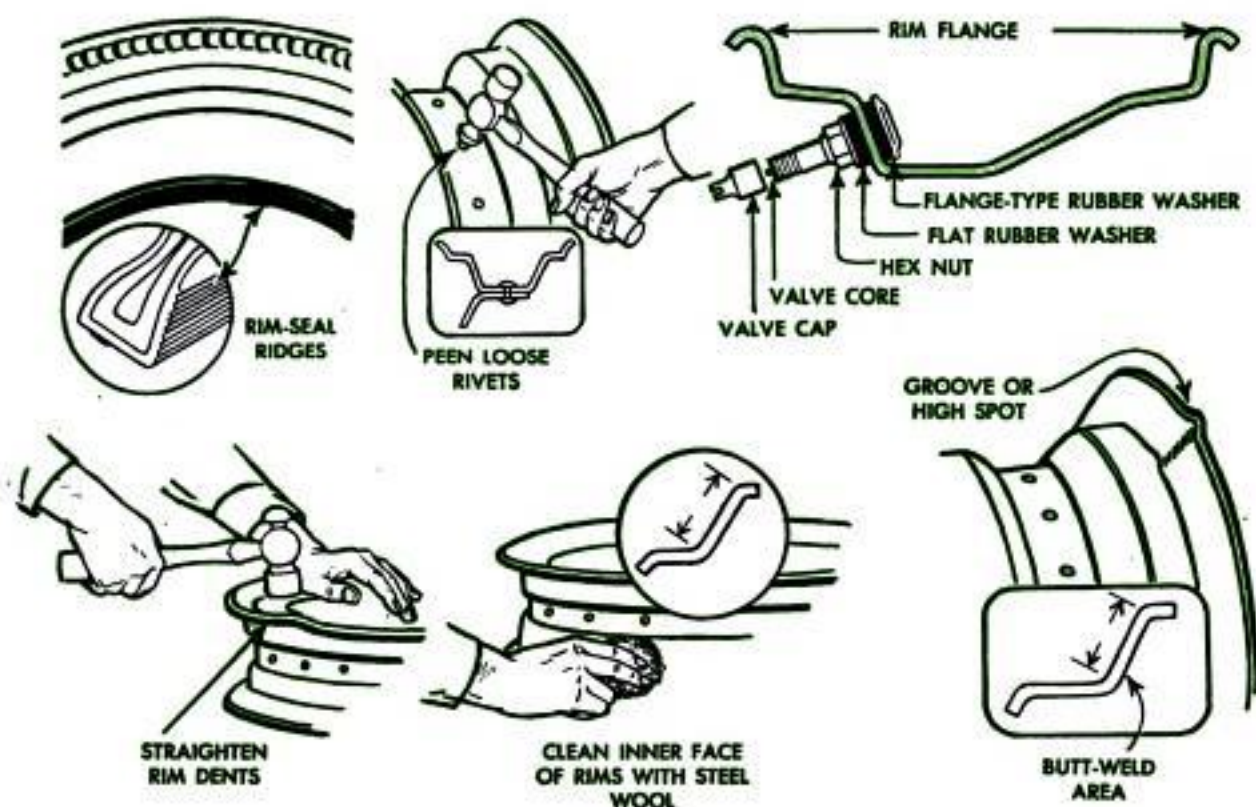


Plug repair is effective for holes to 3/16 in. in dia. Usually it is not necessary to demount tire

fore the new tubeless tires are installed. Examine carefully for any irregularity, especially bends either in or out at the flanges. Ridges, or corrugations, formed on the outer face of the bead at the time of vulcanizing form an airtight seal between the bead and the metal flange when the tubeless tire is inflated. That's why it's important to hammer out dents, peen any loose rivets and thoroughly clean the inner surface of the rim with steel wool or abrasive cloth as in the details below. If there's a weld at any point on the flange, this should be smoothed with a file or ground

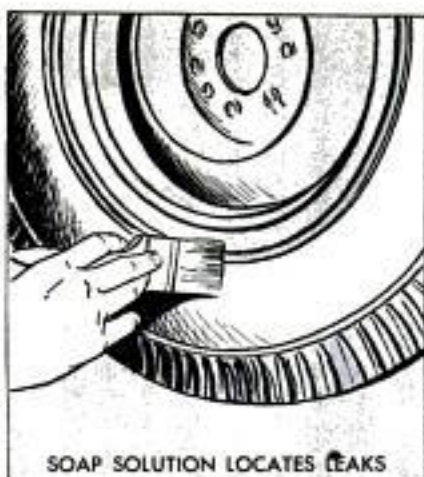
very nearly flush with a power grinder. Do not attempt to mount tubeless tires on conventional wire wheels as air leaks are likely to develop at the points where the spokes are riveted to the rim.

Repairing small punctures in tubeless tires usually can be done without removing the tire from the rim. The two left-hand photos on the opposite page and the two above picture approved methods. The one quite generally favored for repairing small punctures made by nails makes use of a rubber plug which is forced through the hole with a special needle as in the lower





START LIFTING BEAD AT VALVE



SOAP SOLUTION LOCATES LEAKS



BUBBLE INDICATES LEAK ON TREAD

left-hand photo, page 198. This repair is quite reliable for punctures from $\frac{1}{16}$ to $\frac{3}{16}$ in. in dia. Another approved method of repairing nail punctures utilizes a special gun to force resealing compound into the hole. In either case, locate and mark the leak. If the nail is still in the tire, pull it straight out to avoid enlarging the hole. Reduce pressure in the tire to 5 lb. or less. Remove any foreign matter from the hole and from the immediate area. Clean with a rasp dipped in solvent. Then, when using the plug, dip both needle and plug in cement and force into the hole until the plug projects about $\frac{1}{4}$ in. above the tread. Then withdraw the needle (the plug unhooks automatically) and trim the projection of the plug flush, or a little above, the surface of the tread. Give the cement about 15 min. to set, then inflate and check for leaks in a water tank.

Resealing small punctures with a gun is done as pictured in the upper left-hand photo on page 198. As a rule it is not necessary to remove the tire from the wheel. Simply locate and mark the leak and then reduce pressure in the tire to 5 lb. or less. Wipe the area around the puncture dry and clean the hole with a rasp dipped in solvent. Then fill the puncture with the gun, giving the handle three to four half turns. Allow the compound to set for 15

min., then inflate and check the repair in a water tank.

When necessary to repair with the hot-patch method, the tire should be removed from the rim and the puncture, or break, and the area around it thoroughly cleaned and buffed. Then center the hot patch over the injury and hold in place with a hot-patch clamp as in the upper right-hand photo, page 198. In most cases it also is advisable to fill the injury from the outside of the tread with resealing compound before applying the patch. Tighten the clamp, light the patch and then allow it to cool 15 min. Then remount, inflate and check in a water tank.

When ordinary tire tools are used to remove tubeless tires from wheel rims, the ends of the tools should be buffed so that they are perfectly smooth. If no power buffer is available, use fine abrasive cloth and steel wool. Proceed carefully when lifting the tire bead over the rim so as not to damage the corrugated seal on the face of the bead. If a water tank is not available leaks usually can be located by coating the surface of the tire, either the sidewalls or tread, with a soap solution. Before remounting the tire, coat the beads with a soap solution. After the tire is on the rim use a rope "tourniquet" or a constrictor to seat the beads. ★ ★ ★



TIRE CHANGER SAVES TIME

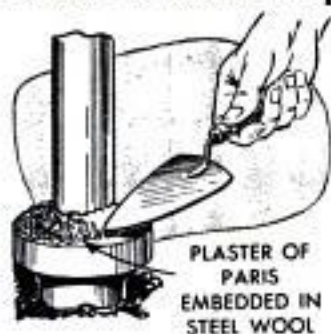


COAT BEADS WITH SOAP SOLUTION



ROPE "TOURNIQUET" SEATS BEADS

Plaster in Downspout Joint Assures Easier Repair



When chiseling away the concrete in the soil-pipe connection of a downspout resulted in a broken bell on the pipe, one homeowner assured easier repairs in the future by using plaster

of paris instead of cement when resealing the joint. Steel wool first was stuffed into the space between the downspout and the bell, then the plaster was troweled over it. The hardened plaster was painted with roofing cement to weatherproof it.

Wood Putty Lengthens Short Leg

A chair or table that wobbles because of a short leg can be made steady by lengthening the leg with wood putty. First, squeeze some putty onto a piece of waxed paper placed on the floor. Set the short leg on top of the putty and force it down until the piece of furniture is level. When dried completely, trim off the putty with a knife, then file and sand it smooth. It now can be painted or stained to match the finish.



Typist's Folding Copy Holder From Corrugated Cardboard

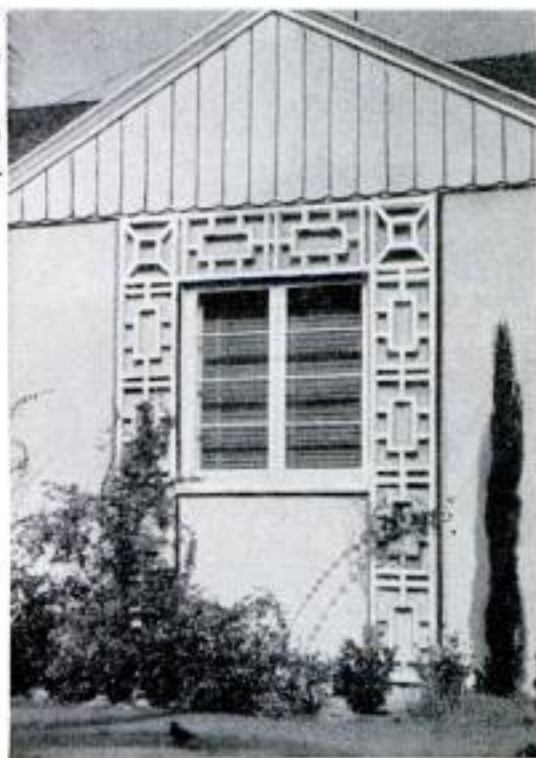
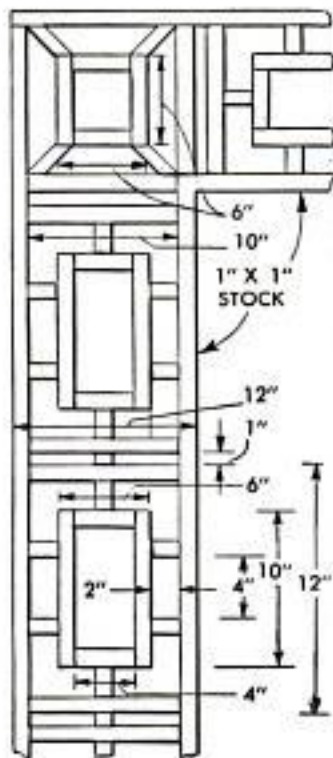
When you need a copyholder for typing, three 8½ x 11-in. pieces of corrugated cardboard can be assembled into one quickly. The base and front pieces are hinged to the back with masking tape, as pictured in the photograph. When thus hinged, all of the pieces fold flat so the holder can be stored in a drawer. To hold the front upright, tape a narrow strip of cardboard across the base to form a stop. A spring-type clip over the top edge of the front holds the copy in place at a convenient angle for typing.

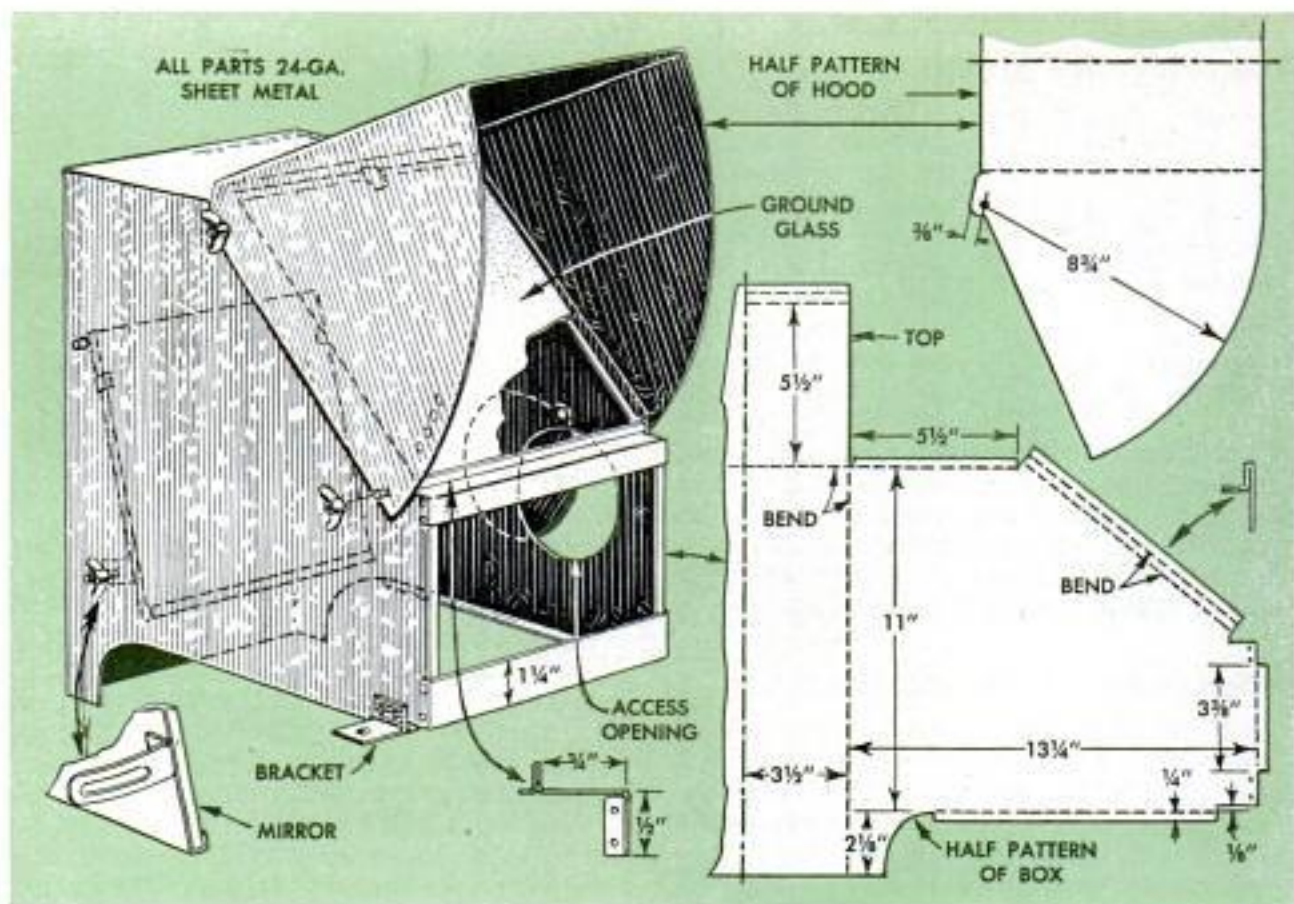
Chinese-Chippendale Frame Relieves Plain Window

This Chinese-Chippendale frame will dress up a plain window or give a lift to a side of the house that has a bare look. It is constructed of 1 x 1-in. lumber, the dimensions being determined by the size of the window to be decorated. Those shown in the diagram are average dimensions and will be in proportion to most windows. A further touch of decoration can be added by putting 1-in. spacer blocks between the frame and the wall, so that the frame can be used as a trellis. If desired, the joints of the outer members may be half-lapped for additional rigidity. To prevent warping and swelling from exposure to the weather, the frame should be assembled with nails and a good waterproof glue. It is then given several coats of exterior paint, either the same col-

or as the window trim or a color which contrasts pleasantly.

Hi Sibley, Nuevo, Calif.





SHORT-FOCUS FILM READER

By L. H. Georger



LACKING A MEANS of reading the images quickly and clearly, editing film soon can become a tedious, eye-straining chore, especially when long runs of 8 and 16-mm. film must be scanned. When using this film reader, or shadow box, on an editing board of the type pictured, the short-focus feature eliminates glare and at the same time reproduces a clear image of each frame on a hooded ground glass located at a convenient angle for viewing.

The photo above shows the setup with splicer and the unit supplying the light source and objective lens, the latter fitted to the opening below the inclined ground

glass. Note on the detail above that this opening is given as 3 1/8 in. high. This dimension may have to be changed to accommodate the type of unit used as a light source. Note also, in both the photo and detail, that there is an access opening on the right-hand side of the box, making it possible to reach the objective lens for focusing without removing the unit from the editing board. The opening is provided with a swinging cover cut from sheet metal and riveted to the side of the box.

In the detail above note that the box and hood are separate parts, but that each is formed from one piece of sheet metal. The lower view shows only one half of the box pattern with the center of the back indicated by a dot-and-dash line. This can be used as a base line in laying out the pattern on the sheet metal and scoring the "cut" and "bend" lines. Lips and reverse bends are shown by dotted lines on all edges. The bottom lip, which supports a piece of cardboard or thin plywood, is an optional detail. The only purpose of a bottom in the box is to eliminate a possible source of reflected light, which might be objectionable.

The mirror holder, or cradle, is pivoted on a length of 1/8-in. rod to which it is soldered. The ends of the rod project about



$\frac{1}{4}$ in. A slotted angle bracket is sweat-soldered to the back of the holder near the lower left-hand corner as indicated by dotted lines in the assembly view on the opposite page. When assembled in the box, the ends of the pivot rod pass through holes drilled in the sides of the box and a $\frac{1}{4}$ -in. bolt is passed through the slotted bracket and through a hole drilled in one side of the box as indicated. This bolt, fitted with a wing nut, provides a means of tilting the mirror and locking it in any desired position. The lower edge of the mirror is held in place by a pocket formed by making a reverse bend along the bottom edge of the holder as shown in the lower left-hand detail on the opposite page. Projecting tabs near the top of the holder are bent over the edge of the mirror to prevent it from tilting forward.

Note the double bend on the inclined front of the box. Here the metal is bent back on itself to form a shoulder and lip which support the ground glass. In the

lower center detail on the opposite page the upper cross member at the front of the box is shown in section. The reverse bend also forms a lip which supports the lower edge of the ground glass. A lip at each end of the member is bent at right angles and riveted to the side of the box as shown.

The hood is a simple bending job, but it's a good idea to check the measurement across the ground-glass opening and make the width accordingly. For this reason no width dimension is given on the half pattern for the hood, upper right-hand detail on the opposite page. Two $\frac{1}{4}$ -in. bolts with wing nuts serve as pivots and a row of spaced holes drilled or punched near the lower corner of one side, or wing, take a $\frac{1}{4}$ -in. bolt and wing nut which provide a means of locking the hood at any desired height. Two angle brackets bent from 18-ga. sheet metal and riveted to the sides of the box provide a means of attaching the viewing unit rigidly to the editing board. ★ ★ ★

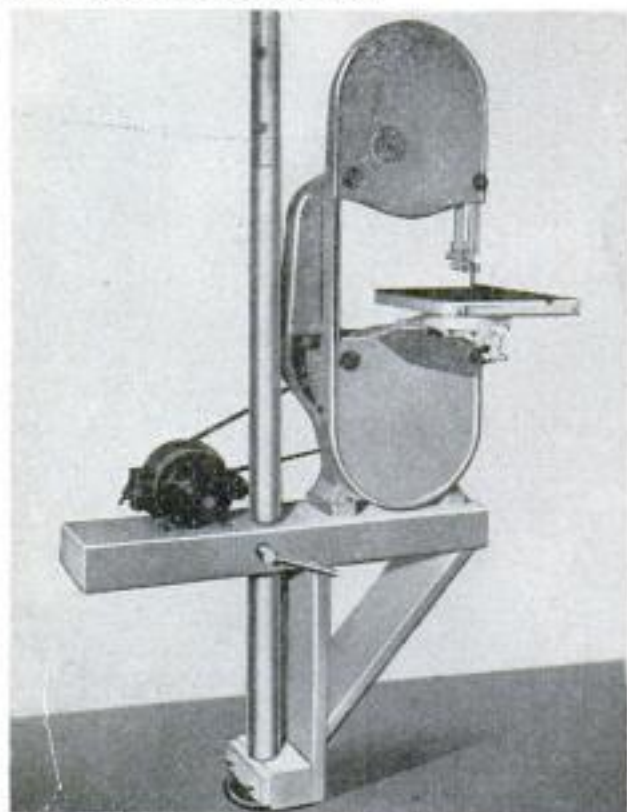
Cardboard "Freezer Chest" Used to Transport Frozen Game

Two or three corrugated-cardboard boxes and a few pounds of dry ice will help assure that frozen fish or game brought back from a hunting or fishing trip will stay frozen en route. First, of course, the game must be taken to the local freezer plant, cleaned, wrapped and quick-frozen. For the trip home, obtain two or more cor-

rugated-cardboard boxes that can be fitted inside each other. Pack the game in the smallest box, add a couple of packages of dry ice and seal the box. Place this box inside the next largest and fill the space between the boxes with shredded newspaper or sawdust.

Bill Cartwright, Pittsford, N. Y.

Pivoting Bandsaw Support Installed on Column



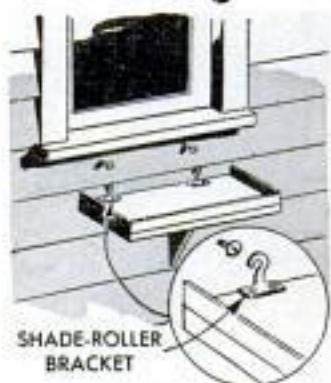
Instead of being an obstruction, a steel support post in one basement workshop provides a column for a pivoting support under a bandsaw. Sheet brass is wrapped around the post at the bottom to provide

a bearing surface. The support, made of lumber, is fitted with a lock screw which permits it to be held in any position around the column. When built around a fixed post, the top and bottom shelves of the support are made in halves and then bolted together. If a removable jackpost is used, it can be slipped through bored holes before the assembly is installed.

Fred M. Stevens, Worcester, Mass.

Bird Feeder Hung From Brackets Can Be Removed for Cleaning

Window-shade-roller brackets permit this bird-feeding shelf to be lifted off the wall and taken inside when it is to be cleaned or supplied with food. The brackets hang from two screws or nails driven into the siding of the house.



The shelf itself is a narrow length of plywood or hardboard, fitted with a low railing to prevent seed from being blown off by the wind. To prevent the shelf from tipping under the weight of birds, a triangular-shaped wooden brace screwed to the bottom rests against the side of the house.

Popular Mechanics Bookshop

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eliminate many costly repairs. It covers the Plymouth from bumper-to-bumper. It tells you what can go wrong; how proper adjustment and servicing should be done; how to prevent major troubles and costly repairs later on.

Complete chapters cover the battery, ignition system, starter, generator, regulator, lighting, fuel system, engine maintenance, lubrication, cooling system, motor tune-up, clutch, transmission, differential, brake adjustment, running gear, wheel alignment, tire care, body maintenance and trouble shooting on the road.

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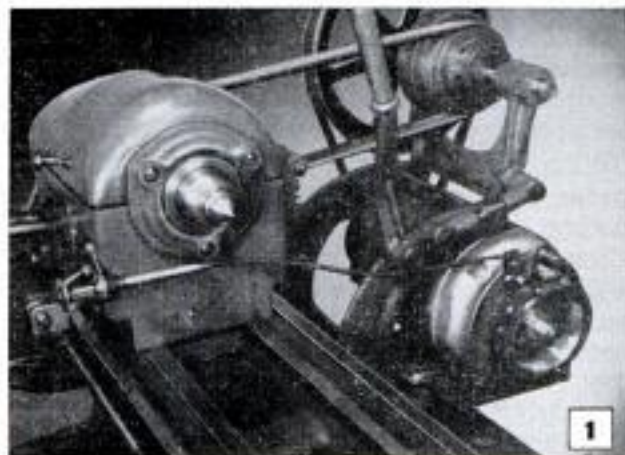
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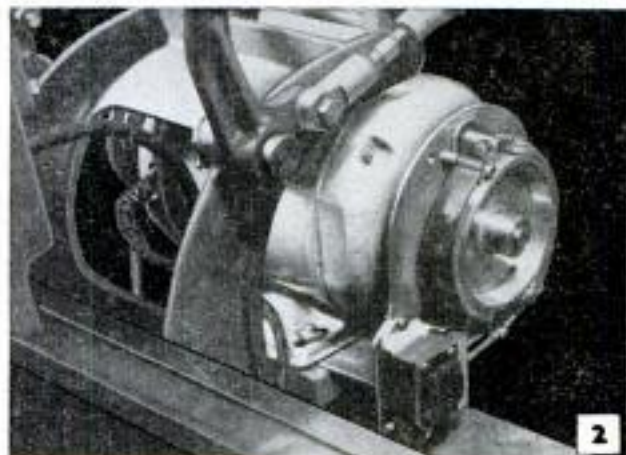
CHICAGO 11, ILLINOIS



Shop Notes



Many operators of small lathes prefer a manually operated brake with control at headstock as shown



On certain types of work an automatic electrically operated brake is an advantage. Stops motor quickly

LATHE BRAKE FOR QUICK STOPS

By Keith Heryford

S MALL BENCH LATHES are not usually equipped with instant-reversing motors and for this reason a lathe brake comes in handy when turning work that requires frequent speed changes, spindle reverse or changing from free spindle to back gears. For a lathe of the bench type having a separate motor-and-jackshaft drive, an external band-type brake operating directly on the motor shaft is easy to build and usually gives the most satisfactory performance. To be useful over a wide range of work the unit must give positive braking action and must release readily and sufficiently to prevent any tendency to drag while the motor is running.

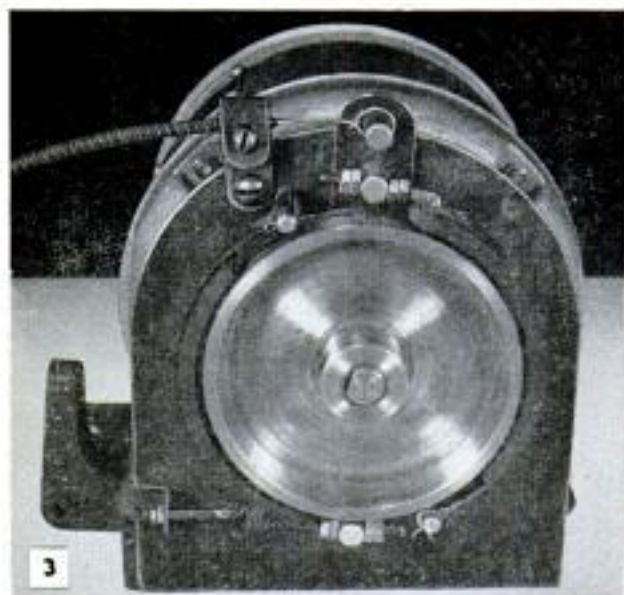
Figs. 1 and 2 picture a simple external-band brake mounted on a 10-in. bench lathe. The brake can be arranged for manual operation, Fig. 1, or electrical operation, Fig. 2. For average work, operators of small lathes usually prefer the manual brake with the flexible-cable control mounted on the headstock as in Fig. 1. In this position the cable control is always within easy reach and does not interfere in any way with the operation of the lathe or its accessories. However, for certain types of work the automatic electrically operated brake is an advantage.

Mechanically both types of brakes are of essentially the same construction. Fig. 3 shows an end view of the manual brake and Fig. 6 a similar view of the electrically operated brake. The latter is actuated by an electromagnet consisting of a coil and

movable armature, Figs. 6 and 8, which works off the lathe switch, releasing when the switch is turned on to start the lathe and applying instantly when the switch is turned off.

The photos and details show the unit mounted on a double-shaft motor. When necessary to mount the unit on a single-shaft motor, turn a special step pulley with the brake drum integral and mount the brake mechanism on the driveshaft end of the motor.

Fig. 4 details the construction of the manual brake, using a 4-in. drum of the face and hub specifications given. Begin by making the base, which is a $\frac{1}{8}$ -in. flat-steel plate bent to a right angle and inserted under the motor base. Before making the bend, determine the distance from the bottom face of the motor mounting pads to the center of the motor shaft. Then locate and drill the $\frac{5}{8}$ -in. hole through which the motor shaft projects when the base is in position. Next, make the pivot disk, the brake lever and the retaining plate. Then center-drill the pivot disk and lay out and drill three clearance holes for 10-24 screws. The holes should be laid out 120 deg. apart on a concentric circle. Use the disk as a jig for locating and drilling 10-24 tap holes in the base. Tap holes for the brake-band studs are not drilled until a later stage in the assembly. The anchor studs are shouldered as indicated and inserted in holes drilled in the upper and lower arm of the brake lever and peened over. Assemble



A manually operated brake mounted ready for use on double-shaft motor. Brake drum is machined all over

the brake lever on the angle base and screw the retaining plate in place.

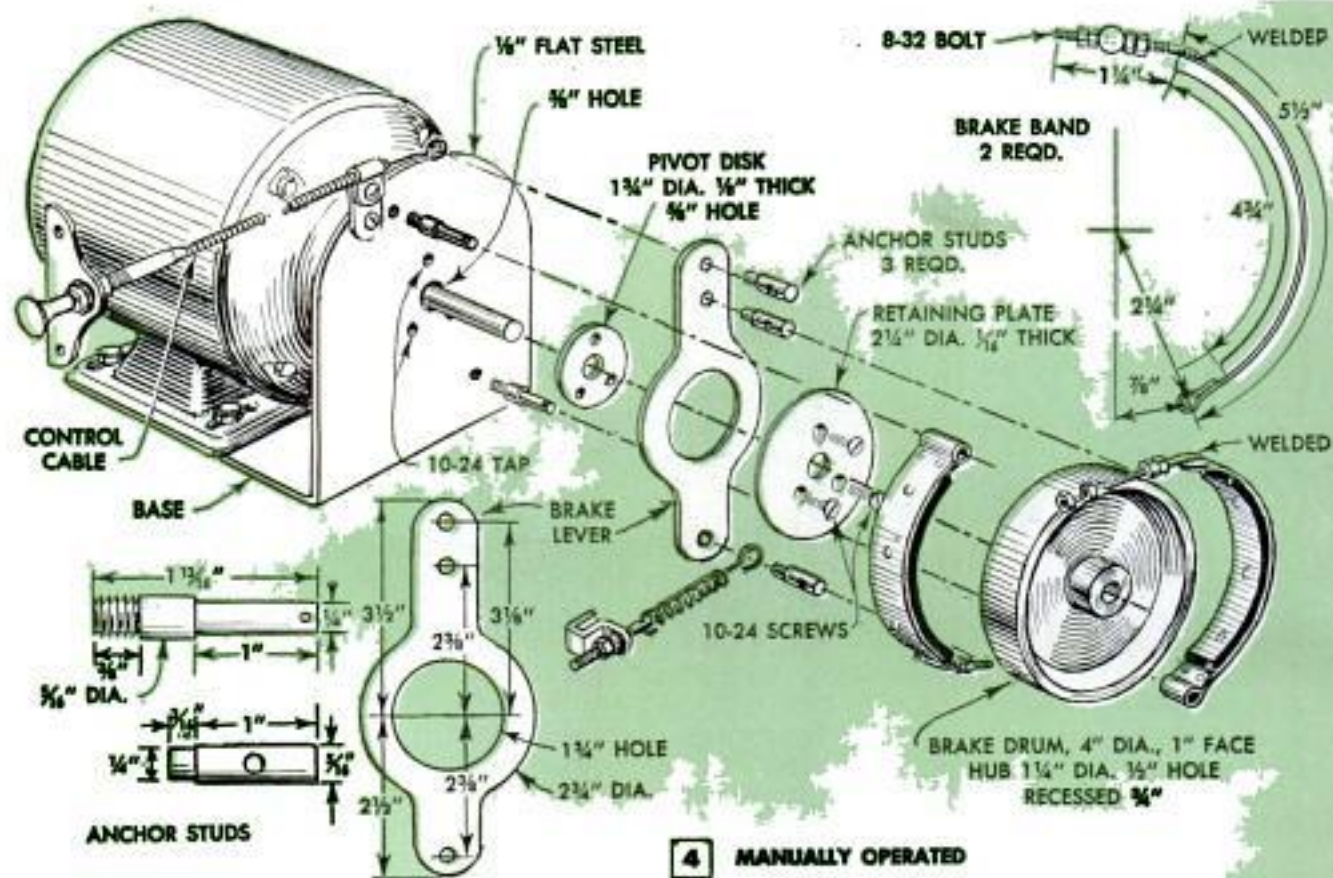
Next, make the brake drum and bands, lining the bands with pieces cut from regular brake-lining material or a rubber-impregnated fabric shoe sole. Turn and bore the brake drum in the lathe to assure that it runs true. Then place the drum on the motor shaft and clamp the bands in position on the drum. Check to make sure that the motor is properly shimmed up on the side of the base opposite the angle base

which carries the drum assembly. Then locate, drill and tap the $\frac{1}{4}$ -in. holes for the flanged studs on which the brake bands are pivoted. Note the assembly detail in Fig. 8, which shows one band in position. Tighten nuts on the projecting ends of the studs.

Drill and tap holes for the control-cable brackets in the angle base and on the lathe headstock. The position of the bracket on the headstock will be seen in Fig. 1.

With all the parts assembled, test the brake, turning the drum by hand and adjusting the bands so that there is no drag when the brake is in the fully released position. Then install the return spring and lug and test the brake with the motor running. Adjust the brake bands, if necessary, until the brake stops the motor smoothly without any tendency to chatter.

Fig. 8 details the electrically operated brake which utilizes the same base, lever, bands and drum as are used on the manual brake. Note in the detail that the brake lever is reversed, also the return spring. An L-shaped mounting plate is welded to the angle base to support the electromagnet. The original electromagnet was made by using the core iron from a discarded radio transformer to form the magnet core and armature. The core iron is stacked and riveted and bolted together to form a core of approximately the dimensions given. The coil is wound on a form as in Figs. 5 and 7. The width of the form should be





Coil for the electromagnet is wound on a form to assure correct size to fit over center leg of core

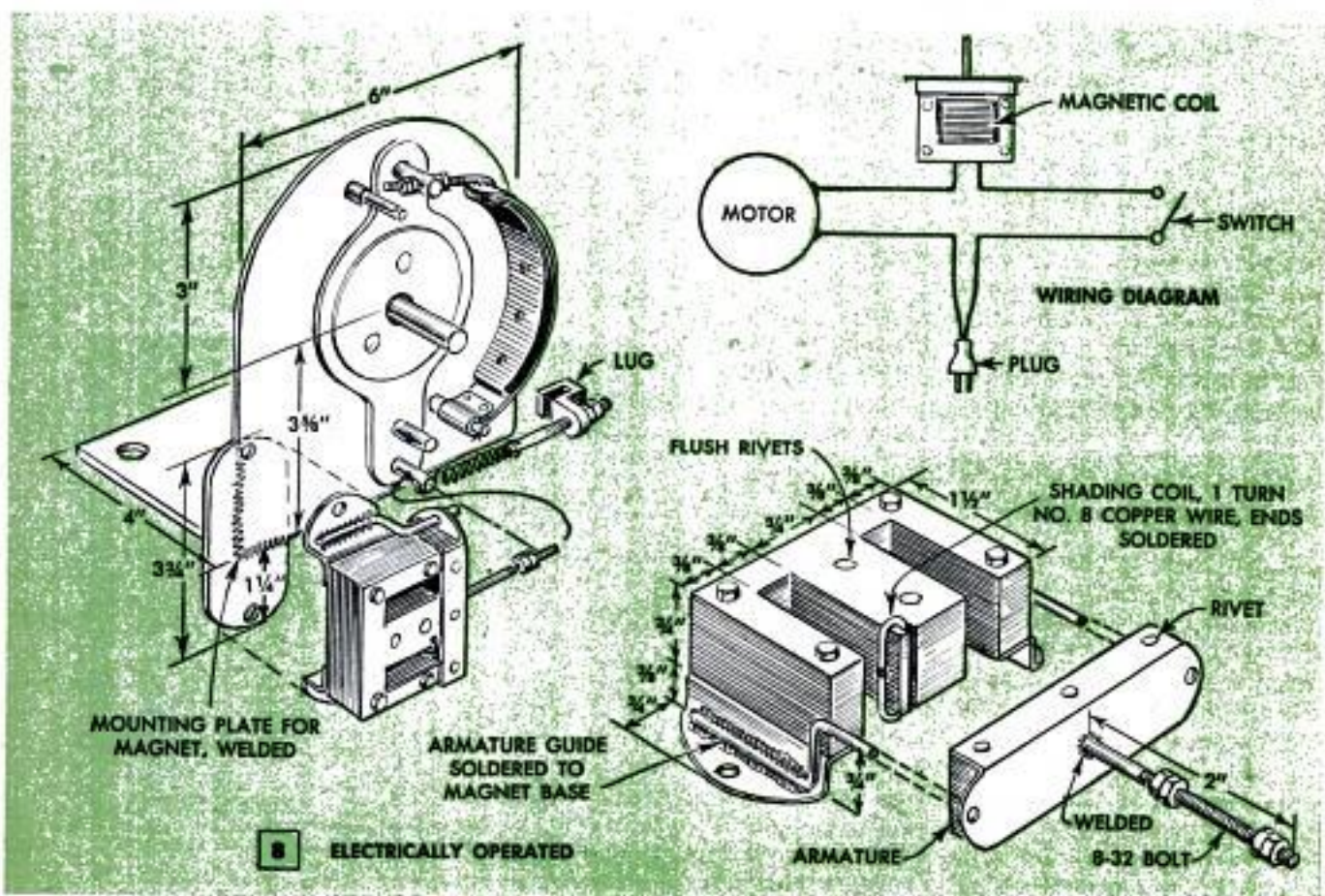
about $\frac{3}{16}$ in. less than the length of the center leg of the core. Use 25 ft. of No. 12 enameled wire which will give between 45 and 50 turns on the form. Drill and slot the center leg of the core and add the shading coil as directed. This will prevent excessive hum when the current is on. Add the armature guides, armature, bolt to the angle base and connect to the brake lever. Wire the electromagnet into the motor circuit as in the wiring diagram, Fig. 8. Test for proper operation. ★ ★ ★



The electrically operated brake is controlled by the motor switch which is supplied with the lathe



A discarded radio transformer supplies the iron core for the electromagnet. Note coil-winding form



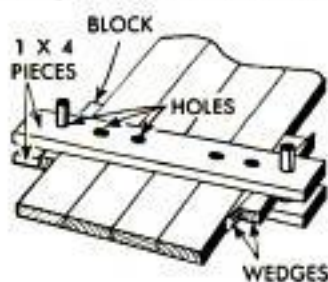
Auto Wheel on Gas-Station Wall Keeps Air Hose Handy



A brightly painted automobile wheel is bolted to the wall of one gasoline service station to serve as a handy reel on which to wind the air hose. The wheel does not rotate, but the hose is simply wound around the rim. This gives motorists easy access to the hose. The bright color calls attention to the location of the hose.

Walter Burton, Akron, Ohio.

Improved Bar Clamps



When bar clamps are not available, or when an occasional job does not warrant purchasing them, two lengths of 1-in. stock and some $\frac{3}{4}$ -in. dowels provide a good substitute for clamping joined and glued boards together. Drill a number of equally spaced $\frac{3}{4}$ -in. holes in the two lengths of stock. Place the work to be held between the lengths of stock and force a length of dowel into holes on either side of the work. Fit a block between the dowel and work at one end and facing wedges at the other end. Considerable force can be applied to the boards by tapping the wedges together.

Soap Cleans Water Glass As Boiler Operates

A shallow container of soap solution can be used to clean the inside of the water glass on a boiler while it is in operation. First, close the lower valve of the glass and open the pet cock below the bottom valve. Steam will blow through the glass and out the pet cock. Next, close the top valve, and as soon as steam stops flowing from the pet cock, hold the container of soap solution under it so the nozzle of the pet cock is submerged in the soap. The suddenly cooled air in the glass will cause a partial

vacuum that will draw the glass full of the soap solution. Close the pet cock, remove the soap container and open both top and bottom valves. The glass will show a blue color for about three hours, then will become clean and clear.

Frank Skalla, Niles, Mich.

Forming New Hook in Spring End

Bending a new hook on the end of a coil spring, which is a difficult job with a pair of pliers, can be done easily by placing the spring on the corner of a vise or anvil and using a hammer. Fit the last coil of the spring over the corner and hammer it at right angles to the axis of the spring. Move the spring slightly while hammering to prevent cutting the spring wire on the edge of the vise jaw.



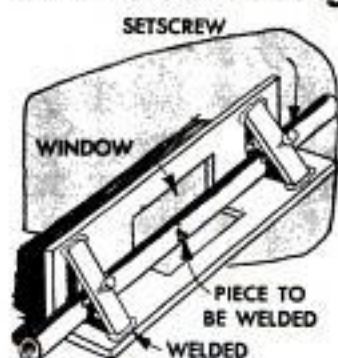
Harold H. Cutter, Oakland, Calif.

Self-Feeder for Poultry Grit Prevents Waste

Mounted on a post in the poultry house, this feeder prevents waste of oyster-shell grit. It is made of 1 x 10-in. planks nailed together and supported above the floor by a length of galvanized-steel strap passed around the post and nailed to both post and feeder. The lid of the feeder has a leather hinge which holds it at an angle sufficient to discourage roosting. A board placed at a slant between the side members of the feeder forms a hopper for the grit.



Work Welded All the Way Around When Held in Angle-Steel Fixture



Made from a length of angle steel and two short lengths of flat steel, this jig permits welding all around a piece of work without resetting it. A "window" is cut on the heel of the angle, extending three

fourths the way up each web. Turning the jig over permits the work to be welded through the window. A setscrew in each of the flats welded across the angle holds the work in position.

Henry Josephs, Gardenville, Pa.

Strap Prevents Floor-Joist Twisting

To prevent the floor joists from twisting when wallboard was installed to provide a ceiling for a basement rumpus room, one homeowner used steel strap ordinarily employed to secure heavy packing cases. The strap was bent up and nailed to the end joist, then stretched with the strap tool and nailed to the lower edge of each joist.

Calf Tethered Near Mother Learns to Wean Itself

To wean his calves more quickly, one dairy farmer lets the mother "teach" her youngster to eat hay. The calf is fitted with a comfortable leather collar and tied near his mother in the barn with a tether that will not let him reach her udder. Seeing her eating hay, and not being able to get her milk, the calf quickly learns to copy his mother's eating habits.

John Krill, North Lima, Ohio.

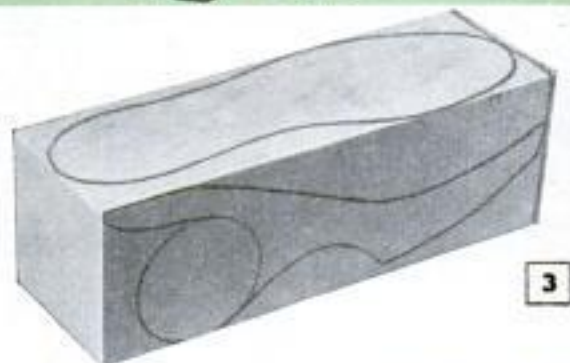


Circle-Cutting Jig Rotates Work While Torch is Stationary

Accuracy is assured when using the circle-cutting jig made by one ranch-shop owner, because the work rotates while the acetylene cutting torch is held stationary on a horizontal arm. The steering gear and column from an early model car is used to rotate the work; older types of steering gear will turn 360 deg., newer types rotate only through a partial circle. The steering wheel is replaced by a crank to facilitate turning. The work to be cut is held down against the rotating shaft of the steering-gear box by a pointed length of round stock which slides in a vertical collar on the horizontal arm of the jig. A setscrew in the collar locks the round stock down against a center-punch mark in the work. The cutting torch is adjusted horizontally along the upper arm of the jig to cut on the circumference of the circle as the work is turned slowly by the crank.

Glue Disk Cleans Sanding Belts

Clogged sanding belts can be cleaned quickly by using a disk cast from white, vinyl-type glue. Cast the disk by pouring the liquid glue into a cardboard tube about 1 in. in diameter to a depth of at least $\frac{1}{2}$ in. When the glue has thoroughly dried it has a hard, rubbery consistency and is used on the sanding belts in the same manner as a stick of belt dressing.—Warner G. Tilsher, South San Gabriel, Calif.

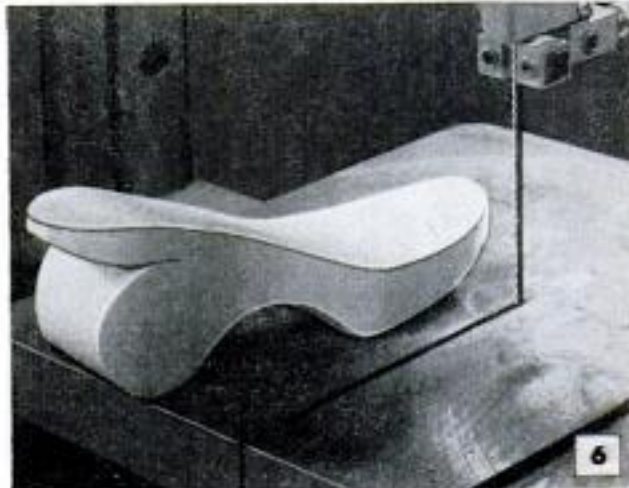
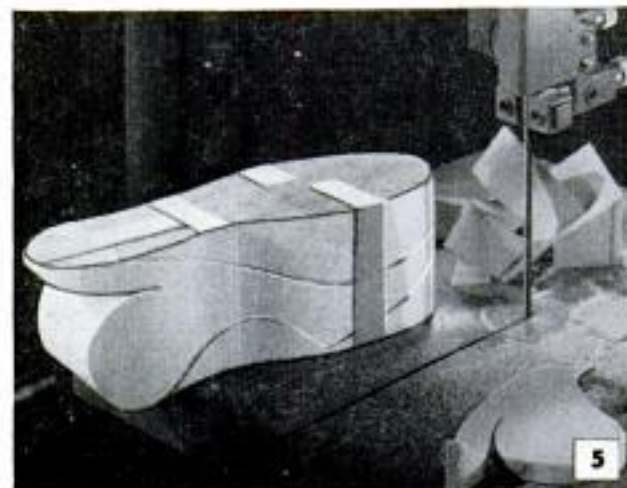
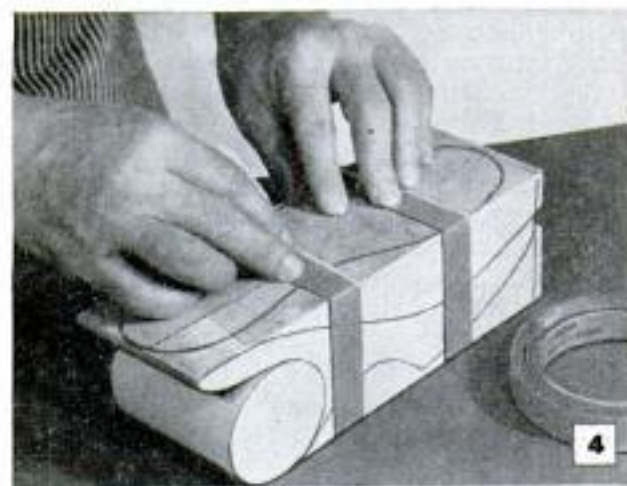


COMPOUND

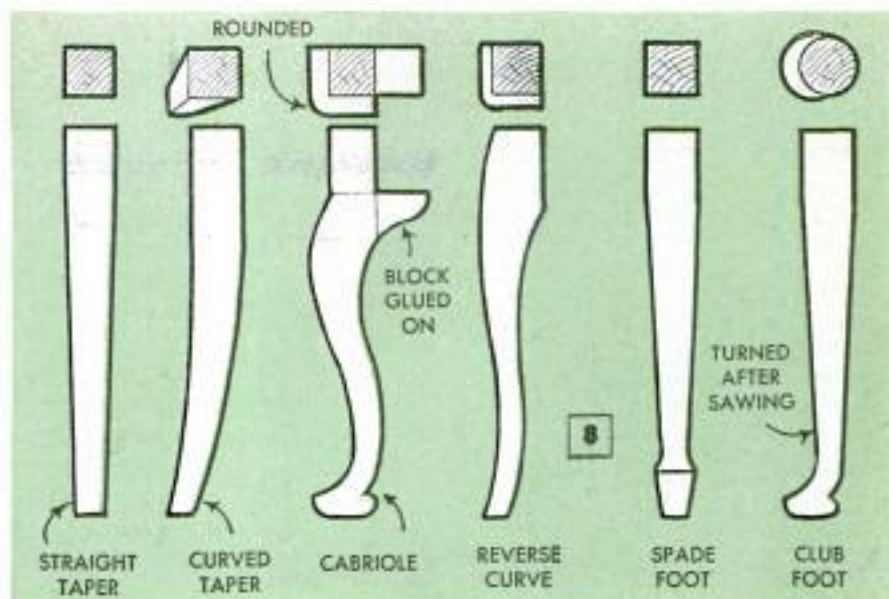
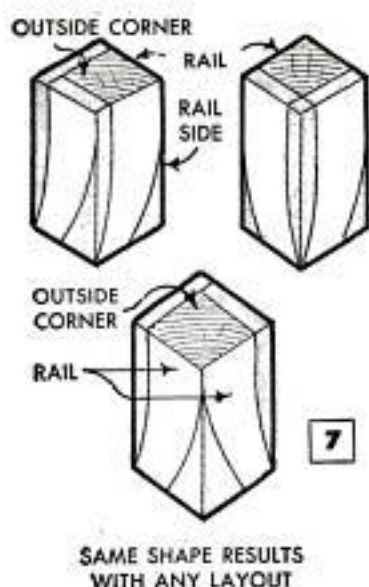
By Sam Brown

CURVED LEGS for tables, chests and chairs are rough-cut to shape by compound bandsawing. The procedure is fast, accurate and simple to carry out. The finished work has that certain professional look that delights the eye of the craftsman. Usually the work is three-dimensional, that is, to bring it to the required shape calls for bandsawing to profiles on two or more sides. A common example of this type of work is the cabriole leg, Fig. 8, but note also the number of variations possible, Figs. 2, 7 and 14, as well as those shown in Fig. 8.

The beach shoes, Fig. 2, are a good project to begin with, as these are shaped from small blocks on which the cuts are easier to control. To shape each shoe requires bandsawing the block on all four sides. The size is not given as this must be



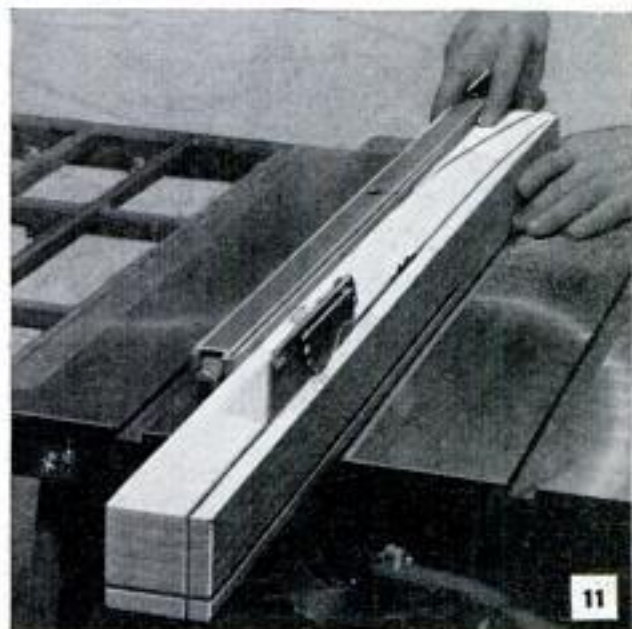
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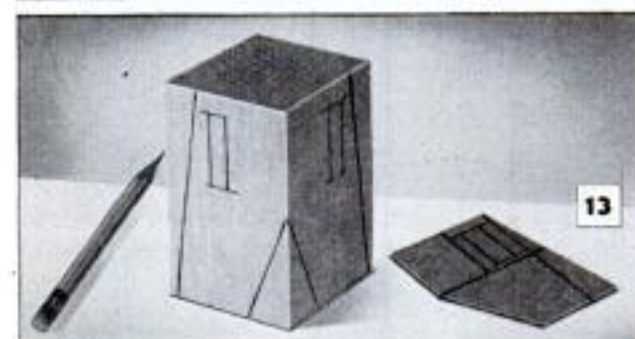
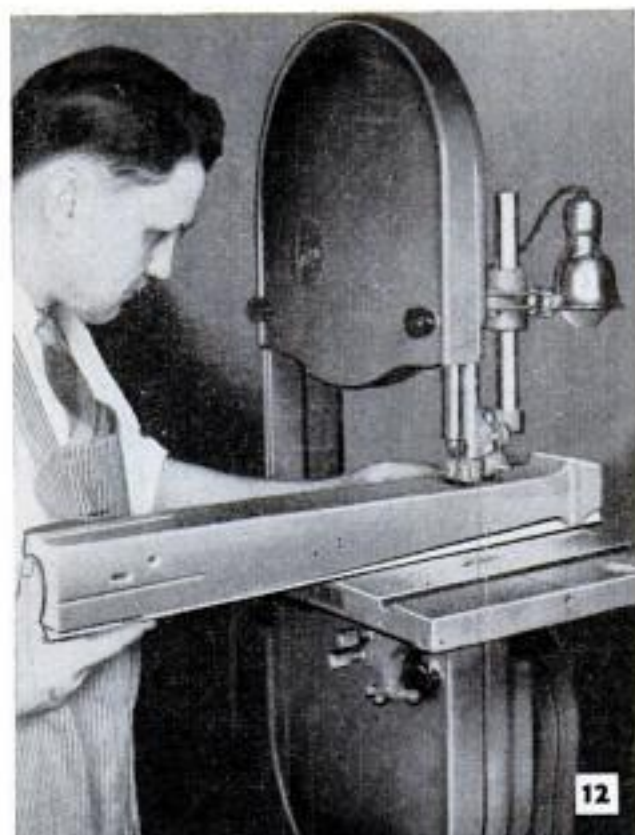


BANDSAWING

determined from the foot the shoe is to fit. Make cardboard patterns and lay out the cuts on three sides of the block as in Fig. 3. Figs. 1, 4 and 5 show how the shoe, or sandal, is bandsawed to the final shape, Fig. 6. Note in Fig. 1 that the waste is removed from the top and bottom of the block and also from the back, forming the heel. Then—and this is the trick—the waste pieces are replaced and taped in position so that the pattern lines previously marked on the stock are in register, Fig. 4. The bottom waste piece, the removal of which forms the "sole" of the shoe, is bandsawed in two separate cuts, the first cut running in from the toe to the instep. Then the blade is backed out of the cut, entered at the heel and run across the instep until the two cuts meet. This removes the waste piece intact so that it can be taped in position as in Fig. 4 to give a flat bearing surface on the machine table when making the final cuts on the sides of the block as in Fig. 5. If care is taken to make smooth cuts, very little sanding will be required to remove the saw marks.

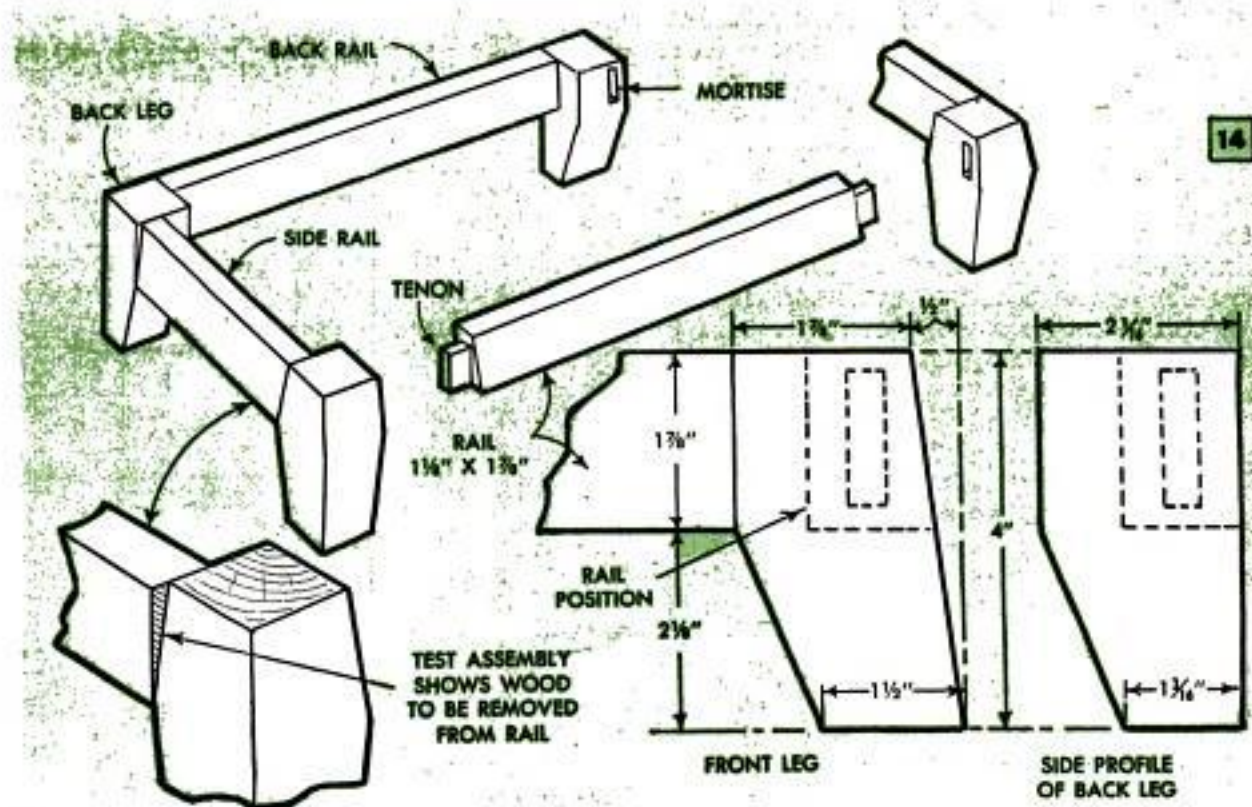
Two variations of the curved, tapered leg are shown in Figs. 7 and 8, the shorter one, Fig. 7, being suitable for a stool or chest of drawers, the other for a lamp table, Fig. 9. Both lengths can be bandsawed, but it will save some finishing time if the straight portion of the leg is cut on the circular saw as in Fig. 11. Make a cardboard pattern of the curved section of the leg and lay out as in Fig. 10. Note that a vertical mark is made across the width of the stock at the end of the pattern. Then cuts are run with the circular saw on two





faces of the stock as in Fig. 11, the cuts stopping at the mark. To prevent running the circular blade into the curved portion, make a witness mark on the saw table. When the marks are in register stop the cut and finish the curved section with the bandsaw, taking special care to keep the cut smooth so that it meets the straight cut without leaving a shoulder which is difficult to finish. Use the same procedure in making all four legs. The short leg, Fig. 7, is quite simple to make in various forms and degrees of curvature. The shape must, of course, be bandsawed as there are no straight cuts.

The straight-tapered leg, Fig. 8, is a circular-saw job, but it can be handled on the bandsaw by replacing the waste pieces in the manner already described. By making an allowance on the pattern the tapers can be smoothed up on the jointer after bandsawing the four faces. The reverse-curve and spade-foot legs are bandsaw jobs, Fig. 12, and all saw marks must be removed by a thorough sanding with several different grades of paper from medium coarse to fine. Care should be taken when sanding the legs not to alter the shape. All corners should be slightly rounded. The club-foot leg, Fig. 8, often is made in two forms, one full-round as shown, the other rounded from the square only about one third its length. In either case, a part of the job is done on the wood lathe. The club foot is bandsawed to the rough form and then finished by offset turning in the lathe, or by hand with rasps and sandpaper.



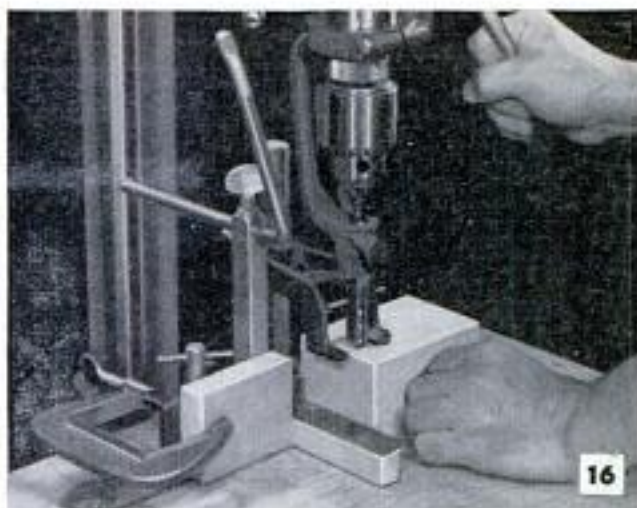
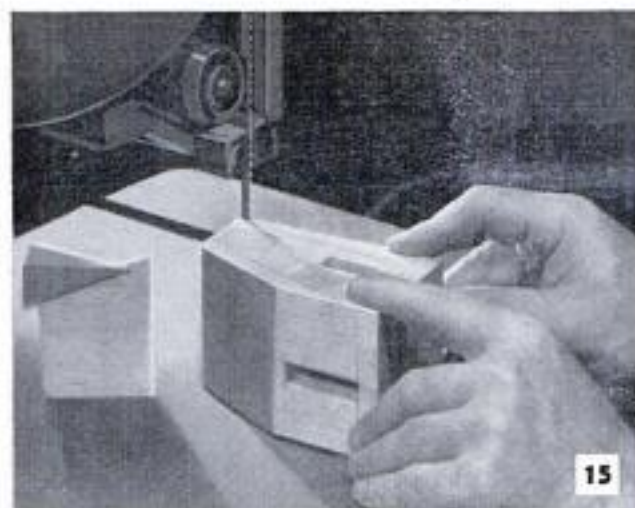


Fig. 8 details an assembly of the short, or stub, leg on which the tapers are straight from end to end or, as in the partial-assembly view, having two tapers starting from a point near the center. These are laid out as in Fig. 13 and bandsawed as in Fig. 15. When an assembly of this type is to be used to support a chest of drawers or other furniture that is normally placed against a wall, the back face of each back leg should be straight as in the side profile, Fig. 14. The straight leg permits the piece to stand

closer to the wall. This shape of the back legs also simplifies construction.

All work necessary to the joining of the leg to the rails or other part of a structure, such as mortising, Fig. 16, should be done while the stock is still in the square. This assures accurate joinery, which in some instances might not be possible after the leg is sawed to form. Legs reduced by bandsawing to small cross-sectional size, such as those on the lamp table, Fig. 9, should be made of hardwoods. ★ ★ ★

Glass Jar on Pencil Sharpener Enlarges Shavings Capacity



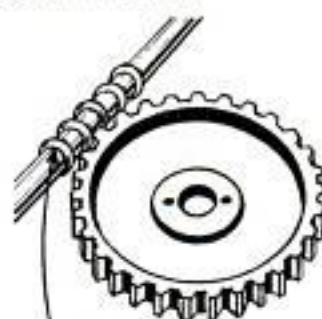
If you are tired of frequently emptying shavings from a much-used pencil sharpener, enlarging the shavings capacity will solve the problem. Cut off the bottom of the sharpener case, leaving about $\frac{1}{4}$ in. projecting that can be bent up for flanges.

Next, cut an opening in a screw-type lid from a fruit or mayonnaise jar to receive the sharpener case. Fit it into the opening, bend up the flanges and solder them to the lid. When finished, simply screw on a glass jar to provide a transparent, large-capacity shavings receptacle.

Ronald L. Ives, Williamsville, N. Y.

Wire Wound Around Shaft Substitutes for Gear Worm

When a small worm is needed for a worm-and-gear on a toy or model, and no machining facilities are available, the worm can be made by wrapping a helix of steel wire on a suitable shaft. Use wire of a diameter that



WORM FORMED FROM WIRE SOLDERED TO SHAFT

will engage properly with the worm gear. Form the helix on a shaft slightly smaller than the one to be used, so the helix will fit snugly on the larger shaft. Clean the shaft thoroughly, after making sure all points of the wire touch the shaft, then solder in place. Operation of the gear will depend on neatness of soldering job.

Fan Ventilates Haymow



Dust caused by dropping baled or loose hay when filling a haymow can be dissipated and the workmen cooled in the hot mow by use of this homemade fan. It is merely a $\frac{1}{4}$ -hp. electric motor with fan blades mounted on the shaft. The fan should be mounted where it can pull clean air from outside the barn—in this case at the top of the hay chute—and high enough to clear the workmen's heads.

Router Bit for Home Workshop Made From Broken Drill



A wood router for small jobs can be made by modifying a broken drill bit. Simply grind the end of the bit at right angles to its length. A $\frac{5}{16}$ -in. drill is about right for the average job. The router bit works best when used in

a drill press, but a hand electric drill can be used.

Charles H. Hardy, Los Angeles, Calif.

Flashing Compound Replaces Lead In Emergency Drain Repair

In an emergency, when no plumber was available, one homeowner replaced a leaking drainpipe that ran from a sink to a cast-iron soil pipe and used flashing compound in place of lead to make the connection. (Although the flashing-compound joint will last for a time, you should have a professional plumber lead the joint as soon as possible.) The old lead was drilled and chiseled out, then the new drainpipe

was fitted into the bell of the soil pipe. Oakum was calked around the pipe which was centered in the bell. The flashing compound then was carefully packed into the joint on top of the oakum. If no oakum is available, a piece of rope or heavy cord or, in an extreme case, strips of cloth could be utilized. The oakum prevents the flashing compound from entering the soil pipe.

Arthur Richards, Belleville, Ill.

Shellac Brings Out Beauty Of Unfinished Wood Surfaces

A long-lasting protection for unfinished wood surfaces can be provided by applying one or two coats of shellac. An occasional wiping with wax will assure a smooth, attractive finish indefinitely. The clear shellac brings out the natural beauty of the grain of the wood, but attractive effects can be produced by staining the wood before applying the shellac.

Shellac Information Bureau.

Forked Tops on Wooden Poles Support Wires Over Road

During the construction of a high-voltage electric line, public crossings were protected from the hazards of falling charged wires by wooden poles fitted with forked tops. A pole was located under each wire on both sides of roads, highways and other thoroughfares. The poles were removed when the construction of the line was complete.—Grover Brinkman, Okawville, Ill.



MOUNTING LATHE CHUCK

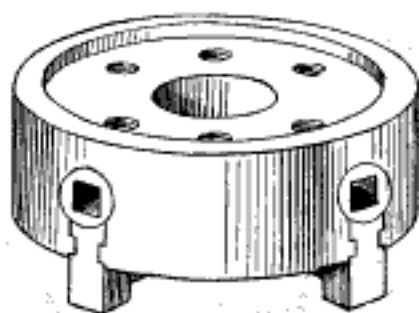
By C. W. Woodson



S MALL LATHE CHUCKS of the three and four-jaw types generally are furnished threaded to fit the lathe spindle, the threads being cut in the chuck body. However, intermediate sizes of chucks usually come with the back recessed for a separate back plate, or chuck plate, which must be machined to fit the recess in the chuck body and then fastened in place with cap screws. Threaded and shouldered chuck plates are available for those who wish to do their own fitting. Or, if desired, the owner of a lathe can go a step farther by making the wooden pattern, having the plate cast in gray iron and then doing the entire machining work himself. The complete job is an excellent exercise in foundry and machine-shop practice for schools.

If a wooden pattern is made, be sure to make the correct allowances for shrinkage of the casting. Keep in mind that the rough casting must be oversize to permit machining both the hub and periphery to the required diameters.

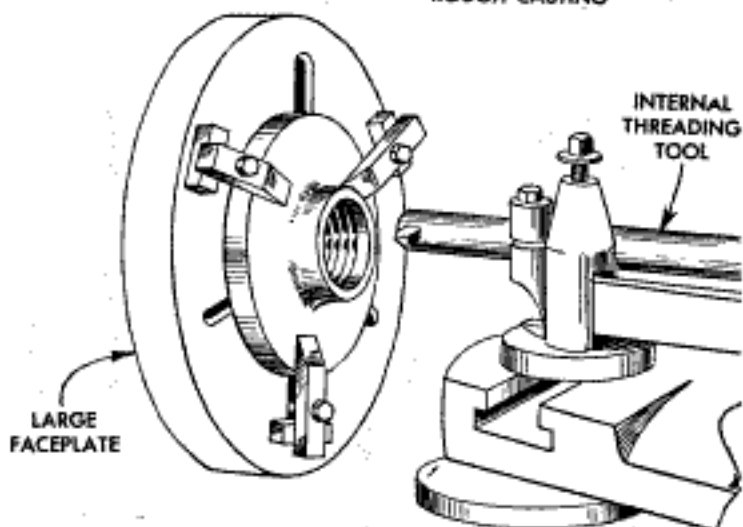
When machining the casting, it's



CHUCK WITH
RECESSED
BACK



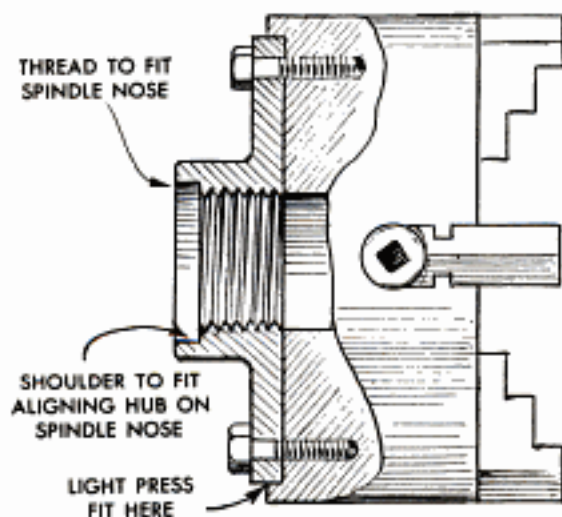
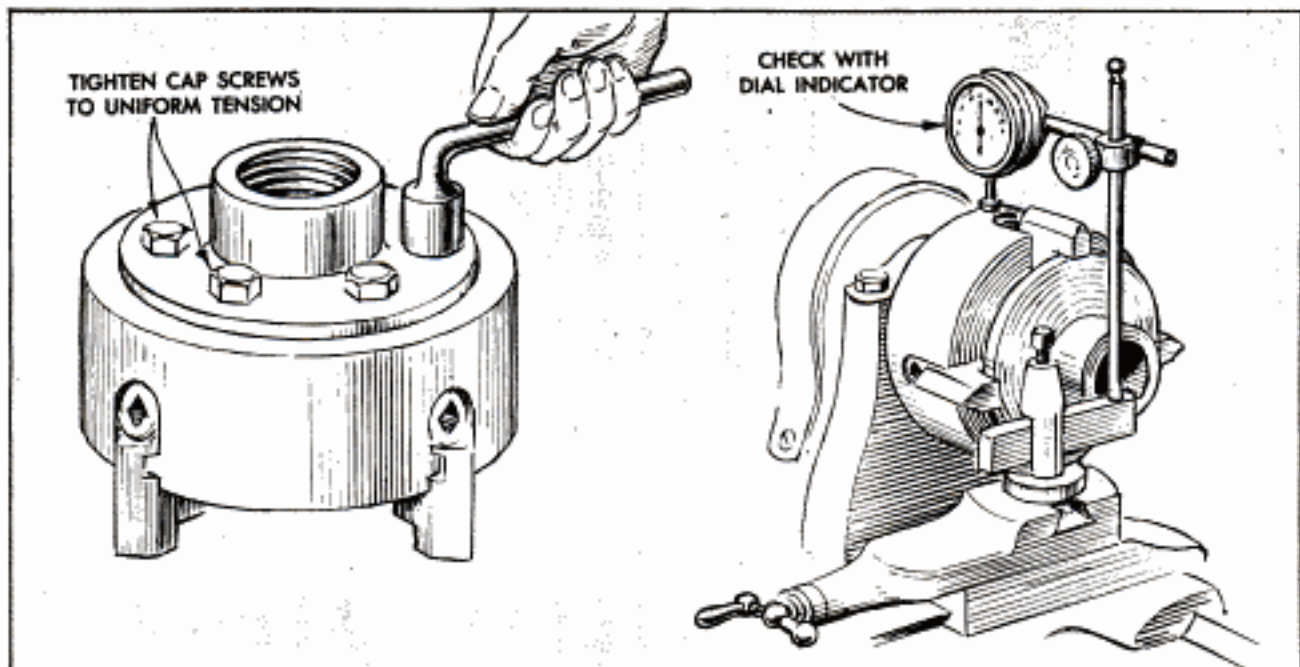
ROUGH CASTING



LARGE
FACEPLATE

INTERNAL
THREADING
TOOL

THREADING
BACK PLATE



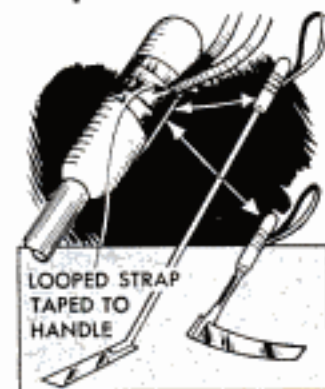
the usual practice to mount it on the faceplate as in the lower right-hand detail, preceding page, and shoulder the hub to fit the aligning flange on the spindle nose. Then face off the outer end of the hub. Next, cut internal threads to fit those on the spindle nose, making sure beforehand that the threading tool is correctly ground. Now, remove the faceplate from the spindle (the work should not be removed) and check the threaded hub for fit on the spindle. It should run onto the spindle nose easily and shoulder up tightly. If the fit is satisfactory, reverse the faceplate, replace it on the spindle and break (chamfer) the inner and outer corners of the hub end about $\frac{1}{32}$ in. This will remove the sharp edge left by machining and prevent injury to the hands. Although not necessary, some machinists prefer to finish the hub and back face of the plate and machine a fillet at the point where the hub meets the back face.

Now, remove the partially machined plate from the faceplate and screw it onto the spindle. Place a few drops of light oil

on the threads and the outer end of the hub to prevent any tendency of the plate to "freeze" onto the spindle under pressure of the turning operations yet to be done. Measure the diameter of the recess on the chuck body. Note from the lower detail at the left that the plate must be a light, press fit in the recess. This calls for an accurate measurement. Set the lathe tool and machine the plate to the required diameter. Break the corner about $\frac{1}{32}$ in. and then face off to a flat, fully machined surface. The surface should project about $\frac{1}{16}$ in. beyond the end of the spindle nose when the plate is run up tight on the spindle.

Next, locate and drill holes for the cap screws which hold the back plate in place in the chuck recess. Tighten the cap screws to a uniform tension, using a torque wrench if available. Then mount on the spindle. Test with a dial indicator as in the detail. If the machining has been done correctly, the chuck will run true. ★ ★ ★

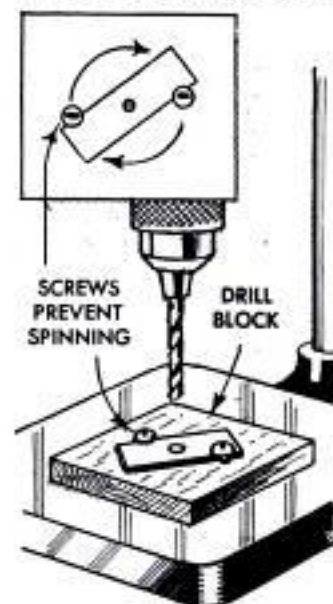
Looped Strap on Weed Cutter Helps Prevent Accidents



A narrow leather belt can be used for the purpose.

A wrist strap taped to the handle of a weed cutter or grass hook will prevent injury to a bystander in the event that the tool should slip from the user's hand. The loop should be large enough to permit free wrist movement.

Drill-Press "Vise" Improved With Block and Screws

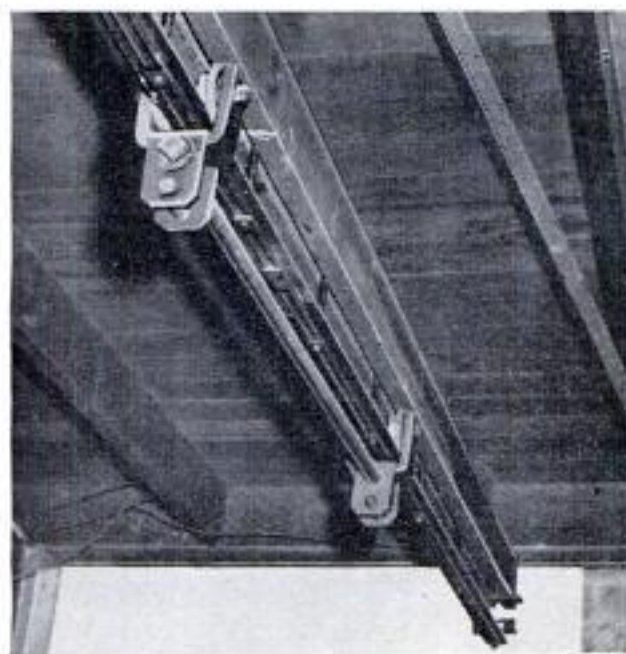


An emergency "quick-action vise" for holding small sharp-edge parts when using a drill press consists of two round-headed wood screws driven into a block of wood. The screws are located as shown in the detail so the rotation of the drill forces the work against them. The drill block now can be held by hand or, for greater safety and ease

of operation, clamped to the drill-press table. For a production job, two bolts could be screwed into holes drilled and tapped in a steel plate.

Extra-Long Carrier in Farm Shop Utilizes Parts of Hay Hoists

Brackets and wheels from two hay-hoist carriers connected by a cross pipe are used to provide the extra-long carrier on the overhead track in one farm machine shop. A hoist or falls hooked to each end of the carrier provides twice the hoisting power when lifting heavy objects such as a tractor engine. The overhead track consists of several sections of hay-carrier track. The ceiling joist that carries the track has a supporting beam bolted to both sides to hold the weight imposed by the two hoists.



APRIL 1955



Trough Dragged Behind Truck Distributes Drain Tile

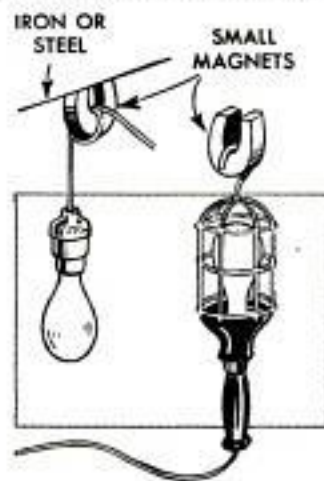
One way to simplify the distribution of drain tile alongside a ditch is to construct a V-shaped trough which, when dragged along behind a slow-moving truck as shown, provides a chute for lowering the tile to the ground. Consisting of two planks nailed together, the trough is left open at one end while a board wide enough to hook over the truck endgate is nailed to the opposite end.

Oily Rags Stored Safely

Rags soaked with paint, oil or solvents around the home or farm workshop can cause spontaneous-combustion fires if left in the open, thrown in corners or stored in a closet. However, they can be stored in a discarded kitchen canister safely. The canisters have tight-fitting covers which eliminate the hazard that is always present when the rags are left uncovered. A potato-chip can also makes a good storage container.

Extension Cord Hung From Magnet

When an extension light is used under machinery, tanks or other large objects having iron or steel surfaces on which it is difficult to hang the light, use a small, extra-strong magnet. A cage-end extension is simply hooked through the legs of the attached magnet, while a plain bulb and socket can be suspended by wrapping a turn of the cord around the end of the magnet in the manner shown.



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SHOPPING FOR



1. ALL-METAL SAWHORSE folds into a compact unit for handling and storing. Stands firm on uneven floor, due to flexible design of the frame. Weighs only 10 $\frac{1}{4}$ lb. Has a rated capacity of 500 lb. Top of frame has wide, flat surface to support load firmly. Frame is 42 in. long. No parts removed when folding
Federal Aircraft Works, 3656 N. Washington, Minneapolis 12, Minn.

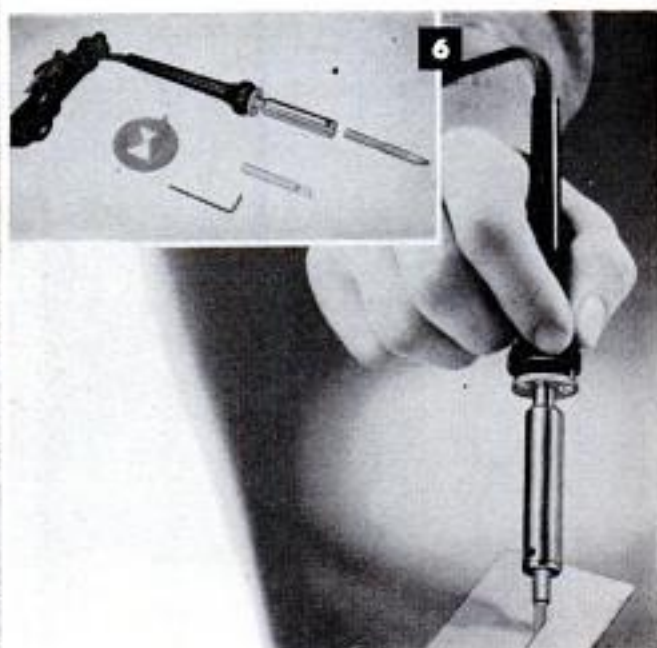
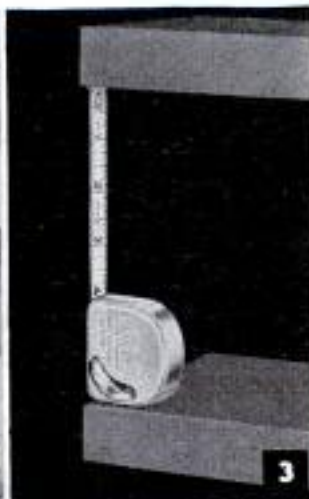
2. NAIL DRIVER is especially suited to starting and driving small nails and brads that are difficult to grasp. Prevents injuring fingers when starting nails in difficult-to-reach places. Nails also can be started where it is impossible to reach the nailhead with hammer. Easily carried in the pocket
Freeman & Co., Box 132, Brookline 46, Mass.

3. DIRECT-READING RULE for in-between measurements has a window in the housing, enabling user to read the precise measurement from an indicating pointer. Rule has clear black graduations and numbers on a white-enamel surface. Self-adjusting hook at end of rule gives exact outside measurements
Stanley Tools, 111 Elm St., New Britain, Conn.

4. BIT GAUGE is designed to mount on the shank of auger bits of various sizes. Has adjustable depth gauge which is locked in place by turning a thumb-screw. There are no loose parts to become lost. Won't mar the surface as spring-loaded depth gauge bends if boring continues after gauge contacts work
Stanley Tools, 111 Elm St., New Britain, Conn.

5. INDICATING MICROMETER is read direct from an indicating dial having a range of 0-1 in. in thousandths. The indicating mechanism controls the measuring pressure, eliminating all possibilities of error due to variations in finger-tip feel. Carbide anvils are standard. Comes in sizes up to 4 in.
George Scheer Co., Inc., 200 Lafayette St., New York City 12.

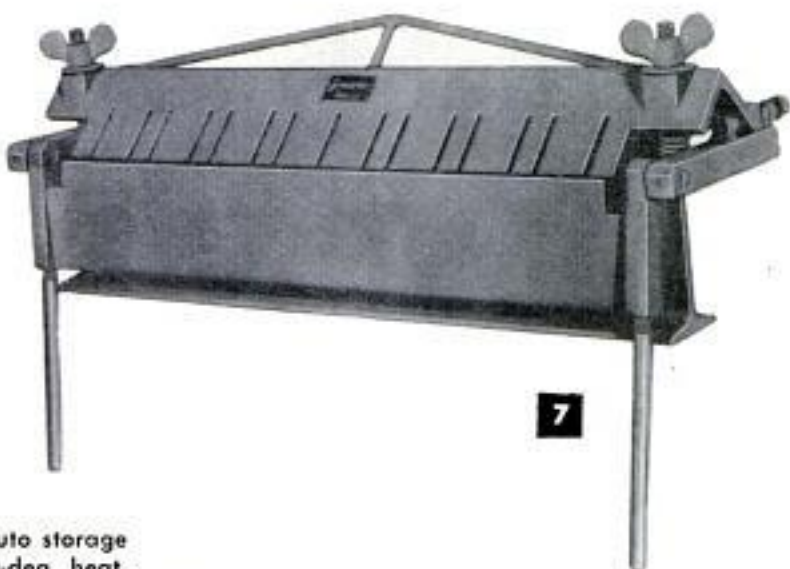
6. PLASTIC-TILE CUTTER is thermostatically controlled to maintain a uniform temperature at tip. Cuts plastic tile in any direction, square across, miter, or short-radius curves for fitting around fixtures. Heating element is designed for continuous use. Comes with interchangeable cutting and soldering tips
Garden City Industries, Inc., 910 W. Jackson Blvd., Chicago 7.



TOOLS

7. SHEET-METAL BRAKE handles 22-ga. mild-steel sheet to a maximum width of 24 in. A novel feature of this small unit is the slotted beam, or clamping member, which makes it possible to bend boxes and shallow forms to a depth of 1½ in. Slots are spaced so that boxes or trays up to 24 in. long can be made. All required adjustments are provided

W. Whitney Stueck, Inc., Old Saybrook, Conn.



7

8. PLIER-TYPE SPOT WELDER works off auto storage battery of 6 to 12 volts. Generates 2000-deg. heat. Work to be welded or hard-soldered is inserted between carbon electrodes which form jaws. Current is turned on by means of a switch located in one of the handles. Makes strong, industrial-type weld

Tip Top Electric Products Co., 1440 Broadway, New York City 10.



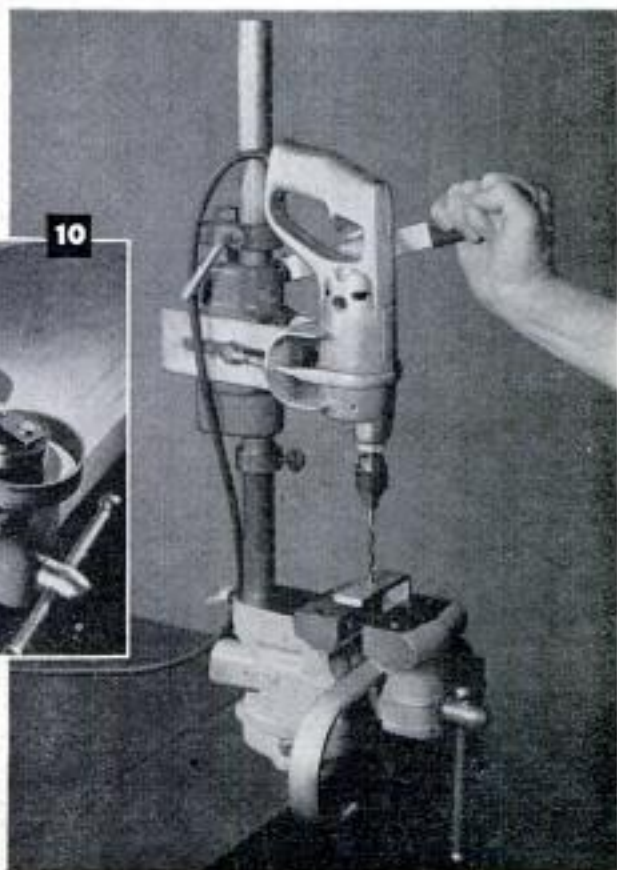
8

9. OPEN-END WRENCH has ratchet head which gives greater flexibility when tightening or loosening nuts and screws. Ratchet also permits a variation in location of head with relation to handle when it is necessary to get into tight places. Ratchet-type wrench heads are available in several sizes

Adam Machine Tool Co., Ltd., 4 Grange St., St. Albans, Herts., England.

10. METAL-FORMING UNIT is designed to meet the needs of home craftsmen and school shops. Consists of three parts, a special swivel-base vise, a bender for flat, round or square stock and a drill stand having a universal-type holder that will take any ¼-in. electric drill. Setups are made as pictured

Swayne, Robinson & Co., Richmond, Ind.



10



9

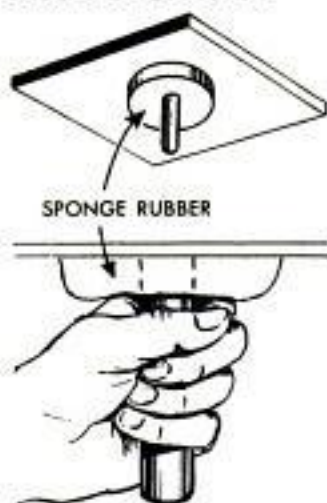


Automatic Poultry-Feed Mixer

Mixing 1200 lb. of poultry feed at one time requires only $\frac{1}{2}$ hr. in an automatic mixer built by a Florida poultryman. The mixing box, constructed of heavy lumber, is a 44-in. cube. Thorough agitation of the feed is assured by running the mixer axle diagonally through the box from one upper corner to the opposite lower corner. Power for the mixer is furnished by an electric motor through a set of gears that reduces the rotating speed of the box to 3 r.p.m. The motor switch is controlled by a timer to run for 30 min.

S. R. Winters, Orlovista, Fla.

Sponge-Rubber Pad on Hawk Cushions Hand



Hand comfort can be provided on a plasterer's hawk by gluing a thick ring of sponge rubber to the underside around the handle. Waterproof linoleum cement can be used to cement the rubber in place. Sponge rubber of the kind used for kneeling pads is suitable.

Repairing Split in Wooden Column

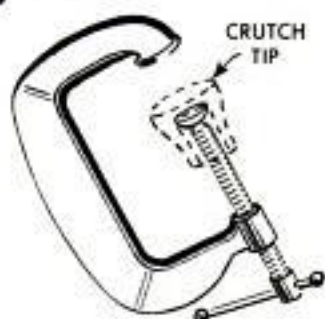
A split in a wooden porch column that is beginning to show signs of rot can be repaired and protected against further damage by filling it with wood putty. The rotted portion of the wood should be cut

or chiseled back to sound wood. Fill the crack with putty, building it up above the surface of the column. If the crack is quite wide, build the putty in from the sides, permitting each coat to dry before applying the next. When thoroughly hardened, file and sand smooth. Then paint to match the rest of column.

Bureau of Industrial Service, Inc.

Crutch Tip Over C-Clamp Jaw Prevents Marring Work

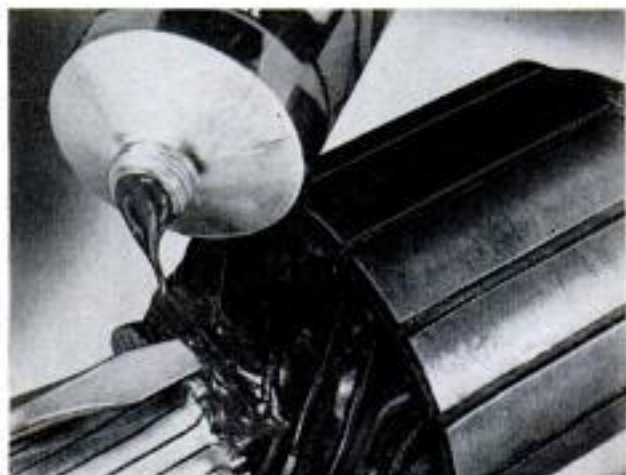
To reduce the juggling required to place a protective pad under each jaw of a C-clamp when tightening it on work that must not be marred, use a rubber crutch tip. With the tip fitted over the movable jaw of the clamp it becomes a fairly simple job to slip a protective pad under the fixed jaw while turning the clamp screw.



Overheated Generator Repaired With Aid of Gasket Cement

It sometimes is possible to salvage the armature of an automobile generator that has been overheated to a point where some of the insulation has burned off the wires and the soldered connections have been melted. First, each loose wire should be resoldered to its commutator bar. Next, spread the bared wires so they do not contact each other. The wires now can be both insulated and cemented in place by pouring hard-setting gasket cement over them. Force the cement down between the wires and smooth it off with a piece of wood, cardboard or the end of a screwdriver blade, being careful not to move the wires or break the connections.

Ed Packer, Oak Park, Ill.





brings you the **HOTTEST** news in



SPARK PLUGS



Exclusive BUTTRESS-TOP insulator design!

1 Provides a longer path of resistance to electrical leakage than any other make of spark plug. This is the much discussed electrical "flashover" length. Under unusual dirt or moisture conditions, this buttress-top design greatly reduces "shorting" or "flashover."

Exclusive COPPER-GLASS seal!

2 In AC Spark Plug manufacture the center electrode is sealed in the insulator by a *patented* copper-glass seal. This seal, comprised of powdered copper and glass, heated and compressed, is gas-tight, and the mechanical bond is more than equal to any condition of use. The seal is resistant to heat shock and vibration far beyond normal plug life.

Exclusive HOT TIP feature!

3 Not only did AC develop the modern ceramic insulator material that outmoded porcelain—AC engineers found a way to form this material into long, thin, recessed insulator tips. These tips heat up faster to burn away combustion by-products that would foul ordinary plugs. The HOT TIP plug is an AC exclusive.



AC SPARK PLUG DIVISION
GENERAL MOTORS
CORPORATION

GM and AC means continued leadership

Pictures that make your hobbies leap to life!

Every camera owner with a workshop or a studio or an out-of-doors hobby sooner or later brings his lens to bear upon it. It just seems the natural thing to do—to record photographically for his own pleasure or to exhibit to others the boat he has built, the track layout he has designed or maybe just the new paint job on the family garage!



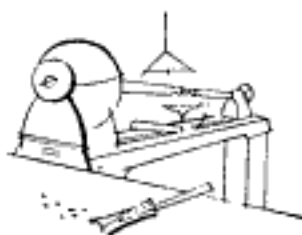
stereo snapshots of the family, of vacations and of travels will be enjoyed as family snapshots have rarely been enjoyed before.

Today's stereo photography is nothing at all like the crude product of earlier days. To begin with, we have the magic medium of Kodachrome transparencies whose rich hues are viewed by transmitted light. But equally important is the new Kodak Stereo Camera—described on the next page—which has brought both an ease and a precision to stereo picture-making which will delight anyone who enjoys equally a fine piece of mechanism and the perfection of the work it can do.



But now, something new has been added—the revealing and exciting realism of 3-dimension photography called *stereo*. If that new HO-gauge passenger train looked good in an ordinary snapshot, stereo makes it seem to leap to life. A gardenful of vari-colored blooms becomes so real you feel you're standing in the very midst of them. Those who make and enjoy Kodachrome slides will get a special thrill out of stereo. For in three dimensions the already magical effect of Kodachrome's rich and lifelike color is multiplied many times over by an utterly new and satisfying kind of realism.

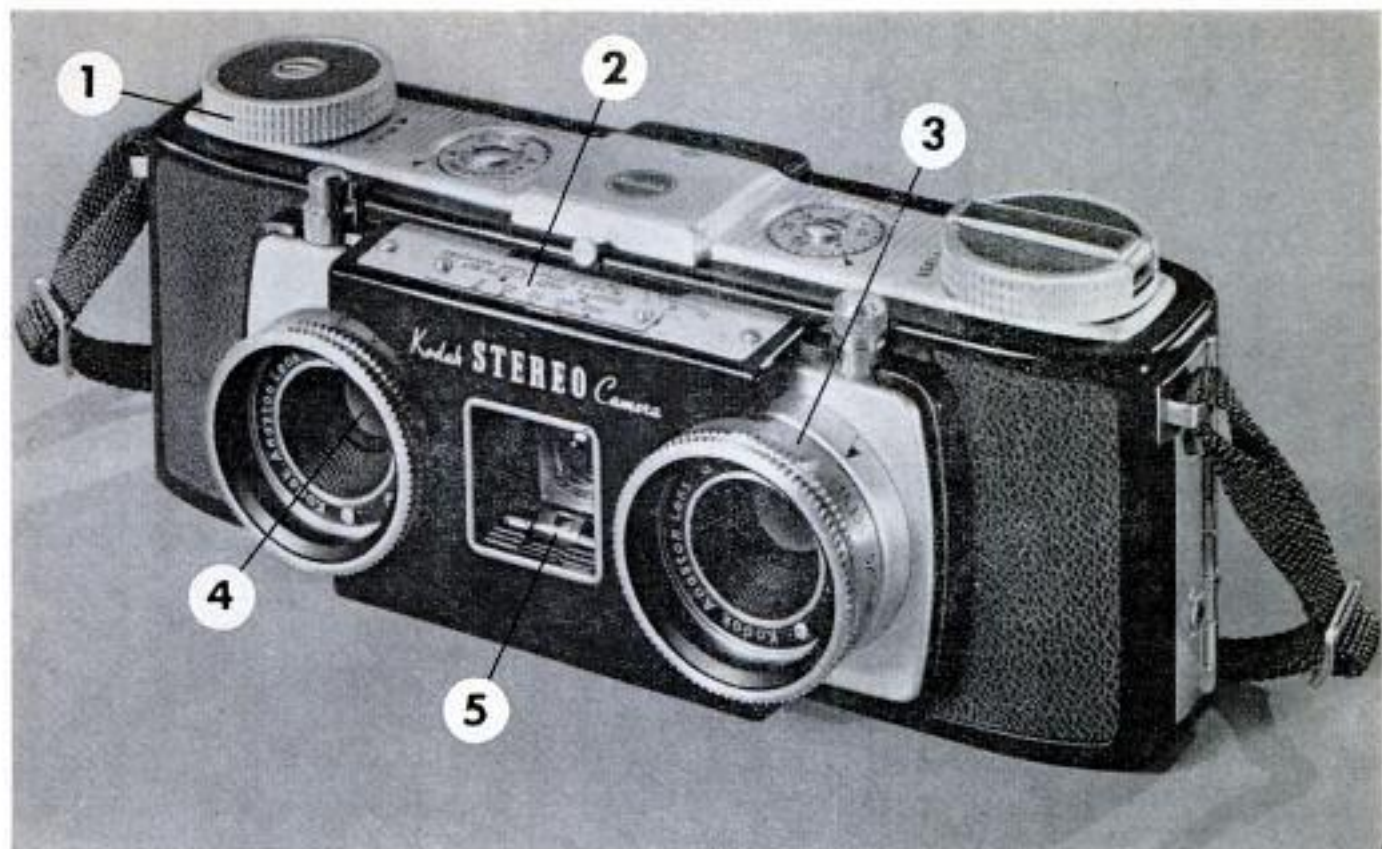
To the hobbyist looking for a new twist to add to his favorite avocation—whether it's making things or doing things—the recording of it in full-color stereo is guaranteed to add some real zest. And for exactly the same reasons,



Supplementing the camera are Kodak's two superb stereo viewers, which make Kodachrome images sparkle as never before; and, of course, they provide the optical precision by which stereo seems to lift you right off your chair!



Kodak dealers are pretty enthusiastic about this Kodak stereo equipment. The one you deal with can show you some of the exquisite results you can expect with it. They'll be pictures worth walking several blocks to see—Kodachrome transparencies which seem to draw you right out into three-dimensional space. The first thing you'll think of is what Kodak Stereo can do for the pictures *you* especially want to take. And you'll be right. They'll be wonderful!



The Kodak Stereo Camera only \$84⁵⁰

Probably the easiest-to-use precision camera you've ever had your hands on. Its designers thought of *everything*. It is beautifully balanced and its controls are so nicely located you can make finger-tip adjustments without changing your grip on the camera itself. Workmanship is really fine—the kind that makes an owner pretty joyful with his purchase. Here are operating details:

(1) Quick, simple loading. Lay film in position, close cover, wind. **(2)** No trick to exposure. Set shutter speed—selector automatically sets lens opening as you move pointer to light condition—"Bright," "Hazy," "Cloudy-Bright." **(3)** Zone focusing—Set scale on lens for "Close-Up," "Group," or "Scene," and lenses are quickly focused. Usual distance scale provided, too. **(4)** Matched, Lumenized *f*/3.5 lenses for sparkling color slides. Accurate shutter with speeds to 1/200; synchronized for all popular midget lamps. **(5)** Scopesight viewfinder. Precisely centered, frames subject exactly as you'll see it in picture. Spirit level shows when camera is exactly horizontal. Other automatic features include film advance which prevents

double exposures, stops at next picture, counts each exposure, cocks shutter. And the price, \$84.50, is extremely moderate for a precision stereo camera.



Kodaslide Stereo Viewers

Model II (above, right) has fine 2-element lenses; brightness control; focusing knob; adjustable eyepieces; plugs into house circuit. \$23.75. Model I has single-element lenses; focusing knob; adjustable eyepieces, is battery operated. \$12.75.

Kodachrome Film (K335 for daylight, K335A for indoors) is especially designed for stereo cameras. Takes 20 standard 23 x 24mm stereo pairs; is returned mounted, ready for viewing.

Prices are list, include Federal Tax where applicable; and are subject to change without notice

Kodak
TRADE-MARK

Eastman Kodak Company, Rochester 4, N. Y.

Care and Feeding of Engines



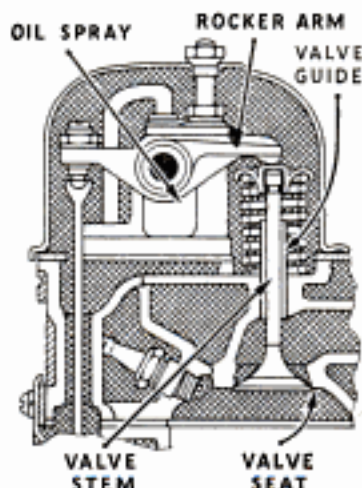
BY
S. P. CORP

VALVE GUIDES VS. OIL CONSUMPTION

A worn intake valve guide can cause excessive oil consumption as oil seeps down between valve stem and guide on the intake stroke of the piston. A worn exhaust valve guide allows valve to cock over, causing valve burning and possible loss of compression.

In valve-in-head engines, check the spray of oil that lubricates rocker arm to see that it does not spray out over intake valve stems, as oil would then be drawn down past valve guides by the vacuum created on the intake stroke. As guides wear, this condition becomes worse and can cause oil waste.

To check wear on valve guides, use a new valve to check clearance between valve stem and guide. In most engines, valve guides can be replaced. Some engines have cast-in valve guides which can be reamed to oversize, after which valves with oversize stems are used.



OTHER OIL WASTE POSSIBILITIES

Every mechanic knows worn piston rings waste oil. When you re-ring with factory-seated KromeX Ring Sets, the improvement is immediate. Other oil-wasting spots may be (1) a damaged vacuum diaphragm in fuel pump, requiring replacement; (2) oil filler cap placed with opening at front; turn it to rear, away from blast of fan; (3) valve cover, oil gallery plugs, or oil pan gasket. To find whether a leak is at rear of engine or front of transmission, add $\frac{1}{2}$ teaspoon of oil soluble dye to oil in warmed-up engine, and let run until dye mixes with oil. Stop engine, clean underside of flywheel housing and transmission, and lay a clean sheet of paper below. Run engine at fast idle speed, then look at paper. Colored oil shows an engine leak. Uncolored oil indicates leak at front of transmission.

NEW FREE MANUAL

Send for this new free manual on car care, "Care and Feeding of Engines," which pictures and describes many operations you will want to know about. And when you re-ring, be sure to use Sealed Power KromeX Ring Sets. They break in fast, start saving oil immediately, and give sensational service. Sealed Power Corporation, Dept. G-4, Muskegon, Michigan.



Sealed Power

PISTON RINGS

Clinic for Homemakers



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.

Lawn Edging

Q—During the past several seasons it has been my practice to edge my lawn along all the walks, using a regular edger and cutting about 2 to 2½ in. deep. I like the appearance of the lawn after the job is done, but I'm told that this is detrimental to the grass, provides a lodgement for weed seeds and a ditch for running water during hard rainstorms. The question is, to edge or not to edge a lawn?

—N. K., N. J.



A—Many seem to feel that neat appearance makes edging of the lawn along walks and driveways worth the time and labor involved. However, a good edging does provide an ideal foothold for weed seed and where the opening is continuous down a slope it may be the cause of considerable lawn damage due to washing. The most serious damage resulting from the practice of edging can occur during prolonged dry weather. During such a period the soil may dry out completely for a distance of a foot or more from the edge of the walk. Grass growing in the area withers from lack of moisture and may die out completely on the poorer soils. In some seasons only a heavy watering schedule can save it. For these reasons edging is not ordinarily recommended on lawns growing on light soils and in a location where subsurface drainage conditions remove surface water at a faster than ordinary rate. Also, on lawns growing on fairly steep slopes, edging is not advisable as both soil and plants may be carried away during heavy rain.

Early Garden

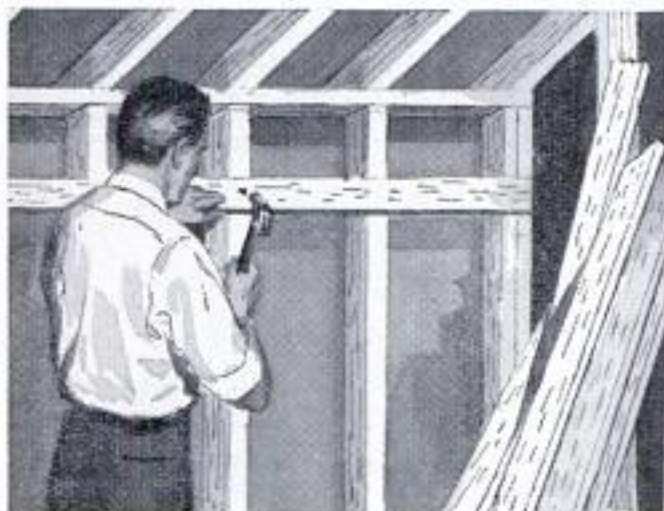
Q—I've been told that if you plant seeds of garden vegetables in a shallow trench late in the fall and then cover with straw you can have fresh vegetables as much as two weeks earlier than usual. I suppose the straw is removed early in the spring, about the time growth starts. Is this stunt practical on a small plot?—E. Y., Ohio.



A—Although the procedure has been carried out experimentally, it appears to have little to recommend it over regular planting schedules. In some

(Continued to page 226)

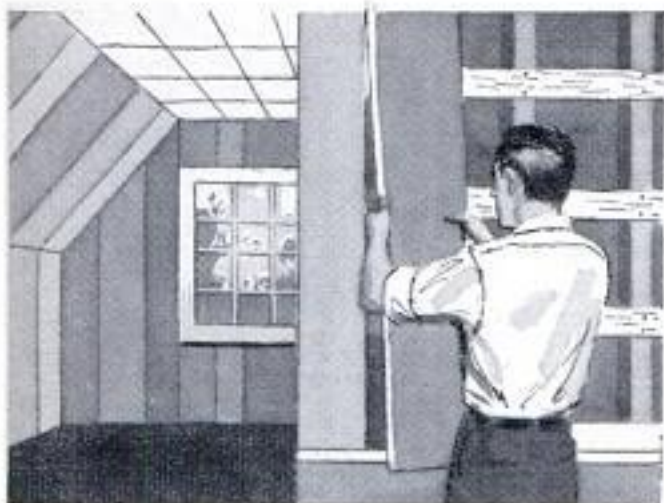
Add extra living space this easy, economical way



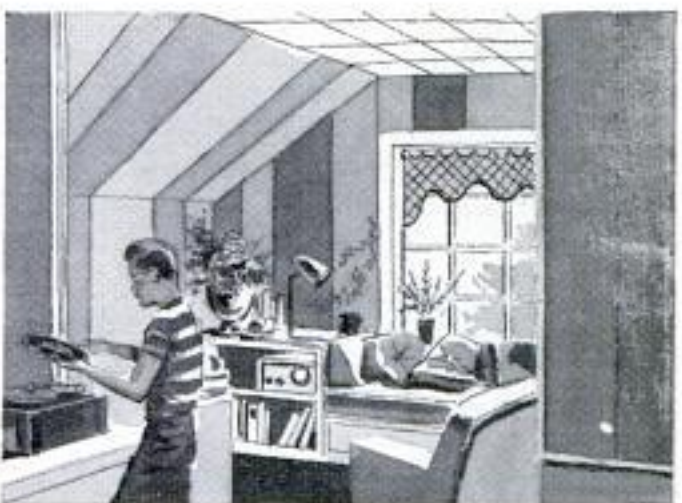
1. Do the job yourself. Start by framing unused space in the attic, basement, enclosed porch, or converted garage. Then provide a nailing base for the interior finish by nailing 1" x 3" wood furring strips at right angles to all framing members. Surface must be smooth and level.



2. Ceiling installation is easy with Armstrong Temlok® Tile. Temlok's Lok-Bevel* joint hides all nails or staples, assures neat joint lines, helps you do a really professional looking job. Pre-painted in Snow White or Light Ivory, Temlok comes with a smooth or noise-absorbing perforated surface.



3. Walls go up in no time with Armstrong Temlok Plank. The long, random-width planks are quickly nailed or stapled to the furring. Temlok Plank's attractive "Suntan Blend" adds permanent beauty to the room. Both Temlok Tile and Plank build, decorate, and insulate in one simple application.



4. Job's done in a day or two. Temlok is clean and fast to work with, leaves no mess, little waste. And there's no painting to do—once Temlok is installed the job is finished. Just add a few decorative touches and you'll have a comfortable extra room at remarkably low cost.

Get the full story on Temlok Tile and Plank and other Armstrong building materials from your local lumber dealer. He'll be glad to show you samples and give you help with your remodeling plans. For the free booklet, "New Ways to Remodel Your Home," write Armstrong Cork Company, 3704 Watch Avenue, Lancaster, Pennsylvania.

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Columbia-matics fit outside the window, just like ordinary screens, yet they go up from inside. They are the revolutionary new screening idea that saves you time and money and lets you say good-bye to old-fashioned screen troubles.

Columbia-matics are flexible, full length; need no side frames, just a top rail and spring-loaded bottom rail that holds screen tightly at all times.



Easily installed the first time—anyone can do it. They come in exact sizes, no fitting. All you need is a screwdriver. Rustproof aluminum® needs no painting, ever. Available with regular or Kaiser Aluminum Shade Screening.



Two patented tension locks anchor bottom rail securely to sill. Press down, they're locked. Flip up, screen swings free. No hardware on sill to snag clothing.

*Available with galvanized screening in certain western states.

Columbia-matics cost no more than ordinary screens. Millions now in use. Get the facts at your screen dealer's. Or mail coupon.

The Columbia Mills, Inc.
Dept. PM-4, Syracuse 1, New York
Send facts on Columbia-matics

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Address _____

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In Canada write: Cresswell Pomeroy, Ltd., Montreal 28

(Continued from page 224)

cases it is possible that initial growth would take place sufficiently early in the season to provide vegetables somewhat ahead of the normal time, as you have been advised. However, we doubt if the method can be made to produce consistently from season to season. Of course, it would be interesting as an experiment if one had the time and space. Probably in most average soils it would be best to plant small seeds not more than an inch deep and cover with sufficient loose straw to make a depth of 6 or 8 in. when it settles. This depth of packed straw will prevent the soil from freezing even in severely cold weather. All, or nearly all, of the straw must be removed early in the spring to permit the soil to warm quickly and germinate the seed. The hazards to early germination and growth should be obvious. Field mice may tunnel under the straw during the winter and destroy the seed. A late-winter or early-spring freeze may damage the seedlings beyond recovery if they sprout unusually early.

Packing Foods

Q—I recently purchased a freezer and I'd like to know more about packaging foods. The information I have seems confusing when referring to the types of containers to be used. Does one use metal cans in the freezer? Also there's something about allowance for expansion. How do I proceed?

—A. O., Colo.



A—The essential feature of most wrapping and packaging material used to protect foods when freezing is that it be as near moistureproof and vaporproof as possible, also that it be easy to handle and seal tightly. Some freezer owners pack certain foods in waxed cartons, such as milk and cheese cartons and seal them with a hot iron. Ordinarily foods that dry out (dehydrate) quickly are sealed in standard glass jars or in metal cans. Under ordinary conditions, very little, if any, rust occurs on metal containers in the freezer. However, when using containers made of materials that do not expand under pressure such as glass jars or cans, it is important to allow a head space of $\frac{1}{2}$ to 1 in. for expansion of the contents, which takes place during the freezing process. Ordinarily we do not recommend the use of glass containers for storing foods in a freezer. This is due to the danger of breakage and the possible scattering of fine glass particles among other foods stored in the freezer compartments. Metal containers are sometimes recommended for preserving the colors of certain fruits and vegetables. Plastic bags, made and sold for the purpose, are excellent. Sheets of aluminum foil are often recommended for wrapping dressed poultry, vegetables and any other item which is of irregular shape. The foil can be molded tightly to almost any surface. Meats must be kept cold prior to storage and special care should be taken to make sure that all wrappings and containers are scrupulously clean.

Prevent Putty From Hardening

Q—How does one keep unused putty from hardening? I've tried everything I know of and the stuff won't keep for any length of time in a usable condition. What does one do about it?—H. E., Calif.

A—Where you have use for only a small quantity at a time it's a good idea to purchase glazing putty in a metal container having a friction lid, or cover, similar to that of a paint container. Then after removing a small quantity, press that remaining in the container into a compact mass which is fairly level across the top and in contact with the sides of the container all the way around. Then cover with a disk cut from heavy oiled paper to a diameter which fits tightly into the can. Glazing putty stored in this manner should keep almost indefinitely when the friction lid of the container is forced on tightly. Another method is to pack the putty into a small glass jar having a screw-type lid. Before screwing the lid on, pour water over the putty to a depth of about $\frac{1}{2}$ in.

News About Glues

FOR "DO-IT-YOURSELFERS"

FROM UNITED STATES PLYWOOD CORPORATION
World's Largest Plywood Organization

NOW! A GLUE FOR EVERY "DO-IT-YOURSELF" PROJECT

Read all about these amazing "Wizards with Wood"

WELDWOOD® Plastic Resin GLUE

America's fastest selling wood glue. First choice of "pros" and amateurs alike. Highly water-resistant — stain and rot-proof. Strengthens as it ages. Thrifty — mix it as you need it . . . a little goes a long way! Many industrial woodworkers have relied on it for years. 15¢, 35¢, 65¢ and larger sizes.



ACTUALLY MAKES JOINTS STRONGER THAN THE WOOD ITSELF.



TRADE MARK

New! WELDWOOD CONTACT CEMENT

... now you can bond without clamps or presses



Revolutionary new adhesive! First it dries — then it bonds. And it grips instantly, permanently, on contact. No clamps or presses needed — not even a single nail! It's actually a wonderful new shop tool for you. Try it today. Also in handy tubes or bottles. 25¢, 35¢, 60¢ and larger sizes.

3 BIG USES:

1. To apply Micarta and other laminates in kitchen, bath, or to furniture.
2. To put up plywood panels without nails.
3. To make or mend 1001 things around home, shop, garage. Ask for leaflet.

At hardware, paint and lumber dealers

New! WELDWOOD PRESTO-SET* GLUE

Amazing new glue used everywhere to make or mend things

Bonds wood to wood, cloth to wood, wood to compo board. For scrap books, art object repairs, leather, shop work, hobbies, etc.

Perfected at last! A white liquid glue worthy of the Weldwood name. So easy to use, works so well in home, hobby or shop.



Because Weldwood Presto-Set Glue sets so fast (20 to 30 min. on soft woods—somewhat longer on hard woods), you can often complete a project in one session! Forms a powerful, lasting bond that does credit to any craftsman! Also available in jars. 25¢ & 45¢ tubes — pint and quart jars.

READY TO USE! SETS SO FAST! BONDS LIKE MAGIC!

And for a perfect finish — use these wizards with wood



SATINLAC®

... the modern way to get that natural finish on any wood. Gives a costly hand-rubbed look. Brings out and preserves the wood's full beauty.



FIRZITE®

... "WHITE" for woody blond or pickled effects (easily tinted). A "must" undercoat on fir plywood. "Clear" to tame that wild grain on fir plywood.

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FREE! HELPFUL LEAFLETS
Mail Coupon Now

Anyone Can Be a Frogman

(Continued from page 116)

only two cylinders of air and do not go below 120 feet you are quite safe.

Spear fishing with an aqualung is illegal in France. The commercial fishermen had complained that it was destroying their livelihood; and certainly the large fish are much shyer and scarcer than they were before the war. So we could watch only fish that we might discover. But there were plenty of other things to see.

The most spectacular places were the great undersea cliffs. The boat would anchor in some 40 feet of water on a bed of thick rushy *zostera* seaweed, like bundles of green ticker tape. We would go off together, a whole flight of divers, perhaps as many as 14, and sail over this plateau and begin dropping down the side of the cliff. The light would become dimmer and grayer as we floated down through shoals of tiny unconcerned fish and, at about a hundred feet, we would suddenly enter a layer of icy water. Here the face of the cliff would begin to be hollowed out by hundreds of small caves.

These caves are gardens of sponge and coral in a range of quiet and unearthly colors: Yellow sponges like spaghetti, fingers of orange and a beautiful purple-gray, black bath sponges and spreading eruptions of dark red, while from the roof hang branches of dark-brown coral dotted with tiny flowers resembling crystals of snow. These strange colors are the result of the dim greenish light at this depth, and if you take the purple-gray sponge to the surface it will turn to a sickly dirty pink. The coral will become bright red.

In a crevice of the cave you may see the whiskers of a shy crawfish and, with practice, you may be able to lure it out to be caught. Or you may see a moray eel staring at you with a beady eye, and backing into the shadows—or perhaps an octopus.

Some divers have learned to play with octopuses, and to charm them—decidedly an acquired taste. The most expert at this art is probably Robert Gruss, a thin and quiet publisher from Paris. He once showed me a large octopus, crouching under an encrusted grapnel, and I learned how he tempts the shy creature out and teases and caresses it until it falls into a sort of coma and no longer resists him.

Cousteau and many other experienced aqualung divers maintain that octopuses are actually timid, harmless creatures and no danger at all.

Between dives I used to spend my time swimming with goggles, and soon learned

(Continued to page 230)



Why Motorists Prefer **FRAM** More Than 2 to 1

Recent surveys show motorists prefer FRAM Oil Filters *more than 2 to 1* over other brands and with good reasons!

FRAM is engineered for extra-high filter efficiency to trap engine-killing dirt and dust particles *your eyes can't even see!* That means FRAM keeps oil clean, cuts wear, saves power and reduces repair bills.

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Send FRAM boxtop or 25c for big, colorful, 68 page *Vacationland America Book* describing motor trips throughout America!

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Fram Canada Ltd., Stratford, Ont.

THIS IS MOPAR CAR-CARE MONTH!



**NOW - RESTORE
"NEW-CAR" INTERIOR
BEAUTY EASILY -
FOR ONLY \$2¹⁵***

**Amazing new MOPAR KAR KLEEN
removes stains, spots,
and dirt like magic!**



New MoPar KAR KLEEN brings back the beauty of your car's interior quickly, easily, magically. It removes stubborn stains and dirt from upholstery, headliner, visor panels, etc.—whether the materials are cloth, vinyl, or leather! *Everything* can be cleansed and beautified by MoPar KAR KLEEN. One bottle provides more than enough—and you need only a small brush or sponge to do the job!

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many tips from the veterans. Wlandi had taught me to wear an old thick sweater when diving; once the water held in the wool had been warmed by the heat of my body, it was remarkably effective in keeping out the cold. Some divers even wear long woolen underpants, but most of them use foam-rubber suits.

Later I learned about some archeological finds that had been made under the sea. The club had found several Roman anchor stocks cast in lead—the rest of the anchor had been made of wood and had rotted away. One of them bore on three sides a head of Medusa. Broussard showed me marbles of St. Tropez. These chunks of stone were shipped from Carrara 2000 years ago to be made into a Roman temple, probably at Narbonne. The Roman galley sank in shallow water in St. Tropez bay. Every trace of the boat has vanished, and the surface of the stone has been eaten away by shellfish until it looks like a sponge, but where it was covered by sand it is as good as new with the chisel marks still plainly visible. These marbles, the material for three columns six feet in diameter, have now been salvaged and lie on the quay at St. Tropez.

Broussard also told me how they found a wrecked galley load of wine jars at Anthéor. Fishermen had been bringing up pottery near some dangerous submerged rocks half a mile offshore, so a party of divers went off to investigate.

They searched for some time around the area where the pottery had been found. The sea bed, about 70 feet down, was covered with a thick mat of rushy *zostera*.

"I had not put enough lead on my belt," Broussard told me, "and I had to hold on to the weed to prevent myself from floating away, so I pulled myself along by my hands instead of swimming normally. Suddenly I realized that the thing I had taken hold of a few yards back was of a familiar shape—I thought it was a man's shinbone—so I turned back to have a look, and I found it was the handle of a wine jar."

He produced one of these handles for me to see, and it was certainly shaped just like the bone in one's shin.

Divers are at last learning to fraternize with fish instead of trying to kill them. And people are beginning to dive for fun in all the habitable oceans in the world.

American frogmen have long been diving in California and Florida, seeking large game fish and exploring the paradise of subtropical reefs in the Caribbean, where there is always a chance of finding a frigate or a pirate vessel, loaded with cannon and muskets if not with doubloons and pieces of eight. ★ ★ ★



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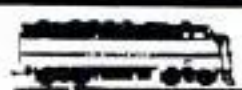
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He Irrigates With Clocks

(Continued from page 137)

Fifteen wells pour from 1000 to 3000 gallons of water per minute each into ditches leading to growing cotton, grain, hay and pasture crops. Although operated as a family unit, the acreage is broken into three farms, two of 1000 acres and the third, bought in 1952 by Alvin, of 320 acres. John and Paul live on the two large farms, but receive and give assistance to the other brother.

Development of the irrigation clocks followed acquisition of the large number of acres. Labor costs zoomed while cotton prices plunged. A clock used to prorate production of west Texas and New Mexico oil wells provided the way to slice costs and increase profits. One man, working two hours daily, can irrigate 20 acres every 24 hours, and still put in an eight-hour day on the cultivating tractor.

"Going into the clock program was a big move," John recalled. "We had to have fields as nearly the same size as possible, and the water flow had to be constant. We had to eliminate pebbles and rocks in field ditches, which, if present, would keep headgates open."

The family leveled 1178 acres of the farms into benches, a method of converting slopes into a series of flat levels. Ditches which carried water to the fields were lined with concrete, eliminating high seepage losses as well as the unwanted stones. Drop structures, devices for stepping water down from one bench to another, were installed and equipped with mounts to handle the clocks and portable steel headgates.

Attached to the clocks by a chain, the headgates are dropped into the ditch after a preset time interval, shutting off flow.

Gentry begins his irrigating chores by timing irrigation of the field's lowest bench. Clocks installed on drop structures and attached to headgates on each bench up the tract are set with the interval and the farmer goes about his business.

If the lower bench requires an hour for irrigation, the clock on the next bench is set to trip its headgate at the close of one hour, the next at two hours, and so on up the field.

"Using this system demands that the farmer have a consistent flow of water and that all benches in a particular field be of the same width and length," Gentry warned. "Otherwise, in case of a small bench, water would spill into roadways, or if the bench was larger, the bottom end would go unwatered. A variation of water supply is equally bad."

(Continued to page 234)

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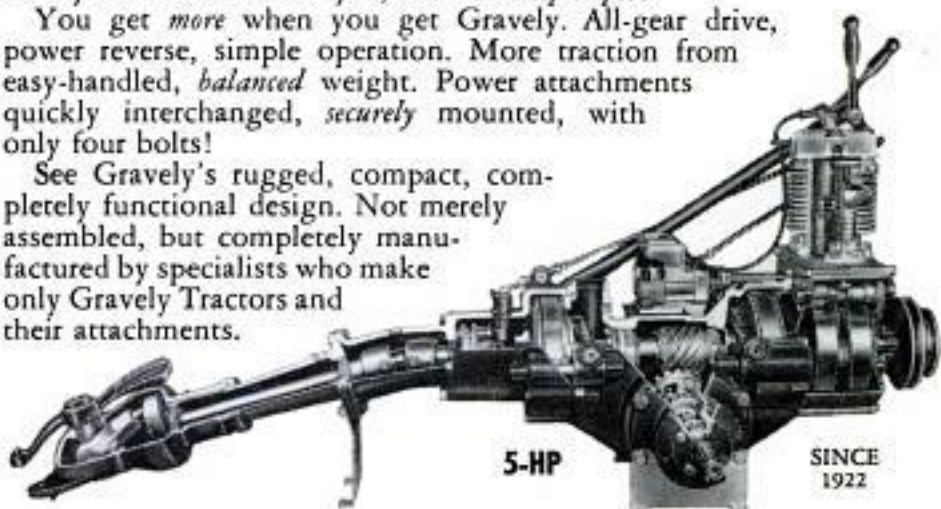


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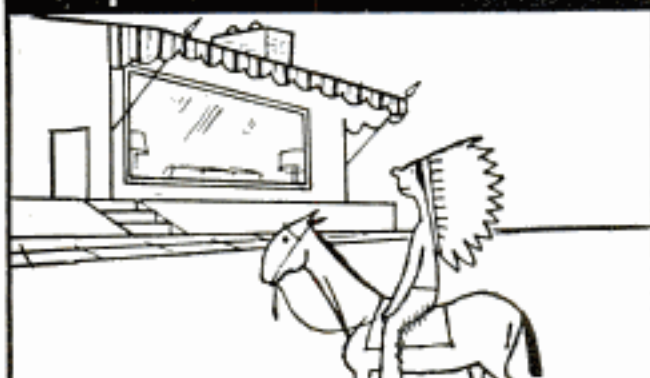
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Most of Gentry's acreage is broken into uniform benches of one to two acres each, depending upon the amount of slope in the original hillside. The water-delivery and bench system permits him to irrigate an acre per hour without erosion of the soil and at the same time leave sufficient water for the growing crops.

He ties in a combination of wells which gives him 4500 gallons per minute. The inner edge of the ditch is two inches lower than the outside, permitting the water to flood into the field.

The uniform fields are laid out so that a roadway is paralleled by two field ditches, permitting entrance of a pickup truck to transport the clocks and headgates. Each setting is made for 12 hours' irrigation when uniformity of benches within the fields permits. After timing the first bench, one man can set up clocks and headgates for a 12-hour irrigation schedule in less than an hour.

The future of Dell City was summed up by the weary tractor driver, who said: "Wait 'til we get REA and telephones for the women and more irrigatin' clocks for the men. The women can gossip on the party lines and leave us men folks to our clock watchin'. We figure if a woman can last out a couple of years on the desert, she'll either make a good farmer or a good clock watcher out of her husband. Look what Earlene Gentry did with John—she did both!" ★★★

Crimped Metal Tubing Replaces Turnbuckle



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Crimped metal tubing does the work of a turnbuckle in a method devised by engineers at the Army Chemical Center in Maryland. The tubing is slid over steel cable formed in a closed loop and used to bind a cylinder lengthwise. The tubing is then crimped, with a resultant shortening and tightening of the cable, to maintain a tension of 70 to 100 pounds. The amount of tension in the wrapping cable is regulated by the crimping tool. The new method is simpler, faster, and less expensive than the conventional method using a turnbuckle. The crimping is done quickly and efficiently with hand tools or automatic machines.

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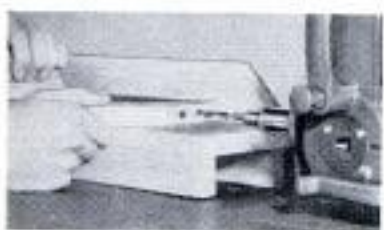
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Tire Doctor

(Continued from page 157)

"the whole story's written right there in their treads.

The evidence was convicting. Treads were chipped and cut, the rubber chewed where the driver had spun his wheels rather than drop a gear. Flat places indicated too-fast braking. Excessive heel and toe told of shuddering stops at intersections.

The driver went away mumbling something about "that rubber sleuth." It might be surmised that tire consultants seldom win popularity polls around fleet garages.

"Sure," Towner admits, "some drivers really hate me. But I don't play favorites. Neither with drivers nor manufacturers. If some brand isn't giving my client service, I recommend a switch. I'm paid strictly by clients. I've nothing to sell but service."

Service includes not only quarterly summaries (a 20 to 30-page report) but also biweekly inspection reports.

As Towner makes the rounds, he indicates tire faults on a special worksheet. At the end of the inspection, Towner hands one copy of his worksheet to the repairman, another to management. It's up to the fleet owner to see that faults are corrected.

Towner also makes sure clients get their rubber's worth. Recently he noticed a

batch of poor-quality retreads (treads were ripping off after only 5000 or 6000 miles). He reported his findings. The retreader was called in, but insisted only first-grade rubber had been used. Skeptical, Towner called the retreader's supplier.

"No," the supplier confirmed, "the guy doesn't buy nearly as much top grade as he used to. Yet he claims business volume is about the same."

Obviously the retreader was using some top grade, but also a lot of inferior rubber, though charging the old price. Backed by Towner, the trucker got a substantial refund. And he switched retreaders.

All this points up why more and more truckers are hiring independent, unbiased tire engineers — experts like Towner. A fleet's regular mechanics seldom have the time or the knowledge to analyze the whys and wherefores of tire wear.

Typically, many repairmen give blown carcasses a casual glance, then toss them on the waste heap. Not Towner. Every carcass gets a post-mortem, determining why the tire blew and how to prevent another in the future.

Blowouts are generally caused either by impact or heat. An X, Y or T-shaped break in the carcass wall indicates impact fracture, perhaps from overpressuring. A

(Continued to page 238)

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diagonal break often comes from overheating, may mean too fast driving during hot weather, or carcass fatigue. Every mark, scuff and wear on tread or carcass is a clue. It's the tire engineer's job to find the cause.

Probably Towner's least appreciated but most scientific assignment is establishing each client's inflation program. Manufacturers recommend what they consider normal pressure, but often it isn't optimum. All depends on the type of truck fleet, its loads, speeds and running conditions. Towner experiments with different pressures for months before fixing a fleet inflation standard.

Sometimes, when in doubt, he sets up a half-dozen test fleets — each operating on different inflations. By the end of the test, Towner has his inflation standard backed by facts and figures.

Why do truckers hire independent tire experts and gladly pay their asking fees?

Consider one of Towner's clients who, working California oilfields, was lucky to get 40,000 miles from a carcass. Towner inspected dozens of junked casings and concluded that poor inflation and worse maintenance were responsible. Within a year he had increased tire life (through three recaps) to 125,000-150,000 miles. Since recaps cost only \$16.50 compared with \$90 to \$120 for a new tire, his client's replacement bill was cut sharply. A bruised carcass can often be saved by investing \$11.00 in a resection.

The tire engineer's only complaint: The hours. It's best to inspect tires after they've "rested"—have cooled and their pressures have returned to normal. Busy fleets seldom rest during the day. So Towner finds himself working Saturdays, Sundays and odd hours. He doctors one fleet between dawn and 8 a.m.; another, from 5 p.m. until midnight.

Towner isn't griping. He's forever thankful for that day in 1946 when he looked under a truck chassis. ★★★

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**Report on a New Profession:
Photoanalyst**

(Continued from page 121)

On New Year's Day, 1944, thinking over his glum prospects, young Belcher blew up with impatience. He airmailed a letter direct to Gen. Douglas MacArthur in which he declared how necessary he was to the Pacific campaign.

Back came a batch of air photos and the challenge, "Prove it."

He spent the week end marking them with circles and arrows, and airmailed them back with his analysis. Meanwhile, U. S. Marines were making a strategic landing at Cape Gloucester, New Britain, and getting badly bogged in a swamp their maps hadn't warned them about.

A few days later Belcher's samples arrived. They showed his warning finger pointed at the dismal swamp.

In two weeks, Belcher was flying the Pacific to become a civilian intelligence expert.

Compared to other things he's done, Belcher says spotting that swamp was pretty simple. In the photo he saw volcanic slopes coming down toward the sea, but there was a rise along the shore line. Obviously then, this formed a pocket and this pocket would be a catchbasin for water and washed volcanic soils—a fine mess of goo.

That was the "hard" analysis. Belcher could see the swamp another, easier way. It showed up as a much darker area, meaning a heavy growth of trees using lots of water.

It was dramatic proof. Before the war was over, Army engineers switched him north to Alaska, then the R.C.A.F. borrowed him to analyze a wild belt of northern Canada from the Mackenzie River to Labrador.

To date he has worked in 23 countries and all 48 States. He has added projects for our Navy and Signal Corps, and some of the work is obviously hush-hush. He pops up in West Germany one week, Burma a week later.

Some of the travel is to check finer details. Some is to get personally acquainted with unfamiliar terrain. Other times he wants to be there to see that his instructions are followed correctly.

In Iran, for example, he had to outwit local potentates who wanted water for their own luxury needs instead of for the general public. It was there, working on a UN assignment, that Belcher and his men produced 50 well sites in that many days.

Most of them were in a valley which had

(Continued to page 242)

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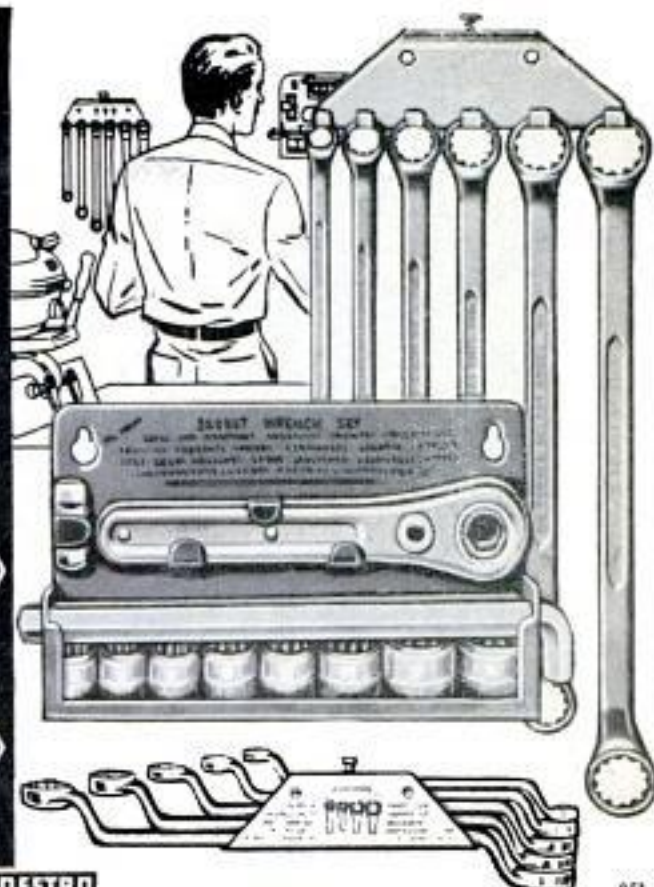
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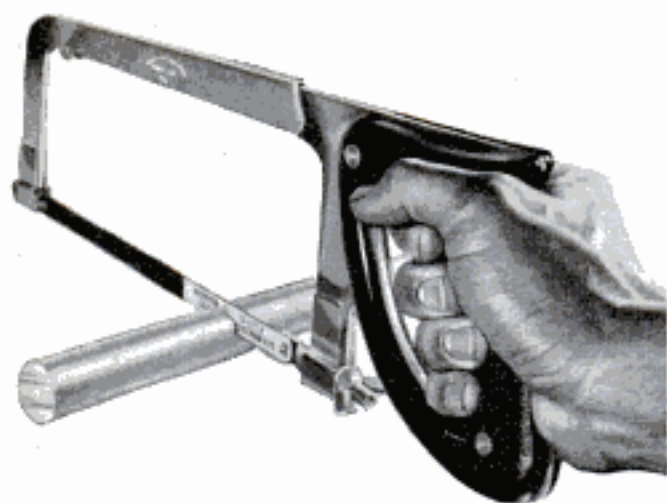
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been Persia's bread basket 2000 years ago. Now it was desert. But from the slant of rock walls in the bordering mountains, Belcher knew that—despite the layers of rubble and sand—the ancient stream still flowed below.

When he arrived Belcher confidently bet his own Western clothes against a sheik's costume that he'd find water for that tribe. When he left he was wearing the sheik's outfit.

At times Belcher's technique has been challenged and he has shown people what was in their own back yard.

One town desperately needed gravel for roads. Belcher discovered an extension of an overgrown pit forgotten for many years. Another time he asked his assistant, L. E. "Red" Gregg, now Technical Director of Highway Research in Kentucky, to bring a sand-dune sample back from a New England township. (By collecting sands, Belcher has worked out a method of telling the size of sand particles from air photos.) The local road engineer insisted, patiently and then in anger, that there was no such sand deposit a couple hundred feet off the highway.

"I helped build this road. I've patrolled and inspected it hundreds of times the past 20 years. I ought to know if there's any sand around," he snapped.

But the sand turned up right where Gregg expected—covered by a growth of trees. Their lighter-colored leaves in this dry place was the tip-off.

Belcher reached a village in west Canada and hired a taxi. He said he wanted to be driven out of town past a certain bridge and dropped at a trail off the Alcan Highway.

"I've got some soil-testing to do along that trail," he said. "I'll follow it around and come out where it hits the road again."

The native stared and said, "You never been here before, have you? Well, I've hunted every trail in this country the past 13 years, and there's no trail there."

But there was. Belcher led him on to it—a faint animal trail that enlarged where the brush was thicker.

The driver grabbed Belcher's air photo: "Mean you saw this on the picture?" The "greenhorn" professor showed him the spidery line.

Even before Belcher, of course, aerial surveying had revealed how much more you could see, and faster, with a plane's camera. And there had been a start in prospecting. Spying oil "domes" by air and sensing certain ores by magnetometer have become standard practices.

Belcher's original contribution is going

(Continued to page 244)



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down right into composition of the soil. Now he is developing the spotting of uranium or iron possibilities by color differences in earth or vegetation. Prospecting is one of his newest services.

With photos Belcher has given landslide warnings to railroads and others. For example, New England builders planned to set one end of a dam on what seemed good footing. Actually it was an earth layer resting on a slippery, tilting layer of underground clay—an ideal setup for tragedy.

He's also consulted by companies laying great pipelines. His diagnosis directs them to a right-of-way that will have a minimum of rock and corrosive soils.

Belcher's first Alaskan assignment was to find out why Northway Airport was badly stuck in the mud and how to correct it. He advised a better location—the runways had been built over sandy permafrost. When uncovered by bulldozers, this perpetually frozen subsoil acquires a top layer of mud thawed by the sun.

The U. S. and Canada then shared his services for several investigations in the far north. He located all sorts of things—oil structures, townsites, airport sites. Recently his staff began a complete study of terrain around Fort Churchill, the busy center of activity on Hudson Bay.

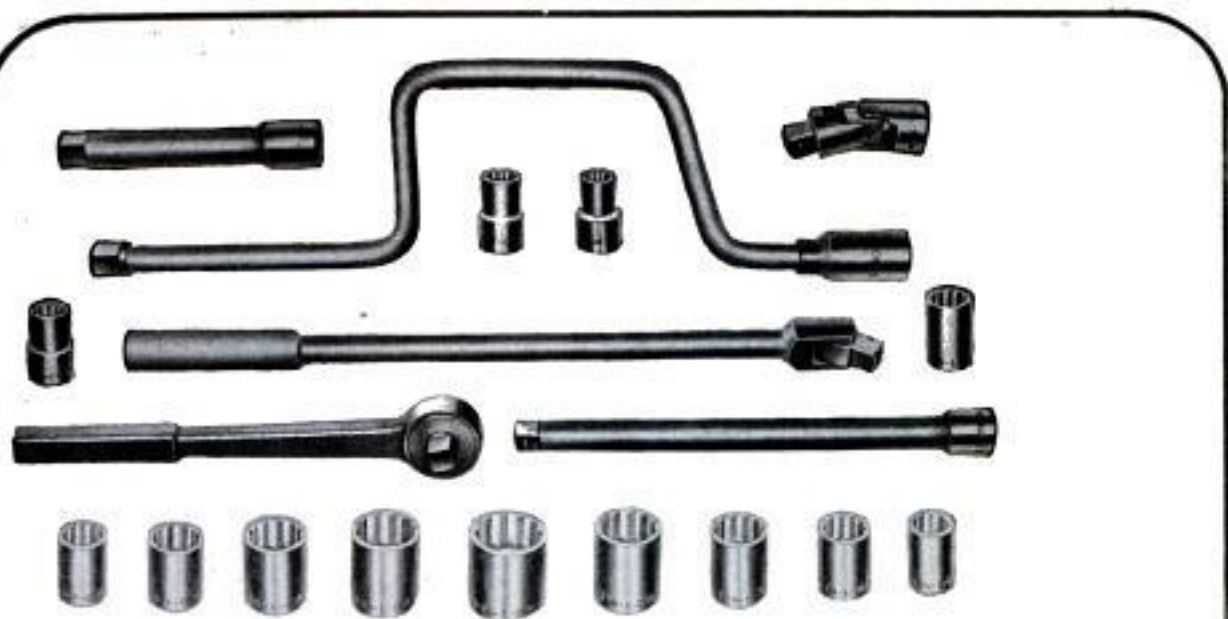
Belcher started locating permafrost depths with a steel penetrating rod but soon had the aerial clues he wanted. Black spruce and tealeaf willow are his indicators of ground wetness, which means bad drainage, the tip-off to impervious frozen soil. Of the two, the willow is superior.

Where the willow grows densely, he knows its water-thirsty roots are doing fine, so permafrost doesn't start above a four-foot depth. Where trees are scattered along with grass, the frost begins at around two feet. In low terrain without the willow Belcher has his warning—permafrost within 18 inches.

Can a photoanalysis skill like his be taught? One answer is the class of around 40—from all over the world—who study under Belcher at Cornell. Another answer is the system of branch-training programs. There's one now in faraway Burma which Belcher set up, then turned over to assistants.

Here's a new science with practically no special tools. For mineral prospecting and some military work, Belcher might use special film emulsions to study foliage or to pierce camouflage, or infrared to penetrate long-distance haze or darkness. This red, when used in forest photography, is also handy for differentiating one tree species from another.

(Continued to page 246)



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Otherwise his work these days is done with ordinary overlapping air photos and a stereoscope costing only \$10.

He says the most important requirement is a wide-open mind and groundwork in more than one of the standard sciences. That's why he mistrusts specialists. You might expect a professional cameraman or engineer to be fine material. Exactly the reverse. Belcher says the "disciplined imagination" he requires is more likely to be found in a landscape architect.

In one of his foreign jobs, a \$200,000,000 dam-building project, he sat in Ithaca and located gravel for mixing concrete, and clay for facing the dam. It was easy. Despite heavy forests, Belcher noted typical erosion gullies. A V-shaped nick meant the quick drainage of gravel. Longer, thinner ones meant the slower runoff from clay.

Belcher was astonished later to receive a geologist's report that clay wasn't there. With Dr. Ta Liang, his ace assistant, he grabbed the first available plane and rushed to the dam site at his own expense.

They cut their way through wilderness to the place where Belcher's "X" had marked the spot for clay. And they turned up 4,500,000 cubic yards of it.

Belcher got his bachelor's degree from Purdue in 1934, year of depression, and recalls that jobs were rare.

He studied shorthand and typing to make himself more useful and finally got on a Purdue highway-research program. That meant much outdoor work with soil maps.

One day in 1937, a friend working in soil conservation was cleaning his car. He gave a bundle of old aerial photos to Belcher, who tossed them into his own car and forgot them.

A few weeks later, on highway work, he got caught by rain. Sprawling in the back seat, he unrolled the air photos. Then, remembering he had soil maps for the same region, he started comparing them. Each showed the same streams, roads, houses.

Then he noticed a "funny round area" that was exactly the same on map and photo. It was an area of "Wisconsin Till"—one of those rich corn-and-hog gumbo soils. It had been drawn on the map after much trudging on foot for soil samples.

A click of the shutter in an aerial camera had done the same thing. In the photo, this area showed a darker color.

That was the beginning. Belcher gathered more proof. The CAA heard of his work and borrowed him to locate future airports. For example, his analysis showed Springfield, Ohio, how to save \$502,000 by building over solid gravel rather than a badly drained site—and have its airport about

(Continued to page 248)

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four miles nearer the center of the city. Then he began showing builders of highways and railroads how to avoid bad soils and muck traps. When the war came, he wanted to see his build-up of clues and technique used by the Army. But he couldn't arouse interest.

He saw a chance one day when Wright Field published a night photo taken of open countryside.

"I recognized the soil pattern at once," Belcher recalls, "the way you would recognize an old friend in a strange city. It was typical of a narrow belt from Illinois across Indiana into lower Ohio. With county maps I narrowed it down and found the exact spot."

He informed Wright Field. Officials there were impressed but had to admit they couldn't confirm Belcher's location—their fliers had just banged away with the camera.

However, the story spread that Belcher could tell amazing things from air photos.

Belcher kept trying, and finally the campaign in the South Pacific gave him his chance to make good.

It's the Brazil job that's displaying his virtuosity right now. Since 1789, Brazilians have dreamed of a great new capital city. Fifty years ago they set aside their "Future Federal District"—19,000 square miles of

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Belcher was called in last January. A flood of air photos reached his Ithaca office. Out of the blacks, whites and grays he was to select sites for not one but five capital cities—Brazil would make the final choice among them.

Each city site was to be a full package. Belcher had to think of streets, of transportation by rail, air and highway. There had to be water for homes, factories, offices and power generators. The site had to have the right kind of rock on which to erect skyscrapers, also had to have loam for home and commercial gardeners.

Belcher's staff cut the photos to eliminate distorted parts and ended with a mosaic from floor to ceiling, covering both sides of nine sliding panels. To this mosaic was transferred the analysis made on 3-D prints by Belcher and his crew.

By July, when other Belcher crews went out into the wilderness itself to make spot checks and contour maps, not a shovel of earth had been turned. Yet Belcher and his short-cut explorers had chosen and roughed out the sites for five spanking-new cities—work that otherwise would have taken years. ★★★

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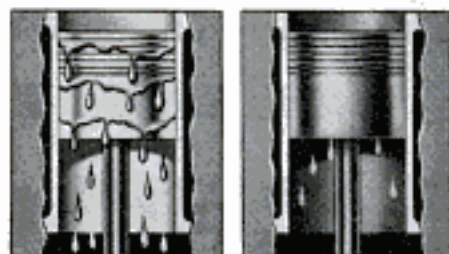


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CEDAR
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The World's Hottest "Garbage"

(Continued from page 127)

nuclear reactors, and the solutions produced in chemical processing of the product from nuclear reactors.

It requires a lot of water to cool a reactor. Take, for instance, the new \$16,000,-000 reactor recently put into operation at the National Reactor Testing Station near Arco, Idaho. Rated as the world's fastest atomic reactor, the giant machine generates superhot temperatures. But the water cooling it never gets above a mild 111 degrees.

The answer is the large volume of water used. Pouring down a six-foot tube, the water swirls around the hot core at the rate of 20,000 gallons per minute. The water is first filtered and processed to eliminate as much as possible substances that might become radioactive. After going through the reactor, it is held in basins until the radioactivity of the remaining impurities dies down and then is released. The water is still carrying some "hot garbage," but not very much. This whole filtering process is expensive—but necessary.

Here's a report by Dr. Richard F. Foster, aquatic biologist, and Dr. Royal E. Rostenback, chemical engineer, both of Hanford, on the safety payoff of such a system:

"Small amounts of radioisotopes in water returned to the Columbia River after cooling Hanford reactors have had no adverse effect on water supplies, or fish or plant life below the project. A person could eat game fish caught in the most radioactive part of the river in the improbable amount of 20 pounds daily without exceeding permissible limits of radioactivity."

But that doesn't mean that river checks aren't continuing. Atomic energy is a business in which just one slip-up could be highly dangerous and costly. The Columbia River, for instance, has a \$10,000,000-a-year commercial fishing industry, and a lot of sports fishing besides.

Water samples are routinely collected throughout the year at selected sites on the Columbia and tributary streams. Fish are caught with everything from gill nets to rod and reel and hand seines. Plankton is also collected with silk-bolting-cloth nets. Even rocks are picked up by hand and the attached algae and invertebrate organisms scraped or picked off. All are given intensive analysis.

A midget farm, using 1/1000-acre plots, is even operated at Hanford to check on the effects of water used from the river for irrigation. Harvest results have shown no difference in the crops—whether river or well water was used.

(Continued to page 252)

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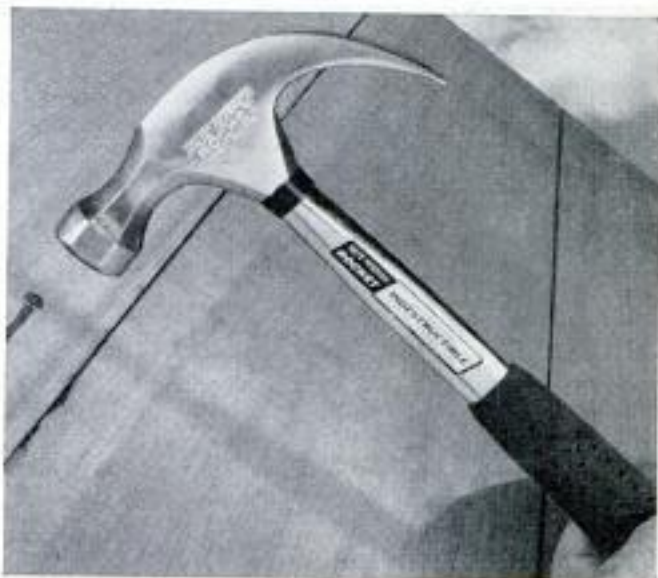
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In handling liquid wastes from chemical processes, the scientists first separate strongly radioactive materials from others. The really potent liquids are placed in special containers, stored and guarded. Some of these liquids, without dilution, will remain dangerously radioactive for thousands of years. What is the answer for eventual disposal?

Ocean-dumping of atomic wastes—in the black gloom of deep water beyond the continental shelf—has been done on a limited scale. But this is a type of "casting bread upon the water" which, if done on a large scale, might come back manifold—with a vengeance.

Another disposal possibility suggested is literally out of this world—shooting the materials into outer space. But an idea that seems more likely is the possibility that waste materials may be reprocessed for atomic use—just as the development of the flotation system revolutionized the mining industry some years ago and made economically practical the reprocessing of old mine tailings.

Lending strength to this possibility is the recent report by Dr. Victor K. LaMer, Columbia University chemist, of a new filtration process for extracting uranium in commercial quantities from phosphate-plant wastes. Low-grade wastes from the production of fertilizers have been piling up "by the millions of tons in Florida alone," said Doctor LaMer. Now a chemical way has been found to use them with profit.

Just as you have wondered how to get rid of something like an old bicycle frame along with the garbage, the scientists have the problem of what to do with atomic equipment that is too "hot" to be decontaminated. This equipment may include tools—and even a building. Until a better answer comes along, the equipment is buried and guarded.

All of which brings us to the conclusion: So far so good. We are enjoying safety in our atomic-energy production right through the garbage detail—in an expensive sort of way.

As a result of the waste material already collected and stored, however, there are today some truly "hot spots" on the earth, which will be some time in cooling. ★ ★ ★

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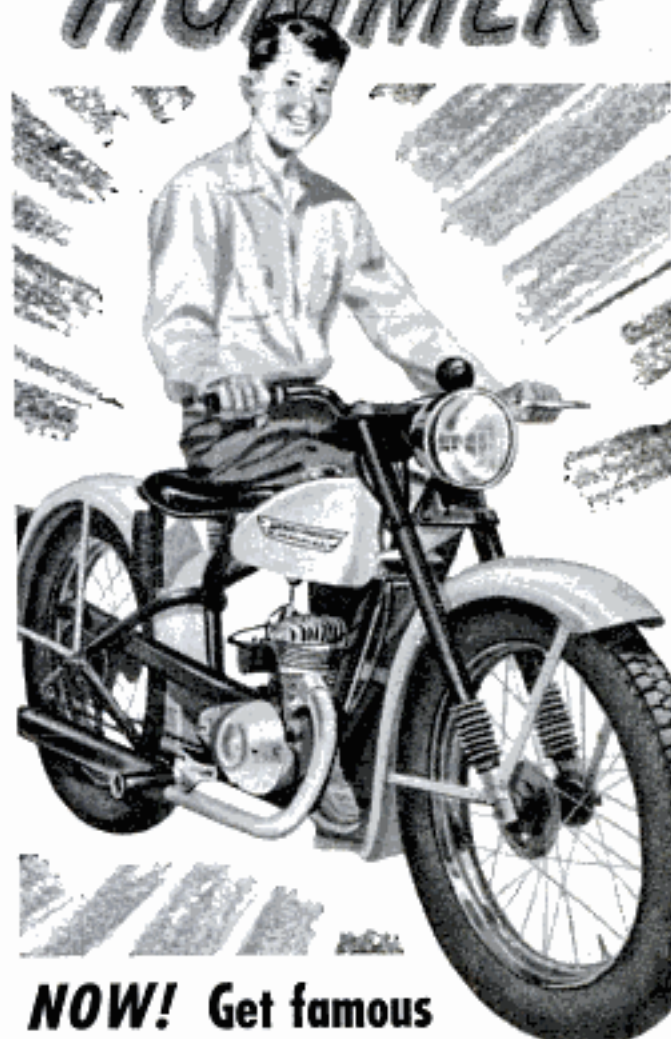
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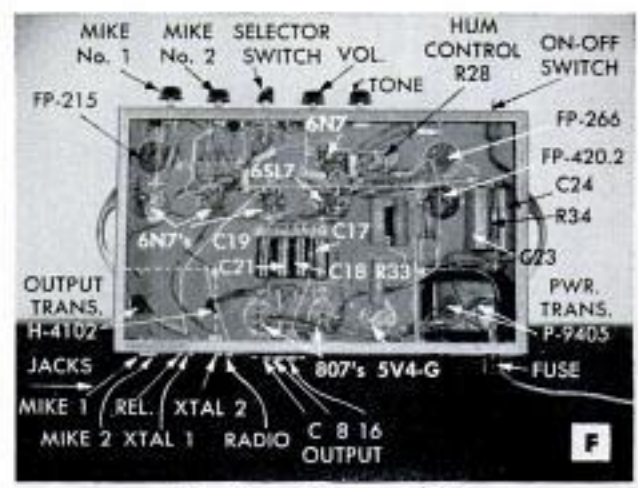
30-Watt 807 Amplifier for Dance Halls and Auditoriums

(Continued from page 163)

Driving this 6SL7-GT tube is a 6N7 dual triode mixer. Half of this tube is fed by whichever input is connected by the selector switch, the other half by either, or both, microphones. The input tubes are all 6N7 type which are very sturdy with minimum microphonics. Please note that the extra-high-gain reluctance tube is rubber-cushion mounted. Since there are four type-6N7 tubes used, an interchange should be tried to get the quietest one in this sensitive position, the reluctance (rel.) amplifier. The 6N7-tube metal cases are internally connected to pin No. 1, making an effective shield.

To reduce hum pickup, the preamplified tube grid resistors R3, R5 and R18 are grounded to the common bus bar, also to pins 1 and 8 (shield and cathode). Only two cathode capacitors are used, C20 for the 807 output tubes, and C8 for the 6N7 input mixer. The volume control is bypassed for the "radio" connection—to prevent having two—one on the amplifier and one on the radio set. The only "set and forget" control is the hum control on top of the chassis. Input and output strips, a.c. outlet and line fuse are on the rear side of the cabinet, see photo C. A power choke is eliminated, resulting in less weight and better regulation (keeping voltages under constant load). When set correctly, the measured hum of the 6SL7-GT driver and 807 push-pull output tubes alone is 76 db below the rated output power. This is adequate for the use for which this amplifier is intended—and is much better than many commercial hi-fi jobs. It is, however, more hum than a truly hi-fi amplifier should have. It is suggested that a 3-amp. fuse be used if the 2-amp. fuse blows when turned on and off quickly.

The selector switch used must have four



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(Continued to page 256)

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"In case you wish to use this letter in any way you feel it may be beneficial, please feel free to do so, and I would like anyone reading it to know that it was not, in any way, asked for or solicited."

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"live" positions and no OFF. File a flat on the shaft, to insure the knob staying in place after determining its location.

When wiring, keep the wire-wound power resistors away from the chassis to insure all-around air circulation. The common-ground bus-bar wire is spaced about 2½ in. away from the 3-in.-deep chassis

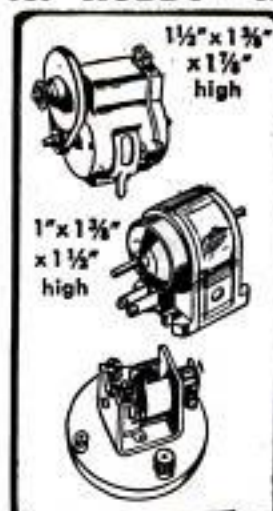
RESISTORS

- NOTE—K = 1000; W = WATT; WW = WIRE-WOUND; POT. = POTENTIOMETER
 R1, R3, R5 = 47K OHMS, CARBON ½ W.
 R2, R10, R18, R37, R40 = 10K OHMS, CARBON ½ W.
 R4, R6, R13 = ½-MEGOHM LOG. POT. (MIKES 1 & 2, AND VOL.)
 R7, R8 = 68K OHMS, CARBON ½ W.
 R9, R23 = 33K OHMS, CARBON ½ W.
 R11, R30 = 10K OHMS, CARBON 1 W.
 R12 = 2-MEGOHM, LINEAR POT. (TONE)
 R14, R16 = 470K OHMS, CARBON ½ W.
 R15 = 4.7 MEGOHM, CARBON ½ W.
 R17 = 2.2K OHMS, CARBON ½ W.
 R19 = 1 MEGOHM, CARBON ½ W.
 R20, R29, R45 = 220K OHMS, CARBON 1 W.
 R21 = 27K OHMS, CARBON ½ W.
 R22 = 68K OHMS, CARBON 1 W.
 R24 = 56K OHMS, CARBON 1 W.
 R25 = 33K OHMS, CARBON 1 W.
 R26 = 12K OHMS, CARBON 1 W. 5%
 R27, R42 = 4.7K OHMS, CARBON ½ W.
 R28 = ½ MEGOHM, LINEAR POT. (HUM CONT.)
 R31 = 10K OHMS, WW, 20 W.
 R32 = 4K OHMS, WW, 20 W.
 R33 = 75 OHMS, WW, 20 W. (NOTE—NOT K)
 R34, R35 = 270K OHMS, CARBON 2 W. 5% EA.
 R36 = 470K OHMS, CARBON 1 W.
 R38 = 220K OHMS, CARBON ½ W.
 R39, R41 = 1K OHMS, CARBON 1 W.
 R43, R44 = 220K OHMS, 1 W. 5%
 R46 = 200 OHMS, WW 10 W.
 NOTE—½-W CARBON 10%; 1-W CARBON 10% UNLESS OTHERWISE MARKED

base and is supported by the insulated tie-point strips. Use rosin-core wire solder and make certain that all soldered connections are well made. Use high-voltage ignition-type cable for the extended connections to the 807 plate caps. Do not use solid wires, for these should be flexible, well-insulated leads terminating in ceramic plate caps—not metal caps. The 807 plates are more than 400 volts above chassis ground and should never be touched when the amplifier is turned on. The insulated ceramic plate caps and the perforated metal cover are necessary safety measures in any audio amplifier or transmitter that employs type-807 beam-power tubes. Do not ground the electrolytic condenser cases to the chassis base; instead use the common bus bar. The ground wires to pins 1 and 8 of the cushion-mounted 6N7 tube should be made with No. 20 stranded wire so that the socket is free to move. All tube sockets but this one mount from the underside. Use rubber grommets, mounting in ½-in. holes, for the plate-cap leads of the 807 tubes and for the a.c. power cord. Please note that the No. 14 tinned-copper common-ground bus bar is grounded to the chassis at the input terminals only. If the chassis base is painted, be sure to scrape the paint off on the inside, so that when the input

(Continued to page 258)

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woodworking tools

Make screens for your porch with simple tools like a saw, a hammer, scissors—and Reynolds *Do-It-Yourself* Aluminum. Reynolds screen frame members of good looking, non-rusting aluminum are easily cut and assembled. Attaching aluminum screening is quick and simple. Ask for Reynolds Plan No. 117—only 25¢.

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As Easy to Work
as Wood



*T. M. REYNOLDS METALS COMPANY
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Available in Canada

jacks are screwed in place they will make a good ground at this point. Mica-filled or ceramic-type sockets should be used for the 807 tubes and for the 5V4-G rectifier.

If you are in doubt about your wiring and want to test the amplifier in safety for the components, use a 1000-ohm, 20-watt wire-wound resistor in place of the 75-ohm R-23. This will reduce all voltages to make preliminary tests, check feedback, etc. To adjust hum: Take out one tube, the 6N7 mixer input, and leave all other tubes in place. Turn the unit on and wait a couple of minutes. Next turn the hum control back and forth to get minimum hum in the loudspeaker. Leave hum knob at lowest hum point. When operating, all controls not being used should be turned completely off.

This amplifier will take more than two ordinary speakers to use up its 30 watts. Do not try your favorite speaker. If you turn the amplifier full on—you will certainly damage the speaker. Turn up volume very slowly. You will find plenty of output at less than half of the volume-control setting. Speakers must be "phased," that is, the cones must go in and out correctly and together. Connect all speakers and use a No. 6, 1½-volt dry cell in series for this phasing test before connecting them to the amplifier. Detailed student material list R-431 is available from *Popular Mechanics'* Radio-TV and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

That Flying Saucer Was Probably a Balloon

Vitally interested in flying saucers but professing ignorance of their actual existence, the U. S. Air Force does accept responsibility for many "saucer" sightings. The USAF Air Weather Service sends aloft some 800 balloons a day, and balloons are frequently reported as saucers, particularly when they tend to flatten out because of reinforced tops and bottoms. The balloons range in size from those about 18 inches in diameter, used for measuring the height of the ceiling over an airport, to big "Skyhooks" that are 73 feet across and 129 feet long. The Skyhooks, balloons made of non-expandable plastic, carry scientific equipment weighing up to 80 pounds as high as 100,000 feet. In between are 3½-foot balloons used for tracking wind currents, and six-foot spheres that take parachute-equipped radiosondes up to 80,000 feet. A radiosonde is an automatic radio transmitter that relays pressure, humidity and temperature data to ground stations.

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You need this brand-new pocket-size 20-page handbook. Explains sanding technique on wood, metal, glass, plastic; shows correct methods and names proper tools for removing surfaces of different types of woodwork. Lists sandpaper grades and uses; tells how to sand hard-to-reach places, etc. Helps you save time, money on home projects—invaluable to beginners, experts. Authoritative, informative! Fully illustrated. Includes Syncro Sander-Jig Saw Catalog. Send coupon for your free copy NOW.

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New HEAVY-DUTY '900' removes paint, varnish—outlasted all other portables by running over 1,500 hours without breakdown in laboratory tests. Easiest to use. Built-in sight-saving lamp! Most powerful reciprocating sander motor (Patented). Priced low.



No. 900



No. 900-D



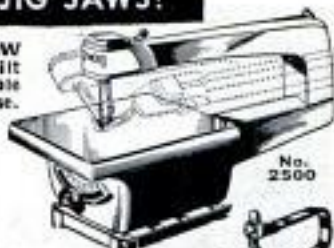
No. 504

900-D "GIFT" kit contains No. 900 heavy-duty sander in metal carry case, liberal supply assorted sandpapers, polish pad. Low price.

No. 504 "gift" kit offers you America's best light-weight sander for vertical, overhead jobs and finishing—inside metal carry case. Priced low price.

NEW SYNCRO JIG SAWS!

FIRST TILT-ARBOR JIG SAW EVER! Blade, Motor, Arm Tilt Together 45° Either Side—table stays FLAT for easy lumber use.



No. 2500

Do-It-Yourselfers! Don't buy any jig saw till you learn about this brand-new 65 pound heavy-duty Syncro '2500'—first and only jig saw with motor, blade, arm built to tilt simultaneously! Cuts 2" wood. Industrially rated. Quickly adjusted calibrated dial knob. SUPER-SELF-POWERED. Startling low cost. At hardware stores. Mail coupon for facts.

With or without Metal Table, Lamp

New '208' Jig saw even cuts 2 x 4s, thin aluminum, metals, plastic, etc. Adjustable arm permits any length cut. Built-in motor guaranteed against burnout all during ownership. Priced low.



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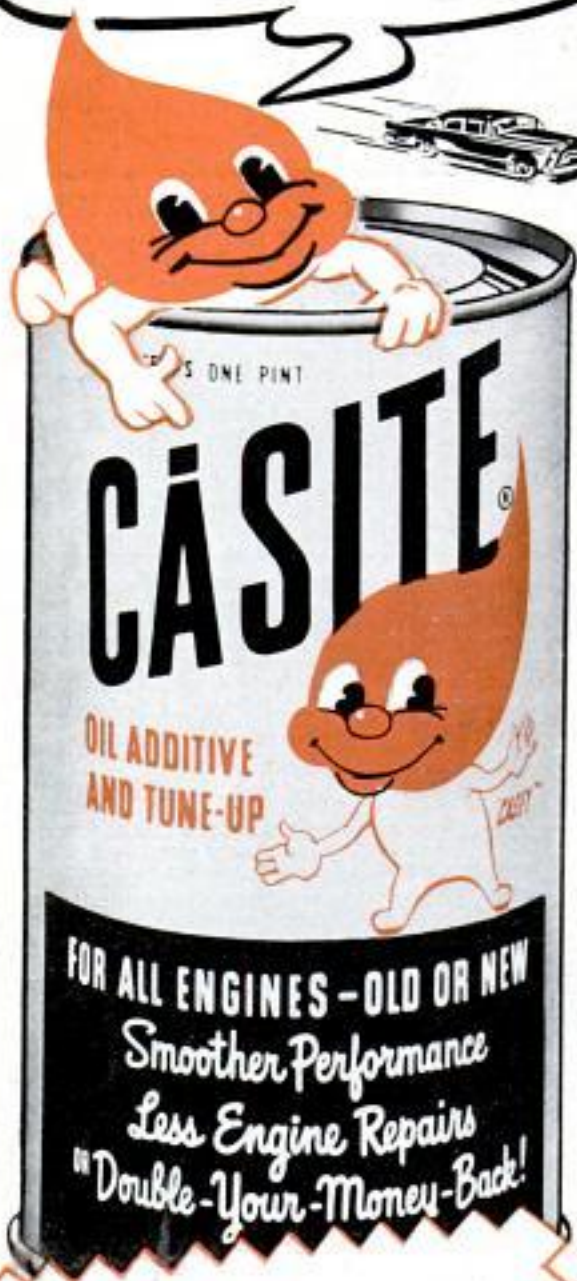


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Only \$1.00



Recreation area for the crew on the new DEs is a far cry from shoddy quarters of Caine Mutiny fame

The Pouncer Challenges the Sub

(Continued from page 93)

escort strikes with weapons that weren't even dreamed of when the first DEs were born. Instead of the ineffective "ashcan," tired hero of a hundred war movies, she is armed with rocket-propelled depth charges guided by the sonar-coached fire-control equipment; and in place of the World War torpedo that ran only in a straight line, she carries self-guided torpedoes that hunt the sub with compact but incredibly intricate sonars of their own, pursuing its echo through every evasive maneuver until they explode against its steel hull. Her anti-aircraft guns are as nearly human as a weapon can get—they load automatically, they automatically train and elevate like scared rabbits, and each unit carries its gun-mounted radar that tracks the incoming plane and points the guns as the hunter leads a pheasant. These swift-firing guns, though primarily for planes, would murder any sub that surfaced to slug it out with these new DEs.

In warfare, as in love, the race goes to the swift. A nation that places its faith in yesterday's weapons courts certain defeat. The modern ocean escort, our Navy's answer to today's high-speed snorkeling subs, is built from the keel up to make sure that our convoys get through. ★ ★ ★

(The opinions and assertions contained in this article are those of the author, and do not necessarily reflect the views of the Navy Department or the Naval Service.)

New G-E *All-Weather* Headlamps help you see through fog, rain, snow

Make night driving safer than ever before—good weather or bad!

GREATEST advance in night-driving safety since the first sealed beam headlamp. New General Electric *All-Weather* Headlamps help you see through fog, rain and snow. Make it easier to see the road against oncoming headlamps. Give 25% more light!

SAFER IN FOG

The photos at right, taken in simulated fog, show how much better you can see in fog, rain and snow with G-E *All-Weather* Headlamps. Regular headlamps (top photo) cause kick-back glare that obscures your vision. General Electric *All-Weather* Headlamps (bottom photo) greatly reduce kick-back glare.

MAKE THE ROAD EASIER TO SEE AGAINST ONCOMING HEADLAMPS

New G-E *All-Weather* Headlamps have a new reflector and lens that focus the light more effectively. Especially the low beam. It hits the road farther ahead and more to the right. It extends your seeing distance along the side and shoulder of the road up to 80 feet!

BOTH BEAMS MORE POWERFUL

5 extra watts added to each beam, plus more efficient filaments, give about 25% more light in the 6-volt lamp. It



Photos of identical fog scene show difference in visibility between regular headlamps (above) and new G-E *All-Weather* Headlamps (below).



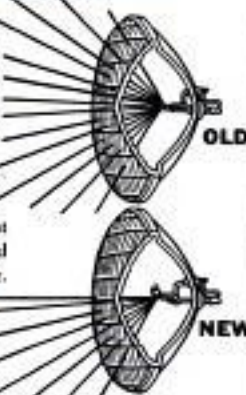
shows up obstacles that are out of range of ordinary headlamps.

You can't stop in time if you can't see in time. Why take chances? Replace ordinary headlamps with General Electric *All-Weather* Headlamps today! Most garages and service stations have them.

HOW G-E *All-Weather* HEADLAMPS CUT REFLECTED GLARE IN FOG

Ordinary headlamps: uncontrolled upward light from filament shines in front of windshield, bounces off fog, reflects back in driver's eyes.

G-E *All-Weather* Headlamps: filament shield blocks off uncontrolled upward light, greatly reduces reflected glare.



G-E *All-Weather* HEADLAMPS

6-volt PER PAIR

\$3.60 plus nominal installation charge

12-volt \$3.80 PER PAIR



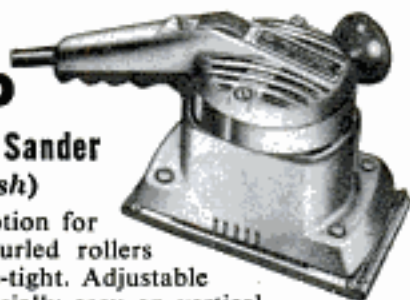
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**New Oscillating Sander
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With oscillating motion for smooth finish. Knurled rollers hold sandpaper vise-tight. Adjustable swivel handle—especially easy on vertical work. Direct drive—no belts, no pulleys. Heavy duty. Extra-large ball bearings.



Model No. 200

MORE DO-IT PER DOLLAR!

Do-It-Yourself has become what amounts to a national pastime. And the "Do-It" in Do-It-Yourself is less work and more fun with good portable power tools.

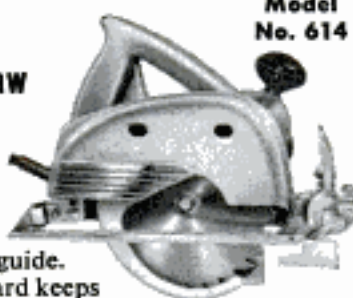
There are many such tools on the market. But none offer the outstanding performance of PET tools at such low prices. Check around. Price all leading, nationally advertised brands. Do that and you'll insist on PET Power Tools.

Millions of PET Power Tools have been made and sold. This business was built on one idea—to make quality tools and to sell them at the lowest possible prices. They're worth looking for.

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**New Ball-Bearing Saw
(Mirror Finish)**

Cuts a full 2 1/8" at 90°. Cuts a dressed 2x4 at 45°. Ball bearings give smooth operation, long life. Has adjustable rip guide. Rotating, telescoping guard keeps blade covered for safety.



Model No. 614

\$2595

**New 1/4" Electric Drill
(Mirror Finish)**

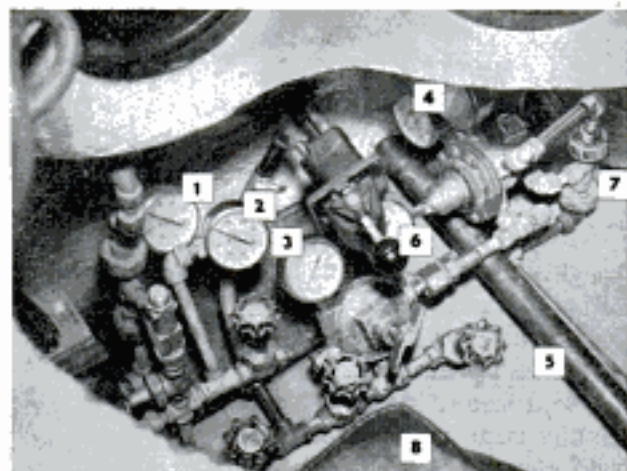
Has a handy pistol grip and a rugged gear-type chuck. This drill is of special-duty design to give ample power. Multiple ball thrust bearing takes drilling load. All others are oversize, oil-retaining bronze bearings. Fan-cooled motor.



Model No. 1440 GM

Treasure Hunter Builds Midget Sub

(Continued from page 95)



Interior view of sub shows gauges for: 1, outside pressure; 2, air compressor; 3, reduced pressure for low-pressure regulator; 4, high pressure, also 5, shaft for claw arms; 6, claw-control knob; 7, air-storage bottle and 8, seat for the pilot

conditions. It carries enough air to last the two-man crew three days.

The sub uses the simplest and oldest form of buoyancy control—the inflated bladder. It is similar to the "floaters" of a fish. The hull was molded in two sections, upper and lower. The entire lower section is blocked off from the top section by a steel plate. One hundred and eighty 1/2-inch bolts hold the two sections tightly to the 1/4-inch plate which forms the deck as well as the top of the compression chamber.

Under the steel plate lies the rubber bladder. It can be filled with air through three pipes leading through the deck plate.

A series of 1/4-inch holes in the lead keel permits water to flow in and out of the lower chamber as the bladder contracts or expands. The keel weighs 600 pounds and serves as ballast to keep the sub upright.

Air to control the craft's buoyancy can be let into the bladder in two ways: Either by compressor or from the storage bottles.

Packings around the two propeller shafts and the pivot rod for the claw are backed up with V-rings. The conning tower is sealed by inflatable rubber rings which wedge it solid with 2000 pounds' pressure.

Thanks to the great strength of the plastic hull, normal pressure within the sub will keep the crew comfortable. It can plunge quickly to working depth and return rapidly to the surface when a job is completed.

Once in the water, the RX-101 is completely independent. Large water foils projecting out of the upper bow operate in conjunction with an airplane-type elevator

(Continued to page 264)



PORTABLE ELECTRIC TOOLS, INC.
320 W. 83rd St., Dept. PM-104
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In Canada: Portable Electric Tools, Ltd.,
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Finest quality Boat Kits at the lowest prices in history! Mahogany decks. Easy to build.
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VARIABLE SPEED HYDRAULIC POWER TRANSMISSION



It has Infinite Speeds 0 to 550. Reverse. Automatic Overload Protection; Adjustable Torque up to 180 inch pounds. 5/8" Input and Output Shafts. It will handle 1/2 to 1 1/2 H.P. Motor. Case measures 7 1/2" long, 7" high, 6 1/2" wide. **VALUE OVER \$300.** Shipping Wt. 25 lb. On C.O.D. Orders we require a 10% only Feb. Chicago

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LAWN AND GARDEN TRACTOR
USE ONLY WRENCH AND SCREWDRIVER
Complete kit with all parts fitted and finished. Requires less than three hours assembly time.
ACCESSORY KITS for Lawn Mower, Roller, Dump Cart, Hay Mower, Rotary Tiller, Snow Plow, Circular Saw, Emergency Light Plant.

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PROTECT WALLS when painting woodwork with the masking tape professionals use! Makes painting faster, neater; tape sticks tight to prevent "bleeding"; strips off clean.

Flexible crepe-paper backing conforms easily to curves and irregular surfaces, too. "SCOTCH" Brand Masking Tape—35¢, 69¢, 98¢—wherever paint is sold. Minnesota Mining & Mfg. Co., St. Paul 6, Minn.

Build your own

FIREPLACE

INDOOR - OUTDOOR

FREE Booklet shows how



Booklet gives Complete instructions.

- Foundation
- Steel heat-circulating form
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- Mantel or decorative front

Fireplace form set on foundation includes firebox, damper, down draft shelf and smoke dome.



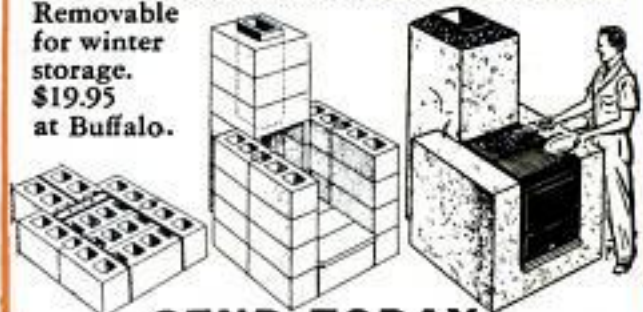
Brick, stone or cement block can be used around the form.



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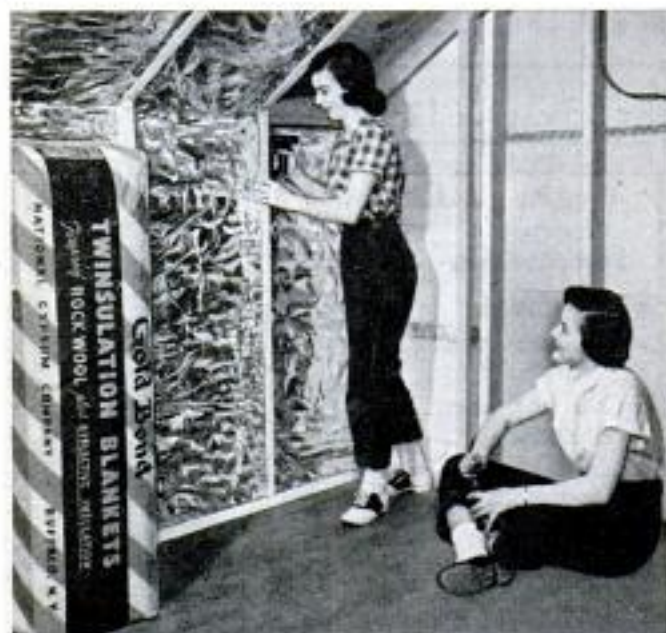
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to 20%. Soon pays for itself! So easy to install... you can do an average attic in a few hours time! Start now...see your Gold Bond dealer today!

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to control her pitch. A single rudder set between the two props controls her horizontal direction. Cowlings over the screws shield them from entanglement as well as directing the screw wash over the rudder.

Lead ingots are handy to either operator for finer degrees of control in pitch and roll. With a little practice, the two operators should be able to pick up a fishing plug at the bottom of the sea.

For lifting objects up to the surface the claw can be dropped to hang like the bail of an upside-down bucket from the sub's midsection. Its operating position is directly in front of the sub, where both men can see it.

Other attachments besides the claw, such as a drill, hooks and even a small crane can be fitted on the bow, and operated by compressed air from the inside. LeCompte points out that the claw or other equipment can be dropped from the inside, giving the sub some 200 pounds more buoyancy in emergencies.

LeCompte, who has never been to sea in a surface craft, much less a submarine, is a former supervisor at Tinker Field near Oklahoma City. He first became interested in underwater craft when he read a magazine article by a Navy diver who spent years in the Bureau of Records studying up on sunken treasure.

"My glass-fiber sub started as a pipe dream," says LeCompte. "Then I built a scale model and it worked perfectly. Finally, we decided to go ahead with the real thing. It took five months and cost \$19,000."

Seven of LeCompte's friends pooled their life's savings to pay for the midget. They formed a corporation and hope to get their money back in the first year of operation.

After the tests at Lake Texoma, during which the sub dived to 100 feet, LeCompte returned it to his shop in Oklahoma City where it is undergoing modification.

Sometime this spring, he plans to take off for the clear waters of the Caribbean for final tests. Then he will search for long-lost treasure on the ocean floor. ★ ★ ★

Cold-Morning Push-Button Start

Capt. Kenneth R. Kurtzman, Air Force officer stationed at Westover Field, Mass., likes a warm car when he drives to the air base every morning. So he rigged up a remote starting device that enables him to start his car while it's in the garage simply by pressing a push button in the kitchen. Forty feet of television lead-in wire carry the current that turns on the ignition and operates the starting motor. He calls his invention MATO — Morning-Assisted Take-Off.



IDEAS and Plans for Your GARAGE

Here's a 32-page Plan Book that includes 12 smart garage designs and sensible floor plans, how-to-build instructions, material lists, driveway sketches, etc.

Plans provide for the 9' wide Strand Garage Door (gives you a full 12" of extra width; saves banged up fenders!). This popular all-steel door will stay new *for a lifetime*; you get permanently easy operation. No warping, swelling, sagging—ever. Strand doors are galvanized with a heavier, hot-dipped zinc coat for rust protection and clinging base for paint.

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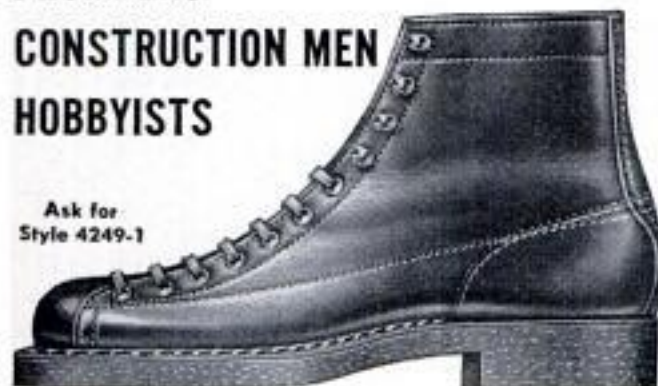
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Garden Work—
Small Farm Chores!**

**SHAW
DU-ALL
TRACTORS**

with AUTOMOTIVE
Gears—3 speeds
and reverse



Plow,
Cultivate,
Mow,
Rake,
Bulldoze,
Snowplow,
Saw wood,
everything!

**New Design 1½ to 5 H. P.
Walking Tractors**

You just steer... Shaw "Du-All" does the work. Makes fun of those garden, lawn jobs. A "must" for acreages. Four rugged walking models. Two with power turn. Many features: variable speeds, run between or astride rows, independent tool control takes care of uneven rows, etc. Traction is tops. Wide selection of tools. Low prices will surprise you.

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You've never had it so easy! Comfortable, practical. Every one a powerhouse! Models to pull 8, 10, 12, 14 inch plows; work between 38" rows. Brakes aid turning. ¾ to 7 mph. Operate belt attachments. Eat up work!



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2015

**Plymouth Has Power, Style and
Handles Well, Say Owners**

(Continued from page 106)

of speed if you wish it."—Ohio truck driver.

"Plenty of room inside for comfort on long trips."—New Jersey papermaker.

"For the first time in years I have a car with doors that don't hit the curb when opened. My new Plymouth doors swing

**SPECIFICATIONS
1955 PLYMOUTH**

ENGINE

Type	In-line, L-head 6 OHV, V8
Displacement	230 cu. in. 260 cu. in.
Bore and stroke	3.25 x 4.63 in. 3.563 x 3.250
Brake horsepower	117 at 3600 167 at 4400
	r.p.m. r.p.m.
Maximum torque	194 at 1600 231 at 2400
	r.p.m. r.p.m.
Compression ratio	7.4 7.6
Carburetors	Single downdraft Dual downdraft
Transmission	3-speed conventional. Overdrive or Powerlite automatic unit optional
Power pack	None 177-hp. at 4400 r.p.m.

GENERAL

Wheelbase	115 in.
Tread, front	58.4 in.
Tread, rear	58.5 in.
Weight	Plaza—3129 lb. Plaza—3246 lb. Savoy—3154 lb. Savoy—3265 lb. Belvedere—3159 lb. Belvedere—3267 lb.
Turning circle	40 ft. 1 in. 40 ft. 6 in.
Steering-wheel turns, lock to lock	4 turns 5 turns
Steering ratio	Not available Not available
Road clearance	8.0 in. 8.1 in.
Length over-all	203.8 in. 203.8 in.
Width over-all	74.6 in. 74.6 in.
Height over-all	60.1 in. 60.1 in.

CAPACITIES

Gasoline	17 gal.	17 gal.
Oil	5 qt.	5 qt.
Water	13 qt. (less heater)	19 qt. (less heater)

**INTERIOR
(4-DOOR SEDAN)**

Front hiproom	62.5 in.
Rear hiproom	62.8 in.
Front headroom	35.0 in.
Rear headroom	34.6 in.
Front legroom	44.5 in.
Rear legroom	44.5 in.

wide and clear the curb nicely."—Illinois editor.

"Best improvement is removing the gas-filler pipe from back of car and putting it back in fender."—New Jersey plumber.

"Engine went bad at 500 miles. Dealer gave me a brand-new engine at no cost. I don't think I would ever own another car but Plymouth."—Florida carpenter.

More Plymouth Complaints

The following quotations were selected as representative of the complaints made by Plymouth V8 owners in order of the frequency of mention.

(Continued to page 268)

Save \$40!



... WITH AMAZING
"ARCO JIG-SAW"

ONLY **\$10⁹⁵**

First to fit 1/4" drills, this rugged portable jig-saw attachment has same capacity & precision as \$55 saws. Does work of jig, keyhole, coping, crosscut, rip, band & hacksaw! Built-in "Air-Jet" blows away sawdust. Guaranteed to cut intricate patterns—however large—in plywood, plastics, metals—even cuts 2x4's! Starts inside holes without boring. Converts to Table Model with "ARCO STAND" Sturdy Casting \$2.75 6 Extra Blades \$1.95 SOLD AT BETTER HOME STORES. If not available, try this amazing tool on our UNCONDITIONAL 10-DAY MONEY BACK GUARANTEE. Send check or M.O. (ppd), C.O.D.'s—plus post.

ARROW METAL PRODUCTS CO.

Dept. PM-4, 140 West Broadway, New York 13, N. Y.

179.03 MPH WITH DYNA-JET!



A jet model plane powered by Dyna-Jet miniature gasoline engine holds official AMA world speed record. Dyna-Jet holds ALL jet model records! Finely engineered. Develops 4 1/4 lb. thrust. Wt., 16 oz. Max. dia. 2 1/2". Length 21 1/2". Limitless possibilities for planes, cars, boats. Price \$35 parcel post paid from factory. Send check or money order now! (Reference: Citizens National Bank, Bedford, Ind.)

CURTIS AUTOMOTIVE DEVICES, INC.
P. O. Box 232-D, Bedford, Ind.



ELECTRIC WELDER AC or DC 110 Volts

The "Little Marvel" all-metal welder. 5-year written guarantee. Welds 1/8" metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Complete with everything—rods, unit, eye shield, directions. \$9.45

plus 50c postage. Flame torch accessory for soldering, cutting, brazing \$3.95 complete with carbons, brass rods, flux. \$2.00 Deposit on C.O.D. 1/4 Inch Transformer Welder \$19.95 F.O.B.

ESSAY MFG. CO., Dept. 51, Quincy 69, Mass.

\$6⁴⁵
Com-
plete

Swift

New 50/50 Solder
and Flux in
paste
form

Swift SOLDER
EASIER TO APPLY,
WORKS FASTER
AND CLEANER. DO
small jobs with heat of
a match. One tube makes
hundreds of joints.

At Hardware counters **59¢**

a **HERCULES** product

DO-IT-YOURSELF and

Save Over 50%

on Extruded Aluminum
COMBINATION WINDOWS
and **DOORS**



For a limited time you get regular \$9.95 Combination Window Kit for only \$8.95 f.o.b. factory—compare this quality, extruded aluminum window with any \$25 window. Due to elimination of assembly costs and mass production to meet increasing demand, and because you "do it yourself," you save as much as 50% on all U-Fab-It-Yourself "Home Comfortizing Products."

KITS INCLUDE: All parts factory cut, drilled, mitered and hardware attached. The following Complete Line of U-Fab-It-Yourself Kits engineered for easy assembly with household tools:

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- COMBINATION DOORS
- BASEMENT WINDOWS
- SCREEN DOORS—SCREENS
- CASEMENT WINDOWS

"Satisfaction Guaranteed"

Send for
FREE BOOK
on Complete Line
of Deluxe
Combination
Windows
and Doors.

U-FAB-IT-URSELF, INC.
Worthington, Ohio

Please rush details of **SPRING SPECIAL**—\$9.95 Kit for **ONLY \$8.95** f.o.b. plant. **PM-455**

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\$35,000 REWARD

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Precision Geiger Counters and Scintillators are the finest instruments made for URANIUM prospecting. These highly sensitive instruments are compact, lightweight and ruggedly built for field use. Prices start at \$29.95.

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... at better paint & hardware stores

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SAVOGRAN CO., Dept. 67, 25 Huntington Ave., Boston, Mass.

"Factory assembly is lacking in minor details. Front bumper off-center, causing a thud at fender. Innumerable bolts and screws not tightened around interior. Bad fitting of trim around bottom of front seat."—New Jersey repairman.

"With 1953 Plymouth I was getting 20 miles per gallon. Haven't enough miles on the new V8 to judge fairly yet, but I'm getting 16 miles per gallon on trips and about 13 in the city with PowerFlite."—Illinois auditor.

"In rain, water comes in when you open door due to design of body where windshield and post meet. No drain apparent to me."—Florida salesman.

"Rain leaks in between roof and windshield molding."—Michigan Air Force inspector.

"PowerFlite very jumpy and noisy. Mechanics don't know how to fix it."—New Jersey superintendent.

"PowerFlite passing gear cuts out at 55 miles per hour."—Ohio guard.

"Poor service. I could write a volume on the petty ways of auto dealers."—Illinois physician.

"Outside door handles hard to operate. Require extra effort to open at times because push button seems to catch."—New Hampshire office manager.

"In muddy weather, dirty water is slung up by tires through front grille."—Tennessee minister.

"Rear-view mirror mounted too high for good rear vision. Dimmer switch too far up on floor board."—Virginia Navy man.

"Front-bumper design is poor. The license plate sticks out too far in front and is soon mangled by careless parkers."—Illinois accountant.

"Tubeless tires clump at 20 and 60 miles per hour. Feels like riding on loose planks."—New Jersey truck driver.

"Why is the right-hand sun visor designed so as to interfere with rear-view mirror every time it is pulled down?"—Idaho Air Force man.

"Dealer packed the price by \$200."—New Jersey laboratory technician.

"Too many 'Plaza' or 'PowerFlite' or 'Plymouth' signs. I don't fancy being a billboard."—Illinois secretary.

"It's hard for a tall person to see overhead traffic lights through windshield."—Ohio meter reader.

"Chrome around taillights not easy to get at for cleaning."—Michigan stagehand.

That, then, is what the owners report on the 1955 Plymouth V8. For a detailed analysis of the various percentages, see the table on page 105.

Turn back to page 102 for Floyd Clymer's road test of the Plymouth V8.

SENSATIONAL LOW-PRICED IMPROVED DOCK

30-FT. PIER

INSTALLS IN 2 HOURS

After Easy Assembly



**FOSTER
PORTABLE
PIER**

Install Without Boats—No Standing in Water



For Camps,
Lodges,
Resort Homes

Written up in LIFE. Fast pivot assembly swings sections into position from the shore or dock, easily taken-out each winter. Readily portable. Complete with rust-proofed Tubular Steel Frame, Wood Decking, and Jack, for all sizes and plans.

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STATIC master
ELIMINATES SURFACE STATIC ELECTRICITY
Removes Objectionable Dust and Lint

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The Pelonium Strip Does The Trick \$4.95

NUCLEAR PRODUCTS CO.
Dept. 63—10173 E. RUSH ST., EL MONTE, CALIF.

2 GREAT AUTO BARGAINS



NEW KING MIDGET for 1955, lower priced, improved performance. Drive it for 75c per week. Rider agents wanted, earn your own car. Also just out **KING MIDGET JUNIOR** chassis, finely engineered.

ready to run, and priced at less than the retail cost of parts. Agents wanted. Get all the facts—send 25c for literature, special prices and proposition on both cars, or \$1 (refunded first order) for this plus actual assembly book and service manual.

MIDGET MOTORS MFG. CO.
ATHENS 1, OHIO



Make \$20 to
\$30 a Week
**EXTRA
MONEY**



MACHINE SAW FILING PAYS UP TO \$3 or \$5 an HOUR

• Turn your spare time into CASH—sharpening saws with a Foley Automatic Saw Filer pays up to \$3 or \$5 an hour. You will find you can make \$20 to \$30 a week in your spare time as a starter.

You can work in your basement or garage—no experience necessary. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. No canvassing—"I advertised in our local paper and got in 93 saws"—says M. L. Thompson. The Foley is the only machine with which you can file all hand saws, also band saws and cross-cut circular saws.

SEND FOR FREE BOOK "MONEY MAKING FACTS"

Shows how you can get business from home owners, farmers, carpenters, schools, factories, etc. With a small investment, no overhead, no stock of goods to carry, you can get right into a cash business, and possibly later on develop into a full-time repair shop. Send coupon today for Free Book. No salesman will call.

"Each saw I filed got me 6 more and business has been picking up that way since a year ago. If it keeps up I will have to buy another Foley Saw Filer."
William C. Baldwin



"I have done 4 or 5 thousand saws in my spare time in the 4 1/2 years since I got the outfit, and they are all coming back."
Len Crego



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specialty
priced
\$4.19

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886 M

Irwin Speedbor "88" bit set for 1/4" electric drills



Exclusive
hollow
ground point

Set of 6 Irwin Speedbor "88" wood bits in molded plastic case with transparent top and bright red tray. Sizes 3/8 to 1". Exclusive hollow ground point and spade-type cutters bore faster, deeper, cleaner — even in seasoned hardwood maple, plaster, plastics. One-piece steel forging and hardened full length to stay sharp longer. See your independent hardware dealer.

IRWIN
Wilmington, Ohio

- the original solid center auger bit
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Holt's **WORLD FAMOUS**
"Do-It-Yourself"
PRODUCTS

HOLT'S ORIGINAL
TRADE MARK
Piston Seal

does help in
6
important ways

- 1 - reduces oil consumption
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Good for 10,000 miles of carefree driving. Next best thing to a complete motor overhaul . . . at 1/20 the cost. Today's biggest seller. Millions of tubes have been sold throughout the World during the past 18 years. Undeniably safe for even the finest engines. Endorsed by leading technical automotive experts. Easy to use. Costs less than \$5.

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Holt's
GUN-GUM

Mends leaky mufflers—
seals pipes and joints

MUFFLER SEAL

Sets like a weld in
a few minutes.
Apply by hand

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Prices slightly higher in Canada

Write
for full
details

Clymer Road Test

(Continued from page 102)

the highly desirable safety rims on all cars.

The Plymouth V8 has lost a little economy over the smaller six, but apparently today's owner doesn't worry about slightly less miles per gallon. He prefers an automatic transmission, even though overdrive-equipped cars get from two to four more miles per gallon. Gas economy is average and regular gasoline gave good performance (see Economy Chart). No oil was added. The new V8 engine seems to be a miser on oil.

The speedometer showed 107 miles per hour at top speed although, like all speedometers, it is about seven percent fast. There is minimum engine vibration due to the live-rubber engine mounts, which Plymouth pioneered, and the well-balanced short-stroke engine.

As always, Plymouth's brakes are tops. There was little evidence of fading. Brakes are easily applied and perfectly balanced.

The test car was equipped with automatic transmission (PowerFlite). This is an excellent well-designed unit. It is a large, air-cooled planetary unit employing a torque converter with gears. For a car of Plymouth's horsepower and weight, it is definitely oversize, which should assure long life with little service expense. There is a feeling in driving the car that the transmission might be heavier and stronger than necessary.

Acceleration in all speed ranges is good, but the V8 really shines when the engine gets to "revving." If the driver is careless, the upshift and downshift can be rough but, with a little practice on throttle opening at the time shifting automatically occurs, the change is quite smooth. The automatic shift takes place at different speeds, depending upon the position of the throttle. The minimum upshift is at 26 miles per hour. If the throttle is held wide open, the shift to high takes place at about 58 miles per hour. Passing gear does not operate at speeds above 58 miles per hour. Below 58, when the throttle is depressed, a noticeable engine hum and a forward surge (and I do mean surge) take place as the car picks up speed instantly. Its power is sensational.

Last year's Plymouth was shorter and had a stubby look, which retarded sales, but now the car looks even larger than its 115-inch wheelbase indicates due to the long front and rear fenders. Bumpers are plain with no bulletlike extensions, which makes it possible to push another car without damage from overriding.

The parking lights are amply protected

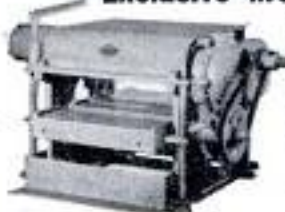
(Continued to page 272)

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Exclusive MONEY-MAKING features:



- Full 12 3/4 in. x 6 in. capacity
- Power feeds at 24 ft. a minute. (Easily adjusted for lower feed rate)
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LOW DOWN
PAYMENT
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How to choose a paintbrush that does faster, streak-free work



Look for **TYNEX**® on the handle

Here's why it pays you to use a brush with Du Pont TYNEX nylon bristles



1. No break-in! You don't have to soak or flex a new brush... if it has "Tynex" nylon bristles.



2. Full point pickup! Specially tipped and flagged "Tynex" bristles hold a full load of paint.



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Powerful, Easy to Use, Handy as a Hammer!

Satisfaction guaranteed up to tenpenny nails.

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Carpenters' favorite. Convenient in tight places, carries in pocket. Tool steel counteracting jaws driven into wood under nailhead. Double leverage with hammer. All steel, rustproofed.

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Do your own pipe work with this Drop Head Ratchet Die Stock. Threads 90% of the pipe work around the home. OD-4A Die Stock Set comes complete with four instantly changeable die heads for threading 1/8, 1/4, 3/8 and 1" pipe, all in a fitted steel case with handle and hasp.

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COOLING SYSTEM

CLEANER and CONDITIONER

A COMPLETE COOLING
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IN ONE PACKAGE!

1. Cleans out rust and scale
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Clean out your cooling system this spring the easy all-in-one way with all new Permatex Cooling System Cleaner and Conditioner. Cleans out rust and scale—puts grease and oil in suspension and carries it out—and, as a plus, prevents rust from re-forming and seals all leaks. Two compartment containers with cleaner in top and rust preventative, sealer, and neutralizer in bottom.



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Like It!

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OVER 50 CHEMICAL PRODUCTS FOR BETTER
AUTOMOTIVE MAINTENANCE

by the massive grille. There is excellent trunk space (33.8 cubic feet). The trunk lid is not easy to raise and needs slamming to close. Its operation should be improved. The lid is not self-locking, but requires use of a key to lock it.

Front vision and windshield design are excellent, although I detected some distortion in the curved corners. Rear and side vision is average for a modern car.

Windows are quickly lowered or raised by only three turns of the crank. They could turn more easily. The doors open and close easily and the body has a solid feel. I found no evidence of water leakage and no dust seeped into the car at any point. There is a noticeable body rumble at high speed. No rattle or squeaks developed and assembly appeared above average.

There is ample inside body room and excellent room for tall persons in all Plymouth models.

Plymouth has really gone all out insofar as interior finish is concerned. Certainly no car in its price class has better interior appointments, except for the rather plain-looking instrument panel, which is not in keeping with the other features. The armrests are well located and the driving position is comfortable, as is the location of the steering wheel. The top of the steering wheel is below the line of vision, which is good.

The ventilating system is excellent and Plymouth wisely has retained the screened-cowl ventilator located high in back of the hood at the bottom of the windshield. It now operates by the sideways movement of a lever below the center glove compartment. I found the Plymouth heater far above average. When the blower is on it is rather noisy but soon the heat comes through so fast that the two-speed control knob has to be turned to low position or off entirely. The defroster is efficient and the air slot extends clear across the base of the windshield.

An excellent feature is Plymouth's eight-inch brake pedal, which can be operated with either foot. Drivers will find that left rather than right-foot braking is more efficient with automatic-transmission cars. Certainly no car has better brake and throttle positions than Plymouth. The left-hand-operated parking brake is easy to apply and release. The hand brake still operates on the propeller shaft, which Chrysler claims is an excellent feature, but I'd still prefer rear-wheel application.

The speedometer design does not appeal to me. Plymouth engineers located the full-circle horn ring so that the upper half partially obstructs the speedometer. There is

(Continued to page 274)

GOSH! what a boat!



Cadillac molded plywood boats, feature the finest advances in outboard design. They're light, fast and roomy. Special hull contours permit greater speed and cat-quick handling—with full-load safety. Molded from 5 to 7-ply clear veneer—they're rugged. Rich mahogany wood and chrome plated brass hardware. These beautiful boats give you superior quality and performance at reasonable prices. Write for free literature on Cadillac's complete line of molded plywood, aluminum and cedar strip boats.

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The Gem Maker comes complete with all necessary equipment, including a super-charged diamond blade for sawing, and all wheels for grinding, shaping and polishing; also complete instructions. The complete equipment as shown, less motor and belt, for only \$29.50, f.o.b. Burlington, Wisconsin. Write today for information and literature.

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Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send in your blueprints and inquiries.
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1955 Edition! Everything for car, truck, custom-styled car, hot rod... at **LOWEST PRICES!**
Save up to 50% on all parts, accessories! Only complete automotive buying guide... 50,000 items... 148 pages! Thousands of hard-to-find parts; equipment, parts for 1920 to 1955 models; **Hollywood accessories** never before offered; **hi-speed parts**. Send your name and address and \$5c (refundable with first \$5.00 order) to:
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\$6.95 DRAINS cellars, cisterns, wash tubs;
IRRIGATES - CIRCULATES - SPRAYS

Submersible! Won't Rust! Won't Clog!
Original Type P—Pump of 1,001 Uses—house, garden, farm. Up to 3,000 GPH; 450 GPH 80' high; or 1800 GPH from 25' well. Use 1/6 to 3/4 HP motor. Motor coupling included. Oil-less bearing. Stainless steel shaft. 1" inlet; 3/4" outlet. **\$695**

Exclusive Double-Bearing Heavy-Duty Pumps
TYPE X—2 oil-less bronze bearings for smoother running; longer life. For every pumping need. Up to 7,500 GPH. Use 1/4 to 1 HP motor. 1 1/4" inlet; 1" outlet. Stainless steel shaft. **\$1095**

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Up to 50 lb. pressure. Ideal for water systems, sprinkling, irrigation, etc. Use with Type X or XB Pump. **\$595**

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INSIDE and OUT
with low-cost* Weldtex**

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some reflection from the instrument panel into the windshield at night, but very little in the daytime.

I'm glad to see Plymouth continues to use gauges instead of warning lights for amperage, fuel, oil pressure and water temperature. Two of the gauges are well located in front of the driver, but the oil-pressure and temperature gauges, located in front of the passenger, are too far away from the driver's eyes.

The glove compartment is well located in the center of the panel, and the ash tray is nearer the passenger than it is the driver.

Plymouth's automatic-transmission selector lever, located on the instrument panel, is something really different. My first impression was that I didn't like it but, after driving the car a few days, I found it has some desirable advantages. It is extremely easy to operate. The handle is located within five inches of the ignition switch. I don't know why Chrysler stylists felt it necessary to change the apparently satisfactory location of the shift lever, but they did. I do believe, however, that members of two-car families may find it confusing when changing from another make of car to Chrysler-built cars, or vice versa. Chrysler stylists contend the new location is better because it is close to the ignition key, out of the way and that the automatic-transmission driver no longer shifts—he selects. Maybe Chrysler has started a new trend—who knows? A light behind the indicator lever would be appreciated by most drivers.

While on the subject of lights, I think the dome or side light should turn on with the opening of any door, and not just the right one. When the Plymouth left door is opened, no light comes on, although a hand switch directly above the left door controls the dome lights.

Almost every one with automotive knowledge agrees that Chrysler products have been exceptionally well-engineered for dependable, economical service, but that they were behind in styling until this year. More Plymouths are used for taxi service, which is the hardest service possible, than all other makes of stock-production cars combined. Undoubtedly one reason is economy and the fact that Plymouth cars always have been easy for mechanics to work on.

In addition to the new V8 models, the Plymouth is available with the 117-horsepower six-cylinder L-head engine. Plymouth offers a choice of three transmissions: three-speed, three-speed with overdrive and the automatic PowerFlite. All models can be bought with power brakes, power seats, power steering and power windows.

★ ★ ★

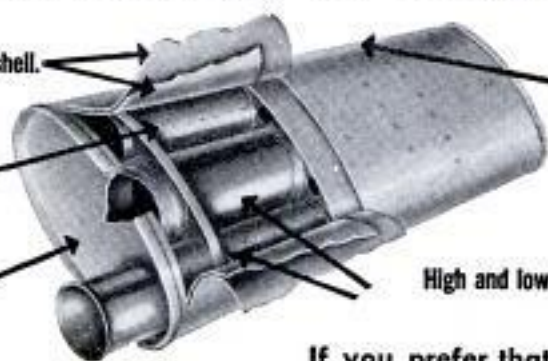
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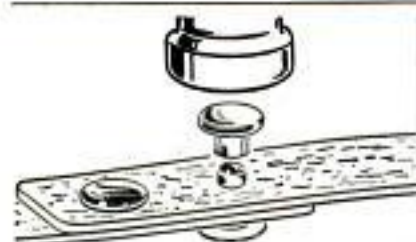
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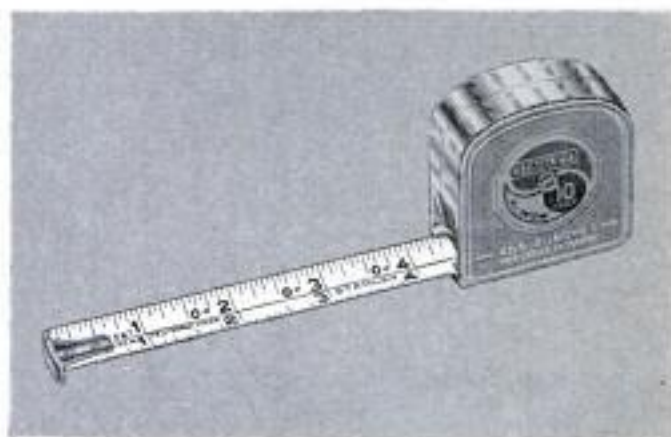
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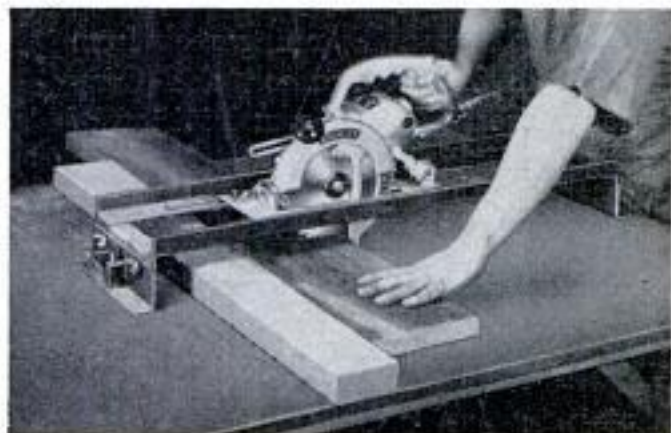
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Switchyards for the Freight Trucks

(Continued from page 86)

keeping its rolling stock on the road.

Other facilities at the Baltimore Transfer shops include steam washing rooms, spray-paint bays, a check-out point where all outgoing equipment is safety-inspected and weighed, and even a blacksmith shop.

The blacksmith shop, with its old-fashioned forge and anvil, may seem an anachronism in the midst of all the modern equipment, but maintenance men say some jobs can be done there that can't be done anywhere else.

Many terminals also contain lounges, locker rooms and showers for drivers getting ready for the road or coming in off a run. Some companies even provide sleeping facilities for their drivers, especially at terminals located at the far limits of their systems.

Meeting and lecture rooms where employees can be brought up-to-date on the company's operations and safety programs (safety has become an increasingly important concern to the industry) are seen frequently in many of the larger terminals.

The trend toward larger and more elaborate terminals is a natural development of the phenomenal growth of the trucking industry, which is carrying an ever-increasing share of the nation's goods from one part of the country to another.

"It's a matter of economics," one trucker said. "After all, our main selling points are that we can move goods cheaper, we can move them faster and we can provide the shipper with flexibility of service he can't get anywhere else.

"In order to back up those claims, in order to meet competition from other truckers as well as from other forms of transportation, in order to stay in business at all we had to find ways to cut costs and eliminate delays.

"It didn't take long to figure it out. We could see that most of the delays resulted from inefficient handling on our platforms. Delays mean higher costs. So we modernized."

Actually, the truck lines have developed little in their new terminals that hasn't been used before. But the way they have adapted existing ideas to meet their own needs is a good example of how an American industry rises to a challenge.

How about that other problem—the one we're all familiar with—the truck that slows you down to a crawl when climbing a long upgrade? Well, next time you get behind one of them, take what comfort you can from the thought that they are working on it. ★ ★ ★

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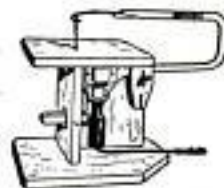
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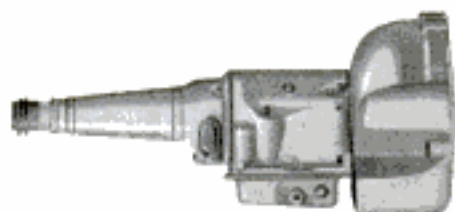
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1

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2

Want extra passing and hill-climbing "go"?

Merely step down on the accelerator (at speeds up to 60 m.p.h.) and Fordomatic "kicks down" into intermediate gear. You get the extra burst of power you need for passing or to pull you up a steep grade.



3

Want a new feeling of security on the road? With Fordomatic you can drive with added confidence. For example, downhill braking is smooth and easy at *any speed*. You simply move the selector lever into Low (Lo)! At speeds above about 23 m.p.h., Fordomatic will go into *intermediate* for smooth, effective engine braking, then shift to low *automatically*, when speed drops below about 23 m.p.h. If you haven't driven a Fordomatic Ford lately . . . see your Ford Dealer for a Test Drive.



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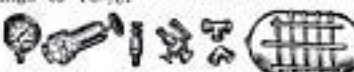
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YOUR car's radiator and cooling system need a good cleaning twice a year—and Spring is one of the best times to do this job. That's because you probably still have your winter anti-freeze in, and automotive engineers agree that anti-freeze should be drained when Winter's over.

Here's why: Anti-Freeze, while very valuable in the winter, does not have as effective heat transfer properties as water. It makes your engine run hotter, especially in the Spring and Summer, and has the effect of cutting up to 6 points from the octane rating of your gasoline. And this reduction in octane rating can mean the equivalent of a loss of 1½ gallons of premium gasoline in every tankful!

What goes on inside?

Ideally, your cooling system is a closed or sealed system. Exhaust gases, however, often get into the coolant, forming acids that corrode metal parts. Rust and scale also form due to the natural characteristics of water. And although your anti-freeze may be permanent, the rust inhibitor in it is not! So you have the second problem: you must take steps to clean out old rust, scale and grease, and keep them from forming in the future.

What can you do about it?

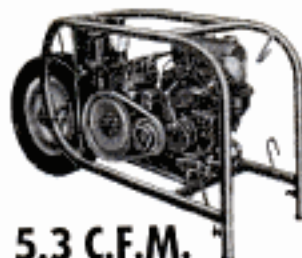
Here's what the Society of Automotive Engineers recommends, "Where anti-freeze has been used, drain the solution in the spring; flush the system thoroughly and clean if necessary; then install a fresh filling of summer rust inhibitor and water."

*A message in behalf of
your car engine from...*

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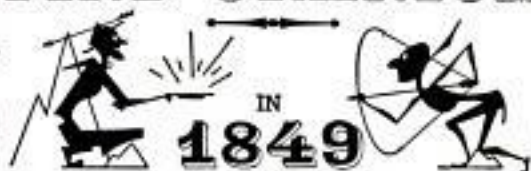
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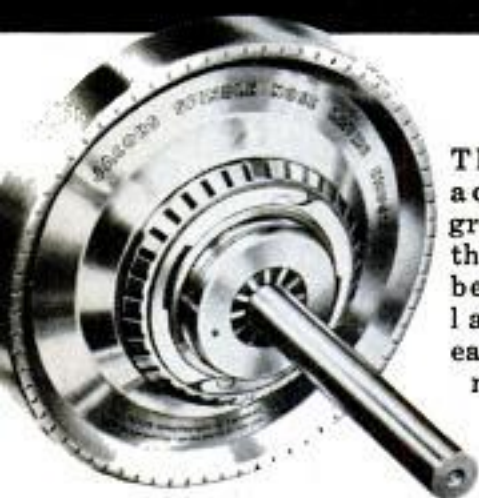
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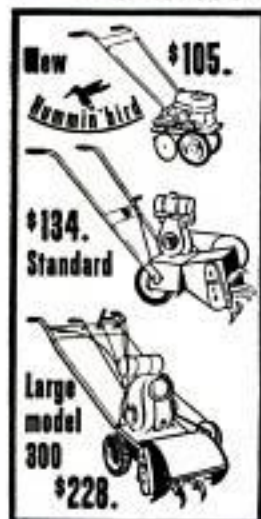
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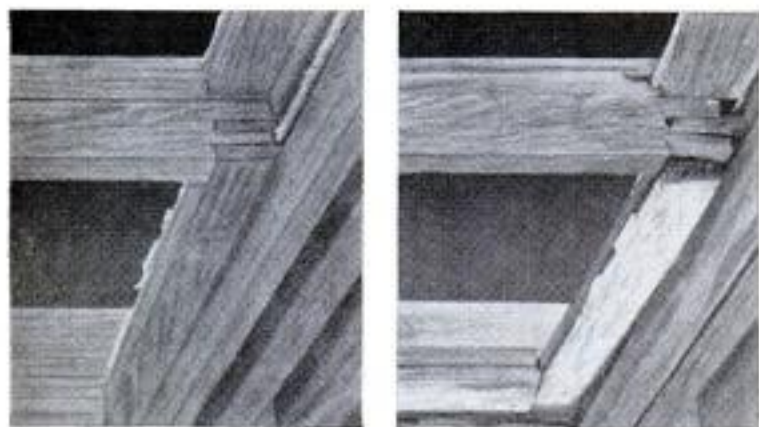
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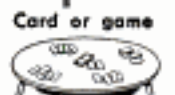
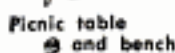
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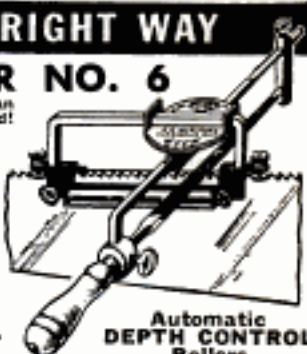
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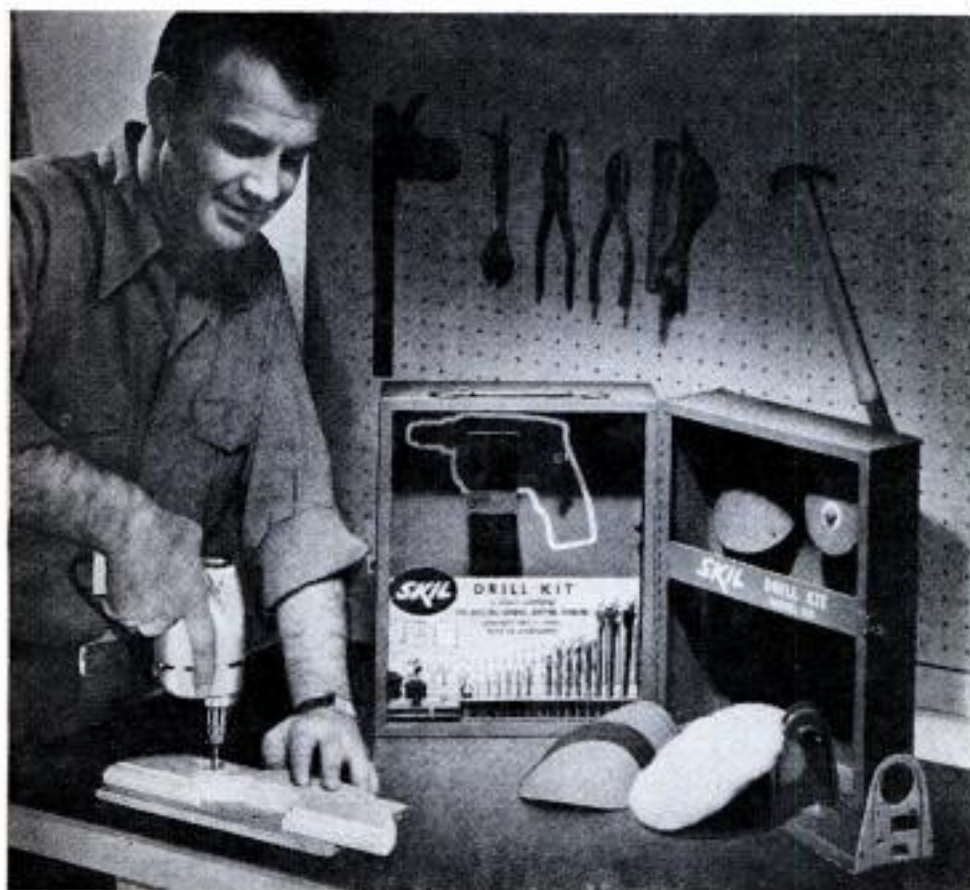
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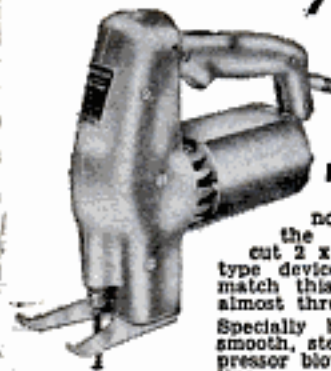
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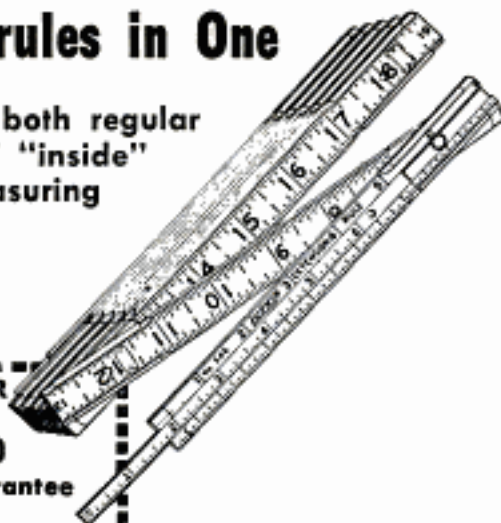
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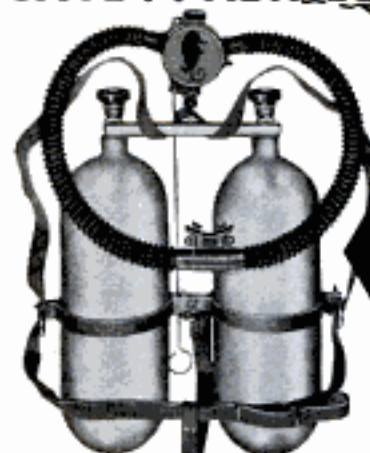
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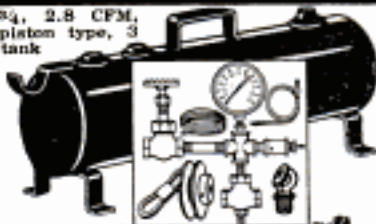


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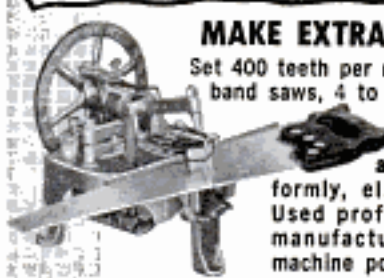
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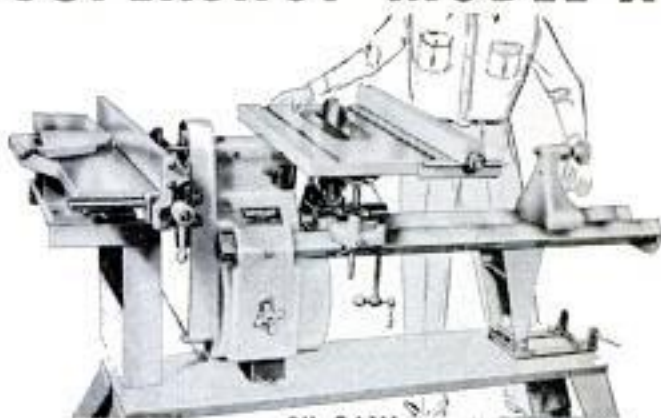


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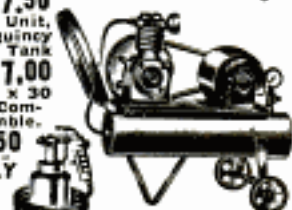
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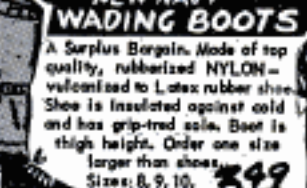
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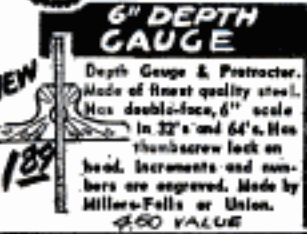


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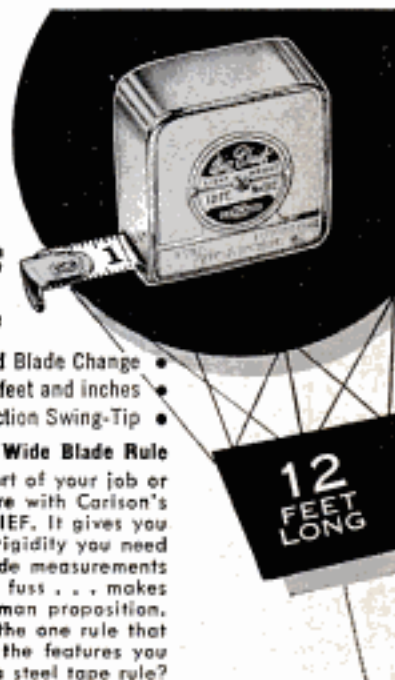
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1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output. **\$199.50**
LITTLE GIANT—350 WATT (Item 273) 115 v. DC 1 1/2 hp. Briggs engine. Perfect for lights, radios, chain saws and power tools. Wt. 65 lbs. **\$99.75**

PORTO-POWER 1500-1750 Watt Plant
115/120 v. 60 cyc. AC. Push button start. Powered by a 4.5 HP Briggs engine. Combines compactness and easy portability with higher output for handling heavier starting loads. Ideal for operating all burners, sump pumps, freezers, television, lights, communication systems, etc. Perfect for contractor's power tools. Wt. 160 lbs. (Item 20) **\$279.50**

MASTER-LITE 2500 Watt Plant
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 250 lbs. Reg. price \$645.00 (Item 21) Factory Price **\$329.50**
Dual Voltage 110/220 available for above plant for \$30.00 additional.
3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. \$760. Factory Price **\$379.50**
We make fully automatic controls to operate any of the above light plants. Write for details. We make all sizes up to 25,000 Watts.

Variable Speed Selector
Heavy duty, made by B. F. GOODRICH for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "stroke free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: 1 1/2 hp. 36 lbs.; 1-2 hp. wt. 35 lbs.; 2-3 hp. wt. 105 lbs. Reg. list \$228, \$252 and \$352. Our prices **\$79.50, \$89.50 and \$114.50**

JET STEAM MASTER
Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 points of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 403. Special factory price **\$329.50**

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New! with power reverse-improved, Master Gardener with new extra power and a full gear transmission—providing forward, neutral and Power Reverse! Works for you the year around. Prepares mellowed deep seed beds without labor. Built-in power take-off to drive pump, saw, generator, etc. Safety clutch—can't burn out. Has independent clutch on tiller. New gear tread tires assure non-slip drive. Performs better—does more than tractors costing twice as much. Converts in minutes to Tiller, Sickle, Power Mower, Snow Blower, etc. Basic self-propelled tractor with famous 2 1/2 hp. Clinton engine complete with rewind starter. Wt. 110 lbs. **\$129.00**
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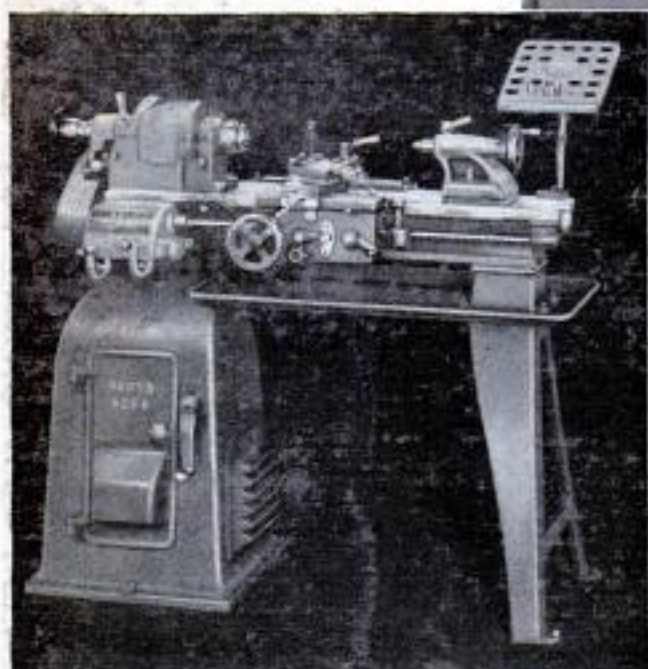
JET STEAM MASTER

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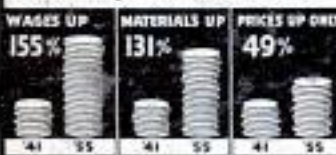
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