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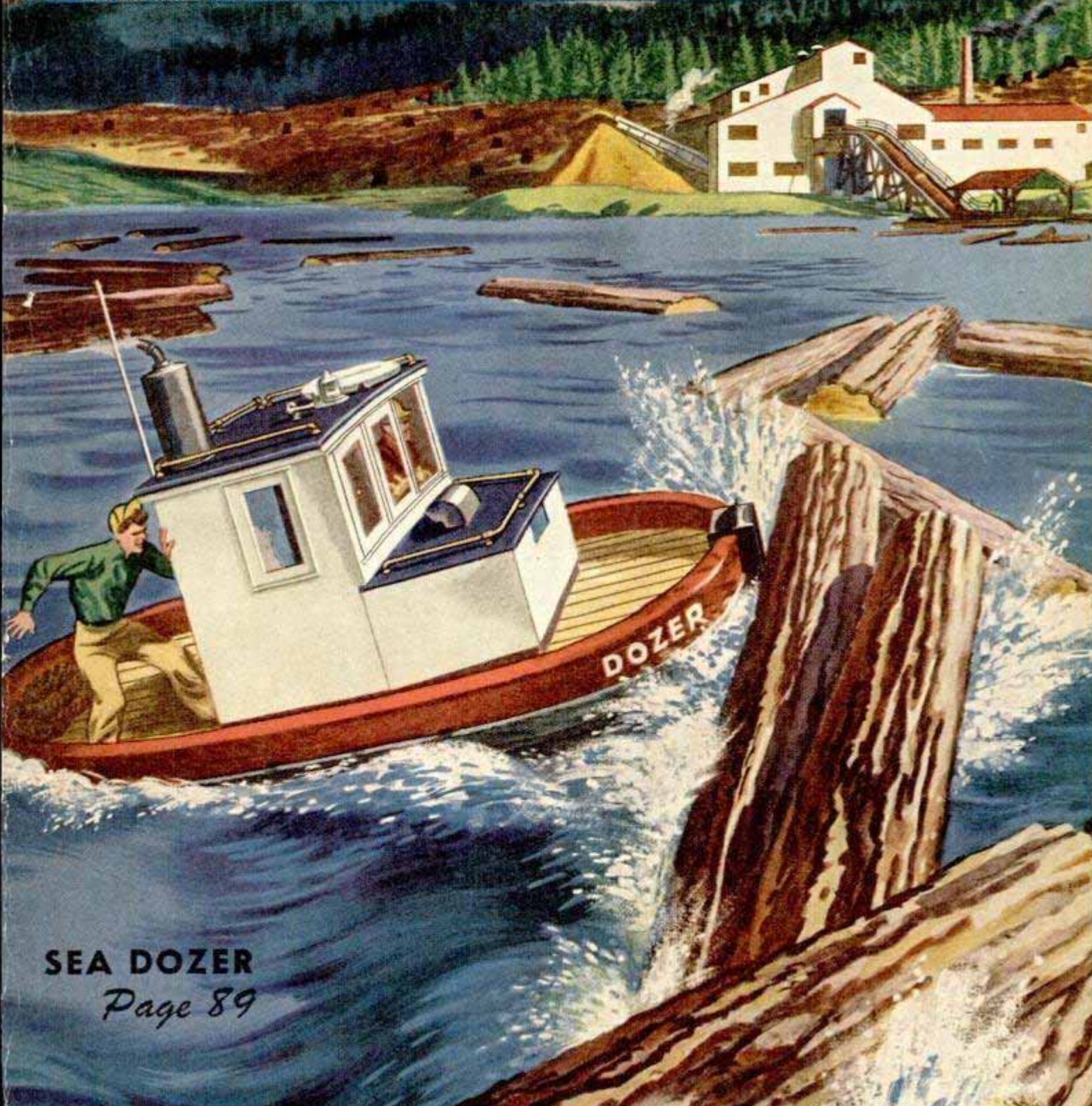


# POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

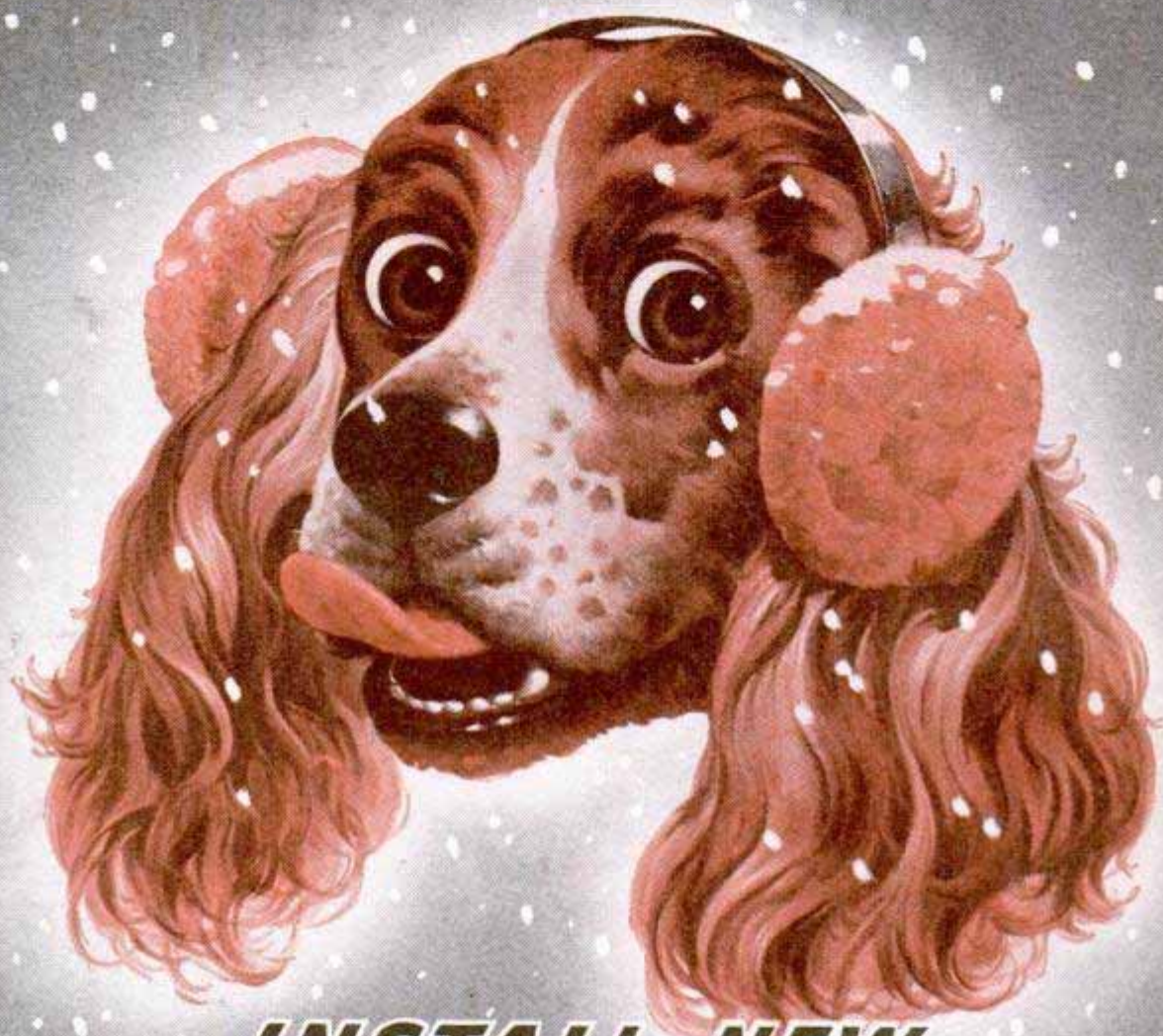
REG'D. TRADE MARK GREAT BRITAIN No. 410428

REG. U.S. PAT. OFF.



**SEA DOZER**  
*Page 89*

Ready for **WINTER ?**



*INSTALL NEW*

**CHAMPION**

**SPARK PLUGS**

# Can you answer these 6 questions about the 3 leading low-priced cars?



..Which car has the highest compression ratio for greater engine performance and economy?



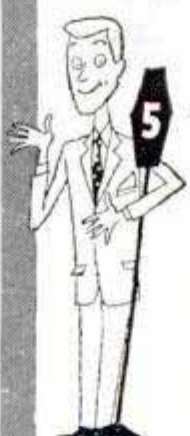
..Which car has the famous Air Pillow Ride for your greater comfort?



..Which car has Safety-Rim Wheels for your added protection in the event of a tire blowout?



..Which car has Automatic Ignition-Key Starting for your greater convenience?



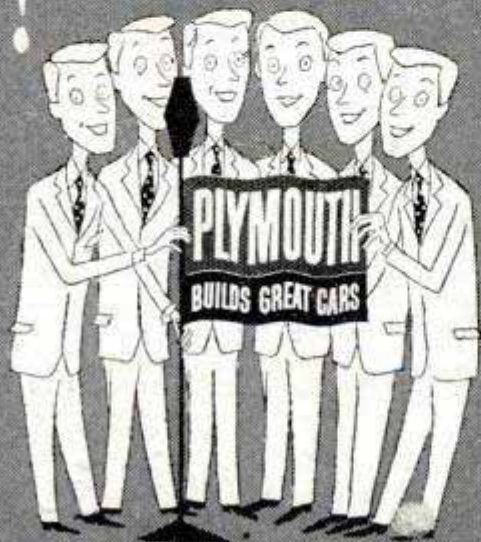
..Which car has Floating Power for smoother engine performance and longer car life?



..Which car has Automatic Electric Choke for quicker warm-up, more economical use of gas?

## You said it!

THE ANSWERS ARE ALL THE SAME—



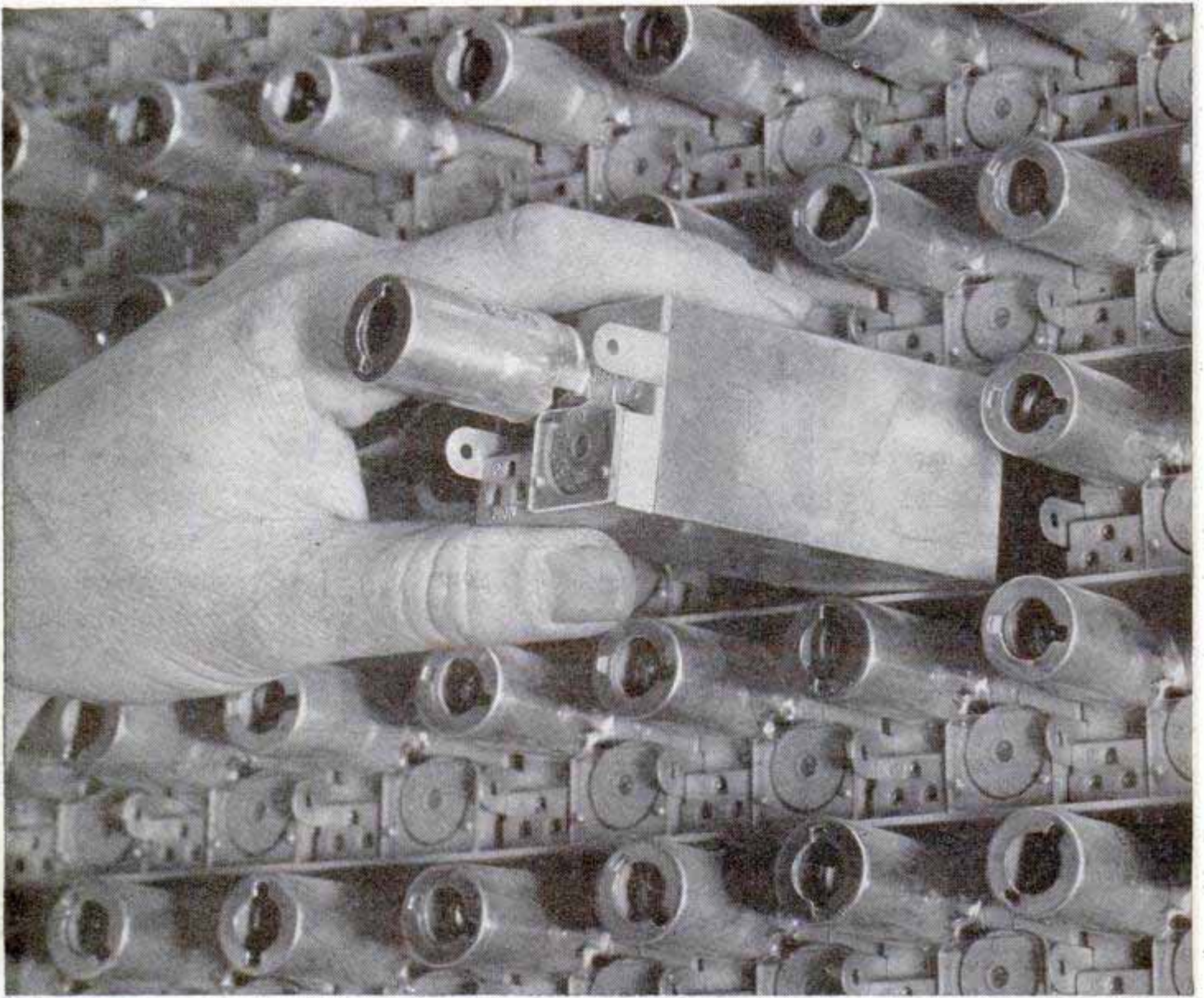
# PLYMOUTH

the car that likes to be compared

This One



1DEP-9ZC-UYQ5



**ANOTHER SCORE IN THE**

## *battle of the inches*

It takes many costly buildings to house your telephone system. Every inch saved helps keep down the cost of telephone service. So at Bell Telephone Laboratories engineers work constantly to squeeze the *size* out of telephone equipment.

In the picture a new voice frequency amplifier is being slipped into position. Featuring a Western Electric miniature vacuum tube, tiny permalloy transformers, and special assembly techniques, it is scarcely larger than a single vacuum tube used to be. Yet it is able to boost a voice by 35 decibels. Mounted in a

bay only two feet wide and 11½ feet high, 600 of the new amplifiers do work which once required a *room* full of equipment.

This kind of size reduction throughout the System means that more parts can be housed in a given space. Telephone buildings and other installations keep on giving more service for their size — and keep down costs.

The new amplifiers, which will soon be used by the thousands throughout the Bell System to keep telephone voices up to strength, are but one example of this important phase of Laboratories' work.

**BELL TELEPHONE LABORATORIES** *Exploring and Inventing, Devising and Perfecting, for Continued Improvements and Economies in Telephone Service*



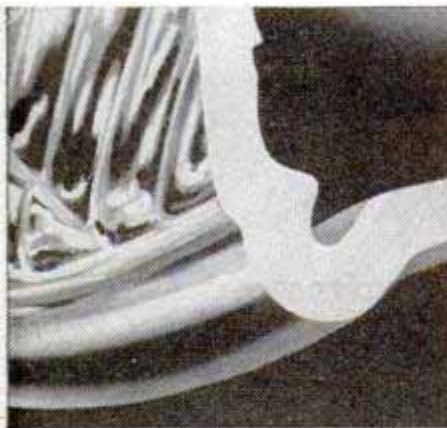




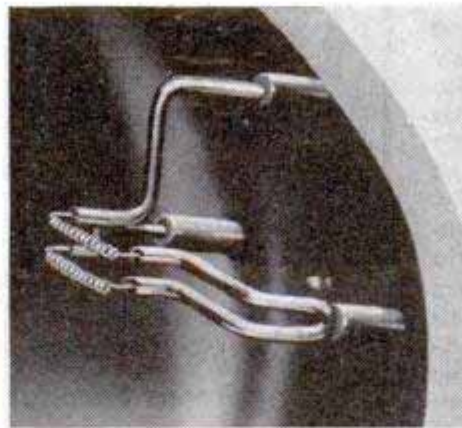
**ALL-GLASS**  
sealed beam  
**HEADLAMPS**



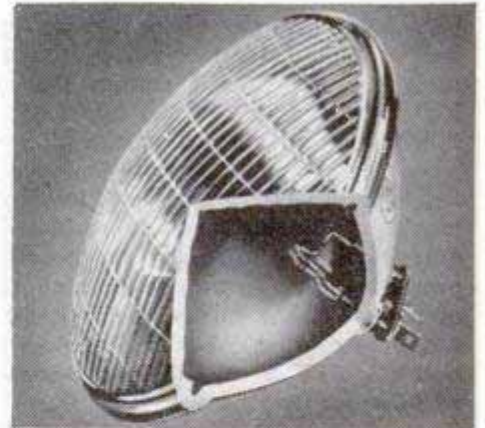
## Why this headlamp does not grow dim



**1. DIRT AND MOISTURE** can't get in to steal the light, because the General Electric headlamp is a one-piece "all-glass" unit. Lens is shock-resistant hard glass, precision-made to throw maximum light on road.



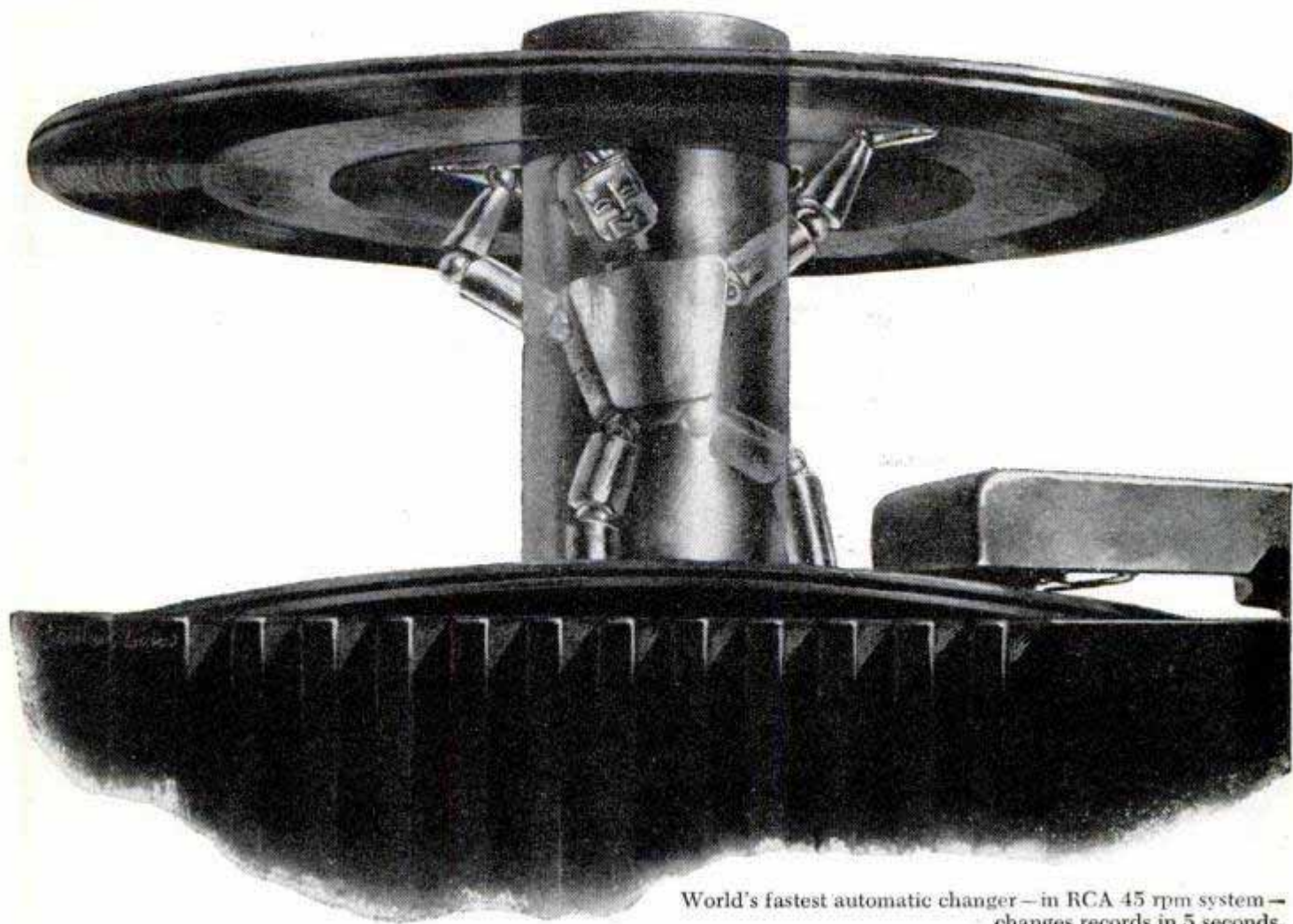
**2. RUGGED FILAMENTS** give 12% more light on the road for driving, 16% more light for passing. Clamped in a vise-like grip, they won't shake loose. And the reflector stays mirror-bright for life.



**3. ONE-PIECE CONSTRUCTION** means G-E headlamps average 99% of original brightness at end of life . . . *do not grow dim!* Have lights checked when car is serviced. Get G-E lamps for replacement.

*You can put your confidence in—*

**GENERAL**  **ELECTRIC**



World's fastest automatic changer—in RCA 45 rpm system—changes records in 5 seconds.

## *Quick change artist*

Hundreds of thousands are now enjoying RCA's thrilling new way of playing records . . . they marvel at its wonderful tone, its compactness . . . and the speed with which it changes records.

Prolonged research is behind this achievement, research which sought—for the first time in 70 years of phonograph history—a record and automatic player designed for each other.

Revolutionary is its record-changing principle, with mechanism *inside* the central spindle post

on which records are so easily stacked. Result: a *simplified* machine, that changes records in 5 seconds.

Remarkable, too, are the new records—only 6 $\frac{1}{8}$  inches in diameter—yet giving as much playing time as conventional 12-inch records. Unbreakable, these compact vinyl plastic discs use only the distortion-free “quality zone” . . . for unbelievable beauty of tone.

Value of the *research* behind RCA's 45 rpm system—which was started eleven years ago at

RCA Laboratories—is seen in the instant acceptance, by the public, of this better way of playing records. Music lovers may now have *both* the 45 rpm system, and the conventional “78.”

\* \* \*

*Development of an entirely new record-playing principle is just one of hundreds of ways in which RCA research works for you. This continued leadership in science and engineering adds value beyond price to any product of RCA, or RCA Victor.*



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*World Leader in Radio — First in Television*

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you need!**



Imagine the fun of pulling away from pals on upgrades . . . and of gliding along on level stretches while others churn their legs!



Shift gears as in a car

Like the gear shift on a car, the New Departure "Speed Changer" offers *low speed* for quicker getaway, easier pedaling on hills, better control in traffic; *high speed* for making time on level stretches.

Be first in your neighborhood to sport this wonderful "Speed Changer"! Fits right into the New Departure Coaster Brake on your bike. Ask your dealer about it now!

On your new bike insist on America's favorite

## New Departure COASTER BRAKES



**FREE!** Have fun mystifying your friends! Guess their ages, read their minds! Send a postcard for Magic Packet P6. Address:

**NEW DEPARTURE • DIVISION OF GENERAL MOTORS  
BRISTOL, CONNECTICUT**

1869

in this corner.....

## THE EDITORS



THERE'S a new infant in our family. *Populær Mekanik*, Scandinavian counterpart of *Popular Mechanics*, was born in Copenhagen, Denmark, in September of this year and is now being distributed throughout the Scandinavian countries. It is directed by Jorgen Grusgaard and Jorgen Norredam of the Danish capital. This is our third foreign-language edition. *Mecanique Populaire* began publication in Paris, France, shortly after the close of the war and this French edition now circulates throughout most of continental Europe and Canada. A Spanish-language edition, *Mecanica Popular*, is printed in our own Chicago plant and distributed throughout the Latin American countries and Spain. All these editions are direct translations of *Popular Mechanics*, and their sale, now approaching 300,000, is evidence of the vast interest in American scientific and mechanical developments on every continent. It is our hope and belief that these editions are playing a vital part in extending American influence and prestige.



\* \* \*

### Letter to the Editor

Gentlemen:

There has been considerable interest out here in your article of how to build a Geiger counter (Feb. 1949). Especially, people are building and using the counters in the rich ore regions of Idaho.

A funny thing happened there. Some modern prospector had the clever idea of going to the state capitol at Boise, Idaho, and running his Geiger counter up and down the shelves of ore samples which have been on display there for years. When his counter went by one piece of ore, it clicked at full speed. But no one in the museum could tell the excited man what part of the state that particular sample came from. There was no record or placard on the piece of ore and no one could remember who brought it in. Since then

(Continued to page 8)



**"What's he got  
that I haven't got?"**

LOOK at the successful men you know. "What have they got" that you haven't?

Very little, probably. In most ways these men are no brighter or naturally more capable than average. Many of them probably have no more formal education or better natural aptitudes than you.

But that little extra they have is important. They have the special knowledge and ability for which business is glad to pay well—they know the what, why and how of business. They have also the confidence and aggressiveness which come from knowing that they know and can apply their knowledge.

You may add that extra—may get that same profitable knowledge and ability—that same confidence and aggressiveness—if you are willing to pay the price in earnest, necessary study. For LaSalle has spent over 40 years developing, testing and proving, with over a million student members, spare-time success training in certain specialized business fields. What scores of thousands of men and women—many just like you—have done, you should be able to do.

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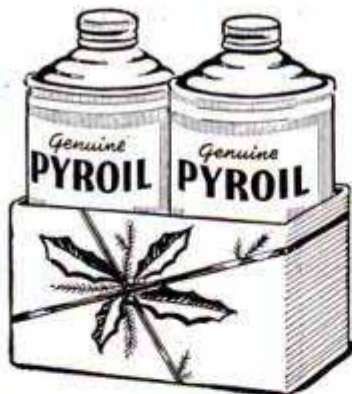
Next time you stop for gas or oil—add Pyroil—add more smooth miles to your car.

## Pyroil for Aircraft Engines

Use Aircraft Pyroil B for lubricating oil, Aircraft Pyroil A for gasoline.

## Ideal Christmas Gift

Surprise him with a practical gift that will be enjoyed for months—a twin quart Christmas wrapped package of Pyroil—one quart for the gasoline—one quart for the lubricating oil. Included in each package (without extra cost) are two useful auto accessories—a windshield scraper and a rubber key case—extra gifts he will appreciate.



2 Extra Gifts  
At No Extra Cost

## SPECIAL GET ACQUAINTED OFFER

This unusual gift—2 quarts of Pyroil and 2 extra gift items only \$3.25 postage prepaid anywhere in the U.S. You not only give a gift—but improved car motor performance that will thrill him. Mail your order today. It's a great way to remember all your friends who drive. Send remittance with order to save C.O.D. charges, we will have a local dealer fill your order or we will fill direct.

## PYROIL COMPANY

97 Pyroil Bldg. La Crosse, Wisconsin

(Continued from page 6)

prospectors have been feverishly building counters and are combing the whole state for the origin of that ore sample. There has been such a demand for the special tubes used in Geiger counters that the Raytheon jobber in far away Portland, Ore., has been swamped with orders.

Thomas E. Riley,  
233 Kellogg Park,  
Portland 2, Ore.

\* \* \*



## Thanks, Inspector!

After reading our "how to build" story of the Concrete Block House last May and June, a subscriber in Ann Arbor, Mich., decided to build it, bought our set of plans and showed them to the city building inspector. We blush with pride over the next letter from Ann Arbor: "I would like to tell you that the Inspector said he had never seen such a detailed set of plans in all of his years in his position, and that he only wished that everyone had as complete information as you have given. We are very pleased with the whole setup."

\* \* \*

## Letter to the Editor

Dear Sir:

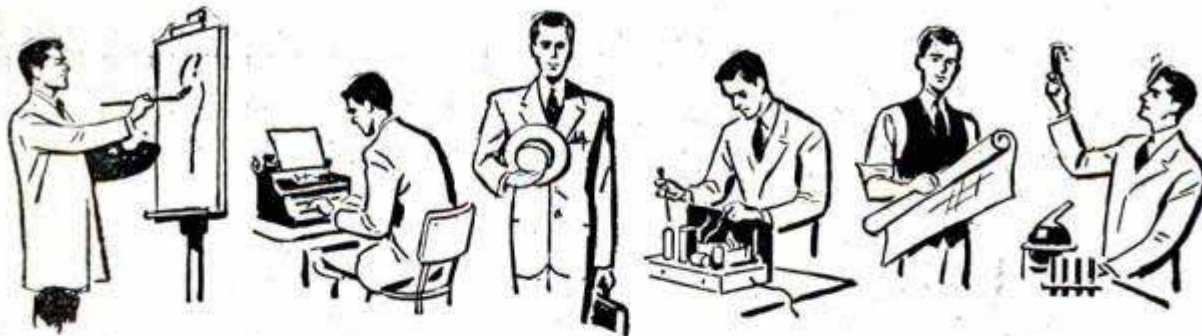
I read with interest the article about the Journal Publishing Co., Portland, Ore., in the June issue. On page 138 you have an illustration of a typesetting machine being lowered by a specially designed carriage. The caption (says) it is one of the Linotype machines. It so happens that the machine in the picture is an Intertype... To a printer there is a difference... like showing a picture of a Ford and calling it a Chevrolet.

L. V. Nesbit,  
2231 Ward St.,  
Berkeley, Calif.

Mr. Nesbit has a printer's sharp eye.

\* \* \*

☐ For those who are left unsatisfied by the ordinary paper match, there is now a perfumed match whose fragrance lingers on.



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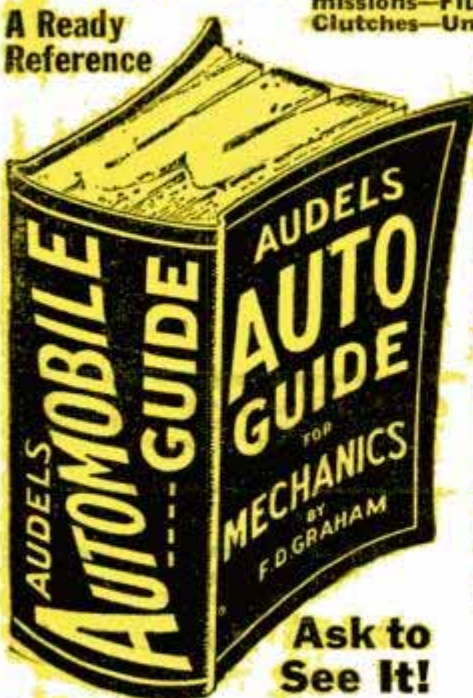
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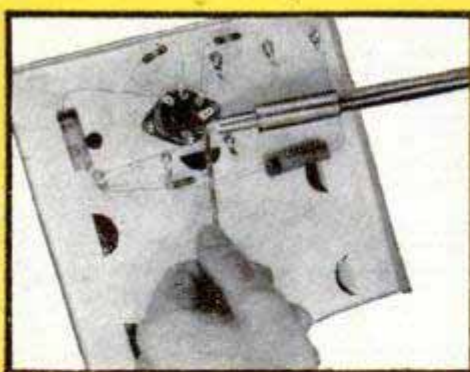
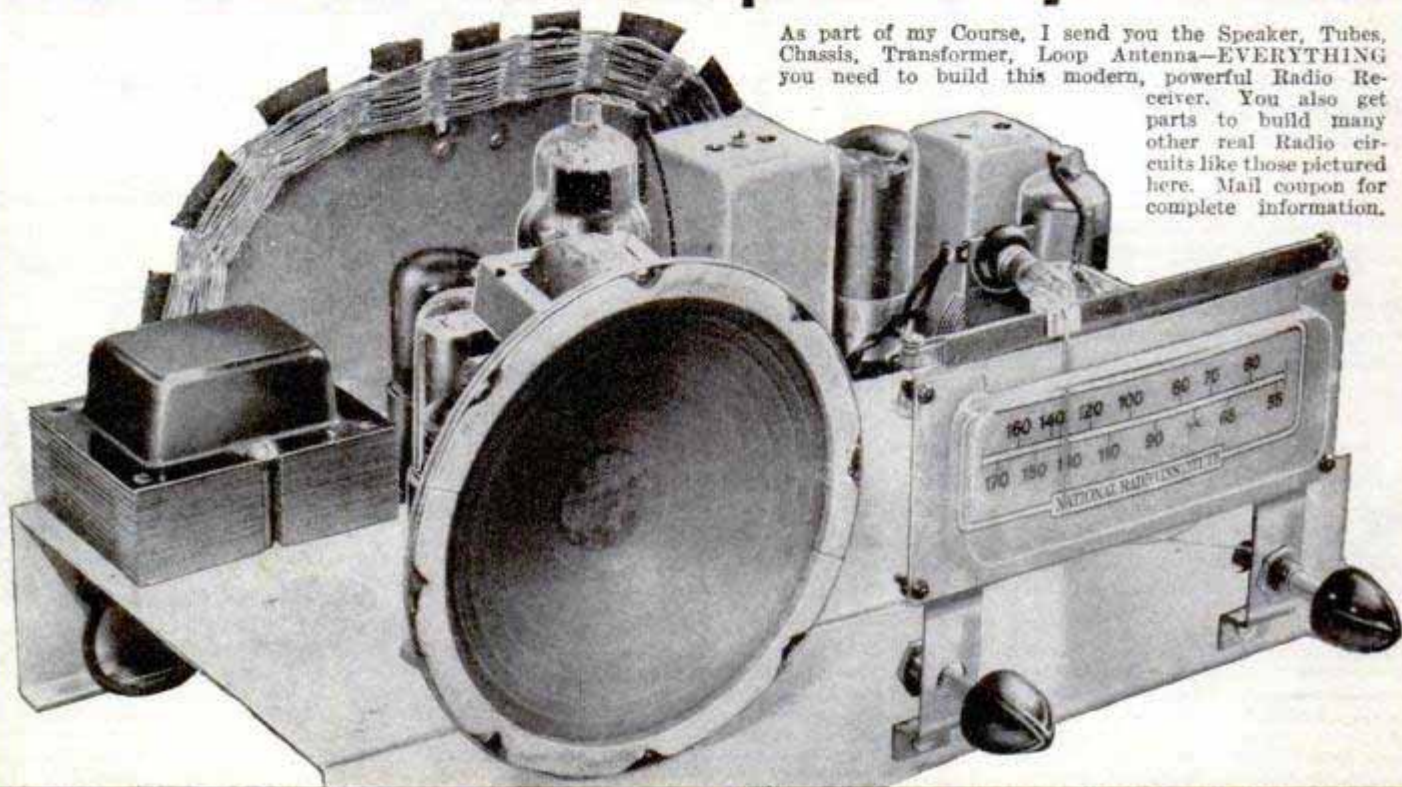
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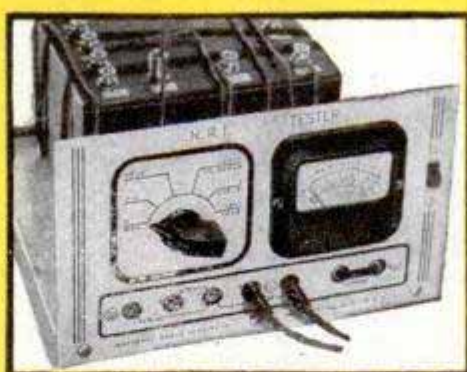
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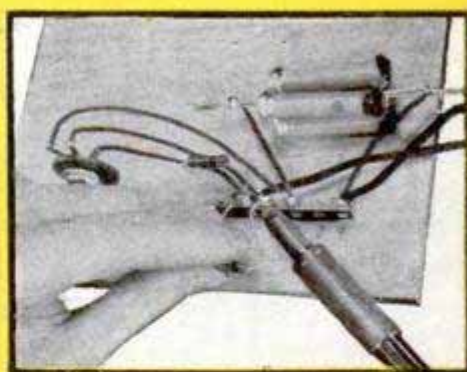
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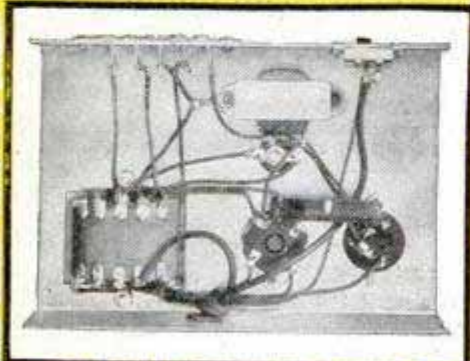
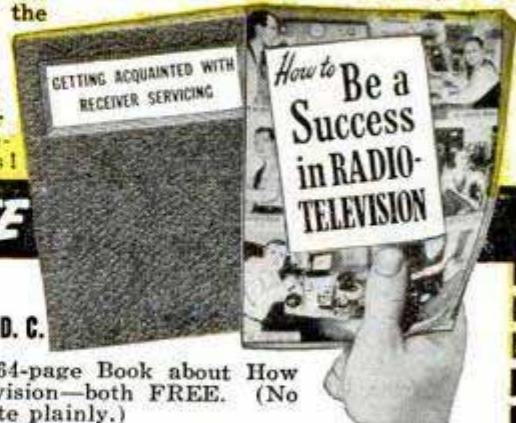
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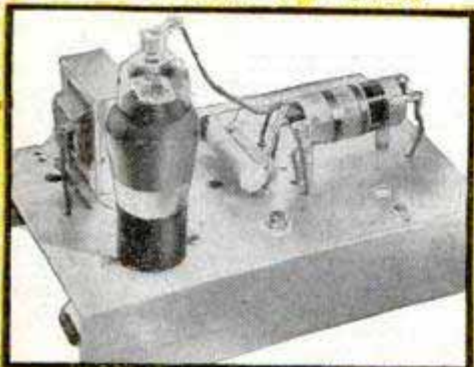
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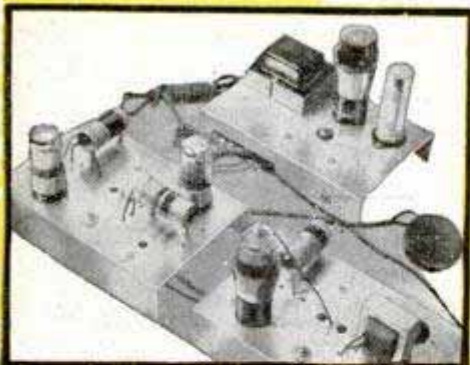
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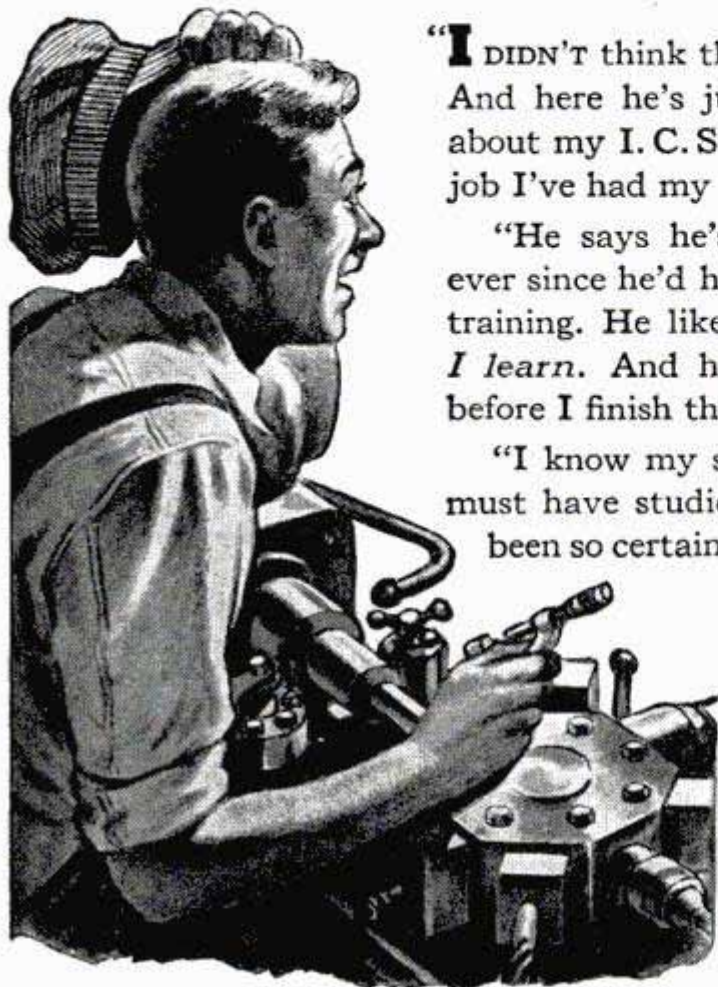
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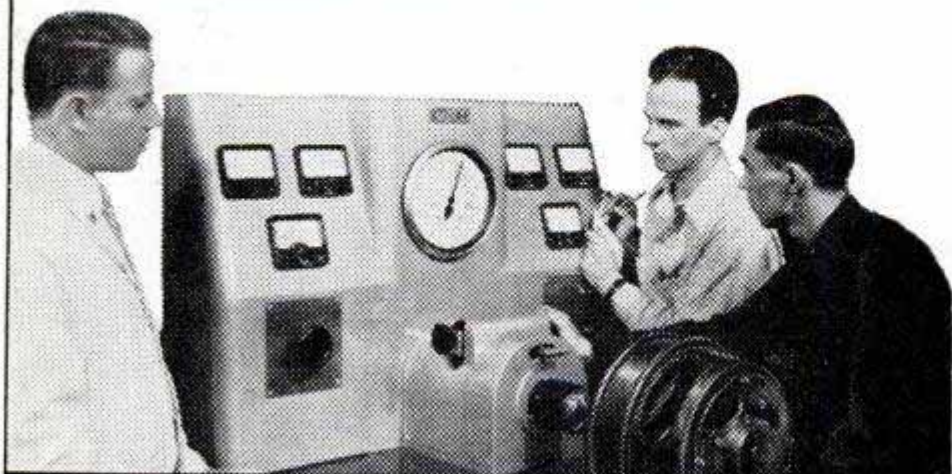
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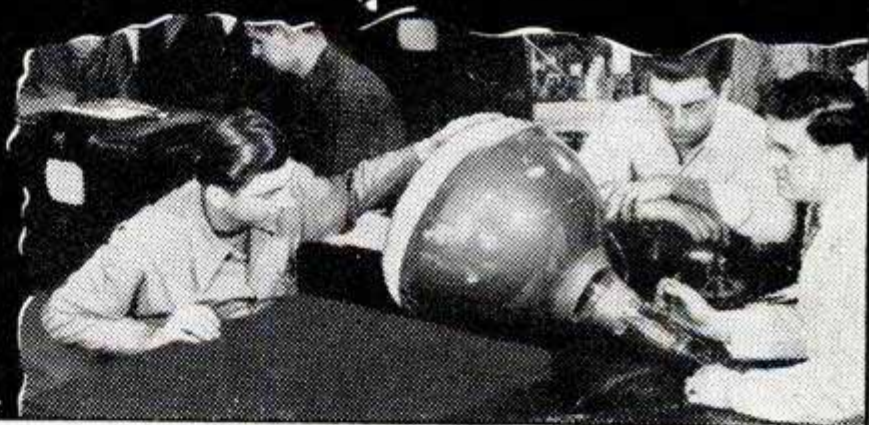
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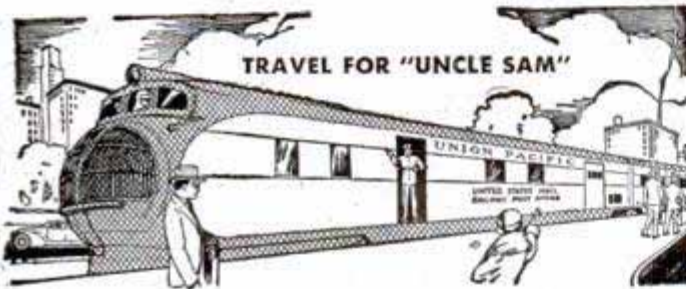


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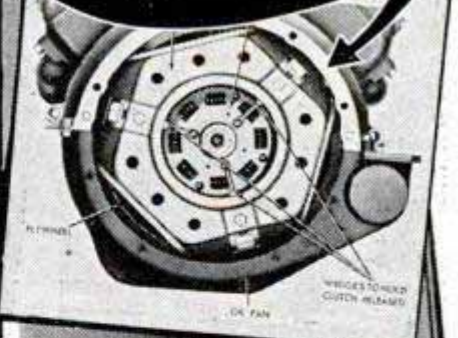
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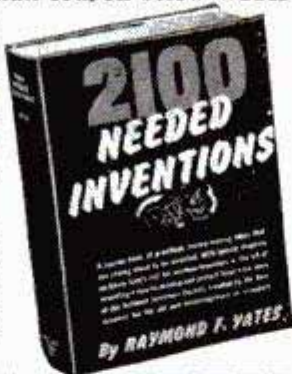
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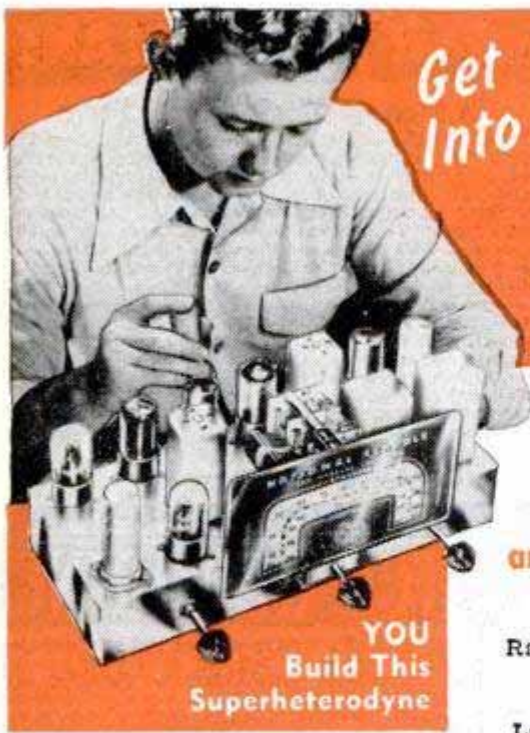
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State of Illinois, County of Cook, ss.  
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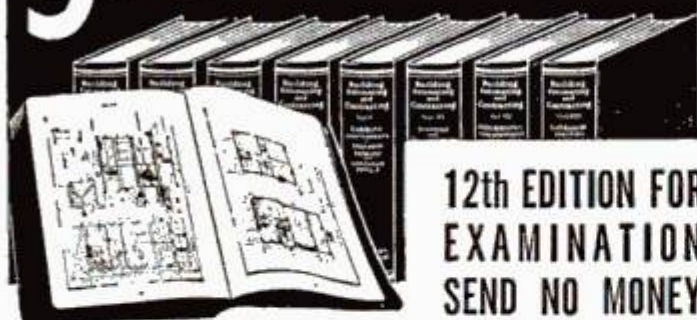
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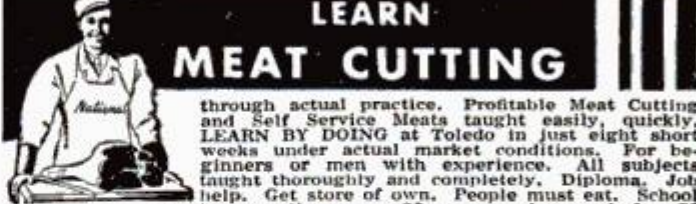
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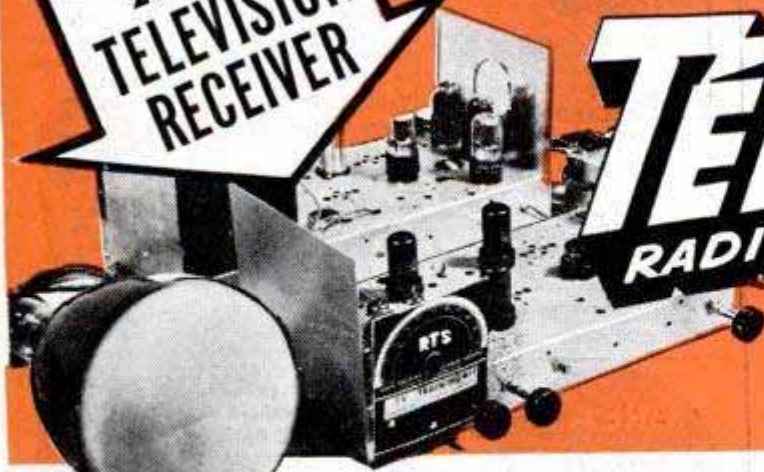
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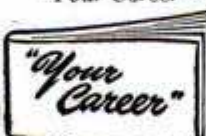
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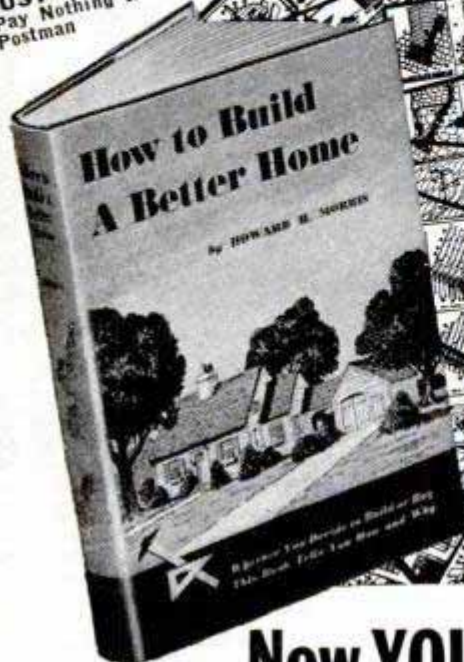
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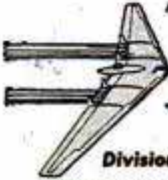
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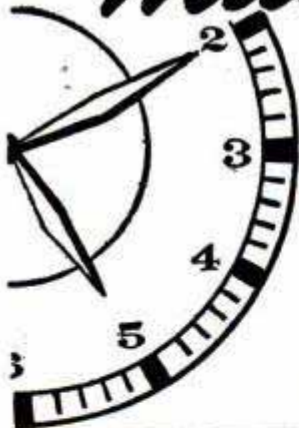


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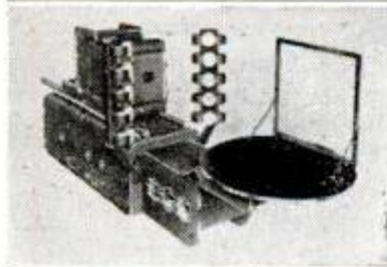
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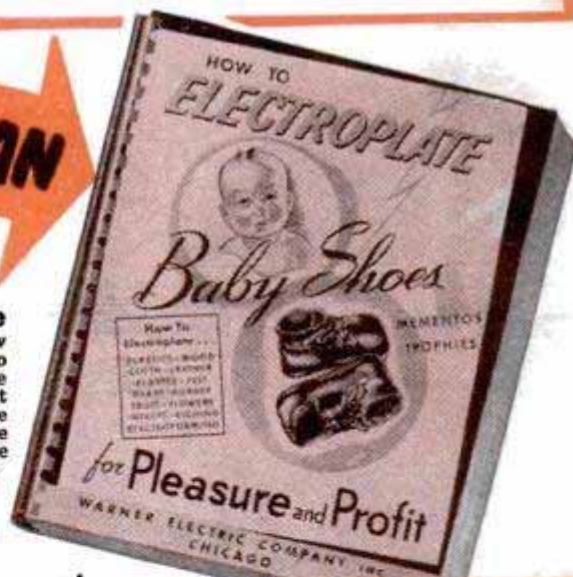
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POEMS Considered for musical setting. Send poem for immediate examination and useful rhyming dictionary. Richard Brothers, 24 Woods Building, Chicago.

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**BIG Money** selling tooth powder. J. Walker, 633 Plymouth Ct., Dept. 1, Chicago 5, Ill.

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**SELL** Big money-maker to men and women. Easy handwork makes fast-selling useful articles. Sunmade Company, Brockton 64, Mass.

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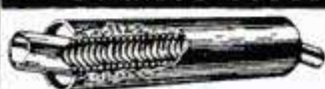
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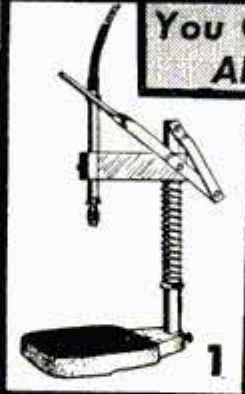
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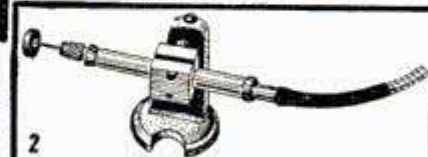
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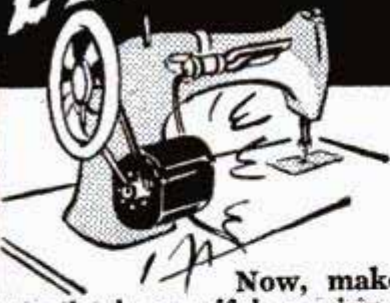
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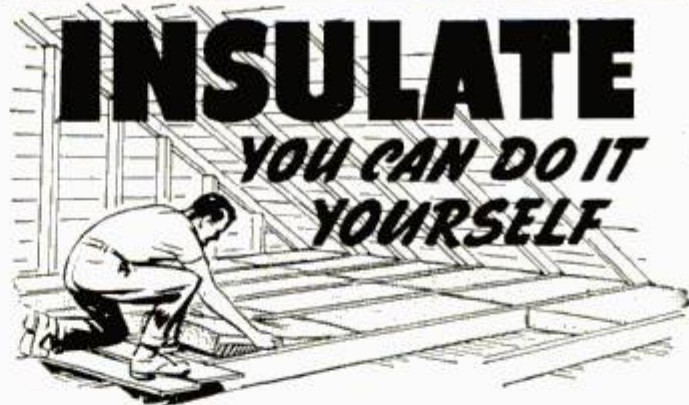


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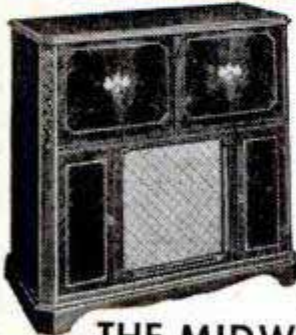
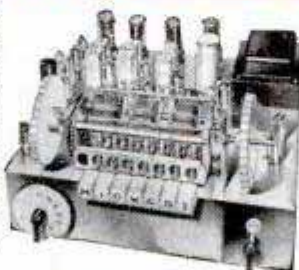
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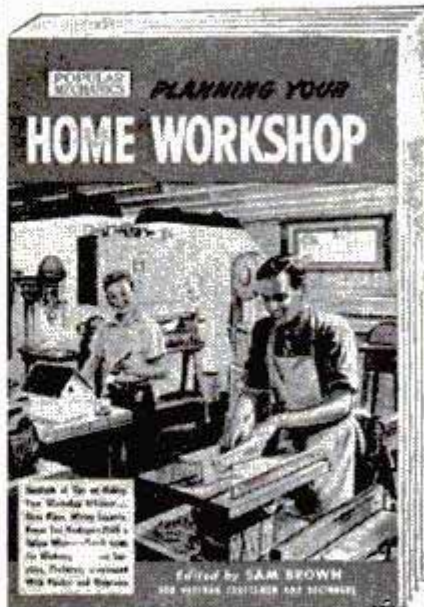
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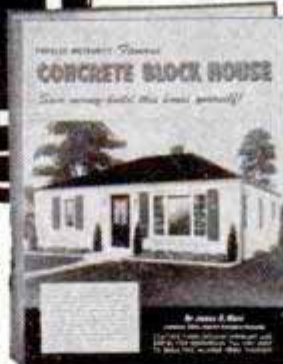
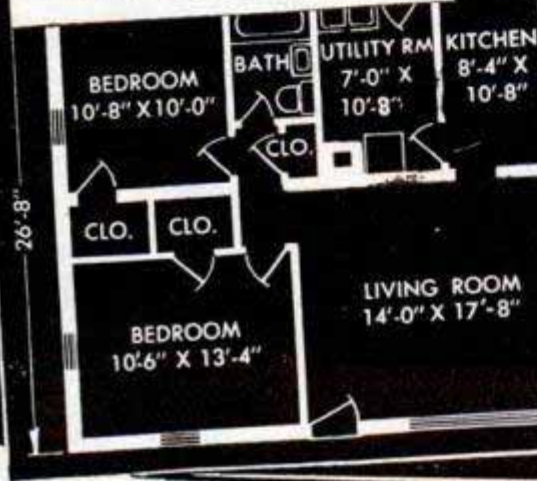
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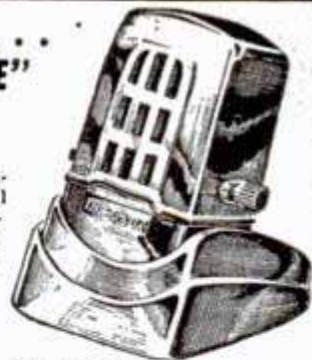
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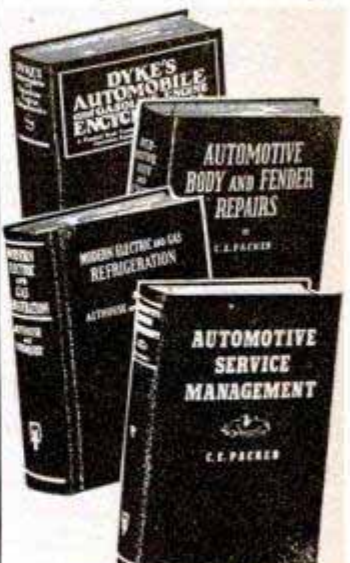
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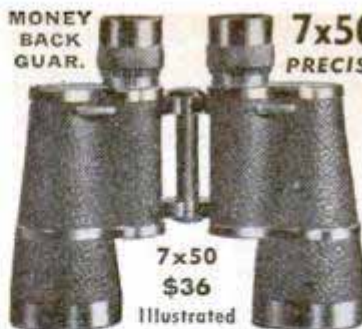
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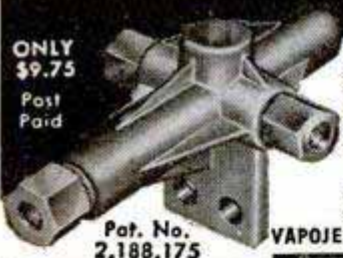
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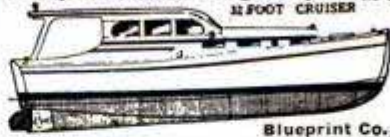
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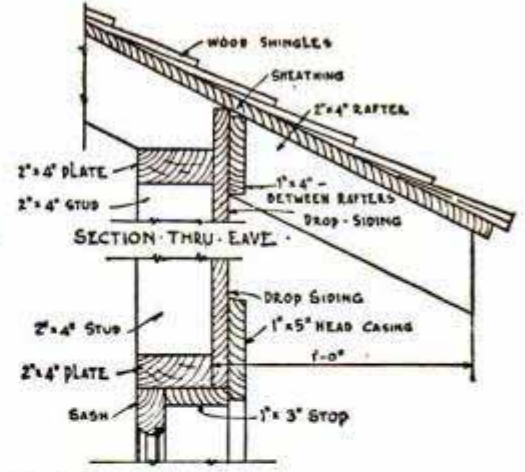
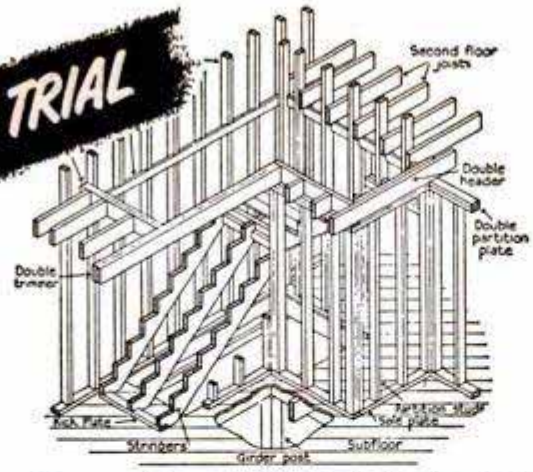
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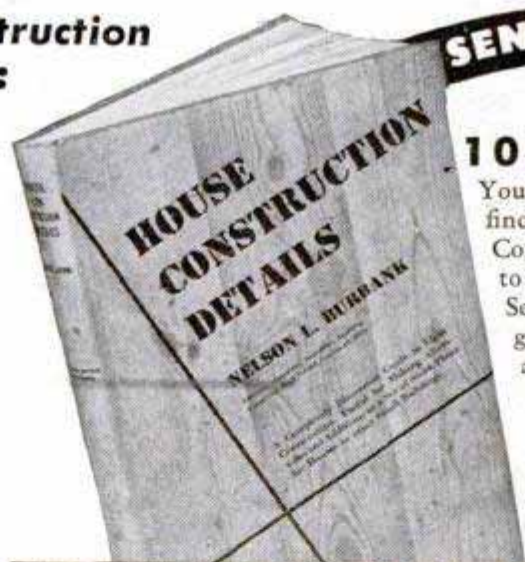
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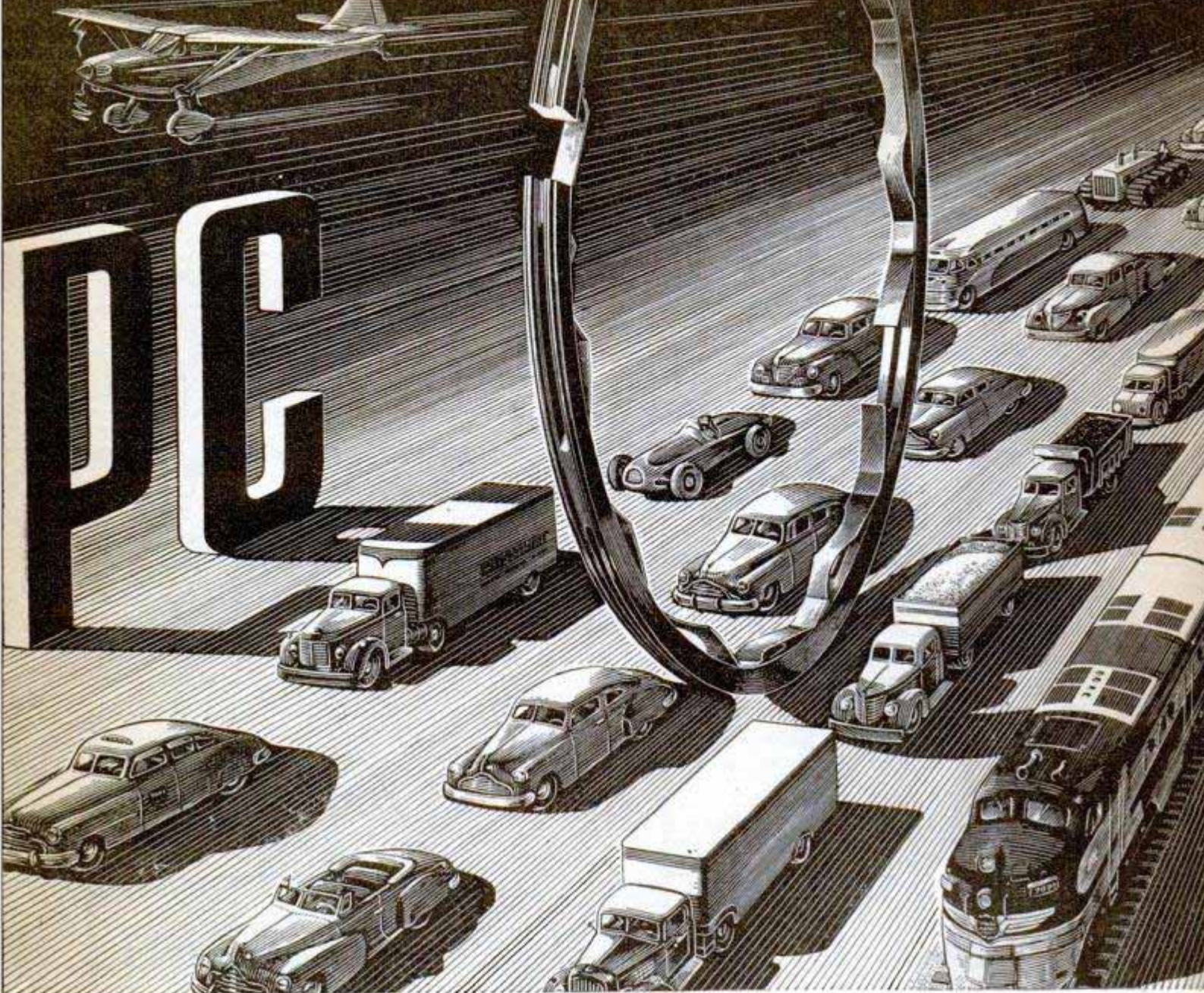
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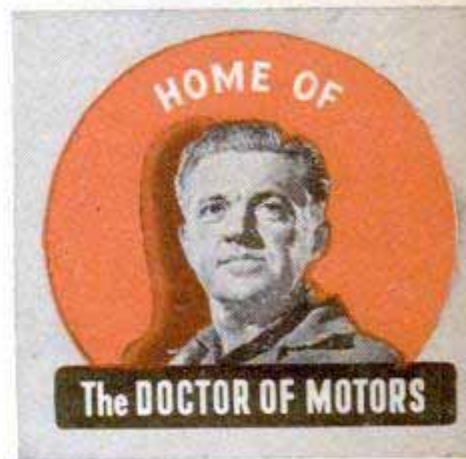
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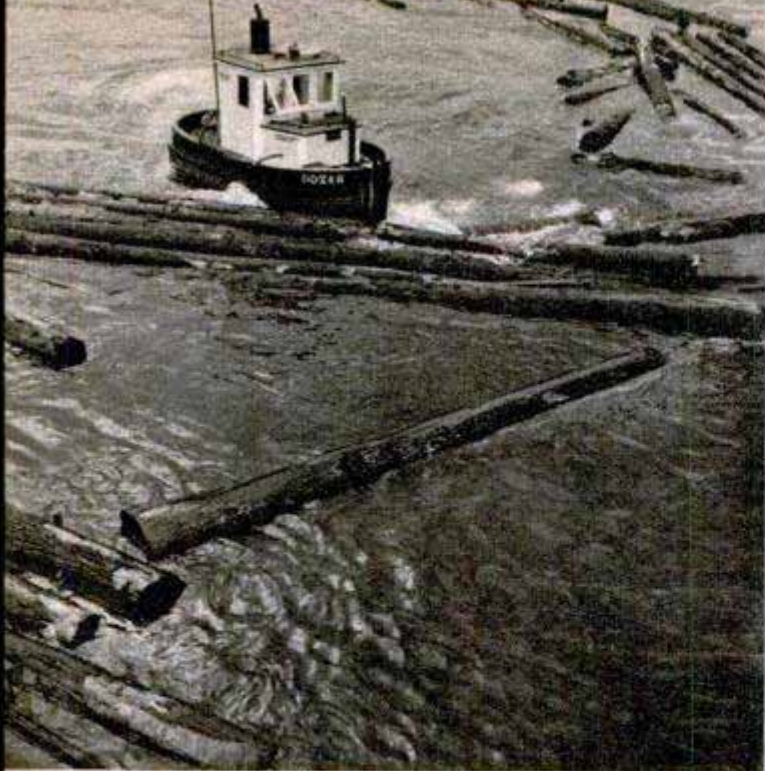
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# POPULAR NOVEMBER 1949 MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 92 NO. 5

*By Ewart Thomas*

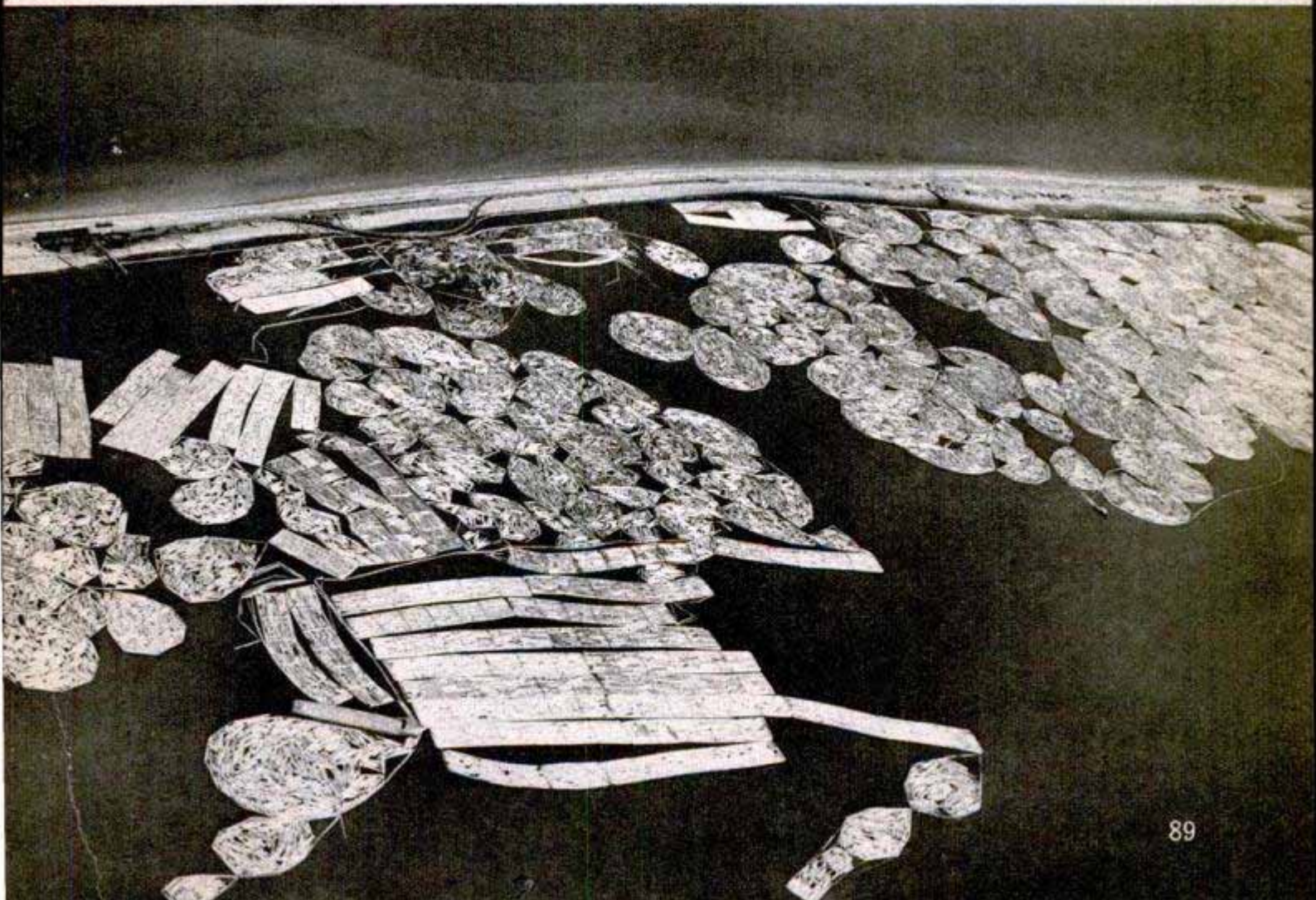
**S**HORTY HILT rides a tubby little boat instead of a horse. He works on the water instead of on the range and he herds logs instead of cattle.

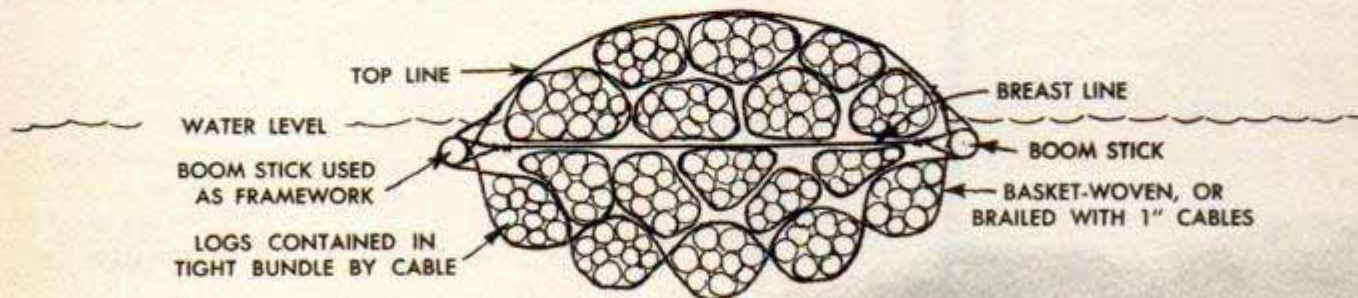
Yet, if Shorty wore spurs he'd be a typical cowboy. His job is almost exactly the same as handling cows on a western ranch.

With the squat, powerful little Dozer under him, he charges around the end of a log raft at Port Angeles on Puget Sound and cuts out the logs that he wants, then

## *Logging "cowboys" ride the sea dozer*

Above, Sea Dozer slams into tangled jackpot. Below, cribs and rafts make a fascinating pattern from the air





Here's the way a crib is built: Top, left, lowest logs are bound with cables. Top, right, crane lifts logs from truck to crib. Diagram shows cross section of crib. Above, a crib 260 feet long begins its journey

shoulders them to one side. He storms after a few logs that are drifting away and pushes them back into line. Spinning around so fast that his stern ships water, he slams into a tangled jackpot of logs and separates them into an orderly array of floating pieces.

No ordinary boat could take this punishment and the Dozer is one of the most extraordinary ever built. Only 16 feet long, it has been called the sturdiest and most powerful craft for its size ever built.

Its fir keel is 14 by 18 inches in cross section. Its ribs are 5 by 5, on 12-inch centers. The stem is a piece of 10 by 14-inch gumwood, additionally armored by a 14-inch steel I-beam in front. The planking consists of 2-inch fir that is topped by a ½-

inch layer of ironwood and further protected by an exterior skin of half-oval corrugated steel.

The boat's heavy-duty 140-horsepower marine engine turns an oversize 26-inch propeller that has a 22-inch pitch. When the six-ton Dozer rams a 12-ton log, it's the log that gives way.

The Dozer was built when Crown Zellerbach Corporation wanted an improved "seadozer" that could do the same work in the water that a bulldozer does in the woods. Specifically, the company wanted a craft that could safely break up the deep rafts that are delivered to its newsprint paper mill at Port Angeles.

In the past, the rafts were broken up by crews of calk-booted boom men who were



Sea Dozer is as agile as a cow pony, rounding up stray logs or maneuvering in close quarters between them

in constant danger of being plunged from a rolling log and caught or crushed under water. Today, the Dozer performs the hazardous work safely and easily and the men have other tasks.

For its Port Angeles mill, Crown Zellerbach gets most of its pulp logs from scientifically managed forests at the northwest tip of the Olympic Peninsula. The logs are hauled down to Neah Bay, near Cape Flattery, on huge logging trucks that roll their 50 or 60 tons of cargo over specially graded private roads.

At Neah Bay, the trucks are driven out over a causeway to a crib dock where an overhead crane picks up an entire load of logs and deposits it in a "crib" or deep raft. The skeleton of the crib consists of huge logs, called crib sticks, that are chained end

to end to form the exterior shape of the raft. The first loads of logs that are deposited inside the crib sticks are woven together with one-inch steel cables. Tied together this way, they serve as the underwater hull for the succeeding loads of logs that are laid on top of them. When ready for its tow to Port Angeles, the completed crib is 260 feet long, draws 20 feet of water, and may stand 25 feet above water. One of the deep rafts may contain 1500 separate logs that will total more than ½ million board feet. The top loads are tied down and are secured to the crib sticks with additional lengths of cable.

A deep raft, properly built, can withstand fairly heavy seas; it needs to, for Juan de Fuca Strait is seldom like a millpond. Shipping of all sizes takes a beating when

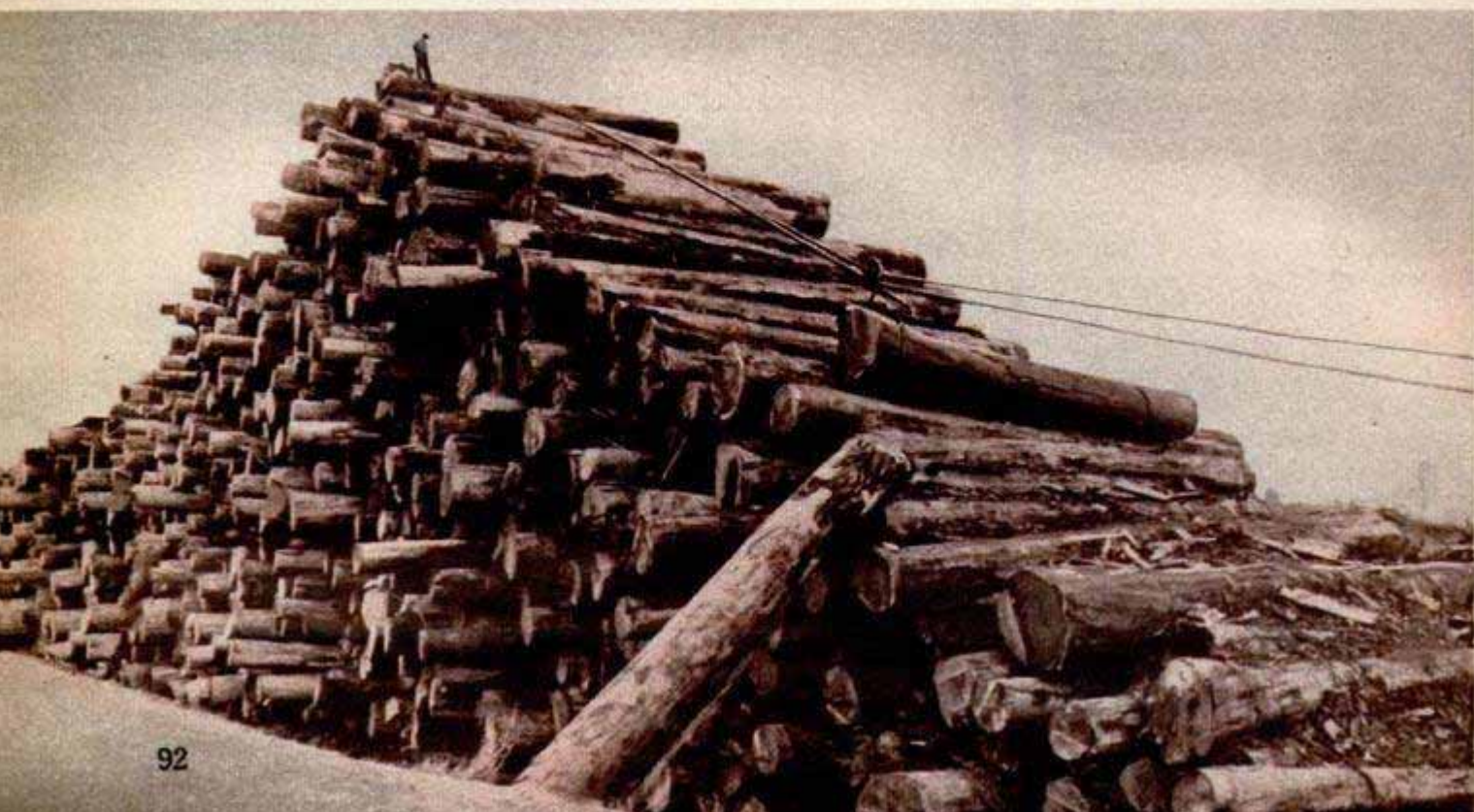


Above, left, hook on bow plate prevents the Dozer from riding over a log. Above, oversize propeller takes constant beating

winter storms swoop down from Alaska. Yet only two of the last 56 Crown Zellerbach cribs have suffered storm damage during the 46-mile tow to Port Angeles. This is in spite of the fact that the weather sometimes gets so bad that the causeway at Neah Bay is repeatedly swept by green seas. At times like these, the logging truck drivers wait on shore until a lull occurs, then they race out to the crib dock and discharge their loads. Sometimes, however, they can't get out to the dock until the rocks that the waves have left on the roadway have been heaved aside.

After a crib reaches Port Angeles, its cables are loosened and connected to overhead lines that are then hauled free by a donkey engine on shore. In theory, all the logs in the raft should spread out over the water immediately, one log deep. This never happens. Some of the logs in the pile are

Left, branding logs with hammer prevents "rustling." Below, logs exposed to water too long are stacked in a huge pile



rolled sideways when others move above them. Some are upended as the raft begins to spread. Many scrambled bunches or jackpots result.

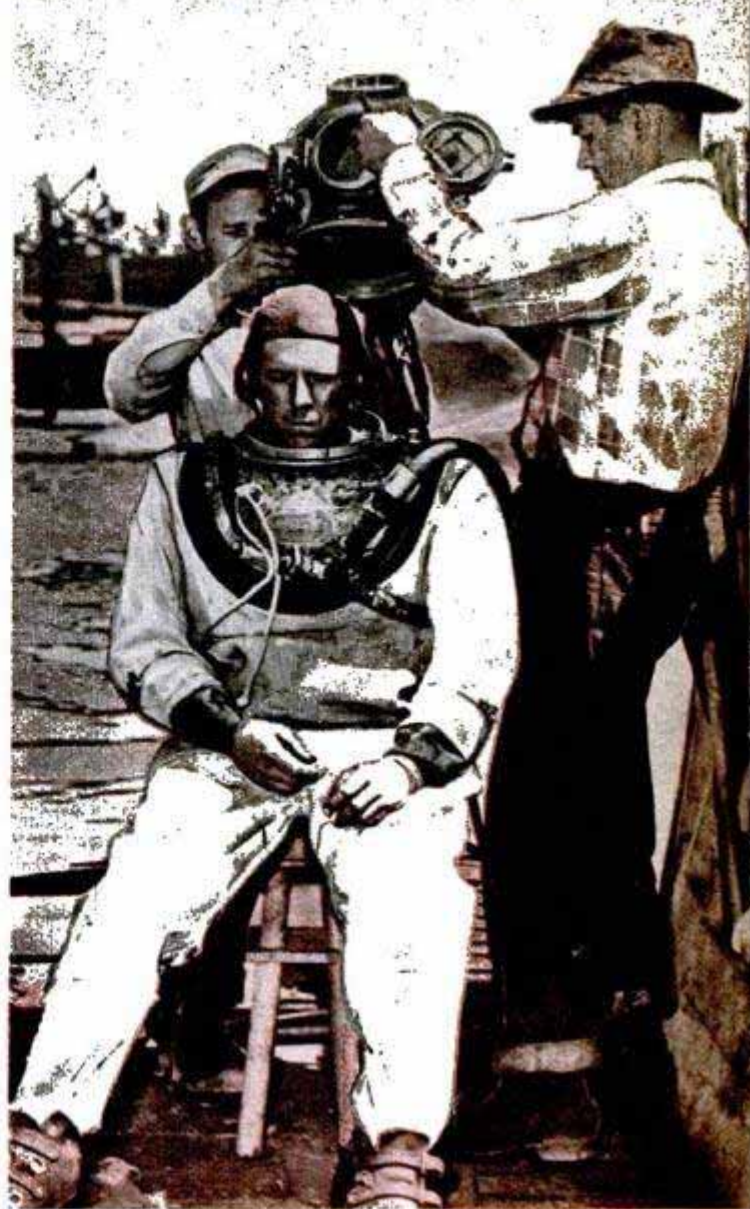
Busting these jackpots is the job for which the Dozer was built. But even the Dozer can't do it by brute strength alone. Shorty Hilt, in the wheelhouse, uses a dozen tricks to cajole the key logs into freeing themselves from the tangles.

The I-beam stem is sharp enough to prevent a log from slipping when the Dozer pushes against it and the result is that Shorty can plough right into a log and then twist the wheel around and move the boat sideways or at an angle to withdraw the log from the jackpot. Held against the stem, the log moves with the boat. An ordinary boat can push a log only when moving straight ahead but Shorty can nudge a log with either bow or with the side of his boat with little fear of damaging the hull.

One way of getting a log out of a jam is to roll it out, and Hilt does this by putting the stem in contact with the log and then turning and rolling the boat at the same time. Caught by the corrugations of the hull, the log is literally spun out of the pile.

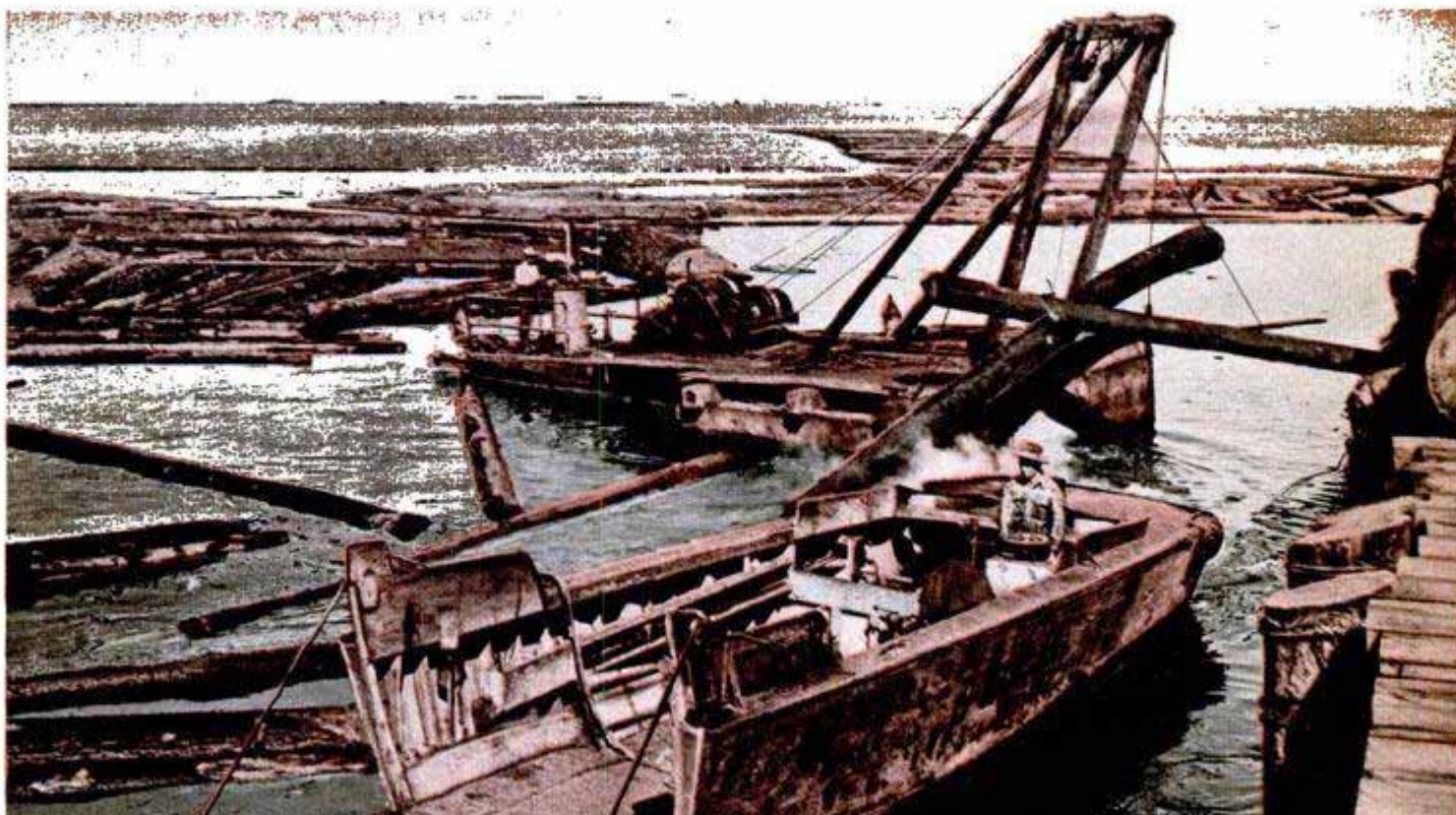
The bottom of the armored stem projects outward in the form of a hook that catches under a log and prevents the boat from riding up onto it when pushing straight ahead. That was its original purpose, but it has other uses as well. Shorty has learned that the hook is as good as a crane for boosting up the free end of a partly submerged log and getting it loosened from the pile. Rubbing up against the log, he puts the Dozer's nose down by jockeying the throttle and the reverse gear. This gets the hook

(Continued to page 254)



Log diver prepares for a trip to the bottom in search of logs so water-soaked they sink instead of float

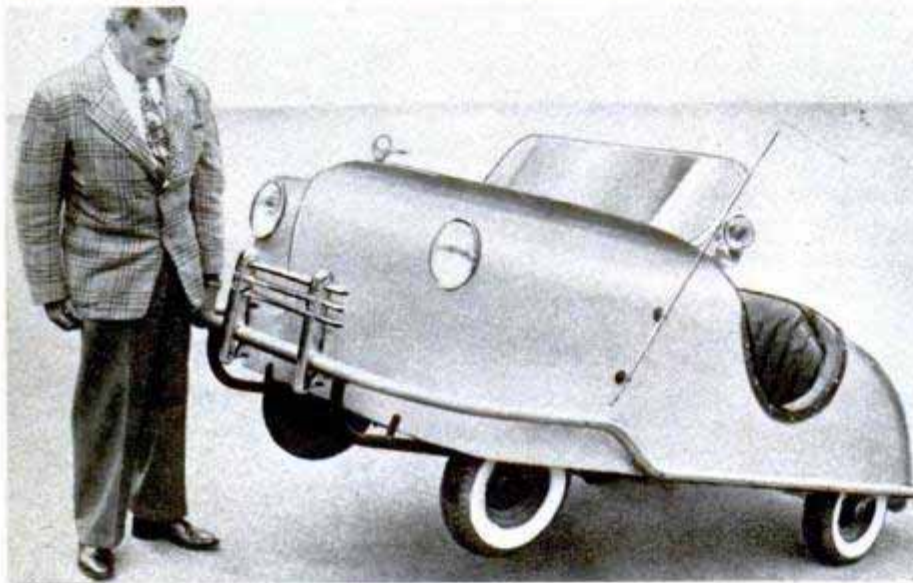
Diver uses the smaller barge in the foreground. In the background is the grappling barge, which has snagged two logs on the bottom and hauled them up





## Auxiliary Auto Weighs 475 Pounds

You'll be able to drive up to 240 miles on three gallons of gasoline in a tiny automobile designed as an auxiliary vehicle for the American family. The car, called the Imp, has a 7½-horsepower rear engine, weighs only 475 pounds and is expected to sell for about \$500. The fully automatic transmission eliminates the need for a clutch pedal and gearshift. Luggage space is in front of the seat.

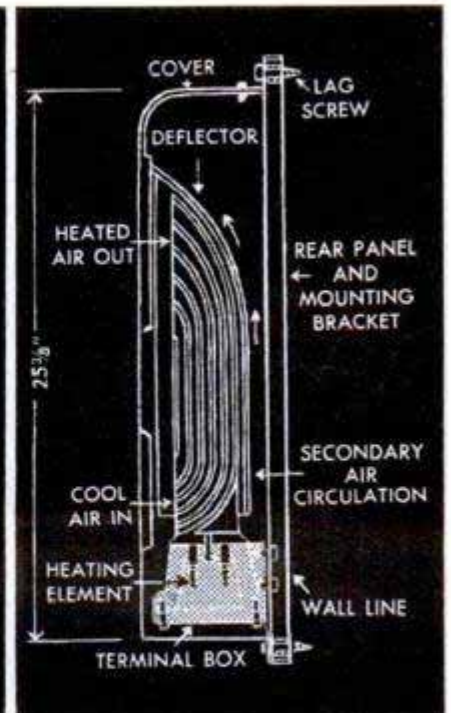


## Oil Stick With Spring Gives True Reading

Accurate oil readings are assured by a new dip stick made in several models to fit different makes of cars. The stick, actuated by a spring mechanism, must be pushed all the way to the bottom before it can be pulled out. Thus the driver, while seated in his car, can be sure that the attendant has checked the oil supply accurately.

## Metal-Sealed Heater Is Explosionproof

Electric heaters with elements that are completely sealed in metal are designed especially for warming dangerous areas that contain gasoline, naphtha, natural gas and dry-cleaning solvents. Because the wires are completely encased, the heater is said to be explosionproof. The nickel-chromium wire is insulated and sheathed in seamless metal tubing, then embedded in a one-piece aluminum casting. The casting has fins which conduct the heat at a low operating temperature. The heater is designed for gasoline bulk stations, dry-cleaning establishments and other buildings where an open heating unit



would be dangerous. It is available in three models with ratings of 2000, 4000 and 6000 watts.



## Enlarging Camera Copies Movie Film

Favorite frames of your home-movie reels can be made into wallet-size snapshots with the help of an enlarging camera that is used under normal room illumination. The camera and its built-in illumination unit are mounted on a convenient stand. The camera takes 127 film and has a fixed-focus lens. With a viewing device that is part of the unit, you select the frame you wish to copy, then press a shutter-release button and the job is done. The film is processed as usual to produce standard prints or, if desired, jumbo enlargements.

## Bug Killers More Potent Yet Safer To Use Than DDT

Five times as potent as DDT, two new insecticides are only one third as toxic to animals, thus providing farmers with a safer method of pest control. The two insecticides, BNB and BNP, are not yet on the market, but field tests have shown they will kill pests that DDT does not, such as the Mexican bean beetle. Although expected to be about five



times as expensive as DDT, the new chemicals will be no more costly to use because of their greater potency.

## Commands Spoken Into Mike Operate Model Railway

"Start!" says Ray DeVault into a little microphone, and his model train begins chugging down the track. "Go back!" he

says, and the model immediately shifts into reverse. DeVault, who lives in Walnut Creek, Calif., designed the voice control in



a Marine radar shop on Guam. The control is attached to the remote-control unit that is a part of almost every electric engine these days. The number of words the operator speaks determines what the engine will do. The voice is picked up by a microphone and operates a relay, which is timed to trip not more than once per word, regardless of the speed of pronunciation. DeVault now is manufacturing the control for other fans.

☐ Potatoes can be graded for baking, boiling or frying by measuring their specific gravity, according to experiments at Colorado A. & M. College.



In emergencies, the Army's ham station, K4USA, can operate in the field with this portable transmitter

# ARMY HAMS to the RESCUE

By **Richard F. Dempewolff**

**T**HIS is K4USA — King Four Uncle Sugar Able — calling CQ, CQ, CQ. Come in for a rag chew."

The man at the radio transmitter, beaming the general "seek you" signal familiar to anyone who has ever fanned the ham frequencies on the short-wave sector of his radio dial, may be a top-ranking military officer these days. Reason?

Uncle Sam's military establishment is a "ham." In fact, it's a whole network of hams known as MARS, the Military Amateur Radio System. Established less than a year ago, the net already comprises some 1000 military and organized reserve radio hams throughout the United States, Panama and Hawaii. Other overseas outposts have just been set up in Labrador, Newfoundland and Turkey. Soon MARS may reach out to encompass most of the country's 75,000 licensed civilian amateur radio operators, who fill their designated channels with enthusiastic chatter 24 hours a day.

Some folks (and there are some) who think of hams as slightly daft hermits who spend every waking moment in an attic corner diddling with dials on a plumber's nightmare of homemade radio equipment might wonder why the Army would want to join the act.

Chaplain St. Onge and his radio were key links in communications during the Greenland icecap rescue





**Forced down on the Greenland icecap, the men in this C-47 were picked up with the help of Chaplain St. Onge and the Army ham net. Note snow dugout that sheltered the crewmen**

The military doesn't wonder at all. It's no newcomer to the ham bands. Major Rawleigh Ralls, Chief MARS, Air Force, and Captain E. L. Nielsen, Chief MARS, Army, explain it simply: "Before the war, the AARS (Army Amateur Radio System), a blueprint for the present MARS, proved the value of hams beyond all question. In every theater of war, amateurs formed a hard core of military radio personnel. Hams became the instructors at Army radio schools, the research engineers who helped develop radar, the small manufacturers who adapted, perfected and built much of the efficient modern field radio equipment that contributed toward the winning of World War II."

The military thinks it would be nice to have such a backlog of skilled radio talent again. Then, there's another and even more important use for a good ham net-

**It was a jato-equipped C-47 with landing gear like the one shown here that rescued the stranded flyers**

work in peacetime. It has to do with the very nature of a ham.

There's nothing in FCC regulations that says a ham must do anything besides "bat the breeze" with brother hams in China, Afghanistan or Bemidji in order to keep his license. But, when floods hit Texas last year, amateurs with portable transmitters and put-put generators rushed to the stricken area. Where telephone and telegraph lines were wiped out, they set up emergency communications, aiding the Red Cross and other rescue services to maintain contact with scattered rescue teams and the outside world, sending messages to relatives of survivors and dead. In earthquakes, tornadoes, big forest fires and explosions, amateur radio operators always come running with their home-grown apparatus to help out.

It was to organize and coordinate this



vast potential of emergency communication that the Army and Air Force last November quietly hoisted two spidery, signal-squirting antennas to the roof of the Pentagon Building and went to work.

MARS is controlled from two stations, operating on a wide range of frequencies. Eventually, the net will use lightweight teleprinters, facsimile machines and a host of other modern time-saving devices.

K4USA is the Army's central ham shack atop the Pentagon. The Air Force sends its chatter from K4AF in an adjoining part of the building. Net control stations are set up at Army posts and airfields in each of the six Army areas in the United States. These stations, in turn, provide the link with control stations on the state level—to which local members report.

How does the network operate when disaster hits? Suppose there's a gigantic munitions explosion in a New Bedford, Mass., plant. The telephone exchange is reduced to rubble, telegraph lines are down, local radio stations are demolished. For blocks around, buildings are piles of broken masonry. Dead and injured lie along the streets.

But there's a MARS ham in the suburbs, whose 100-watter sits safe and sound on a table on the sunporch. He has seen and heard the explosion. A quick visit with local police and Red Cross workers gives him an appraisal of the situation. There's a dire communication emergency. The ham reports into the net.

W2USA is the MARS control station for the First Army area in New York. Our ham sends a QRR signal there. QRR is practically synonymous with the old SOS.

From W2USA, Capt. Richard Speer has the message relayed to the Pentagon. A check with Red Cross National Headquarters verifies the communications emer-

gency and the help of MARS is requested. The network is in business officially.

Now, something else happens. All MARS stations have two sets of call letters. When K4USA is just "rag chewing," it is simply K4USA. But, when it's working the net as official MARS, it switches to regular Army frequencies and becomes WAR. Likewise, K4AF becomes AIR. Member stations with private "W" call letters change their "W" to "A" or "AF."

So, using calls WAR and AIR, the Army and Air Force control shacks in the Pentagon go out over the MARS channels, alerting all hams in the New Bedford area: "QRR, QRR, QRR—attention all MARS members. This is the MARS headquarters station. Stand by on this frequency for instructions."

The rest is routine. Hams in New Bedford are ordered out to the disaster area with portable rigs; others monitor the frequencies from their home sets and relay messages. The Red Cross needs ambulances quickly. In a few minutes, a roving MARS member on the scene has made the request, which is relayed to Washington. Military commanders in the Pentagon authorize 50 ambulances sent out from nearby military establishments. That order goes out over WAR and AIR to Massachusetts Army posts and airfields on the network. A few minutes later, the ambulances are rolling.

Meanwhile, the local MARS members in New Bedford are busy messaging back and forth between separated rescue parties, helping coordinate operations. After all necessary equipment, doctors and other aids have been ordered, MARS hams then go to work relaying personal messages to

Future Army hams practice code at Fort McPherson's radio school, attended by regulars and reservists





Last winter, during "Operation Snowbound," plowing and rescue operations were directed by Army ham radio

relatives of casualties and survivors. It is all done quickly and efficiently.

MARS already has had a chance to show its stuff. Last December, a C-47 with seven men on board crash landed on Greenland's bleak icecap. Air Rescue Service planes scouted the wreck, saw the survivors waving their arms, but couldn't land due to rugged ice and snow conditions. They needed special equipment—and quickly.

At his tiny amateur radio station—VO6AN—in Goose Bay, Labrador, Army Chaplain Alexis St. Onge, an incurable ham and now a MARS member, talked with the returning rescue party and learned their plight.

VO6AN was on the air a moment later

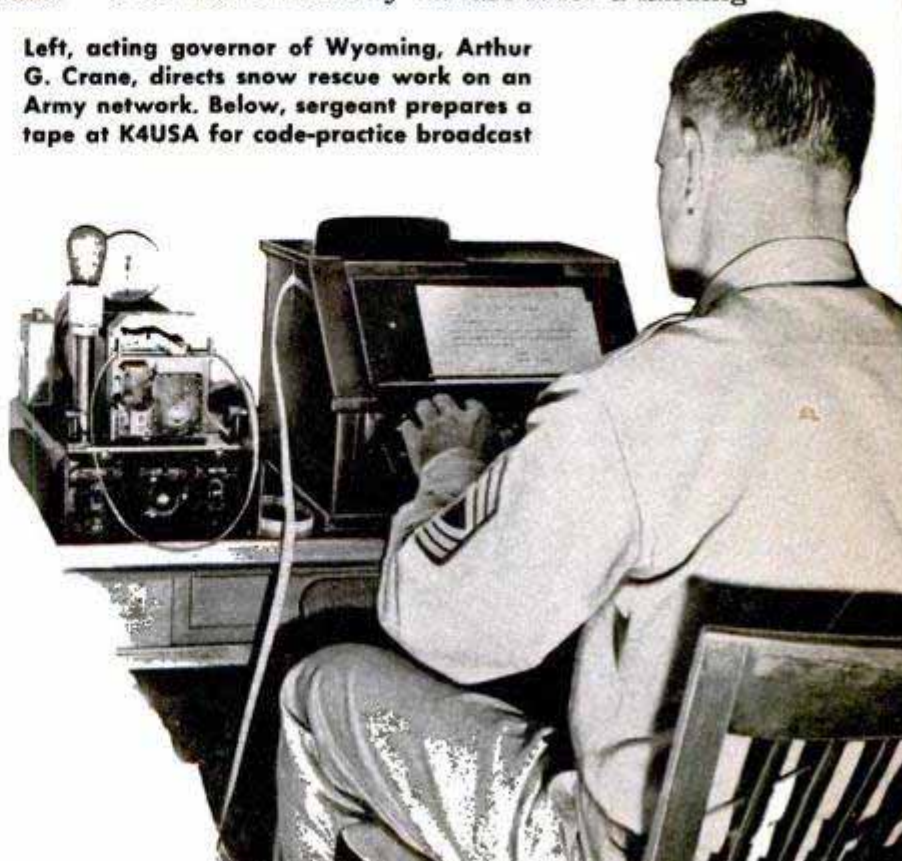
with a QRR. In a short time, K4USA was coming through in good shape. The contact was maintained and became the main line of communication between the Air Rescue party and Washington throughout the dramatic rescue.

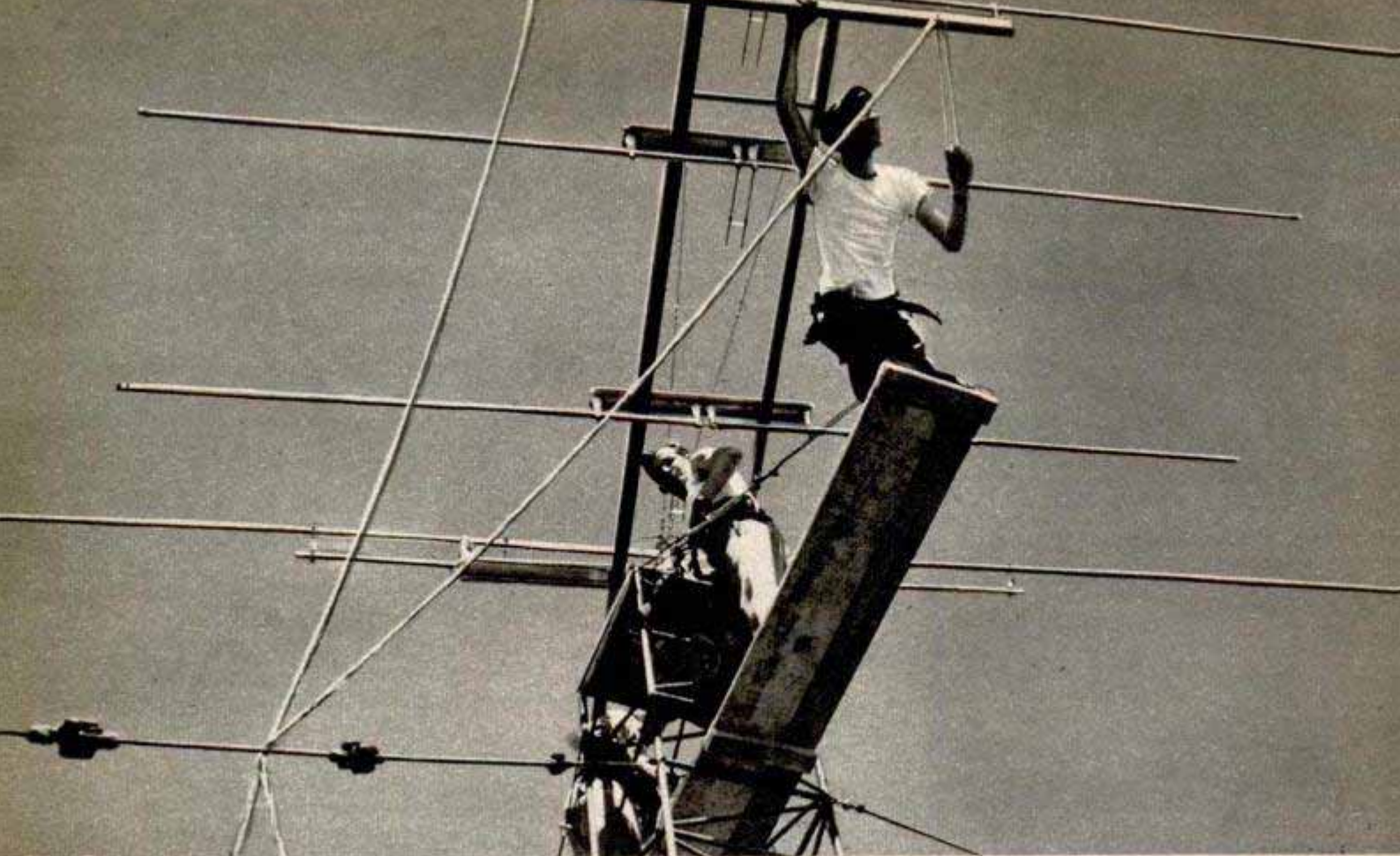
Over the hookup, Air Rescue men described the tough conditions. Washington experts quickly radioed from the Pentagon to Army posts in widely separated parts of the country to procure the special equipment that would be needed. They ordered it flown to Greenland immediately.

Hours later, a big plane took off from an airfield in Greenville, S. C., with a glider in tow. The glider had a special tow hook that would not only release it for a landing



Left, acting governor of Wyoming, Arthur G. Crane, directs snow rescue work on an Army network. Below, sergeant prepares a tape at K4USA for code-practice broadcast





Atop the Pentagon Building, Air Force personnel erect an antenna for broadcasts beamed by MARS station K4AF

while the tow plane continued to fly, but would also catch a dropped line from the tow plane. Thus, it could be dragged aloft again after picking up its cargo of survivors.

At Wright-Patterson field in Dayton, mechanics hurriedly prepared another plane, a C-47 with combination wheel-ski landing gear and jato units—just in case the glider missed. It, too, thundered toward the icecap.

The whole world knows the outcome. The glider cracked up on landing. A Fortress went in after it and ditto. But the C-47 made it in safely, picked up the survivors of all three crashes and took off easily with its jet assist.

The point is that without a good through line of communication it might have been weeks before proper equipment



Radio is almost an obsession with hams. This Army officer didn't let a stay in the hospital interfere with his fun. He took his ham set with him



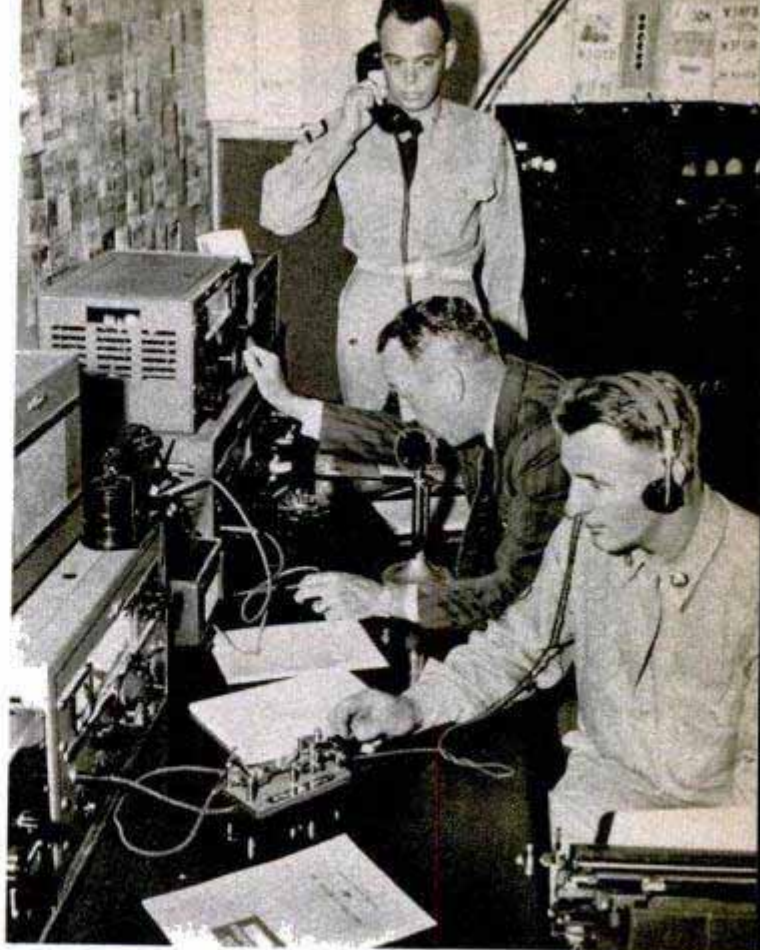
was brought to the scene and the frozen survivors rescued.

MARS hams don't just bat the breeze all the time between disasters. There's plenty of official duty. Members must report into the net at specified times for MARS news and instructions. Semiofficial messages—Father's Day greetings from soldiers and sailors overseas, family death messages, minor orders — pour from K4AF and K4USA at a rate of about 50 a day. The boys engage in DXing and traffic handling in simulated emergencies. Every night from the Pentagon shacks, operators send Morse code practice tests, starting at 5 words per minute and working up to 35. The day of the brass pounder is not yet over and all MARS members must report for these lessons in order to develop what's known as a "sweet fist."

For a time, Pentagon operators had to pound out the monotonous tests themselves. Even Sgt. Paul Allyn, K4USA's operator, whose fist is sweet enough so that he can send 50 words a minute in good shape, got bored with the routine. Now, he has a Boehme keyer to do the job for him. This is simply a circuit-breaker activated by punched tape. The tape ends can be pasted together, forming a circle of perforated paper. Thus, the same message will go 'round and 'round through the keyer while Allyn simply adjusts the speed to anything from five to 150 words a minute. It takes a pretty hot ham, however, to transcribe anything over 50.

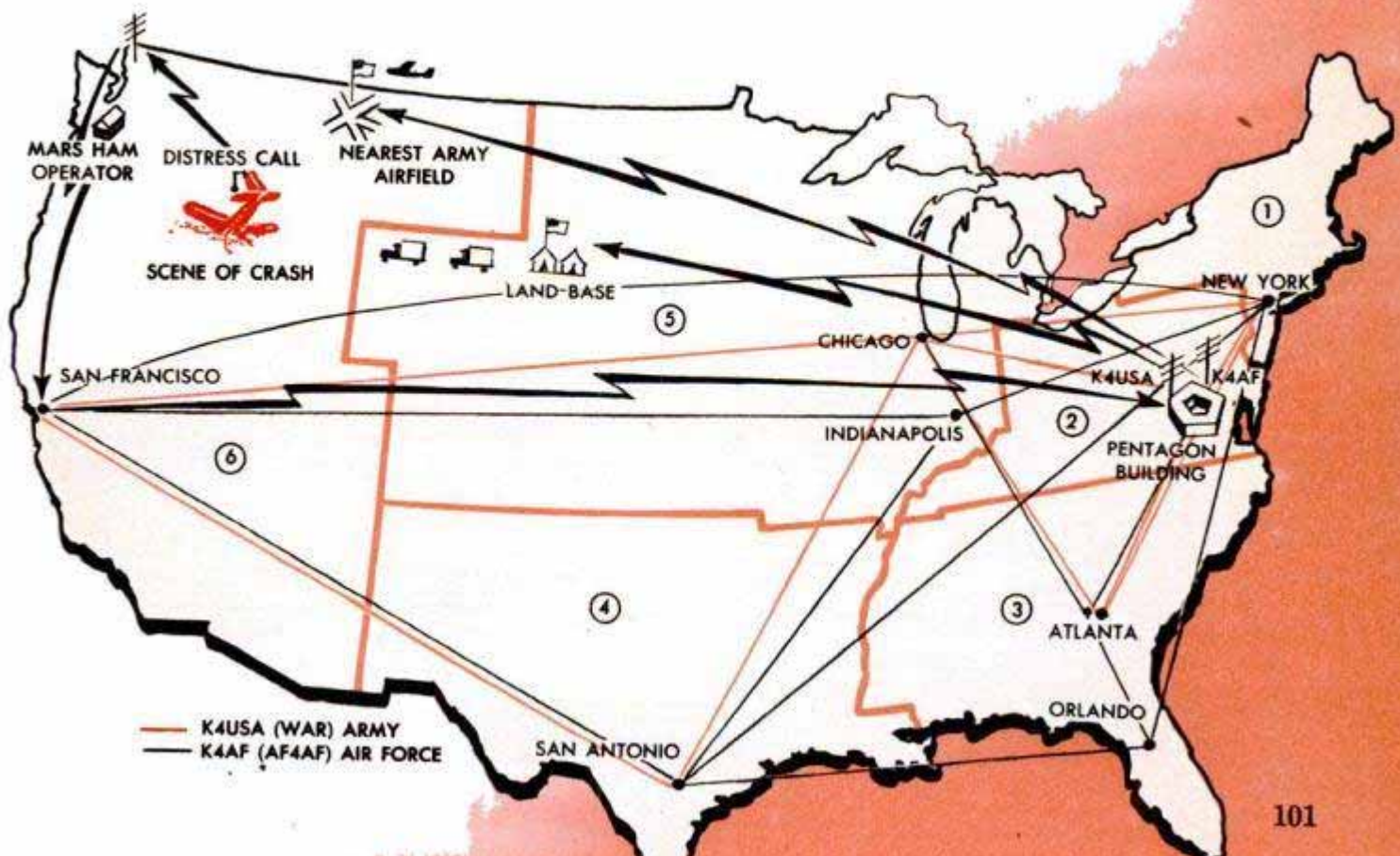
Whether MARS is working on an official

(Continued to page 246)



Inside the Army's ham shack atop the Pentagon Building in Washington. From here, net-control station, K4USA, broadcasts to MARS members around world

Army areas, numbered on map, have MARS headquarters. Radio net, maintained by areas, is shown by straight lines on the map, one set for K4USA, the other for K4AF. Also shown is system of relaying word of plane crash to Washington, which orders out rescue teams from the nearest land and air bases





## Versatile Yard Cart

Lawn chores are made easier by a versatile vehicle with interchangeable parts. The basic unit consists of a tubular framework mounted on a wheel and two legs.

With a metal basket attached, the vehicle becomes a wheelbarrow. A revolving reel handles garden hose. A tray fits the vehicle to make it a steady serving cart, or a broiler can be installed to convert it into a rolling grill for the back yard.



## Motor for Wheel Chair Operates on Battery

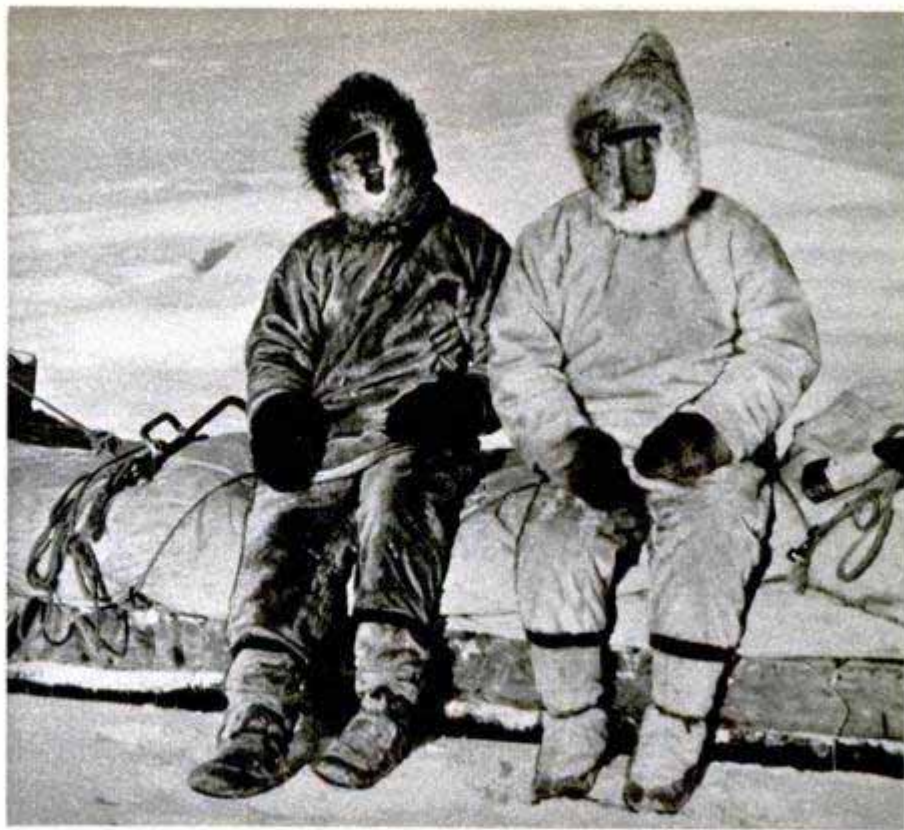
Wheel chairs are made self-propelled by a new electric motor and battery unit. The attachment fits any folding tubular chair of standard design. It is fastened behind the chair and delivers power through two small wheels, belt-driven from the electric motor. A steering lever fits the front wheels of the chair. Atop the steering handle is a button which starts and stops the motor. Provided with the unit is a portable battery charger that plugs into any electric socket.

Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX, available without charge from Bureau of Information, 200 East Ontario Street, Chicago 11, Illinois



## Nylon Fur

Two Canadian scientists have developed a nylon fur which, according to tests, is warmer than the caribou skins the Eskimos wear. Assigned by the the government to produce a synthetic fur for Canadian soldiers and airmen in the far north, the young chemical engineers developed the first suits of nylon in little more than a year. Men who tested the synthetic furs in 50-below weather for several days had only one criticism — the nylon fur might be too warm. It is mothproof, fire-resistant, washable with soap and water and long-wearing. When Eskimos first saw the synthetic material, they wouldn't believe it was anything but natural fur. So far, the scientists have duplicated only caribou and wolverine furs, but they say it's only an-

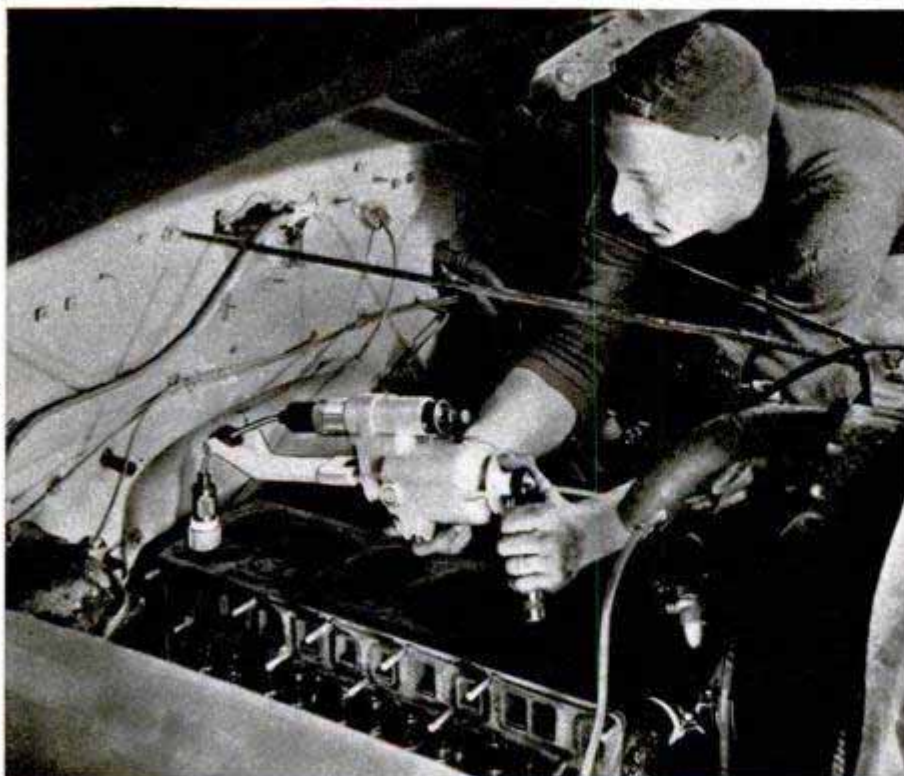


other step to imitating furs such as muskrat, beaver and mink. The method may produce a new Canadian industry.

## Preincubated Eggs Can Be Cooled Before Shipment

Poultry breeders now can start the hatching of an egg, interrupt the process for several days and then finish the incubation without damage to the chick, according to scientists of the Department of Agriculture. This makes it possible to candle the eggs after the preincubation, eliminate

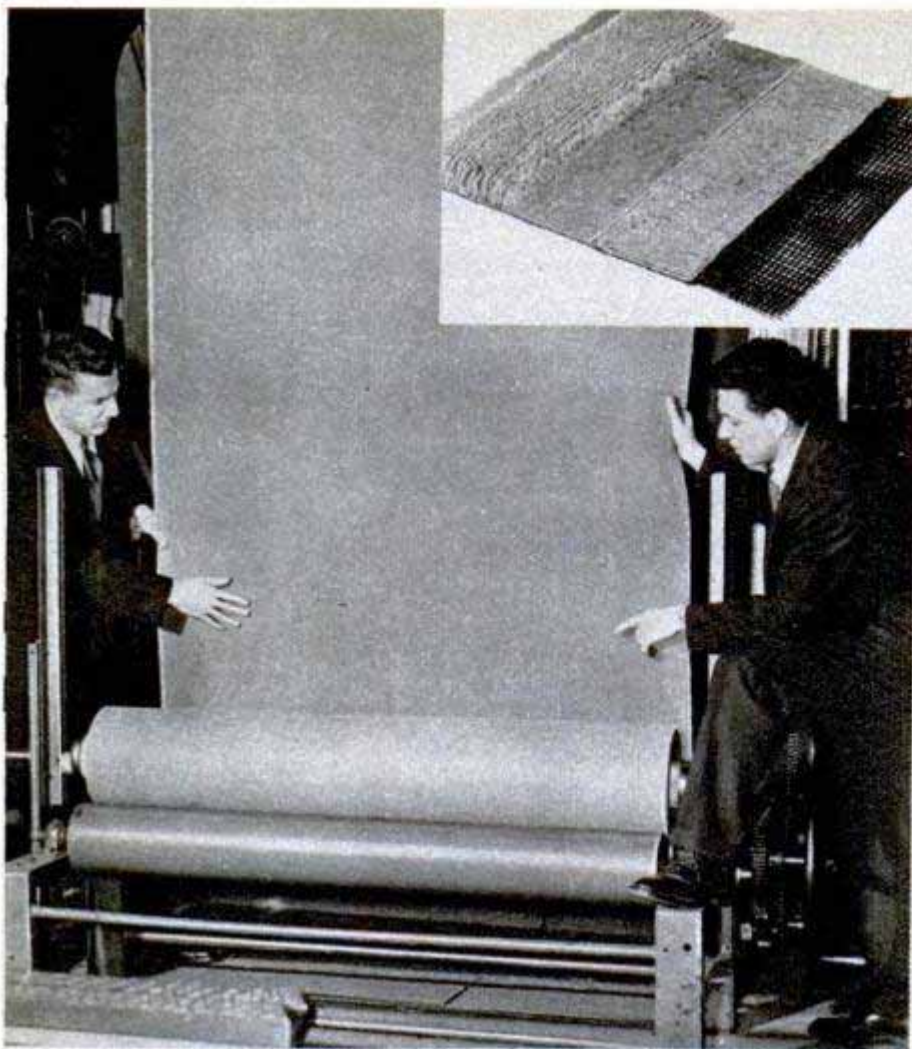
the infertile ones and guarantee that the eggs will be almost 100 percent fertile. The eggs are preincubated for 16 to 18 hours at 100 degrees. They then are cooled to about 50 degrees, candled and shipped. When they reach the hatchery or poultry grower, the incubation is resumed.



## Angle Attachment For Valve Grinder

Hard-to-reach valve seats on new models of cars and trucks can be reconditioned quickly with an angle attachment for power grinders. The flexible drive shaft runs through a rigid-aluminum bracket, enabling the tool to work under cowl overhang. Two steel pins guide the attachment accurately into position on the grinder and one screw locks it securely.

Over 100,000 school busses carry the 5,416,000 students in the U. S. who depend on these vehicles for transportation.



## Cemented Carpet Wears Longer

Weaving is eliminated in a radically new carpet in which the wool tufts are cemented to a heavy cloth backing. Use of the adhesive, specially developed by the United States Rubber Company, makes it wear over 50 percent longer than a conventional floor covering of the same pile height and thickness. The adhesive is tough but flexible, giving the carpet the same feel and handling qualities as the woven type. It is ravelproof and frayproof, and can be cut in any direction for fitting and repairing.

Section of new carpeting, which has tufts cemented to a heavy cloth backing. Inset, a cutaway showing carpet's construction. Starting at right, open fabric is cemented to burlap and wool pile placed on second layer of adhesive. Oven "curing" follows

## Lighter-Fluid Can Has Built-In Pump

Cigarette lighters are filled without spillage from a can with a tiny pump that prevents evaporation and has no cap to replace. When the nozzle is swung around over the edge of the can, a valve inside the pump opens, allowing fluid to flow steadily as the sides of the can are squeezed. Flow stops instantly when the pressure is released. To seal the can, you simply swing the nozzle around, closing the valve.



## Wood Panels Mount on Car Body To Add the Station-Wagon Look

Standard automobile bodies can be given the luxurious look of a station wagon with a wood covering that attaches to the sides of the body with metal screws. Frames of the covering are hardwood and the panels are mahogany, varnished to protect them from the weather. The conversion kit comes complete with simple mounting instructions so the owner can make his own installation.



**P**ERMANENTLY "perky," a new plastic lace provides a ribbon of color around everything in the home from the kitchen window to the housewife's hat. Just looking at the delicate lace, called Lacelon, suggests a thousand and one ways to use it. The featherweight material won't wilt when it's wet and can be washed with one swipe of a damp cloth. It won't run or unravel, can be cut at any point and stitched by hand or machine. Florists have welcomed the lace because it will remain crisp despite moisture or cold. Used on a hat, Lacelon can be shaped into ruffles, bows or swirls that will retain their shape if worn in the heat of the sun or sudden showers. Need a new lamp shade? Just sew bright ruffles of Lacelon on the top and bottom edges of the old one. Instead of buying new curtains, tack a ruffle of the colorful lace around the kitchen window. The rainbow material is available in three and five-inch widths. The homeowner has his choice of 10 colors that will appeal to the entire family including the children. For a bow in daughter's hair, just twist the lace into the proper shape. If baby has no hair, stick the bow in place with a bit of cellulose tape. Junior probably won't stand for this for more than a few seconds—but you may have time enough to snap a photograph.

↓ Delicate yet colorful, Lacelon retains its crispness indefinitely, can be cleaned with damp cloth



Minnesota Mining & Manufacturing Co. photos

↑ Housewives can make colorful frames for kitchen windows with the plastic lace. No curtains to wash!

## Plastics Spin a Rainbow Indoors



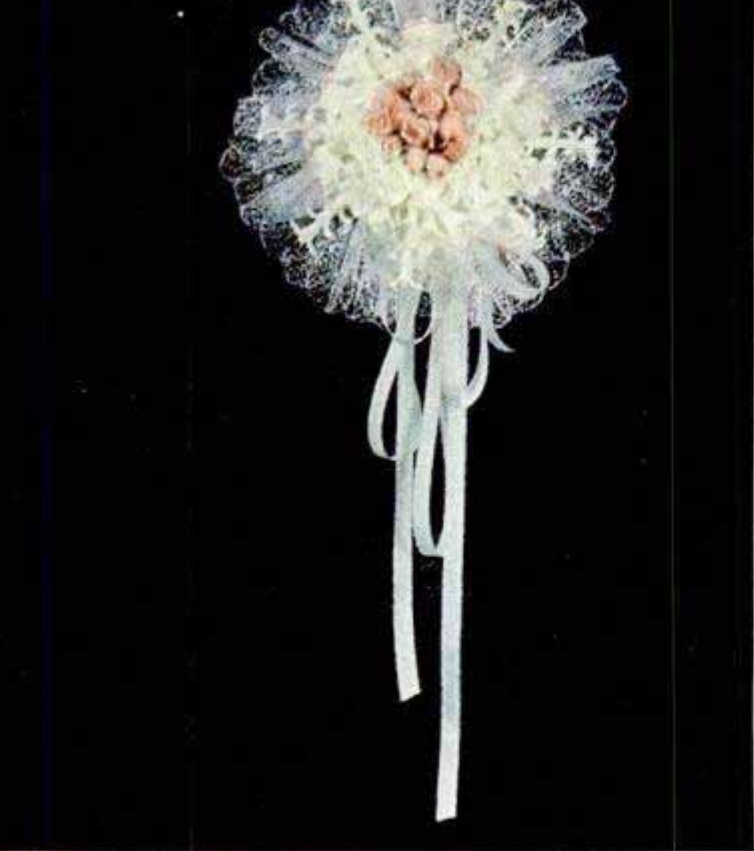


† Florists have been quick to adopt Lacelon because it retains its shape despite moisture and cold. Arrangements such as these can be made in advance, then placed in cooler. Fabric laces would wilt under such conditions

↓ There's no trick to sewing the perky lace—just run it through the machine as you would any material. Stay inside the scalloped edge, which might tear out



† To make filmy ruffles the housewife sews straight down the lace, just inside the delicate swirled edge. Then the ribbon is ruffled up along the thread and tacked to the window or sewed to last year's hat



↑ Plastic forms a crisp halo for an arrangement of roses

Above, right, an old lamp shade becomes a new one with ruffles of color on it

Right, wrapping gifts is an art made easier by a material which is bound to look good

↓ Strips of various colors sewed together make delicate doilies that can be wiped clean





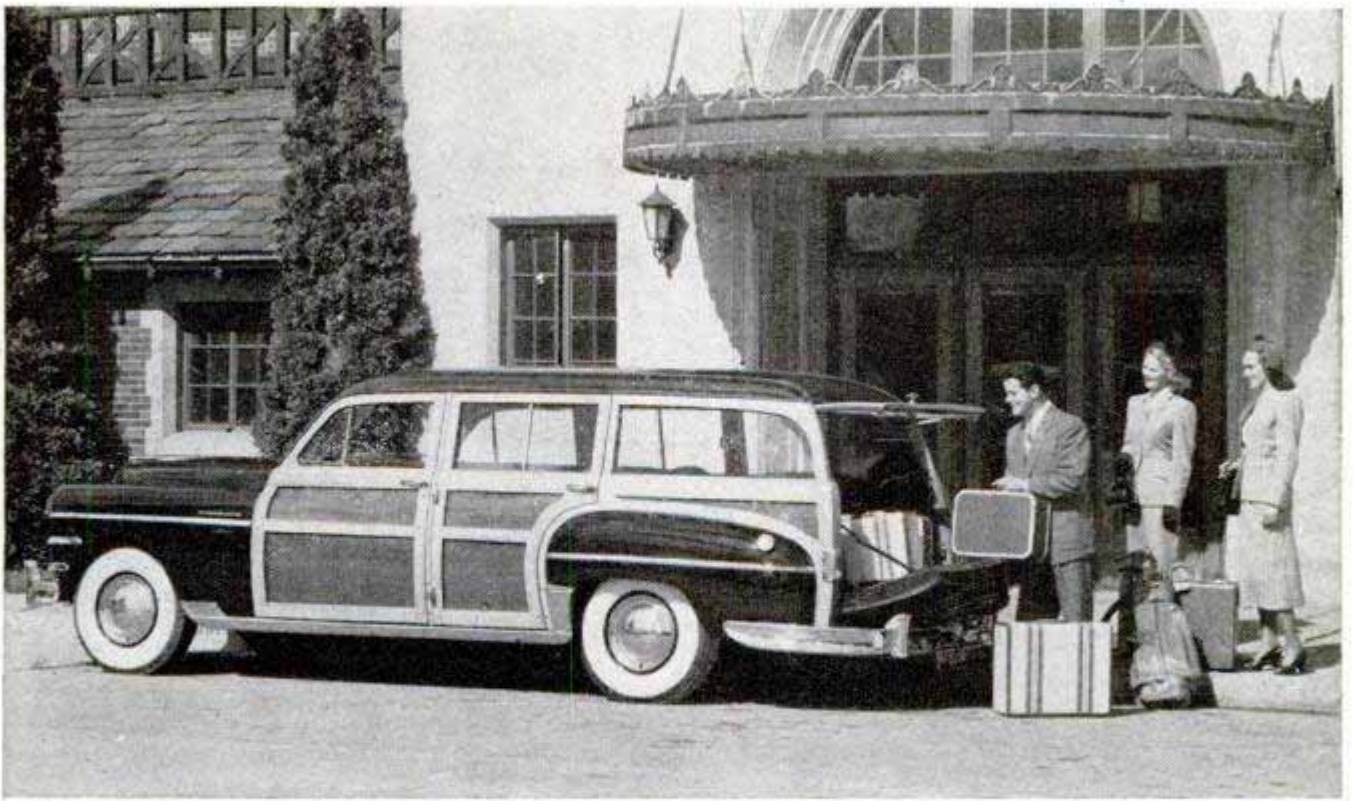
↑ Milady has a new hat—only it's the old one with a perky halo of lace. The original trimming is removed and a ruffle of Lacelon sewed around the hat. Artificial flowers can be combined with lace if desired



← Anyone can make imaginative gift wrappings with the new material. Large bows and lace "flowers" are made by gathering the material as desired, then holding it in place on the package with cellulose tape

↓ Using the crisp material in unusual places puts spots of color in the kitchen. Here a "new look" is achieved by trimming the shelf edges of a whatnot with runners of lace. The plastic is flame resistant

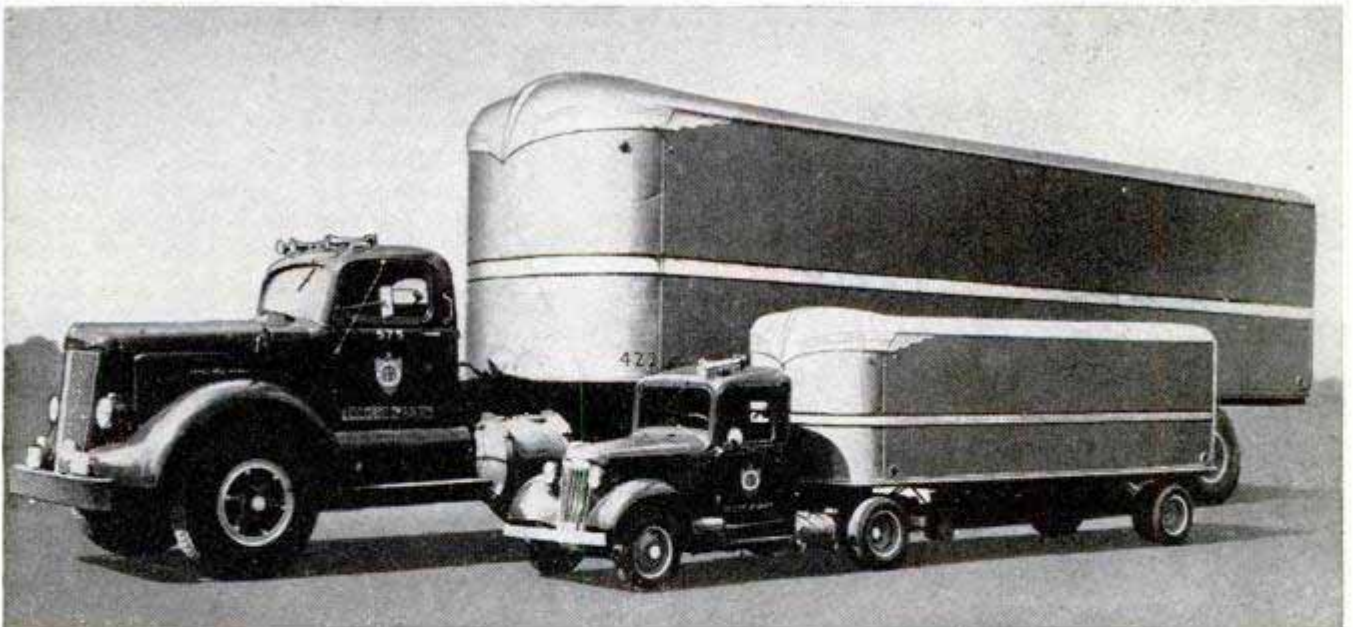




## Chrysler Station Wagon

Chrysler's first station wagon since 1941 is a nine-passenger Royal model powered by the six-cylinder Chrysler Spitfire engine. The car has three full-width seats and two of them can be removed to provide a loading space 10 feet long. The spare tire is mounted in a special compartment in the

tail gate and can be unlocked and removed without lowering the gate. Stoplight and license combination are a part of the tire-compartment cover. The station wagon has white-ash trim fitted onto steel body panels with a mahogany finish. Interior upholstery is a leatherlike plastic resembling alligator hide and can be cleaned with soap and water.



## Baby Trailer

Employees of a truck line in Tampa, Fla., recently spent five months and \$7000 to build a miniature semitrailer that looks exactly like its prototype except for size. The baby truck including trailer is 14 feet long and 4 feet wide. Weighing 1310 pounds, it has a Crosley Cobra engine that

pushes it along at speeds up to 50 miles per hour. The midget truck is making a tour of the cities served by the company. It is driven on short hauls, but on long trips it is carried by one of its big brothers.

☐ Disposable oxygen masks, made of paper, Pliofilm and plastic, have been developed by the U. S. Air Force.



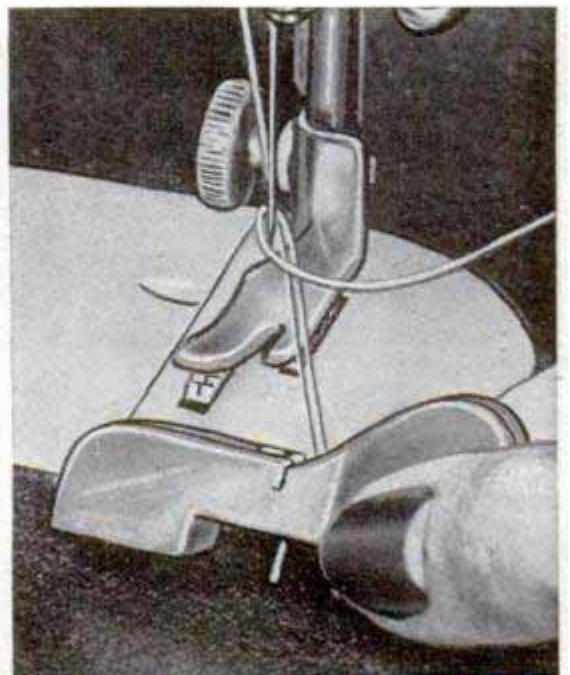
## WHAT'S NEW *For Your Home*

**CLOTHESLINE PROP** adjusts in length like a telescope. One twist of a locking device clamps the two sections together securely at any position. Rubber tips on both ends keep the aluminum prop from slipping or toppling in the wind. It can be adjusted from 4½ to 8 feet

**WASHABLE LAMP SHADE** quickly slips off its base of translucent parchment to be cleaned in warm water and suds. The parchment base serves as a shade while the rayon cover dries. Elastic in the fabric shade assures a neat, trim fit



**NEEDLE THREADER** for sewing machines ends eyestrain for the seamstress. Just a couple of turns of the handwheel and the threading is done. It works on any machine







**PASTRY ROLLER**, left, is a modern version of the centuries-old rolling pin. Entirely of plastic, it has eight nonsticking rollers to speed pie-making and its multiple action eliminates lumps and waves



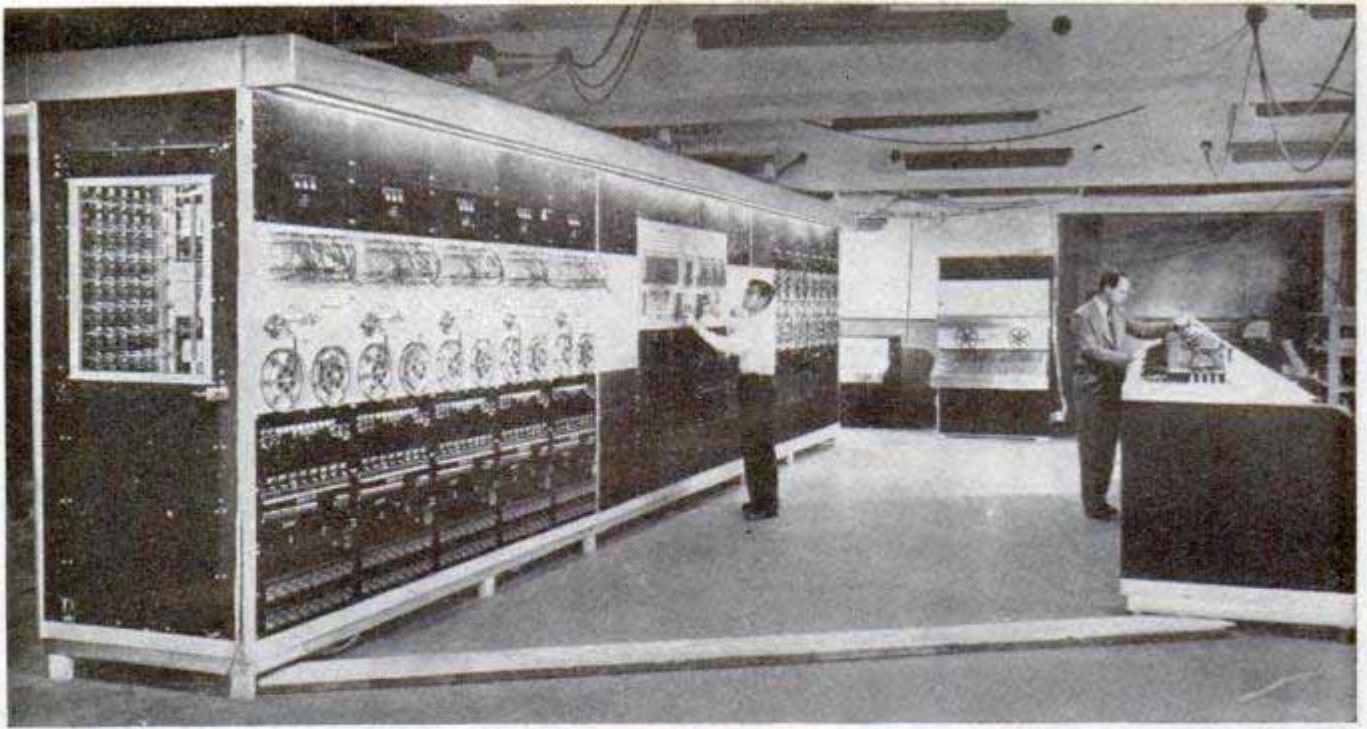
**COFFEE-BOWL HOLDER**, above, does two jobs at one time. It holds the glass top of a coffee maker securely and has a recessed base to catch drippings



**SELF-EMPTYING HAMPER**, above, fits on any door or wall and empties itself when a catch is released. It is made with an open weave for ventilation

**PORTABLE BABY BED**, below, is so light you can carry it and the baby at the same time. The tubular-aluminum frame folds to suitcase size for carrying. Net sides provide ventilation and let baby look around

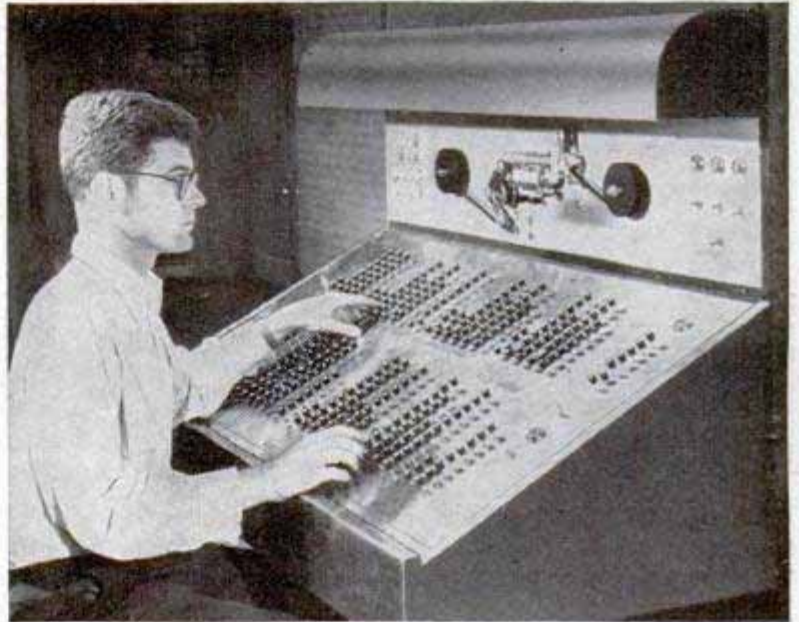




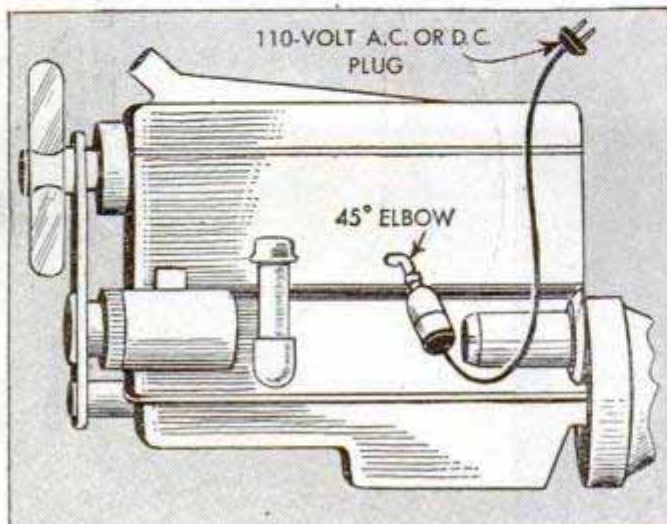
Mathematical marvel, the Mark III, answers problems on magnetic tape. Tape then is fed into typewriters which write solution. Right, information is given to coding box

### Computer's Memory System Stores 64,000 Numbers

In just about  $\frac{1}{1000}$  second a new computer can multiply two 16-digit numbers; it can add the numbers in one third that time. The computer, the Mark III at Harvard University, has a memory system capable of storing up 64,000 digits for later use. The system consists of nine drums. Difficult mathematical problems are fed on magnetic tape into one drum, which in turn "commands" the machine to solve the problems by using the numbers in the eight storage drums. All information and numbers for the computer are represented by small magnetic spots on the whirling drums. Because the answers are



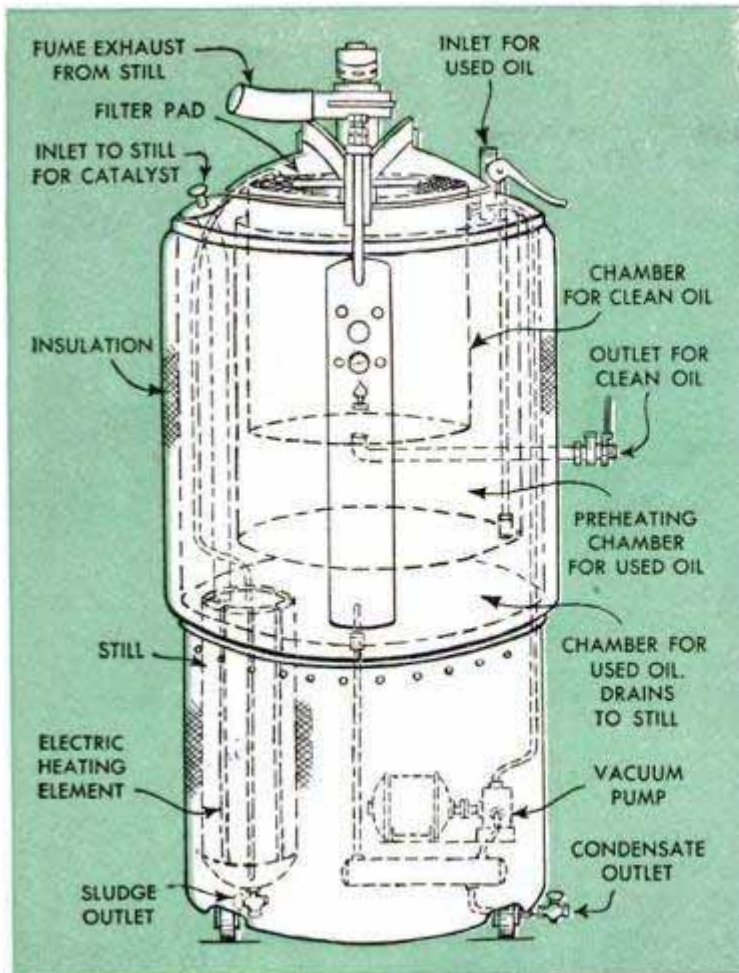
computed faster than typewriters can print them, they are recorded on magnetic tape which then is fed to a battery of typewriters at a slower speed. The computer is 30 feet long and weighs almost 10 tons.



### Engine Heater

Easy starting of a car during cold weather is assured by a water heater, installed on the engine, which can be plugged into any convenient electric outlet. A pipe elbow is installed in the drain hole of the engine block, and the heater screwed to the elbow. When the cord is plugged in, the water inside the heater is warmed to a certain temperature, discharged into the engine block, and more water drawn into the heater.

Using a new type engine, a twin-jet British Gloster Meteor climbed to 40,000 feet in four minutes.



*Refer to: The Hilliard Corp.  
102 W 4th St., Elmira, N.Y.*

## Miniature Refinery Cleans Motor Oil for Reuse

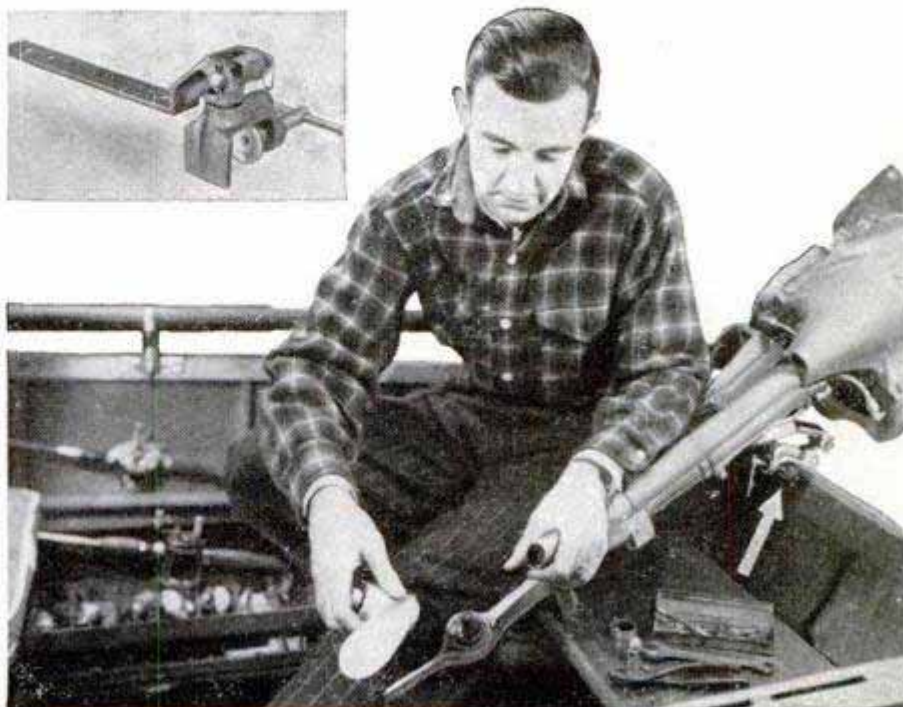
Based on the theory that oil does not wear out, an oil-refining machine uses a catalytic process with high temperatures and sub-atmospheric pressures together with filtration to prepare used oil for reuse. The complete refining unit removes all carbon, acids, metal particles, water and dirt.

According to the maker, the machine turns out lubricating oils equal or superior in all characteristics to the original qualities of the oils. It operates on 110 or 220-volt current, weighs 300 pounds and has a daily capacity of 75 gallons, handling 3½ gallons of used oil at a time.

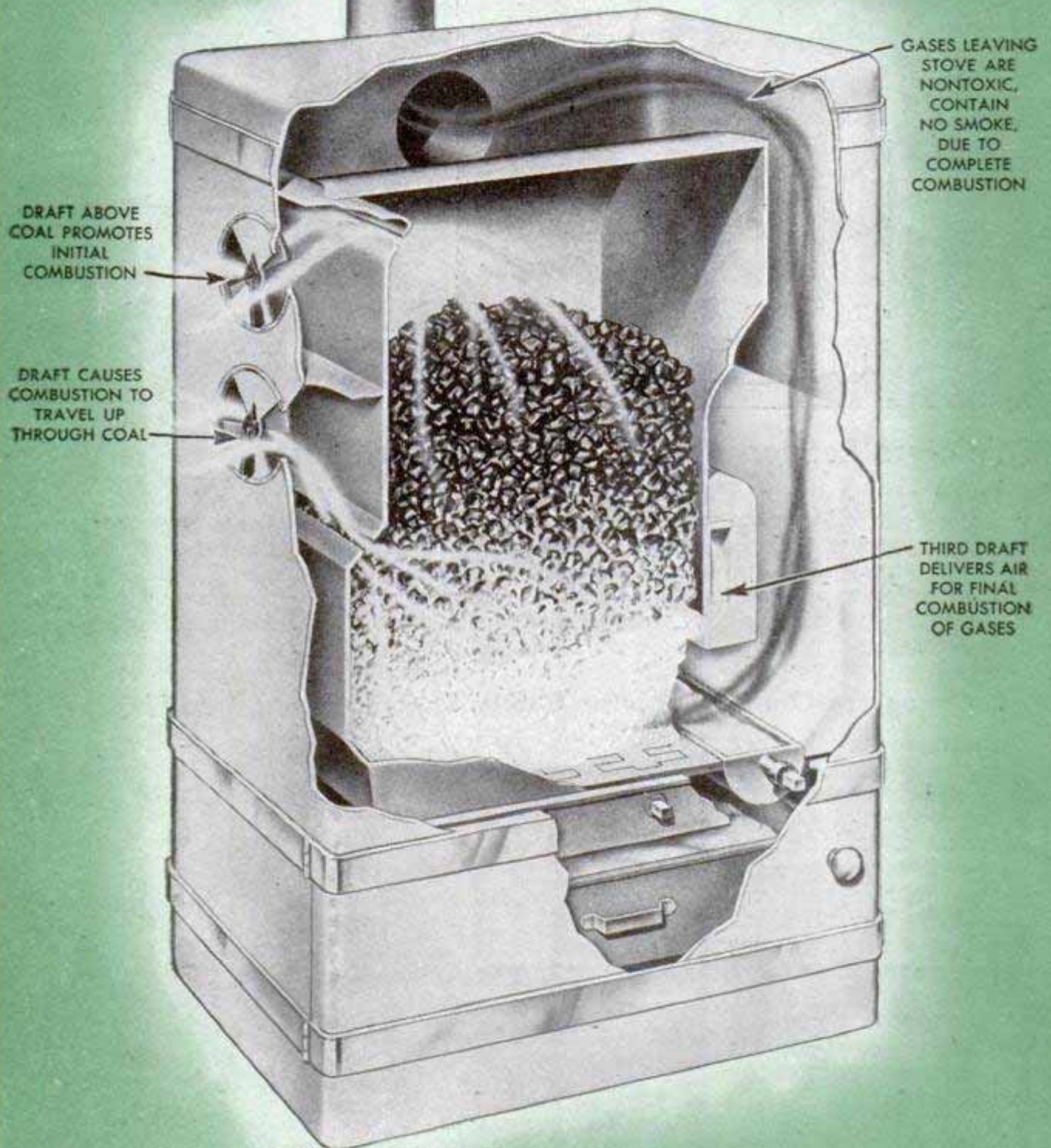
## Lift Clamp for Outboard Motor Allows Shaft to Swing Into Boat

Shear-pin repairs are carried out quickly when the outboard motor has a lifting device that permits swinging the shaft into the boat while the weight of the motor is still supported on the transom. The clamplike lift comes in two sizes to fit all types of outboards. The motor is tipped to a horizontal position so that the shaft can be swung into the boat easily.

Some 43½ million motor vehicles are now in use in the U. S., according to a recent estimate of the Automobile Manufacturers Association.



# Stoves That



This smoke-eating stove achieves almost complete combustion by burning both solids and gases through a unique draft arrangement. Users of stoves of this type report a big saving in coal, and long intervals (from 12 to 24 hours) between stokings

# Eat Their Own Smoke

By Harland Manchester

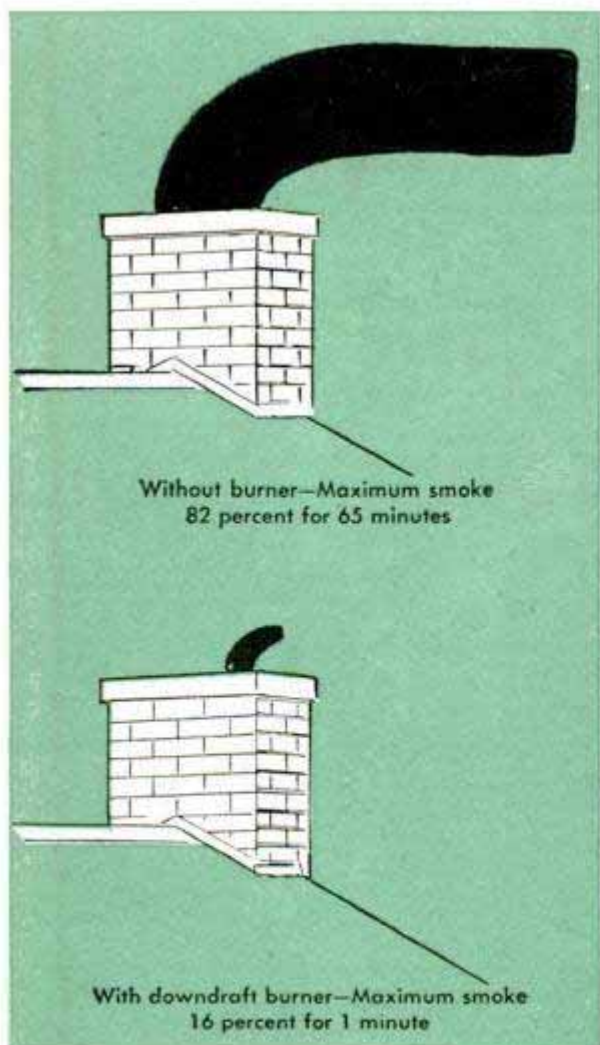
**T**HE CONVENTIONAL domestic stove or furnace is a highly efficient device for carrying fuel up the chimney and sprinkling it on the neighbor's wash. In most stoves, fresh fuel on top of the fire liberates gases before it starts to burn, forming soot and tars which foul up the flue and escape into the outside air. That plume of smoke coming from the chimney may look pretty on Christmas cards but, to an engineer, it is a sign that fuel is being wasted. If combustion were complete, there would be no visible smoke.

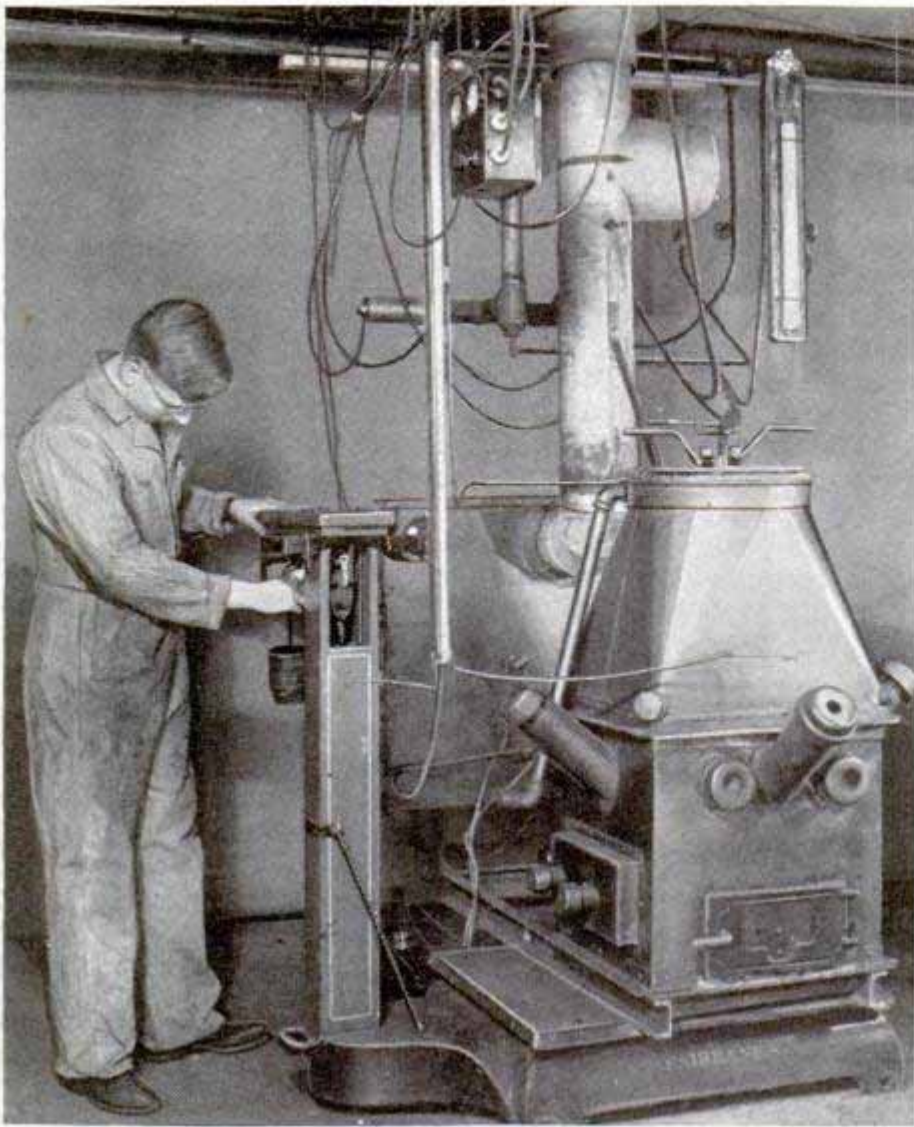
In some 2700 houses in the Midwest and South last winter there was no indication to the passing traveler that the folks were home. The familiar smoke plume was gone. A new type of coal stove, representing the first radical improvement in space-heaters since Ben Franklin's famous invention, had eliminated the smoke nuisance in 2000 houses, and was also cutting fuel bills and greatly extending the intervals between

stokings. In 700 other houses, a soft-coal burning hot-air furnace, also designed for smokeless combustion, was achieving similar results.

The smokeless stove was invented in the laboratories of the Battelle Memorial Institute of Columbus, Ohio, one of the oldest and largest nonprofit industrial-research organizations in the United States. The furnace was developed by Prof. Julian R. Fellows of the University of Illinois. One of Battelle's most important clients is the bituminous-coal industry, whose frank aim in life is to sell more bituminous coal. Back in 1940, Bituminous Coal Research, Inc., the industry's research group, took a hard look at the census figures. They found that 47 percent of the country's homes were heated by some kind of stove, and that soft coal was by far the most important fuel used for this purpose. At the same time, the uncontrolled burning of this major fuel was being widely condemned as a cause of

Prof. Julian R. Fellows demonstrates his smokeless furnace in lobby of hotel to prove absence of flue gas





Laboratory model of coal heater with smoke meter and test apparatus for studying combustion. Scale shows weight loss during burning. Thermocouples test temperatures in different parts of firebox and water samplers collect gas samples. Photoelectric cells measure density of smoke

air pollution—a field in which it also holds first place. Big industries can cleanse their furnace exhausts by installing in their stacks electrical precipitators or other devices which are much too expensive for

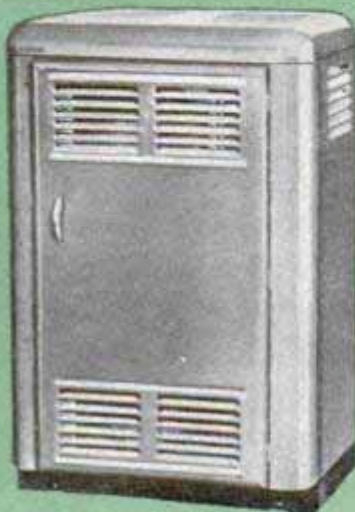
complete combustion by burning the volatile gases that were wasted up the flue, substantial fuel economy would result.

The bare statement of these goals was sufficient to interest stove makers, who sell

home stoves and furnaces. In many cities and towns, homeowners are not allowed to burn the cheap bituminous fuel because of the smoke nuisance. Obviously, if a nonsmoking space-heater could be devised, soft coal would be in a better competitive position with other fuels.

This was the assignment handed to Bertrand A. Landry, Battelle's supervisor of fuels research, and Ralph A. Sherman, well-known fuels expert and assistant director of Battelle, in the fall of 1940. It was found that a number of other possible improvements were intimately connected with this goal. For instance, one reason why the ordinary coal stove produces so much smoke is the need for frequent firings—often every three or four hours. When you shovel in coal you raise a lot of dust, produce a glut of unburned gases, and suddenly thicken and blacken the smoke plume. So they chalked up "longer interval between firings." It was also obvious that if you obtained more

## SMOKELESS HEATERS



FULL-SIZE CIRCULATOR TYPE



RADIANT TYPE



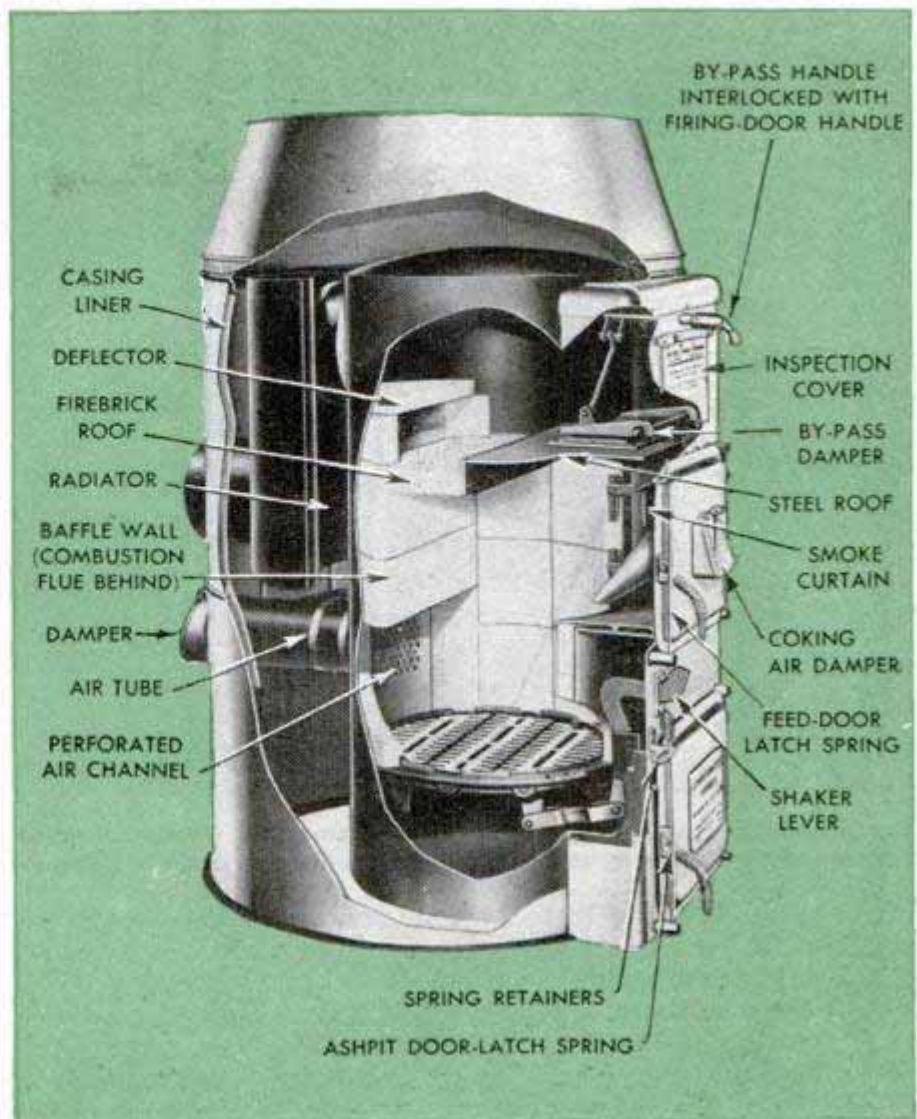
SMALL-SIZE RADIANT TYPE

several hundred thousand coal-burning space-heaters every year. Twenty-seven manufacturers joined in financing the program, and work in the Battelle fuels laboratory slipped into high gear. Many existing stoves were exhaustively tested. They were mounted on scales with flexible connections to observe the rate of weight loss during burning; temperatures in various parts of the firebox were taken by means of thermocouples; the behavior of air currents was recorded; gas samples were obtained by means of water-cooled samplers, and the density of smoke in the flue was measured by photoelectric cells.

It soon became apparent that two steps were necessary for the complete combustion of coal—one for burning the solids and the other for burning the gases liberated by heat. Most conventional coal stoves are based upon the notion that burning fuel is a single, indivisible problem, with the result that black smoke consisting largely of a tar fog rolls up the chimney.

Several experimental stoves were designed and tested at Battelle, resulting finally in the "BCR smokeless stove" now in use. This engineering feat was about as complicated as designing a new internal-combustion engine, but the behavior of the new stove may be described simply somewhat as follows: (1) There is an air intake at one side of the fuel bed and an exit on the other side, both above the grate, and this cross-flow of air causes combustion of the solid fuel, after distillation, so that the hot gases do not pass through the "green fuel" above. (2) An air intake near the top of the fuel bed causes ignition to advance upward, against the downward flow of air, which at the same time carries the distillation products diagonally downward to the exit. (3) A secondary air intake, located near the outlet to the flue, mixes air thoroughly with the hot, combustible gases and burns them before they can escape.

Most of the engineering development necessary to transform the Battelle laboratory results into practical commercial designs has been done by development en-

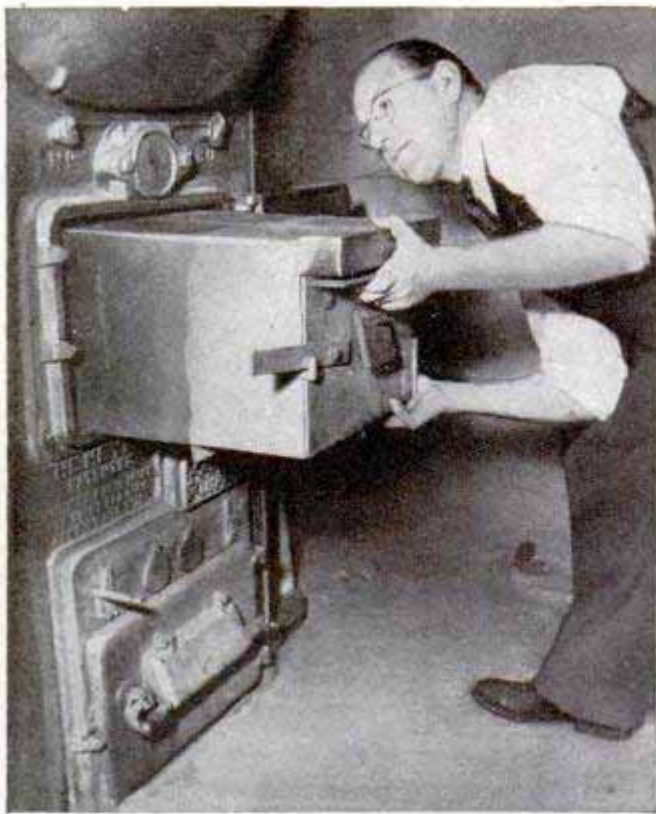


The Lennox smokeless furnace is production example of a down-draft unit

gineers of Bituminous Coal Research, Inc., who have worked in cooperation with several stove manufacturers.

After the stove was completed, it was supplied to many selected householders in Chicago, Indianapolis, Cincinnati and Pittsburgh, and supervised tests were conducted for three years under actual operating conditions. Bituminous coal in a size about 1½ by 2 inches was recommended. Users found that no smoke came from their chimneys except immediately after firing, and many reported a fuel saving of 12.5 percent or better. Many users were enthusiastic because they could throttle the stove down and leave their homes for 24 hours without worrying about freezing pipes.

Two of the participating manufacturing firms are now making the new stove. The Oakland Foundry Company of Belleville, Ill., is turning out two models. One is a circulating-type heater with an attractive enameled jacket which has an output rating of 40,000 B.T.U. per hour—suitable for a small house—and sells for \$110, about the price of a comparable conventional stove. While it is designed for firing with 50 to 55 pounds of coal once every 12 hours, it can



**Experimental Fellows model of down-draft smokeless burner installed in firing door of ordinary furnace**



**Woodomat warm-air furnace will heat eight rooms and one filling of the fuel magazine will last 12 hours**

often be made to go 18 to 24 hours on one stoking. It can be banked for 72 hours. Oakland's other model is a small, cabin-type heater without a jacket which has a B.T.U. rating of 25,000 and sells for around \$60. The King Stove and Range Company of Sheffield, Ala., also is making two models, a plain cast-iron utility heater with a 40,000-B.T.U. output, intended for low-income homes, and an attractive circulating (jacketed) heater of the same capacity. An ingenious control actuated by stack temperature is provided with all types to prevent excessive burning rates, thus saving fuel and protecting the heaters.

These manufacturers sell through retailers, not directly to the buying public. Coal people estimate that 200,000 to 400,000 will be sold in the next five years. For the next few seasons, they will be sold only in a few localities where close watch on their durability can be maintained. Irreproachable performance seems already achieved, but minor changes may be needed to insure long life.

Next on the schedule came a smokeless hot-air furnace, built according to the same principles. Twelve were built last winter. Five were installed in houses and seven are being tested in various laboratories preparatory to large-scale manufacture. One was placed in the cellar of J. Frank Byrne, a physicist on the Battelle staff, to the great satisfaction of Mr. Byrne, his wife and his neighbors. He fires the furnace once a day, he reports, burns two thirds as much coal as with a conventional furnace,

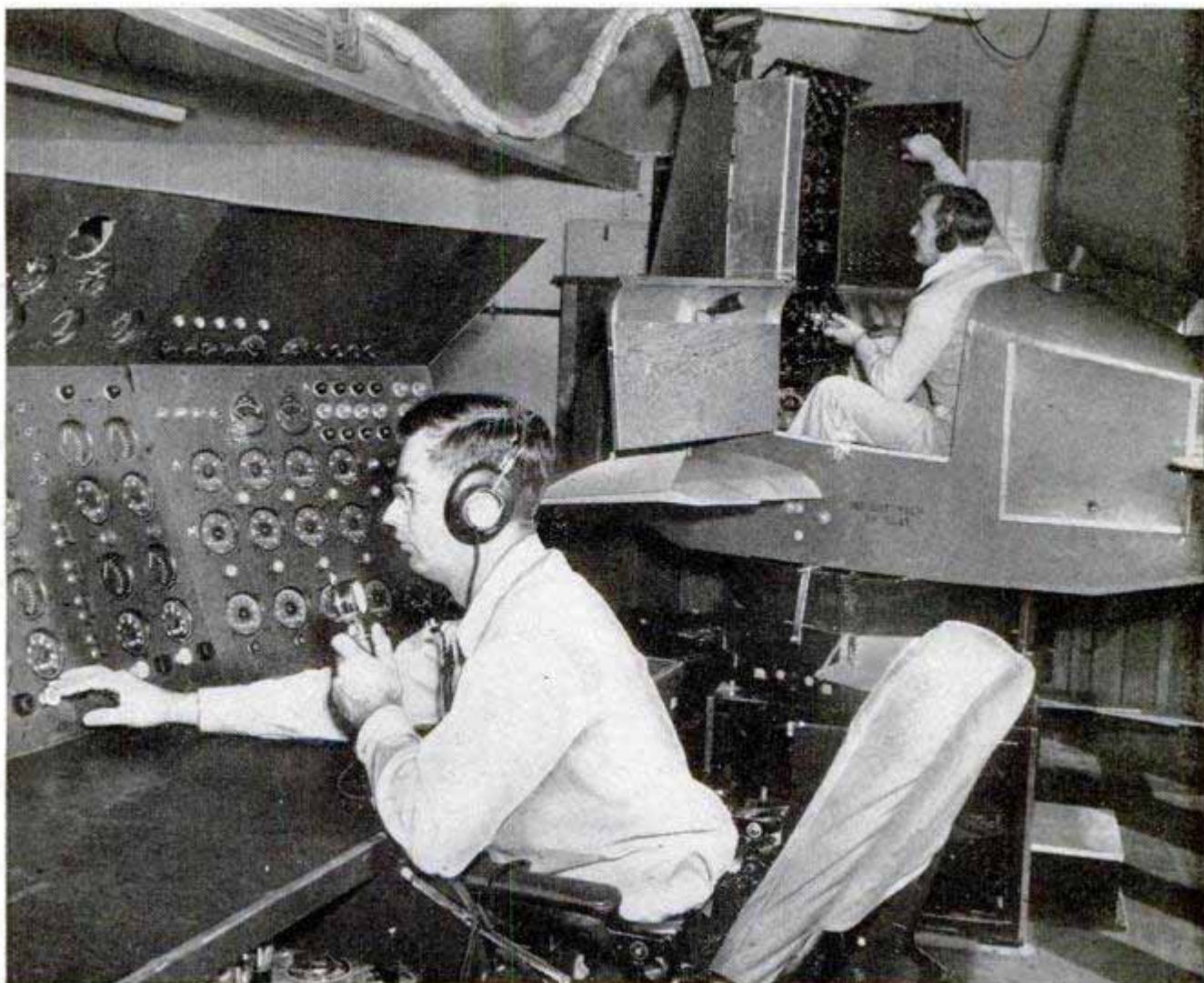
there is almost no visible smoke from the chimney, and his wife has less trouble keeping the house clean. When he opens the feed door for firing, an inner door opens directly to the flue passage so that fumes in the magazine cannot escape into the house through the open door. The institute is also adapting the smoke-eating principle to residential boilers.

The BCR stoves and furnaces were built primarily to enable users to burn cheap bituminous coal without creating a smoke nuisance, and bid fair to fulfill the original purpose of extending the market for soft coal, but any kind of coal can be used in them, with similar advantages in fuel economy and long intervals between firings. BCR's smoke-killing campaign is not limited to home heaters. It has perfected a method of injecting air or steam into the fireboxes of coal-steam power plants to create turbulence and eliminate smoke. Thousands of these overfire jets are now in use.

While the BCR heater was the first of its type to appear, there is no monopoly on the principle of a secondary air feed to burn up the gases which cause smoke. Prof. Julian R. Fellows of the Home-Heating Research Laboratories of the University of Illinois has developed a smokeless furnace which he has demonstrated with no smoke-stack in hotel lobbies without being ejected. Professor Fellows has turned his patent rights over to the university, and seven manufacturers hold licenses. One of them,

(Continued to page 266)





## Trainer for Flight Engineers

All the problems facing flight engineers on big airplanes are simulated in a new ground trainer developed at the Spartan School of Aeronautics in Tulsa, Okla. It is a pilot trainer that has been enlarged to accommodate a control pedestal with from 20 to 22 handles and knobs, an instrument panel with 40 to 50 instruments and additional unit controls. An instructor at a

near-by panel "flies" the trainer, setting up operational problems for the student to solve. The trainee responds by raising or lowering power settings, manipulating the fuel system and controlling the propellers, mixture, cowl flaps and many other units as he would in the air. The government now permits half the 25 hours necessary for the practical portion of flight-engineer certification to be taken in the ground trainer instead of in flight.



## Magazine Holder

Following how-to-build-it plans in a magazine is made easier by a convenient metal stand that holds the magazine open to any page at the correct angle for comfortable reading. Strong enough to support any book from a typist's notebook to a large reference book, the rack makes typing faster and more accurate. When not in use, the stand requires little storage space as it folds almost flat.

Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX, which is available without charge from Bureau of Information, Popular Mechanics, 200 East Ontario St., Chicago 11



Glenn L. Martin Co. photos

## Triple-Jet Attack Plane

Ground support will be the mission of the U. S. Air Force's first three-jet plane, the Martin XB-51. It is 80 feet long and both the wings and horizontal tail surfaces

sweep back at a 35-degree angle. Two engines are on pylons beneath the cockpit and the third is near the tail. Only two men, a pilot and a navigator-radio operator, are required to fly it. The landing gear is of the tandem or bicycle type.



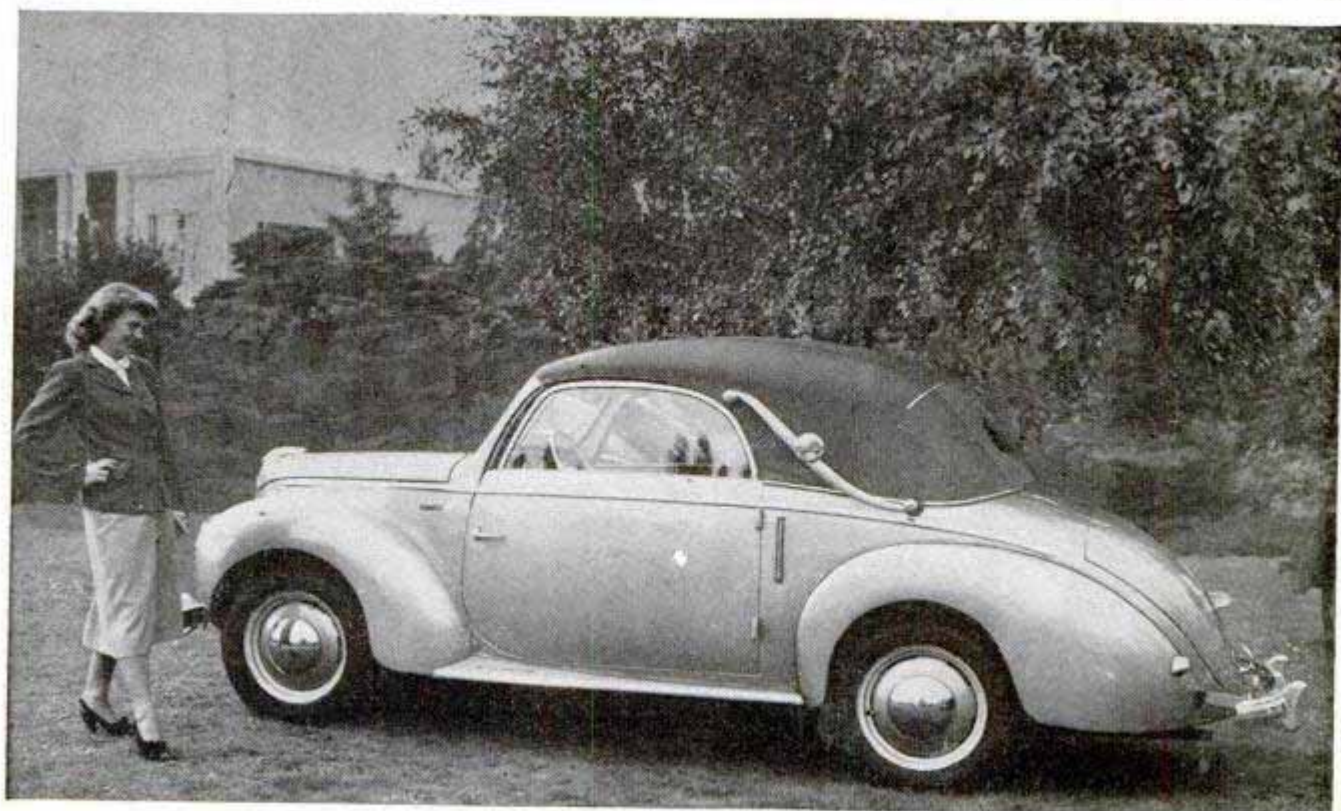
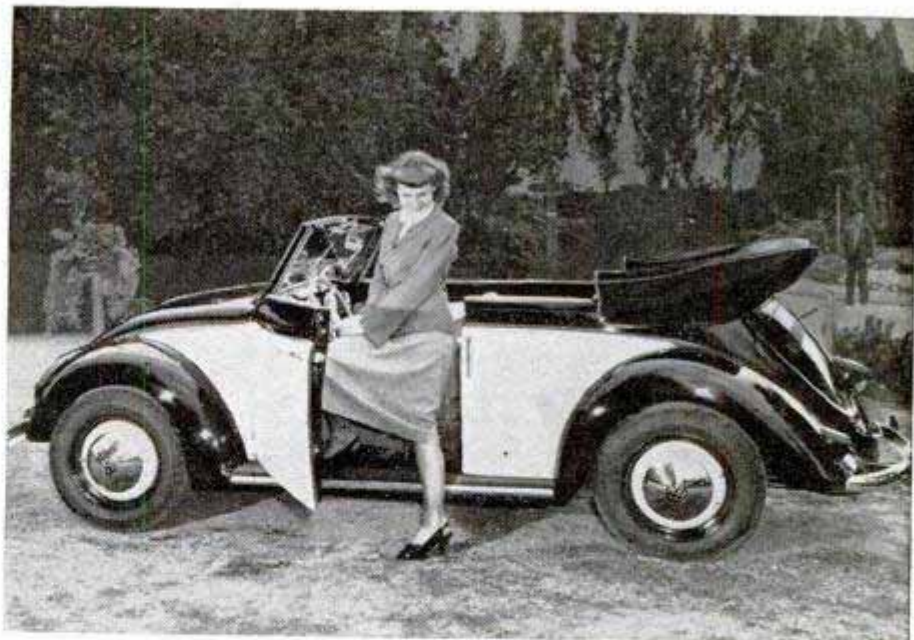
## Four Spigots on Applicator Spread Wax on Floor

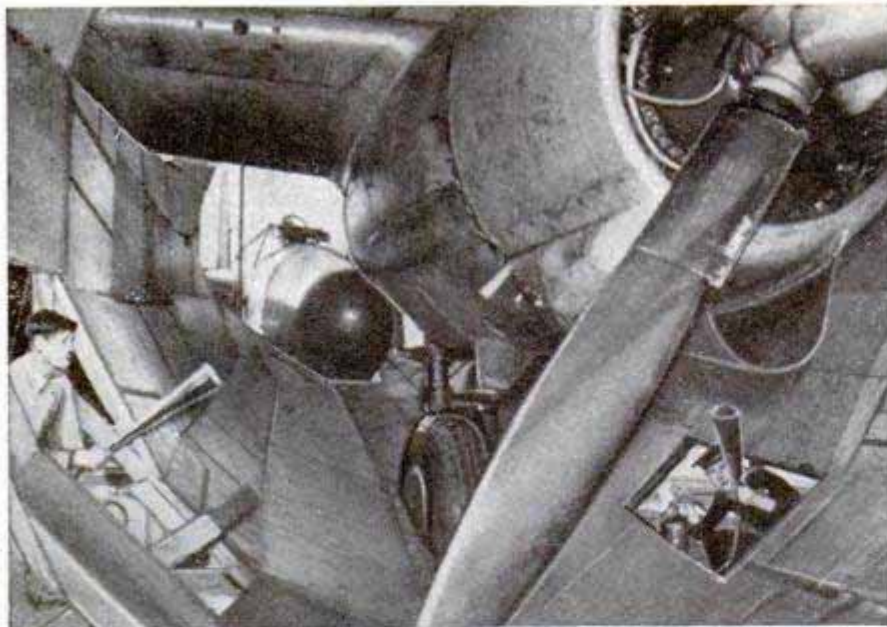
There's no need to stoop or kneel to wax floors when a new applicator is used. The waxer consists of a lamb's-wool spreader and an aluminum tank with four rubber valves. The housewife pours liquid self-polishing wax into the container and replaces the cap. When she lowers the handle so the four valves are pressed against the floor, wax flows out in four equal puddles. She raises the handle to the normal working position and spreads the wax with the lamb's wool. Wax that is not used may be left in the container as long as desired.

## German Automobiles

Berlin's first automobile show since the war showed an American influence in the design of several of the new cars. The Hansa 1500 two-door sedan, built by the Borgward factory in Bremen, has the straight lines of a fenderless postwar American car. It has a maximum speed of about 75 miles an hour and gasoline consumption of 27 miles a gallon. Other cars in the show which attracted considerable attention were the Volkswagen (including a two-color convertible) and Ford's Taunus. The latter is powered by a 34-horsepower engine, has a maximum speed of 65 miles per hour and travels 32 miles on a gallon of gasoline. The show marked the 50th anniversary of the Automobile Club of Germany and more than 80 companies participated.

**Top, a Volkswagen convertible was a hit at Berlin auto show. Right, Hansa design shows American influence. Below, Ford's Taunus has 34-hp. engine**



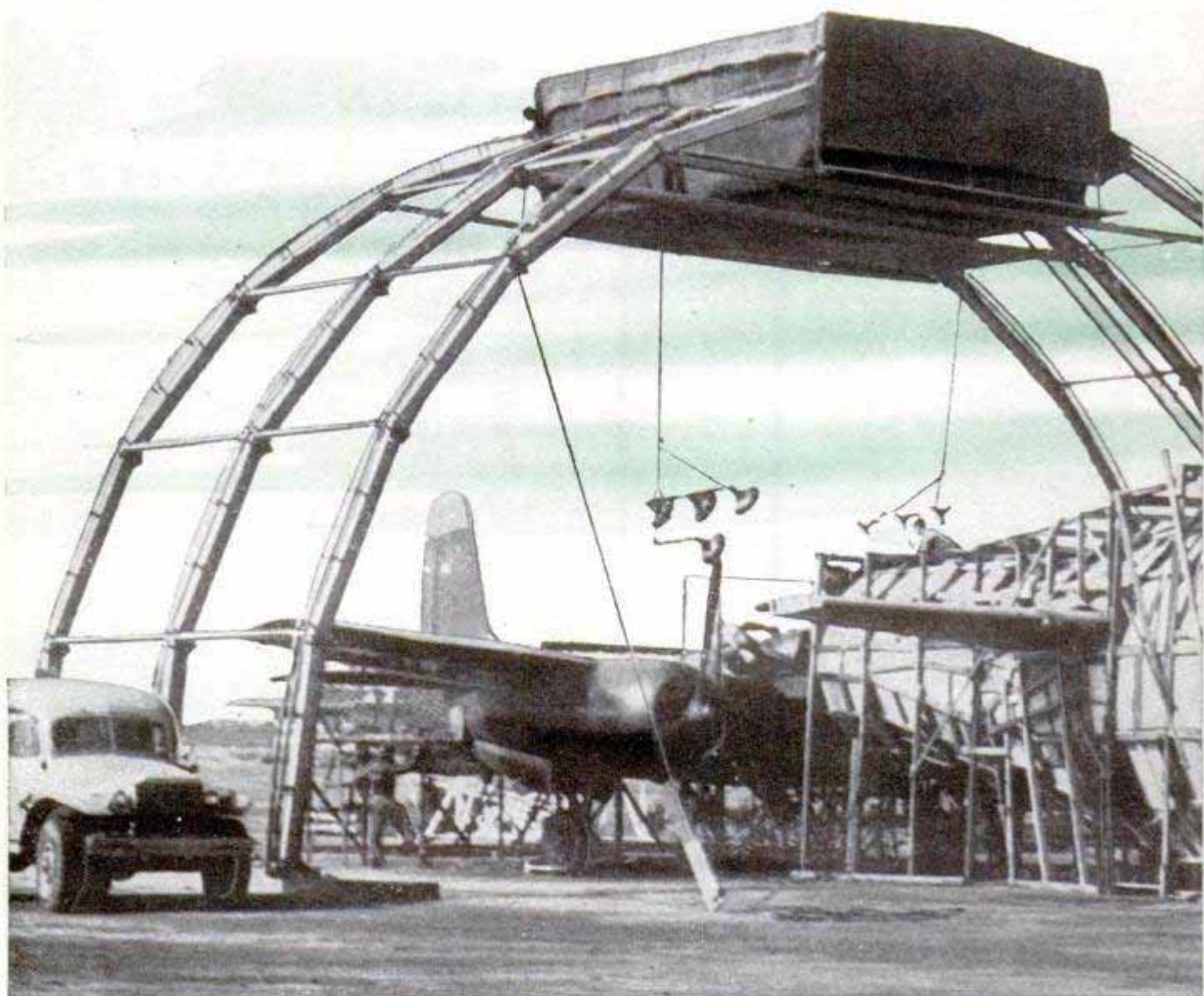


Wind tunnel surrounds the engine of a Marauder. It guides the propeller blast back across the plane from which students practice 'chute jumps

WHEN THE WAR was over, the men who had chalked up a record five million parachute jumps from troop carriers and crippled planes became the only experienced experts on jumping technique. After all, they were alive.

"Roll the plane on its back and drop out," claimed one school. They forgot the long list of men who had tried it and lost an arm, leg or a life to the whipping tail surfaces that clipped them on the way past. "Stand up in the cockpit, pop the 'chute and float home," another group advocated, ignoring cases like that of the Navy pilot who tried it when his

# Bail-Out Rehearsal



engine conked. His shroud lines snagged the rudder and he rode to his grave with the plane.

Recently, officials at the Bureau of Medicine and Surgery and the Fleet Marine Force at Cherry Point, Md., decided to solve the problem of snarled 'chutes and clipped appendages. What was the best way to leap from a crippled plane?

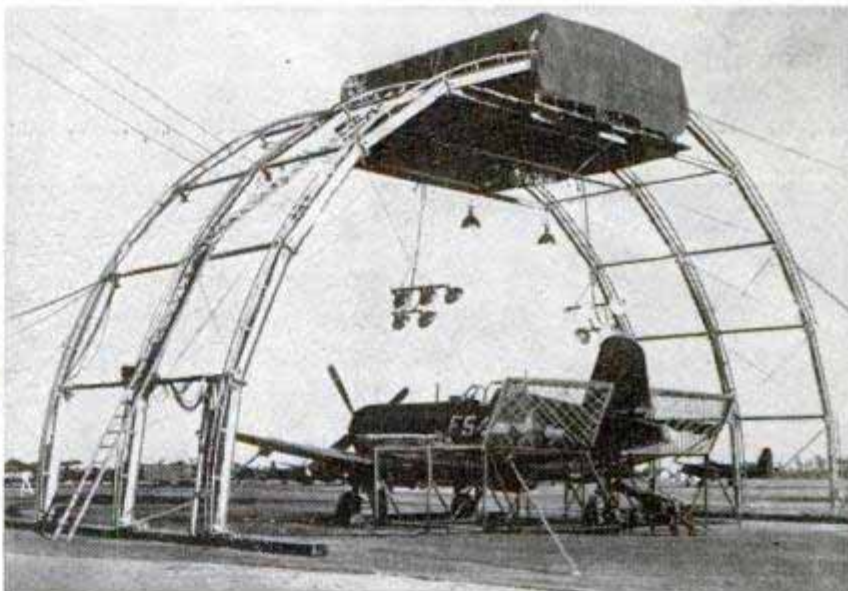
To find out, they rigged up a plane with heavy rope nets over each wing, stretching from nose to tail. Above this was built a section of hangar framework from which they suspended a camera booth and floodlights. To simulate a normal slip-stream blast of 140 miles per hour, the Marines built a plywood wind tunnel around the engine nacelle of another plane. This unit was aimed in the direction of the test plane to give "jumpers" the windy effect of actual flight. The blast from a third plane's propeller cools the engine confined in the wind tunnel.

Some 250 Marine pilots dressed in full regalia made

(Continued to page 264)



Student tumbles from an older-type plane in a practice dive. With head down, slip stream will carry him over the wing and under tail assembly



Instructors photograph the practice jumps from housing above the plane. Pictures reveal mistakes which could take pilot's life in a real jump

Three planes are used in the setup. At far left is the bail-out plane with rope nets to catch the students. Plane in wind tunnel produces a slip stream of 140 miles an hour. Propeller blast from plane at right cools the engine of the second plane, which otherwise might catch fire

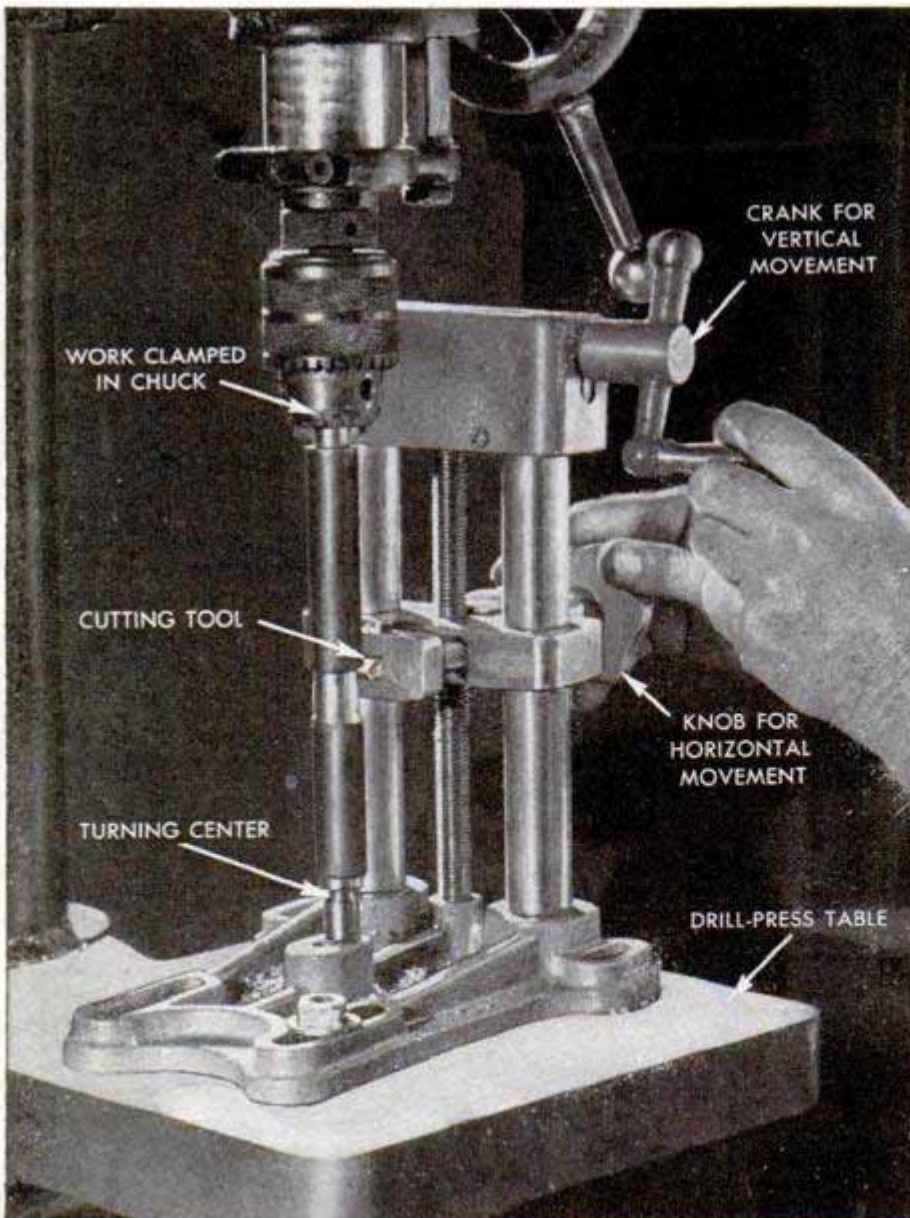




## Swedish Speedboat

Like old-time river boats, a new Swedish speedboat uses a paddlewheel as a means of propulsion. The wheel, made of special

steel to withstand high speed, revolves inside a housing at the stern and throws up a high spray of water as the craft churns across the surface. Powered by a Ford motor, the boat hits a speed of 50 knots.



## Attachment for Drill Press Converts It to Lathe

With a new attachment, an ordinary drill press can be converted into a metal-turning lathe. The attachment bolts to the drill table. Clamped in the drill-press chuck, the work is lowered over a center point on the attachment. The cutting tool is clamped in a holder, which is adjusted by two handles, one for vertical and the other for horizontal movement. As the work spins, the cutting tool is moved against it. Work up to four inches in diameter can be turned with the attachment.

## Calves Dehorned By Soldering Iron

Calves are dehorned before the horn breaks through the tissue by searing the horn-producing cells with an electric soldering iron. A hollowed-out tip is used so that it can be placed over the bump where the horn would normally develop.

## Underground Bridges Are Shell for Subway

TRAFFIC on Toronto's main north-south thoroughfare will run smoothly with a minimum of interruption while Canada's first rapid-transit subway is being built beneath it. The project is expected to take four years to complete and will cost approximately \$30,000,000.

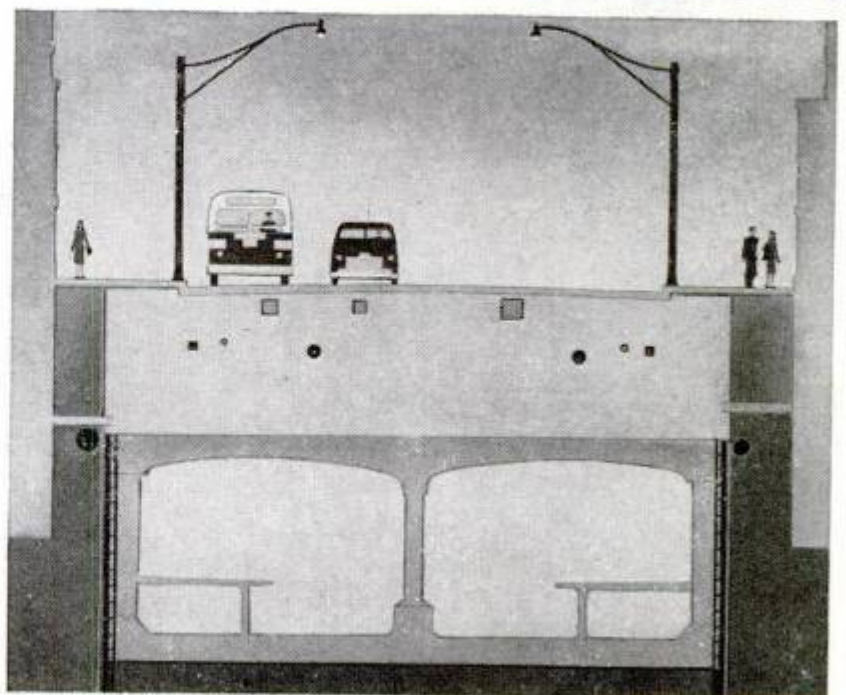
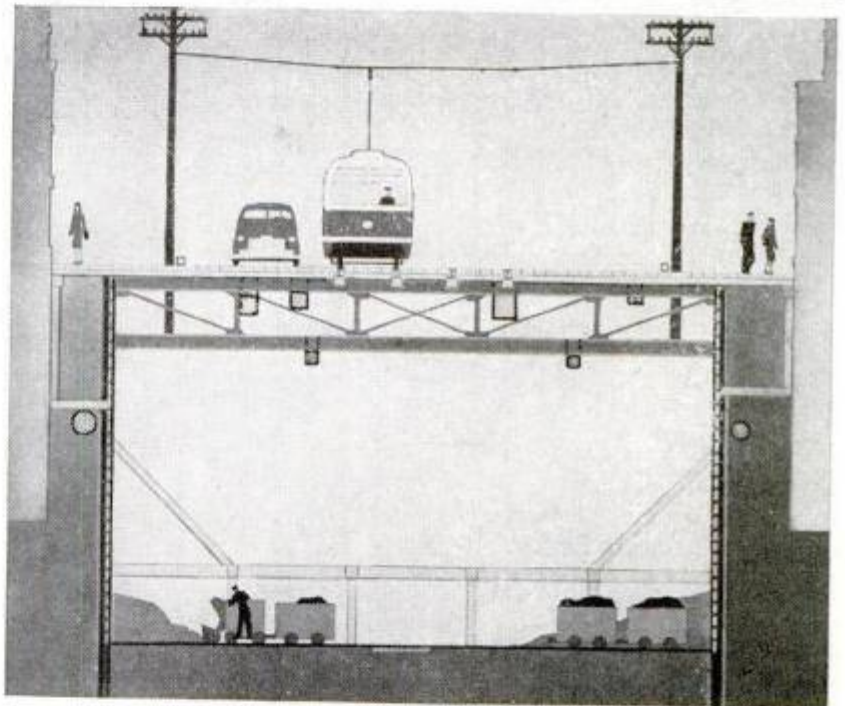
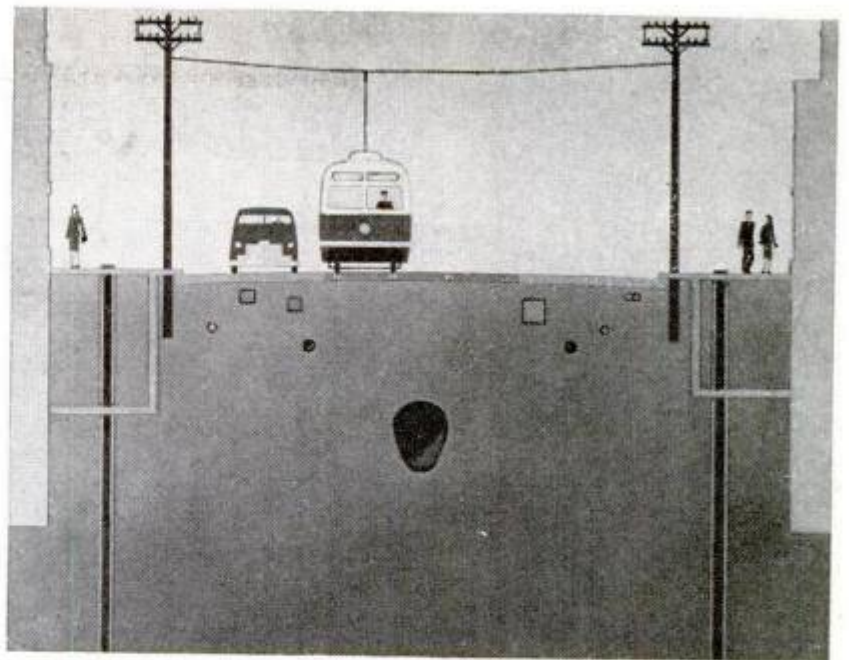
New construction techniques are being used, since the city of close to a million population is built largely on clay and sand, close to sea level. Steel pilings are being driven for 30 or 40 feet into the sidewalks, close to buildings, to form a reinforced concrete retaining wall and to act as supports for underground truss bridges spanning the street.

One block at a time is to be closed off and traffic rerouted while the spans are put in position. The steel-truss bridges will also carry conduits for public utilities such as gas and water mains, electric, telephone and cable lines.

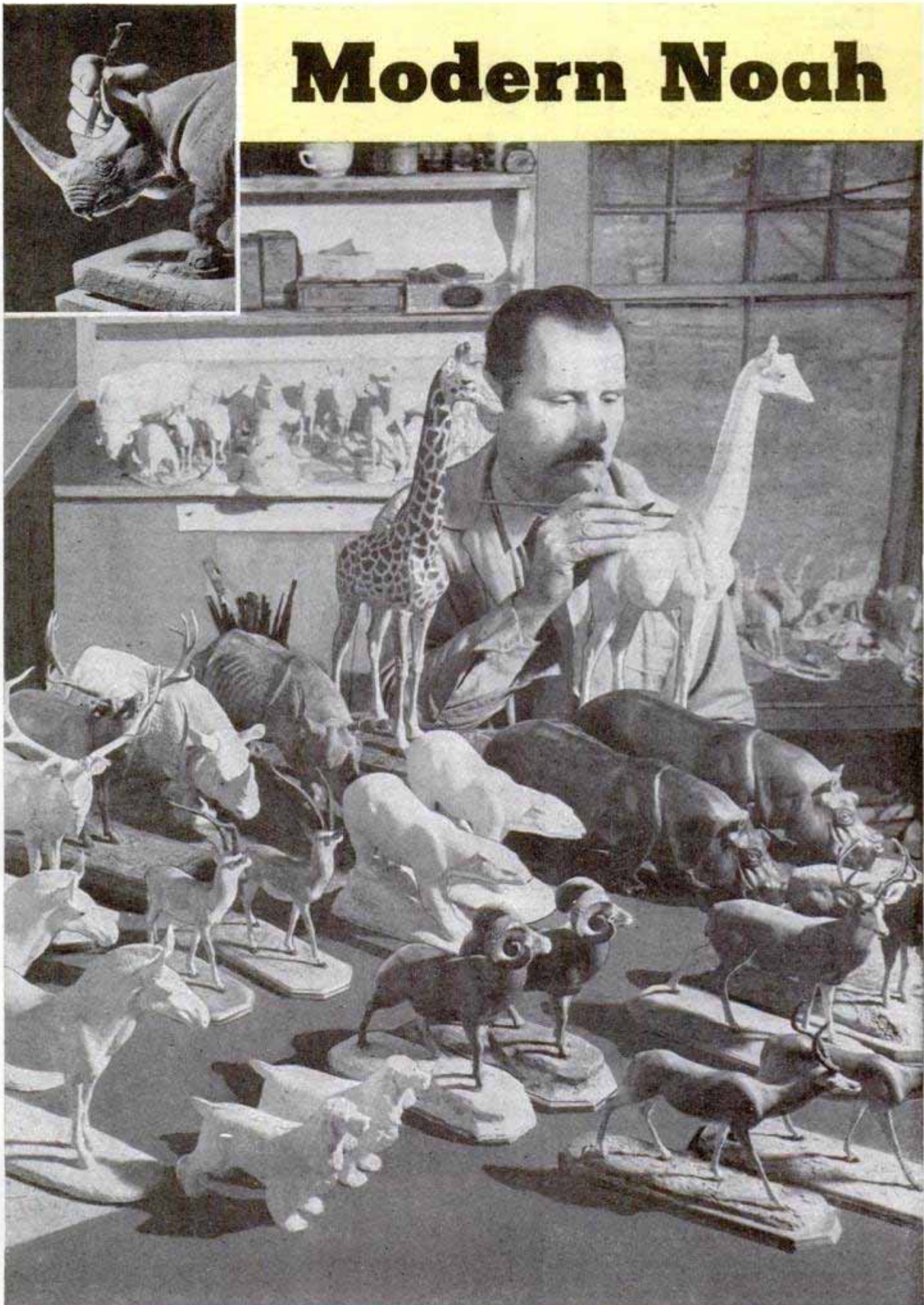
Excavating will start after the spans are in place and concrete tunnels built for the subway tracks. Sand will be put in as a filler between the street level and the top of the subway, and the street surface paved to carry only busses and automobiles.

Using 10-car trains, the 4.6-mile-long subway will cut present surface-car travel time from one end of the line to the other from 45 minutes to 15 minutes. Twelve bridges will have to be built over cross streets where subway stations are located, and there will be 31 ventilating shafts to provide air at the rate of 50,000 cubic feet per minute.

Top, during initial stage of Toronto subway work, steel pilings are driven 30 or 40 feet into the sidewalks. All utilities are underground. During the next stage, center steel pilings will support pavement and house utilities, except main sewer, which has now been relocated along the sides. Bottom, on completion of concrete subway tunnel, inside the steel girders, only motor traffic will use the street level



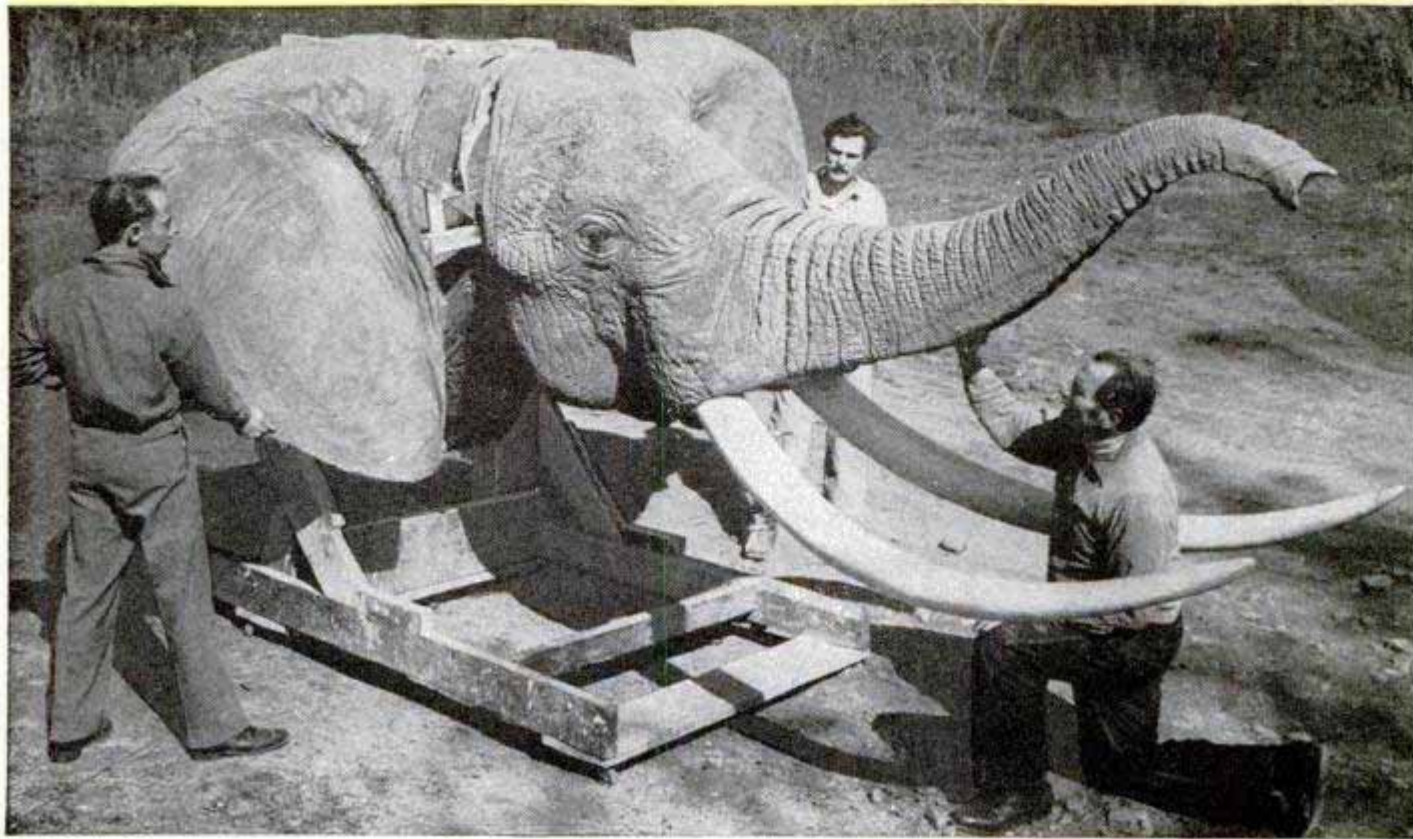
# Modern Noah



Louis Paul Jonas, only modern rival for Noah, is shown working among his candidates for his private ark. He first makes a clay model such as the detailed piece for a rhinoceros shown in the upper left corner



# Peoples an Ark



By Alfred Eris

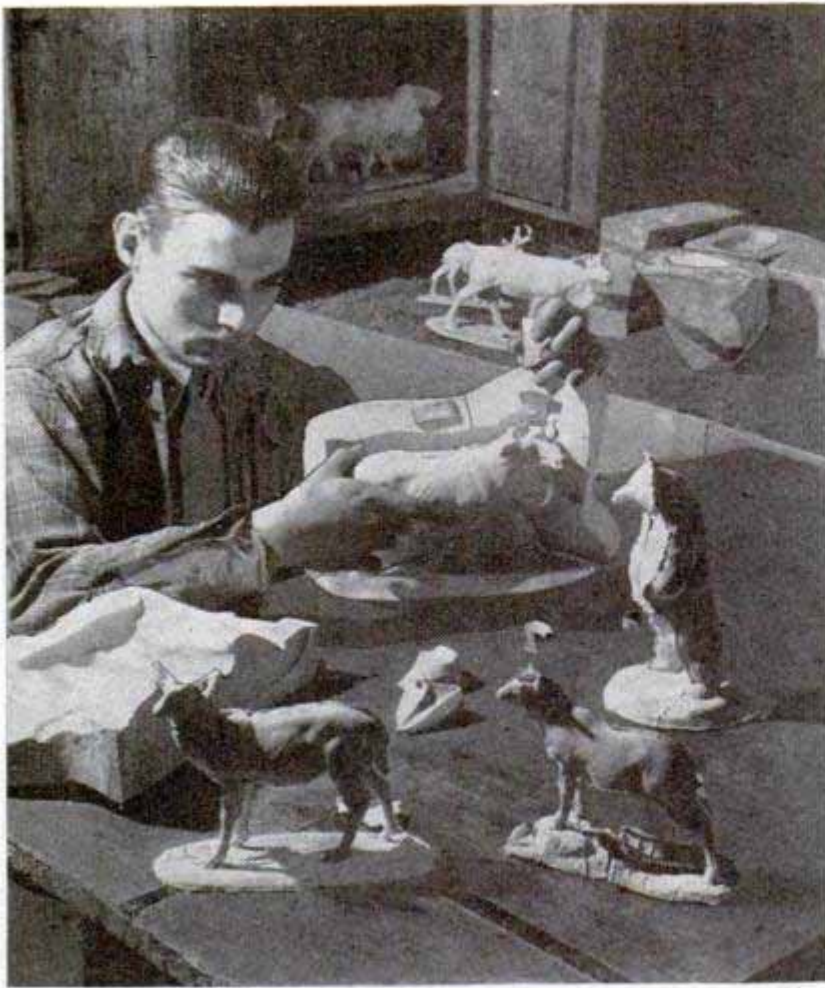
**T**HERE'S no telling what you may run into prowling around some of those upstate New York barns—like the one belonging to Louis Paul Jonas. Open the barn doors and you may find yourself face-to-face with a life-size elephant head complete with menacing tusks.

Instead of ordinary cows, the Jonas barn is full of such creatures as the cheetah, bongo, dikdik, takin, babirusa and the koala. Their presence is explained when you learn that Jonas, one of America's well-known sculptors, has taken over a barn on the Churchtown-Hollowville Road in New York where he is turning out his amazingly life-like animals for museums, schools and collectors. One of the world's foremost miniature-animal sculptors, Jonas has been at work for years on his favorite project: making a perfect  $\frac{1}{10}$ -scale model of every mammal in the world. There are about 250 distinct species and he has done close to half, all realistically painted. Jonas does not believe in mass-production methods.

This is the elephant head that startles visitors to the barn where Jonas works. Both ears are detachable for transport

Below, the sculptor puts a finishing touch to one life-size elephant eye. The artificial hide is almost perfect replica

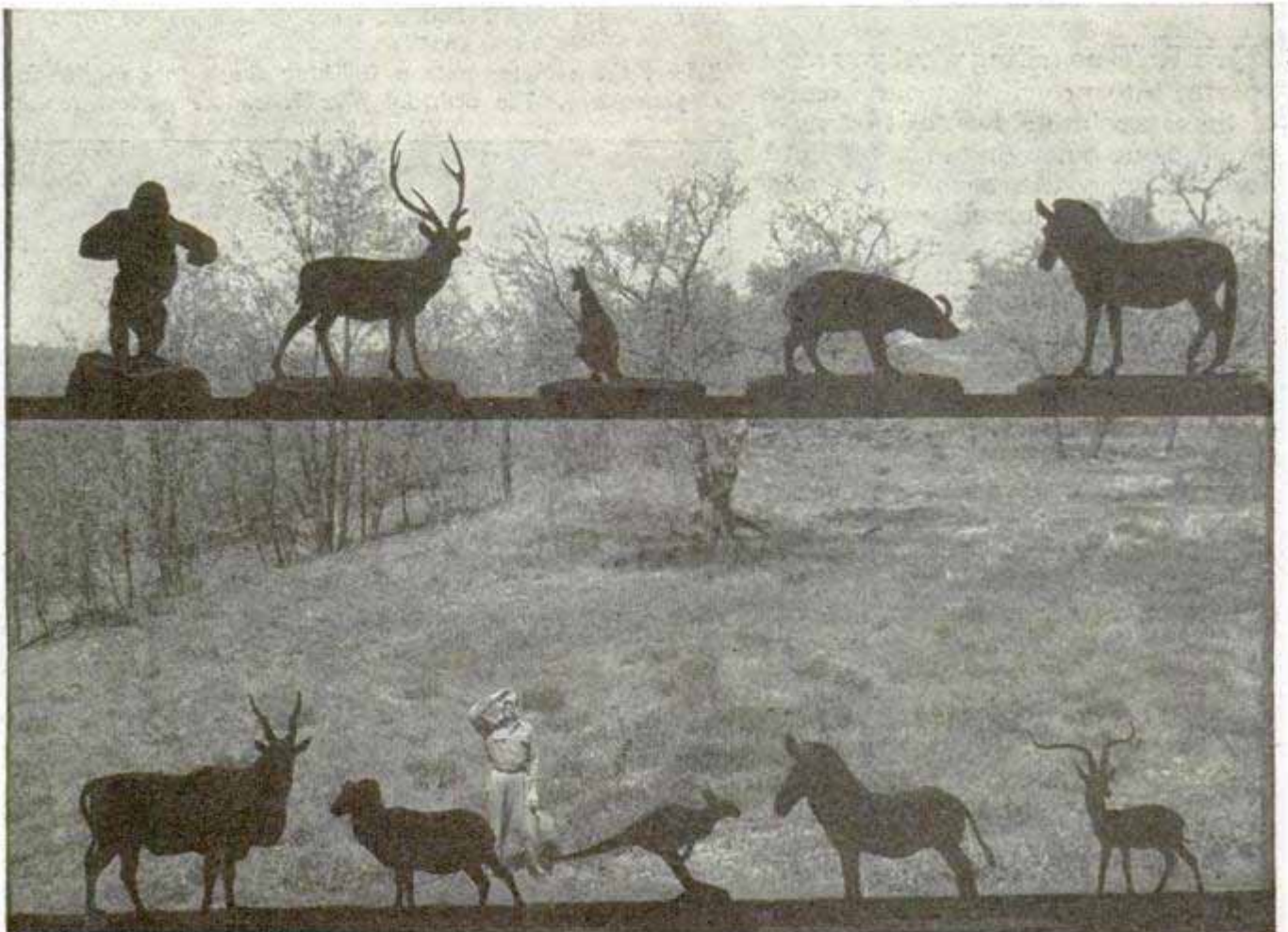


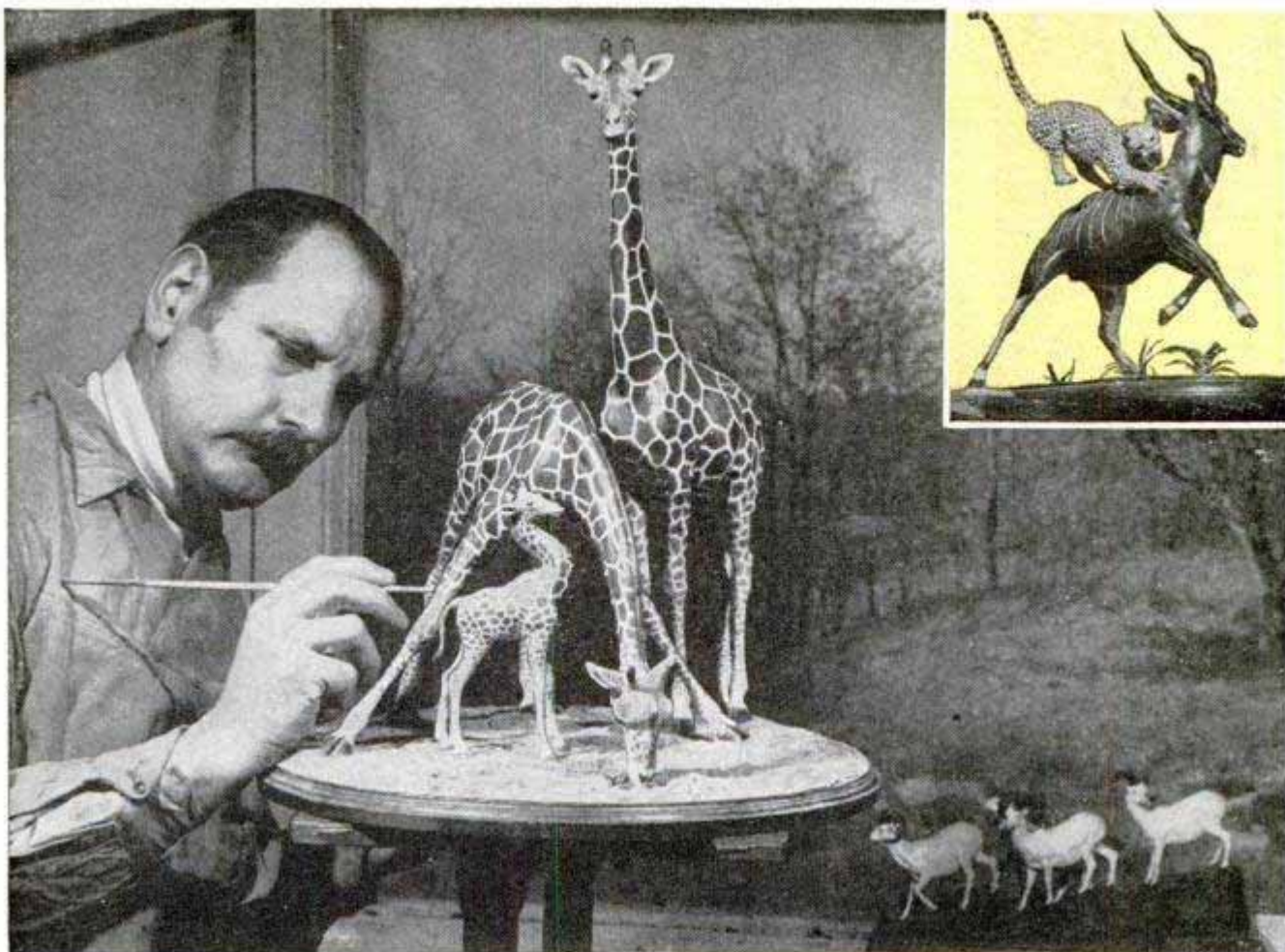


Cast from plaster molds, the models are made of a rubbery substance and then painted realistically. They stand rough handling. Below, a workroom window frames silhouettes—all are 1/10 scale

He says that no two tigers are striped exactly alike and in Jonas' collection you will not find any two miniature animals identical. He feels that this conforms with Nature's subtle variations.

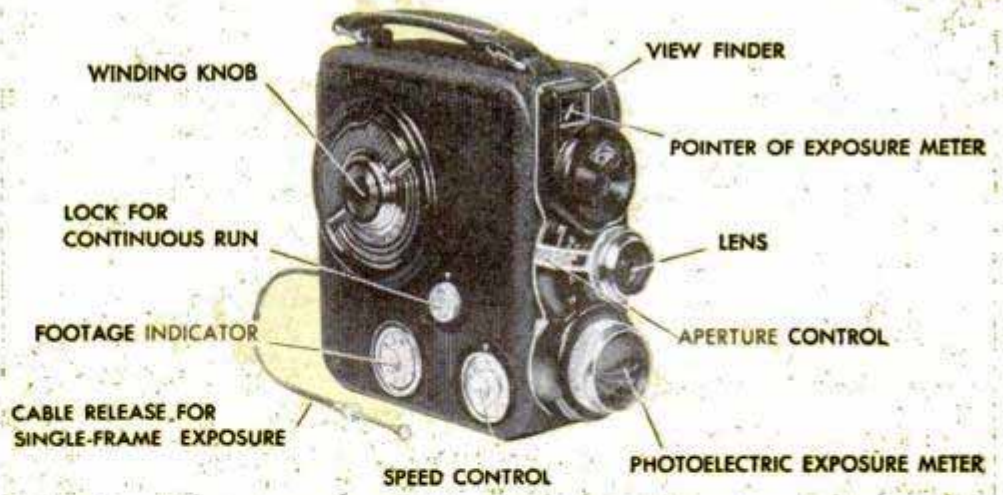
Jonas was born in Hungary. He arrived in the U. S. when he was 14 to join four older brothers, all taxidermists, in Denver. A few years later, he was apprenticed to Carl Akeley at the American Museum of Natural History where he learned his art. Since those days Jonas has done habitat groups for museums all over the country. He uses his own composition for his miniatures, a rubbery combination of latex and a plastic binder. His miniatures can be handled roughly, are lightweight and more permanent than plaster castings. The sculptor has complete files on every known animal, its measurements, weight and other details. He has thousands of paintings and photos of animals. From his library data alone, he can mold an accurate miniature of any animal in the world.





If this carefully painted giraffe family were magnified it would fool its own cousins. One of the animals is spreading its feet to drink at a water hole. Inset shows a leopard attacking a bongo and only one foot of the leopard is attached to prey. Below, African mammals will occupy one corner of the growing Jonas' ark





## Movie Camera Has Built-In Exposure Meter

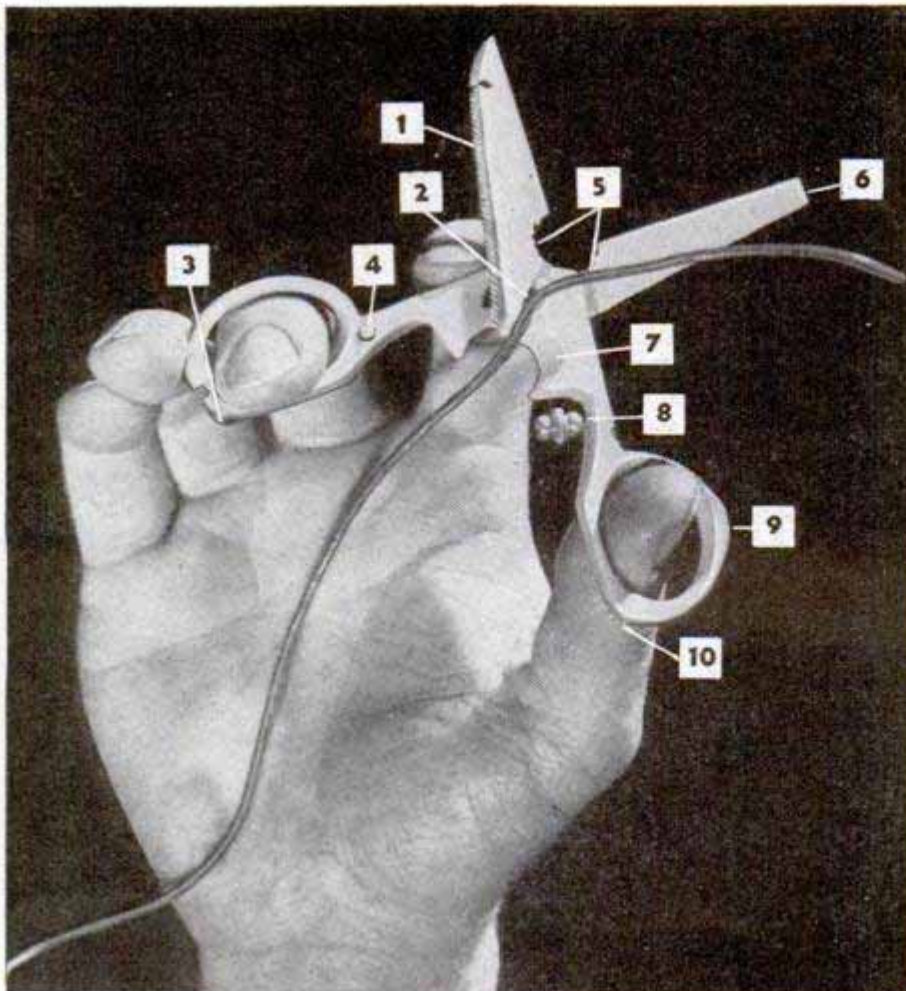
Determining correct exposure is an automatic operation with a new 8-mm. movie camera that has a built-in photoelectric exposure meter. The pointer of the meter is located in the view finder and is coupled to the aperture control. By moving the aperture control until the meter pointer is

centered in the view finder, the photographer automatically sets the diaphragm opening for the correct exposure. The exposure meter is also coupled to the shutter speed control and automatically adjusts for any speed from 8 to 32 frames a second. The camera has an f:1.9 coated lens.

## German-Made Scissors Are a Tool of Many Uses

There's almost nothing a pair of German-made scissors can't do. Like any scissors, they will cut paper and cloth, but, in addition,

they drive nails and screws, cut glass and wire, tighten small nuts, make button-holes and can be used as a tiny pipe wrench.



The blades come apart, allowing one blade to be used as a paring knife and nail file. A perforating wheel on one handle scores paper for accurate tearing. Etched on the back side of one blade is a ruler and, as an added attraction, there's a small glass lens in the handle inside which are scenic views of Germany.

Numbers on the picture at left show some of the extra features of these multi-purpose scissors. 1—nail file. 2—wire snips. 3—glass cutter. 4—lens. 5—wrench jaws. 6—screwdriver. 7—cigar cutter. 8—buttonhole adjuster. 9—hammer. 10—paper perforator. Naturally, scissors can be used for cutting paper as well

Rescuing more than 5000 persons from danger last year was only one of the Coast Guard's many activities. The group also operates the International Ice Patrol and enforces the Migratory Bird Act.



### Pocket-Size Hand Warmer

Your hands won't get cold no matter how low the thermometer drops when you carry a personal hand warmer, which looks like an oversize cigarette lighter. The miniature stove burns benzine or white gasoline, but there is no flame, just a faint glow. With the perforated cover in place, the warmer can be carried in the pocket or held in the hand. One filling lasts from 24 to 36 hours, depending on the fuel used. Ideal for winter sportsmen, the warmer can also be used instead of a hot-water bottle in the sick room. There's no danger of setting clothing or bedding afire, according to the manufacturer.



### Powered Saw Gummer

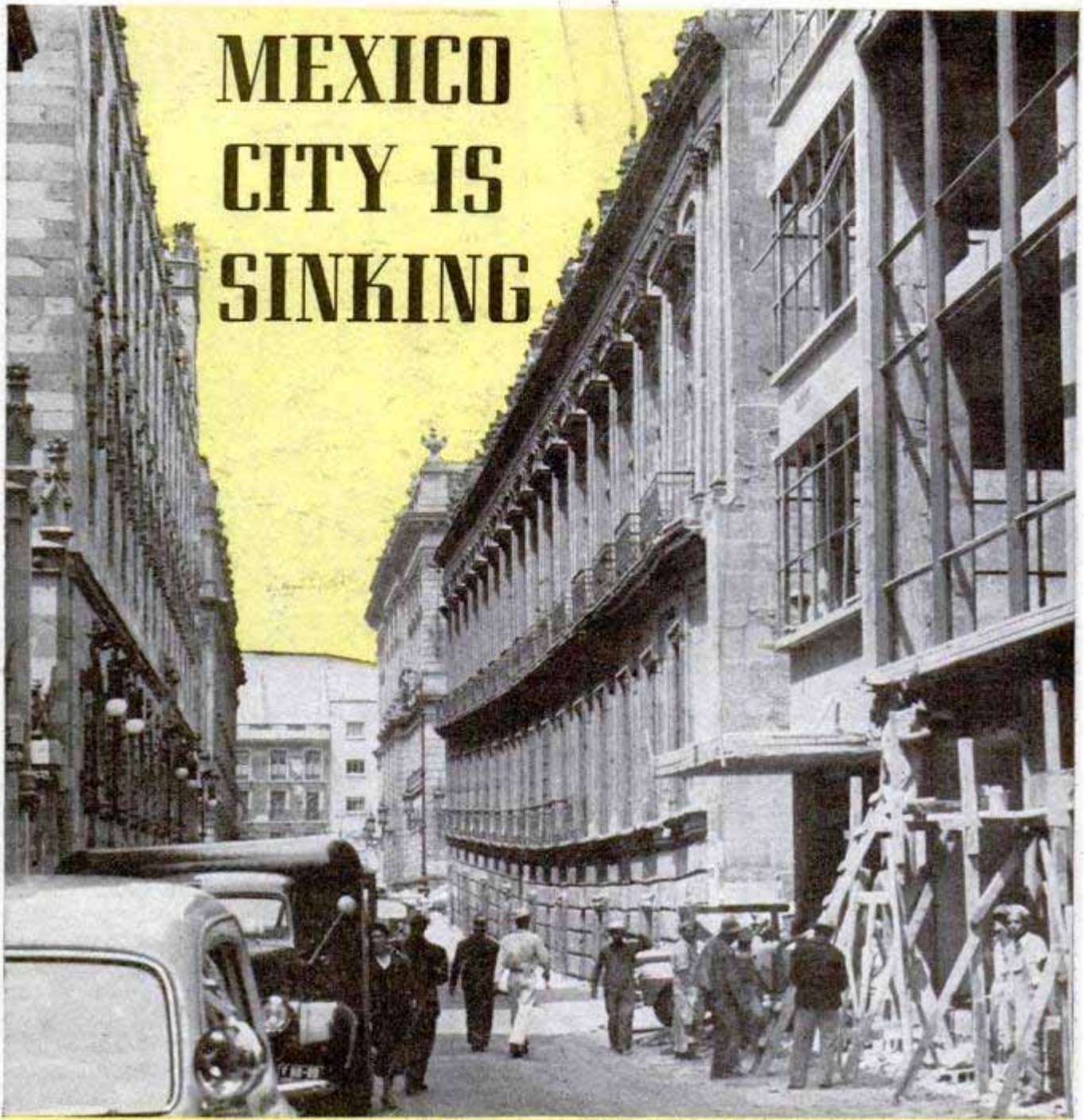
Circular-saw blades are kept in top-notch operating condition by a power grinder that evens up the teeth to make the blade perfectly round and shapes the back of the teeth to balance the saw and eliminate "galloping." After these two operations, known as jointing and gumming, all the operator has to do is touch up the points of the teeth with a hand file. The motor that powers the wheel is built right into the machine, which handles all types of circular blades from 8 to 48 inches in diameter. Weighing only 77 pounds, the machine is portable and is quickly mounted on the edge of a workbench.

### Rollers Simulate Bumpy Road to Detect Rattles in Car

Rattles and squeaks in automobiles can be quickly detected by a mechanic in the garage with the aid of a pair of rollers that simulate road conditions. The mechanic mounts the car's two rear wheels on the two rollers and blocks the front wheels to prevent forward movement. The rollers, which are concave to prevent sideslip, vibrate the entire car when it is in gear.



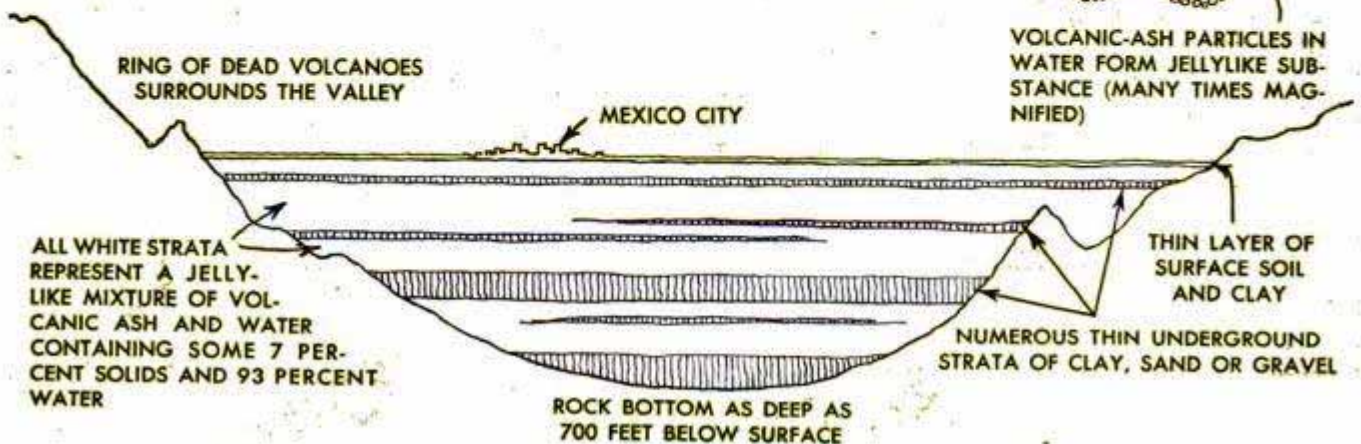
# MEXICO CITY IS SINKING



Jose A. Cuevas, a Mexican engineer, builds skyscrapers that float. Hearing of his ingenious schemes to defeat nature in a city that tilts and sags on its soft crust, Popular Mechanics sent Thomas E. Stimson, Jr., to the Mexican capital to tell his story



VOLCANIC-ASH PARTICLES IN WATER FORM JELLYLIKE SUBSTANCE (MANY TIMES MAGNIFIED)





Threatened by unstable jellylike subsoil are these modern buildings comprising downtown Mexico City

By Thomas E. Stimson, Jr.

**I**N MEXICO CITY, a man who digs a 40-foot pit big enough for a building foundation is apt to find after a few weeks that his pit is only 35 feet deep. The earth swells upward when the weight of the overburden is removed.

In Mexico City, too, an engineer who builds a 10-story structure may find within a few years that his building has settled a couple of feet into the earth and has tilted badly to one side. Adjacent structures, meanwhile, will have developed noticeable cracks because of the sinking of their heavy neighbor.

The world-famous Palace of Fine Arts has sunk some 12 feet since it was built on top of a concrete slab early in the century. The ancient Loreto church has tipped a good three feet from the vertical, as a unit. Some old structures half a block or more in length present a wavelike appearance today because of uneven settlement. Even a guest in one of the new hotels may walk up or down hill en route to his room.

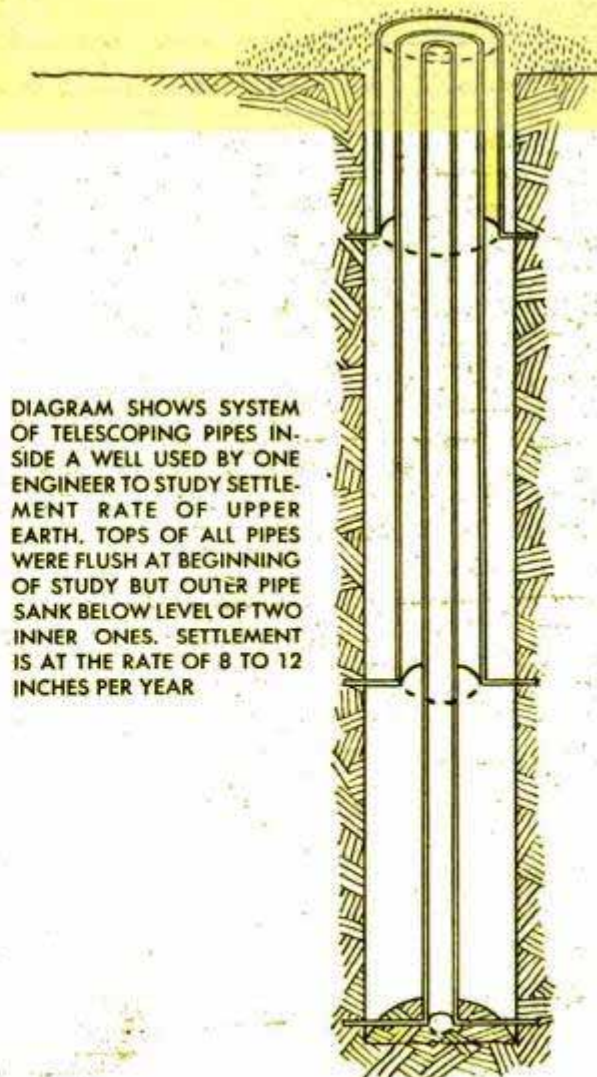


DIAGRAM SHOWS SYSTEM OF TELESCOPING PIPES INSIDE A WELL USED BY ONE ENGINEER TO STUDY SETTLEMENT RATE OF UPPER EARTH. TOPS OF ALL PIPES WERE FLUSH AT BEGINNING OF STUDY BUT OUTER PIPE SANK BELOW LEVEL OF TWO INNER ONES. SETTLEMENT IS AT THE RATE OF 8 TO 12 INCHES PER YEAR



**This 300-year-old church has tilted three feet from the vertical due to uneven settlement of the soft soil**

These odd situations are due to the fact that Mexico City virtually floats on the top of a semifluid subterranean lake. The metropolis rests on a thin layer of soil below which there are hundreds of feet of a unique colloidal-like suspension of water and volcanic ash. This jellied substance is called "jaboncillo" after the Spanish word for soaplike because of its slippery quality. At some depths, the jaboncillo consists of 93 percent water and only 7 percent ash, the ash being formed into a spongelike structure that contains the water. At different underground levels in the jaboncillo are some 20 stiffer, but fairly thin layers of clay, sand, or gravel, all saturated with water.

Any heavy structure that is built on top of this material is bound to sink. The early Aztecs learned to support their stone buildings on small wooden piles that were driven into the ground and the Spanish adopted the same practice after they conquered the Aztec capital. By driving clusters of foundation piles they were able to erect structures three or four stories tall in reasonable safety.

Taller buildings were utterly impractical until engineers discovered they could "anchor" them to relatively firm beds of sand

or clay 100 or 150 feet below the surface. They drove down piles, one on top of the other, until a firm underground stratum was reached. On groups of such deep underground stilts, they could then erect a 10 or 15-story building. Even foundations like these, however, are subject to some sinking and tilting. In a few cases, tremendous jacks have been installed in the basements to help keep the buildings in plumb.

The very newest buildings are being designed on a new principle that avoids all the difficulties encountered in the past. They are built to float in the soil like ships at sea. Their weight is precisely the same as the weight of the material that was excavated to make room for their subsurface structure. Being no heavier than the soil that they replace, they cannot sink. Nor can they disturb the plumb of neighboring structures.

This new idea was originated by Jose A. Cuevas, noted Mexican civil engineer, who first utilized it in the construction of the National Lottery Building, the recently finished headquarters of the government's lottery organization.

In the last decade, Cuevas has developed a number of new principles in foundation engineering, based on his observations of

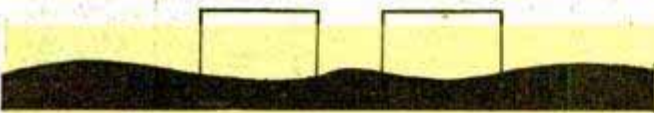




These three sketches show conditions that baffle Mexican engineers. Above, soil under long buildings sinks most in the center due to weight of the structure—in area between X and Y



If central portion of sagging building (A-B) is removed, the two ends must be supported to prevent their collapse. The sinking of the subsoil will continue because of heavy weight

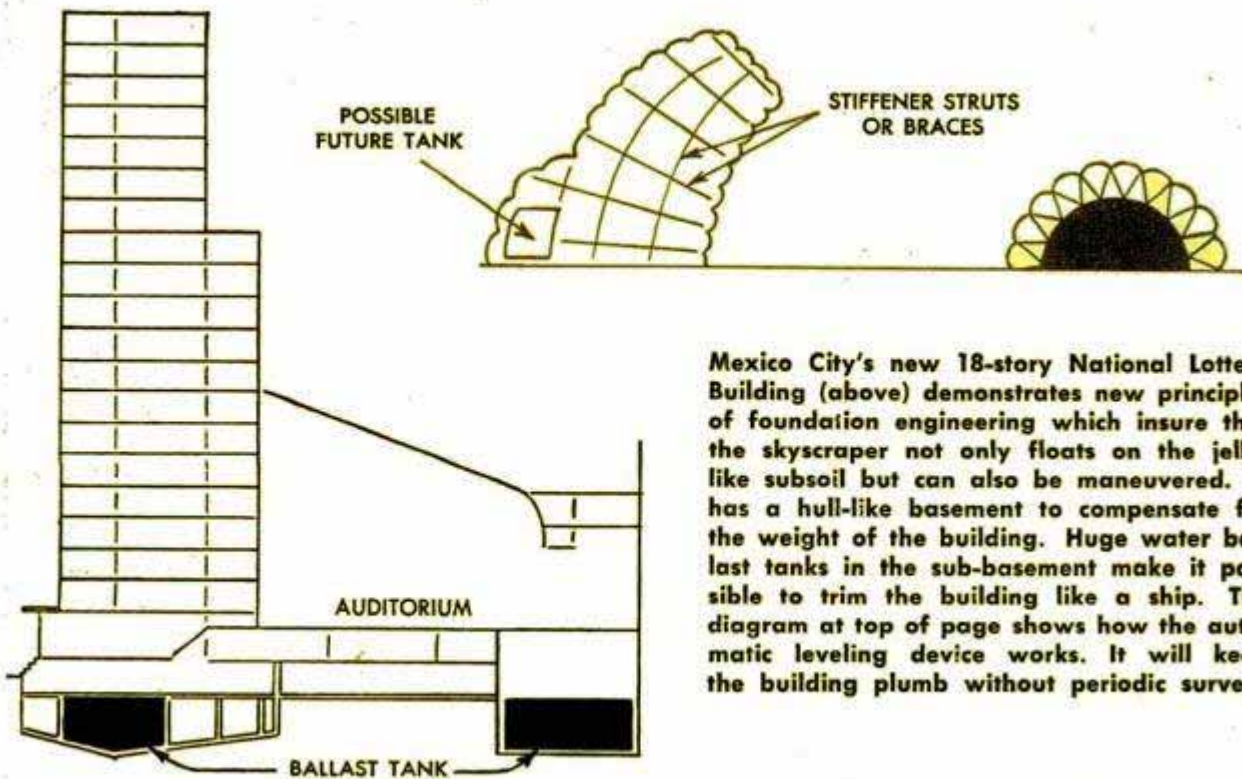
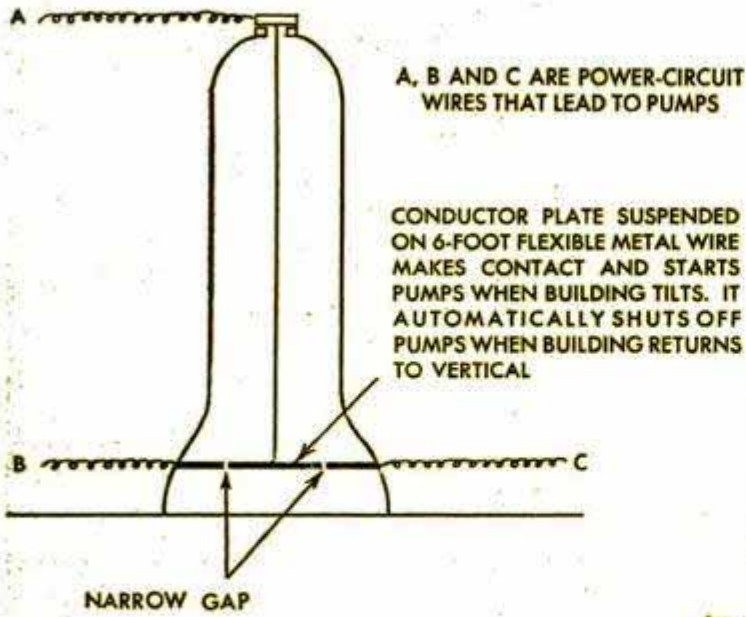


If a wider section of the building is removed (X-Y) the earth will rise between the two ends and each will return to a vertical position. This is due to the spongelike soil far below



Temporary bracings in window niches of this cracked building help to save it from ruin. The trouble was caused by the erection of a larger building next door which caused a local settlement in the earth—a frequent happening





Mexico City's new 18-story National Lottery Building (above) demonstrates new principles of foundation engineering which insure that the skyscraper not only floats on the jelly-like subsoil but can also be maneuvered. It has a hull-like basement to compensate for the weight of the building. Huge water ballast tanks in the sub-basement make it possible to trim the building like a ship. The diagram at top of page shows how the automatic leveling device works. It will keep the building plumb without periodic surveys

the acute conditions in Mexico City. His ideas are now universally accepted and have influenced the design of heavy structures that have been built on top of marshy or unstable soils in various parts of the world.

One of his innovations in designing the National Lottery Building was to provide three huge water ballast tanks in its sub-basement so that the building could be trimmed back to the vertical again in case it ever tilts.

The result is that this skyscraper not only floats but it can be maneuvered. Before the building's elevator was installed, Cuevas hung a long plumb line in the empty shaft, with its bob almost scraping the ground floor. Then he pulled the switch that pumped water into the ballast tank in the building's north wing. Next morning, the plumb bob showed that the building was six inches out of line, tilted toward the north. That day he reversed the flow of water, emptying the north tank and filling the tank in the southern wing. Next day the plumb line showed that the building had passed through the vertical and was now tilted six inches to the south.

By emptying all tanks Cuevas has raised the building  $\frac{1}{2}$  inch above its normal level in 24 hours and by flooding all tanks he has sunk the edifice  $\frac{3}{4}$  inch below its prescribed elevation within a couple of days. Gas, water and sewer lines, of course, have flexible connections.

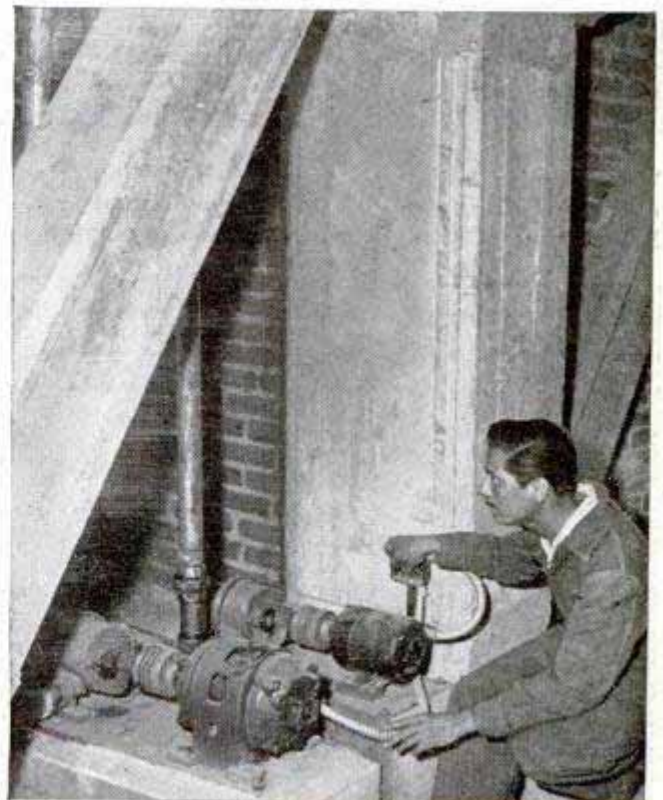
This year Manuel Arizmendi, the building's chief engineer, is installing an automatic leveling device that will keep the building in plumb at all times without

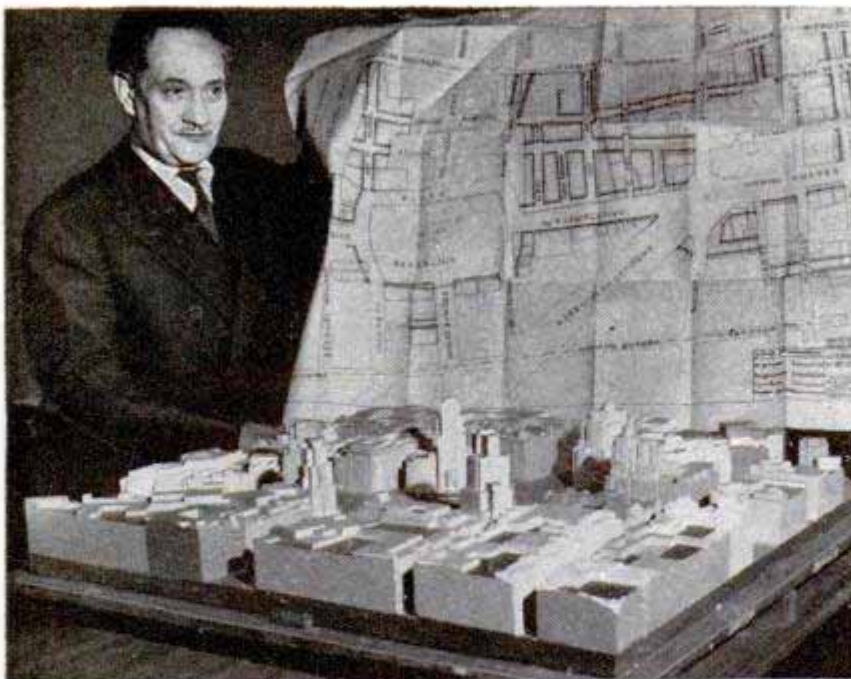


Rafael Reynoso y M., PM representative in Mexico and Thomas E. Stimson check ballast tank in building

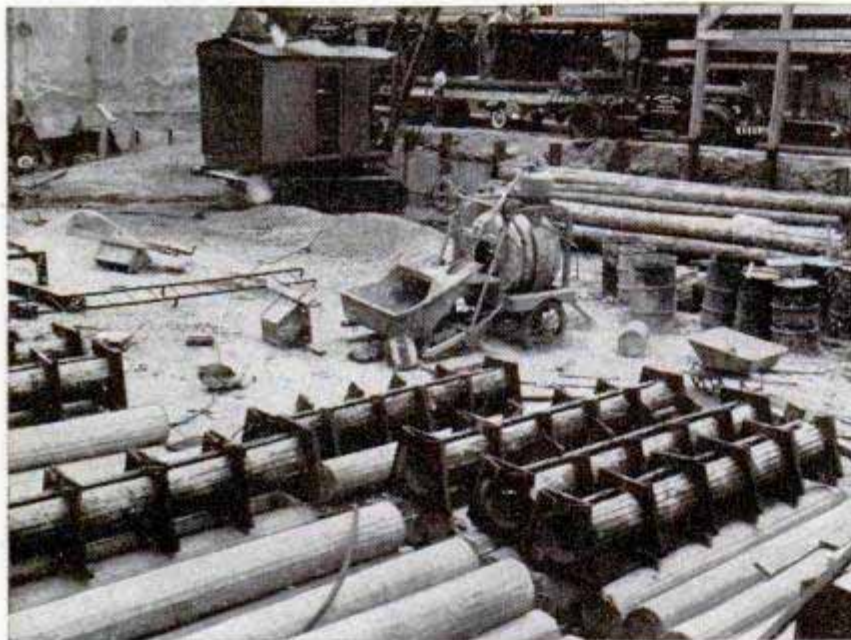
Jose Cuevas, below left, noted civil engineer, poses with model of National Lottery Building he designed

Small motors and pumps in sub-basement of Lottery building are used to fill or empty the ballast tanks





Jose Cuevas, engineer who pioneered new ideas on foundations, shows model of proposed reconstruction of downtown Mexico City



Wooden piles (background) and reinforced concrete piles will anchor a new building to one of firm layers of sand or clay beneath city. Below, some of Mexico's modern buildings along the Avenida Juarez



periodic surveys. The device consists of an electrified plumb line and bob that will swing toward one or three partially circular contacts if the building tilts. When the bob touches one of the contacts, an electrical circuit is completed that starts the pumps that bring the building back into line. When the building is plumb again the bob breaks contact, stopping the pumps.

"As designed, the National Lottery Building was to weigh 16,500 metric tons plus 1500 tons of temporary ballast, equal to the weight of planned future additions," Cuevas says. "Thus the building has a total displacement of 18,000 metric tons. The same weight of material was excavated to receive its hull, which extends some 40 feet below ground level.

"Actually the building is supported on two separate hulls, one under the main portion of the edifice and one under the stage of the auditorium. The tops of the two hulls are connected by bridge members that also serve as part of the building's structure."

Because the authorities were dubious about his daring and unprecedented plan for a floating building, Cuevas modified the construction of the first hull and then, after the skeptics were convinced, built the second hull according to his original plans.

An excavation for the first hull was made and its concrete floor, walls and rigid interstructure were poured in place. Then it was loaded with pressed concrete blocks as ballast to an amount equal to the weight of the building that it was to support. Measurements that were made over periods of time showed that the hull truly did float; that is, it did not sink under the great weight of its ballast. Later, when the building was under construction, ballast was removed day by day to compensate for the growing weight of the structure.

When the first hull-like

(Continued to page 260)

## "Hearing Aid" Radio Weighs 5½ Ounces

Smaller than two packs of cigarettes, a personal radio that fits in your shirt pocket or clips to your belt provides private listening as you walk, work or play. Built like a hearing aid, the two-tube set is battery operated and you listen through a lightweight headphone. The radio weighs only 5½ ounces, complete with batteries. It has a range up to 100 miles. Two models are available. One has the radio and battery pack built into one case. The other has a separate battery case with the radio mounted on a wristband.



## Wonder Drug Can Now Be Produced Synthetically

One of nature's wonder drugs, chloromycetin, can now be made artificially from readily available raw materials, thus making possible an all-out attack against such diseases as typhus, typhoid fever, Rocky Mountain spotted fever and virus pneu-

monia. This is the first time any of the wonder drugs, such as penicillin and streptomycin, has been produced synthetically at a cost low enough to be practical. Chloromycetin combats diseases caused by Rickettsia, organisms of sub-bacterial size.

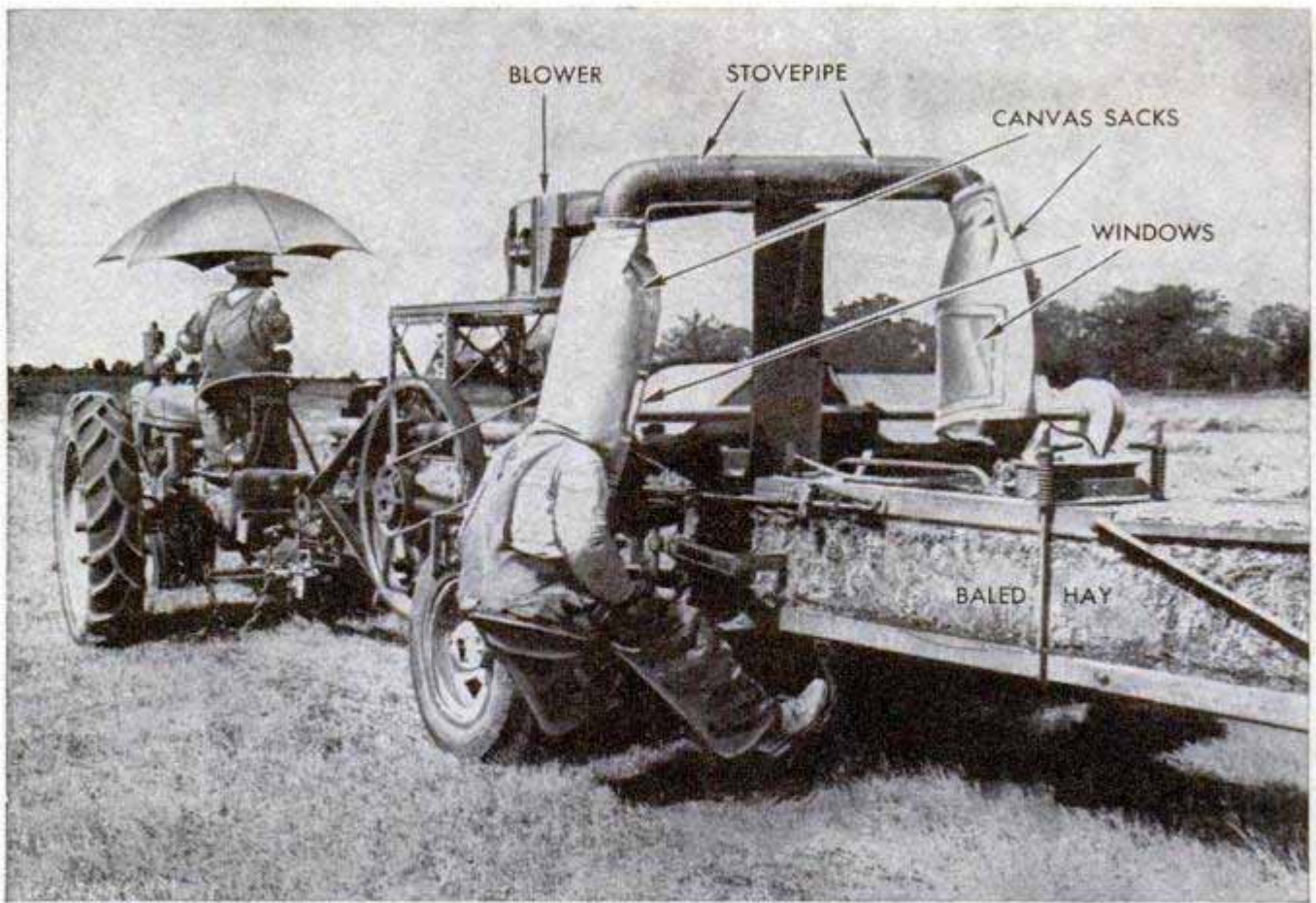


## Train-Ticket Vendor

Setting a destination selector knob and dropping the required coins in a slot gets the passenger a ticket on the Long Island Railroad. Fare rates to all stations are posted on the "automaticket," which vends only one-way passage. The ticket comes out one slot and the change from another.

## Heat Aids Plant Killers

Temperature has a great effect on the ability of 2,4-D to kill plants, according to Dr. Sally Kelly of Vassar College. In experiments, the chemical compound was sprayed on three test plants at three temperatures, 41, 59 and 77 degrees F. At 77 degrees the results were prompt, but at the two lower temperatures there was a decided lag before any change in the plants. When plants that were sprayed at lower temperatures were moved into a 77-degree room, they immediately started to die.



## Farm Hands Bale Hay in Air-Conditioned Comfort

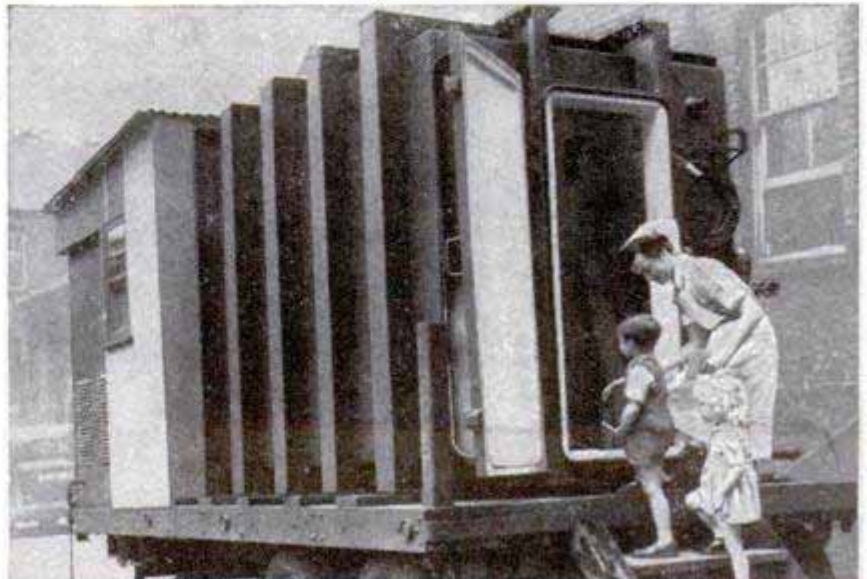
Farm hands work in air-conditioned "offices" when operating the hay baler at Walser Hahn's farm near Jefferson City, Mo. Built by Hahn's son, Herbert, the air-conditioner consists of a blower, several lengths of stovepipe and two canvas sacks.

The workers place their heads inside the sacks, which have large windows in the front, and breathe fresh air blown back from the front end of the baler, minus the straw and dust that float in the air at the rear end of the machine.

## High-Altitude Test Chamber Used to Cure Whooping Cough

Built to permit high-altitude tests on airplane pilots at ground level, the mobile decompression chamber is used in England in an effort to cure children suffering from whooping cough. Pressure is reduced until

it equals that at 12,000 feet altitude. Final results of the experiments are not yet known, but in Paris similar treatment has cut recovery time from weeks to a few days in many cases.



# Industry's lifesaving sleuths



Bethlehem Steel Co. photo

Hunting potential "killers," the industrial hygienist, left, checks radiation of a weld-testing X-ray unit

By John L. Kent

**E**VERY DAY scores of lives are saved by men who neither rush into fire-swept buildings nor plunge into the roaring surf. Neither do they peer into microscopes and hunt disease bacteria. Yet, they spy upon things that endanger the health of the people they protect.

Here's how one "health detective" saves lives in a Pennsylvania foundry.

Quietly approaching a workman grinding rough spots from a casting, the "detective" opens a suitcaselike instrument box and takes out a long bottle, half-filled with a clear liquid. The bottle has a hose connected to a small electric motor in the box. Plugging an electric cord into a nearby outlet, he flips the switch and holds the bottle close to the workman's face.

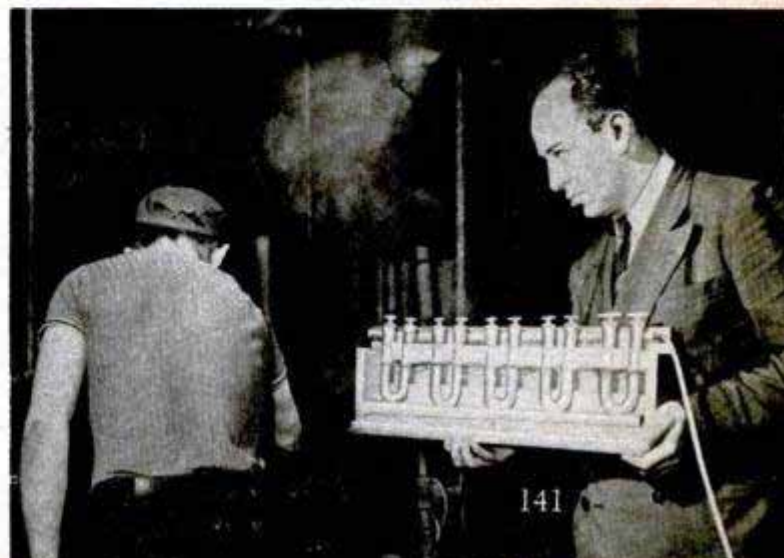
A few moments later, the visitor leaves with the glass bottle in hand. The workman pauses momentarily to acknowledge a goodbye hardly heard above the noise of the grinder and again bends over his work.

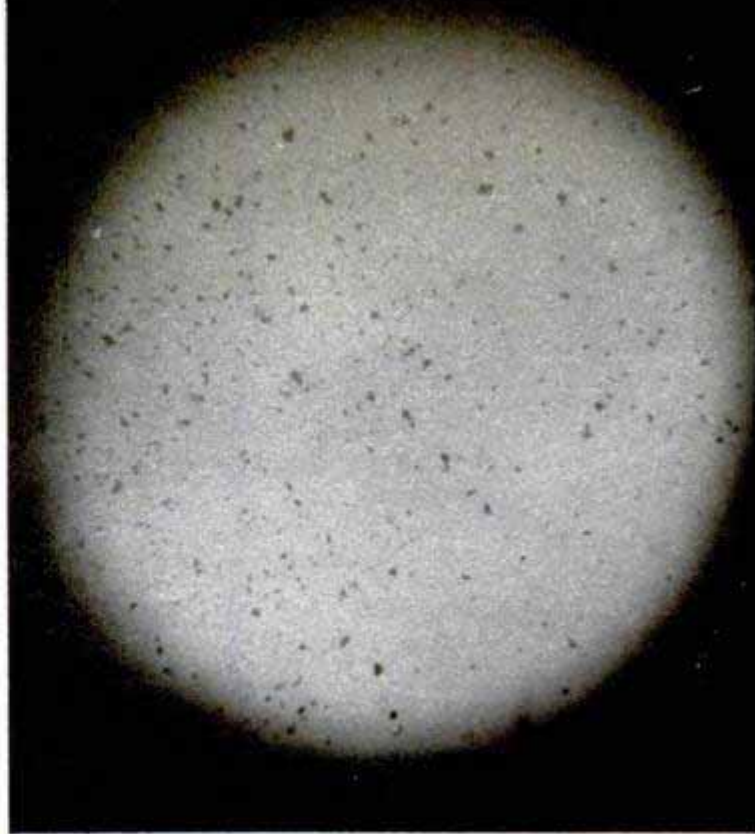
"Oh, him," the workman replies when

you step up and ask about this pantomime. "He's finding out how bad the air is . . . you know, how much dust there is. He checks my place every week or so."

The visitor is an industrial hygienist, an engineer whose job is to save the health and possibly the lives of men and women in that foundry.

Invisible but injurious gases are spotted by this health "detective" who patrols a factory work area





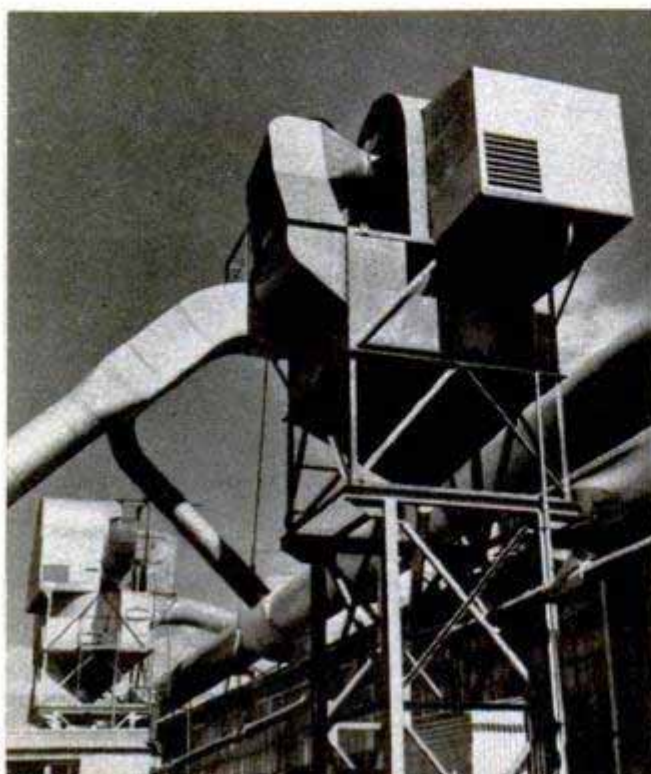
Left, a hygienist counts dust particles with the help of a microprojector. Magnified 100 times, the image is projected on an 8 by 10-inch screen for accurate counting. Right, the dust particles as seen on the screen

The bottle held by the engineer is an impinger, constructed so that any dirt in the air is caught in the alcohol in the bottle. Samples for dust counting are taken from the alcohol in the laboratory.

Dust concentrations are harmful and play an important part in respiratory diseases such as tuberculosis, silicosis and pneumonia.

Our high standard of living depends on the high level of production of our factories. Yet, the many diseases and sicknesses and even deaths resulting from work

**Safeguarding the workers' health, this ventilating system on the factory roof removes contaminated air**



in factories show that our industrial environment is not one intended for man. Man is a sensitive animal. His eyes, ears, nose, throat, lungs and skin are easily damaged.

The industrial hygienist's job is to find what is bad for the workman and either eliminate it or prevent harm from it. A great number of industrial firms now employ full-time industrial hygienists and safety engineers. Many have separate divisions concerned solely with workers' health on the job.

Industrial-hygiene activities are no longer limited to large firms with thousands of employees. All businessmen are finding that it pays and in some cases government agencies have stepped in to safeguard the health of workers. Whereas, a few years ago, only a few organizations, such as the U. S. Public Health Service, the U. S. Bureau of Mines and a sprinkling of states were interested in this field, today there are industrial-hygiene bureaus in every state, and in large cities and counties.

In the modern plant, the employee has back of him a fully organized effort in this direction. There are industrial-hygiene engineers, laboratory chemists, safety engineers, physicians and trained nurses.

Safety appliances are in good working order and working conditions are hygienic. The employee wears a respirator to protect his lungs and goggles to protect his eyes. On some jobs, he's equipped with rubber gloves. Often, he works in an air-conditioned enclosure to counteract heat, smoke or irritating fumes. To get rid of



objectionable dusts and gases, exhaust ventilating systems are used. Measures are also taken to protect him from radiation such as that of X-ray apparatus which may be used, for example, to check on the effectiveness of welding.

To do this, the industrial hygienist has fences erected to keep workers away from ray areas, makes the operators of X-ray equipment wear film badges which indicate the amount of radiation to which they are exposed, and periodically uses an X-ray meter.

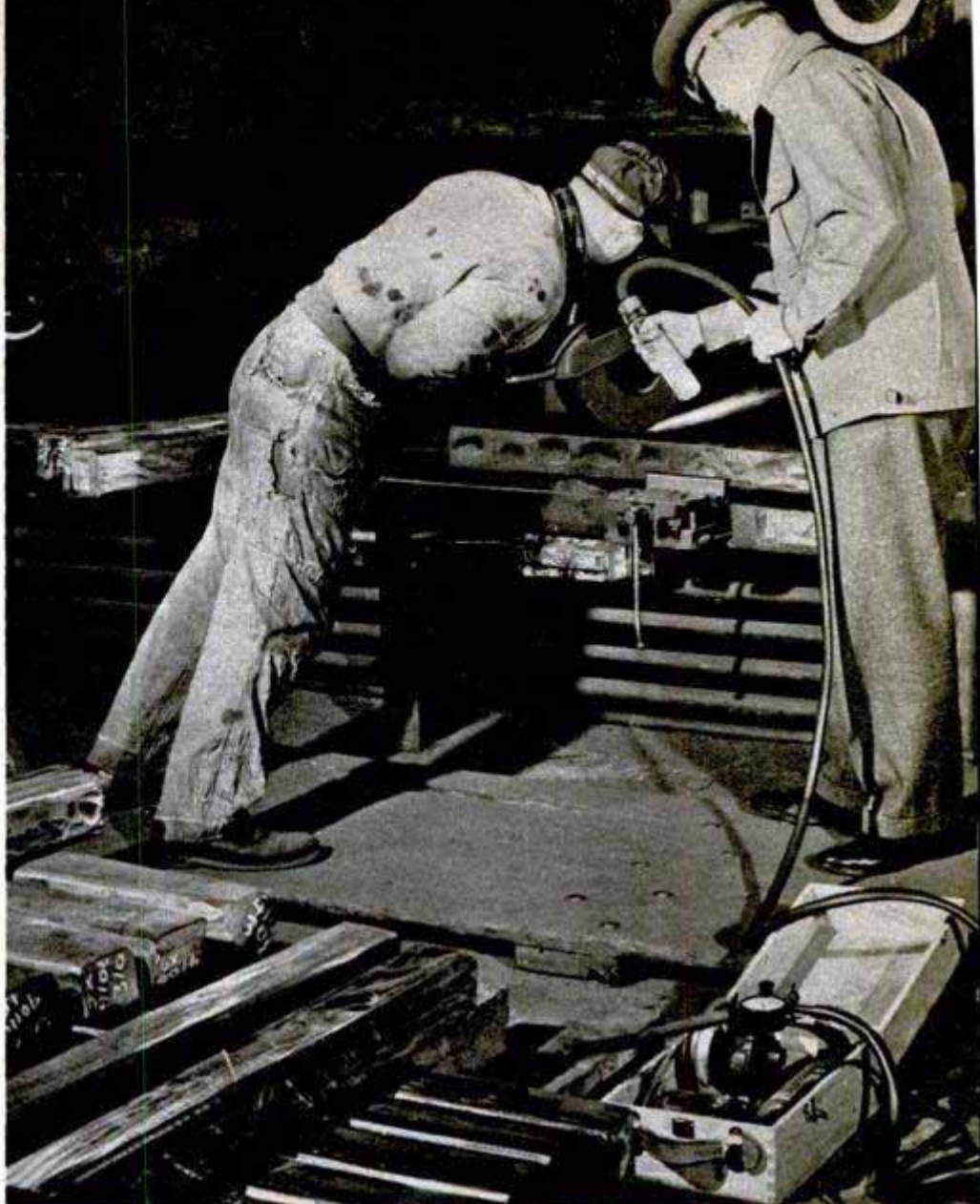
The Bethlehem Steel Company, a pioneer in the industrial hygiene field, is spending \$1,500,000 a year on its industrial medical program to protect the health of its 143,000 employees. An experienced industrial-hygiene engineer is in charge.

Its laboratory is equipped to collect and analyze quantitatively a wide variety of solids and gases in the atmosphere in extremely small amounts and in dilutions as low as a millionth of a gram per cubic foot of air.

Usually, collected dust is analyzed chemically to determine its content of contaminants. However, under some conditions, an actual count of the number of particles of dust is required.

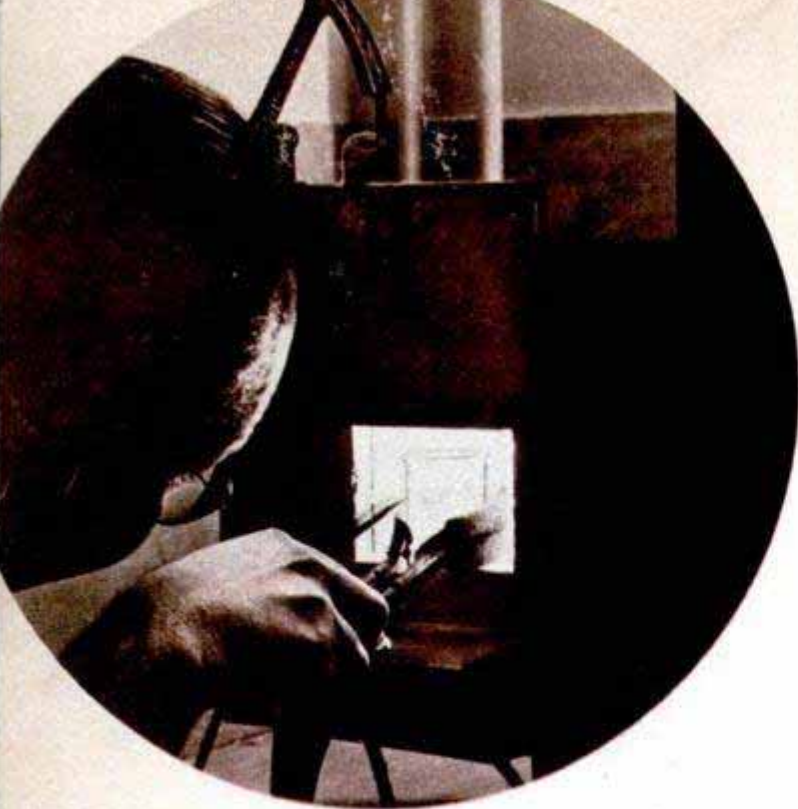
To make such a count, a sample of liquid containing the collected dust particles is allowed to settle in a glass cell which is placed under a microscope. Definite areas are blocked out and the number of dust particles in several of these areas is counted. To count the particles easily, the image on the stage of the microscope is thrown onto a large screen by means of a microprojector.

Colorimetric methods are also extensively used in the laboratory. The actual amount of a certain colored



Above, a health sleuth collects an air sample alongside a swing-frame grinder. Caught in a vial of alcohol, the dust in the air is measured on the microprojector. Below, a counter measures atomic radiations of an isotope stringer that is being withdrawn from the pile at Oak Ridge





Above, urinalysis provides advance warning of lead poisoning. Sample is removed from furnace before it is checked for lead content. Below, fractionating column determines composition of unknown solutions

chemical compound contained in a solution may be quickly and accurately determined by comparing it with a similar solution of known concentration.

Such comparisons are frequently carried out by visual observation, but in many cases a spectrophotometer is used. In this instrument a photoelectric cell, far more sensitive to color variations than the human eye, is used to make the comparisons.

The possibility of lead poisoning is investigated by urinalysis. Subjected to intense heat in a muffle furnace, all organic matter in the sample is burned away, leaving only the ash. A solution of the ash is drawn into a vial which is inserted into the spectrophotometer. The percentage of light transmitted through the solution shows how much lead has been absorbed by the workman.

A particularly handy instrument is a fractionating column, used to determine the percentage of each component of an unknown solution. The components are separated by being boiled off at their respective boiling points.

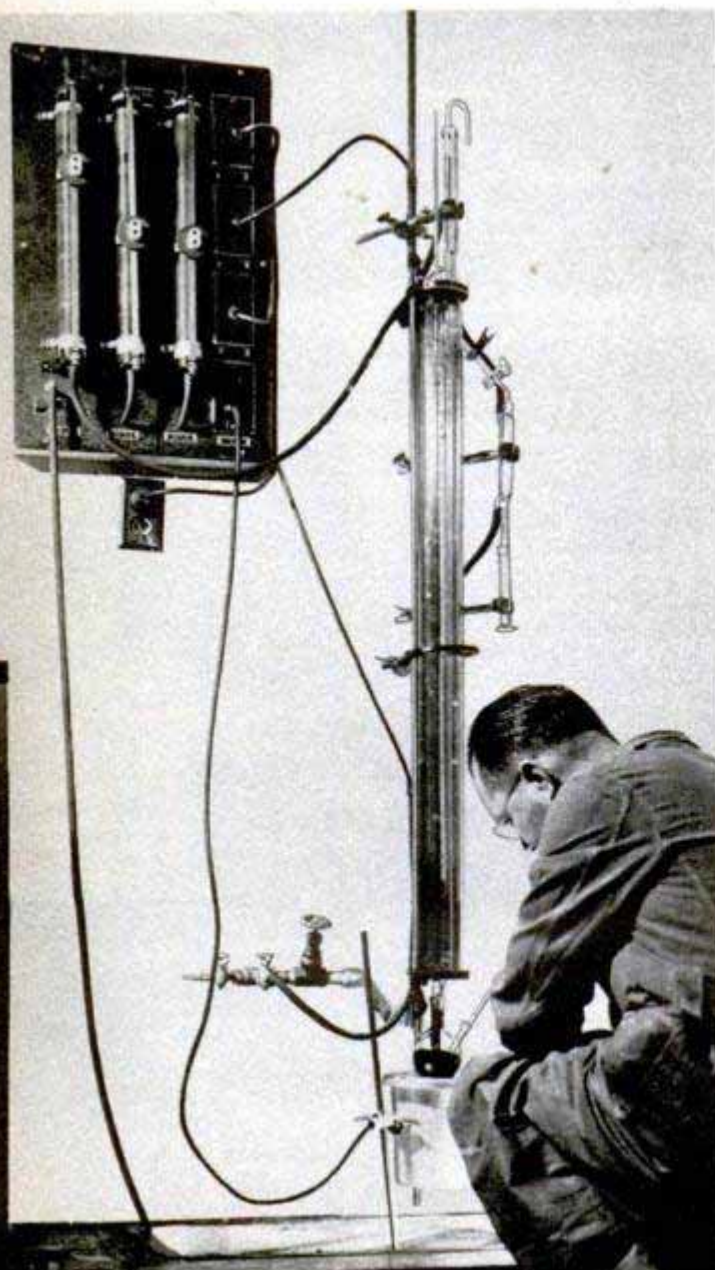
Another device is the refractometer. It determines the refractive index of liquids and solids and also offers a means of determining their concentration. The index measures the ability of a substance to bend light. This helps to identify the unknown substance. The refractometer is often used in conjunction with the fractionating column.

The latest reports of the U. S. Public Health Service and State health departments describe studies of the familiar types of occupational hazards such as exposure to lead and silica in potteries, fumes and dusts in foundries, and solvents in degreasing operations and in dry-cleaning establishments. Others tell of exposure to excessive temperatures and humidities, continuous vibration and poor lighting.

Dermatitis is a skin infection common among machinists and metalworkers who handle cutting oils used in cooling and lubricating cutting tools. On the West Coast a number of fruit sorters recently developed what was promptly dubbed "left arm dermatitis." It was the result of handling fruit which had been washed in a new type of fungicide. In the packing sheds, fruit is processed by passing it through a wash tank for removal of dirt and spray residue. The fungicide, used to control mold on fruit while it is in storage, was dissolved in the rinse water.

Most of the dermatitis originated on the worker's left arm because in guiding the wet fruit as it rolled along the sorting table the worker drew it to one side in the curve of his arm.

Last summer, a workman in a Cleveland



paint-manufacturing plant refused to wear a respirator provided by the company. Apparently perfectly healthy, he suddenly became ill and died within a few days. As a result, the Cleveland Department of Public Health and Welfare made a study of the industry. Of the 51 paint plants in the city, 35 were found to be using lead carbonate or leaded zinc in appreciable quantities.

The city's public health engineers concluded that while lead poisoning is not widespread in the paint industry now, it is still a potential health hazard.

The U. S. Public Health Service recently completed a study of the health hazards in the use of sodium fluoride at open-hearth furnaces. The chemical, introduced into the manufacture of steel during World War II, preserves the fluid state of molten metal, allowing for the escape of trapped gases which otherwise cause blowholes in the ingots. Workmen complained bitterly about its use. However, after a careful study made at four Republic Steel Corporation plants in Ohio, the Public Health Service concluded that while the addition of the sodium fluoride caused more smoke and fumes, it did not constitute a significant health hazard.

Government reports also reveal efforts at minimizing newly developed hazards. Although several people have died as a result of exposure to radioactivity in the course of atomic-energy research, no deaths have been reported in the industrial handling of isotopes and other radioactive substances.

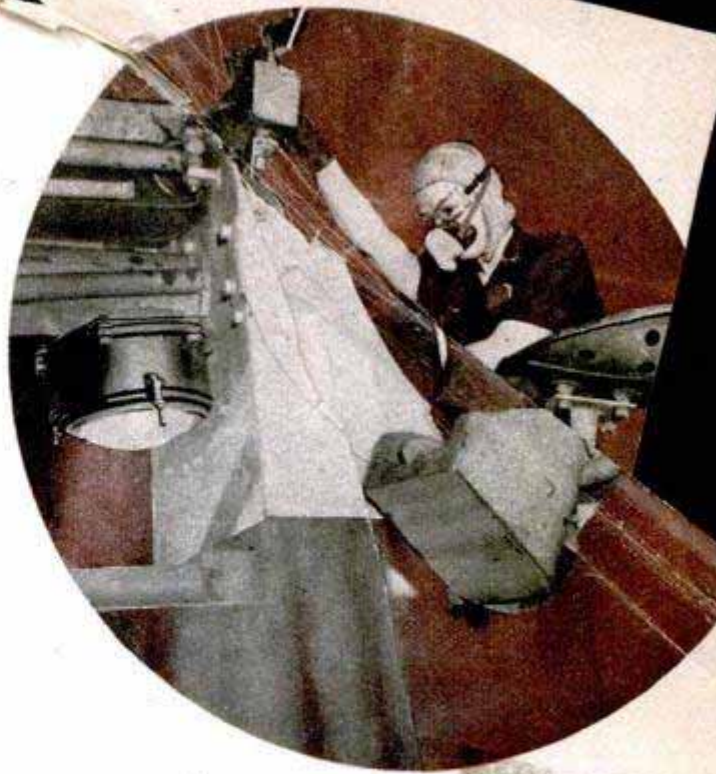
To prevent injury and deaths from this newest industrial servant, the Atomic Energy Commission and the National Military Establishment are engaged in a continuous study aimed at devising better indicating and protection methods.

At one time, the health and safety of the employee was of little concern to industrial firms. If a man got sick, he was laid off and a healthy man hired. But, industry found that this was a shortsighted approach.

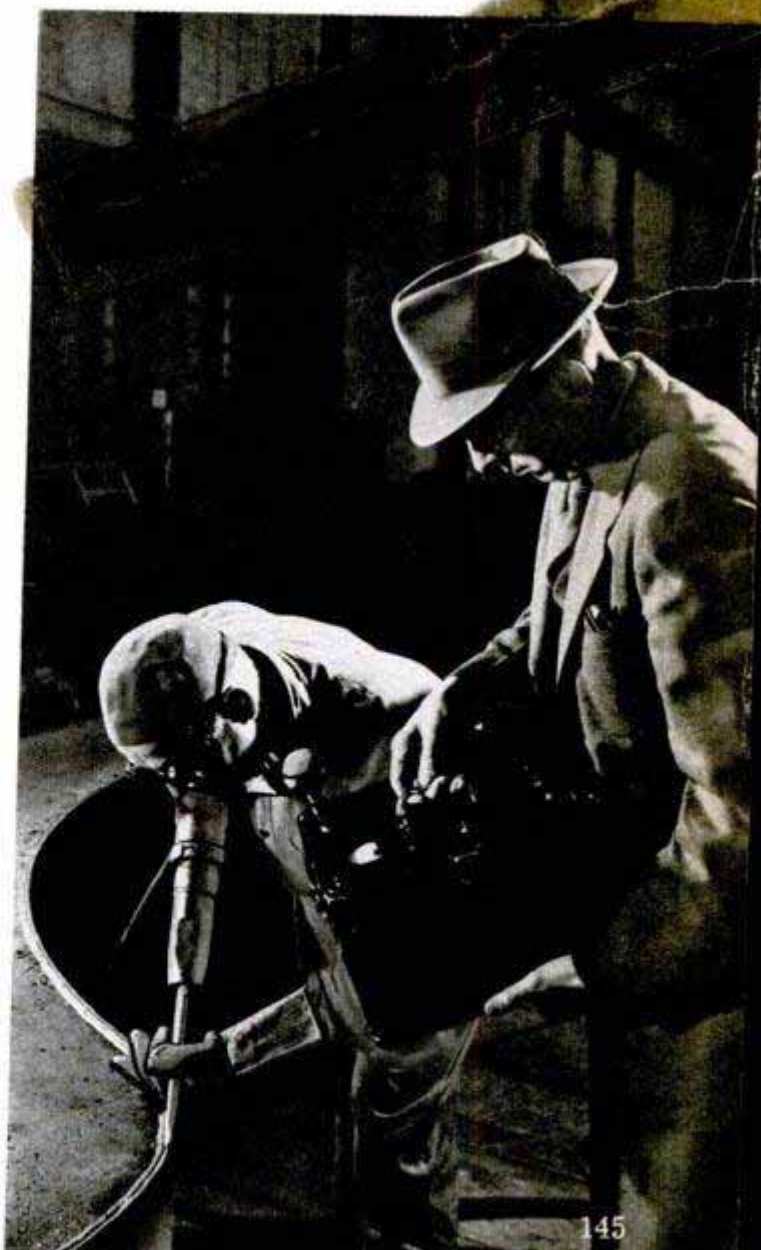
Says J. J. Bloomfield, Assistant Chief of the Division of Industrial Hygiene, U. S. Public Health Service:

"On the over-all scene, there is a keener appreciation of the importance of the worker's health. The preservation and maintenance of industrial health has various implications. To management, it means greater profits and new outlets. To the worker, it means employment. To the consumer, it means new luxuries—television and other modern inventions."

But, these developments often bring new hazards and it takes a bit of detective work to uncover the health menace before it strikes. This is the increasingly important job of the industrial hygienist.



Above, woman operator of sandblaster wears goggles and respirator to protect her health. Below, factory hygienist is measuring the noise made by a chipping hammer to be sure it does not exceed safety limit.

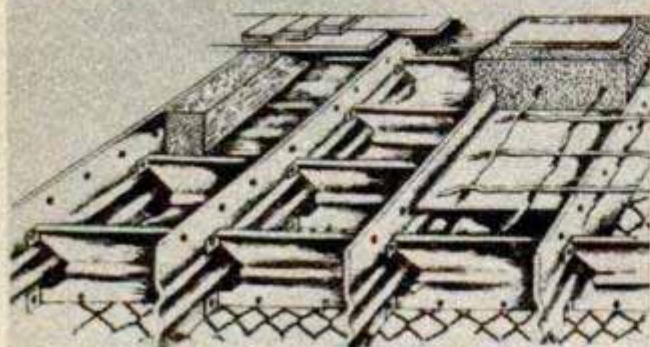
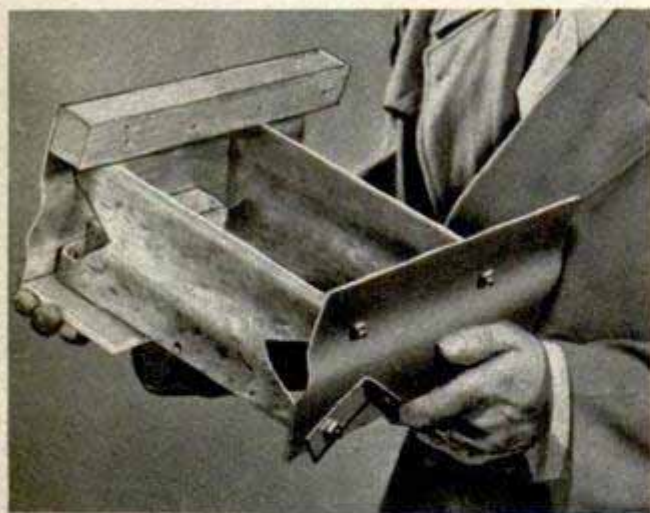




## Electric "Housemaid" Even Shines Shoes

British housewives now have an electric "housemaid" that cleans shoes, scours pans, peels potatoes, grinds meat and coffee, beats eggs and sharpens knives. A variety of polishing and scraping heads comes with

the machine. Because a traditional duty of the housewife in England is shining her husband's shoes every week, the electric machine is becoming very popular in that country.



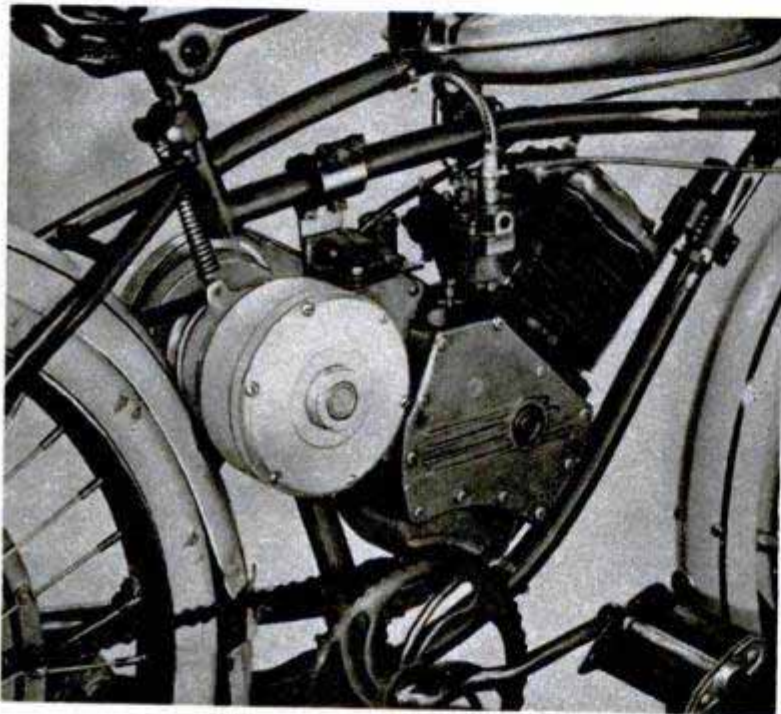
## Lightweight Metal Joist

Floor joists of aluminum would provide a rigid, nonwarping support for floors and ceilings that can be mass-produced, according to the inventor, Dudley C. Pierce of Grand Rapids, Mich. Not yet in production, the joists have provision for nailing wood floors to one side and attaching metal lath to the other side for plastering. If desired, the floor can be made of concrete or any other standard floor material. One important advantage of the prefabricated joist is that it would eliminate the waste space in commercial buildings where a false ceiling is usually suspended from the joists. With the metal joist, ceilings could be mounted directly on the supporting members.

Sources of available products described in this issue are indexed on pages 10, 14 and 24. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT INDEX, which is available without charge from our Bureau of Information, 200 East Ontario Street, Chicago 11, Ill.

## Cables Carry Mail From Road to Farm

Farmers now can sit inside their homes, press a push button and their mail will zip up from the road in a cylinder that rolls along a pair of cables. The trolley mailbox, invented by N. E. Leatherman of Pueblo, Colo., is designed for farm homes situated some distance from mail routes. A motor inside the box picks up current from the cables and powers the wheels. The car will travel  $\frac{1}{2}$  mile or more.



## Automatic Transmission For Motor Bicycles

Motor bicycles, garden tractors and power mowers can now have a fully automatic transmission that can be installed in 10 minutes. It has no fluid coupling or hydraulic system; instead, power is transmitted through a centrifugal clutch. As the motor speed increases, the clutch gradually engages and power flows to the rear wheel. When the motor is idling, the clutch automatically throws the transmission out of gear. In low gear, the transmission has a gear ratio of 1.7 to 1 and in high gear, direct drive is used. On bicycles, the transmission eliminates belt slippage and makes it unnecessary to pedal to help the motor.

## Room-Size Humidifier Attaches to Register

Individual humidifiers that slip over the top of a hot-air register allow you to control the humidity in each room. Consisting of an aluminum tank and a curved steel hood, the humidifier also directs the hot air out into the room, thus reducing the streaks and smudges often deposited on walls above registers. The tanks are easily filled from the side and one filling lasts about eight hours.

Scientists at Armour Research Foundation have developed a synthetic substitute for African and East Indian palm oil, a vital ingredient in making hot-dip tinplate.



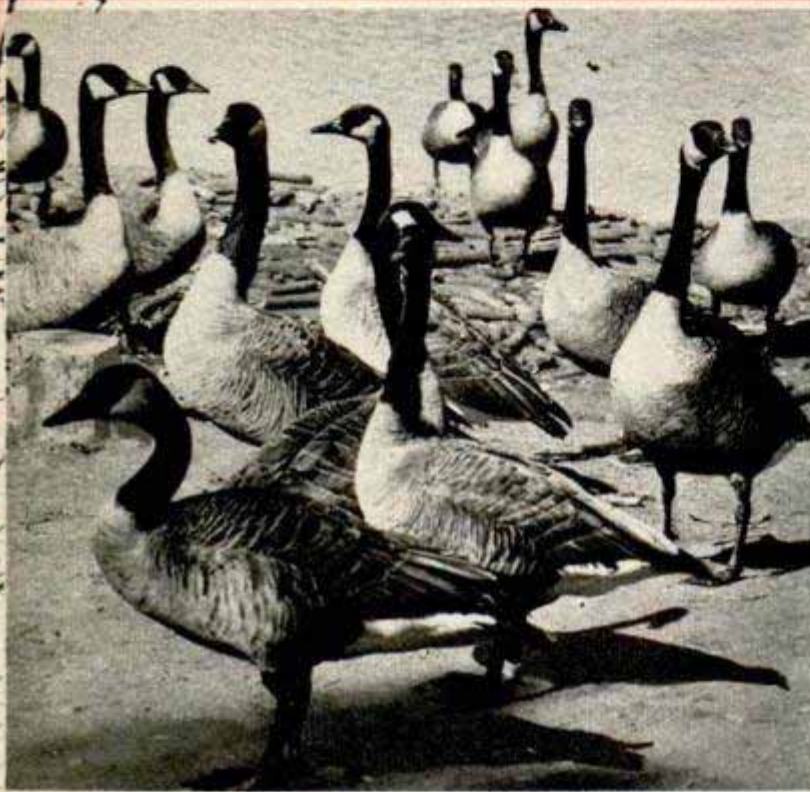
# Winter Resort for Geese

*Photos by Hugo H. Schroder*

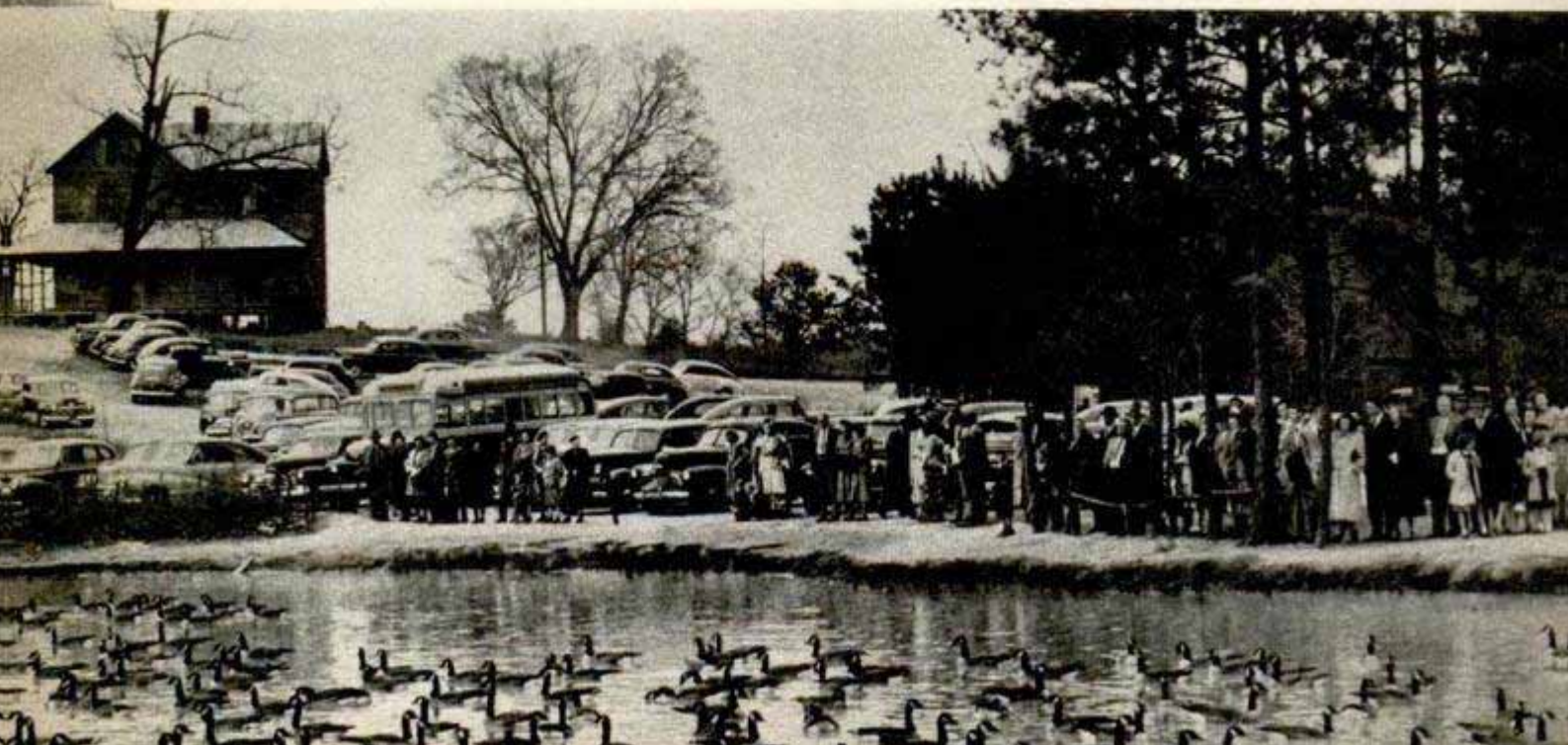
**T**HOUSANDS of wild geese, most of them from Canada, converge each October on the farm of Lockhart Gaddy near Ansonville, N. C. There they spend a leisurely winter under the protection of a man they have come to regard as a personal friend.

Back in the early '30s Gaddy built a three-acre artificial pond on his farm. In 1934 nine wild geese swooped down to investigate the pond and remained for the winter. Making friends with these first birds was a difficult task, for they were as wary of humans as any wild game birds. After three winters of persistent effort Gaddy earned the trust of the geese, and they came within a few feet of him to pick up grain he scattered on the shore.

As the winters passed these



Friendly yet untamed, the geese permit humans to approach within a few feet of them—as long as they are at Gaddy's pond. Below, scores of people crowd the game refuge when the geese swoop in





Flock of Canadian geese takes off from pond. Appreciating the hospitality, many will return next winter

birds attracted larger flocks until 6000 of them—a high mark in the winter-resort population—arrived for a six-month stay a few years ago. Last winter more than 5000 birds sought out Gaddy's protection.

The unique feature of the refuge is the way the wild geese completely trust human beings. Visitors line the shore of the little pond to watch as the birds congregate within reach. Both Gaddy and his wife visit the pond daily throughout the winter

to maintain their friendship with the birds. They even recognize individual geese who return winter after winter.

In recognition of the unique conservation role played by the Gaddy refuge, North Carolina has declared the area within  $\frac{1}{2}$  mile of the pond closed to all hunting.

Formerly an ardent hunter, Gaddy now is just as enthusiastic a conservationist. Since the geese first accepted his hospitality, he has regarded them as friends.

Close friend of thousands of wild geese is Lockhart Gaddy. You'll find no roast goose on his dining table



## Dodge Auto Engine Starts Jet Planes

Air Force technicians at Selfridge Field near Detroit helped solve the tactical problem of getting jet fighters into the air quickly by devising a special auxiliary power unit made up of a Dodge automobile engine, fluid-drive coupling and generators. The new unit has cut the starting time to a matter of several seconds. Jet power plants require a powerful kick to get them started.



## Cross-Country Tour On Plastic Skates

Roller skates made of Lucite are not only one half as heavy as steel skates, but also wear longer and are easier to repair. Except for the axles, wheel bearings, clamps and a few small parts, the skates are all plastic, even to the wheels. George "Dad" Brown, 66-year-old skating expert, skated from Los Angeles to New York City on a pair of Lucite skates he made. He used the trip to test the Lucite wheels and discovered that, while he wore out 18 sets of steel wheels in 1100 miles, he used only 3½ sets of Lucite wheels over an equivalent distance. From Chicago to New York, 980 miles which he covered in 9 days,



he used only Lucite wheels and was on his third set when he reached the coast. Brown custom-makes each pair of skates to match the skater's balance, but claims any handyman could easily make his own.



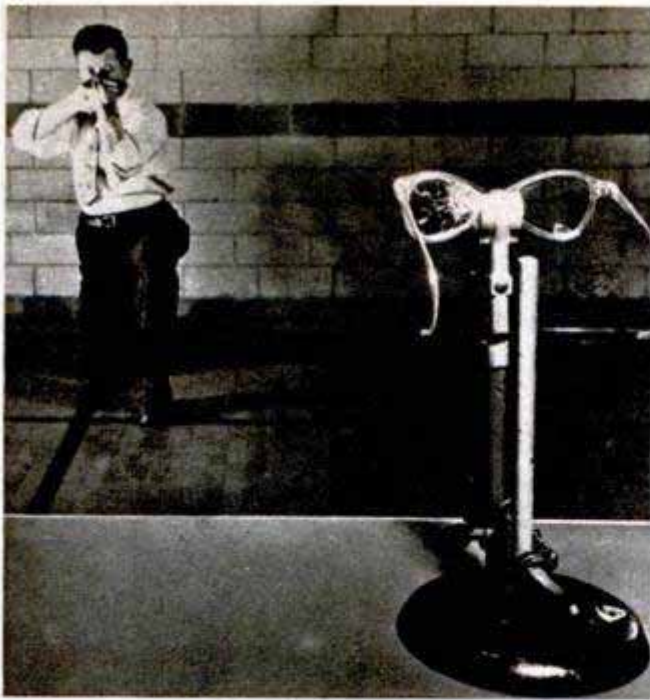
## Motorcycle Taxicab

Taxicabs made from motorcycles recently were exhibited at a trade fair in Hanover, Germany. The little cab, which seats two plus the driver, travels more than 60 miles on a gallon of gas. The maximum speed is about 31 miles an hour. Cost of the cab is about \$700.

☐ There were only 20 fatal accidents on the scheduled airlines of the world during 1948, in contrast to 32 the year previous.

Special heel plate must be fitted to shoes worn with skates; repairs measuring by 1/2 and 1/4 down





### Shatter-Resistant Glasses

Spectacles made of a glass that resists shattering and splintering protect children's eyes from accidents caused by BB guns, slingshots and other missiles. The new lenses are made of two pieces of polished glass joined by a sheet of tough plastic. The plastic's adhesive property helps prevent the glass from shattering under impact, although the lenses will crack. In one test, one of the new lenses was mounted in the left eye of a spectacle frame and a conventional glass inserted in the right eye. A marksman then fired a BB from a distance of 35 feet. The BB smashed the conventional lens but another shot failed to shatter the new glass.

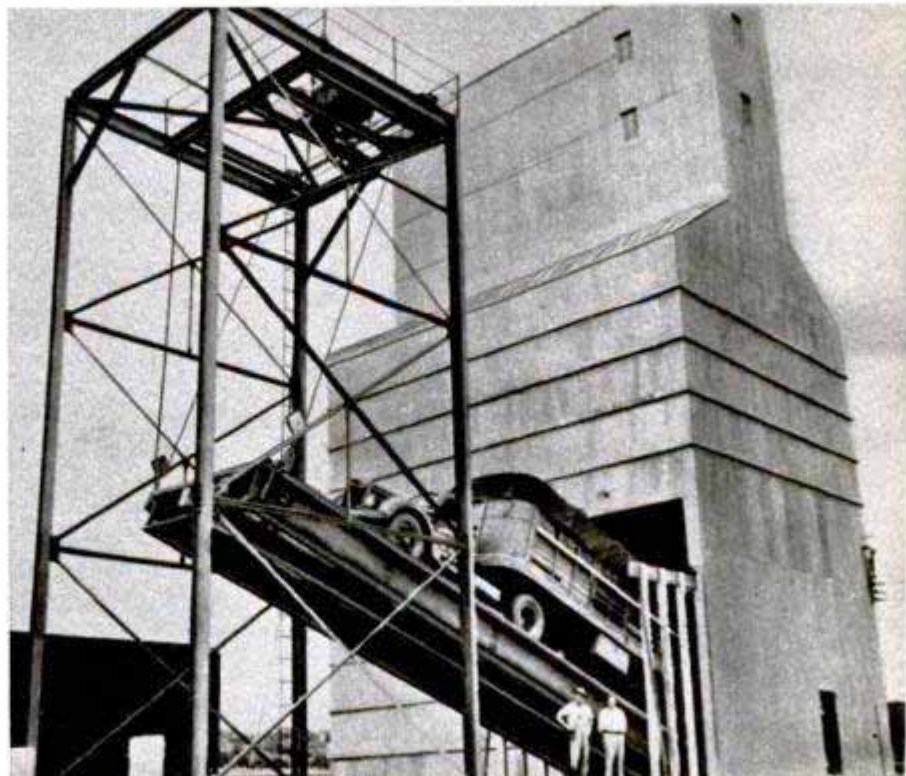


### Range Finder for Movie Camera

Movie cameras can now be accurately focused with a detachable range finder. It is synchronized with the lens by lining up a red dot on the range finder with the infinity point on the lens housing. Operated like range finders on still cameras, the unit has a dial which is turned for pin-point focus until two images in the eyepiece superimpose.

### Truck Dumper

Unloading a trailer-truck filled with grain is a simple matter at a new elevator in St. Marys, Kans. A platform upends the truck and all the grain slides out. The truck is driven onto the 50-foot platform. The front end of the platform then swings  $33\frac{1}{2}$  feet up in the air, and 90 seconds later the trailer is empty.

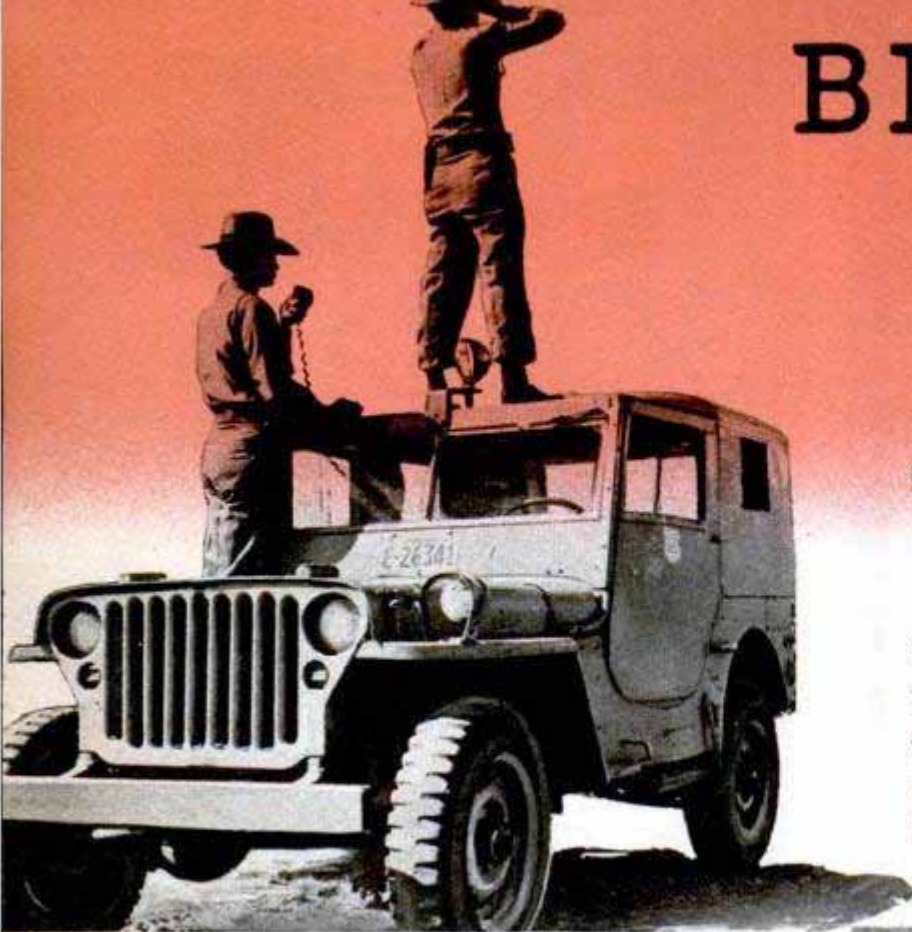


Counting the number of points on a male deer's antlers is not an accurate way to determine the exact age of the animal because when deer reach old age they often have only single points.

# BIG SECRET U.S.A.

By Thomas E. Stimson, Jr.

Stranger, prepare to tell the story of your life when you knock at the gates of Los Alamos, N. Mex. The home town of the atom bomb is wary of visitors. How it keeps its secrets is a secret



**H**ERE'S A MAP that shows you how to get to Los Alamos. Here's an aerial photo of what the place looks like. Here is all the money you need. And now, here are your assignments."

The speaker went into details. Half a dozen men, separately, were to make their way to America's secret town, the citadel in which the atom bombs are made. They were to use their own wits to get past the guards and collect every bit of information they could. Other men, friendly individuals with a knack for striking up conversations, were to mingle with the workers in the hope of gathering a few stray facts. Still others were to penetrate the laboratory area by hook or crook and devise sabotage methods.

"In short," the speaker concluded, "your job is to learn everything possible about what an atom bomb looks like, what's inside of it, how it's made and how the assembly plant could be destroyed. Get to it!"

Fortunately for the United States, the speaker and every man in his audience were trusted Americans. Each was skilled in espionage and each already had done valuable work for his country. This time their job was to test the defenses that surround the production of America's atomic weapons. If it were possible for them to penetrate the safeguards, it might be that unfriendly spies could do likewise.

Los Alamos, supersecret city, is located in the rugged mountains of northern New Mexico. Surrounded by a high fence, it is guarded by telltale instruments





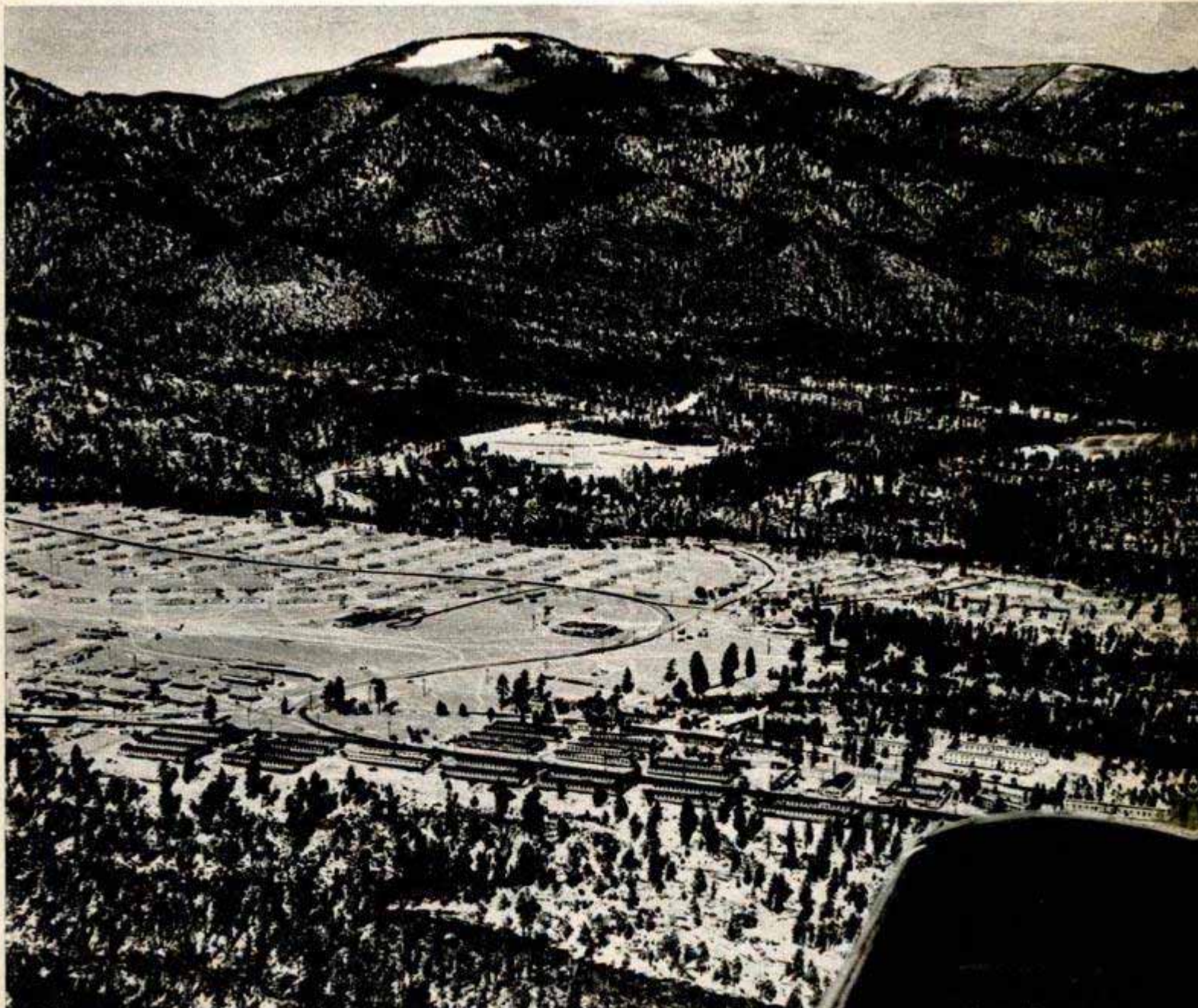
Visitors pass through this gate, guarded by a watchtower. No one enters the city without permission

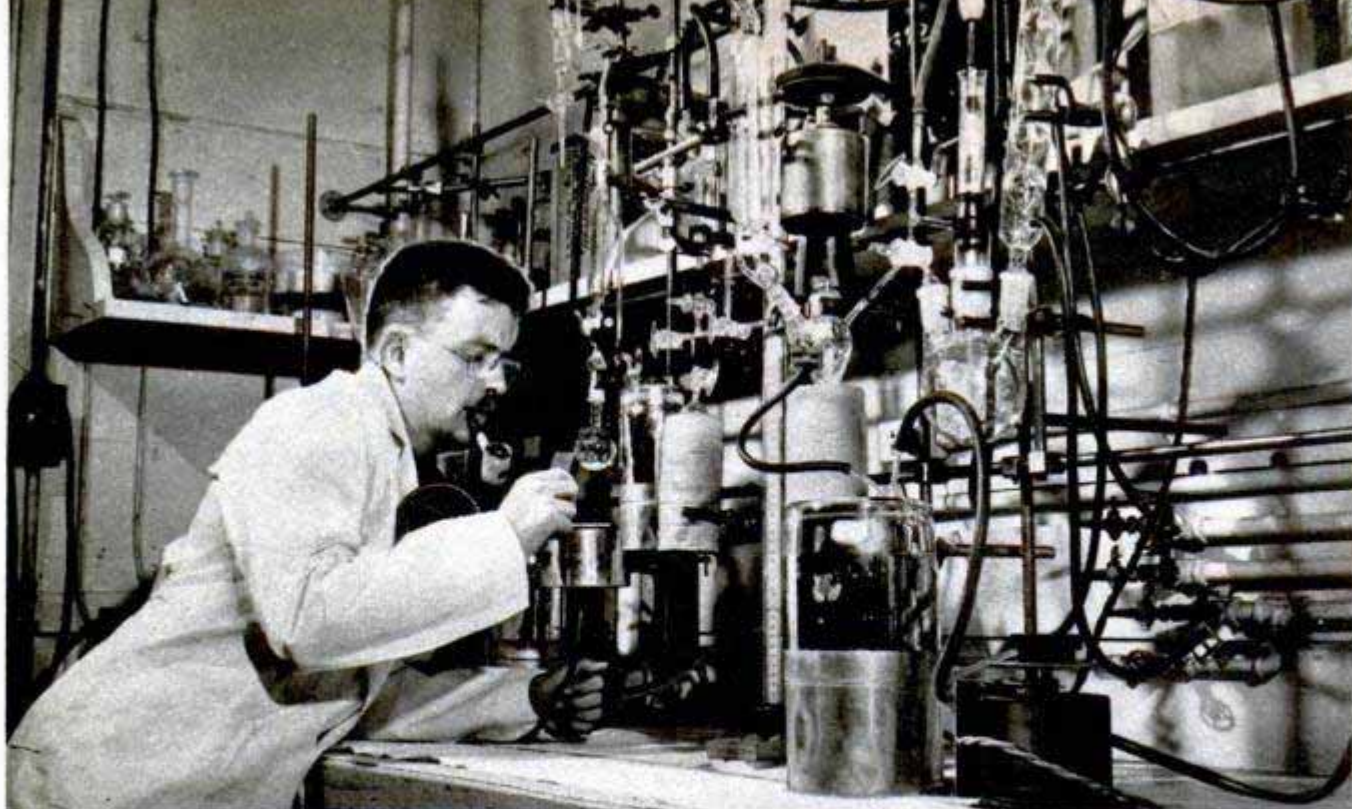
America's biggest secret is so secret that even the ways in which it is guarded are secret. The Atomic Energy Commission won't say whether the meeting outlined above was ever held. It won't enumerate the safeguards that surround the town or the supersafeguards that protect the laboratories.

All that it will state, in a general way, is

that the Los Alamos operations are conducted under "severe security regulations" and that the physical security system includes ingenious scientific detection and alarm devices.

If you lived in Los Alamos you'd be aware of the many miles of strong fencing, set in concrete and topped by barbed wire, around the whole community and its secret





In one laboratory, radioactive carbon is mixed with a vitamin for use in studying reactions of human body

buildings. You'd be familiar with the trim AEC security police in their distinctive uniforms. These officers are so carefully selected that less than one applicant in a hundred passes the preliminary tests. Those who are accepted are trained under ex-Secret Service instructors in such subjects as police work, guard work, judo, fire fighting and terrain searches.

These human guards are assisted by never-sleeping automatic robots in the form of detection and alarm systems. Some of the robots are triggered by the heat radiated by a human body. Some are set off by the change in electrical resistance that occurs when a person walks into a forbidden area. It would be impossible for

Workers are protected by fences that prevent them from entering areas which are exposed to radiation



a spy to remain cold enough to avoid affecting the temperature circuits or to insulate himself against the electrical proximity detectors.

Other automatic alarms are actuated by the noises that a person unavoidably makes even while trying to move quietly, others employ infrared radiation, still others are hooked to photoelectric cells.

Los Alamos is located about 35 miles from Santa Fe in northern New Mexico, in a rugged mountain wilderness. The isolated site was chosen during the war both for safety and secrecy.

The city began as a temporary wartime camp, but now that atomic power seems to be here to stay the town is being developed into a permanent research center. Some 2700 people are employed in the laboratories and in the outlying installations, and the total population is close to 10,000.

You won't be admitted into the town unless you have business there or are sponsored by friends or relatives who live behind the fence. Curious sight-seers are turned back at the main gate. No one gets a job in Los Alamos, whether he is to work in one of the laboratories or in the community center, until after he is cleared by a rigorous investigation. Temporary construction workers are subjected to the same kind of scrutiny.

Nevertheless, Los Alamos has been made an "open" town as much as possible. Few restrictions are imposed on the people who must live and work there. They may come and go as they please, possess sporting firearms and cameras and lead generally normal lives. At 7500 feet altitude, on a

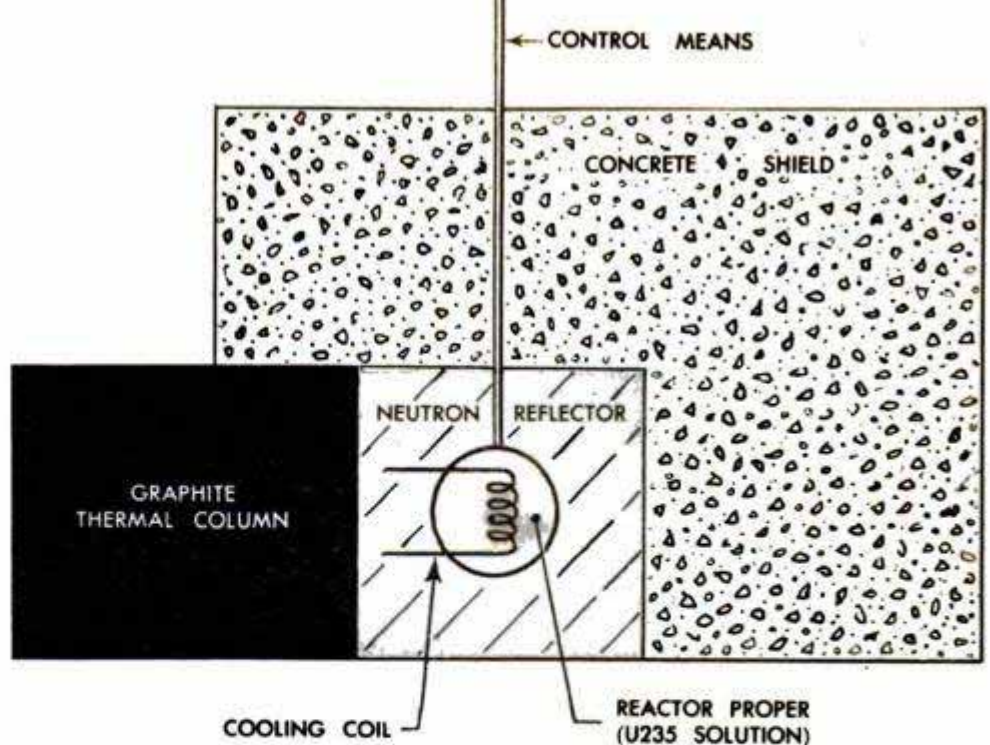
shoulder of the Rockies and not far from the Continental Divide, Los Alamos is in the middle of an unspoiled recreational area. Fishing, hunting, horseback riding, golf and tennis are popular sports.

Today Los Alamos has its own telephone exchange, its own newspaper, "wired" broadcasting station, library, hospitals, churches and schools. Apartment buildings are under construction and hundreds of homes are being built.

To make certain that the town and its laboratories remain self-sufficient under any foreseeable circumstance, Carroll L. Tyler, local manager for the AEC, has found additional sources of water for the community, laid in huge supplies of fuel oil and installed a stand-by propane gas-storage plant to supplement the normal supply of natural gas.

For protection in case of a possible emergency the AEC has borrowed weapons and armored vehicles from the Army. Alerts and tactical maneuvers are conducted in which the Army, Air Force and AEC protective forces operate jointly. The area has been declared a "danger" region over which aircraft may not operate without special permission.

In keeping with its position as a research center, Los Alamos contains what has been called the best physics laboratory of its type in the world. The laboratory has a cyclotron, a betatron, a Cockcroft-Walton accelerator and a 2½-million-volt electrostatic accelerator. A 12-million-volt electrostatic accelerator is under construction and other new huge research devices are being built.

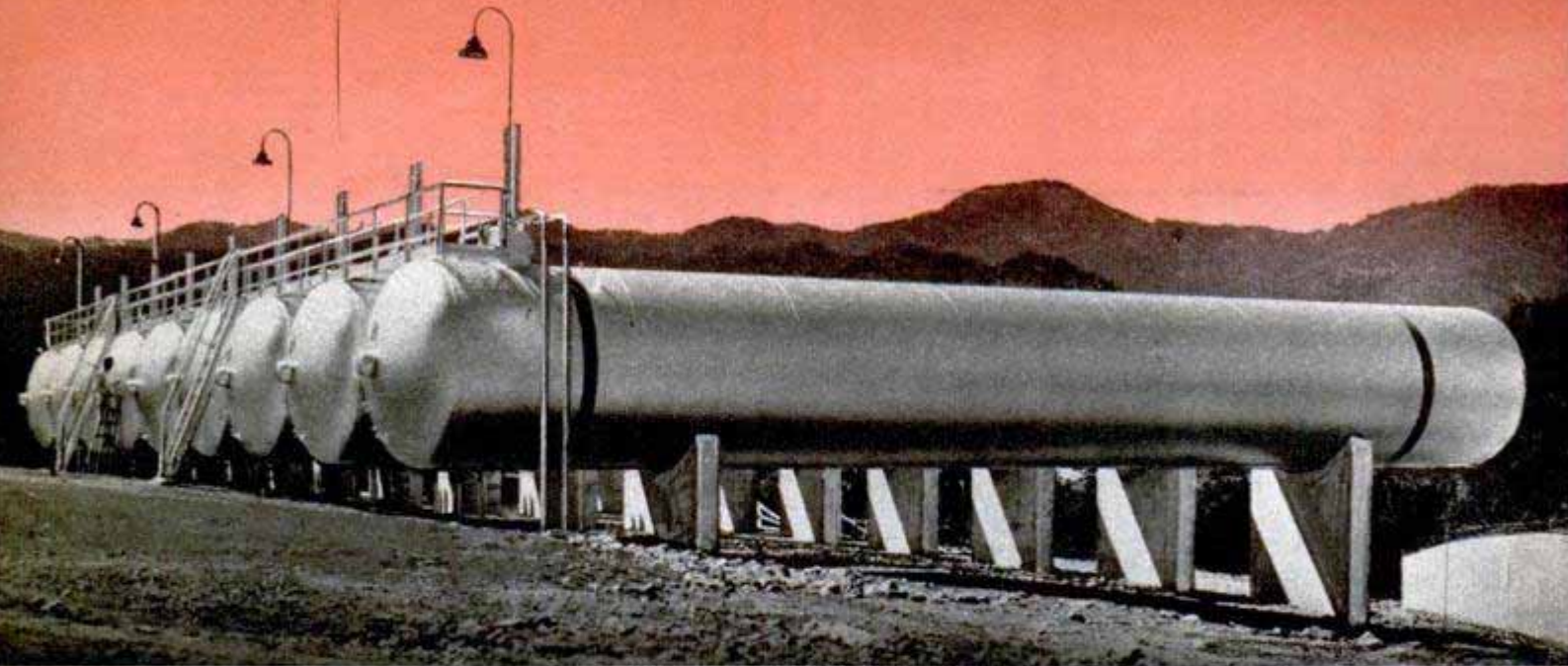


Here's a cross section of a "slow" atomic reactor of the so-called "water boiler" type. Inside the spherical container is an enriched U-235 salt dissolved in water. It is this material that is the source of the power. The reactor is employed chiefly to produce neutrons for experiments



AEC police examine an incoming truck. Nothing comes into the laboratory area or leaves it without permission. Some safeguards are automatic, touched off by heat of human body or by noise. Below, at the airport adjoining town is this combined control tower, weather and fire station





Los Alamos is self-sufficient in nearly all respects. Butane from these tanks could be used if anything happened to the natural-gas pipe line. The town also has extra water resources and a huge supply of fuel oil



Radioactivity is tested by placing material in lead safe with Geiger tube. Below, animal skeleton is checked for radioactivity



In the laboratory is a "slow" radioactive pile or reactor of the so-called water boiler type that uses enriched U-235 for the mass production of neutrons. One tool announced by Dr. Norris E. Bradbury, director of the laboratory, is a "fast" chain-reaction pile that makes use of man-made plutonium as the power source. Operated at partial power for several years, the reactor is serving as a guide in the designing of future atomic-power plants.

Inventing new atomic weapons is one job at the laboratory; engineering the weapons for greater ease of production and for greater serviceability are kindred projects. Also under way are numerous investigations for peacetime uses of atomic power. Many of these projects are "farmed out" to universities and other institutions in different parts of the United States; in these cases Los Alamos acts as a coordinating and advisory laboratory.

Among the investigations that are under way is the use of radioactive isotopes in seeking how to get more plant growth from certain fertilizers. The tracer isotopes, too, are being used to get new facts on animal growth and on how plant diseases and pests develop. Now that numerous "tagged" atoms are available, precise information is being sought on a wide list of subjects ranging from the vitality of the teeth and the causes of cancer to better understandings of photosynthesis.

petroleum refining and metallurgical processes that have defied analysis.

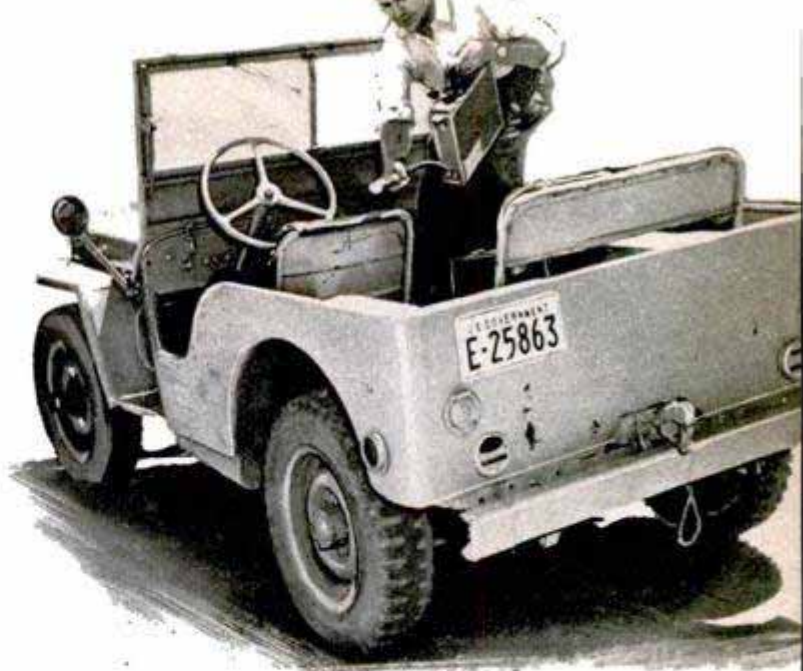
One of the exciting possibilities being studied at Los Alamos in conjunction with other AEC laboratories is that of "breeding" new supplies of radioactive materials and thus augmenting our natural and manufactured supplies.

The thought is that U-233 or plutonium, both capable of chain reaction, can be created as by-products during the operation of an industrial atomic power plant. A blanket of U-238 or thorium, each comparatively plentiful, would be put around the pile to absorb excess neutrons. The neutron action would be to transform the inert blanket material into radioactive substances that in turn could be used for powering other piles.

Recently, Los Alamos enlarged its health-physics laboratory, which is concerned first of all with the prevention of radiation sickness among those who work with radioactive materials. This is partly a matter of adequate design in shielding the reactors and other radioactive sources and is carried out to such an extent that the technicians who perform the final assembly operations on atomic bombs do all of their work by remote control, using mechanical hands and fingers. Seated in another room or even in another building, they view their work by wired television.

So little is known yet about radiation sickness that the health-physics laboratory is doing a great deal of basic research as well as practical work. New instruments for detecting and measuring radiation are evaluated, new tolerances have been set up, and new methods of treatment for those who have received over-exposures are being worked upon.

The guarding of our atomic secrets is one of the biggest security jobs that was ever attempted. There are miles of secret pho-

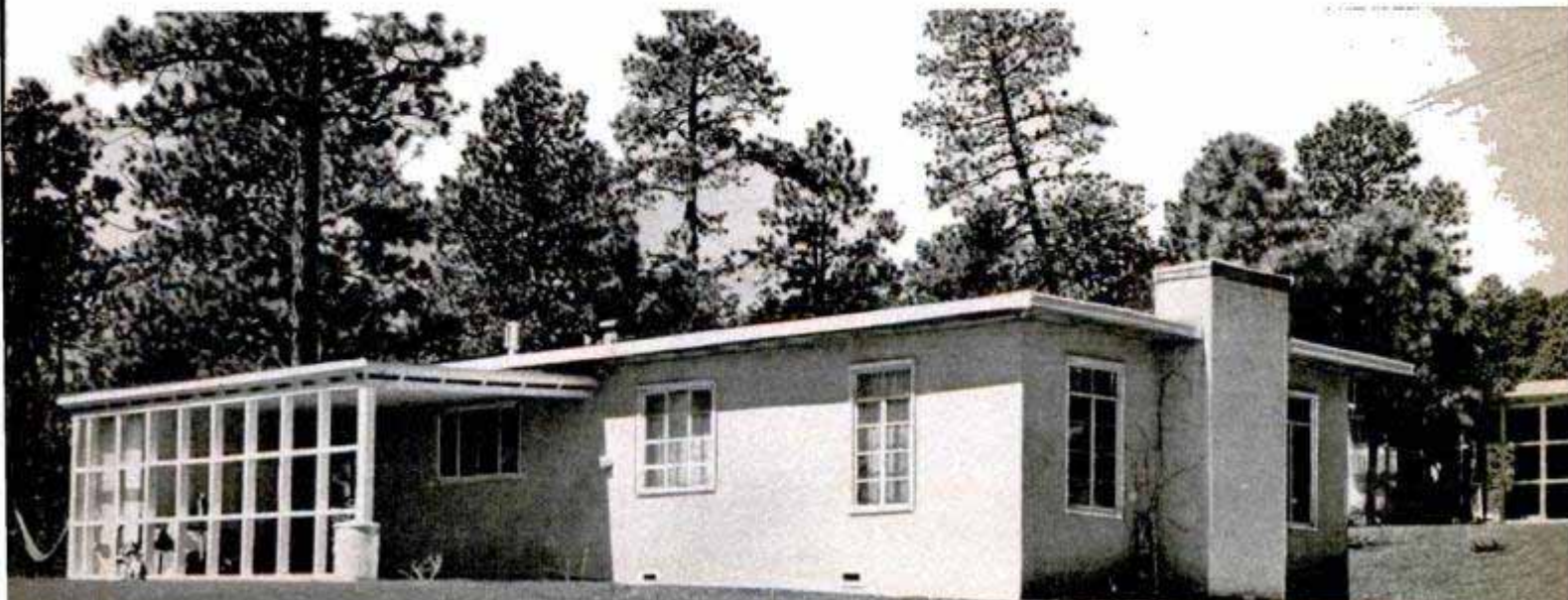


Equipment as well as humans can become contaminated. Here a technician checks a Jeep used in lab

tographic film. Secret construction blueprints would fill trains of freight cars. Hundreds of thousands of documents on secret experiments have been typed or mimeographed. Ten thousand more classified documents are originated every month and about that number must move from one installation to others each month. Even the messages that move between plants and laboratories are mostly in code. One of the biggest security tasks is the safeguarding in transit of several-thousand-mile shipments of atomic materials and the manufactured components of weapons.

Los Alamos is only one location that must be guarded and in all there are 1270 separate plants, laboratories, offices, storage areas and test facilities that must be defended against espionage and sabotage. These are located in 41 different states, in Canada and in the far Pacific. Some of the locations are well known and the very existence of others is secret.

Attractive new homes are built for workers, who find themselves in the center of a vast recreational area





## Dual Wheels and Single Tires Add Stability to Tractor

When a tractor used by the city of Ishpeming, Mich., developed a tendency to tilt as its scoop was raised to full height, the city engineer decided that dual rear wheels might solve the problem. Extra tires were not purchased at the time, but the dual wheels and spacers were installed as soon

as they arrived. The single tire was mounted on the outer wheel. The operator discovered that the additional tires were unnecessary as the added width of the rear tread gave the necessary stability to stop the tilt and, to his surprise, the tractor steered more easily than before.

## Adjustable Clothes Rack for Automobile Mounts on Window Molding



Strong enough to support as many as 12 garments, an adjustable rod that mounts on the window molding of any car keeps clothes wrinklefree on motor trips. Existing screw holes can be used to mount the rack or, if the molding has no screws, it is installed by boring two small holes about 12 inches apart. The bar is adjustable in length to match holes in the molding.

## Adapter Unit Gives Bike Two-Speed Transmission

Bicycle riders can convert their bikes for two-speed operation with an adapter unit that fits any New Departure coaster brake. Shifting is accomplished by a finger lever mounted on the frame. The unit uses direct drive in low gear, and in high gear the gear ratio is increased by planetary gears similar in principle to those in automatic car transmissions.



## Horn-Shaped Trap Snares Plant Bugs

Government scientists, seeking a way to stop the spread of a potato disease in the state of Washington, have produced a new insect trap for catching aphids, the carriers of the disease. By studying the life history of the green peach aphid, entomologists hope to learn how to combat the disease. E. W. Davis of the U. S. Bureau of Entomology and Plant Quarantine designed the trap, which is several times more effective than previous models. Shaped like a curved horn, the free-swinging trap has a vane attached to its base to keep it headed into the wind. A roller-skate wheel is used as a bearing at the base of the trap. The wind-borne insects enter the large front opening



and make their way up the narrowing passage into a cloth bag on the top where they are trapped

## Multiple Drill Fits Saw Table

Twin horizontal holes can be drilled quickly in wood with an attachment that fits any circular-saw table. The machine saves time in joining window screens and screen-door frames. The head of the drill has two screws which hold the bits in line with each other, and another screw adjusts the height of the bits. Holes can be varied, center to center, from 1¼ inches to 3½ inches, and the attachment also can be used for vertical drilling.

## Car "Road Tested" On Dynamometer

Mechanics can test the pulling power of an automobile engine without leaving the garage by means of a dynamometer that simulates any desired road condition from level highway to a steep mountain grade. The car is driven on a pair of rollers and, as the rear wheels turn the rollers at varying speeds, the horsepower rating of the engine is shown on a gauge. By pressing buttons on a hand control, the mechanic varies the load on the rollers, reproducing a variety of road conditions. Long used by automobile



manufacturers to test new cars, the dynamometer has been modified to make it available to the automobile repair shop.

# Ageless "canvas" for

**A** UNIQUE art canvas that, according to exhaustive chemical and physical tests, should last for at least 500 years has been invented by Louis Francis, Miami artist. Made of ordinary copper screening treated with a mixture of graphite and a rubber-based oil, the canvas possesses all the painting qualities of regular linen canvas plus permanent flexibility, durability and an ageless resistance to the elements.

The canvas on which the artist paints his masterpiece has always been his worst enemy. Not only does the linen actually rot away from his pigments in the short span of about 20 to 30 years, but the added hazards of insects, mildew, expansion and contraction all mean that, if his work is to be preserved for posterity, it must be constantly restored and retouched. Because of this, the works of the old masters hanging in galleries throughout the world have been redone so many times that one sees more of the work of restorers than of the original artist. Many mediums have been tried in an effort to overcome this, but lacking flexibility and texture, they have never replaced linen as the artist's choice. However, Francis' new copper canvas should go a long way toward filling a need that has been felt by artists since the time of Michelangelo.

In addition to being impervious to dampness, age and insects, the copper canvas has other advantages which, even taken by themselves, should win it many friends among serious workers. Most important to the artist will be the new feeling he will acquire toward color. As the canvas is non-absorbent, there is no drinking up of the oils by the backing. Colors dreamed up on the artist's palette go on his canvas and remain that way — true, clear and bright. There is no fussing and "piddling" to bring out the delicate tones and shades that may become lost when applied to linen. Also, his canvases will be almost damageproof. They can be removed from the stretchers, rolled, pulled, restretched, hammered on and even walked on. They come through uninjured after abuse that would completely ruin linen.

The secret of Francis' canvas lies in an oil which is mixed with powdered graphite and applied to the copper screening. The same oil may soon become valuable in the manufacture of paints, coatings and water-

proofing materials because of its valuable properties. The oil makes it possible to use the ageless though greasy graphite as a filler. It is the only oil that will dry up the graphite, and it does this so well that one thin coat of zinc white and linseed oil will not pick it up, though it remains flexible.

The canvas is no new and untried product. Francis has been using and testing it over a period of 30 years, and he made it available to the public only upon the insistence of his many artist friends to whom he had given canvases. Canvases which he prepared 20 and 30 years ago are still perfect and so flexible they can be rolled around a lead pencil without cracking. A chemist of Coral Gables, Fla., who has been conducting all the laboratory tests for Francis, states that the canvases should last at least 500 years without showing signs of age or deterioration.

Francis hopes soon to have production kinks ironed out so his canvases can be made available through regular artists' supply houses. However, the oil can be obtained from him now and, as the preparation of the canvas is a simple matter, any artist can easily make his own. Standard  $\frac{1}{16}$ -mesh copper screening is used, with a mixture of 95 percent powdered graphite to 5 percent of the oil by volume. The

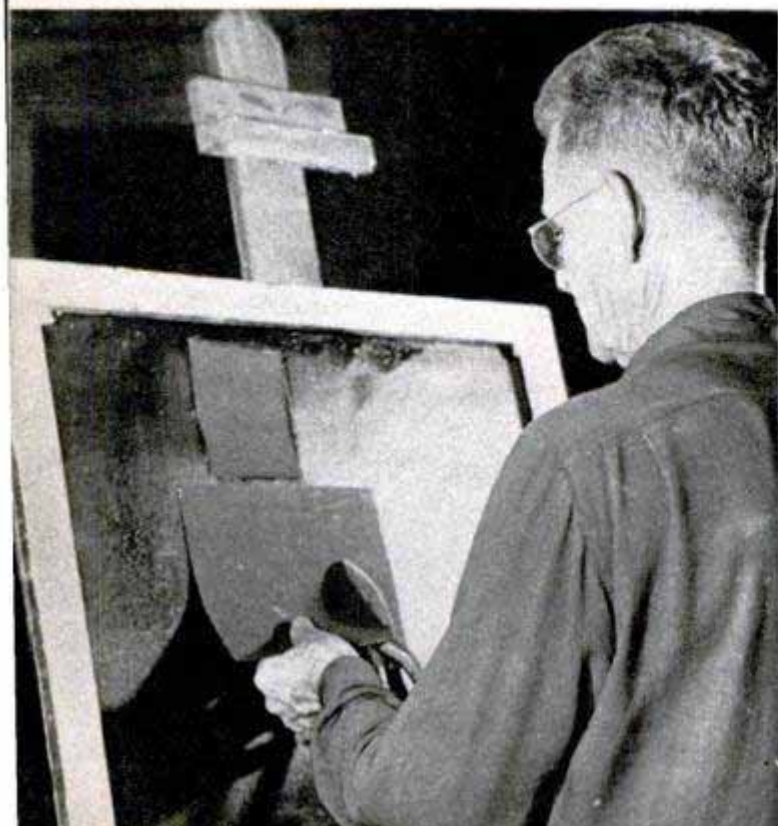


# artists

By  
B. E. Peerless

An artist himself, Francis puts the finishing touches on one of his own canvases. According to tests, this painting will last for at least 500 years

If a canvas is damaged by a sharp instrument, it is easily repaired. On opposite page, torn section is cut away and a new piece of canvas cut to the same size. Below, a larger square of canvas serves as a batten on the reverse side of the patch. Below, right, old canvas is restored by applying it to new canvas with graphite

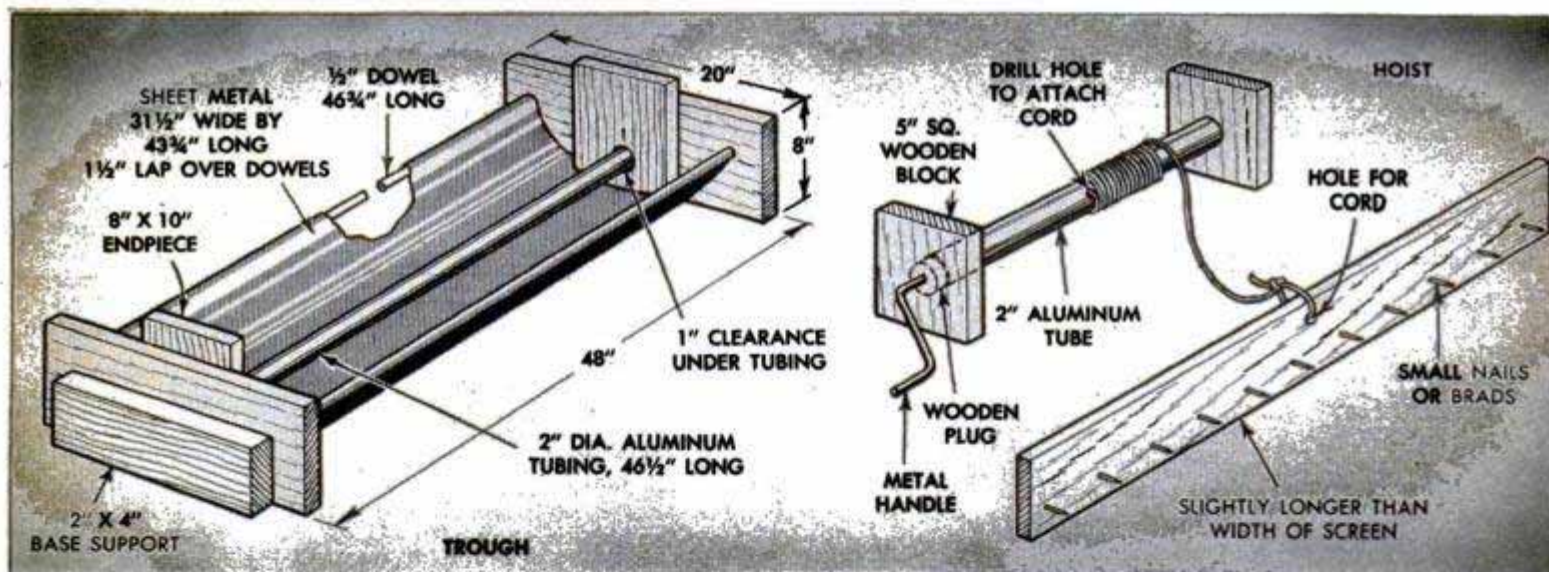




Copper screening is fed through a trough under a roller. Graphite-and-oil mixture fills the trough. Construction details of the trough are shown below



Screening is pulled through by a hoist, which prevents it from touching the edge of the trough, breaking surface tension. Detail below shows the hoist



pictures and drawings on these pages show the equipment Francis uses and the manner in which he prepares personal canvases in his studio. Other methods of applying the mixture can be used, but they should permit an even application and prevent the treated screen from coming into contact with any other surface until it is dry. Contact of any sort will break the surface tension that keeps the mesh filled while it is still wet. Runners may appear in the surface of the filler as the canvas dries, but these are not permanent. By the time the canvas is completely dry, they will have leveled off to a nice even coating with a linenlike texture. A note of caution, however—wear old clothes while working

with the graphite mixture. It won't wash out, though it can be removed from the hands or hard surfaces with kerosene while it is still fresh.

Texture can be varied to suit individual preference by either using a coarser or finer-mesh screening (no adjustment in the proportion of graphite to oil is necessary) or by the manner in which the zinc-white coating is applied—rough or smooth.

While Francis' canvas will preserve the work of contemporary artists, its permanency can also be applied to works of the past. In this capacity, it will greatly lessen the work and care of those responsible for the preservation of valuable paintings. Old rotted canvases can be backed up by the



After the canvas is dry, Francis cuts it with tin snips and stretches it in the same manner as linen canvas. A zinc-white coating finishes the preparation



Francis doesn't anticipate that his canvases will be treated this way, but they are so tough and flexible they can absorb such punishment without any damage

permanent canvas by either of two methods. The first and best method is to apply the old canvas to a freshly treated screen that is still wet. As soon as it is dry, it is ready to be restretched and the restoring job completed. The second method is to apply the old canvas to an already dried and stretched copper canvas with either restorer's glue or the graphite mixture as a bonding agent. For this method, a thinner mixture of graphite and oil is used in preparing the screening—80 percent powdered graphite to 20 percent oil by volume. Such a backing will preserve the works of the old masters many years after the original paintings were made.

Small canvas shows the steps toward a finished painting on one of the screens. The graphite, which fills the screen, shows in the upper-right corner. The white coating of zinc comes next, then the artist applies his oils





### Back-Up Guard Stops Car

Automatically setting the brakes when it touches a person or object, a back-up guard prevents accidents that result because a driver can't see directly behind him while backing up. The guard, a slender bar that looks like a curtain rod, drops down over the rear bumper when the driver shifts into reverse. If the bar strikes something, it sends an impulse to a solenoid which locks the brakes. The brakes remain set until the gearshift is moved.



### Ring Locks Sanding Disk in Place

Abrasive disks snap on and off a new sanding head with a twist of a lock ring that clamps them securely in three places. The lock-ring pressure is adjustable for various types of abrasive, ranging from the very finest to the coarsest. The disks are slit in three places, around the edge so that portions of them protrude through slots in the sanding head. The lock ring holds the disk by pressure of its three spring-steel feet on these protrusions.

### Electric Abrasive Finisher Weighs Only Three Pounds



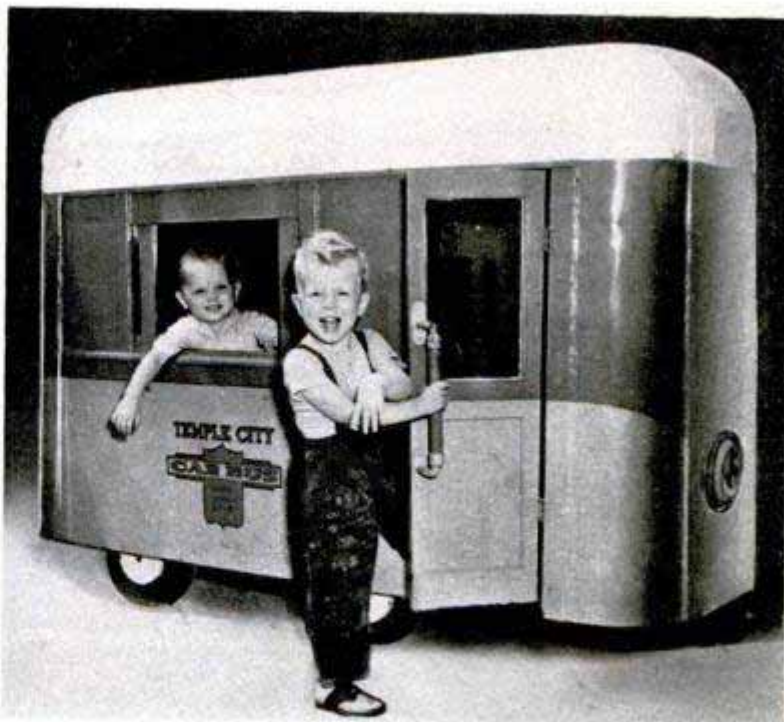
Small enough to be held in the hand, an electric rotary finisher is designed for abrasive finishing of small parts. The abrasive disk is spun at 4500 revolutions a minute by the  $\frac{1}{15}$ -horsepower motor. Weighing only three pounds, the machine is used for cleaning welds, removing paint and carbon, cleaning metal before brazing or soldering and deburring machine parts.

### Biological Warfare Kills Insects

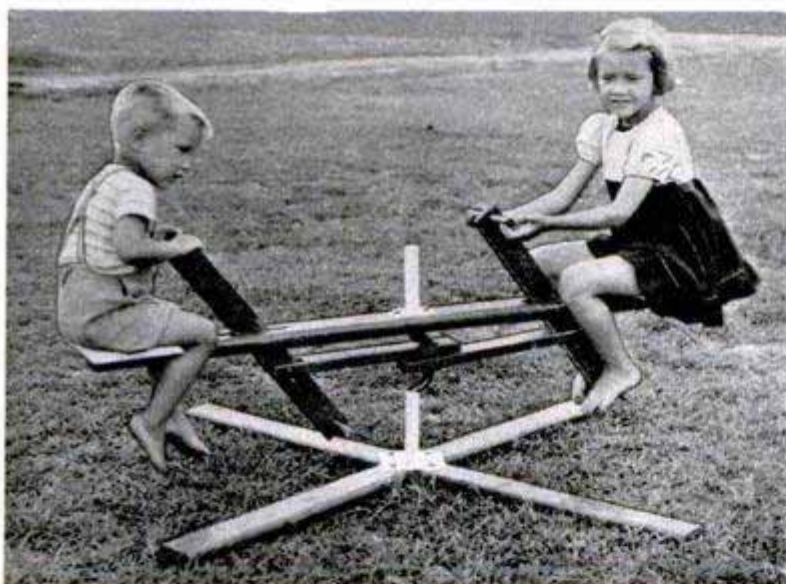
Biological warfare is being waged against the alfalfa caterpillar in California with the virus of a wilt disease that apparently affects no other insect and is harmless to man and animals. Sprayed on fields where the caterpillars are feeding, the virus produces a sweepingly fatal epidemic. In one test plot, the number of active caterpillars was reduced from 96 to 4, while in an unsprayed plot the caterpillar population increased to 154 in 11 days.

## "Car-Bus" Carries Kids On Simulated Ride

Several months ago L. Volner of Los Angeles, Calif., was watching his grandson try to climb into the cab of a small toy train without success. So Volner, who works for the Los Angeles Transit Lines, went to work in his shop, and now his grandson has a "Car-Bus" which he "drives" to give the neighborhood youngsters a simulated ride through the streets of the city. Volner calls it a Car-Bus because it is a cross between a streetcar and a bus. The driver sits in front of a controller like those used on old-style streetcars. On his right is a fare box which accepts slugs. Beneath the floor is a gong, operated by a pin under the driver's foot. A cord above the rear seat permits passengers to ring a bell over the driver's head, indicating their desire to stop. Many of the parts that



were used in the unique toy came from old streetcars scrapped by the Los Angeles Transit Lines.



## Yard Merry-Go-Round Powered by Riders

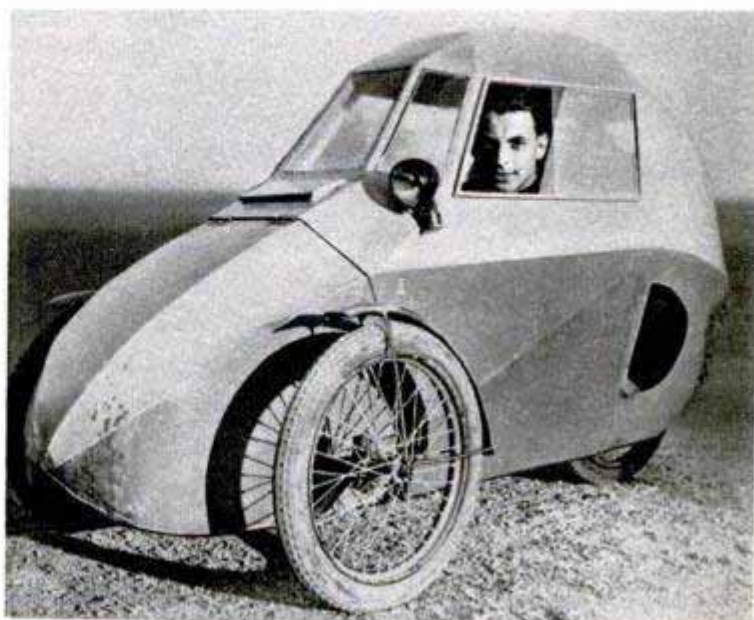
Small fry furnish the power themselves for a small lawn merry-go-round which operates on a crankshaft. Two children sit opposite each other and alternately push and pull on their hand and foot supports. This forces the riding beam in a circle.

☐ There are more than 10 billion phosphor particles with a total weight of only 1½ grams inside a two-foot fluorescent-lamp tube, according to calculations of Westinghouse engineers.

## Single-Seater Automobile Has One-Horsepower Engine

So small that the authorities don't require it to be licensed, a miniature automobile being manufactured in Germany is only a little more than seven feet long. Its one-horsepower engine drives it over the road at a speed of 27 miles an hour. Strictly a one-seater, the car uses motorcycle wheels and costs about \$270.

☐ Horses have been found to be faster than dogs at distances of ½ mile to about 2½ miles, but at greater distances the dog's endurance usually makes him the winner.





BISHOP

KNIGHT

QUEEN

KING

## ***Sculptor of Chessmen***



**M**EDIEVAL knights, priests and page boys battle to the death when the chess pieces of Al Kritzner are placed on the board for play. Kritzner, a boat-yard operator of Port Washington, Long Island, who was bedridden for eight months, developed a unique hobby—carving chessmen patterned after men of the Middle Ages. In a Kritzner set, which even includes a court jester and a butcher, no two pieces are alike. Kritzner roughs out the men with a saw, then uses a knife and electric carver to finish the pieces. Each piece is given a coat of lacquer that takes a high polish. Then, lined up on the board, they present a panorama of medieval times.

← After the intricate carving is completed, Kritzner finishes each piece with a high-gloss lacquer. Below, the hobbyist first roughs out the piece with a saw, then finishes with this electric carving tool







PAWN



PAWN

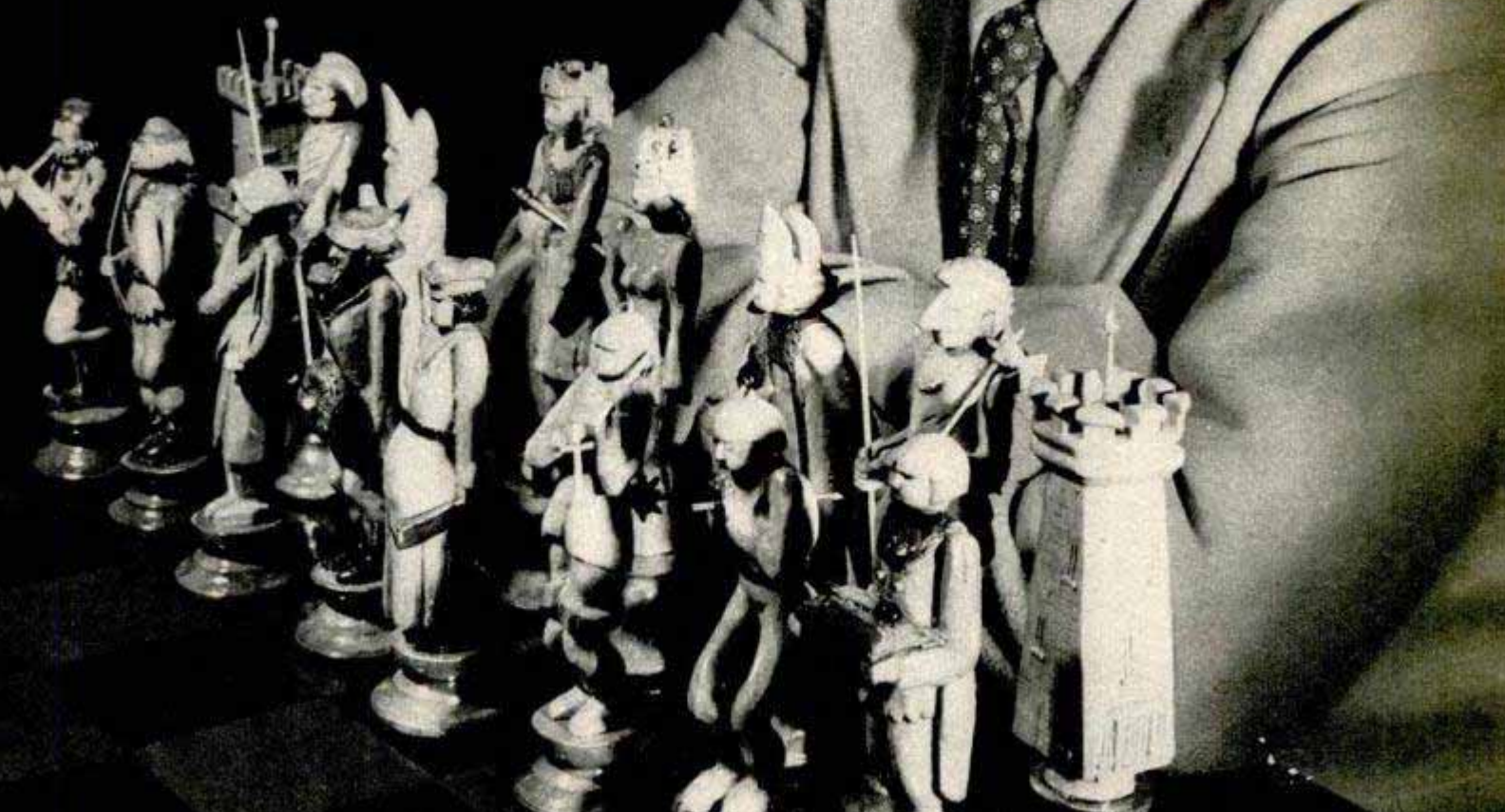


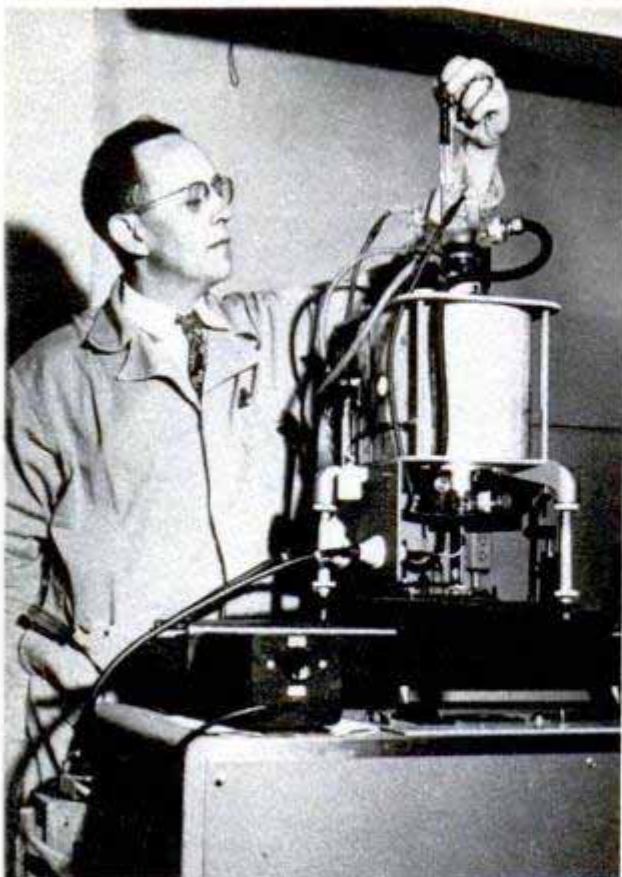
PAWN



PAWN

Lined up for play, the Kritzner chessmen present a unique spectacle. Even the pawns are all different

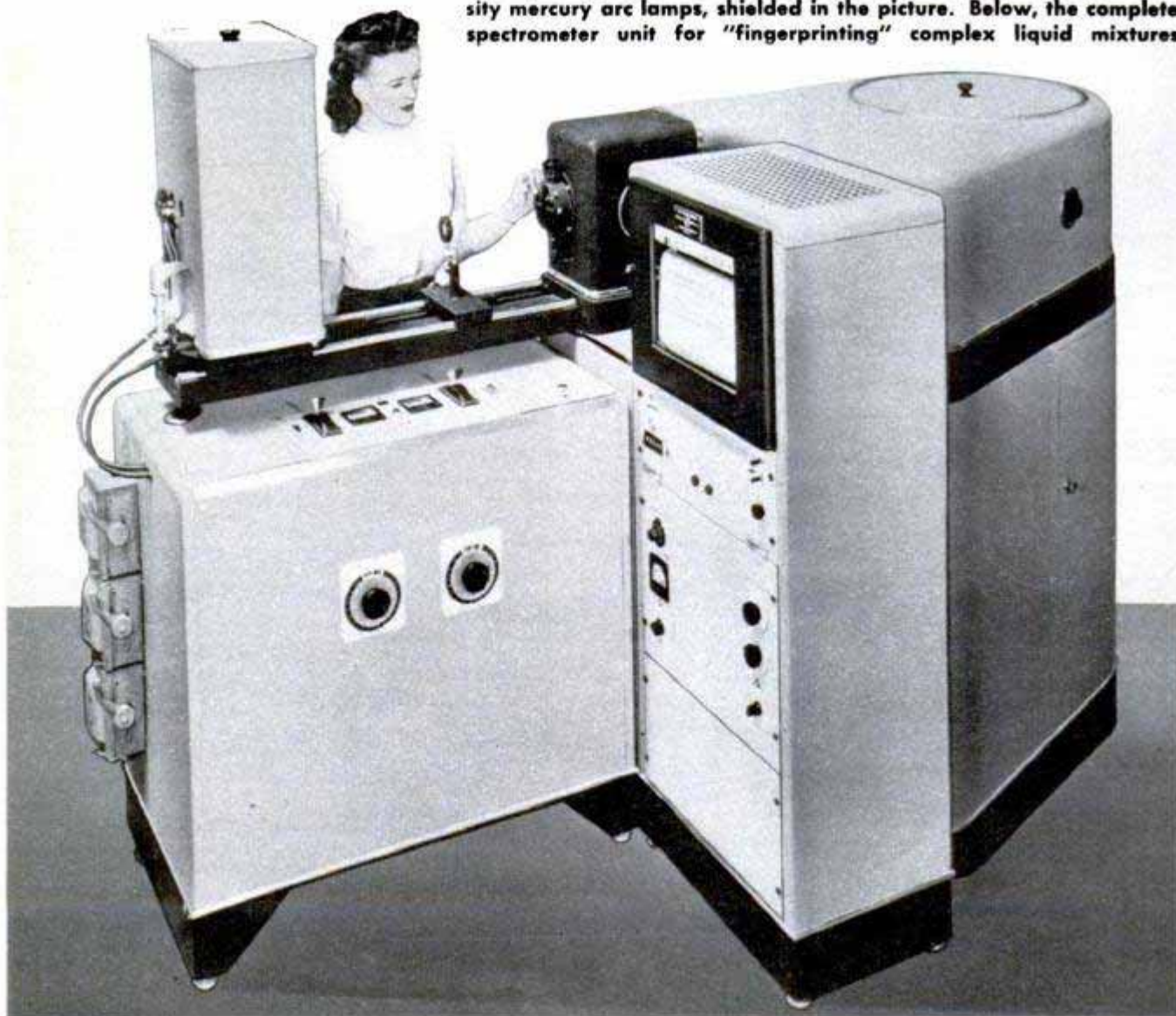




## Liquids "Fingerprinted"

COMPLEX liquid mixtures are "fingerprinted" and their ingredients quickly identified and measured by a new-type spectrometer. It makes a photographic record of the spectral lines of a solution or draws a graph of the liquid's characteristics on a chart. In a few minutes, the machine analyzes mixtures such as wood and grain alcohols dissolved in water, revealing what compounds are present and their quantity. Complex structures, as well as colorless solutions of most organic and some inorganic compounds, are similarly identified. It was previously known that many compounds give off a weak light that can be used to identify them when the compound is illuminated by a beam of mercury light. The difficulty was in creating a mercury light source powerful enough to scatter a useful amount of light through the sample. The new instrument does this by placing the sample in a special test tube, with an optical window in its bottom. The tube is then placed between two mercury arc lamps, operated at up to 30 amperes of direct current.

Above, dropping test-tube sample of liquid between two high-intensity mercury arc lamps, shielded in the picture. Below, the complete spectrometer unit for "fingerprinting" complex liquid mixtures



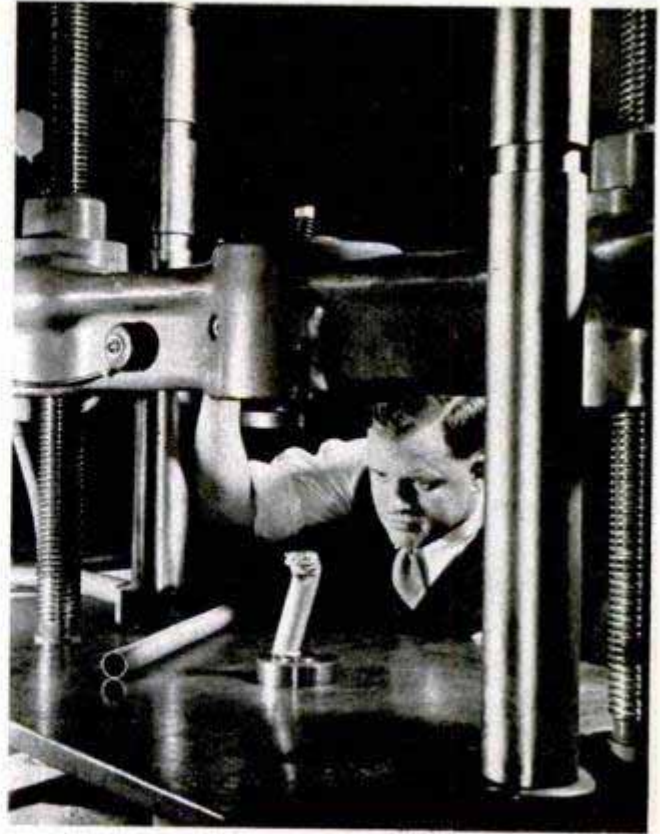


### Cattle Car for Toy Train Loads and Unloads Itself

Cattle move in and out of a toy cattle car as if under their own power when a remote-control button is pressed. A corral, set up alongside the track, serves as a loading dock and has three chutes to accommodate several carloads of cattle. An electric vibrator causes the cattle to move forward when the button is pressed.

### Pocket Fan

Not much larger than a cigarette lighter, an electric pocket fan provides a personal breeze on a warm day. The little fan was invented by a Polish engineer in England. The propeller blades are driven by a microscopic motor. Power is supplied by a standard  $4\frac{1}{2}$ -volt flat dry cell. The fan weighs only eight ounces.



### Plastic Coating on Steel Tubing Resists Chipping and Corrosion

Outdoor structures made of a lightweight steel tubing are protected against corrosion by a plastic coating that is undamaged by rough handling. This coating clings so tightly to the metal that the tubing can be twisted into many shapes without chipping or flaking the finish. A compression test, in which the tubing was severely distorted, failed to damage the protective coating.

### Telephone-Wire Guards Of Lightweight Plastic

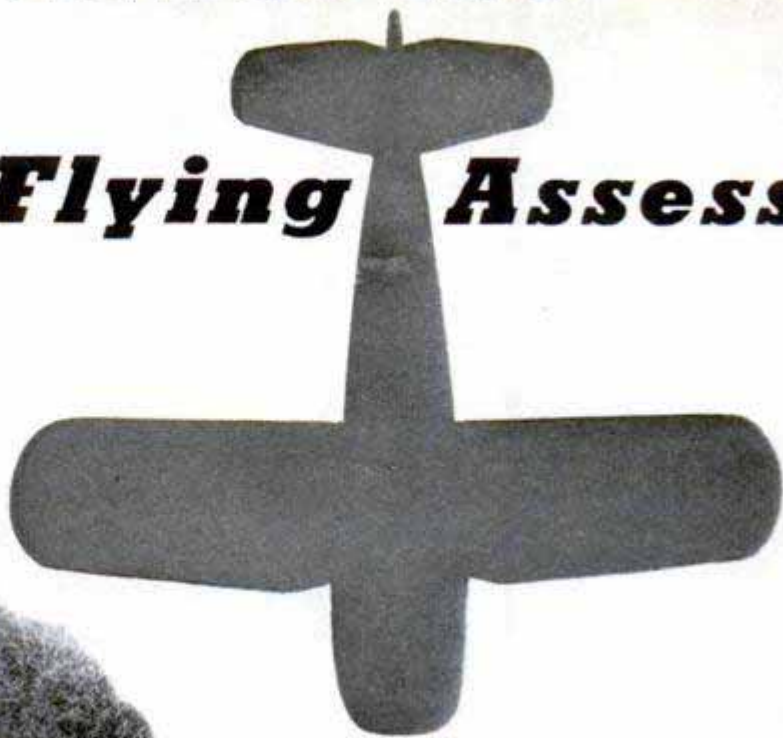
Spiral guards of tough, lightweight Tenite are used by the Bell System to protect telephone drop wires where contact with trees is unavoidable. Made in the form of spirally slit tubes, the plastic guards are installed either by threading the wire through them, or winding them about the wire. S-shaped aluminum clips lock the guards in place.



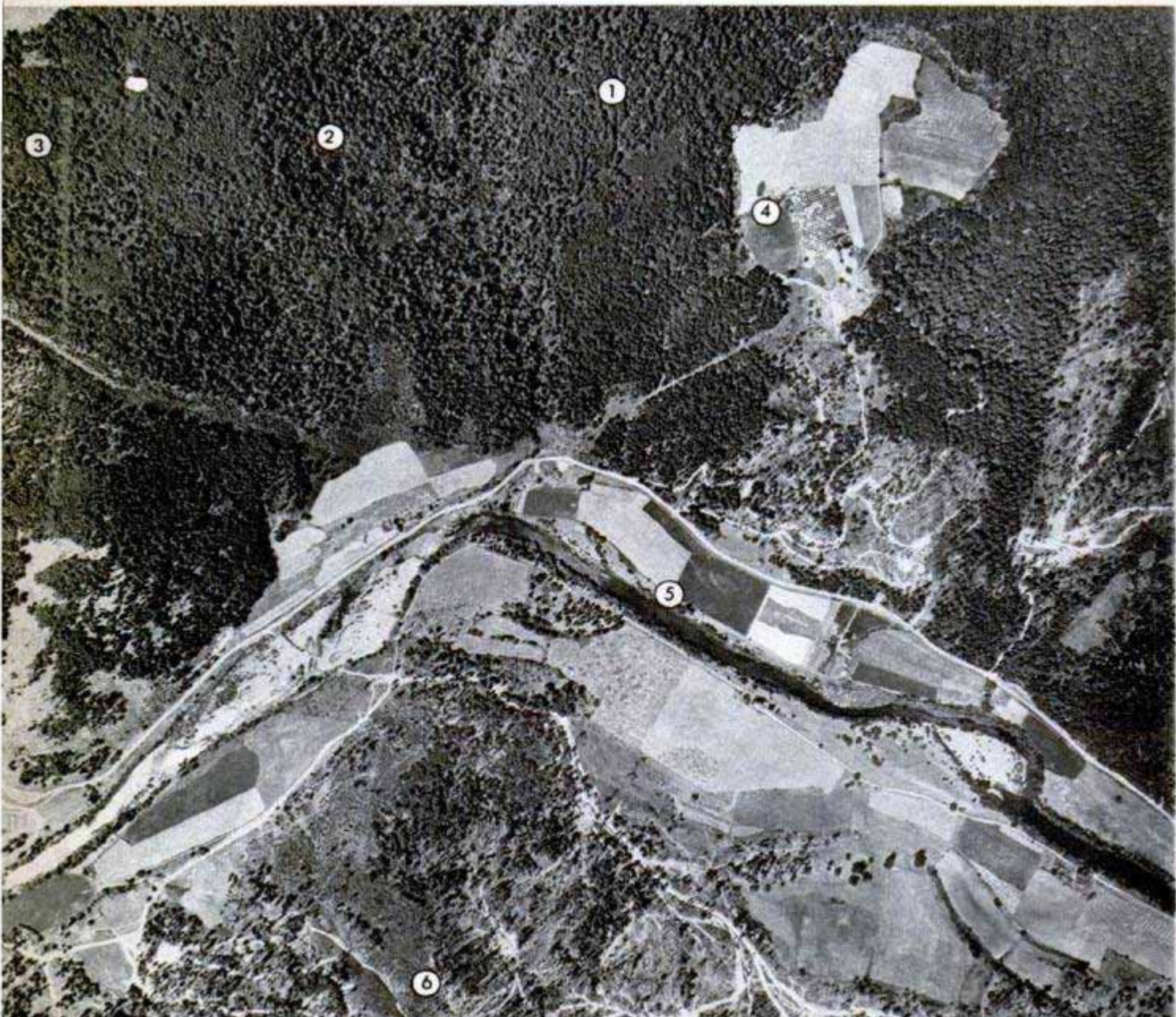
Producing cones in its third growing season, from one to three years in advance of natural seedlings, a fertile hybrid pine may soon fill the nation's need for vigorous, fast-growing timber.



# ***Comes the Flying Assessor***



Above, field-checking an aerial photo. Below, a typical photo used by assessors. Key to the numbers: 1—Half-grown Douglas fir. 2—Mature timber. 3—New growth. 4—Farm. 5—Fertile bottom land. 6—Cut-over timber



There's no place to hide down there when Oregon's assessors ride the sky, their aerial cameras gathering pictorial data in black and white for the tax commissioner

By

**Wallace S. Wharton**

**Member, Oregon State  
Tax Commission**



This photo of farm land has been divided into 40-acre squares and classified

**A**T A COST of less than a nickel an acre, Oregon tax assessors are reappraising the state's 61 million acres with the help of flying cameramen. Aerial photographs provide an accurate and up-to-date inventory of forest and farm lands, an inventory that disgruntled taxpayers can examine if they feel assessments are unfair. There's no way to argue down the camera's eye: the facts are there in black and white—buildings, improvements, tilled land, forests, wasteland and water areas.

Oregon's counties are big—so big that state officials estimate it would take about 52 years to reappraise the land by conventional ground inspection. The 36 counties range in size from 424 to 10,132 square miles. Ten counties spread over areas in excess of 3000 square miles each and only 9 of the 36 are under 1000 square miles in area. Each of 17 counties in the state has

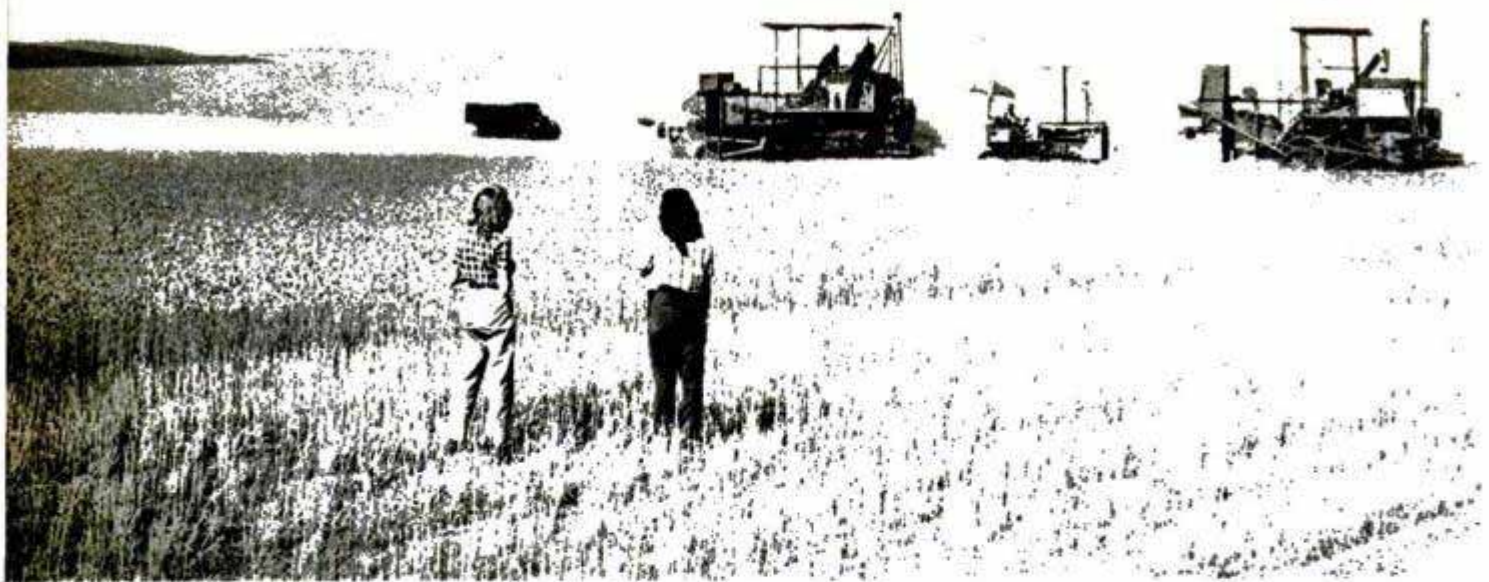
more land area than the state of Delaware.

During the depression days of the '30s, county budgets were cut and appraisals neglected. In several counties, basic appraisals remained unchanged for 20 years. The state's population zoomed between 1940 and 1948, increasing 41 percent to bring about a marked change in land usage. The terrific demand for lumber during and after the war resulted in feverish cutting activity in the forests. The whole face of the state changed and the appraisals were hopelessly outdated. State tax authorities decided a complete reappraisal was necessary. The problem of reappraising the whole state quickly and accurately enough to prevent unfair assessments had to be solved.

Studying military techniques of aerial photography, the tax experts decided the only way to do the job was by air. All

**Range land like this in southeastern Oregon is quickly and accurately appraised by the aerial-photo method**





available aerial photographs were indexed and studied for possible use. Many federal agencies had already taken aerial surveys of the state's forests, rivers and shore line. To fill in the gaps, new pictures were ordered from private companies.

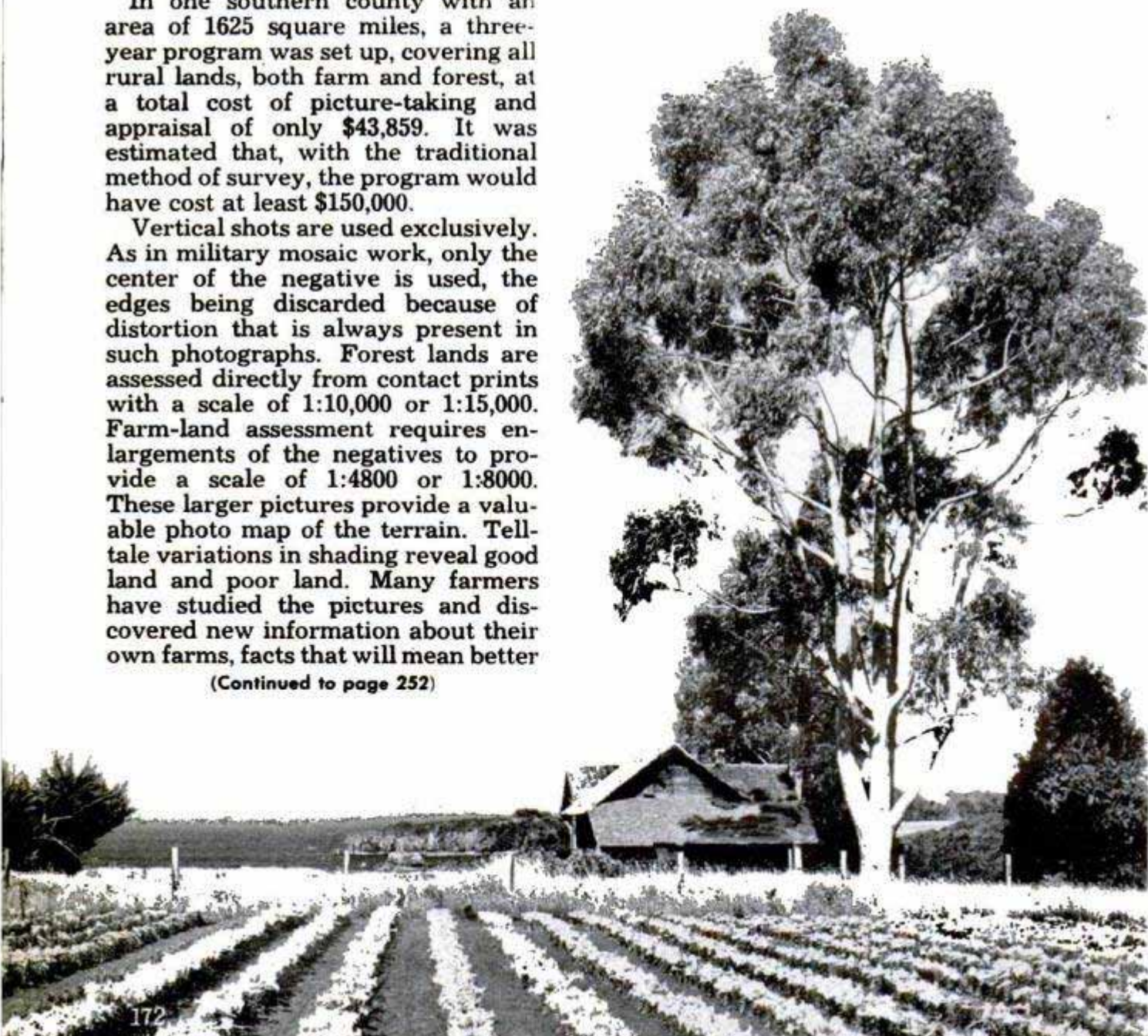
In one southern county with an area of 1625 square miles, a three-year program was set up, covering all rural lands, both farm and forest, at a total cost of picture-taking and appraisal of only \$43,859. It was estimated that, with the traditional method of survey, the program would have cost at least \$150,000.

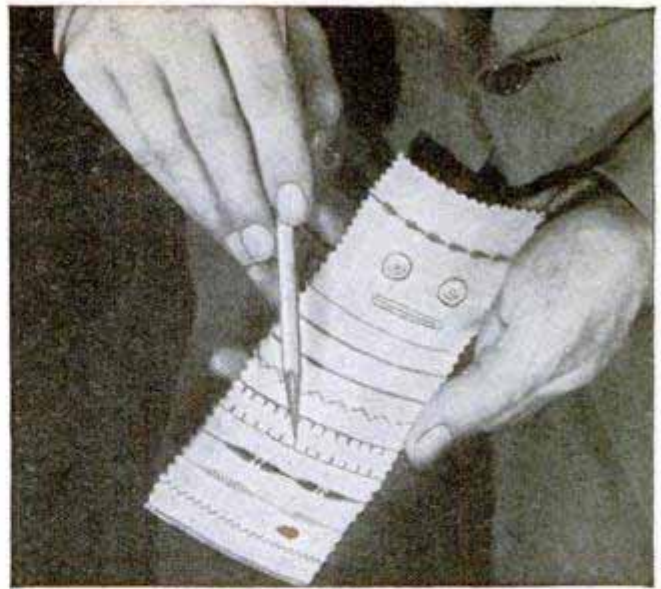
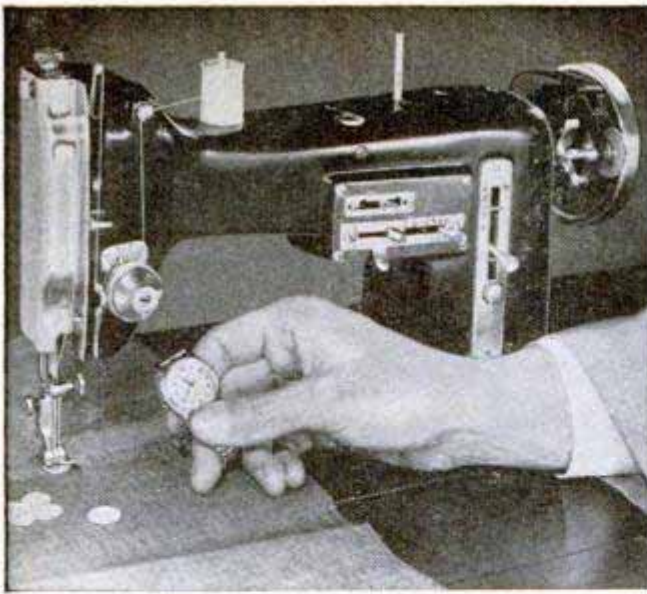
Vertical shots are used exclusively. As in military mosaic work, only the center of the negative is used, the edges being discarded because of distortion that is always present in such photographs. Forest lands are assessed directly from contact prints with a scale of 1:10,000 or 1:15,000. Farm-land assessment requires enlargements of the negatives to provide a scale of 1:4800 or 1:8000. These larger pictures provide a valuable photo map of the terrain. Tell-tale variations in shading reveal good land and poor land. Many farmers have studied the pictures and discovered new information about their own farms, facts that will mean better

(Continued to page 252)

To scout around a ranch this size, the assessor would need seven-league boots—or a plane. This rancher grows wheat

Below, this lily-bulb farm on the shore of the Pacific is an example of intensified cultivation on high-priced land





Above, machine can sew on a two or four-hole button in four seconds. Above, right, on this piece of cloth are some examples of the different stitches the machine makes. Right, milady can embroider her dresses

### Sewing Machine Sews on Buttons

Because its needle can be adjusted to zigzag, an Italian sewing machine makes buttonholes and does applique and monogram work. It also sews on buttons, entering first one hole and then the other. Powerful enough to sew through four thicknesses of shoe leather, the machine sews forward and reverse, over basting pins and does over-edging, such as the stitch used on carpets. Another setting permits the seamstress to make fancy embroidery. Three levers control the needle, eliminating the need for attachments. The sewing machine is distributed nationally in this country.



### Counterfeit-Money Detector

Counterfeit bills are detected quickly by an instrument resembling a telephone dial. Made of Beetle plastic, the dial has numerical designations opposite the finger holes. The user merely dials the numbers that appear on the suspected currency. An alphabetical series then appears on the dial. If the bill in question does not bear the same letters, it is counterfeit.

### Frozen Eggs in the Shell

Fresh eggs stay fresh longer when they are frozen in the shells. A new process, invented in Louisiana, makes it possible to freeze the egg without breaking the shell. The trick of the process is the evaporation of a small amount of the water inside the shell prior to freezing. The water is removed through the porous shell by dehydration, leaving space within the egg for the expansion that accompanies freezing.



## Glass-Fiber Dinghy

Weighing only 30 pounds, a six-foot sailing dinghy molded with four layers of glass fiber is being made by a California boatbuilder on an experimental basis. The hull, which is only  $\frac{1}{8}$  inch thick, is translucent and will not crack. It requires no paint or other maintenance. An elongated skeg runs the length of the bottom to serve as a keel.

## "Noiseless Sound" Opens Garage Door

Without getting out of your car you can open garage doors with sound you cannot hear. No wiring, switches or electric eyes between the car and the garage are required. In addition, lights inside or outside the garage are turned on. To operate this ultrasonic door opener, a push button on the car's dashboard is pressed. The button is connected with the vacuum system, which blows a whistle so high in pitch it is inaudible. A microphone mounted on the garage door picks up the sound, which is relayed electronically to a mechanism that opens and closes the door.

## Progress of Oil in Pipe Line Marked by Radioactive Tracer

When a radioactive barium isotope is introduced into a sample of oil, its progress through miles of pipe line can be followed accurately with a Geiger counter. Held alongside the pipe, the counter sends out

a signal when the radioactive oil passes. It is expected that this method will prove valuable since location of a particular sample aids the efficient movement of various crudes at the refinery.

## Mower DeLuxe Even Has Radio

Mowing his one-acre lawn is no back-breaking chore for Joe Reynolds of Clinton, N. C. He does it in comfort with a power mower that he has equipped with an electric fan, umbrella, radio and cigarette lighter. All these accessories are mounted on the sulky-type trailer on which he rides as he mows.



☞ Milkmen deliver 60 million quarts of fresh milk daily in the U. S.



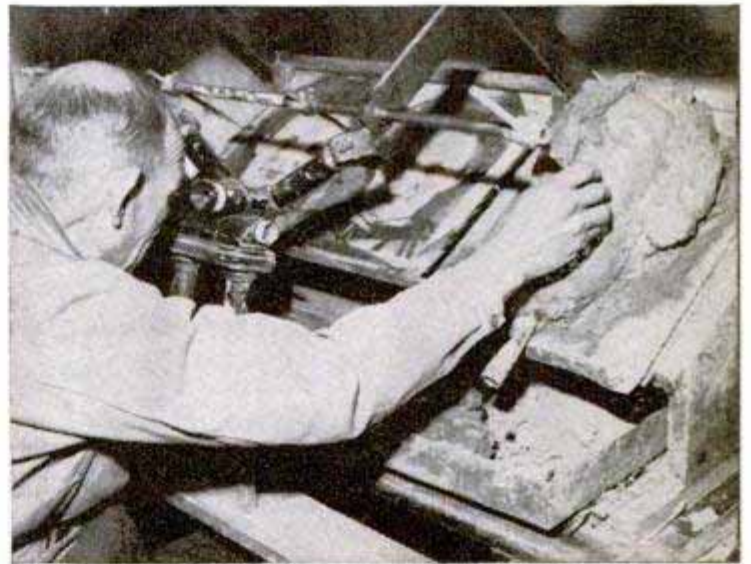


Above, the German inventor photographs the subject with a pair of cameras. Right, a grid, projected on the model's face, provides guide lines on the photographs. Below, by looking through a stereoscope, he models a clay portrait



## Mechanical Sculpturing

Sculpturing in clay requires no artistic talent with a mechanical system developed by a German engineer, who turns out clay likenesses at about \$27 each. Stereoscopic photographs, taken simultaneously with two cameras, guide the sculptor as he works the clay. A screen, projected on the face of the model as the photographs are made, divides the pictures into grids, used for guiding the pointers. By looking at the two photographs through a stereoscope, the inventor, Curt Bayerlen, gets a three-dimensional view of the model and by tracing the grid lines with the pointers, he reproduces the features in plastic clay.



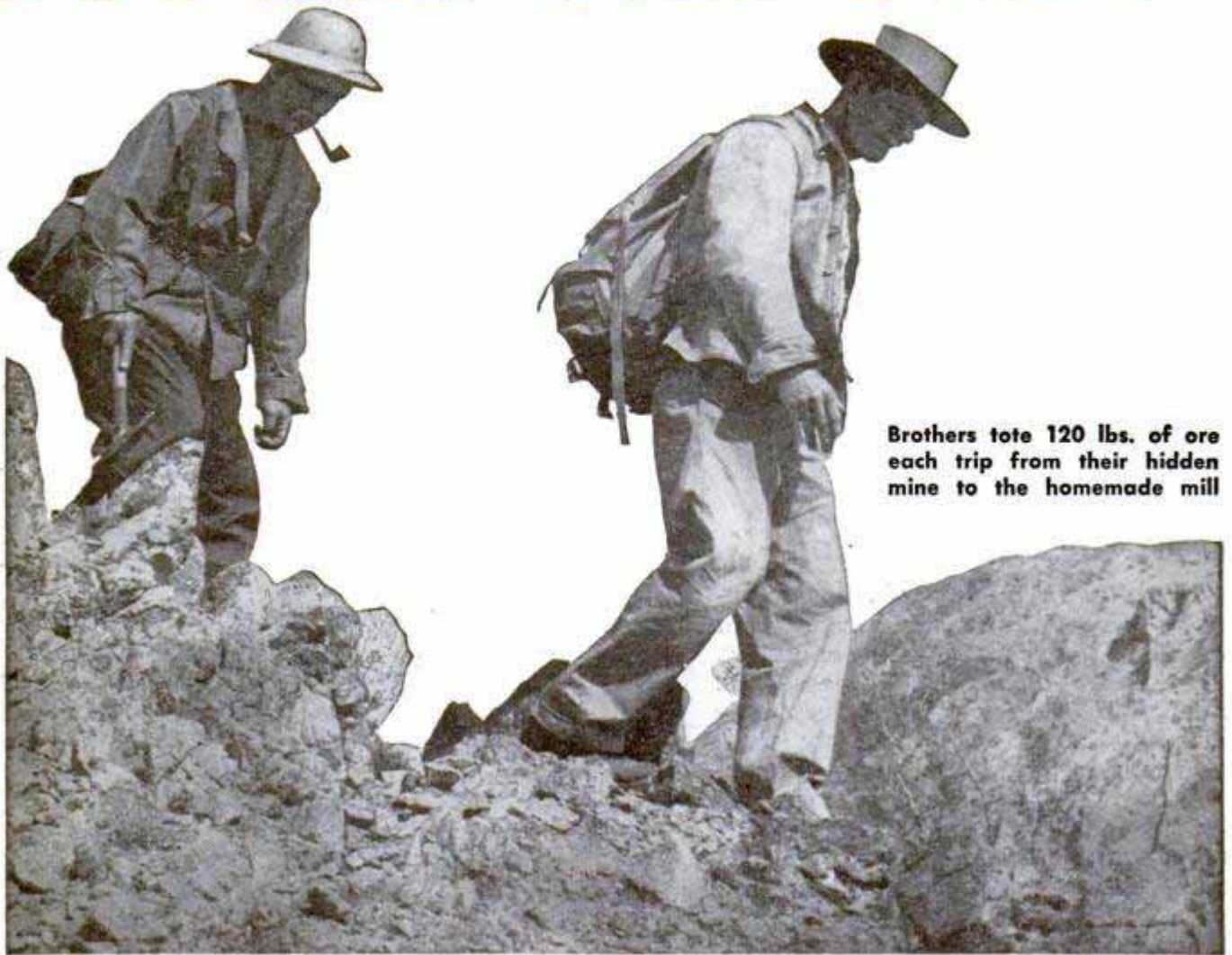
## Army Cargo Launch Is Assembled From Three Sections

Designed so that it can be knocked down into three sections for air transportation, an army cargo launch has an upswept bow for easy beaching. The three sections are quickly assembled with eight bolts. The stern section, which has a 60-horsepower

engine, can be used separately to move rafts and barges if desired. Especially designed for use in shallow water, the boat draws 24 inches with a 5000-pound load and travels up to 10 miles an hour. All aluminum, it weighs about 3200 pounds.



# TWO-MAN GOLD STRIKE



Brothers tote 120 lbs. of ore each trip from their hidden mine to the homemade mill

Below, Art installs distributor from their old car on the motor of milling machinery they improvised

By Gene Segerblom



ON A LONELY BEND of the Colorado River, Ed and Art Schroeder have pieced together a Rube Goldberg contraption to grind raw ore into pay dirt.

In fact, their whole layout is one of the most unusual in mining annals. Where the ore—rich in gold—comes from, they keep a secret. But they do admit, and offer a gold-filled vial as evidence, that they have found a vein streaked with high-grade ore. It's not rich or plentiful enough, however, to go into large-scale mining. So, brothers Ed and Art hit on the idea of digging the ore out by hand, packing it over the rugged terrain to their camp on the river bank and milling it in a hand-made mill.

The mill is a conglomeration of machines salvaged from ghost mining towns in southern Nevada and northern Arizona. One two-cycle motor runs the three machines for the milling process. Each time they run the mill they have to add parts—spark plugs, distributor, coil and battery—stripped off their Model-A Ford.

After they get the ingenious machine

assembled and chugging, the raw ore is thrown into the "chipmunk," which breaks the large lumps into marble-size pieces. These lumps are put into a hopper and ground into pieces small enough to go through an 80-mesh screen. Finally, it is fed into a ball machine that beats it into powder from which pure gold is panned.

The pure gold is amalgamated with mercury and marketed in Salt Lake City, Denver and Los Angeles.

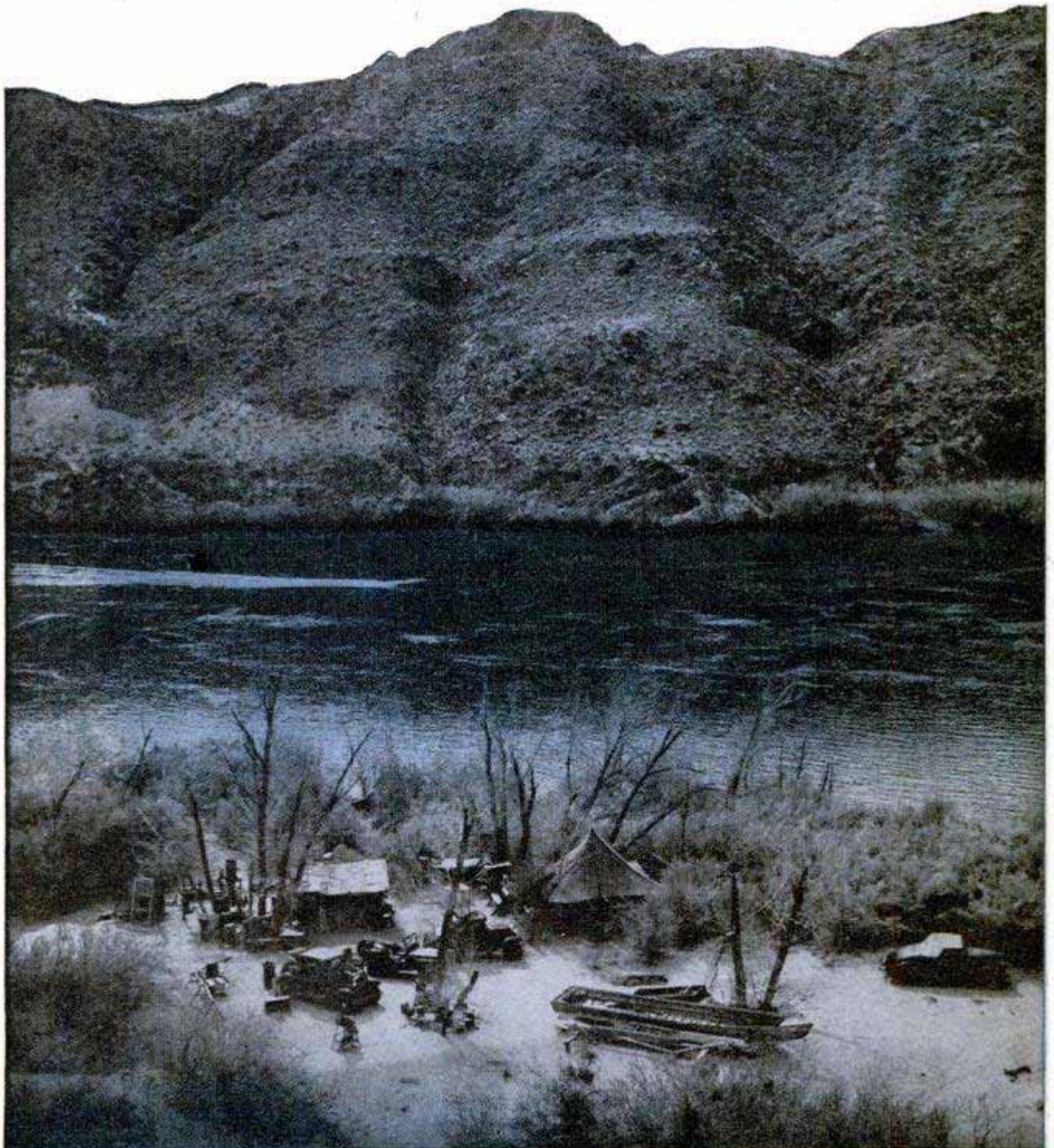
The Schroeders are reluctant about giving the exact location of the mine as it has not been patented. Under government regulations—the property lies inside the National Park Service's Lake Mead Recreational Area—a permit to mine is not nec-

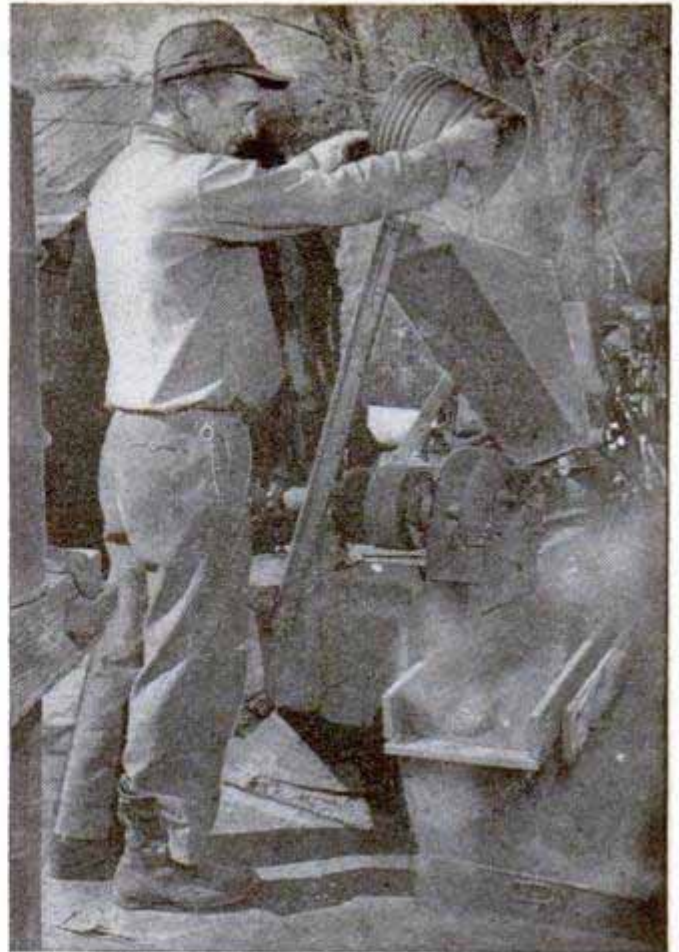
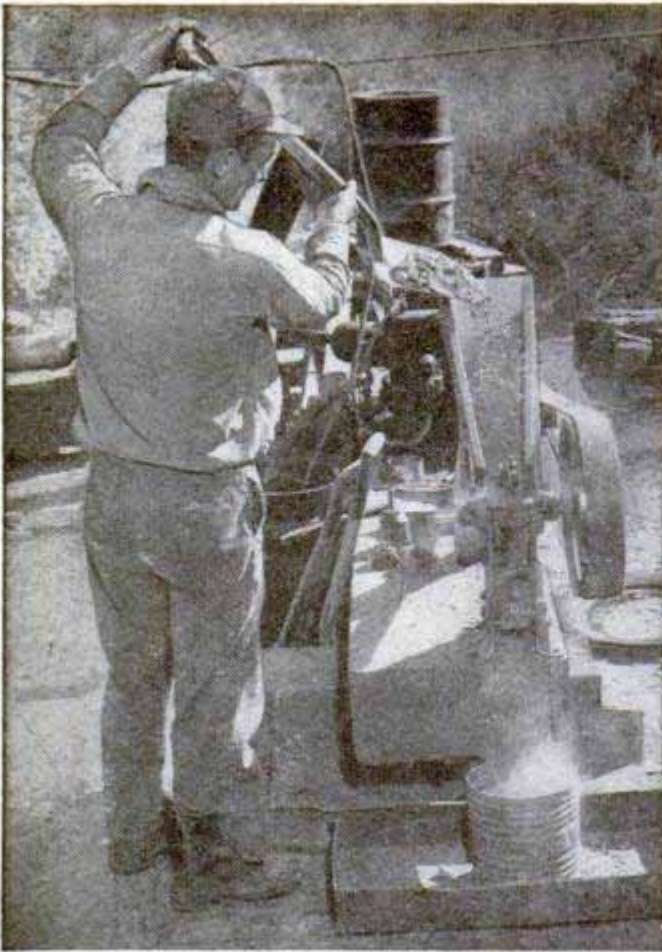
essary unless a permanent structure is erected at the site of the mine. And under Arizona mining laws, a mine claim is not surveyed for taxation unless patented, which means receiving ownership to the land where the claim is staked.

Of course, they can't buy the land as it belongs to Uncle Sam. Their mine, therefore, belongs to them only as long as they keep working it.

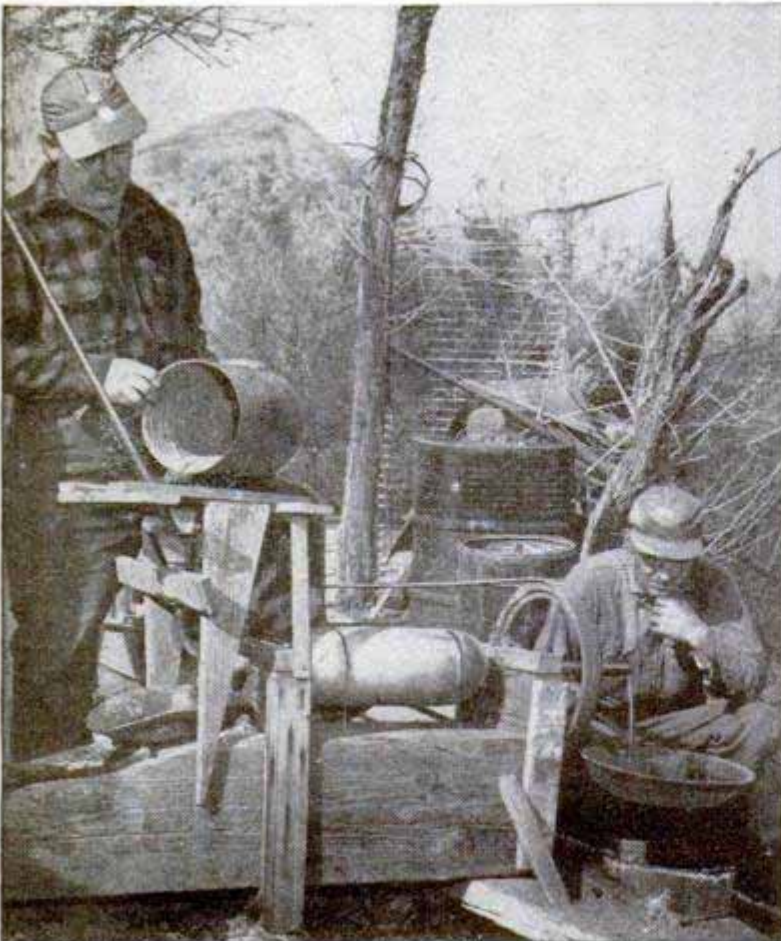
They do admit that their claim is several miles from camp, back from the river in the rugged, desolate mountains. The only path is the one their boots have worn by making the trip twice daily. It is rough going—hauling out the chunks of ore on their backs in Army-surplus packs.

**Mountaintop view shows Schroeders' camp on the Colorado, consisting of a tent, workshop and mill for gold ore**





Here is the machinery the Schroeders have built from parts salvaged from mining camps in Arizona and Nevada. Above, the "chipmunk" breaks large chunks of raw ore into marble-size lumps. Above, right, Art pours the lumps into the crusher which mills them into small pieces. Below, ball machine beats ore into a fine powder. Art holds the pan which collects the richest ore



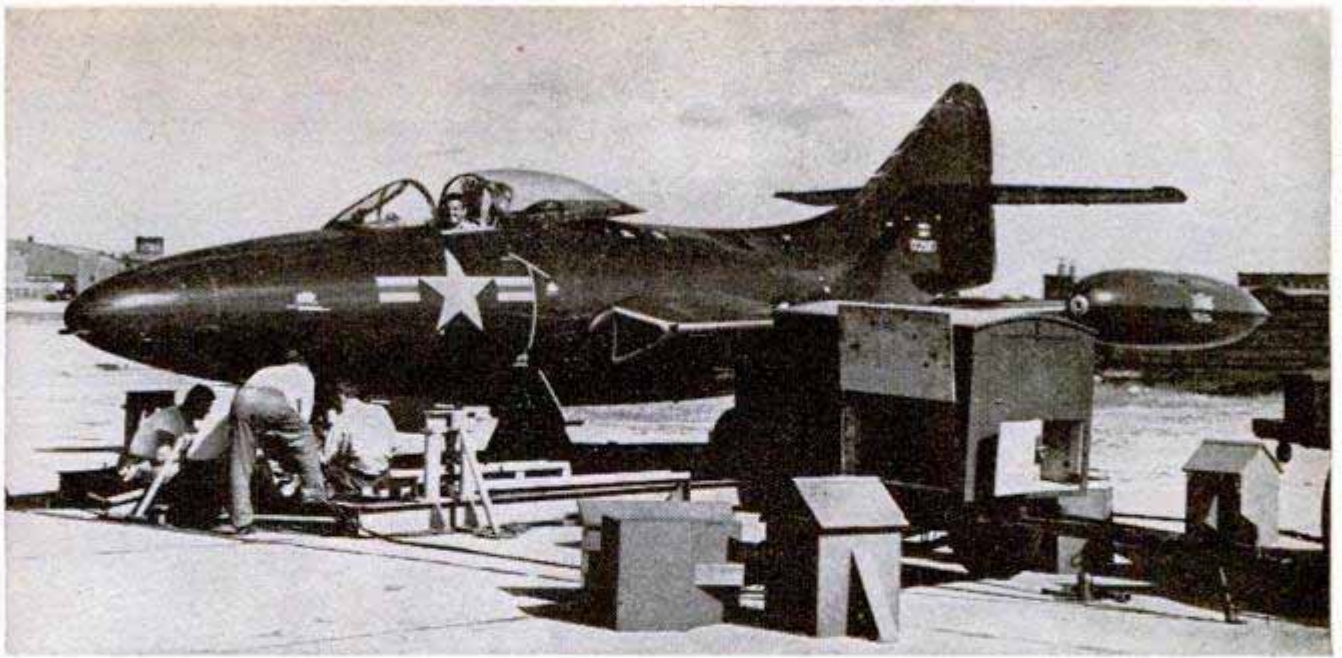
Ed and Art agree that the hodgepodge mill could handle eight tons of ore a day, if they could pack out that much from the mine. They each carry 60 pounds of ore a trip as it is.

Besides the mill, the camp consists of a dirt-floored tent which serves as "home," a wooden tool house and a desert cooler. They have a boat tied up on the river to use for catching some of the plentiful trout.

When they need to make a trip to town—the closest one is Boulder City, Nev., some 20 miles away—they stop operations and put the parts back in their automobile.

Before discovering this fissure vein about a year ago, the Schroeders spent 11 years searching for some of the gold dirt. They prospected along both sides of the Colorado River from Hoover Dam to Needles, Calif.

The only worry the busy Schroeders have now is the lake which is filling up behind Davis Dam below them. The waters of the lake will inundate their camp, but will the lake reach their mine claim? If it does, they will probably turn to panning for gold instead of digging.

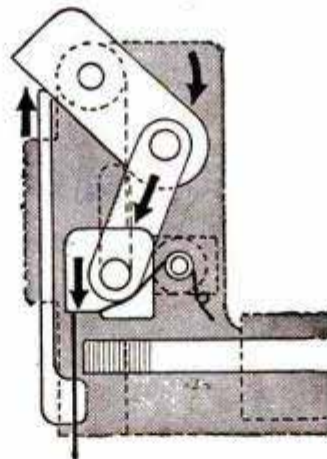
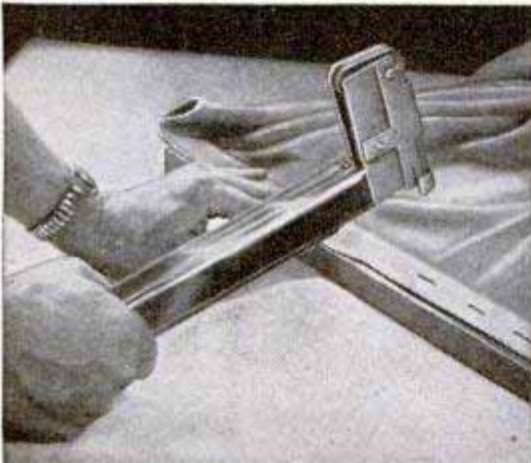


## Jet Fighter "Flies" Without Leaving Ground

Grumman Panthers "fly" without going anywhere, in a newly developed test-stand procedure. The Navy jet fighter is mounted on a suspension platform and operated

as if in free flight. Its full thrust is gauged by a Hagan meter, which measures the thrust by the compressed-air pressure required to hold the craft motionless.

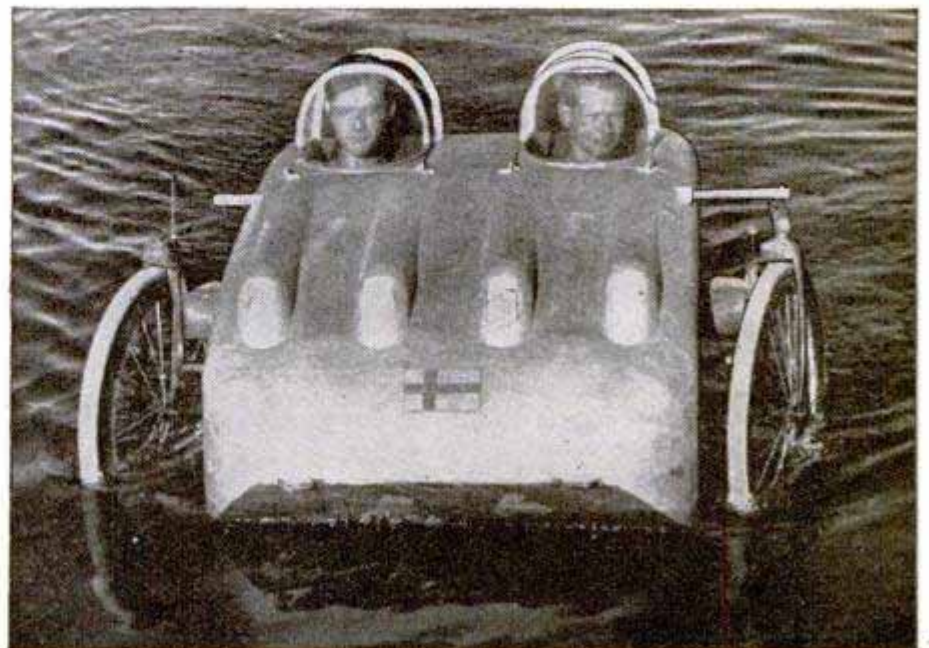
## Stapling Hammer Has a Whiplike Driving Action



Heavy wire staples are driven into hardwood, sheet aluminum and hard-board by a stapling hammer that has a whiplike action. By a linkage inside the hammer head, the power of the blow is multiplied to force the staple into hard materials. Another feature is a transparent handle cover, enabling the operator to see the staple supply.

## Amphibian Cycle Makes Sea Voyage

Crossing the Gulf of Bothnia from Finland to Sweden was just a "bicycle" trip to a pair of Finnish boys who made the 28-mile voyage in a homemade amphibian cycle. Only 1,120,000 cycle-steps were required. When they reach shore, the boys lower the wheels of the craft and it becomes a land vehicle.



Modern skyscraper elevators travel about 14 miles an hour.



Trailer, mounted on sled runners, holds 20 skiers and their equipment. Below, the ski-steered tractor climbs hills and crosses side slopes which have a grade of up to 30 percent. Another model has four driving pontoons



### Skiers Ride in Trailer Behind Snow Tractor

Skiers are carried up steep mountain slopes inside a runner-mounted trailer pulled by a snow tractor. The lightweight trailer holds 20 persons. The tractor slides along the surface, yet has tank tracks. The open-link track moves around a light pon-

toon. It digs into the snow to move the vehicle, yet the snow sifts up through the links to support the pontoon. Several models are available, some with two powered pontoons in the rear and runners in front, and others with four powered pontoons.

### Radioactive Materials Show How Food Moves Up Tree

Radioactive isotopes are being used by the Department of Agriculture in experiments to discover how plant food moves through a tree. Holes are drilled in the tree trunk and chemical salts plus a radioactive phosphorus solution are inserted. Samples of the leaves, stem, wood, bark and roots then are taken from the tree. The experiments show that the radioactive substance

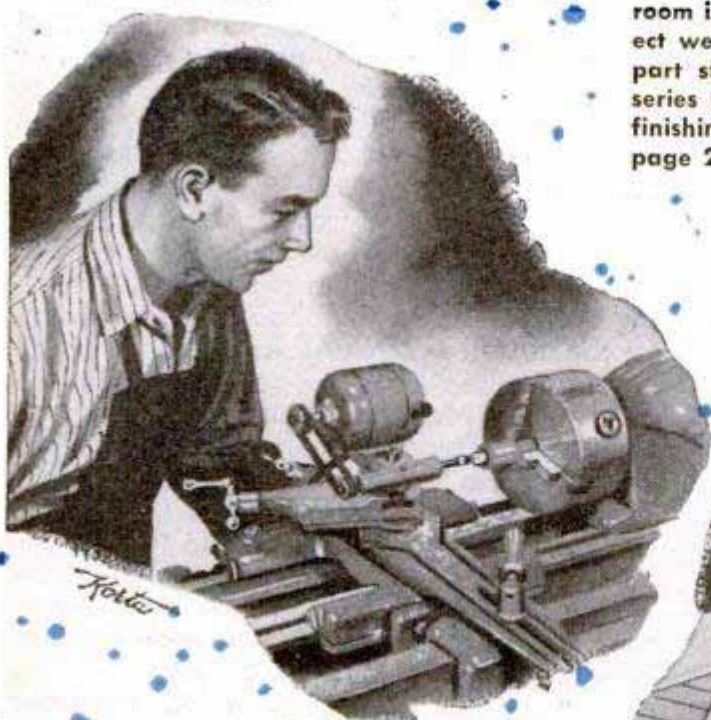
moves rapidly immediately after it is injected, and the movement is largely upward and outward. More of the substance is found in the upper part of the tree than the lower part. Experiments on pecan trees showed traces of the substance in the nuts.

☐ Diesel railroad locomotives are now being manufactured at the rate of 1800 a year.



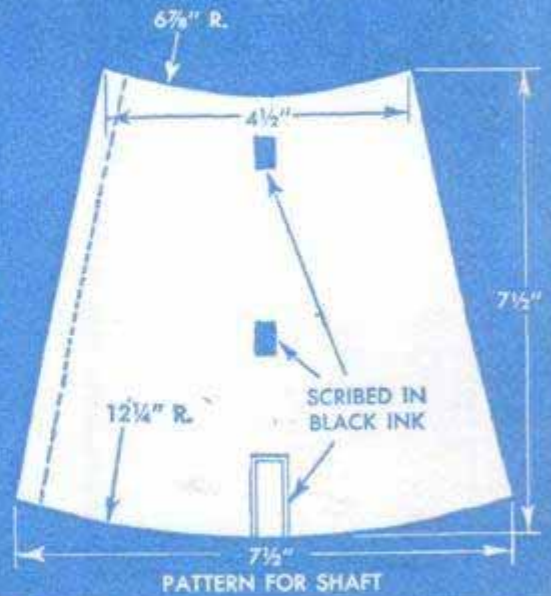
## The *Craftsman*

★ Stunning, isn't it? But even more so when you see this modern living-room furniture in full color on page 190. It's our third article in a series on home-built furniture for every room in the house. Easy to build and upholster, it's a project we are especially proud to present. Beginning a two-part story, Part I details the cabinetwork. ★ The timely series on home upkeep continues with an article on floor finishing and repair, page 204. ★ Shop story of the month, page 226, deals with internal and external lathe grinding



# TABLE-TOP LIGHTHOUSE

FLASHES  
ON AND OFF

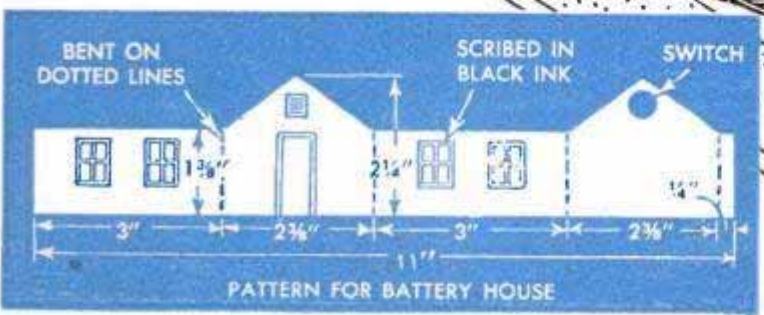
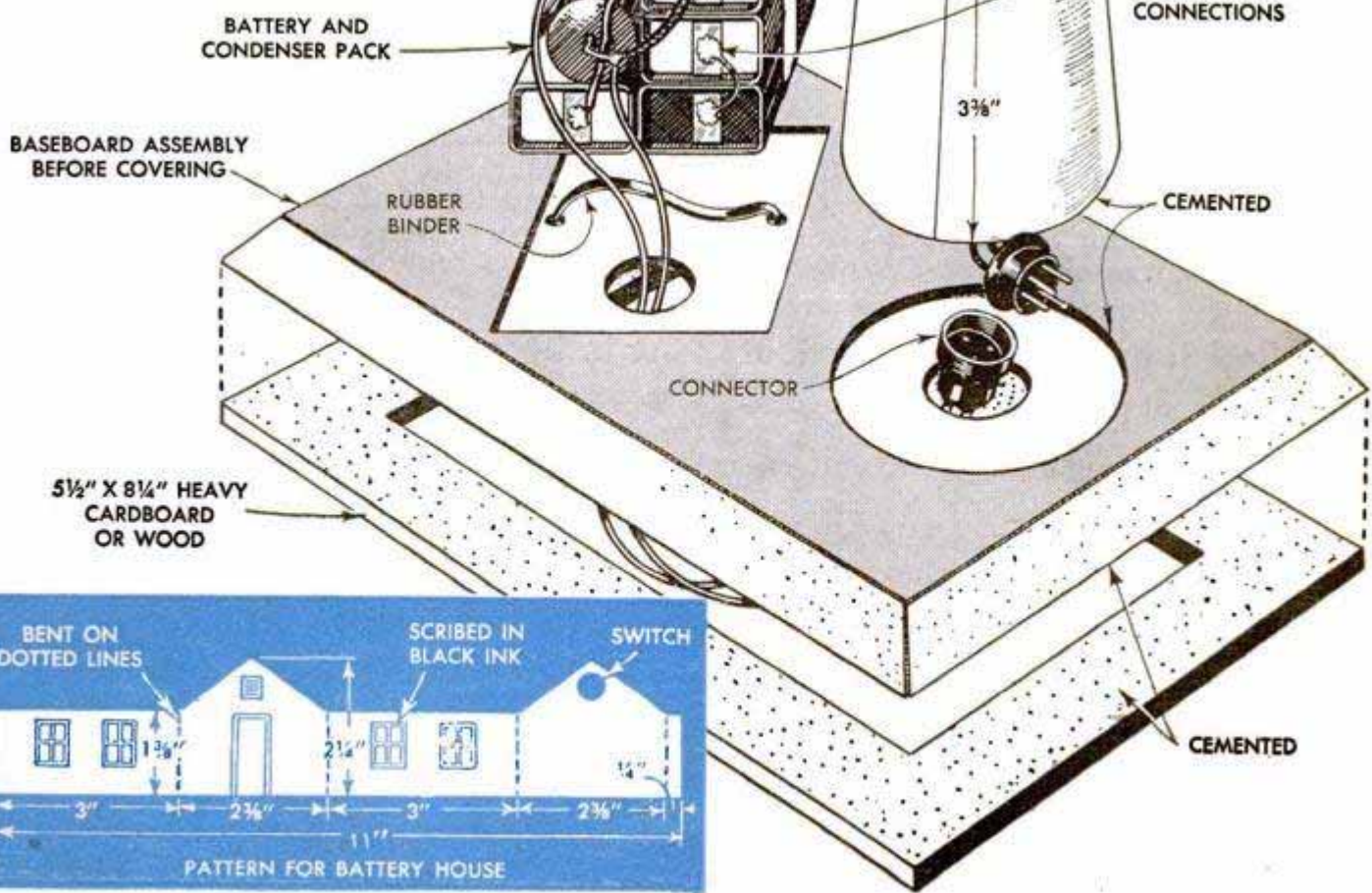
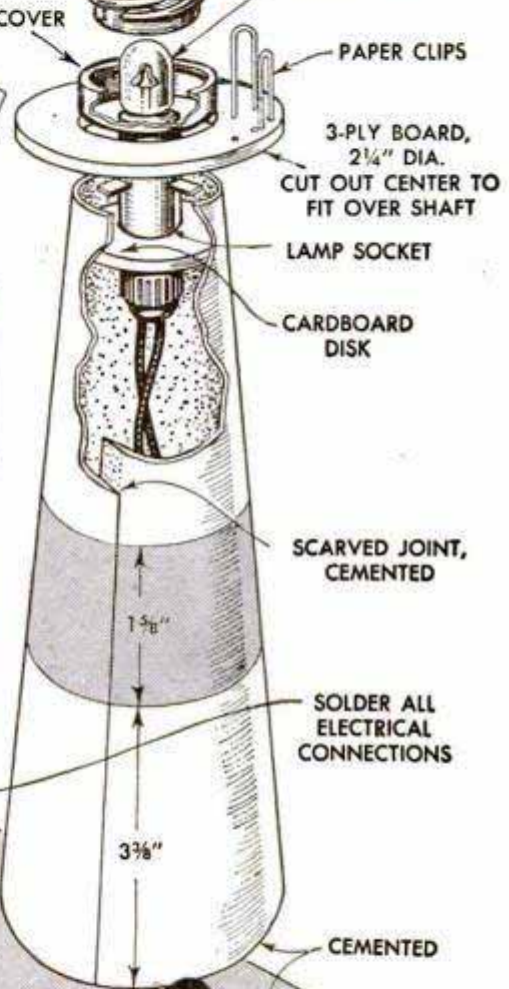
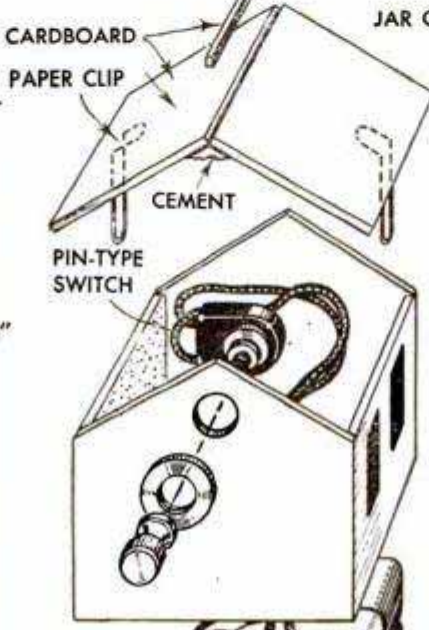
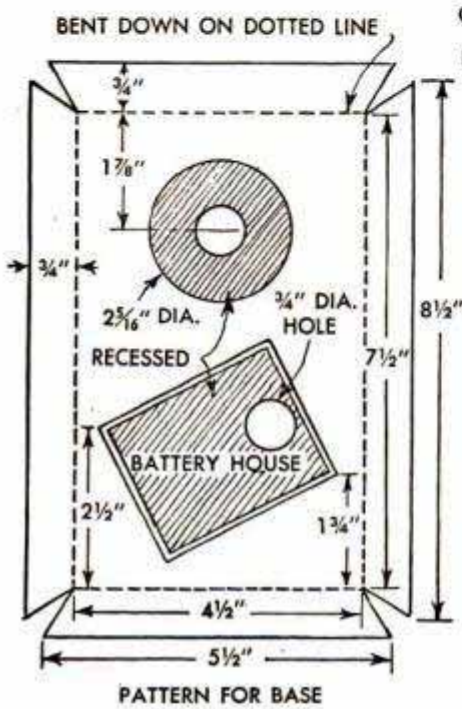
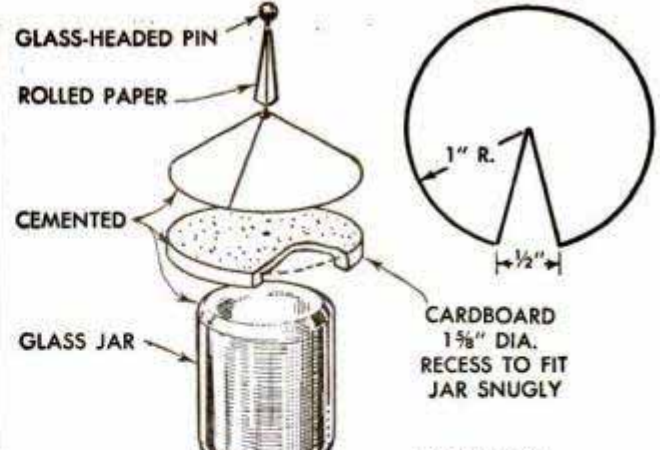
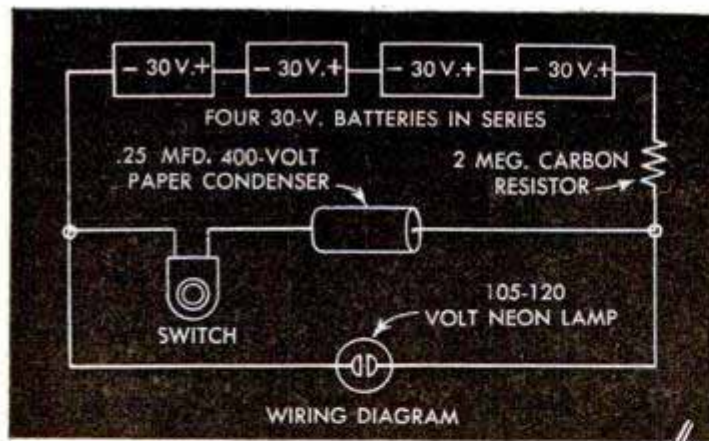


By  
*Douglas Rolfe*

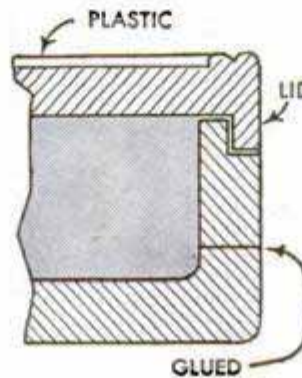
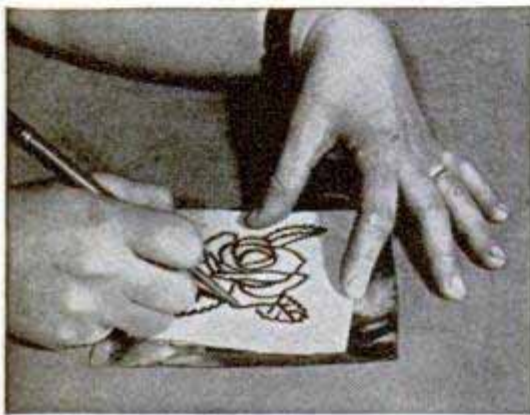
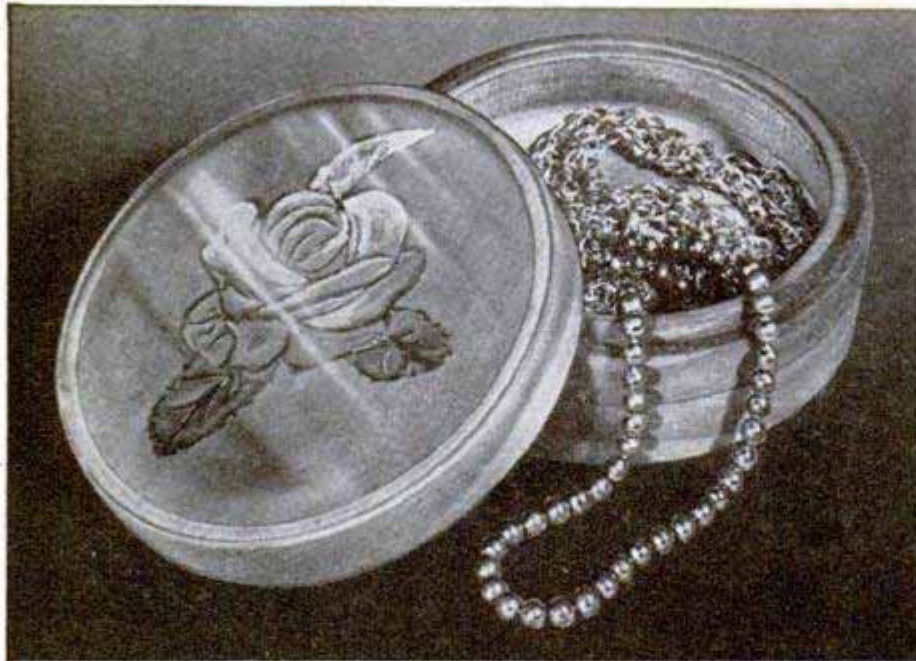
**T**HIS TINY lighthouse with its friendly, flashing light appeals to children because of its realism and also to grownups with a liking for authentic miniatures. The light is operated by a power pack consisting of a condenser and hearing-aid batteries of specifications given in the wiring diagram. No flasher unit is used. Due to condenser build-up and release of current, the lamp alternately reaches full brilliance and fades in a continuous, uniform cycle. Nearly all parts of the lighthouse, base and the keeper's house, which houses the power pack, are made from heavy cardboard. Artist's 3-ply illustration board is just right. Make the column for the lighthouse first, following the pattern detailed on the opposite page. Overlapping edges of the piece are scarved so that they will join smoothly without a raised edge. Use model-airplane cement in joining all the cardboard parts. Glue in the disk which supports the double-contact lamp socket

(taken from an auto taillight assembly) and then assemble the circular gallery, or catwalk, as indicated, using paper clips to form the railing. The jar cover is cemented into an opening cut in the disk. Assemble the conical top and the spire and cement securely to the bottom of the glass bottle, or jar, which serves as a light globe. Cut the battery house from cardboard, following the pattern on the opposite page. Bend on the dotted lines and cement at the joint. Note that the roof is loose so it can be lifted off intact. Make the base according to pattern and glue cardboard to the underside to form recesses for the lighthouse shaft and the battery house. Install the battery pack and then complete the wiring. The conical lighthouse roof, band on the lighthouse shaft and the battery-house roof are red. Windows and doors are simulated by lines drawn with black ink. Other parts are left white. Apply a heavy coating of cement to the base, sprinkle sand over the cement and place several carefully selected pebbles to simulate rocks. Brush off loose sand after the cement sets.





## Jewelry Box Turned From Dark Hardwood Is Ornamented With Tooled Gold Rose



Turned from a dark-colored hardwood this attractive jewelry box is decorated with a tooled gold rose set under an in-laid top of transparent plastic. The box is essentially a hardwood ring sandwiched between two disks. The ring is glued to the bottom disk which is recessed in the lathe and a rabbet is turned around the edge of the ring to fit the extended lip of the lid. The lid is turned from the other disk and recessed as shown in the detail. By using a paper pattern and the rounded end of a penholder or watercolor brush, the rose is tooled from gold foil or metallic wrapping paper. The recess in the lid is varnished to darken it and, after the varnish dries, the rose is glued in place. Then a sheet-plastic disk is set in the recess and cemented around the edges with transparent plastic cement. Wooden parts of the box are given a hard wax finish. — Elma Waltner, Hurley, S. D.

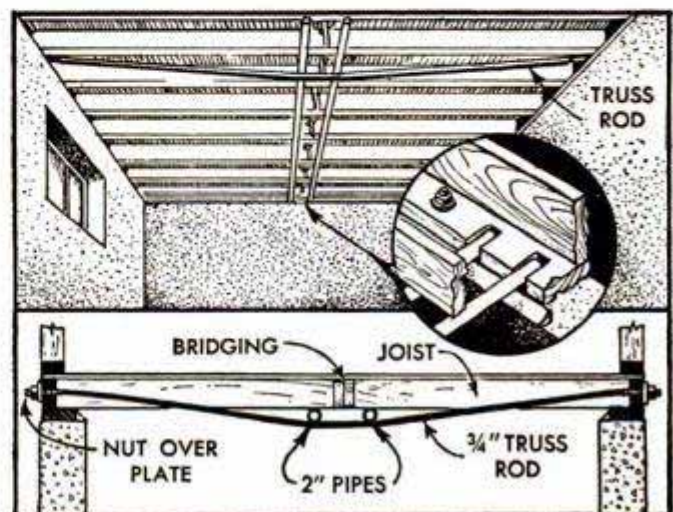
## Simple Formula for Waterproofing Outdoor Blankets and Woolen Clothing

To be fully prepared for all kinds of weather when camping out on fall hunting or fishing trips, waterproof your blankets, woolen shirts, trousers and sweaters with a formula consisting of anhydrous lanolin, 4 oz., and white gasoline, 1 qt. Dissolve the

lanolin in the gasoline, making enough of the solution to submerge the clothing and soak the fabric for five minutes. Without wringing out the cloth, hang it in an airy place to dry. When the gasoline evaporates, the wool will be waterproofed.

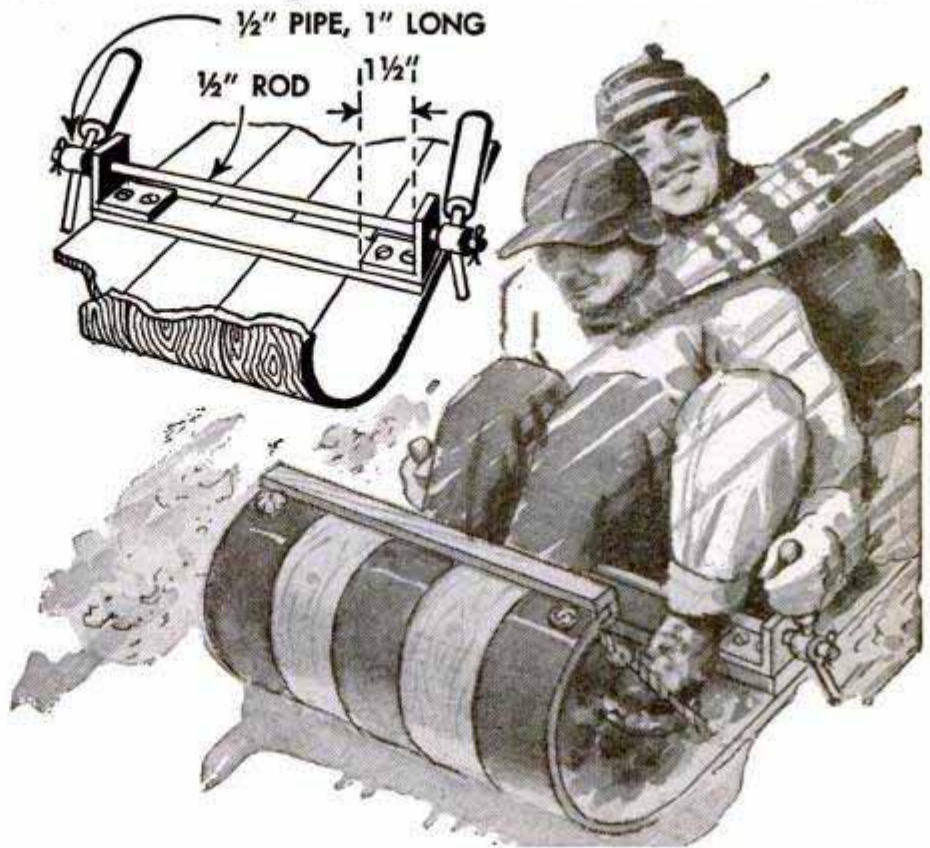
## Truss Rod Supports Floor to Eliminate Post in Basement Recreation Room

If a basement post makes the space useless for a recreation room, the post can be removed and the floor braced with two lengths of pipe and a truss rod. Two lengths of 2-in. pipe are placed parallel from wall to wall across the joists. Notches are made in the sills to take the ends of the pipe. Then a  $\frac{3}{4}$ -in. truss rod, placed parallel to the joists at the center of the room, is inserted through holes drilled in the boxing. Steel plates and nuts over each end of the rod are used to draw it tight from the outside of the house. If the room is more than 16 ft. long, it is advisable to use two truss rods to provide sufficient support.



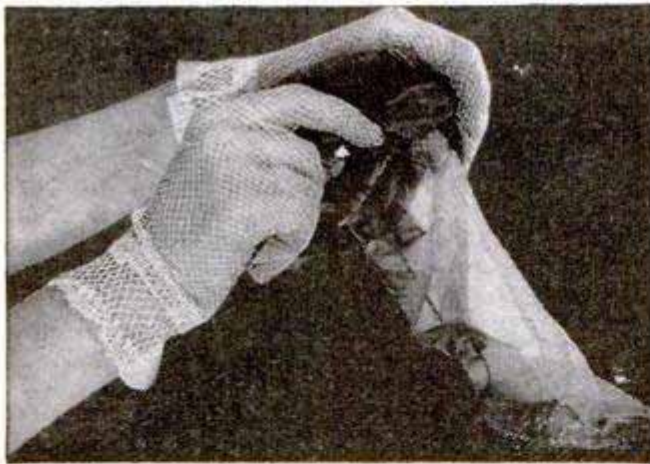
Not only can you slow down a toboggan or bring it to a complete stop in a hurry with this novel pair of hand brakes, but, by braking one side or the other, you can steer either right or left. The brakes are attached to the front batten of the toboggan with two angles made from flat iron. Holes are drilled in the horizontal legs of the angles to permit fastening them to the batten with screws, and the upright arms are drilled to take a 1/2-in. iron rod several inches longer than the width of the toboggan. A small hole is drilled through the rod near each end. Cotter pins inserted in these holes secure the braking levers to the rod. The two levers are made identically, each consisting of a 1-in. length of 1/2-in. pipe which serves as a bearing. To this an 8-in. length of rod is welded to provide a handle. Then a second rod, approximately 6 in. long, is welded to the pipe at an angle of about 120 deg. to the handle. This rod does the actual braking.

## Hand Brakes Mounted on Sides of Toboggan Permit Both Speed and Directional Control



Wooden or rubber grips are fitted to the handles and the unit is assembled so that pulling back on the handle causes the braking rod to dig into the snow.

W. B. Shumilak, Islington, Ont., Can.



## String Gloves Protect Nylons

When putting on a pair of sheer nylon hose, wear a pair of summer string gloves to keep the fingernails or any slight roughness on the fingers from snagging the material. Although ordinary fabric gloves will do as well, the string gloves are easier to slip on and remove, and afford similar protection to the stockings.

☐ To warm the baby's bottle while driving, make a simple basket frame out of wire to hold the bottle in front of the car heater.

## Hole Stops Crack in Car Window

Noticing that a small crack in his car-door window grew larger day by day, one man halted the progress of the crack by drilling a 1/8-in. hole at its end. He used an ordinary twist drill lubricated with turpentine and, as only one layer of the glass was cracked, he stopped drilling when the plastic center of the pane was reached. Then he filled the hole with colorless nail polish to keep out moisture. Should both layers of glass be cracked, a hole can be drilled from each side, stopping the drill at the plastic center and filling both of the holes with colorless nail polish. — John Gaughan, Niagara Falls, N. Y.

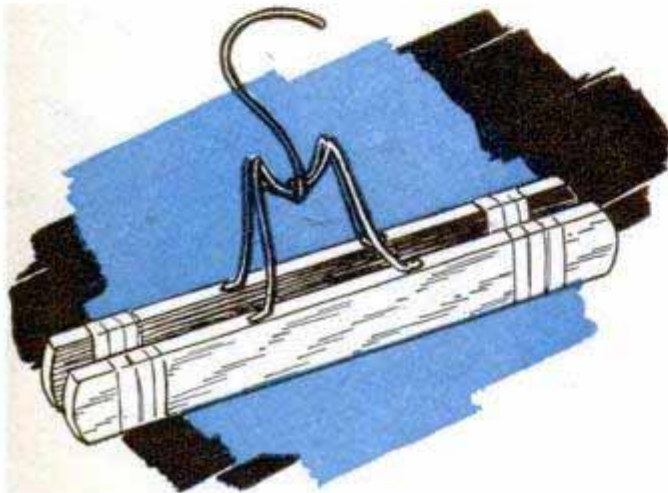


☐ An oil spot on a rug can be removed if a clean blotter is laid directly over the spot and pressed with a moderate hot iron. This procedure is repeated until all the oil has been absorbed from the rug.

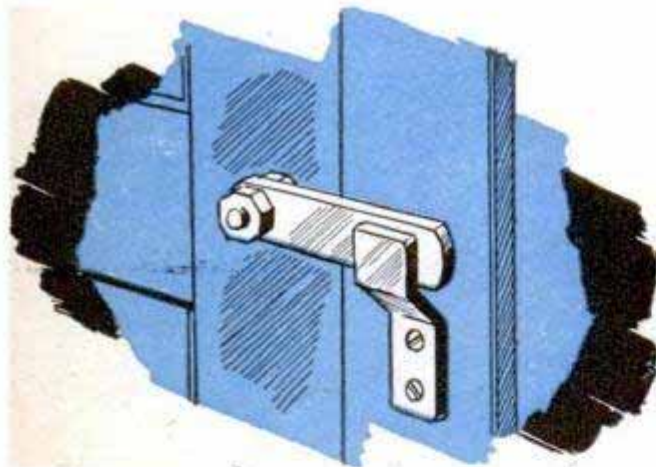
# Solving -



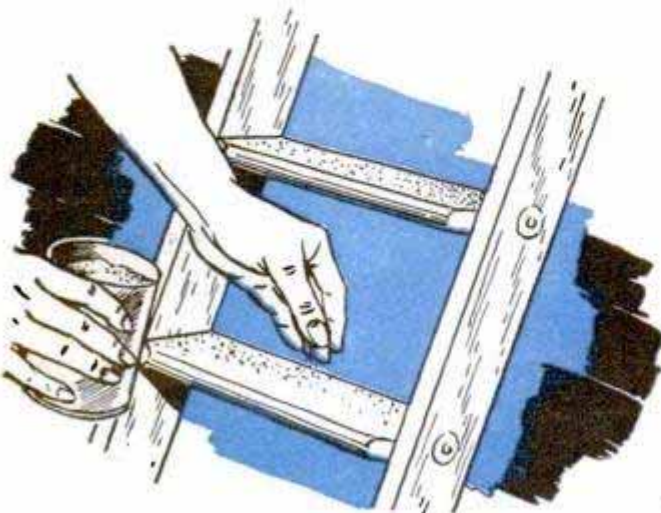
**OPENING MACHINE-MADE BUTTONHOLES** is done quickly and accurately with a razor blade and a wooden clothespin. Place the slotted portion of the clothespin directly under the buttonhole and cut the threads with the blade. In this way, the cloth or work surface under the buttonhole will not be damaged



**LOOSE TROUSER HANGERS** that no longer have sufficient tension will clamp tightly if the ends are wrapped with strips of cloth. Cut four strips about 1 in. wide and wrap one of the strips around each end of the hanger. Then sew or pin the end of each strip to the wrapping to keep it from unwinding



**SAFETY LATCH FOR BATHROOM DOOR** is opened from outside in an emergency with a screwdriver. Bracket and bar are made from flat iron. The bar pivots on a small machine screw and is fastened to the screw with double nuts so that turning the screw from the outside will lift the bar out of the bracket



**NONSLIP LADDER STEPS** reduce the possibility of injury when using a stepladder to work around the home. The steps are made slip-proof simply by sprinkling coarse sand or sawdust over them after applying a fresh coat of paint or varnish. The sand or sawdust must be applied while the paint is still tacky

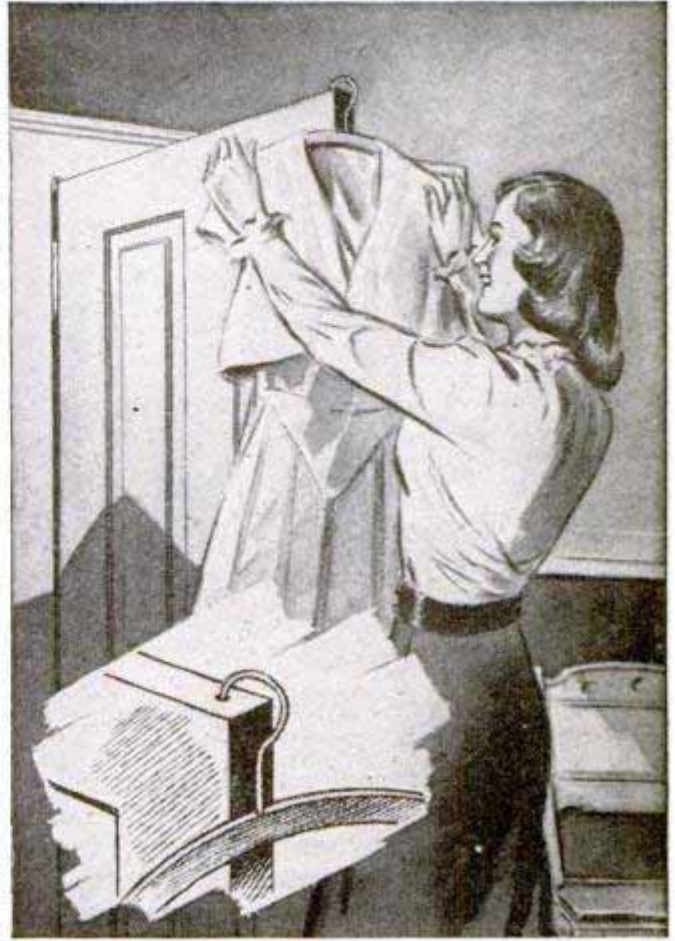
**THE TOP OF A PINEAPPLE** provides an attractive plant for the kitchen or sunporch. Cut the top from the fruit in the usual way and suspend the bottom portion of the foliage in a jar of water until roots begin to sprout. Transplanted in a flowerpot or decorative plant holder, plant will continue to grow



# - HOME PROBLEMS



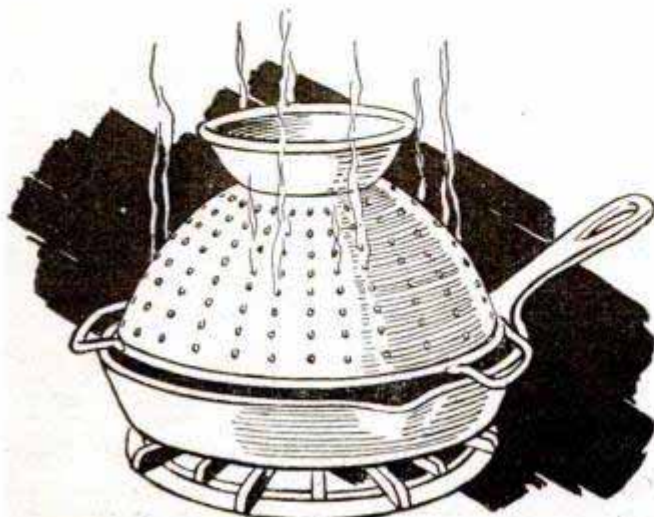
**WINDOW MASK FOR PAINTING SASH** is had by using a short length of metal Venetian-blind slat to protect the glass. The slat is flexible and its curved cross section allows the edge to be held tightly against the window pane, thus preventing the paint from seeping under the edge of the mask and smearing the glass



**WIRE COAT HANGERS SUSPENDED** from a door while pressing garments won't slip off if a hole for the hanger hook is drilled in the top of the door. Make the hole larger than the diameter of the hanger wire so that it is easy to locate. The hole is out of sight and does not mar the appearance of the door

**TO KEEP GREASE FROM SPLATTERING** from a frying pan when you are unable to find a pot cover of the right size, place an ordinary colander over the top of the pan. Inverted as shown in the drawing, the colander provides an effective cover that will prevent staining the range and protect your hands from burns

**IF A CLOTHES STICK IS NOT AVAILABLE** when dyeing garments, use spring-type clothespins as a substitute. The clamping action of the clothespins permits you to grasp the garment tightly without staining the fingers. Also, the garment is not likely to slip from pins and splash into the dye, staining your clothing



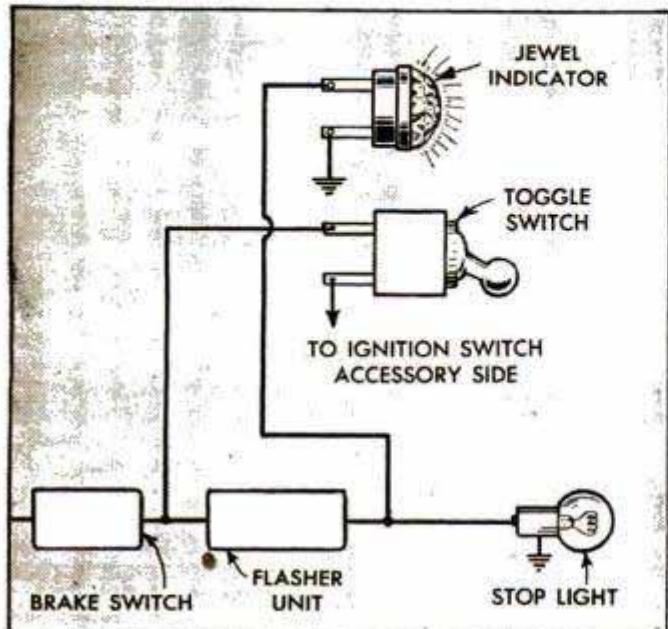
### Tire Traction on Slippery Pavement Gained With Asphalt Shingle



A few asphalt roof shingles, carried in the trunk of your car, will come in handy if the wheels spin when starting on hard-packed snow or icy pavements. A couple of the shingles placed under the rear wheels will provide the necessary traction to get rolling.—H. Leeper, Canton, Ohio.

### Switch Flashes Car Stop Light Without Applying Brakes

With a flasher unit and toggle switch wired into the circuit, a stop light can be used as a flashing warning light without applying the brakes. It is excellent for signaling an intention to slow down or stop



in heavy traffic or on slippery pavement and also is handy to caution approaching motorists if the car must be parked on the shoulder for repairs. The circuit is wired as shown and a radio-type jewel on the dashboard indicates when the light is on.

Richard Todd, Moundsville, W. Va.

### Beam Recharges Luminous Ring Painted Around Flashlight Lens

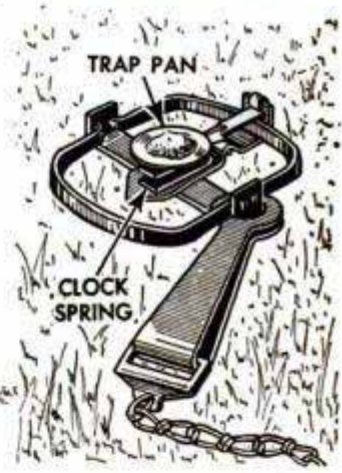
When marking a flashlight with luminous paint so that it can be found in the dark, apply the paint around the edge of the lens instead of on the barrel. The paint will then glow brightly over longer periods of time, as it is recharged whenever the light is used.



Gordon Wilson, Myrtle Sta., Ont., Can.

### Clock Spring Set Under Trap Pan Stops Tripping by Small Animals

One fur trapper, whose traps for large animals were frequently sprung by birds, squirrels and wood mice that were attracted by the bait, decided to put a stop to this loss of valuable pelts. First, he cut several 2 1/2-in. lengths from an old alarm-clock spring. Then, when setting a trap where small animals might trip it, he bent a length of spring to a U-shape and slipped the spring under the trap pan after setting the trap. Although the spring is stiff enough to prevent small animals from tripping the pan, a heavier animal will easily spring the trap.—R. A. Jenkins, St. Louis, Mo.



### Removing Paint From Fabric

Paint can be removed from fabric by softening it with turpentine and wiping with hot soapy water. Then fuller's earth, mixed with water to a pasty consistency, is applied over the spot. When dry, the fuller's earth is brushed off the fabric.

Store linen tablecloths by rolling them on a mailing tube. This will prevent wear at the creases which results from folding.



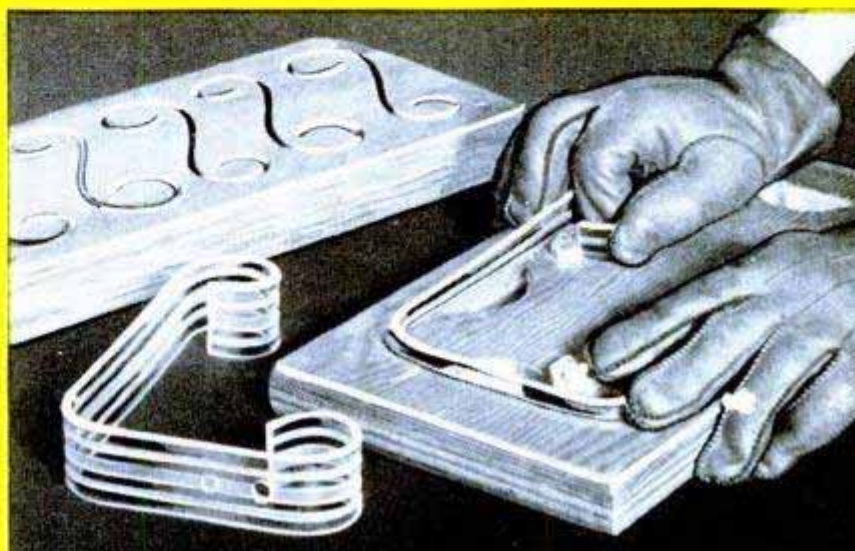
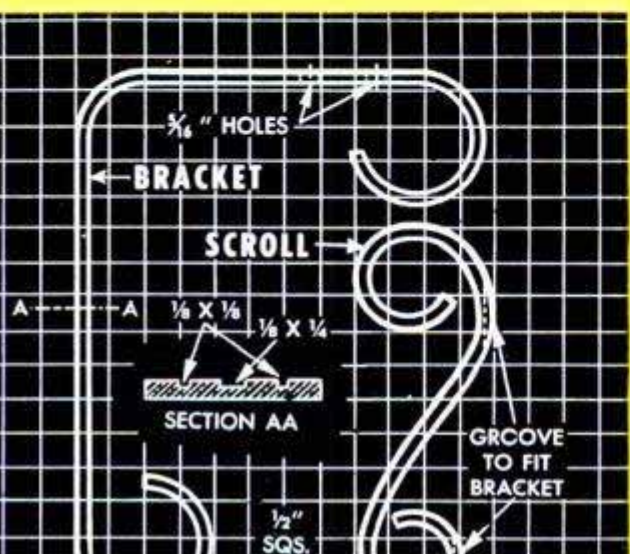
## TWIN PIN-UP LAMPS *in Plastic*

By John P. Arnold

**F**ORMED from acrylic plastic, such as Lucite or Plexiglas, these graceful pin-up lamps add a striking effect when mounted at each side of a vanity mirror. Each lamp consists of three parts, a bracket and two scrolls, which are bent by heating in the kitchen oven at 250 to 300 deg. F. and then placed in wooden jigs to set. Profile patterns for the parts are traced on plywood and jigsawed slightly oversize to permit easy removal of the plastic. The bracket requires a strip  $\frac{3}{16} \times 1\frac{1}{2} \times 18\frac{3}{4}$  in., while each scroll takes a piece  $\frac{1}{8} \times \frac{1}{2} \times 12\frac{1}{2}$  in. Three decorative grooves are made on the

back of the bracket strip, section AA, the center groove providing a channel for the lamp cord. The grooving is given a frosted finish by sanding with wet-or-dry paper.

In assembling, note that each scroll is grooved to fit over the edge of the bracket to which it is cemented and clamped lightly until dry. A  $\frac{1}{8}$ -in. pipe nipple and nut fasten a socket to the bracket. If the socket is the candle type pictured above, a square piece of plastic is used to form a base for the cardboard tube. The lamps are hung by placing the looped ends of the scrolls over small nails driven into the wall.





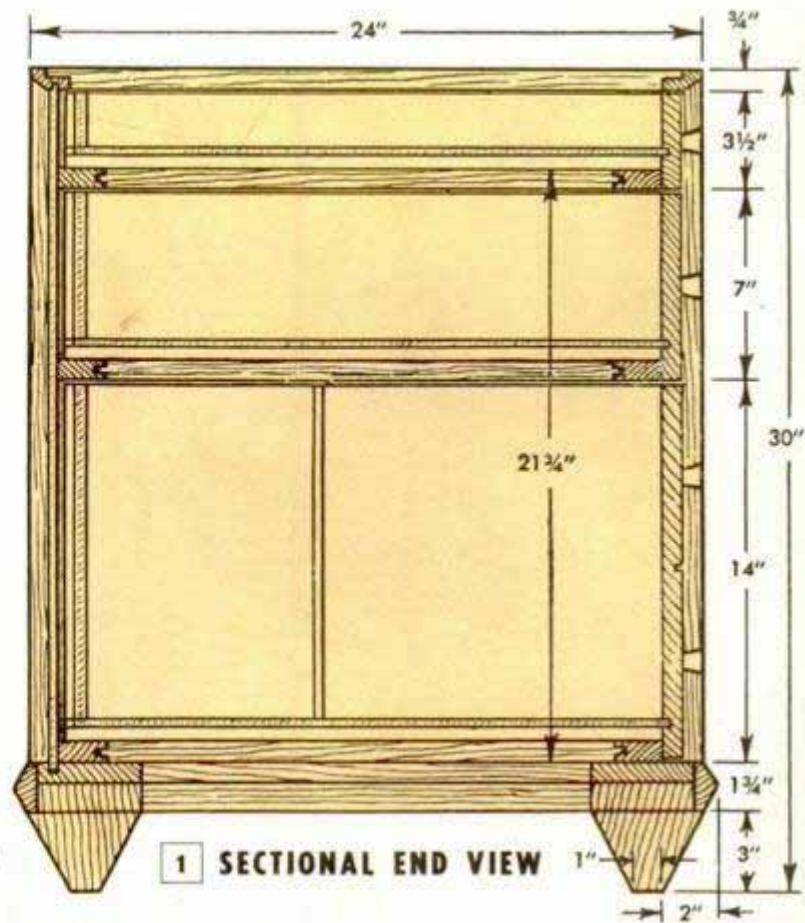


*This can be yours!*  
build it yourself .....





*Styled exclusively for Popular Mechanics by John Bergen, furniture designer*



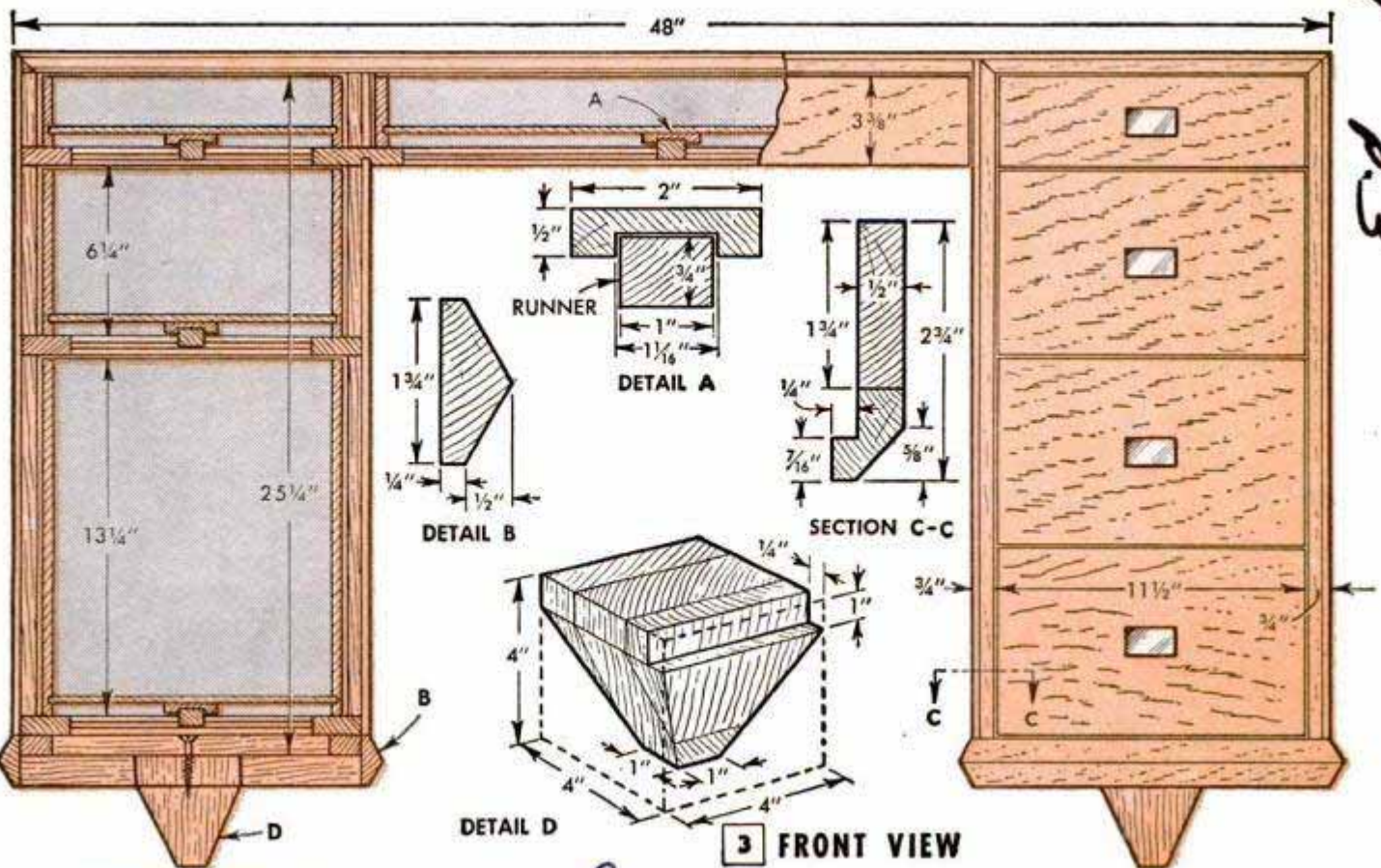
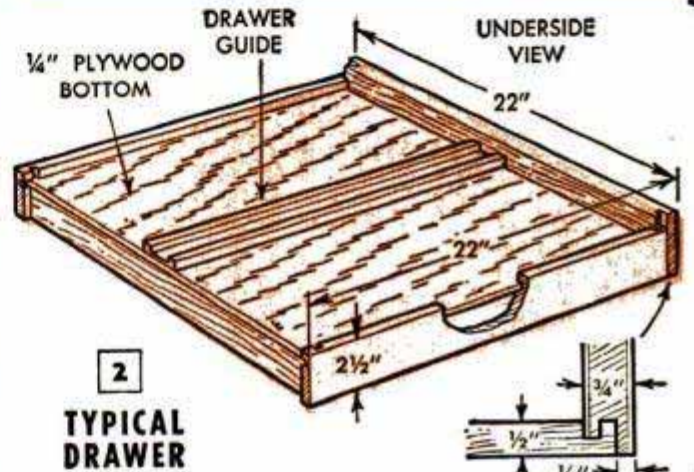
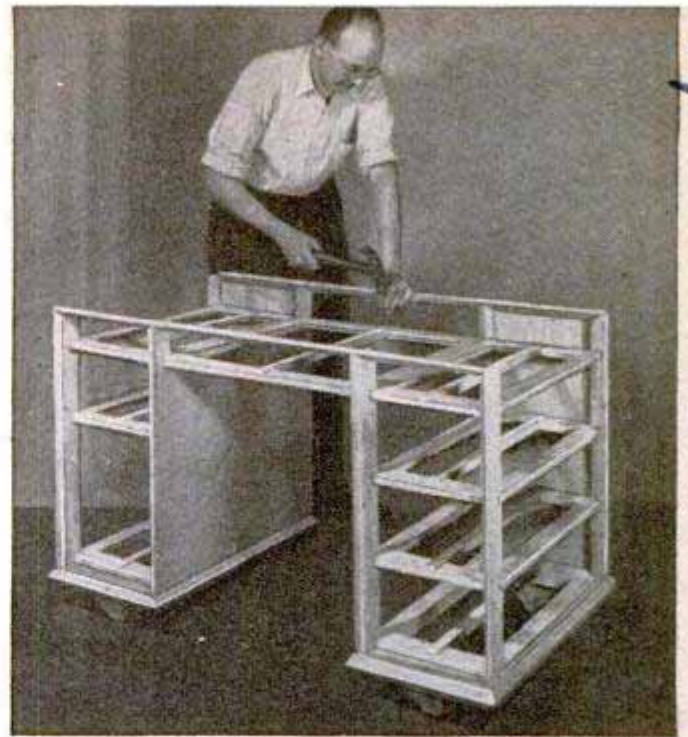
# Living-Room FURNITURE

Story by Wayne C. Leckey

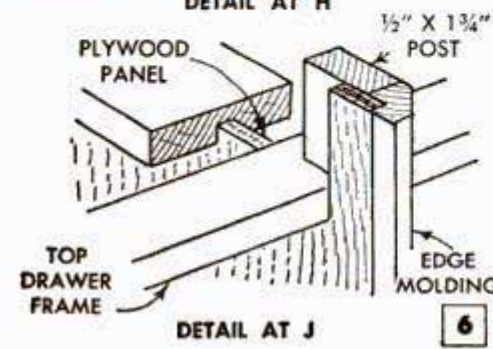
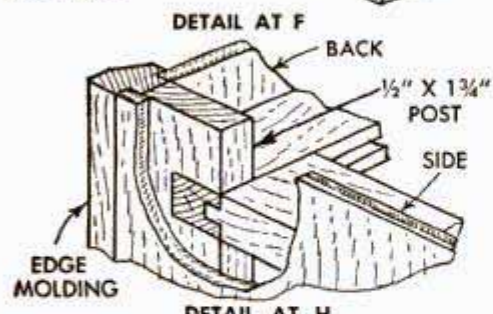
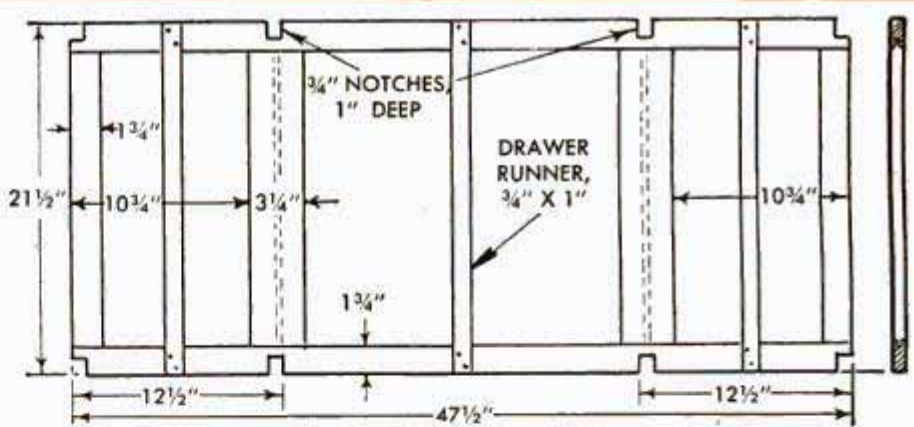
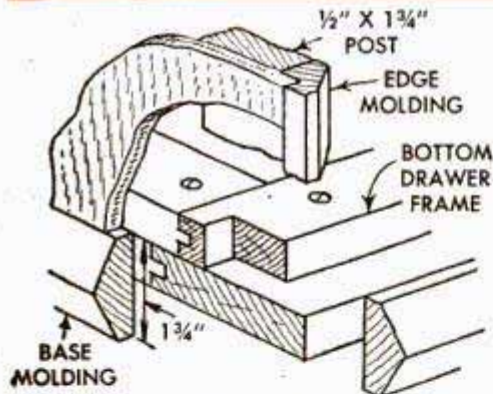
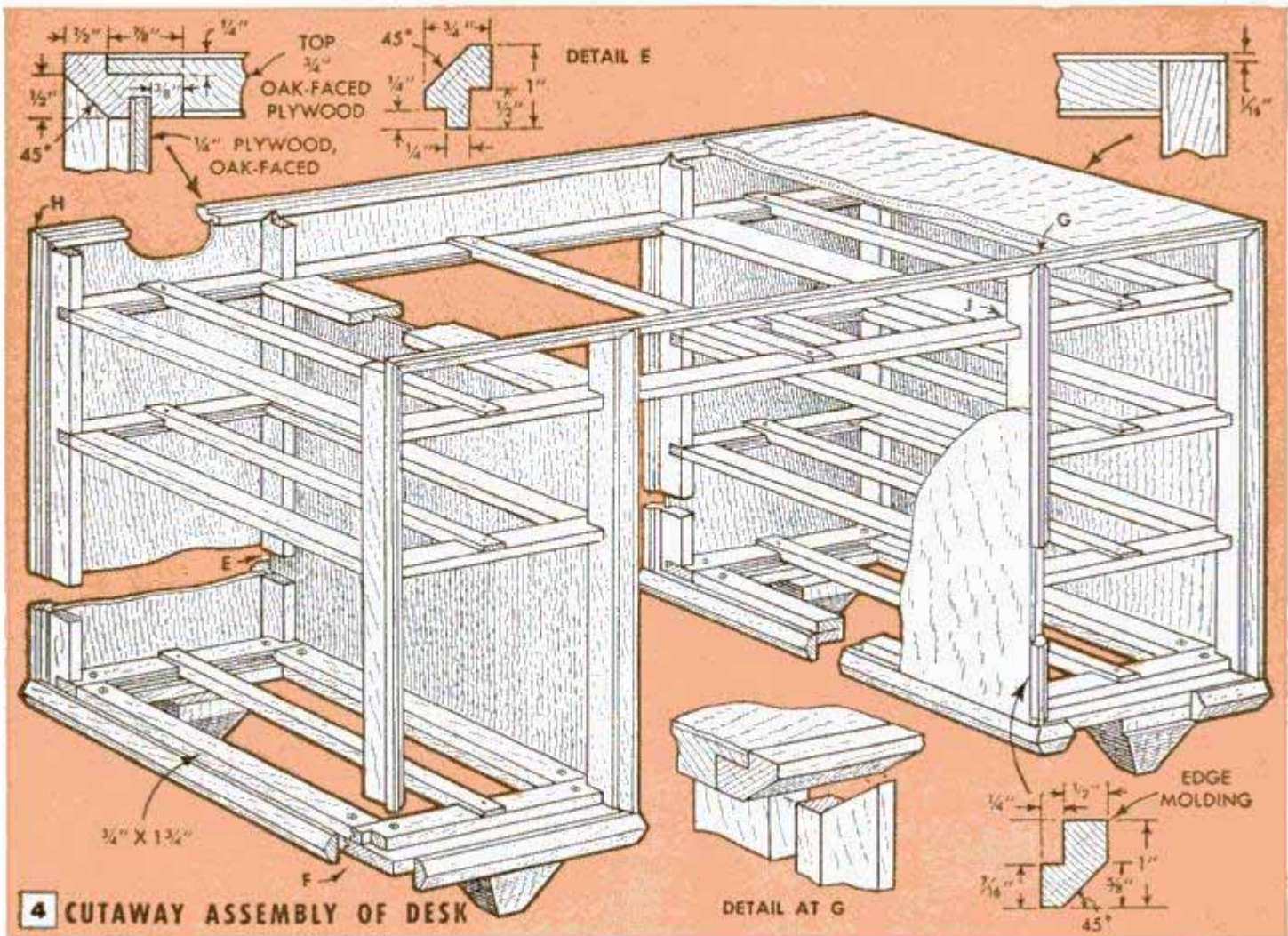
## Part I

MODERN as tomorrow, here's a smartly styled ensemble that will transform your living room into a room of distinction. It's exclusive, colorful and, to top it off, this furniture is easy to build. Designed expressly with the home craftsman in mind, all the pieces of the group can be duplicated with just a jointer and a saw. Combining plywood with solid stock further simplifies construction, and the use of separate upholstered units enables the inexperienced worker to do a first-class job of upholstering the sectional units and easy chair.

The complete group pictured in full color on the preceding pages includes a sectional sofa, easy chair, hostess chair, step table, commode, cocktail table, corner table, desk, table lamp and floor lamp. The desk chair shown was an extra piece and is not included in the group. However, a dining chair of the style presented in our dining-room furniture series, September and October 1949 issues, will



Step - Furniture you Can Build p. 3



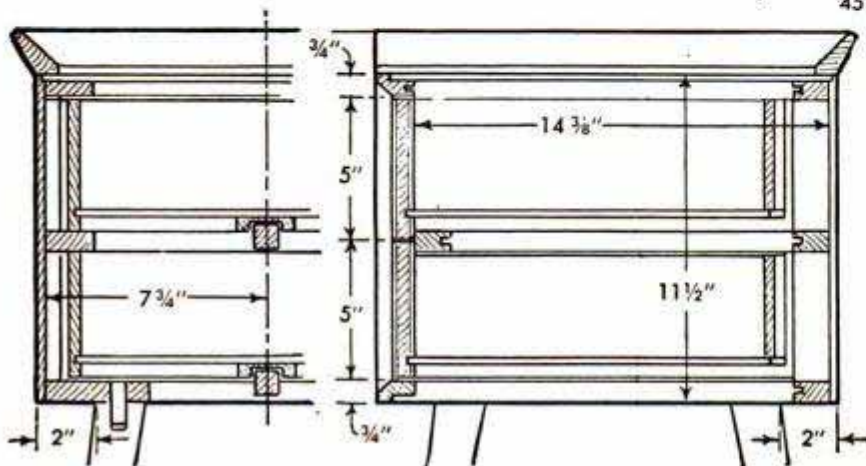
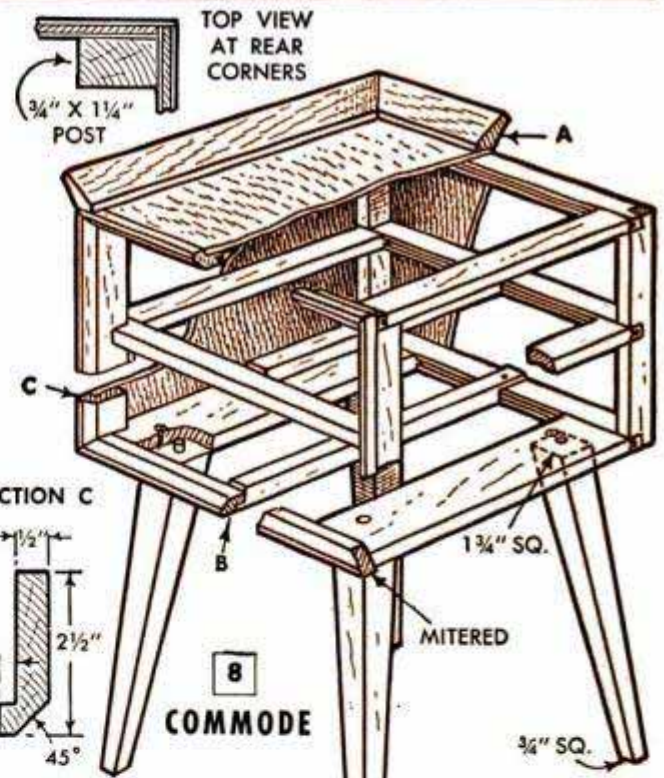
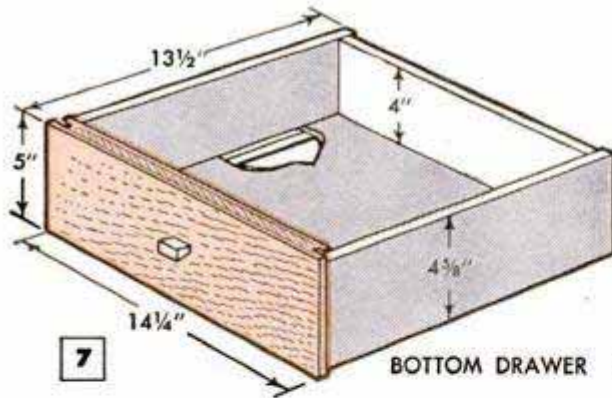
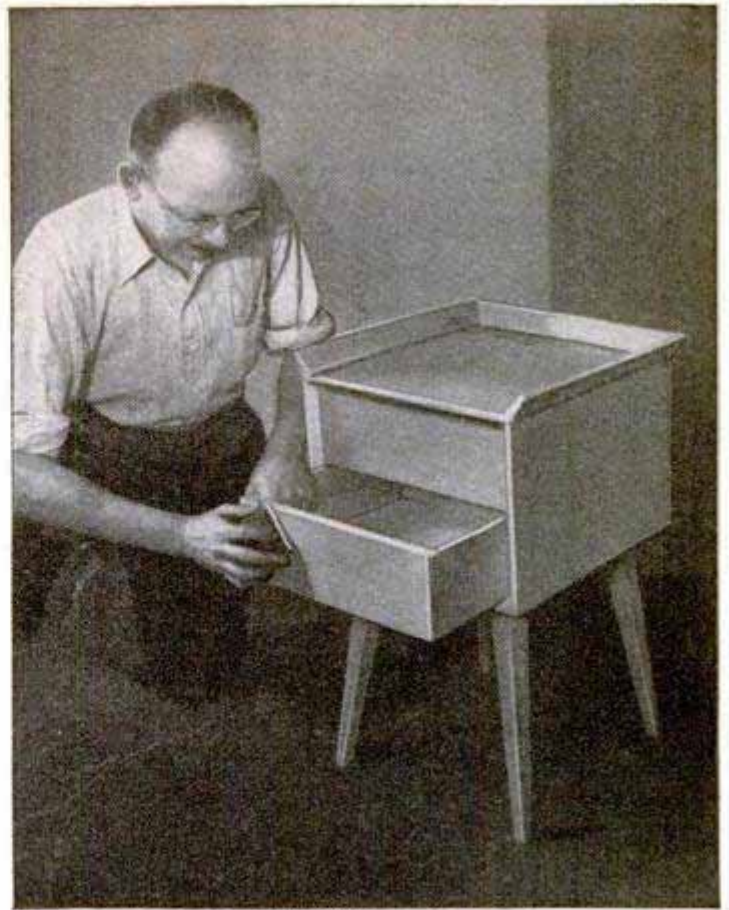
5 UPPER DRAWER-FRAME ASSEMBLY

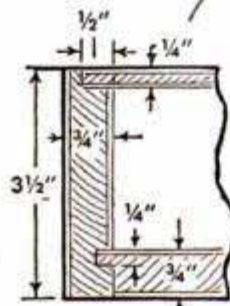
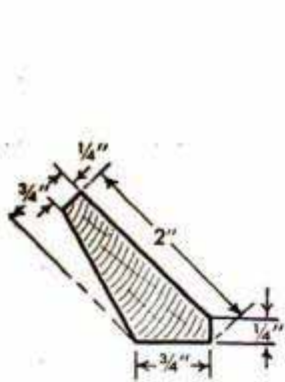
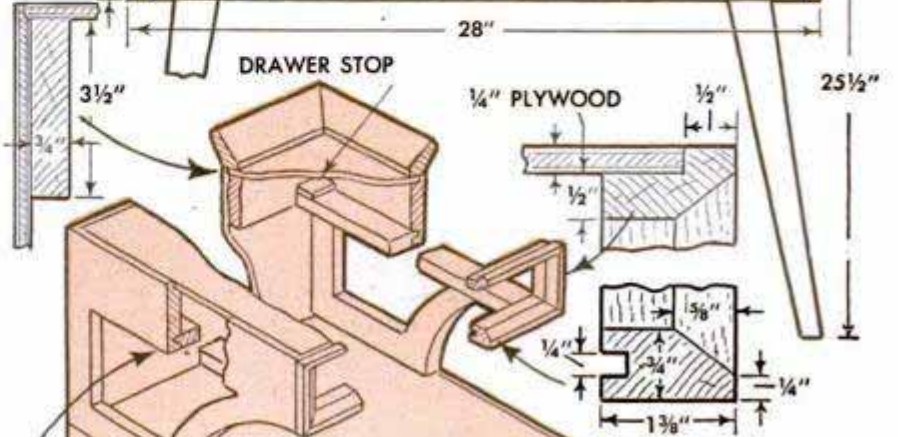
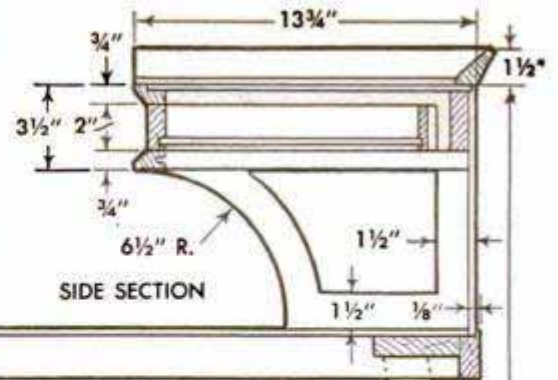
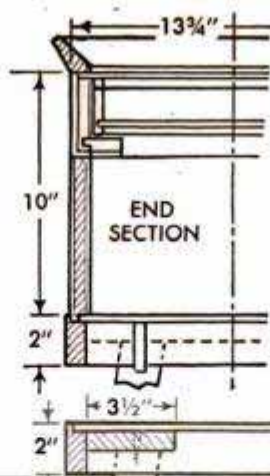
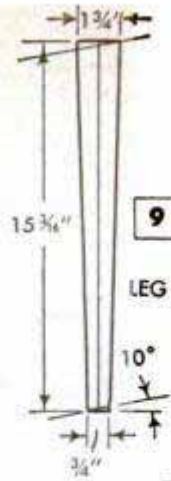
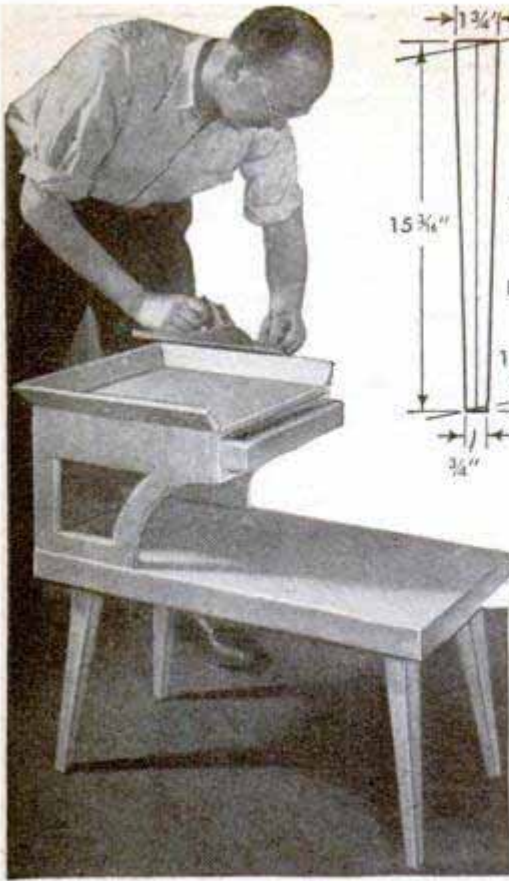
provide a suitable matching chair for the desk. Part I in this issue covers construction of the cabinet pieces, while Part II will take up construction of the upholstered pieces and the two lamps.

The kneehole desk, which may be considered optional, is the most detailed piece of the group and, therefore, requires the most explanation. Figs. 1 and 3 show sectional views, while the cutaway view in Fig. 4 gives a general idea of the assembly. The original furniture was made of oak-faced plywood and solid stock and finished in limed oak, but birch, maple or other hardwood can be used. The upper drawer frame of the desk is made first, Fig. 5, and although the drawer runners are shown in place, these can be added later. The dotted lines represent 1/4-in. grooves which are made on the underside. As no part of this frame is exposed, it can be made of

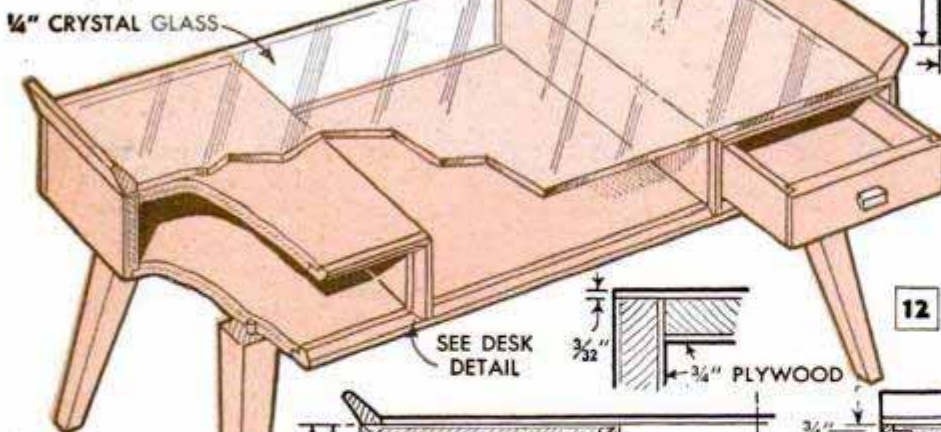
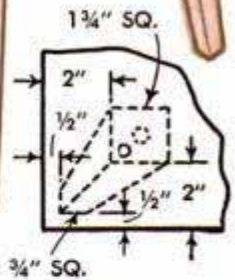
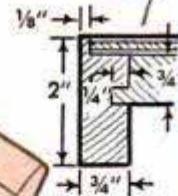
inexpensive wood. The built-up bases at the bottom of each drawer unit are made exactly alike, consisting of a drawer frame, screwed to a bottom frame. The two frames must fit flush at the sides. The front member of the bottom frame should be about 4 in. wide and cut from finished stock. Note in Fig. 6, detail F, that the drawer frame is notched at the corners for  $\frac{1}{2}$ -in. posts which also are notched. Next, the posts are joined to the upper and lower frames, and then the intermediate drawer frames are installed. This produces the skeleton structure of the desk.

Now, a molding is applied around the base of each drawer unit, as in Fig. 3, detail B. This is mitered at the corners, and is glued and screwed to the bottom frame to bring it flush with the top. When this is done, the four tapered legs can be fitted. Fig. 3, detail D, shows how they are built-up and rabbeted across the front edge to come flush with the face of the base molding. Glue and a long, flat-headed screw are used to attach each leg. Next, a rabbeted molding is applied to the edge of the front posts. This is detailed in section C-C, Fig. 3, and is edge-glued to the posts. A similar molding cut according to detail E, Fig. 4, is edge-glued to the back posts. Note that the molding strips on the inner posts, at both front and back, are notched at the upper ends in

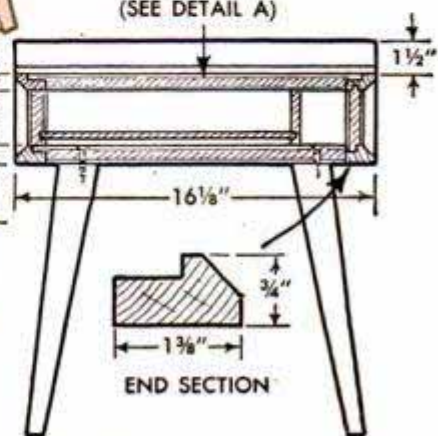
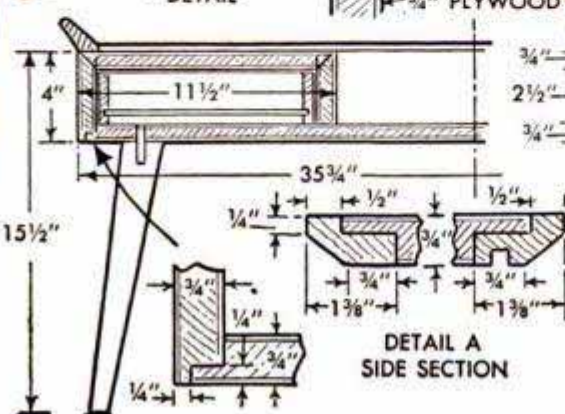
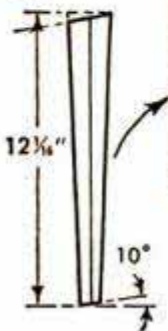




11  
STEP TABLE

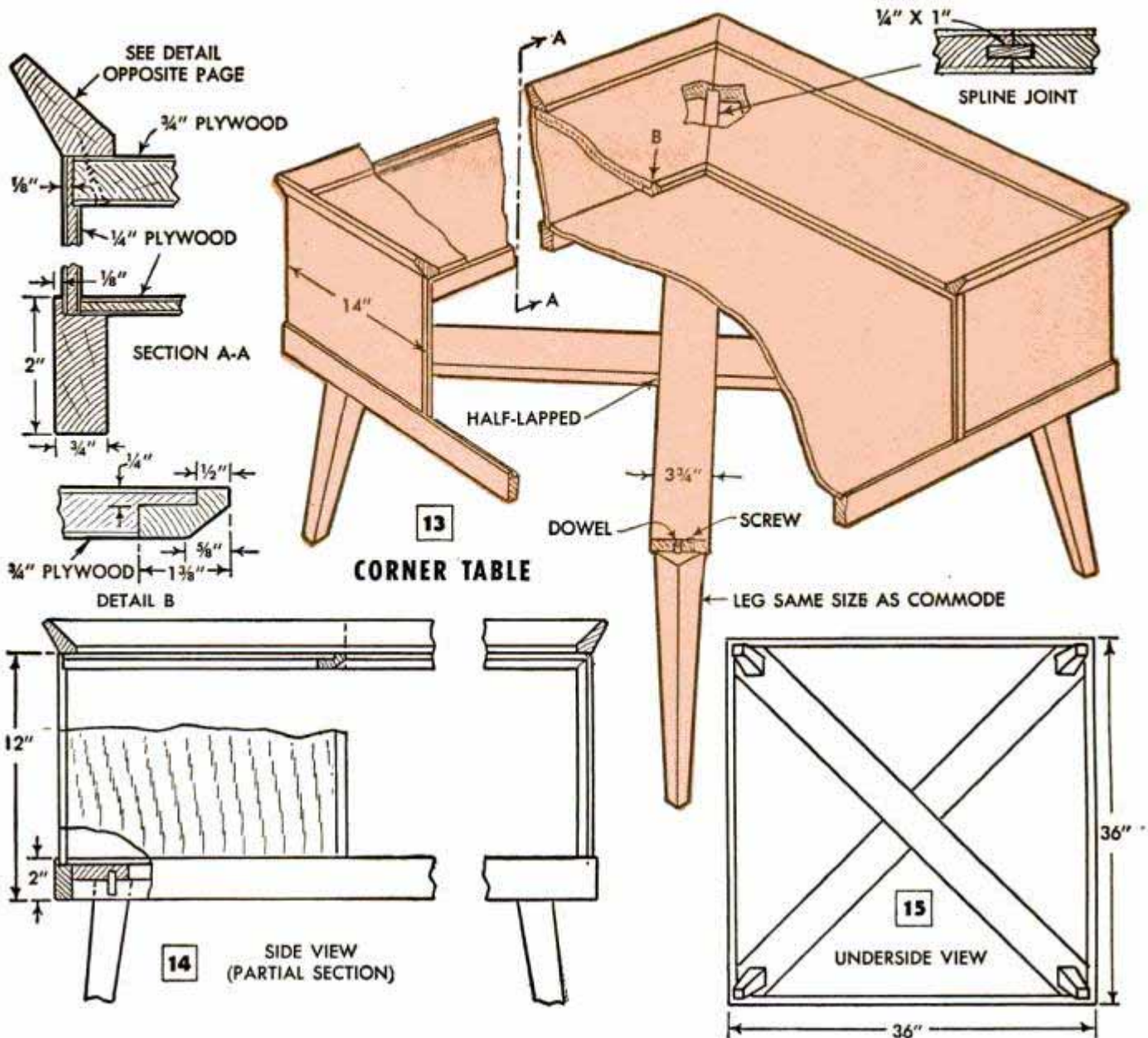


12 COCKTAIL TABLE  
(SEE DETAIL A)



DETAIL A  
SIDE SECTION

END SECTION



the manner shown in detail G, Fig. 4. The  $\frac{1}{4}$ -in. plywood panels on the inside of the kneehole are fitted next. These are cut to fit the rabbeted edge molding and the grooves in the underside of the upper drawer frame. You'll notice in Fig. 6, detail J, that the plywood is cut L-shaped at the top to continue it to the top of the front posts. In gluing and clamping in place, the panels are pushed up into the grooves so that the lower edge rests flush on the edge of the base molding. The panels covering the outside of the drawer units are installed similarly, except that they run to a point about  $\frac{1}{16}$  in. down from the mitered end of the edge molding. This permits the desk top to overlap the end plywood and conceal the plies in a rabbeted joint. Plywood panels which enclose the rear ends of the drawer units are slid into grooves in the edge molding, and then strips of rabbeted molding are run across the top of the desk at the front and back. Note that the rear strip differs slightly from the front one. This leaves the job of fitting the top and the drawers. The top, which is  $\frac{3}{4}$  in. thick,

is rabbeted all around, leaving about the thickness of one ply at the ends and  $\frac{1}{4}$  in. along the sides.

Fig. 2 details typical drawer construction. The one shown and dimensioned is the shallow center one, but all others are made essentially the same. Eight drawers are required, the bottom left-hand one being a deep single drawer which is grooved across the face to represent two smaller drawers. Guides for the drawers are  $\frac{1}{2}$ -in. strips grooved for the runners as detailed in Fig. 3, A.

The commode, detailed in Figs. 7 and 8, is built-up around a rough framework which has a mitered molding edge-glued around the front. The tapered legs are doweled and screwed 2 in. in each way from the corners. The framework is covered with  $\frac{1}{4}$ -in. plywood which is rabbeted, as shown, to conceal the plies at the rear corners and around the top. The top is finished off on three sides with a slanting molding and, finally, two drawers are made and installed on runners in the same way as those in the desk.



The step table, detailed in Figs. 9 to 11 inclusive, is made by grooving and rabbeting solid stock and then assembling it on edge to form a mitered frame. The grooves house tenons on two crosspieces to which the legs are fastened and the rabbet around the top edge receives a 1/4-in. plywood panel. The latter is glued flush with the top of the frame. The scrollsawed sides, which are cut from solid stock, are rabbeted along the top and bottom edges and grooved to take the drawer frame. An edging glued around the front frames a shallow drawer. After the top of the table

is covered, edging is added on three sides to match the commode.

The cocktail table, detailed in Fig. 12, features a glass top, a center pocket for magazines and two small drawers. Except for the legs and molding, the table is made of 3/4-in. plywood. The bottom board is rabbeted all around the edges, the rabbets at the ends being a reverse of those along the sides. The outer sides of the drawer compartments are likewise rabbeted and are glued and nailed from the bottom. Then the endpieces for the backs of the compartments are tenoned and rabbeted to take a rabbeted edge molding which frames both front and back. Conventional construction is used in making the drawers, and each end of the table is fitted with a slanting molding to match the other pieces.

The corner table for the sectional sofa is detailed in Figs. 13, 14 and 15. The top is made of 3/4-in. plywood while sides and bottom of the table are 1/4-in. plywood. Construction is apparent from the drawings. The base is similar to that of the step table, and the legs are the same size as those on the commode. The mitered joint in the top is fitted with a spline and an edge molding, detail B, Fig. 13, is used to conceal the laminations. Here again, a slanting molding is added to finish off the top.

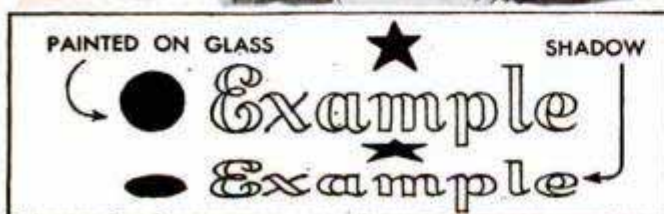
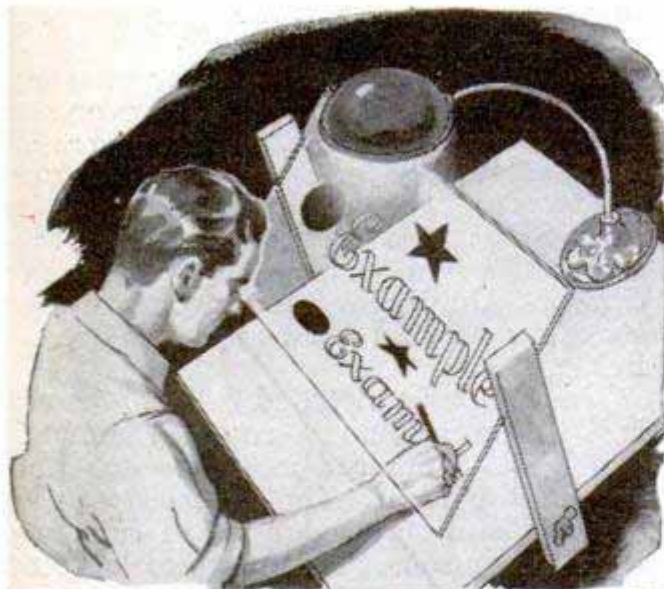
(To be continued)

## Shadowgraph Utilizes Sheet of Glass to Produce Interesting Designs

Consisting of a sheet of plate glass clamped between two wooden uprights, this easily made shadowgraph will cast a variety of shadows for tracing unique de-

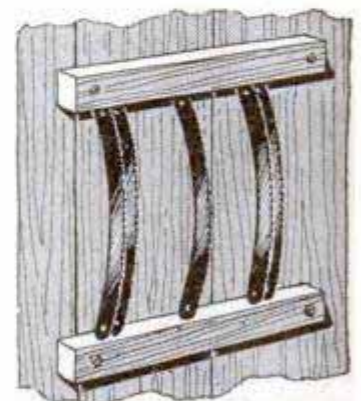
signs. The uprights are grooved at an angle to receive the edges of the glass and are drilled near the lower end for attaching to the drawing board with bolts and wing nuts. The bolts can be inserted through cleats screwed to the underside of the board. The shape of circles, designs and lettering is changed merely by tilting the supports backward or forward to vary the angle of the glass to an overhead light.

Bryan H. Neill, Waco, Tex.



## Wall Rack for Hacksaw Blades

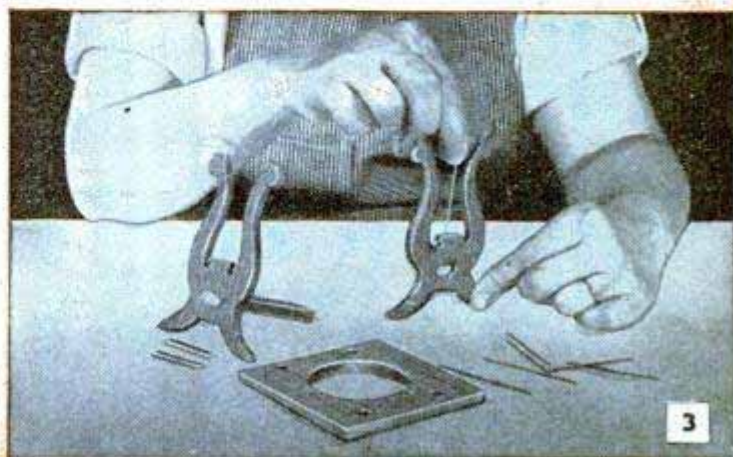
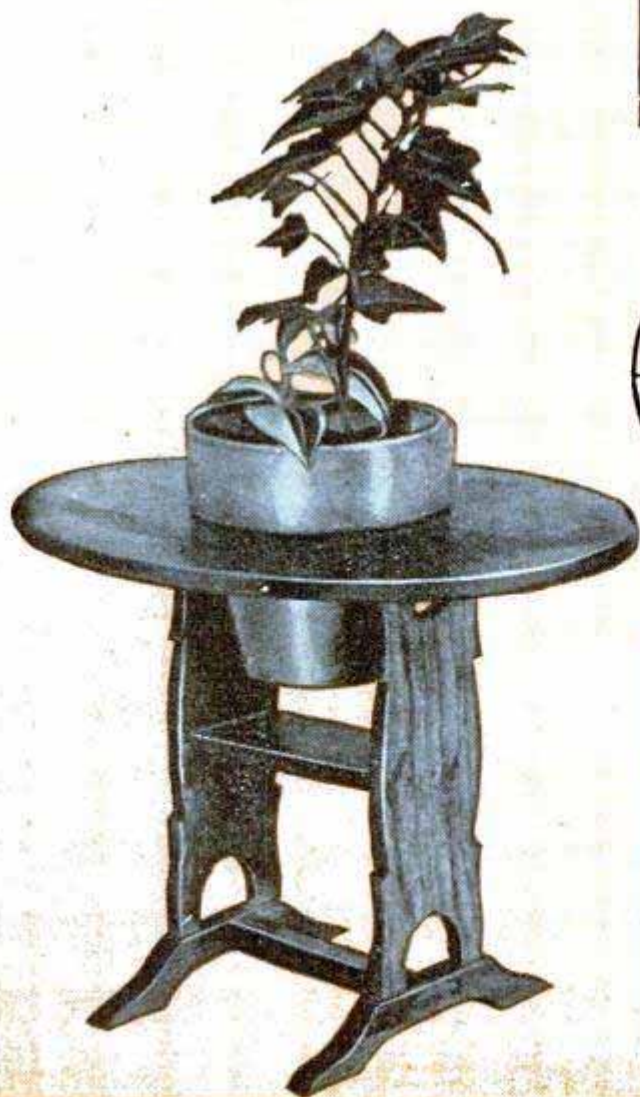
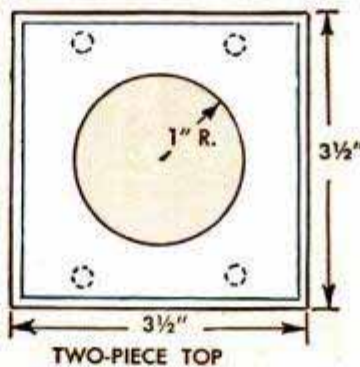
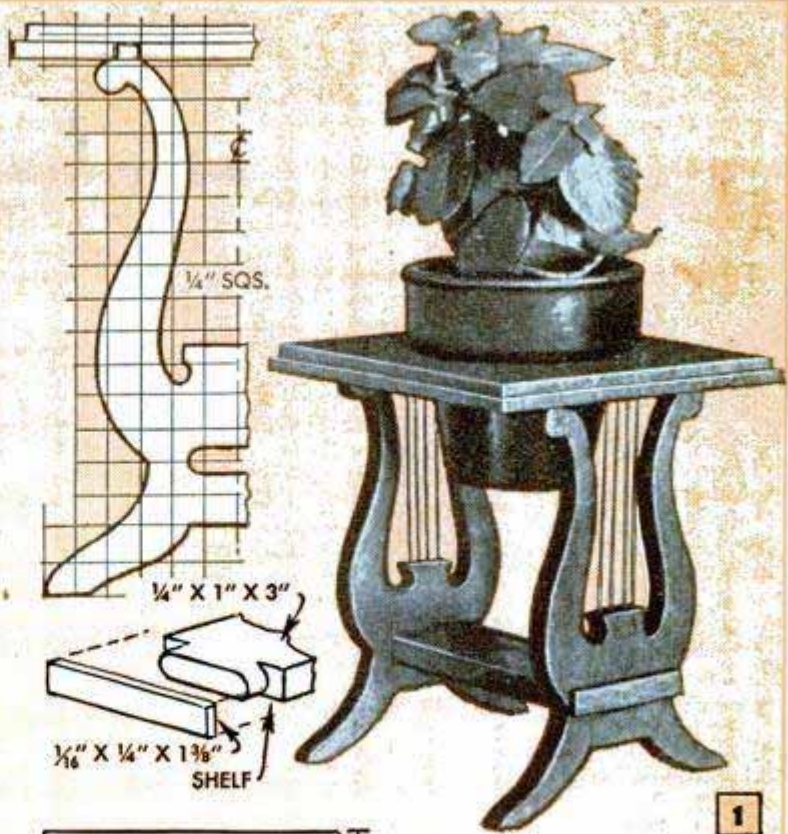
Two wooden cleats, nailed to a wall in an easy-to-reach spot, form a convenient rack for hacksaw blades. The cleats are mounted parallel with each other and spaced apart a little less than the length of the blades. By bending them slightly, the blades are wedged between the cleats and are simply pulled from the rack when needed.



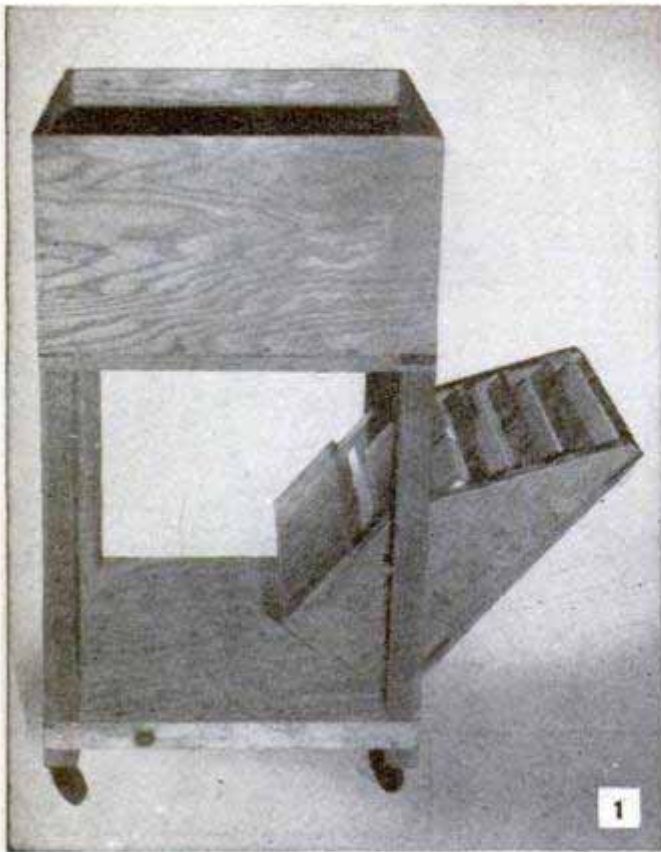


# Miniature PLANT STANDS

Old-time furniture salesmen, or "drummers," as they were called, carried sample cases of furniture miniatures which were scale models of the full-size pieces, complete in every detail even to the kind of wood and the type of finish used. Here's a new and novel application in which similar miniatures are put to practical use as a decorative feature of indoor plantings. Both plant stands accommodate small standard-size flower pots. You can do most of the work on the jigsaw. Use high-grade woods—full-size tables of the type shown usually were made of mahogany or maple—and, after cutting the pieces to size, Figs. 1 and 2, join the parts with waterproof glue and small brads. Lengths of stiff wire are used to represent the lyre strings as shown in Fig. 3. Sand the parts thoroughly and finish in the natural color of the wood with the application of sealer, filler and then varnish.—Charles and Bertram Brownold, Cedarhurst, New York



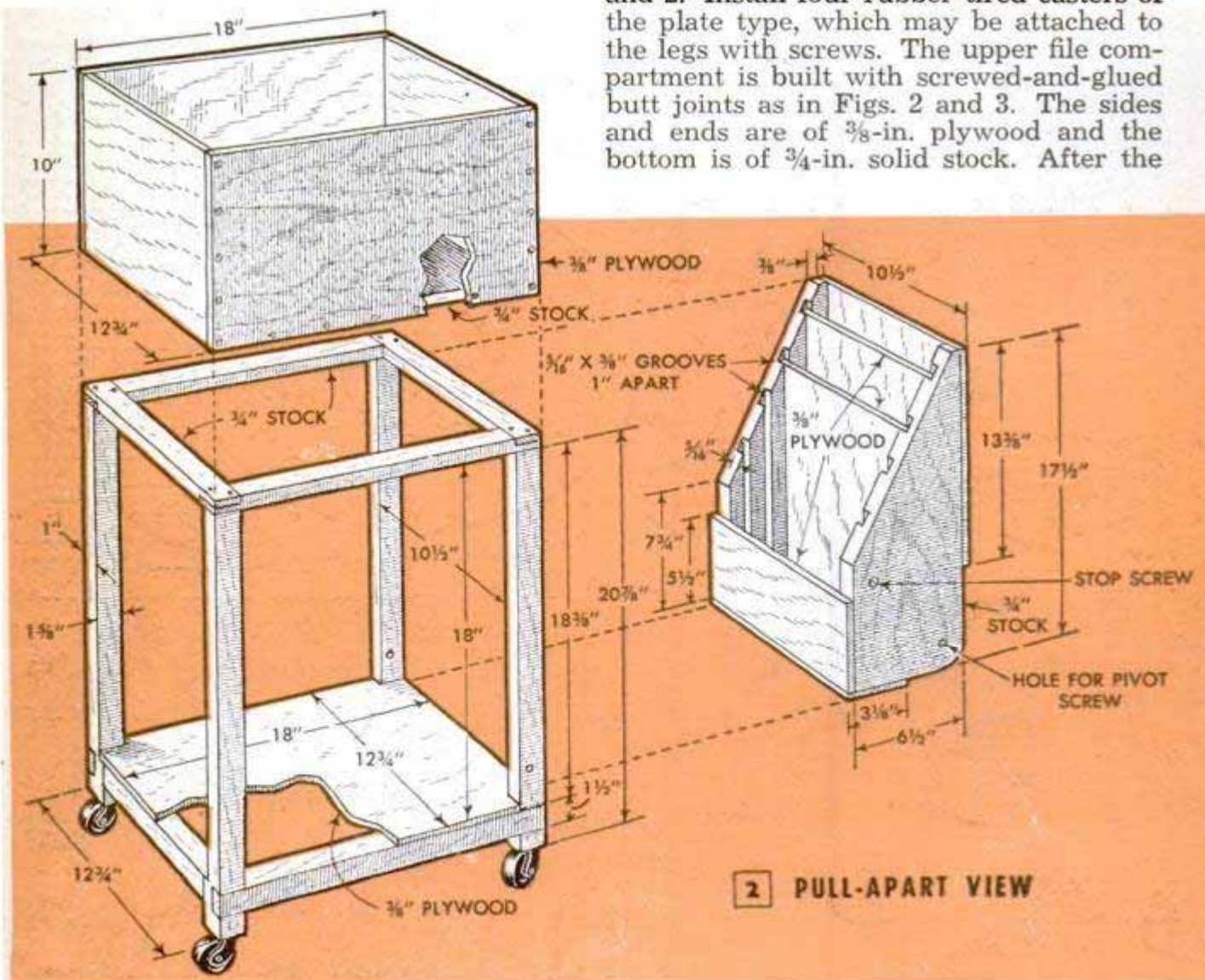
# PORTABLE FILING CABINET



This handy rolling file, with its novel swing-out compartment, is a must for the home office or darkroom where filing space is necessarily kept at a minimum

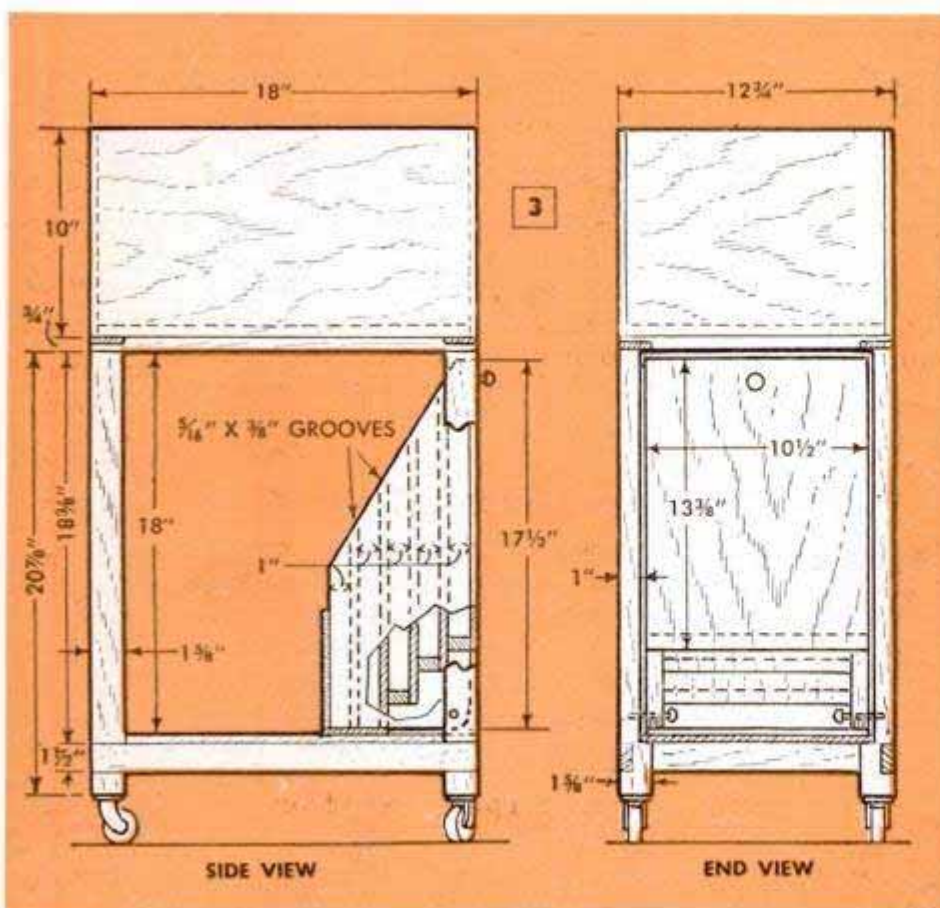
By Louis Hochman

**M**ADE almost entirely from plywood, the top compartment of this portable file accommodates standard letter-size file folders while the swing-out compartment provides ample space for an assortment of stationery. The base, Fig. 2, supports the filing units and consists of four legs assembled with stretchers and cross members at the bottom. Note that the ends of the stretchers are housed in grooves cut in the legs. The cross members are butt-joined, doweled and glued to the legs. Next, a rectangular frame is lap-joined at the corners and attached to the top ends of the legs with screws, or nails, and glue. Then a plywood shelf is neatly notched around the legs and joined to the stretchers and cross members with screws as in Figs. 1 and 2. Install four rubber-tired casters of the plate type, which may be attached to the legs with screws. The upper file compartment is built with screwed-and-glued butt joints as in Figs. 2 and 3. The sides and ends are of  $\frac{3}{8}$ -in. plywood and the bottom is of  $\frac{3}{4}$ -in. solid stock. After the



2 PULL-APART VIEW

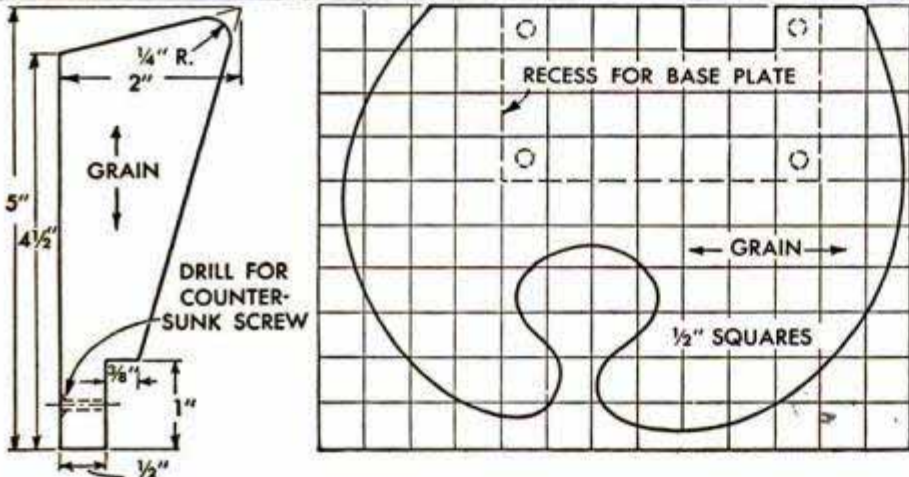
box has been assembled, sand it thoroughly. It can be finished either in the natural color of the wood or enameled in color to match other furnishings. As shown in the cutaway view, Fig. 3, the swing-out unit is fitted with stepped compartments which are all of a uniform depth. The dividers are of  $\frac{3}{8}$ -in. plywood and are fitted in grooves cut in the sides. Solid stock is used for the sidepieces but all other parts are of plywood. Note in Fig. 2 that a radius is cut on the lower front corner of the sidepieces so that the unit can swing outward without striking the shelf. When installing the unit, the pivot screws are driven into the legs from the inside as in Fig. 3. Use round-headed screws and be careful not to drill the pilot holes clear through the legs. Leave the screws slack so that the unit will pivot easily. After installing, determine the balancing point of the unit, and then drive a stop screw into one side as in Fig. 2. This will hold the unit in the open position as in Fig. 1. Note in Fig. 3 that the total height of the completed file is  $31\frac{5}{8}$  in., not including the casters. If you wish the top of the file to be exactly desk height, Fig. 4, allowance must be made in the length of the legs and the height of the swing-out unit.



# Black-Walnut Book Ends in Ultramodern Design



Combining graceful design with the natural beauty of swirl-grained black walnut, these modern book ends are a one-evening project that you will be proud to display in the living room. Using 1-in. walnut, cut out both bases at the same time according to the squared pattern and chisel a recess in the underside of each one for a 3½ x 5-in. metal support plate. Then cut out the uprights, fit them in the bases and trim the backs flush. Carefully sand all the exposed surfaces and fill the wood with a matching filler. After allowing to dry overnight, sand the pieces lightly with fine sandpaper. Apply several coats of high-grade varnish, sanding lightly between the first two coats and rubbing between the following coats with rottenstone or polishing rouge. After finishing, assemble the parts and glue felt over the bottoms to prevent marring furniture.—Monroe A. Maller, North Hollywood, Calif.



## Tags Tied to Heating-System Valves Give Emergency Information

In case a leak develops or some other emergency occurs in a hot-water heating system, it may save considerable expense if any member of the household is able to manipulate the valves to correct or minimize

the trouble. Instead of trusting to memory, attach tags, which give clear and complete information, to the various controls. Arrows can be used to indicate the direction of turn to open or close the valves, and the functions of the controls can be described sufficiently in a few words.

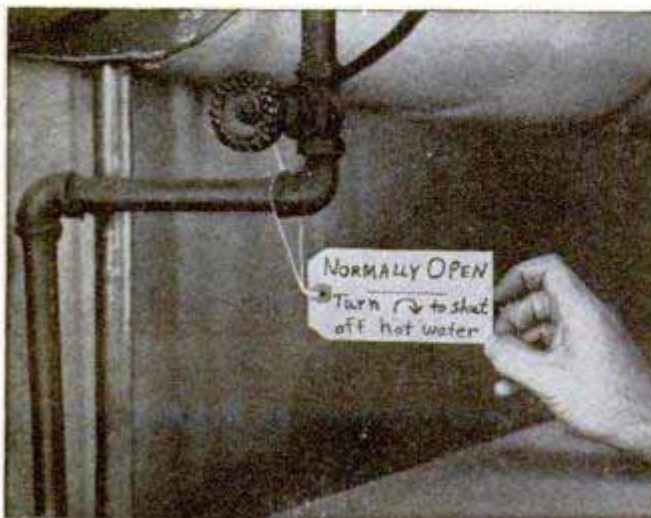
### Old Dress Serves as Pattern

If your favorite dress is becoming worn, why not use it as a pattern to make a new one just like it. Rip all the seams of the old dress and wash the pieces. Starch them so they are quite stiff and press them. Then use each piece as a pattern.

Pat Fey, New York City.

☞ To prevent eyeglasses from clouding with moisture, rub soap on each side of the lense and polish well. The glasses will stay clear for the day with this treatment.

Home Repairs



## Warming Varnish Aids Spreading



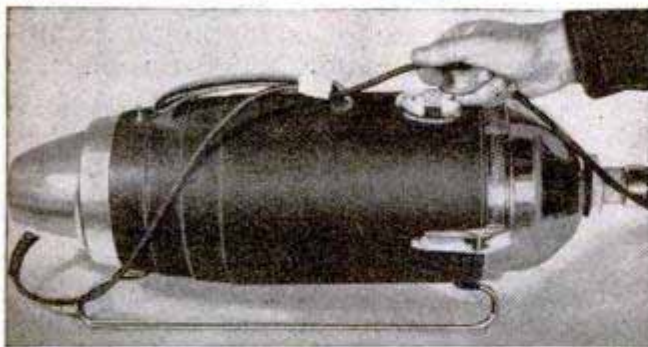
Varnish can be applied more evenly and with considerably less effort if it is kept warm while being used. When varnishing the floor or woodwork of an unheated room, the varnish may be kept warm by standing the can in a shallow pan filled with hot water.—R. F. Donovan, Jersey City, N. J.

## Length of Twine Removes Cork From Inside of Bottle



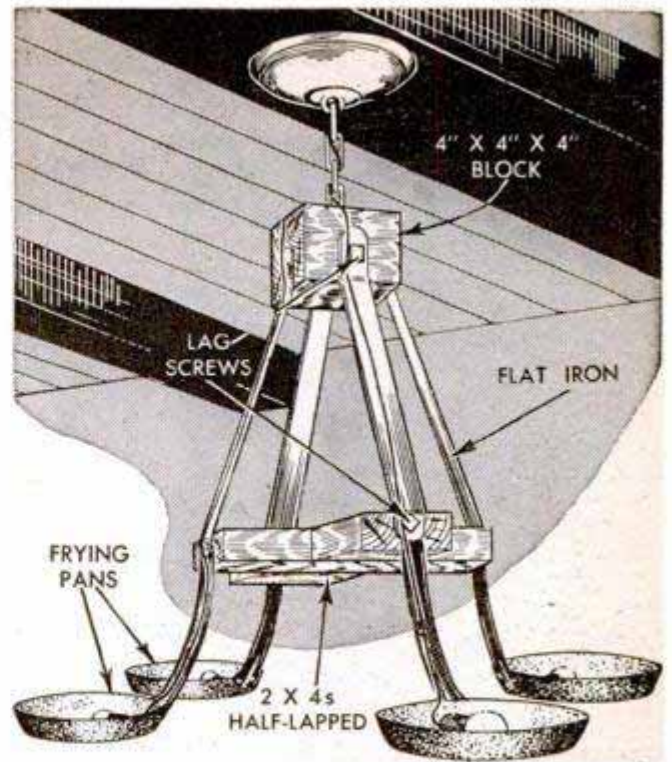
When a cork has been pushed inside a bottle, it can be removed easily with the aid of a length of twine. Double the twine to form a loop and, grasping the free ends with the fingers, insert the loop into the bottle. The twine should reach the bottom of the bottle. Shake the bottle lightly until the cork falls between the two strands of twine. Then, pull the twine slowly from the bottle, forcing the cork out through the neck.

## Taping Cord to Vacuum Cleaner Prevents Loose Connections



As a result of pulling a tank-type vacuum cleaner across the floor by means of the extension cord, the wire connections occasionally come loose inside the cleaner. To take the strain off the terminals, and keep the connections intact, allow a little slack in the cord and tape it to the vacuum-cleaner handle, using several wrappings of friction or adhesive tape.

☐ If lemons are put in the oven and heated, more juice can be obtained from them.



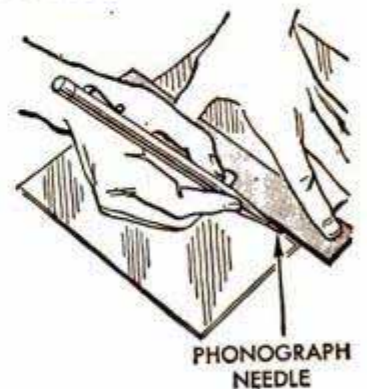
## Frying Pans Form Lighting Fixture For High Cabin Ceiling U. F. '51

Utilizing frying pans to provide indirect light, this novel fixture is just the thing for a high-ceiling cabin or hunting lodge. The fixture consists of two lengths of 2 x 4 lapped together to form a cross which is attached to a 4 x 4 x 4-in. block with four lengths of flat iron. The flat iron is attached to the top block and the ends of the cross with lag screws. The frying-pan handles are bent upward and are sandwiched between the ends of the cross and the flat iron, the lag screws passing through the holes in the handles. The unit is suspended from the ceiling with an ordinary drop chain, and sockets and bulbs, wired individually, are laid in the frying pans.

Eugene L. Heinrich, Peoria, Ill.

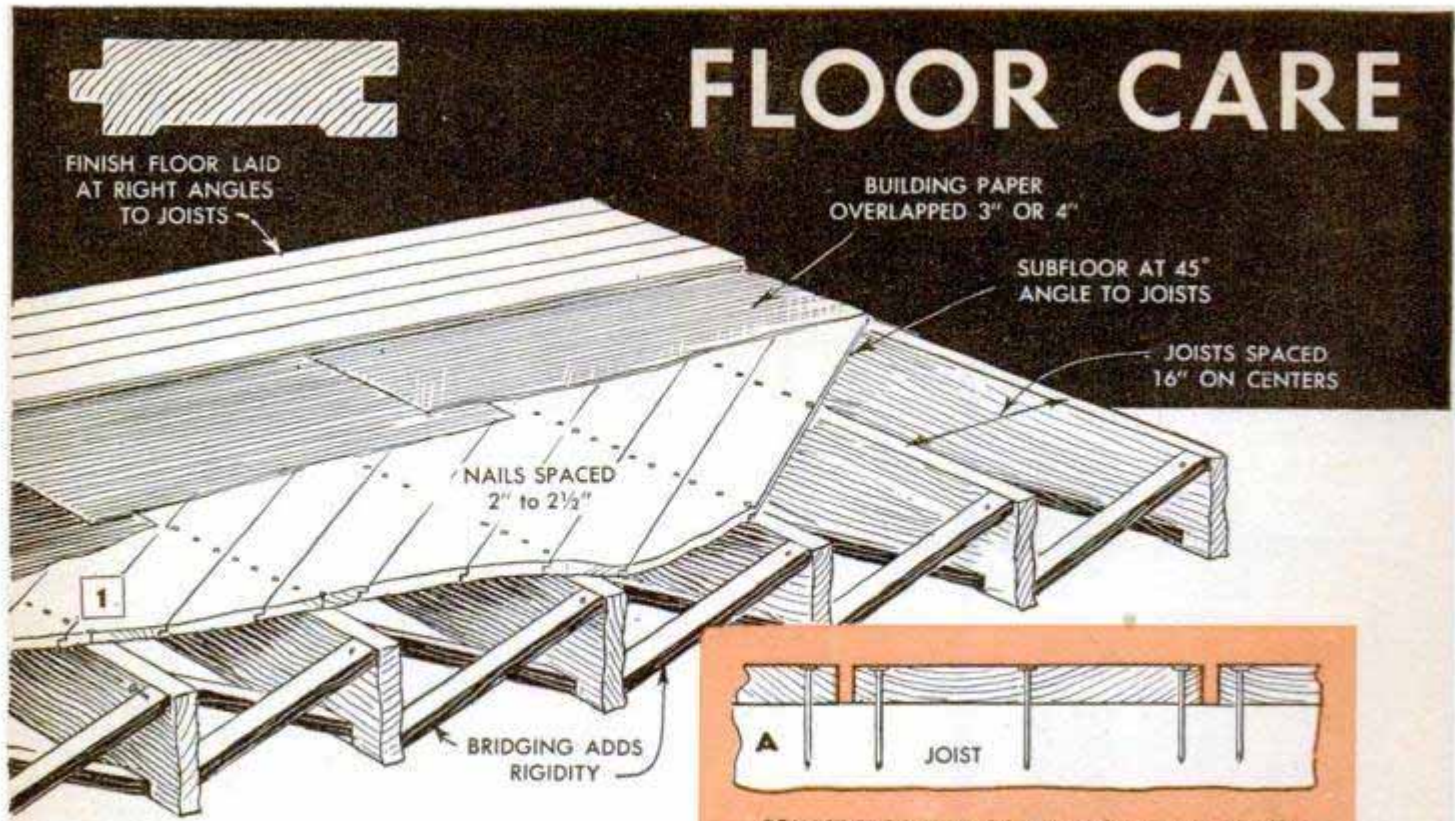
## Phonograph Needle Held in Pencil Provides Plastic Scriber

Worn phonograph needles are excellent for scribing plastic and celluloid. At first, I used them in the end of a dowel to provide a convenient handle, but then I found that the needles could be inserted in an old mechanical pencil. This made it easy to replace the needles when dull and the clip on the pencil permitted carrying the tool in a pocket.



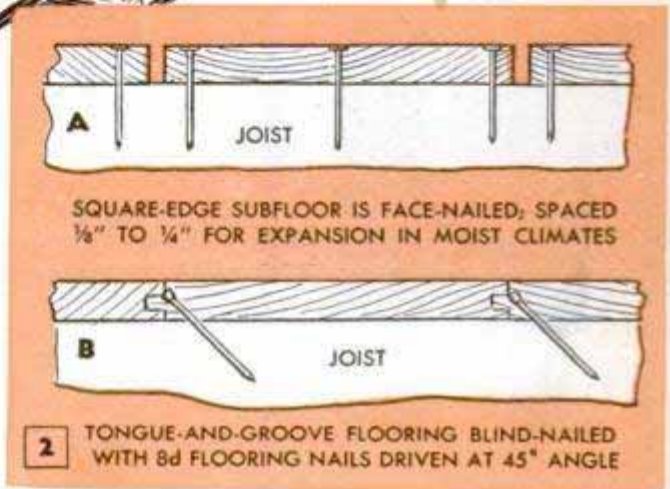
Victor H. Lamoy, Upper Jay, N. Y.

# FLOOR CARE



**AS FLOORS** are subjected to more wear and all-around harder usage than any other structural part of the home, they should receive proportionally more care. Fig. 1 shows the common construction of a wooden floor. In the best type of work, the subfloor is laid diagonally and the finish floor at right angles to the joists, with a layer of building paper between the subfloor and the top floor. In new construction, plywood also is extensively used for subflooring. It is important that the subfloor be nailed securely to the joists and that the wood be thoroughly dry. Square-edged subfloors, spaced  $\frac{1}{8}$  to  $\frac{1}{4}$  in., are used frequently in humid climates and where buildings are unheated. In laying this type of subfloor, 8 or 10d nails are driven straight as in Fig. 2 A. Tongue-and-groove subflooring, as well as finish flooring, is nailed with 8d flooring nails driven through the tongue at a 45-deg. angle, and spaced from 8 to 12 in. apart as in Fig. 2 B. Rabbeted subflooring, or shiplap, is nailed straight with 10d flat-headed nails spaced 2 to 2½ in. apart.

**Squeaking floors:** Shrinkage of wood often causes flooring to loosen slightly so that the boards rub on the nails and against each other, causing the floor to squeak when walked on. If the trouble is in the first floor, thin wedges driven between the top of the joists and the subfloor, as in Fig. 3, usually will stop the squeaks in that particular area. Where the tendency to squeak extends over a wide surface, strips of hardwood forced tightly against the underside of the subfloor and fastened with nails or



screws will help, Fig. 4. A squeaky second floor over a ceiling is a different problem. The simplest remedy is to drive flooring nails through both the finish floor and the subfloor into the joists. Fig. 5, details A, B and C, shows how to locate concealed joists. Slide a hardwood block along the floor at right angles to the joists, tapping it continuously with a hammer. When the block is directly over a joist the tapping gives off a solid sound, but anywhere between joists a hollow sound results. Determine the exact position of a joist by drilling a small hole close to the joist as in detail B. Bend a wire feeler as in detail C and insert this through the hole, turning it until the bent end contacts the joist under the floor. Mark the angle of the handle on the floor to locate the side of the joist. It is then easy to cross-nail the floor to the joist as in detail D. Avoid hammer marks on the floor by driving the nails only part way in, and sinking the heads below the surface with a nailset. After locating one joist in the manner described, measure 16 in. from its center to locate the next one. As a common joist spacing is 16 in. center-to-center, it is easy to drive the nails accurately by measuring 16 in. each way from the center of the joist first located. Nail holes in the

# and REPAIR

By E. R. Haan

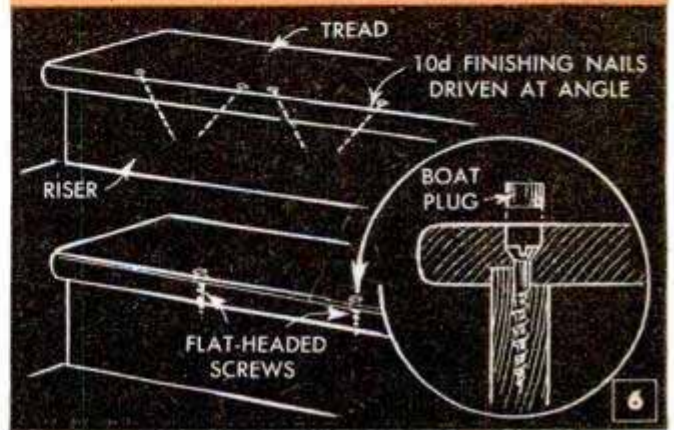
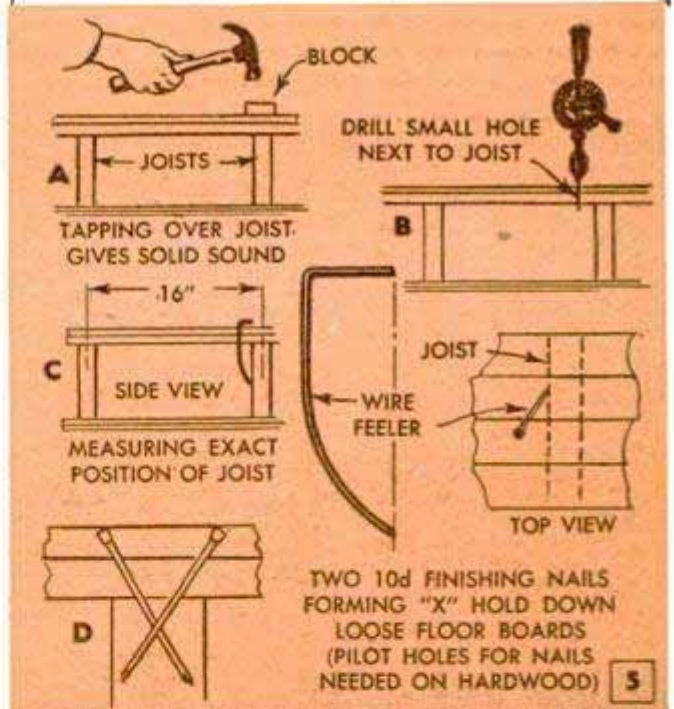
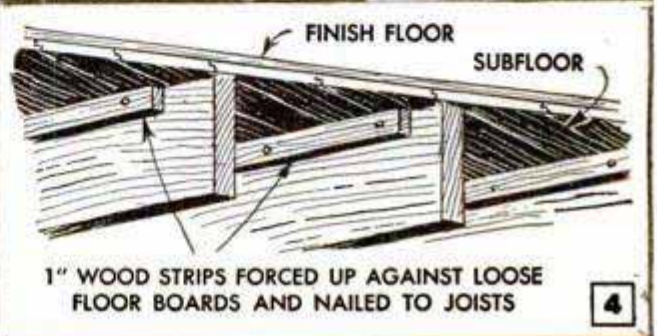
What to do about floors that creak, sag or vibrate. Essentials on refinishing, re-surfacing, cleaning and waxing floors

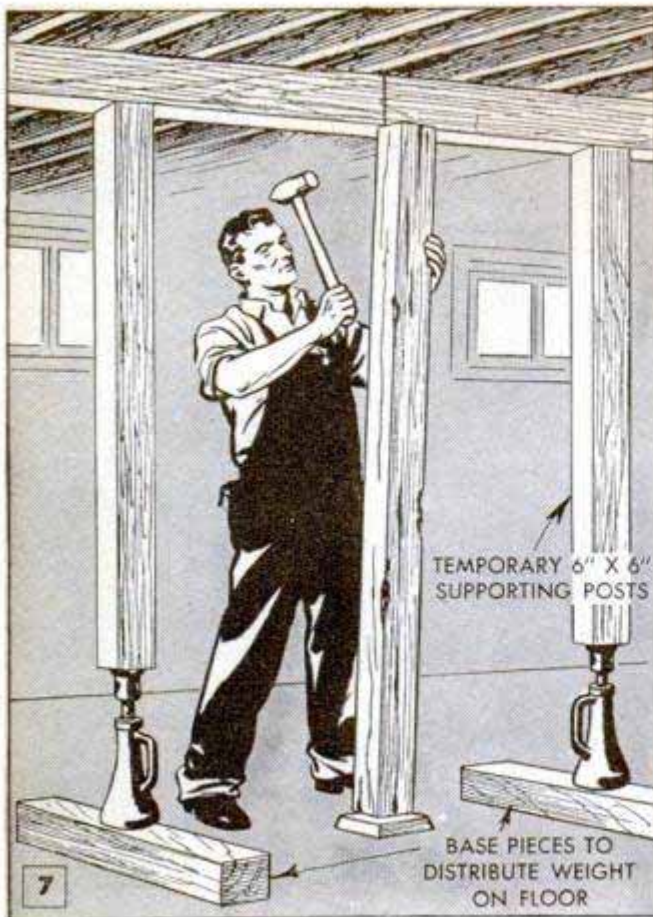
floor are closed with filler stained to match.

**Squeaky stair treads:** On open stairs, it is possible to silence the squeaks by simply driving the wedges tight. These wedges will be found inserted between the treads and stringers on the underside of the stair. However, if the stair well is plastered under the stair it will be necessary to drive nails or screws through the offending treads into the risers or stringers as in Fig. 6. Counterbore the screw holes and after driving the screws, plug the holes with readymade screw-hole plugs of a matching wood—or better, with boat plugs which are cut at right angles to the grain. Sand the plugs flush, stain and refinish.

**Raising sagged floors:** Undue settling of floors at the center of the house often is due to rotting of wooden girder posts. In some cases uneven floors are caused by sagging of the girder between posts. To replace a post, first set up temporary supports on each side of the girder joint as in Fig. 7, with the lower ends of the supports resting on jackscrews. Make sure that the supporting posts are perpendicular, and raise the jackscrews until the weight is fully supported. Spike a 4 x 6-in. bridge block to the underside of the girder across the girder joint as in Fig. 8 and place a steel jack post as indicated, with its lower end bearing squarely on the concrete footing and its upper end centered against the underside of the bridge block. Now, being sure that the supporting jack post is perpendicular, tighten the jack at the top end to take the weight. The steel post is left in place permanently. Where additional supporting posts are required to straighten a sagging girder, it will be necessary to break up a portion of the concrete floor and pour a substantial footing for each post as in Fig. 9. After placing the jack post under a sagging girder, turn the jack up so that it takes the weight, and then raise the girder  $\frac{1}{8}$  in. at intervals over a period of time. In this way, loosening of framing nails and excessive cracking of plaster will be avoided.

**Vibrating floors:** Floors that vibrate when walked upon result from inadequate support, such as the use of joists which are too small in cross-sectional area, too long a





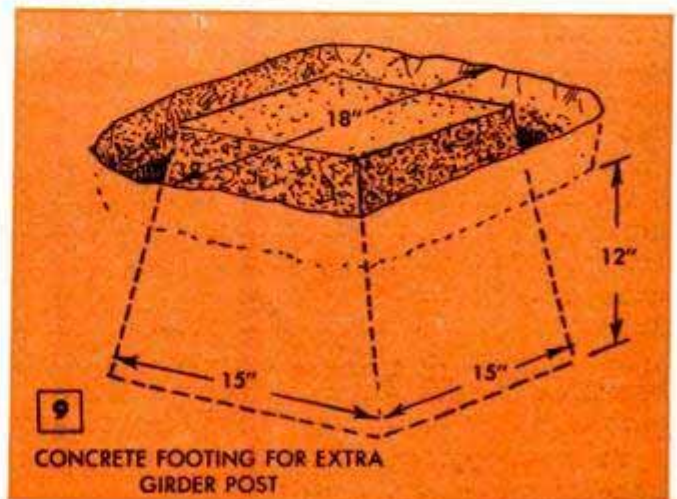
Above, to correct sagging of first floor, one or more temporary supports are placed under girder with the lower ends bearing on jackscrews. Below, the old post is then removed and replaced with a new-type steel post having a built-in jack for raising the girder



span between supporting girders, and insufficient or improperly located bridging between the joists, Fig. 1. There are several simple remedies that can be applied where the floor is open on the underside. Doubling the joists by nailing or bolting an additional member to each of those already installed often is practical and effective. Jacking up the floor from underneath and installing additional lines of bridging is nearly always a sure remedy. When vibration occurs in the second floor, the ceiling of the first floor may have to be opened to install bridging or extra joists.

**Gap at shoe mold:** Settling and shrinkage of wood often cause unsightly gaps between the baseboard and the shoe mold. Details A and B of Fig. 11 show what happens when the shoe mold is nailed either to the baseboard or to the finish floor. To make it easy to close these openings when they occur, the nails holding the shoe mold should be driven diagonally between the baseboard and the finish floor and into the subfloor as in detail C. This latter method of nailing can be used only if there is space equal to the width of the baseboard between the floor and wall. Otherwise, the only way to eliminate the gap is to re nail or replace the shoe mold periodically, Fig. 10.

**Refinishing wooden floors:** When hardwood floors are in good condition and the finish is not excessively marred or worn down to the bare wood in spots, refinishing without resurfacing, Fig. 12, is entirely practical. The floor should be thoroughly cleaned before refinishing, and all wax must be removed with turpentine. On ordinary work there is a choice of two types of floor finishes: (1) Floor sealers which penetrate into the wood, and (2) Floor varnish, shellac and paint, the latter three forming a coating on the surface. Floors treated with a sealer do not show scratches or streaks as readily as do varnished or shellacked floors. However, the sealers used alone are not as durable. The finish must be cleaned and renewed more frequently. Cleaning can be done with a me-

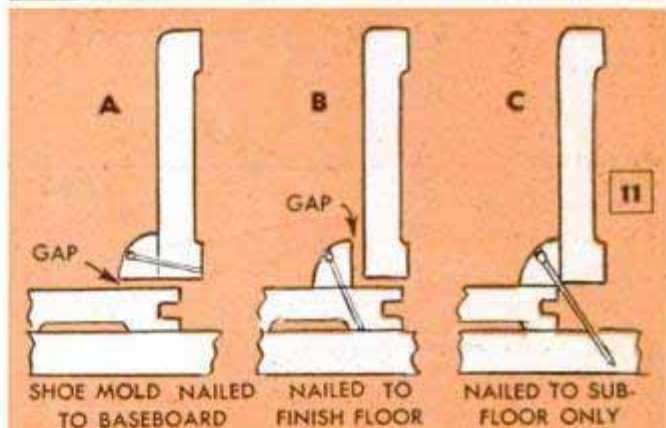




dium solution of trisodium phosphate. After washing the floor, there may be some discoloration and, if so, the wood can be bleached to a uniform color with a mild solution of oxalic-acid crystals (poison) and water. This is applied to the floor with a cloth swab and then rinsed off with clear water. Usually a single application is sufficient. Water in the solution will raise the grain of the wood, so, the floor should be sanded lightly before a finish is applied. (*Caution:* When sanding a floor on which a bleach has been used, wear a dust respirator.) Floor sealer must be laid on quickly, either with a wool applicator or with a wide-bristle brush, first working across and then with the grain. Allow the sealer to set for a few minutes and then wipe off the excess. When the sealer is dry, smooth the floor with No. 2 steel wool. When finishing a floor, start at the corner farthest from the door and cover the floor in strips 4 to 6 boards wide, ending up at the door opening. Clean up the dust as you go with a painters' tack rag and leave the window sash open at the top and bottom and the door slightly ajar until the finish is dry. White shellac is quite extensively used as a wax base on hardwood floors because it dries so quickly that the floor can be back in service within a day's time.

**Resurfacing wooden floors:** When a floor is uneven and its surface has become badly worn, resurfacing with a sanding machine, Fig. 13, will be necessary. These machines can be rented from most hardware and paint stores. Removal of varnish or paint will require the use of a No. 4 open-coat abrasive. After the finish is removed down to bare wood, use a No. 2 abrasive for reducing the deep scratches made by the coarse abrasive. Do not stop the machine while the sanding drum is in contact with the floor, but rather allow the machine to pull itself across the floor. After high spots and the old finish have been removed with the two coarser grades of abrasives, finish a hardwood floor with No. 1/2 or No. 0 abrasive. Most floor sanders will not run closer than 2 or 3 in. from the baseboard. This strip is finished with an electric edger, using the same abrasive grits as with the sander. Avoid getting the floor soiled or marked during or after sanding. If the resurfaced floor is to be stained, apply the stain first and then the filler, and after the latter is thoroughly dry, apply the finish. Use two applications of sealer and three coats of varnish on resurfaced floors. Allow 36 to 48 hrs. for drying between coats. Any type of floor wax can be used over floor sealer or varnish but do not apply a water-emulsion (self-polishing) wax over shellac.

**Painting concrete floors:** There are two general types of concrete floor paints, the



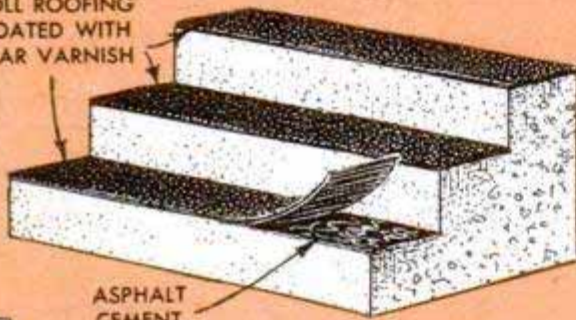
Shoe molds commonly are nailed to the baseboard or to the finish floor. Undue settling and shrinkage of wood in the framing often causes a gap to show under the shoe as at A, or, when nailed to the floor, as at B. To avoid these faults, the shoe mold should be nailed as in detail C. Then, when settling causes a gap to show in either position, it can be closed by simply driving the nails down as shown





13

ROLL ROOFING  
COATED WITH  
SPAR VARNISH



14

SMOOTH CEMENT STEPS MADE SLIP-PROOF



15

varnish-base enamel type and the rubber-base type. Use the former on concrete floors that are above grade and uniformly dry. The rubber-base concrete paints are suitable only for use on concrete floors below grade which are protected from direct sunlight. Rubber-base paints can be applied only to unpainted concrete floors, and should not be applied over any other type of paint. There also are combination concrete sealers and stains. These do not have the color brilliance of the others but do have an advantage in that worn spots can be finished to match other areas of the floor without producing a spotty appearance. In any case, new concrete should age for a year before being painted. Before painting, apply a neutralizer consisting of zinc-sulphate crystals, 3 lbs., dissolved in water, 1 gal. Concrete floors that have been troweled smooth should be etched to assure good adhesion of paint. An etching solution is made by slowly adding muriatic acid, 1 pint, to water, 1 gal., while stirring constantly. (*Caution:* Do not allow the acid or solution to touch the clothing or skin as it can cause severe burns. Avoid inhaling the fumes.) Apply the solution with a cloth swab, and allow to stand for 10 to 20 minutes. Then wash off with a soda solution to remove the acid and also to neutralize any remaining on the surface. Finally, flush off the floor with a quantity of clear water. To minimize dusting of unpainted concrete floors apply a hardener made by dissolving magnesium fluosilicate crystals, 2 lbs., in water, 1 gal. Allow the first application to dry 24 hrs. and then follow with a second application. This treatment may be followed by painting. Smoothly troweled concrete steps which are slippery when wet can be made slip-proof by etching as described, or by covering the treads with pieces of roll roofing laid on asphalt cement as in Fig. 14. The surface of the roofing is given three coats of spar varnish or enamel to bind the slate surfacing. Oil or grease spots on driveways and concrete floors can be removed by scrubbing with a solution of trisodium phosphate, 4 oz., and water, 1 gal. After scrubbing, sprinkle hydrated lime over the stained area and allow it to remain for several hours before sweeping it up. This will remove the oil, and generally most, if not all, of the stain.

**Floor coverings:** A common trouble with new floor coverings is lack of complete adhesion. When single tiles or blocks loosen, it will be necessary to remove the block entirely and replace it over new adhesive. To cement asphalt tile, use asphalt emulsion and spread it very thinly, as excess cement oozing up between the tiles may cause discoloration. The cement is allowed to set until tacky (unless instructions

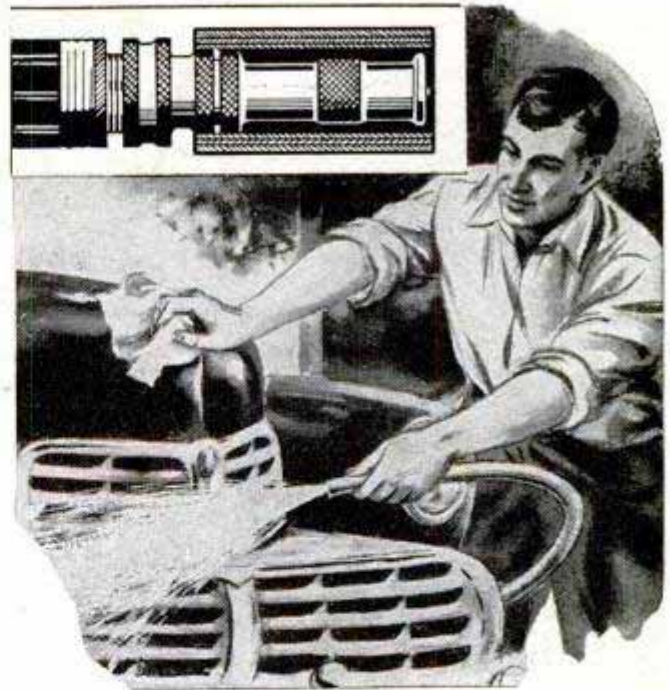
direct otherwise) and then the tile is laid carefully in place. Asphalt tile can be cemented directly to smooth concrete floors above grade. On wooden floors, asphalt tile must be laid on an asphalt-impregnated felt cemented to the floor with lignin paste. Edges of the felt are butted, not lapped. Wooden flooring blocks can be easily cemented directly to concrete or wood with a hot asphalt cement specially made for the purpose. Lignin paste is used to cement cork and linoleum floor coverings. If the floor covering must be cleaned frequently by mopping or flushing with water, it is best to use resin cement and asphalt-impregnated felt as a base. For bonding rubber tile, lignin paste, rubber cement or latex cement may be used.

**Cleaning and waxing floors:** Varnished or shellacked floors which are not waxed should be cleaned with an oiled mop. Floors coated with a sealer can be washed with a slightly soapy water, rinsed with a wet cloth and then wiped dry. Clean waxed floors with a soft floor brush. Do not use an oiled mop as oil softens the wax. To remove embedded grime, rub lightly with a soft cloth wrung out in warm, soapy water. Clean painted concrete floors with plain water. Linoleum floors that are not waxed or lacquered are washed with a mild solution of trisodium phosphate, care being taken that water does not seep under the edges to loosen the adhesive bond. Rubber-tile floors should not be cleaned with hot water. Use a solution of household ammonia in cold water. Most common stains on rubber floor coverings can be removed by rubbing the stained area with No. 00 steel wool. Cork flooring is ordinarily cleaned with a floor brush or a dry mop. If it is very dirty and soiled, use warm, soapy water applied with a cloth or sponge. Rinse and dry the floor immediately. Cleaners and polishes containing oils should not be used on asphalt tile. The common floor waxes are of two kinds: (1) The paste and liquid waxes having volatile organic solvents, and (2) the water-emulsion waxes which are known as nonrubbing or self-polishing. The former require polishing either by hand or with an electric polisher, Fig. 15. Apply wax in thin coatings, each coat being wiped on at right angles to the previous one.

### Increasing Efficiency of Spray Gun Powered With Vacuum Cleaner

When using a tank-type vacuum cleaner to power a spray gun, remove the dust bag and cap from the intake end of the cleaner. This increases the pressure and the volume of air passing through the spray gun.

Mak Mulcahy, Las Cruces, N. Mex.



### Guard Over Garden-Hose Nozzle Prevents Marring Car Finish

To be sure that the finish of your car is not scratched when washing it with a garden hose, slip a short length of hose over the nozzle, allowing it to project about  $\frac{1}{4}$  in. beyond the end. This will not interfere with normal adjustment of the spray and will keep the end of the nozzle from rubbing against the paint when spraying in close quarters.

John Kretschmar, Monsey, N. Y.

### Fan Placed on Electric Range Dries Hair Quickly

Setting a fan on an electric range so it blows across the burners provides an efficient hair drier. Turn the burners to "high" and sit as shown in the illustration. Thus, the hot air from the burners will be blown through your hair to dry it quickly. Do not use this method on any range that has an open flame, as the flame may be blown out or possibly ignite your clothing or hair.

Wayne C. Stauffer, Eugene, Ore.

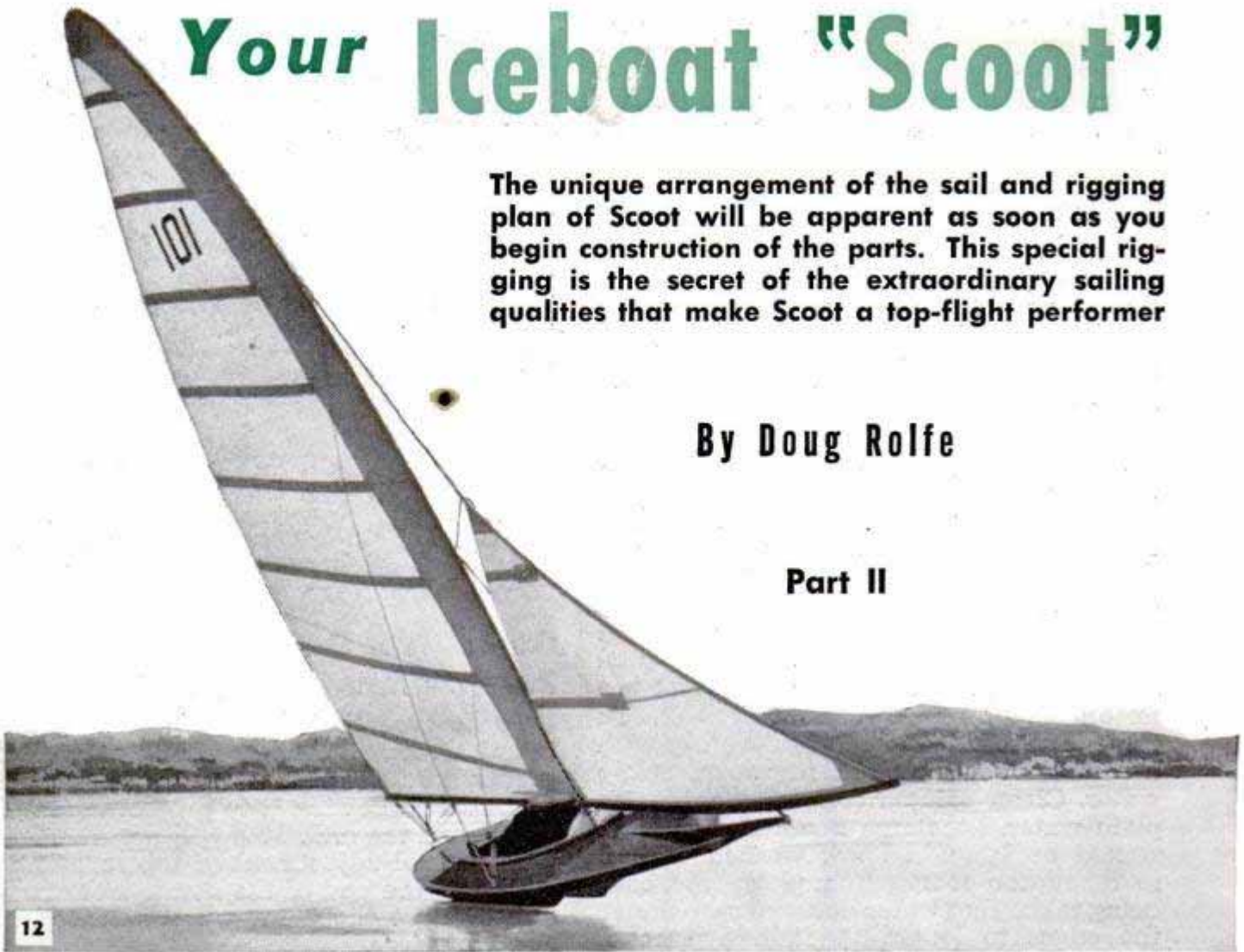


# Your Iceboat "Scoot"

The unique arrangement of the sail and rigging plan of Scoot will be apparent as soon as you begin construction of the parts. This special rigging is the secret of the extraordinary sailing qualities that make Scoot a top-flight performer

By Doug Rolfe

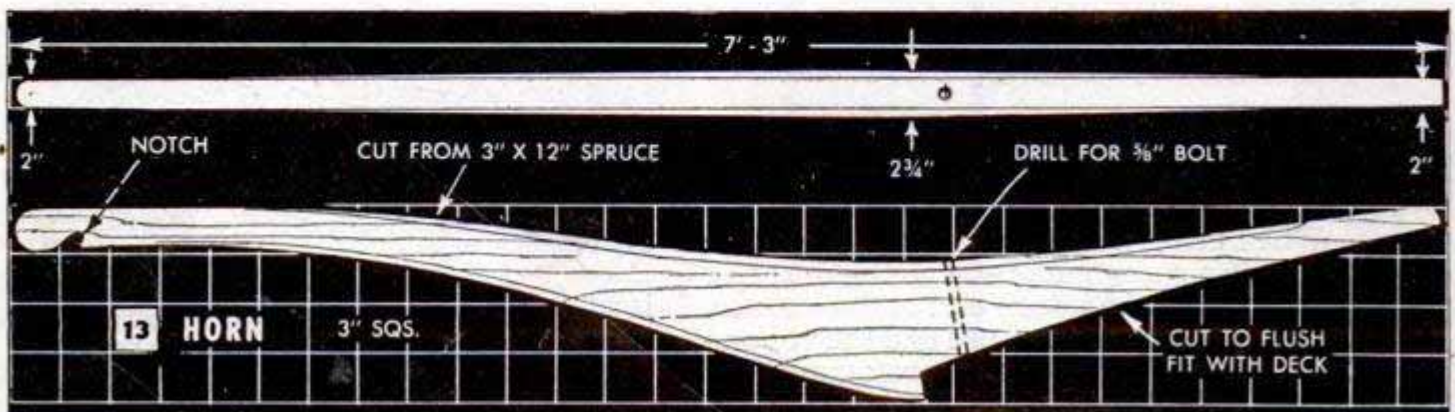
## Part II



**I**N THE photo above you see "Scoot" in action, heeled over to starboard with the flat, streamlined hull bearing on only one runner and the sail rig trimmed for full drive on the long reach of the port tack. Note the trim, hard set of the sail rig, the smooth, tight curve of the hook mast and the pivoted jib boom carried on a specially designed horn, or bowsprit. This special rigging of the jib sail, which is used as a rudder, gives Scoot that quality of instantaneous rudder response so essential in a racing iceboat.

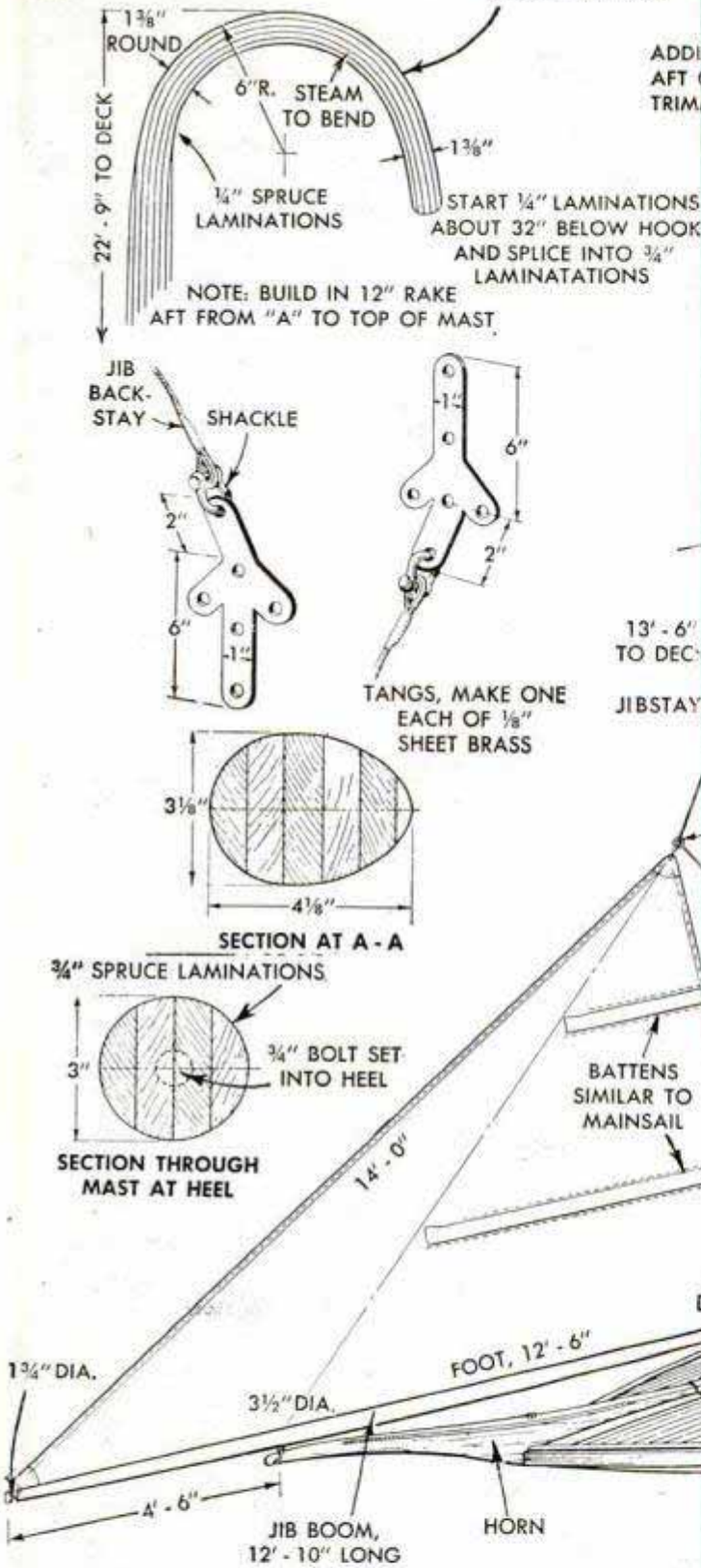
With the hull completed as described in Part I, the first step in fitting rigging is laying out and bandsawing the horn, Fig. 13.

The horn should be very carefully fitted to the curve of the deck, and then tapered and chamfered. The  $\frac{5}{8}$ -in. bolt which holds the horn in place, and at the same time makes it readily detachable, passes entirely through the breast hook. The aft end of the horn is held in a U-shaped clip, Fig. 16, which is screwed to the deck. The smooth round-bottom notch for the jib-boom ring fitting, Fig. 16, is formed by sawing down the sides, and smoothing with a wood rasp and fine sandpaper. A standard tiller-rope guide for the mainsail sheet, Fig. 22, a 7-in. traveler and cleats for the main and jib-sail sheets are the only other permanent deck fittings.

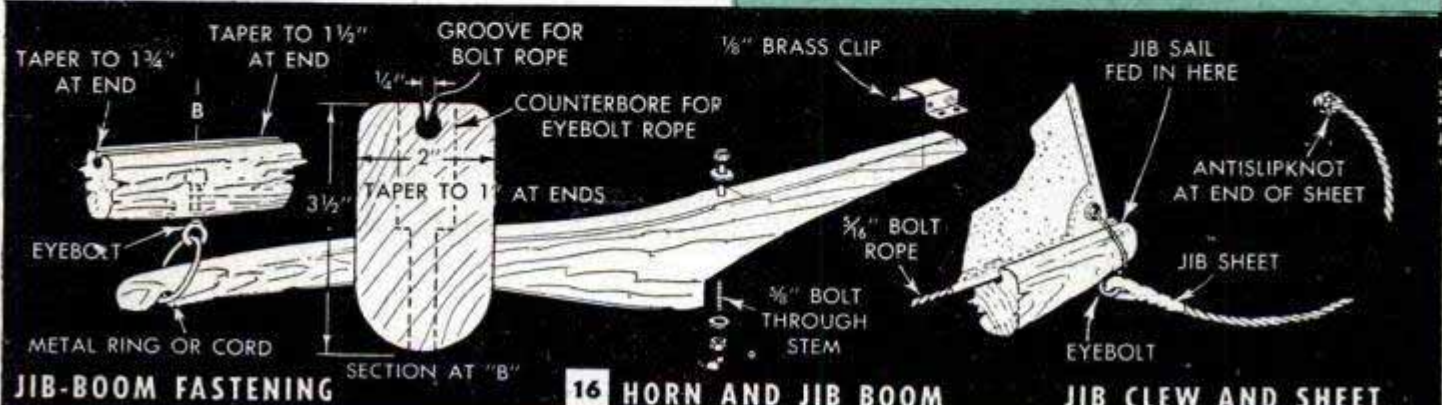
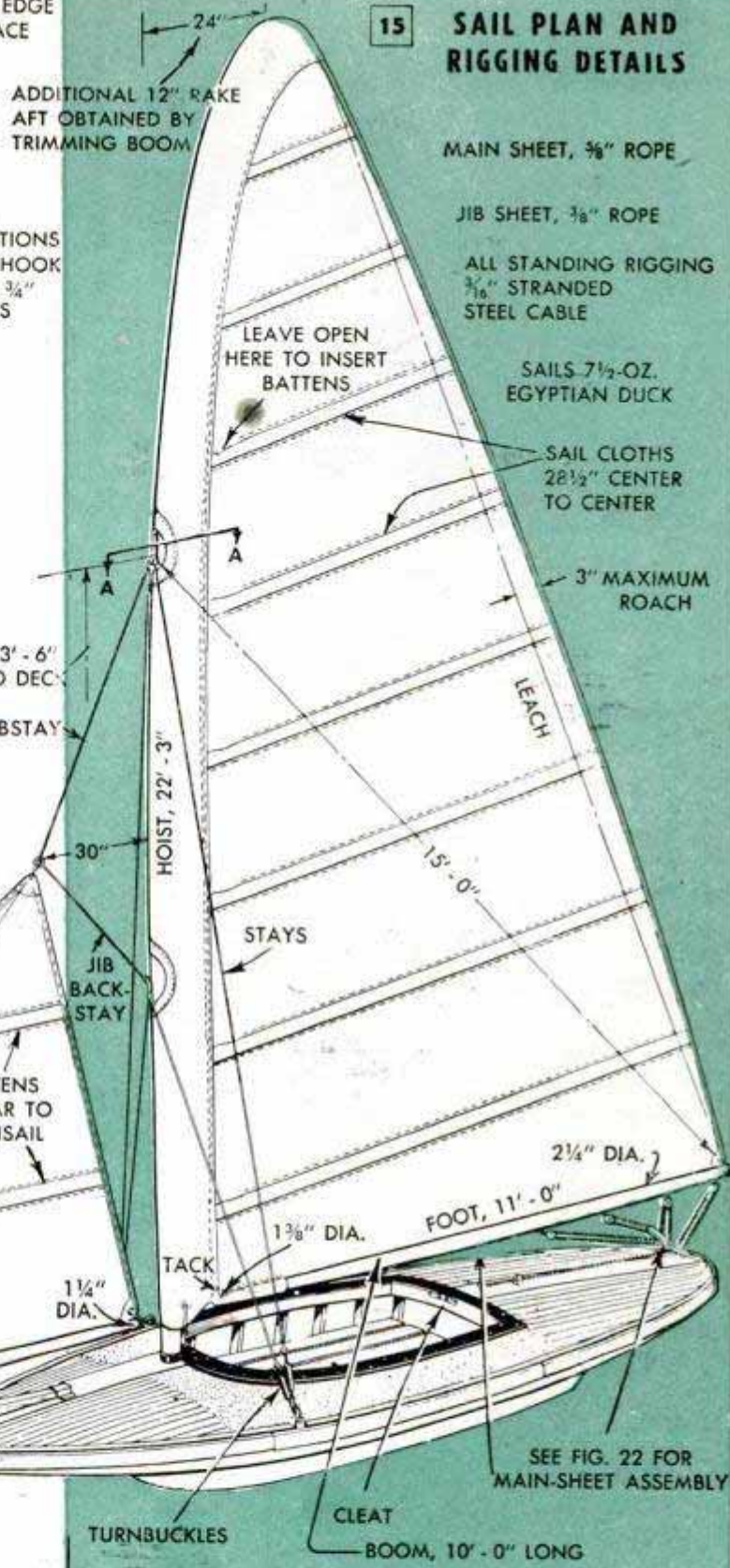


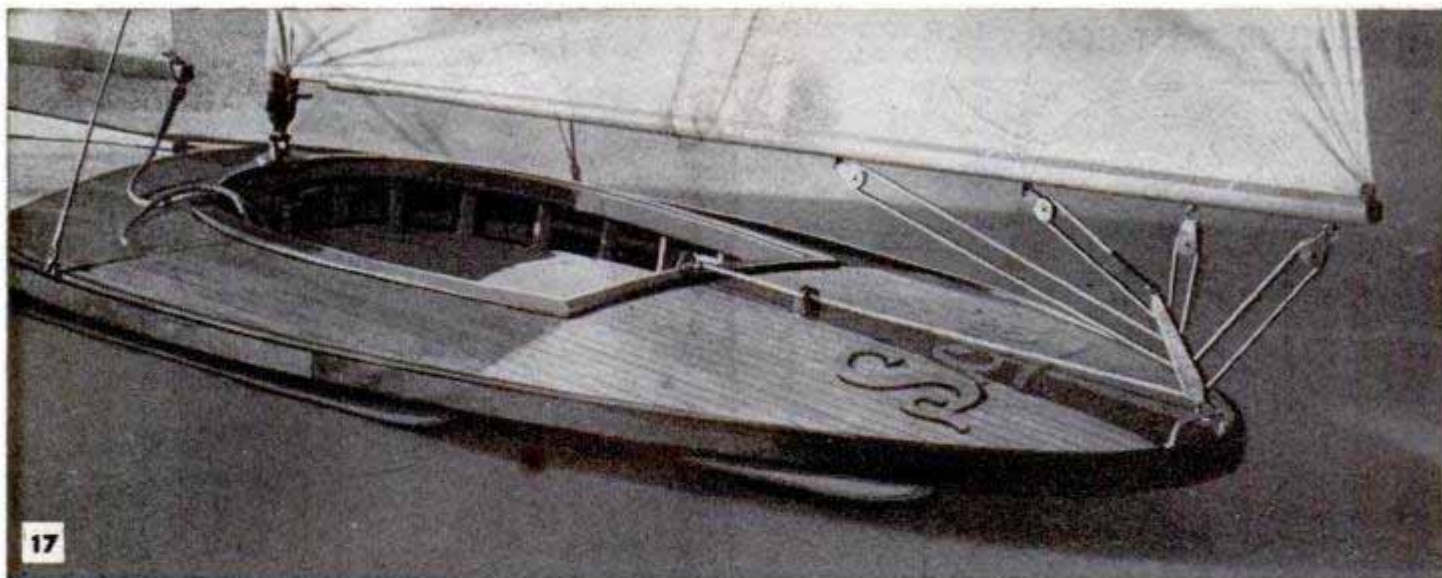
**14** **DETAIL OF MAST HOOK**

TAPER TO KNIFE EDGE ON AFT SURFACE



**15** **SAIL PLAN AND RIGGING DETAILS**



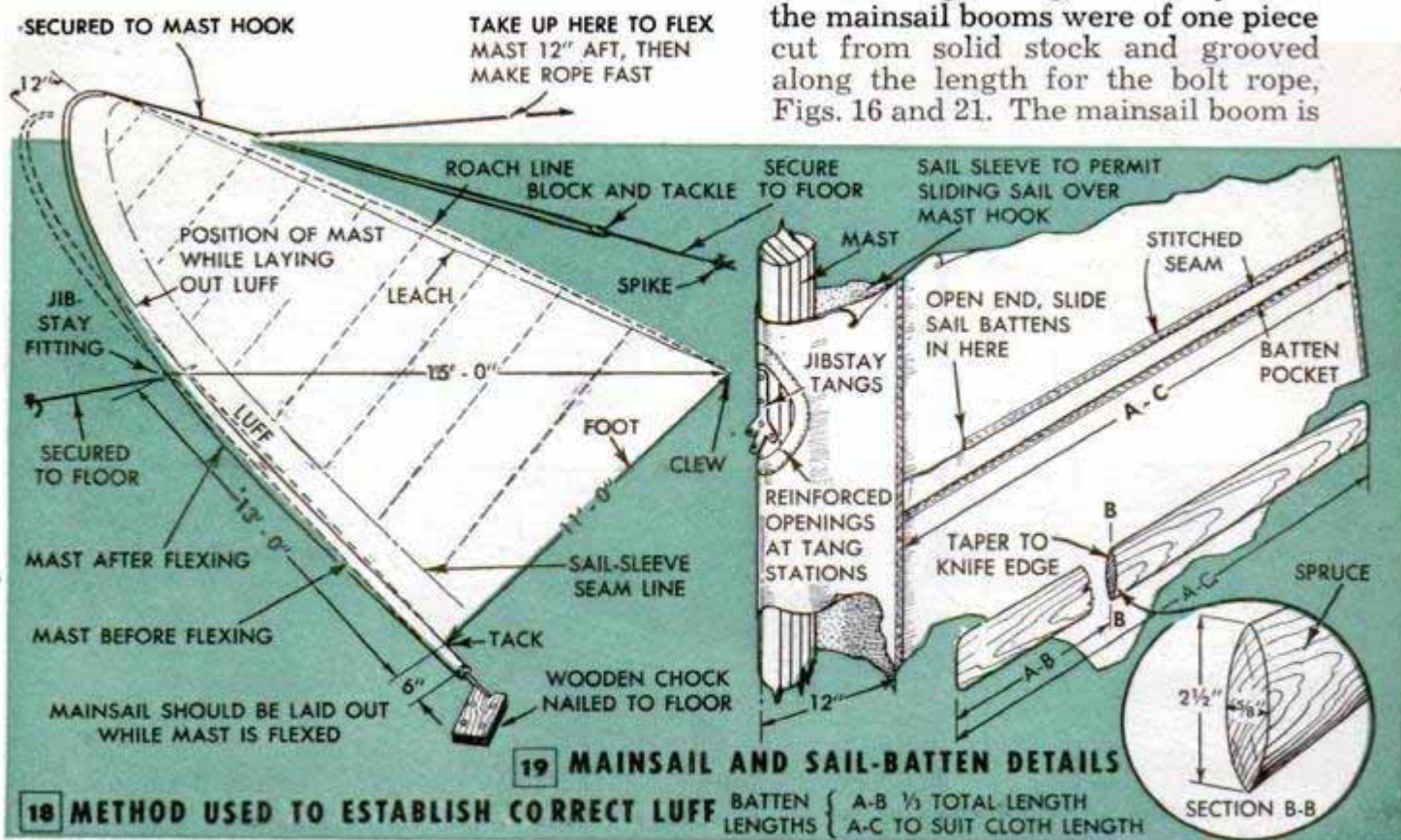


When fully rigged, Scoot looks like this. Note the roomy, shallow cockpit and the novel boom tackle for trimming the mainsail to suit wind conditions. Foot of the mainsail is attached to boom with bolt rope

The mainmast, Fig. 14, is built up to the required size by laminating selected spruce in a rectangular cross section, using both  $\frac{1}{4}$  and  $\frac{3}{4}$ -in. stock. By constructing a bending jig on a level floor of sufficient length, the mast can be built up in one operation. Stock for the hook section must be steamed before bending. Rip the  $\frac{3}{4}$ -in. stock for the lower section to  $3\frac{1}{4}$  in. in width and glue and clamp it into the improvised jig with C-clamps. Use waterproof glue. The ends of the outside members project about 32 in. (See note on the upper detail in Fig. 14.) As the  $\frac{1}{4}$ -in. laminations are built up in the jig, make sure that all joining flat surfaces are coated

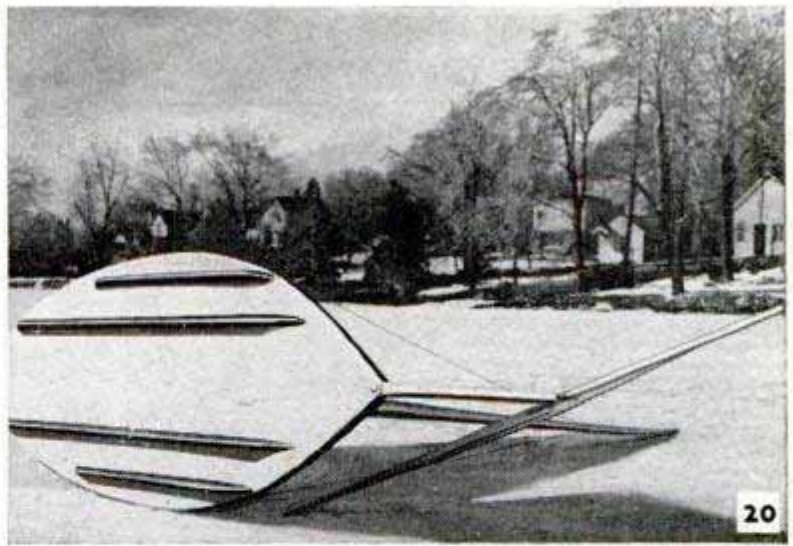
liberally with waterproof glue and that the C-clamps are equally spaced and tightened to a uniform tension. Allow the glued-up mast to dry 24 hours before removing the clamps. Now, note from Fig. 14 that the mast is round at the heel, but that it changes gradually to a pear shape at section A-A, Figs. 14 and 15, and then back to a round section at the forward turn of the hook bend. From this point the section again changes to an elongated oval with a knife edge on the after turn of the bend, Fig. 14. Shaping of the mast is done by hand with a spokeshave. It is then sanded smooth and finished with at least two coats of spar varnish.

In the original rig, both the jib and the mainsail booms were of one piece cut from solid stock and grooved along the length for the bolt rope, Figs. 16 and 21. The mainsail boom is



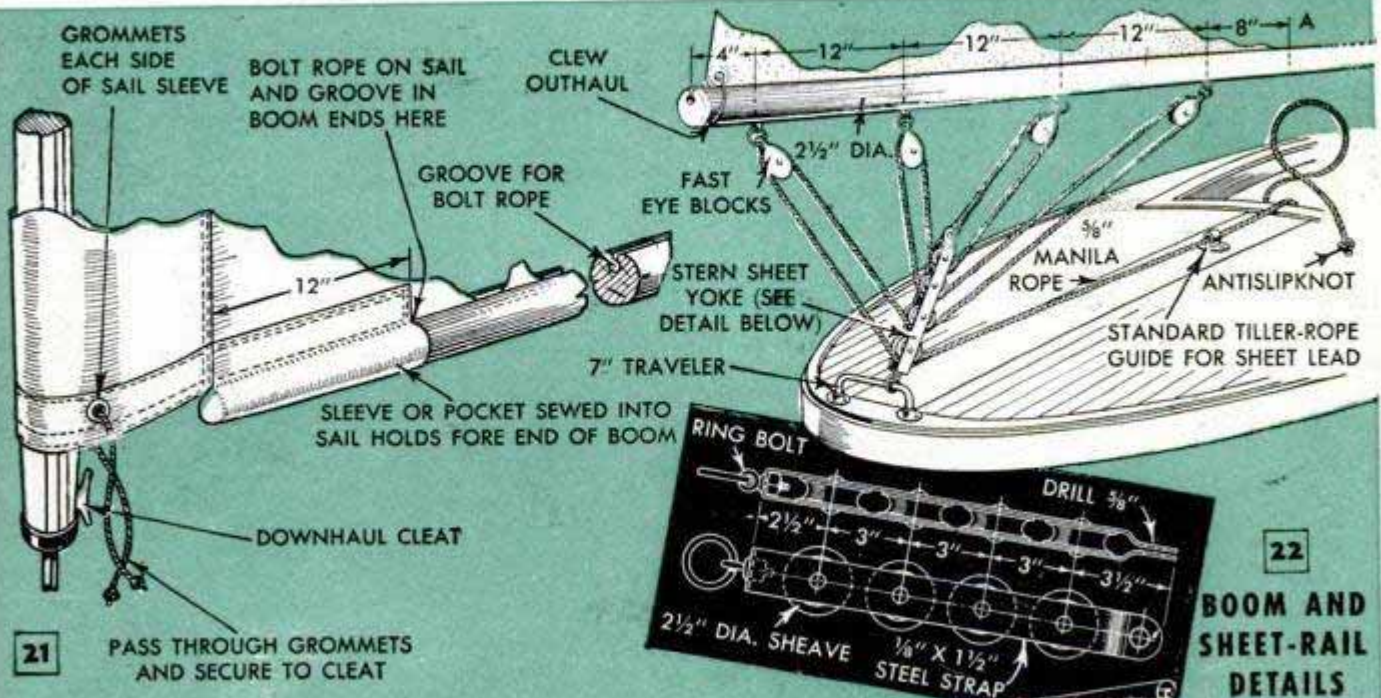
circular in section, but the jib boom tapers each way from the ring fastening and the section is rectangular with rounded corners, Fig. 16. However, it is easier to form the special undercut grooves if the booms are each made in two pieces and glued together after forming a round-bottom groove, or flute, in each piece. When the pieces are glued together, this will result in a single deep groove with a circular undercut as in the sectional view, Fig. 16. Finish the booms by sanding smooth and coating with spar varnish. Making the main and jib sails is a job for a professional sailmaker unless, of course, the builder has had experience in this work. Note from Fig.

21 that the mainsail boom is carried in a pocket sewed onto the foot of the mainsail. There is no gooseneck as in conventional rigging. Also, the builder will have to work closely with the sailmaker in establishing the luff of the mainsail, Fig. 18. The mast must be flexed with a tackle block in the manner shown, and it must be held in this position while laying out the luff of the mainsail. The luff, or leading edge, is in the form of a pocket, or boot, large enough to slip over the mast, Figs. 15, 18 and 19. No sail track is used, the luff being held taut by a short lashing made fast to a downhaul cleat, Figs. 17 and 21. Neither can the mainsail be raised or lowered once it is fully rigged. Instead, Scoot is simply tipped on her side as in Fig. 20 when mooring. Note in Figs. 12, 15 and 19 that both the jib and mainsail are fitted with special batten pockets, double-stitched at the edges. The pockets have open ends, Fig. 19,



The mainsail cannot be raised or lowered once it is fully rigged. When not in use for short periods, Scoot is tipped on its side

so that the battens may be inserted and removed easily. The battens are of selected spruce, worked down to an elongated oval section with sharp edges. In addition, each batten is tapered slightly both ways from section B-B, Fig. 19, to a blunt edge at the ends. The multiple-sheave sheet yoke, Fig. 22, is another special part and must be made up according to the detail. It is essential that all sheaves turn freely. The yoke is attached to the traveler by means of a ring bolt as shown. One end of the sheet is passed through the drilled ends of the yoke straps and is seized to the standing part. Then the free end of the sheet is passed through four eye blocks attached to the boom on the spacings indicated and successively through the four sheaves to make the novel dual-purchase tackle shown in Fig. 22. Tie an antislipknot in the end of the sheet. Then, check for free running of the rope through the blocks.



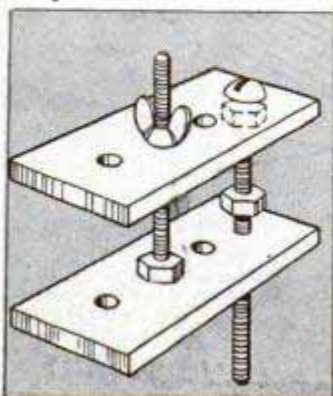
## Sidewalk Snowplow of Sheet Metal Mounted on Lawn Mower



Shoveling snow from the sidewalks around his home is no longer a back-breaking job for one homeowner who uses his lawn mower to push a lightweight snowplow. The latter is cut and bent from a piece of sheet metal and it is made wide enough to extend beyond both wheels of the mower. The plow is attached at the center with a flat-iron brace bolted to the mower handle and, at the sides, with additional braces notched to fit over the mower crossbar. The braces can be either bolted or riveted to the sheet metal. A strip of flat iron, bent at the center and riveted across the bottom edge of the sheet metal, adds rigidity to the plow. Note that the cutting reel and roller are temporarily removed from the mower and, on certain types, the bedplate also can be removed.

Paul J. Pirmann, Webster Groves, Mo.

## Improved Modelmaker's Clamp

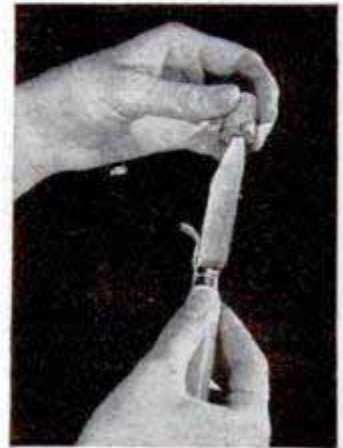


If you need an extra modelmaker's clamp, two steel mending plates and a couple of stove bolts can be used to improvise an inexpensive and satisfactory substitute. As shown in the drawing, the end

bolt, which is used for over-all adjustment, is tightened securely to the top plate and has an adjusting nut to keep the two plates separated. The second bolt is slipped through either of the three remaining sets of holes and the nut is tightened to the lower plate. A wing nut turned on this bolt draws the plates together to clamp the work.—John Behall, Richmond Hill, N.Y.

## Cork Sheathes Blade Point

Before carrying a paring knife or scissors in an apron pocket, press a small cork over the end of the blade to sheathe the sharp tip. This not only will keep the point from cutting through the fabric but will reduce the possibility of injury.



## Gluing Model Airplanes Simplified

When gluing wing and fuselage framing of model airplanes directly on a pattern, lay a sheet of wax paper over the pattern before setting the members in position. The wax paper will prevent the parts from sticking to the pattern.

Thomas Fuscaldo, Paterson, N. J.

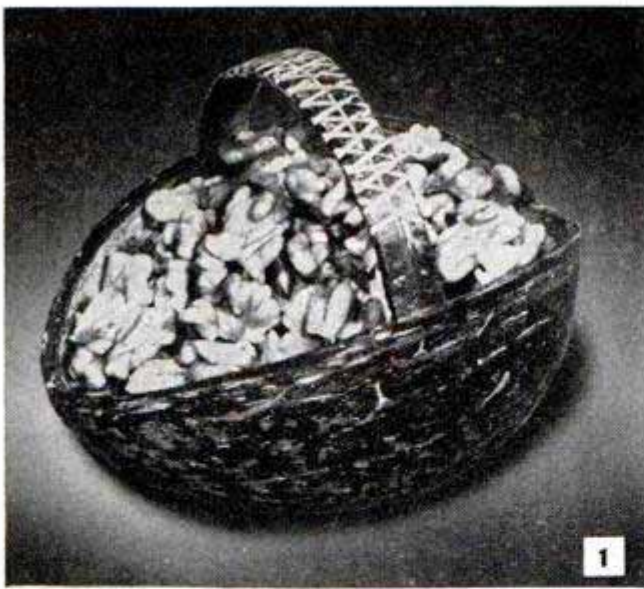
## Glass Container for Toothbrush

A toothbrush can be safely carried in an overnight bag or make-up kit if it is inserted in a glass tube of the type in which toothbrushes ordinarily are sold. A small cork pressed into the open end of the oval-shaped tube keeps the brush from slipping out, yet allows air to enter.

Helen Lemberger, Chicago.



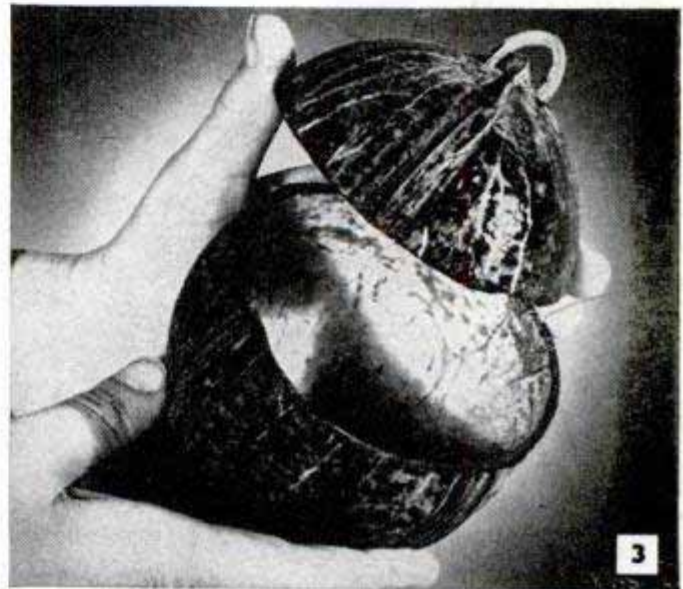




# COCONUT-SHELL BASKETS

*By Elma Waltner*

**U**SEFUL, attractive baskets are easily made from coconut shells, either by utilizing the shell alone or by combining parts of it with plastic handles or other ornamentation in color. Figs. 1 and 4 show a basket made from the whole shell, two sections of one side being cut away, leaving an integral handle. The cutting must be done with a fine-toothed saw blade so that the individual teeth do not bridge the rim of the shell and leave a rough surface. An ordinary hacksaw is just the thing for all straight cuts which must be made through both sides of the shell simultaneously. The rough, fibrous coating of the shell is removed with a wood rasp and the hard surface is smoothed with sandpaper. The ridge pattern can be preserved in low relief by sanding only the tops of the ridges, or a rather unusual finish can be had by first sanding to smooth the ridges and then working the surface with a wire scratch wheel. This treatment brings out the ridge pattern in bolder relief. Another shell basket, Figs. 2, 3 and 4, features a removable cover, a handle of colored plastic and a separate base, or collar, into which the basket fits snugly. It is made from portions of two shells and two pieces of colored plastic. Select two coconuts for uniformity of shell contour for this job. After cutting and smoothing the edges so that the parts fit together neatly, drill holes in the cover for the plastic ring, Fig. 4, and drill and slot the collar to take the ends of the twisted plastic handle. Heat the plastic to 250 deg. for bending and attach it to the shell with quick-setting cement. Finish the baskets with shellac, then wax and polish to a high gloss.



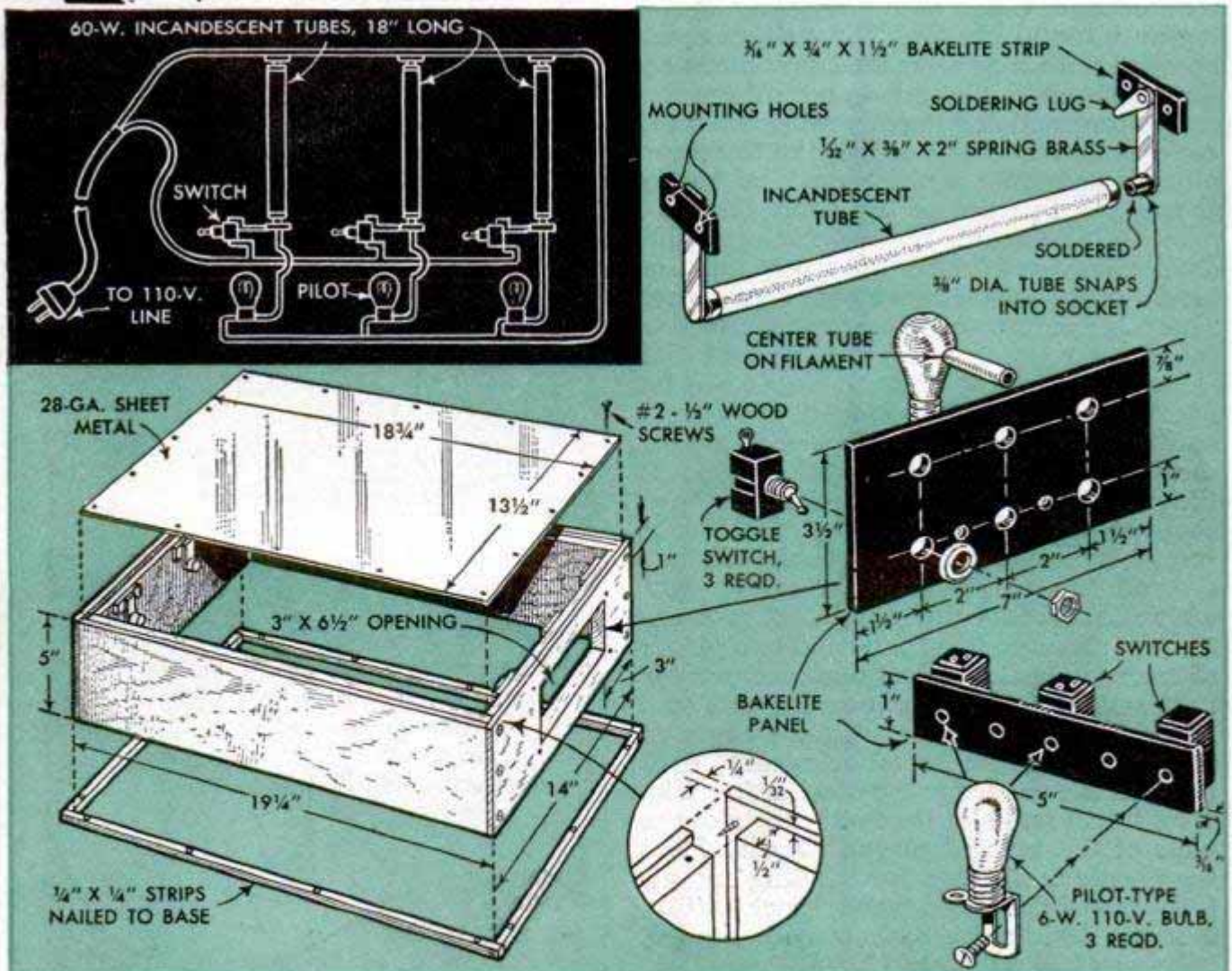
# Dual-Purpose

By Alexander Maxwell



IN IMPROVISED darkrooms where temperatures are likely to vary just enough to produce a sluggish developer at the critical moment, this simple three-stage hot plate will stabilize the solution at 70 deg. F. even when the temperature in the room drops to 50 deg. Just set the developer tray on the unit, place a thermometer in the solution and turn on one, two or three of the switches as required. The heating unit also is valuable in the propagation of temperature-sensitive tropical plants which cannot be exposed to temperature changes during winter months in the colder climates. Potted specimens, which also must be protected from drafts, are placed on the hot plate and covered with glass bottles or jugs from which the bottoms have been removed. The hot plate can be turned on and left in operation for months if necessary without harming the plants or the unit.

The heat source is three incandescent tubes which are supported inside a light-tight box fitted with a metal top. A con-



# Hot Plate

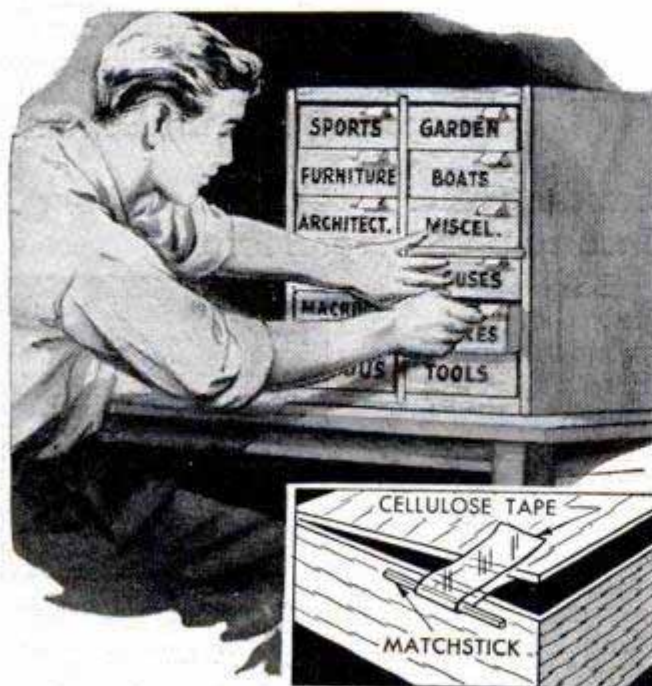
control panel having three toggle switches permits individual control of the incandescent tubes. First, construct a bottomless box of the over-all dimensions indicated in the detail below on the opposite page. Rabbet the top edges of the side and end pieces before assembling the parts with waterproof glue and screws. Use an ordinary drawing board for a base. Place the box on the base and mark lines around the outside to aid in locating the  $\frac{1}{4} \times \frac{1}{4}$ -in. strips which form the light trap at the bottom. Next, mount the tubes in the box, spacing them equally across the width. Cut a  $3 \times 6\frac{1}{2}$ -in. opening in one end of the box and fit the control panel. Then drill the panel for the switches and also the metal tubes centering on the pilot lamps. If desired, the holes for the tubes can be counterbored to take small plastic bezels in red. With this arrangement of the pilot lamps, it is easy to tell at a glance either in the darkroom or elsewhere how many of the incandescent tubes are switched on. Wire the unit as indicated in the wiring diagram on the opposite page. Now, coat the rabbeted top edges of the box with a gun-grade calking compound and screw the metal top, or plate, in place. Make sure that the metal is flat, without bulges at any point to form a light leak. Check for leaks by turning all three incandescent tubes on in a darkened room. Drive rubber-headed tacks into the base at the four corners to



form feet. Paint all the exposed parts with two coats of flat black, applying with a spray gun, if possible, to give a smooth, uniform job. Although not necessary, it is possible to add in some small measure to the heating efficiency by painting the inner surfaces of the sides, ends and bottom of the box with two light coats of aluminum paint applied with a spray gun. This should be done before the electrical fittings are installed and before the top is screwed on.

## Filing Cabinet Utilizes Cigar Boxes for Holding Classified Negatives

In order to file several hundred negatives sorted into a dozen general classifications, one photographer made a simple

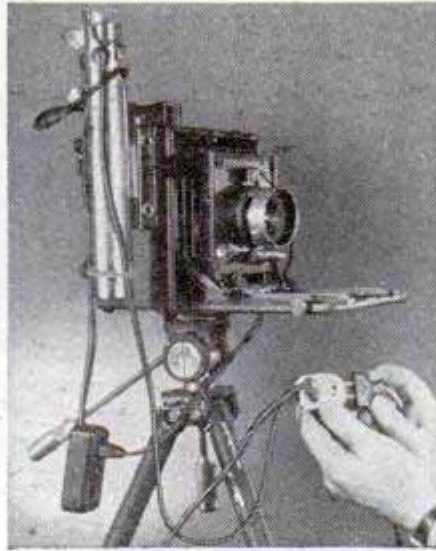
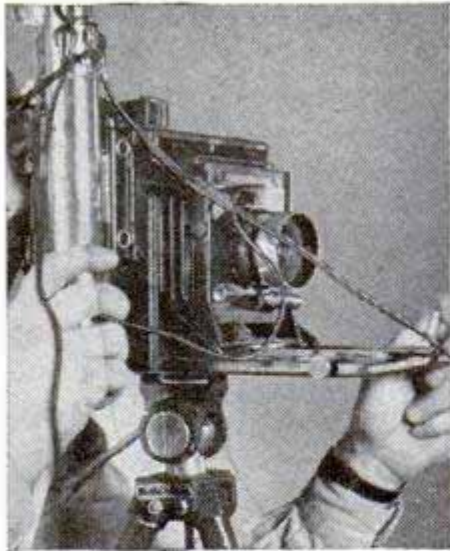


wooden filing cabinet, using ordinary cigar boxes as drawers. Although the original cabinet was divided into four sections, each holding three cigar boxes, it can be made to any size or shape required. The top, bottom and shelf are of  $\frac{3}{4}$ -in. solid stock and the sides and center partition are  $\frac{1}{4}$ -in. plywood. The cigar boxes, which will hold negatives up to  $5 \times 7$  in., are fitted with tabs to facilitate pulling them individually from their position in the cabinet.

## Shadowless Table-Top Shots

When you wish to make shadowless shots of small objects try this stunt. Place the objects on a white window shade. Then, with the lens stopped all the way down, use a photoflood lamp and make several exposures of one-second duration, changing the position of the lamp each time. Thus, by illuminating the background from different angles, converging shadows are nullified, resulting in a print completely void of shadows.

## Drop Outlets on Flash-Gun Extensions Prevent Pulling Cords in Front of Lens



One photographer uses a couple of 2 or 3-way female plugs suspended from drop cords on the flash gun. This eliminates the possibility of side-light extension cords being pulled across the front of the lens as in the left-hand photo. The right-hand photo illustrates how this method lowers the extension below the camera. One to three extension cords can be used from each flash-gun receptacle, and the drop cords are taped to the lower part of the gun.

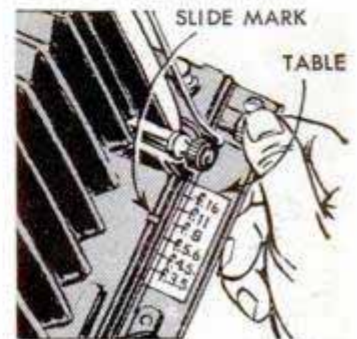
Frank P. Fritz, Chicago.

## Proper Diaphragm Opening Indicated By Handy Table Taped to Camera

On bellows-type cameras equipped with optical range finders, this handy table will instantly tell you the correct opening at which the diaphragm should be set for various ranges. The table must be used in conjunction with a constant flash-bulb size and shutter speed. Mark a short strip of waterproof adhesive tape to duplicate the spacings on the camera distance scale. Then, knowing the size of the bulbs you will use and determining the preferred shutter speed, calculate the diaphragm opening for the various ranges. Type these settings on the tape opposite the corre-

sponding marks and attach the tape to the camera bed in the same position as the distance scale but on the other side of the lens. Place a small piece of tape on the movable slide to serve as an index mark to indicate clearly the diaphragm opening on the table.

Kenneth Murray, Colon, Mich.



## Photo Outlined With Luminous Paint Brightens Youngster's Sleeping Room

A cutout photo of a pet or favorite toy outlined in luminous paint adds a cheerful note to a child's sleeping room after it has been darkened for the night. Using a 5 x 7 or 8 x 10 enlargement of the desired photo, carefully cut out the subject, such as the dog shown in the illustration. Then paste the cutout on a background of heavy colored paper. With a watercolor brush, apply yellow phosphorescent paint to the paper

around the edges of the cutout, stirring the paint often to be sure it flows evenly. Before painting the eyes, nose and other lines which run over the print itself, scrape off the emulsion with a sharp knife or razor blade. The picture can be framed in a regular mat-type photomount.

Betty Scheyer, Los Angeles, Calif.



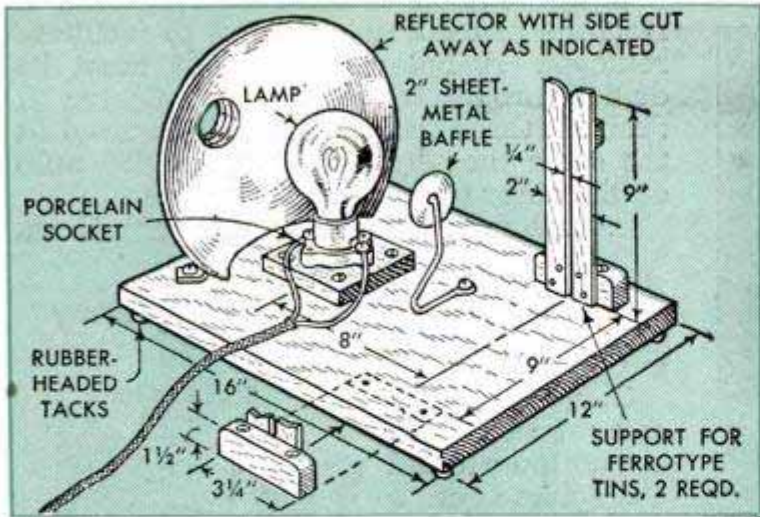
## Sanding New Wooden Photo Tongs Insures Undamaged Prints

Before using a pair of wooden print tongs for the first time, it is a worth-while precaution to sand the inside edges smooth. In this way, you can insure against splinters or rough spots on the surfaces of the tongs marring the emulsion on the paper.

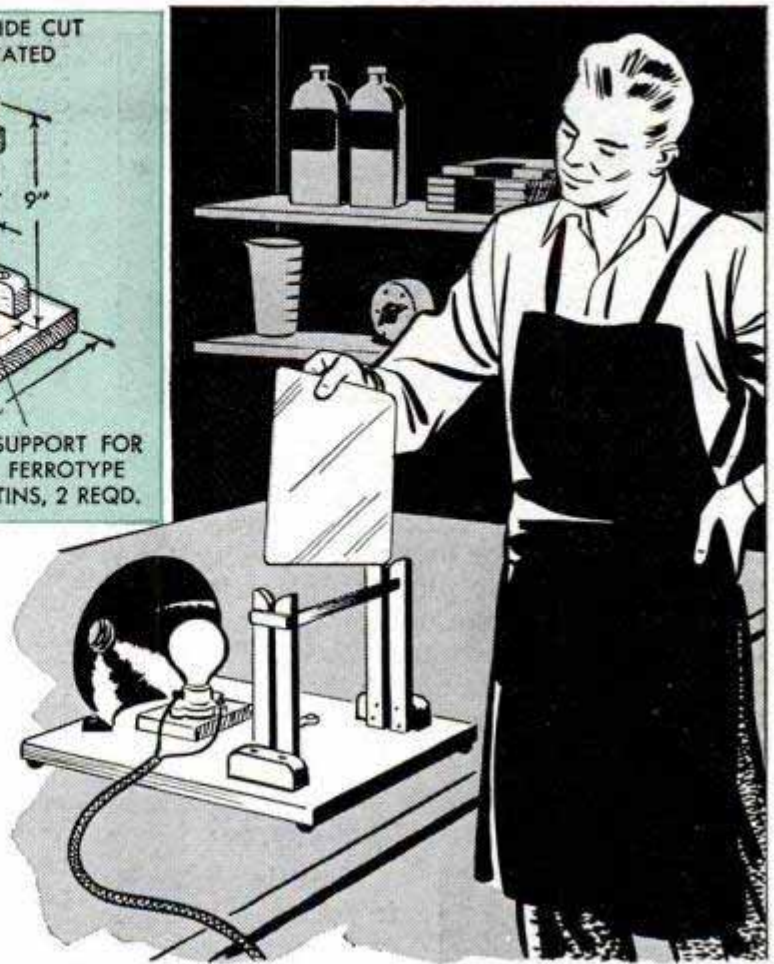
Virginia Hanson, Santa Monica, Calif.



# Lamp Dries Ferrotyped Prints Without Curling



This print drier is designed especially for those whose photo hobby does not permit the expenditures necessary for professional drying equipment. The unit detailed is extremely simple to construct. The parts are arranged to utilize the heat from a special infrared lamp of 250-watt capacity to dry ferrotyped prints at a slow, uniform rate which prevents curling or cracking. The reflector is made by altering a 10 or 12-in. metal reflector of the type used for photoflood lighting. It is mounted at one end of the plywood base by means of small metal angles which are cut from light sheet metal and soldered to the back of the reflector. The angles are attached to the base with screws. Next, a porcelain socket is centered directly in front of the reflector. The metal baffle is supported by a wire holder screwed to the base. The center of the baffle should be at the same level as the lamp filament and about 4 in. in front of it. Ferrotyping tins

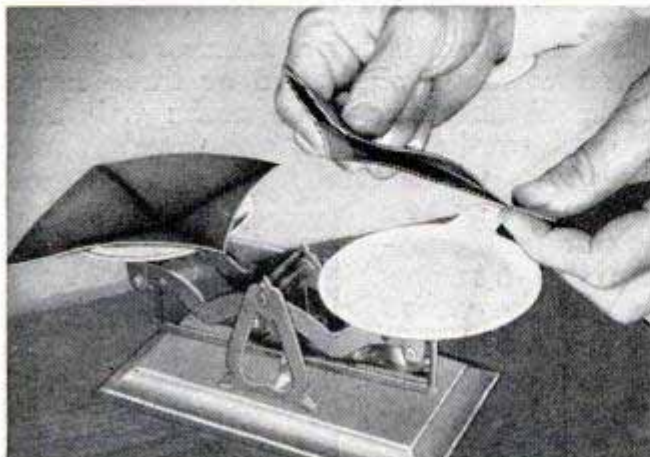


are supported in a vertical position in two special holders or guides, attached to the plywood base with screws in the manner indicated. Note that the distance from the lamp to the ferrotyping tin is given as 8 in. This is the minimum distance which is used for fast drying but for all-around work the distance may be increased to 9 in. At this latter distance, the drying time for the prints is approximately 25 minutes.

E. Peter Smith, Los Angeles, Calif.

## Paper Cut-Film Separators Hold Chemicals for Weighing on Balance

The black paper separators found in a package of cut film are a handy item to keep around the darkroom for weighing

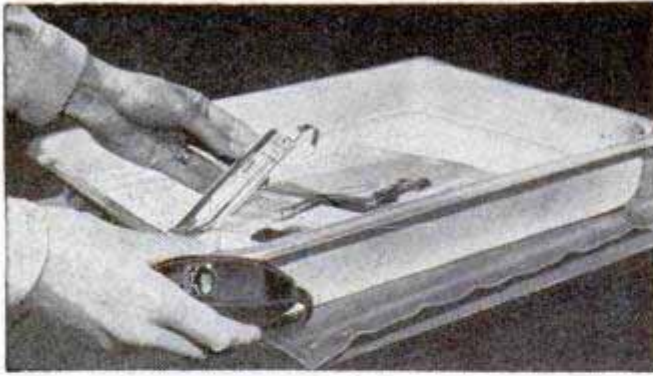


powdered chemicals on a balance. As these sheets of paper are identical in weight, using one of them to hold the chemical on one scale of the balance and another under the weight on the opposite scale will give accurate results. The sheets are creased diagonally between opposite corners to facilitate pouring the powder without spilling.

## Viewer Aids Color-Slide Projection

To make the showing of color transparencies to his friends more interesting, one photographer glances at each slide in a viewer before inserting it in the projector. In this way, he knows exactly which scene is going to be shown next. The dim light from the viewer is not distracting.

## Heating Pad Under Developer Tray Controls Solution Temperature



Because of the loss of heat through evaporation, it frequently is difficult to keep the developer solution within the temperature range necessary for best print quality. One way to do this is to place an electric heating pad, having a manual temperature control, under the developer tray. Then, by checking with a thermometer and adjusting the pad, the temperature of the solution can easily be kept within proper range.

## Salt Softens Contrasty Picture



If it is difficult to get a good range of tones from a contrasty negative even when using a soft grade of paper and diluted developer, add an ounce or more of table salt to the developer solution to soften the tone of the print. Because of the many variables, the exact amount of salt for best results must be determined by experimentation.

## Flash Bulbs Fired Simultaneously By Contact-Ignition Method



When an extra amount of light is necessary, it can be obtained by firing two flash bulbs simultaneously in the same reflector. This is done by placing a second bulb in contact with the one being fired. To mount the second bulb in the reflector, solder a threaded receptacle from an

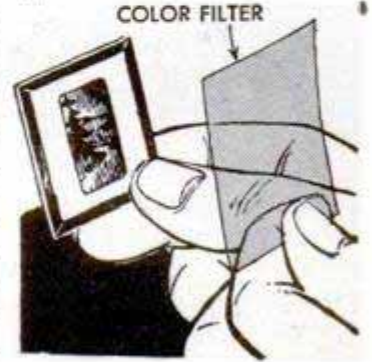
old lamp socket to a length of stiff wire. Then bend a loop in the other end of the wire and bolt it to the reflector, using a machine screw and wing nut to facilitate removal. A hole for the bolt must be drilled through the side of the reflector. If desired, three flash bulbs can be fired at the same time by mounting a third bulb on the other side of the center one.

Arthur Trauffer, Council Bluffs, Iowa.

## Correcting Off-Color Transparency For Improved Projection

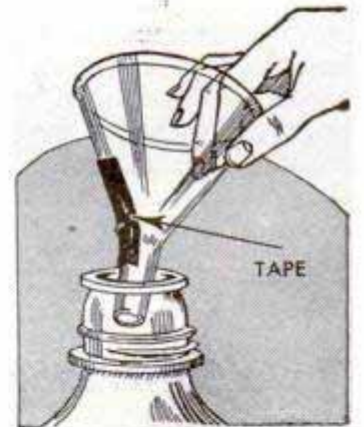
Covering an off-color transparency with colored Cellophane or a piece of color filter will considerably improve its quality when projected. If the transparency appears overly blue, use a yellow filter; if it is too yellow, use a blue filter, and so on.

When in doubt, the necessary correction can be determined by viewing the transparency through filters of various colors.



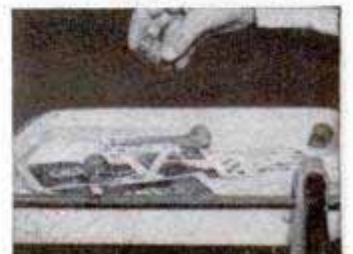
## Tape Stuck to Glass Funnel Permits Steady Flow

Liquid will flow more steadily from a glass funnel into a bottle if a strip of adhesive tape is fastened to the funnel as shown. The tape prevents air-lock by holding one side of the funnel slightly above the neck of the bottle.



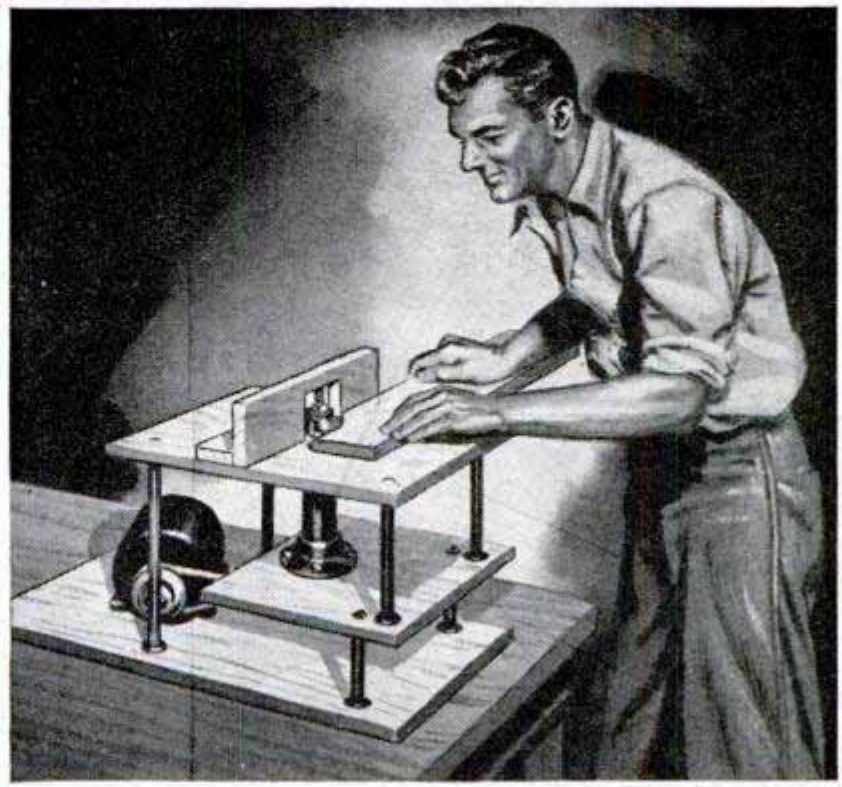
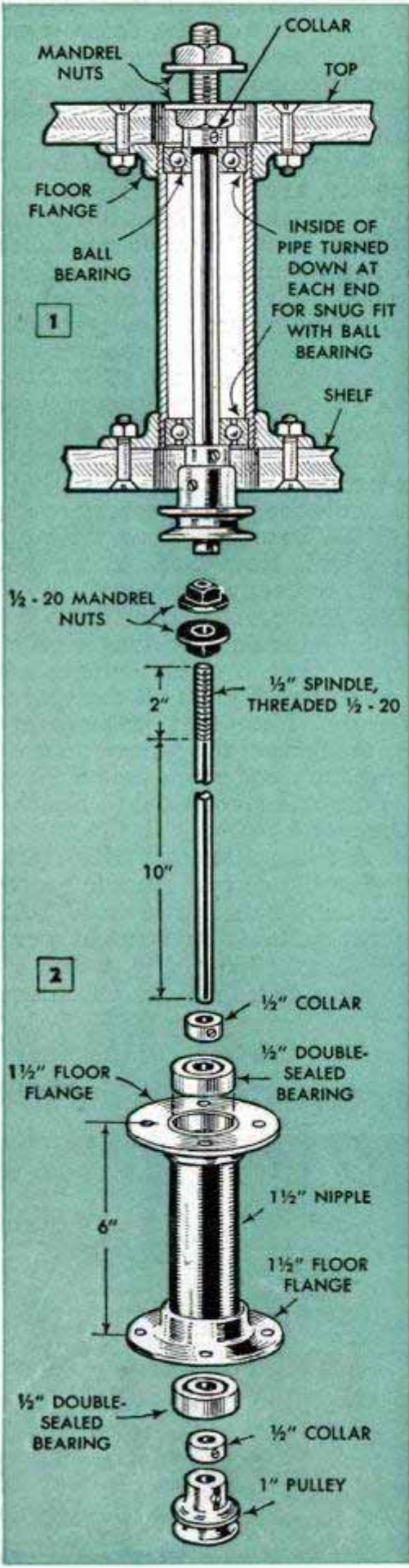
## Corks Floating in Washing Tray Keep Prints From Sticking

To keep prints from sticking together when washing, place two or three large corks in the tray. The corks will bob around in the current and break apart the prints which tend to stick, thus producing better washing and eliminating stains frequently caused by prints adhering to each other. — Harper Lyon, Topeka, Kans.





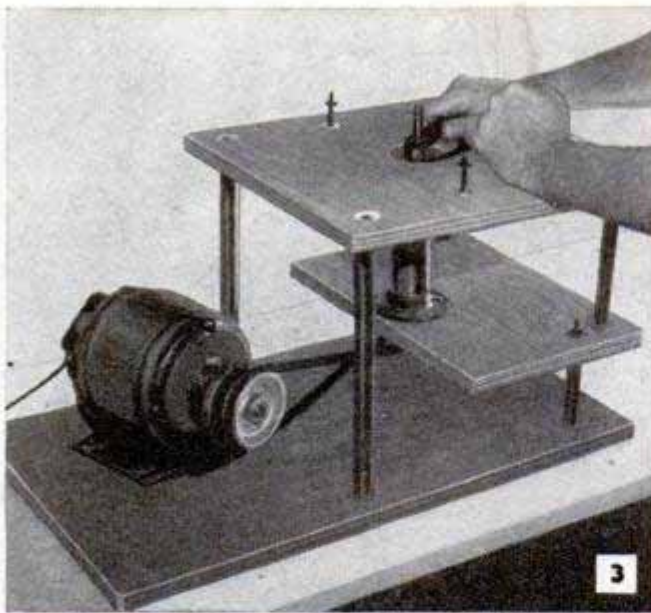
# SHOP NOTES



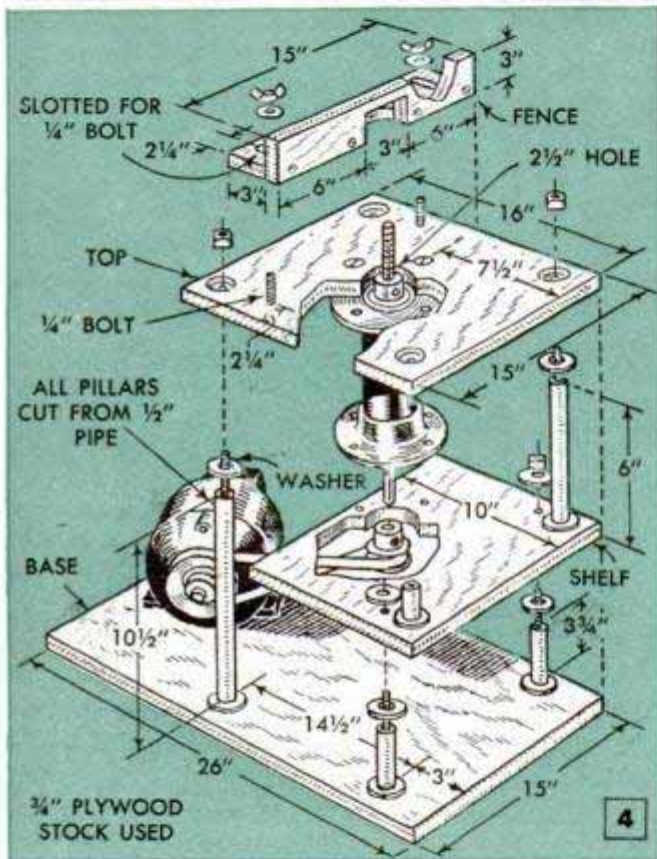
## WOOD SHAPER from pipe and plywood

By Evan Wright

HOME CRAFTSMEN and small woodworking shops having only occasional use for a shaper will find this unit practical and inexpensive to build. It handles any standard three-lip shaper cutter having a 1/2-in. hole and also safety cutterheads with removable knives. The spindle is mounted on sealed ball bearings which permit it to be driven at the high speeds necessary to produce smooth work. A 1/4-hp. motor supplies ample power for average work. The motor is mounted in the horizontal position and drives the spindle with a half-crossed round belt. By simply shifting the belt, the rotation of the spindle can be reversed, a requirement on some types of shaper work where separate cuts must be made on the top and bottom edges of the work. The spindle is made from a 12-in. length of 1/2-in. steel shafting. Cut a 1/2-in. No. 20 thread on one end for a distance of 2 in. It is best to cut this thread in a lathe if possible, as it is important that the thread be cut true with the axis of the spindle. The spindle housing, Figs. 1 and 2, is made from a 1 1/2-in. pipe nipple 6 in. long, and two 1 1/2-in. pipe floor flanges. Note in Fig. 1 that the pipe nipple is bored at both ends to house the ball bearings. This must be done in a lathe. To assemble the spindle unit, press the bearings in place



3



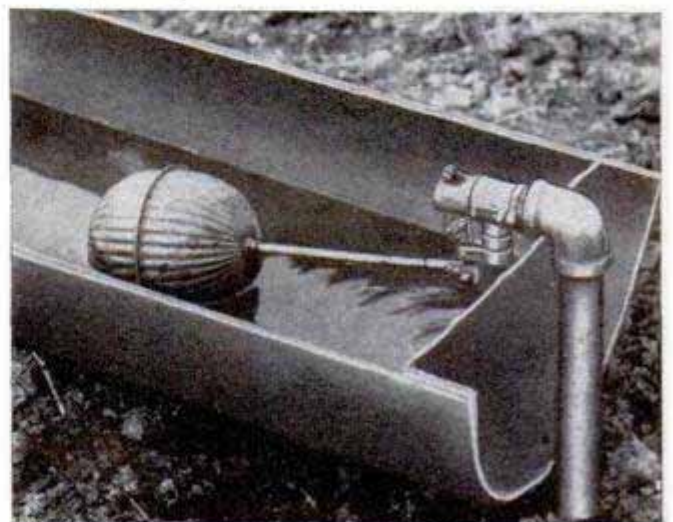
4

and then tighten a  $\frac{1}{2}$ -in. collar on the shaft just below the lower end of the thread. Pass the shaft through the bearings and tighten a second collar on the unthreaded end. This collar must fit snugly against the inner race of the bearing, Fig. 1. Then screw a floor flange on each end of the pipe housing but do not draw these up tightly. Now, note the manner of assembling the three-part frame which provides a table, a shelf support for the spindle assembly and a base for the motor, Figs. 3 and 4. The pipe pillars, or posts, which also serve as spacers, are cut from  $\frac{1}{2}$ -in. pipe to the lengths given. The base, shelf and top are cut from  $\frac{3}{4}$ -in. plywood and holes are drilled and counterbored in the positions indicated. Bolt the shelf to the base first, passing the bolts through holes drilled in the base, through the pipe spacers and through the holes drilled in the shelf. Support the shelf in the level position and set the spindle assembly in place. Then locate the table over the spindle and assemble all spacers between the top and the shelf. Finally, assemble the long spacers between the top and the base and draw the nuts down finger-tight. Now check to see that the spindle fits correctly between the shelf and the table. If necessary, adjust it to the proper length by turning the flanges off or on the nipple. Then bolt the spindle assembly in place and tighten all the spacer bolts uniformly. Note that washers are placed over the ends of the spacers to prevent crushing the wood when the bolts are tightened. Locate the motor on the base by lining up the motor pulley with the axis of the spindle. A 3-in. pulley on a 3450-r.p.m. motor will give the correct spindle speed. Use either a round belt or a  $\frac{3}{8}$ -in. V-belt. A simple fence suitable for straight work can be made as detailed in Fig. 4, and an adjustable shaper fence may be purchased if desired.

## Water Level Maintained in Range Trough By Float-Controlled Valve

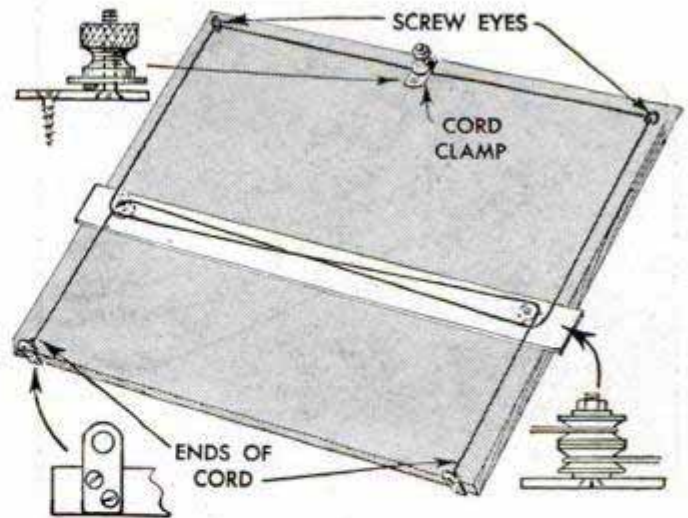
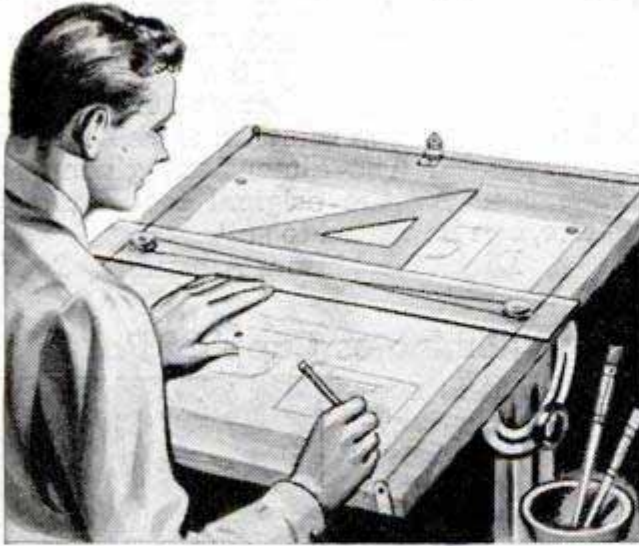
To solve the problem of maintaining a constant supply of fresh water for his range flock without the bother of opening and closing hydrants at regular intervals, one poultryman replaced the faucets on several hydrants with float-controlled valves. To make suitable watering troughs that would require a minimum of attention, he cut old hot-water tanks in half lengthwise and placed one end of each trough under the float valves as pictured. When the water is turned on at the source, the troughs fill and thereafter the float valve permits the supply in each trough to be continually replenished without further attention.

A. M. Wettach, Mt. Pleasant, Iowa.





# Automatic Straightedge Utilizes Odds and Ends

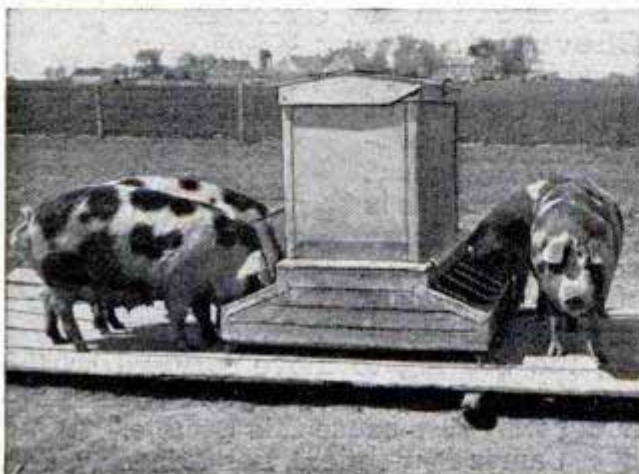


Operating on the same principle as the more costly professional type, this automatic draftsman's straightedge can be made quickly from scraps found around the home. A pulley-and-cord arrangement keeps the straightedge parallel with the position in which it has been set regardless of where it is moved along the height of the board. Double-groove pulleys attached near each end of the straightedge are made from flanges cut from the ends of thread spools. These are slipped over a flat-headed bolt and held together with a nut and washer. The bolt is first inserted through a countersunk hole in the straightedge and a washer is placed over the bolt to form a bearing surface for the pulley. Two screw eyes are turned into the surface of the drawing board at the upper corners, a metal anchor plate is fastened to each of the lower corners and a cord clamp is mounted at the top of the board. The clamp consists of a small piece of sheet metal, a knurled nut, a bolt and a washer which are assembled as shown in the upper left-hand detail. The countersunk bolt head is sol-

dered to the sheet metal to keep it from turning. After the straightedge has been adjusted to the correct position, the knurled nut is tightened, clamping the cord between the washer and the base. Begin threading the unit by tying the cord to the anchor in the lower left-hand corner of the board. Bring the cord up and over the bottom groove of the left-hand pulley and then along the straightedge to the bottom groove of the right-hand pulley. The cord is brought below the right-hand pulley and up through the screw eye in the upper right-hand corner. Then, pass the cord under the clamp, through the screw eye in the left-hand corner and down around the upper groove of the left-hand pulley. Again, bring it along the straightedge, crossing over the first pass and around the upper groove of the right-hand pulley to the anchor in the lower right-hand corner of the board. Finally, pull the cord taut and tie it to the anchor. Braided steel cable can be used in place of cord to eliminate the possibility of stretching.

Wm. E. Danneman, Chicago.

## Skids Under Platform of Large Self-Feeder Permit Easy Transport



It is a growing practice among hog raisers to place large self-feeders on wooden platforms mounted on skids so the whole unit can be moved to a new location with a tractor. This promotes cleanliness, minimizes feed waste and lessens the chance of disease. The platform can be constructed of 1 x 4-in. stock laid over 2 x 4 or 2 x 6-in. skids spaced 18 to 24 in. apart. Some builders use 2 x 4s for the platform and also 2 x 4s spaced 18 in. apart for the skids. The platform should be about 4 to 6 in. wider than the feeder and 8 to 12 ft. long, depending on the size of the feeder. All edges are rounded to prevent injury.

## Tractor Exhaust Heats Blowtorch

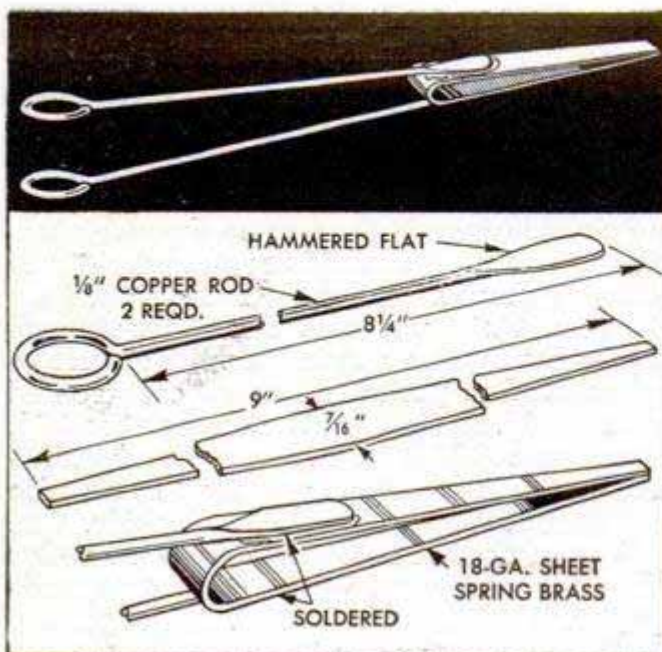


If you happen to be working where a truck or tractor is available, you can pre-heat a blowtorch in a hurry by idling the engine and holding the nozzle of the torch over the exhaust. In about 30 seconds, the hot exhaust will heat the torch sufficiently for quick ignition, eliminating the bother of burning gasoline in the preheating pan.

P. R. Wilson, Brooklin, Ont., Can.

## Novel Spring-Brass Tweezers Retrieve Small Parts

A useful item for the shop or garage, these long-handled tweezers permit retrieving small parts that have fallen into hard-to-reach places. The tweezers are



made by tapering and bending a length of 18-ga. spring brass, back on itself to form two tapered legs, or jaws, of equal length. Pieces of  $\frac{1}{8}$ -in. copper rod are used for the handles. After one end of the rod is formed into a loop and the other end hammered flat, the flat end is soldered to the side of the tweezers. The dimensions given are those used for the original tool, and, of course, can be varied to suit.

Dick Hutchinson, Alhambra, Calif.

## Cover Eliminates Capping Paints

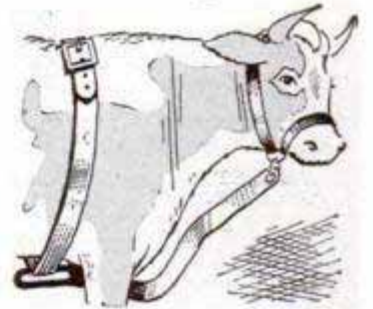
When it is necessary to use several jars of show-card colors on a job, time can be saved by leaving the jars uncapped and protecting the paint by placing the jars under a large glass or metal cover. A bell-type butter-dish cover or one from a cake tray or bun warmer will do nicely.—G. E. Hendrickson, Argyle, Wis.



## Yoke "Weans" Self-Sucking Cow

Bandsawed from hardwood, this improvised yoke offers a sure way to cure a cow of the undesirable habit of self-sucking. The front of the yoke is attached to a halter and the back, which is slotted, is held with a belly-band. Although the yoke restricts sideways movement of the animal's head, it does not interfere with normal feeding.

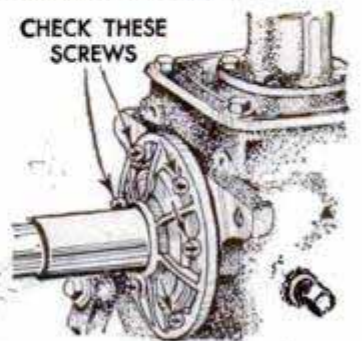
Peter Krueger, Altona, Man., Can.

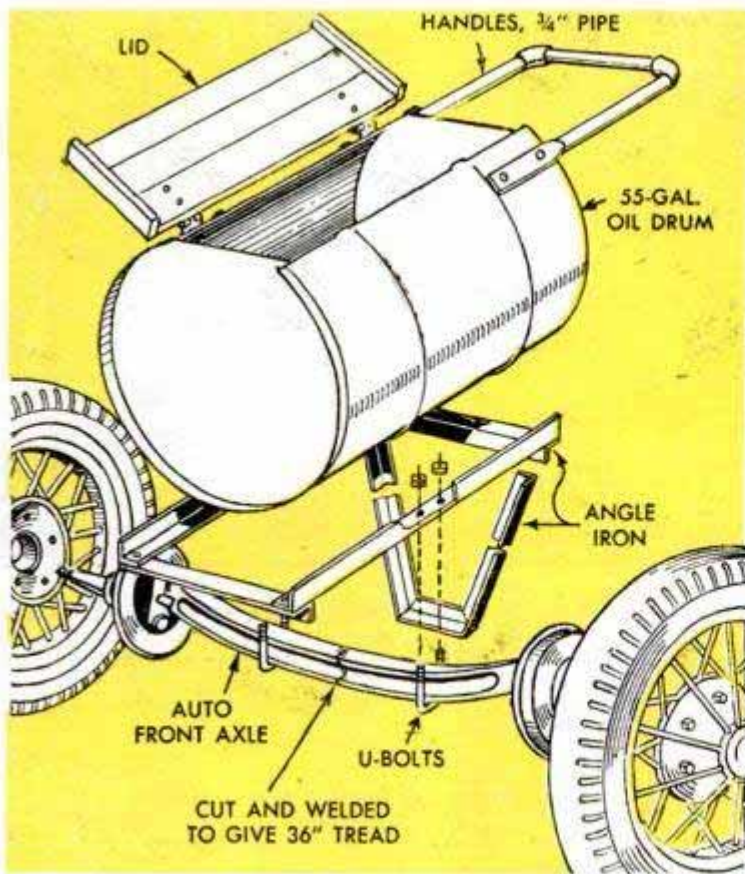


## Correcting Trouble in Shifting Gears By Tightening Bearing Retainer

Sometimes Chevrolets are brought into our garage because of difficulty in shifting into high gear. We find that this is often due to loose screws on the clutch-gear bearing retainer, allowing the bearing to move forward so the gears do not mesh properly. A cracked retainer may also cause this trouble.

James Crutchfield, Long Beach, Calif.





## Narrow-Tread Feed Cart Saves Time in Dairy Barns

Made from an oil drum, a few odds and ends of pipe and angle iron and a Model-A Ford front axle with wheels and tires, this feed cart is now saving one dairy farmer time and labor and preventing waste of dry feeds. To permit the cart to pass through the narrow passageway in front of dairy-barn stanchions, the Ford axle is cut and a section removed to give a tread width of 36 in. when the two parts are welded. With this tread width the cart also can be used in the narrow aisles between

farrowing pens and in large poultry houses for transporting either wet mashes or dry feeds. Build a cradle from angle iron to support the drum and attach it to the axle with U-bolts. Weld an angle-iron foot, or support, to the front end of the cradle frame as in the detail. Then cut one side from the oil drum and also cut a section from each end to form a rectangular opening. The hinged wooden lid is optional. Assemble a handle from pipe as detailed.

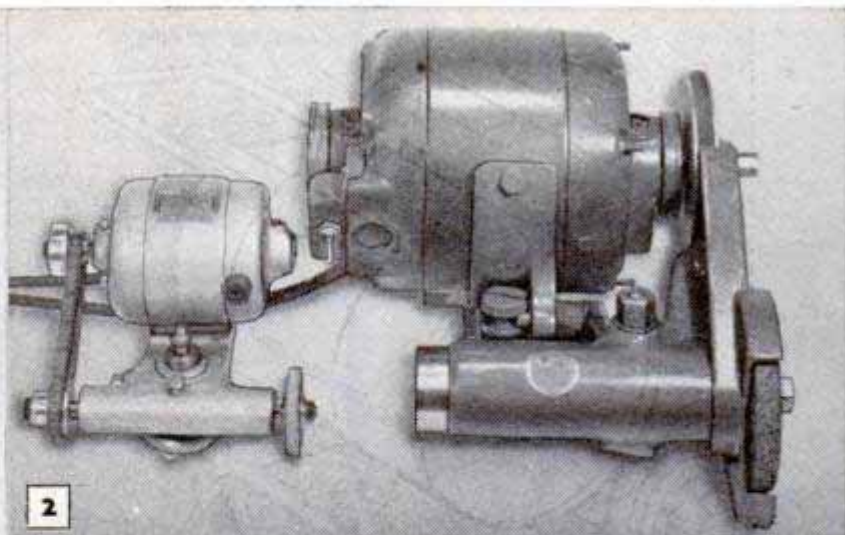
O. A. Fitzgerald, Moscow, Idaho.



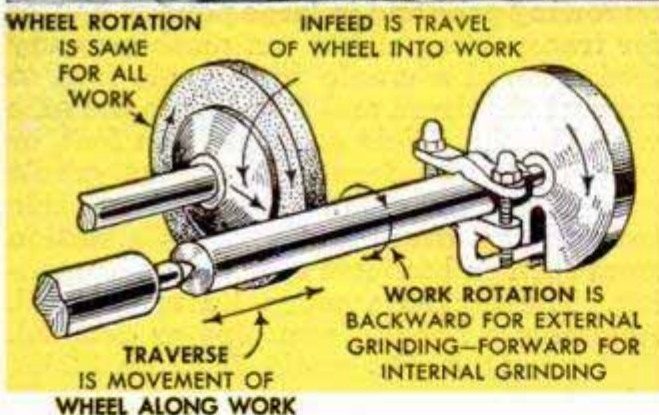
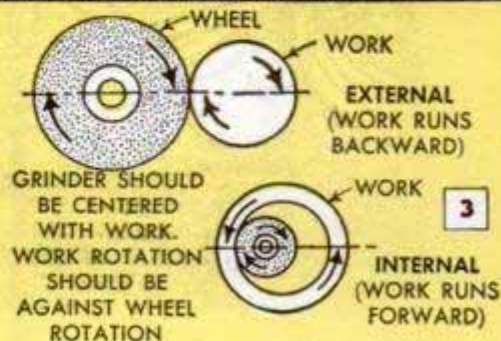
## Inexpensive Forge for Farm Shop Utilizes Old Vacuum Cleaner

Needing a small forge for my farm shop, I made one inexpensively by utilizing an oil drum as a coke pit and an old vacuum cleaner as a bellows. A large opening was cut in one side of the drum and three channel-iron legs are welded to the bottom. Flat-iron cross braces welded between the legs formed a platform for the vacuum cleaner. I used a length of attachment hose to pipe the air from the cleaner to the coke pit.—J. D. Comstock, Pueblo, Colo.

☛ New coats of white paint on buildings in hog lots often look prematurely shabby because of the hogs soiling the lower boards by rubbing against them. The soiled boards won't be noticeable if the lower portion of the building is painted gray or black.



TYPICAL LARGE AND SMALL GRINDERS USED FOR LATHE WORK



# TOOL-POST GRINDING

By Sam Brown

WHEN SMALL cylindrical work must be finished to true concentricity and very close size limits, lathe operators in small shops usually dispense with other methods and use a tool-post grinder for both inside and outside work. Although the grinder is slow when compared with cutting-tool operation, it is capable of producing a degree of accuracy and quality of finish unequalled by any other common lathe accessory. In small shops the largest grinder regularly used is powered by a ¼-hp. motor and swings a 4-in. grinding wheel. The smallest practical size for external grinding swings a 2-in. wheel. Typical grinders in these sizes are shown in Fig. 2. Some tool-post grinders are furnished with interchangeable spindles so that they can be set up for both internal and external grinding operations.

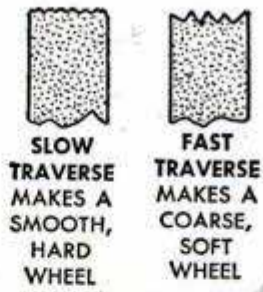
**Operation of tool-post grinder:** The important pointers in tool-post grinding are outlined in Fig. 4. Note that the maximum cut per single pass of the wheel is only .001 in. and about one fourth of this depth is permissible on finishing cuts. The grinding spindle must be set up "on center" in

- 4**
- WORK SPEED** ABOUT 100 S.F.M.\* FOR ALL TYPES OF WORK—HOWEVER, CAN BE FASTER FOR FINISHING CUTS OR FOR SOFT METALS
- WHEEL SPEED** 5000-6000 S.F.M. (THIS FEATURE IS FIXED BY THE GRINDER MANUFACTURER WHO RECOMMENDS A WHEEL DIAMETER TO GIVE CORRECT S.F.M. SPEED)
- INFEEED** .001" PER PASS FOR ROUGH GRINDING .00025" (¼ OF ONE THOUSANDTH) FOR FINISHING, OR IF WORK IS SLENDER
- TRAVERSE** .003" TO ½ THE WIDTH OF THE WHEEL PER REVOLUTION OF WORK. A GOOD AVERAGE SPEED IS .005"
- GRINDING ALLOWANCE** .006" TO .010" ON DIAMETER FOR MACHINED WORK. .015" TO .030" FOR WORK THAT IS TO BE HARDENED.
- WHEEL SELECTION** 46-GRIT ALUMINUM OXIDE BEST WHEEL FOR GENERAL WORK IT SHOULD BE A MEDIUM-SOFT GRADE. 60-GRIT WHEEL IS USEFUL FOR FINE FINISHING

\*S.F.M.—SURFACE FEET PER MINUTE

relation to the work. Nearly all small and large tool-post grinders have an adjustment for centering the spindle. Note the setups for internal and external grinding in Figs. 1 and 8. In internal-grinding operations the wheel and the work rotate in opposite directions as in the lower detail in Fig. 3. However, in external grinding the wheel and the work rotate in the same direction as in the upper detail in Fig. 3. In the latter case, the lathe is reversed.

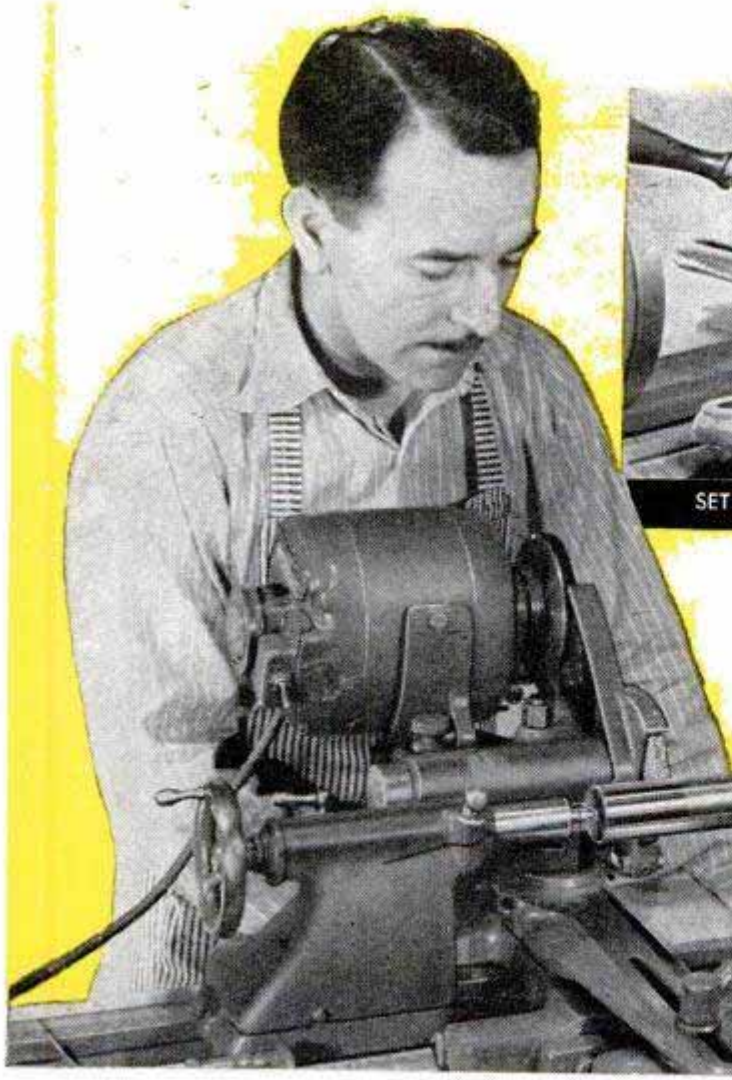
**Wheel dressing:** The first requirement when working to close limits with a tool-post grinder is proper dressing of the wheel. Careful operators always dress the wheel before every job as it is not possible to do accurate work with a wheel that is even slightly out of round. Only a diamond dresser gives the precision cut needed for this job. Fig. 5 shows the setup and Figs. 6 and 7 detail the methods of setting the dresser on center. The dressing is done by traversing the wheel across the diamond with no more than .001-in. infeed. If a smooth wheel is required for a finishing operation, the speed of the traverse is slow, never more than .005 in. A fast traverse opens the wheel for rough grinding as in the upper detail, Fig. 5.



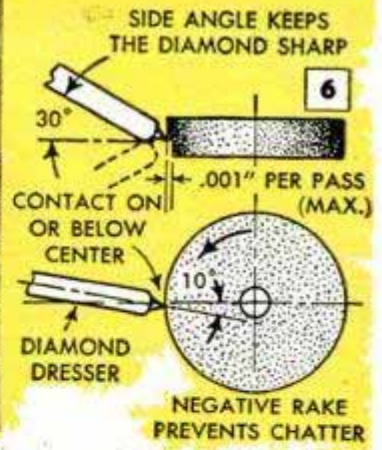
5



DRESSING IS ESSENTIAL FOR GOOD GRINDING. RATE OF TRAVERSE CONTROLS WHEEL HARDNESS

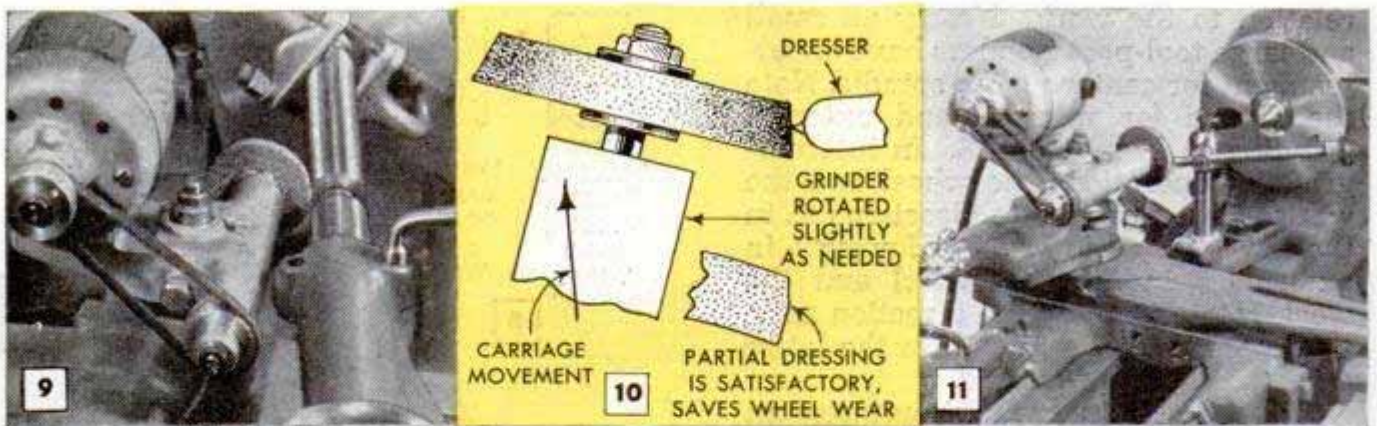


7 SET THE DRESSER "ON CENTER"



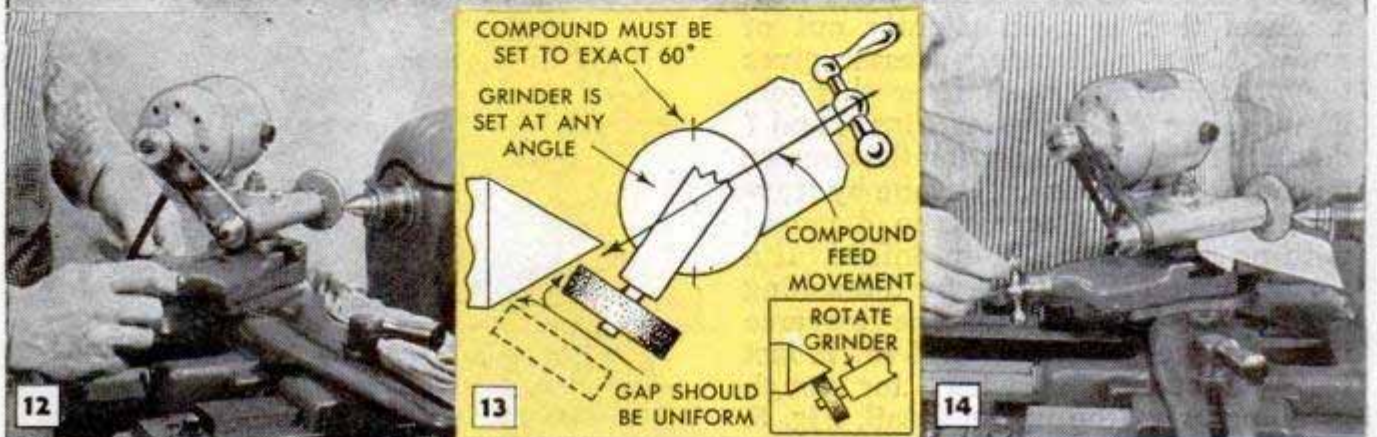
4-IN.-DIA. 46-GRIT WHEEL DOES A GOOD JOB OF EXTERNAL GRINDING WITH INFEEED OF .001" AND .005" TRAVERSE

8



## GRINDING A CYLINDER

THIS JOB IS BEST DONE WITH 4-IN.-DIA. WHEEL, AS SHOWN IN FIG. 8 ON PRECEDING PAGE. IF SMALL GRINDER IS USED, IT MUST BE ANGLED SLIGHTLY TO CLEAR TAILSTOCK, FIG. 9. THE ABRASIVE WHEEL IS THEN DRESSED, AS IN FIGS. 10 AND 11, TO MAKE IT PARALLEL WITH WORK. TAKE LIGHT CUTS AND DO NOT RUN ABRASIVE WHEEL OFF ENDS OF WORKPIECE



## GRINDING 60° CENTER

COMPOUND MUST BE SET AT EXACTLY 60 DEG. BECAUSE THIS SETTING DETERMINES GRINDING ANGLE ON WORK. A TEST SETUP SHOULD BE MADE, FIGS. 13 AND 14. THE WHEEL SHOULD REMAIN SAME DISTANCE FROM WORK SURFACE WHEN TRAVERSED WITH COMPOUND. AFTER COMPOUND SETTING IS MADE, GRINDER IS ROTATED TO BRING WHEEL PARALLEL WITH WORK

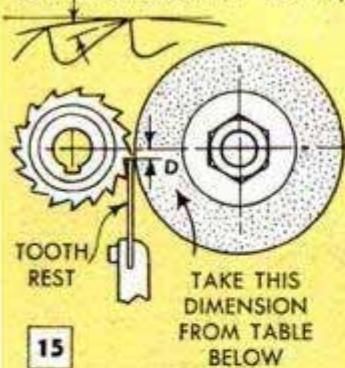
**Grinding a cylinder:** External grinding of a cylinder—a common operation—is pictured in Fig. 8. The work is machined .006 in. oversize. Then it is reduced to exact diameter by successive passes of the grinding wheel, the final pass being made with no infeed and a slow traverse. In making the successive passes, it is important to keep the wheel on the work. It should not run off more than one fourth of its width at the tailstock end. The finish obtained with the 46-grit wheel commonly used for this work is sufficiently uniform for ordinary purposes. If a mirror polish is required, this can be produced by hand polishing with an 80-grit aluminum-oxide tape. If a small grinder is used for finishing a cylinder, it may be necessary to angle the grinder unit to clear the tailstock, Fig. 9. In this case, the wheel must be dressed with the grinder in this position so that the face of the wheel will be parallel with the work, Figs. 10 and 11. The small grinder will do satisfactory work if light feed and slow traverse are used.

**Grinding a 60-deg. center:** This common operation is pictured and detailed in Figs. 12, 13 and 14. Here the traverse is made

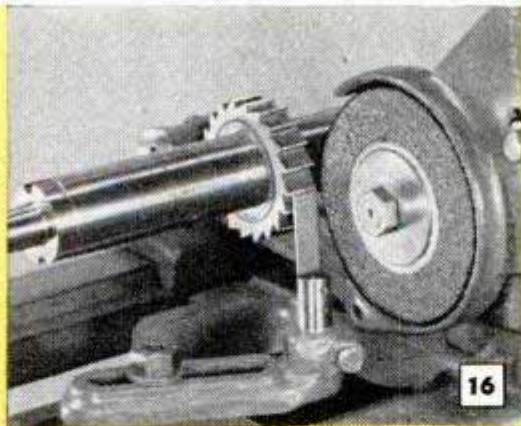
with the compound rest, which must be set at exactly 60 deg. with the axis of the lathe in order to produce the required angle on the center. The traverse is hand-fed toward the headstock spindle as in Fig. 12. This brings the grinding pressure against the center and holds it firmly in position in the tapered spindle sleeve. The return movement of the wheel is made with no added infeed.

**Tool grinding:** Grinding of small milling cutters and other rotary cutting tools is easily done with the tool-post grinder within the required accuracy limits. Milling-machine cutters usually can be ground on their own arbors by simply placing the arbor and cutter between lathe centers. Indexing of toothed cutters is done by means of a tooth rest, which is positioned directly below the tooth being ground as in Figs. 15, 16 and 17. In the actual grinding procedure, the lathe is not in operation, but serves only as a support for the work and a means of traversing the grinder accurately. In some cases, of course, it is necessary to true up the cutter concentrically before grinding each individual tooth to the correct clearance angles. This opera-

CLEARANCE ANGLE (5° TO 12°)



15



16

### TOOTH-REST SETTING

WHEEL DIA.	DISTANCE "D"			
	FOR 5°	FOR 7°	FOR 10°	FOR 12°
1"	.044	.061	.087	.104
1½"	.065	.091	.130	.156
2"	.087	.122	.174	.208
2½"	.109	.153	.218	.260
3"	.130	.182	.260	.312
3½"	.153	.214	.305	.364
4"	.174	.244	.348	.416

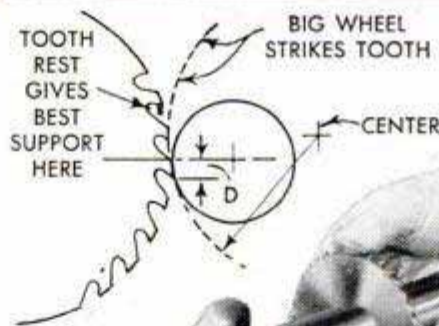


17

GRINDING OF MILLING CUTTERS, REAMERS, ETC., IS EASY TO DO ON A LATHE FITTED WITH TOOL-POST GRINDER

tion is handled in the lathe in much the same fashion as grinding a cylinder. The table, Fig. 15, gives the below-center distances for various wheel diameters when grinding the clearance angle on milling cutters. See dimension "D" in the detail, Fig. 15. After the tooth rest has been properly set, Fig. 16, the grinder is traversed once and then returned across the tooth without added infeed. The traverse is fast, but the return is slow to give a smooth finish. On cutters having teeth requiring a greater rake angle, it is common practice to locate the tooth rest to engage a tooth above the one being ground, Fig. 18. In some cases, the rest must be set two teeth above the one being ground, as in the detail in Fig. 18. Note also that a small wheel must be used to avoid striking the tooth immediately above the tooth in contact with the wheel.

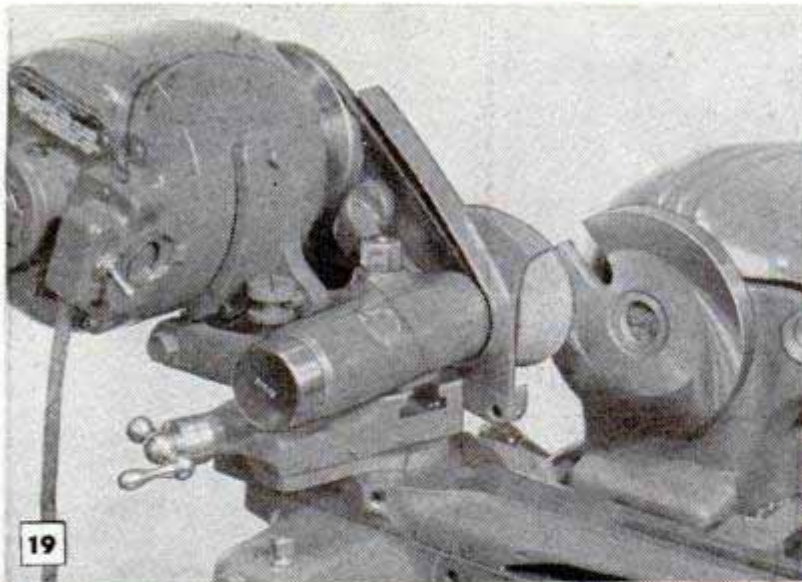
**Surface grinding:** A common example of this type of work is that of surfacing the lathe faceplate, as in Fig. 19. Other work can be surface-ground by mounting it on the faceplate or in a chuck and using the same setup. A cup-type grinding wheel is commonly used for this work. The wheel is dressed with a cross-slide traverse as in Fig. 20. It will be noted that this trues the



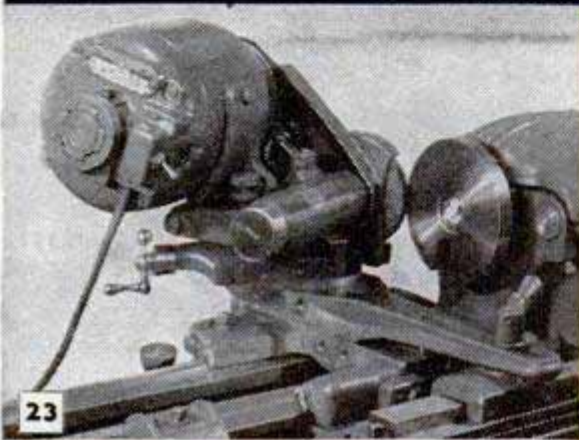
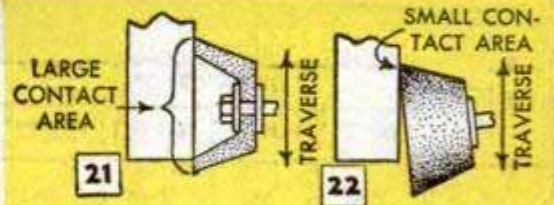
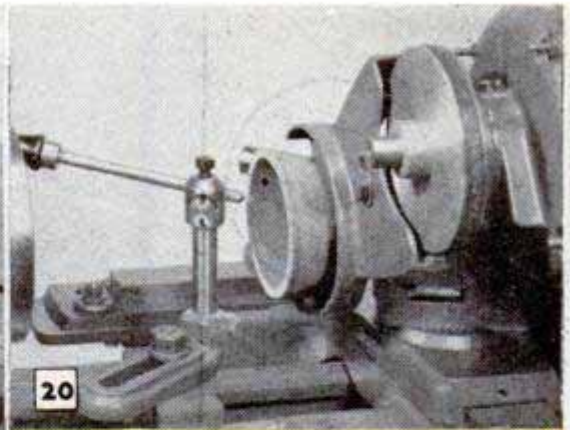
18

SMALL WHEEL IS SOMETIMES NEEDED FOR TOOTH CLEARANCE

wheel exactly parallel with the work surface, Fig. 21. This position of the wheel is practical for the rough-grind, using a coarse-grit, soft wheel. For the finish-grind, use a fine-grit wheel, dressed square, but angle the grinder unit about 1 deg. so that only the edge of the wheel is in contact, Fig. 22. Good surface grinding also can be done with a straight wheel. It is necessary to angle the grinder unit so that the spindle will clear the work, Figs. 23 and 24. After the angle setting has been determined and the grinder set, the wheel is dressed on the corner to form a flat about 1/16 in. wide, Fig. 24. Note in Fig. 23 that



19 SURFACE GRINDING CAN BE DONE WITH CUP WHEEL, ABOVE, OR STRAIGHT WHEEL DRESSED TO CLEAR SPINDLE, BELOW



25 GRINDING-WHEEL SELECTION

WORK	ABRASIVE	GRIT		GRADE	"NORTON"	"CARBO-RUNDUM"
		Rough	Finish			
SOFT STEEL*	ALUMINUM OXIDE	46	60	MEDIUM	46-MB	401-J-30
CAST IRON	SILICON CARBIDE	36	60	SOFT	3736-J5	36-K-G
BRASS	SILICON CARBIDE	36	60	SOFT	3736-K5	36-N-G
ALUMINUM	SILICON CARBIDE	30	40	SOFT	3730-K5	30-N-EC
TOOL GRIND'G	SPEC. A.O. (WHITE)	—	50	SOFT	3850-K	A50-M-100
AUTO VALVES	ALUMINUM OXIDE	60	80	MEDIUM	50-MB	60-J-30
PLASTIC (Ph.)	SILICON CARBIDE	46	60	SOFT	3746-J5	46-O

\* ALL PURPOSE WHEEL

26 ONE-WHEEL SYSTEM (\*46-GRIT ALUMINUM OXIDE)

MATERIAL, OPERATION OR FAULT	WHEEL DRESSING	WORK SPEED	INFEED	TRAVERSE
AVERAGE WORK SOFT STEEL	SMOOTH	100 S.F.M.	.001"	.005"
FOR FAST CUTTING	COARSE	INCREASE	.0015"	.015"
FOR SMOOTH FINISH	VERY SMOOTH	LESS	.00025"	.003"
IF WHEEL GLAZES	COARSE	INCREASE	MAX.	INCREASE
CAST IRON	COARSE	INCREASE	MAX.	LESS
SOFT METALS	COARSE	200 S.F.M.	LESS	—
SMALL-DIA. WORK	SMOOTH	LESS	LESS	LESS

the infeed is set with the compound and that the traverse is made with the cross slide. The lathe carriage must be locked.

**Wheel selection:** A 46-grit aluminum-oxide wheel of medium grade ("grade" is resistance of the abrasive grains against tearing loose from the bonding material) is the best all-purpose wheel. By careful dressing and operating techniques, it can be made to cut as fast as a 40-grit wheel or as fine as a 60-grit one and can be made to run hard or soft as needed. The table, Fig. 26, shows the variations possible with the all-purpose wheel. The table, Fig. 25, lists special wheels for various materials.

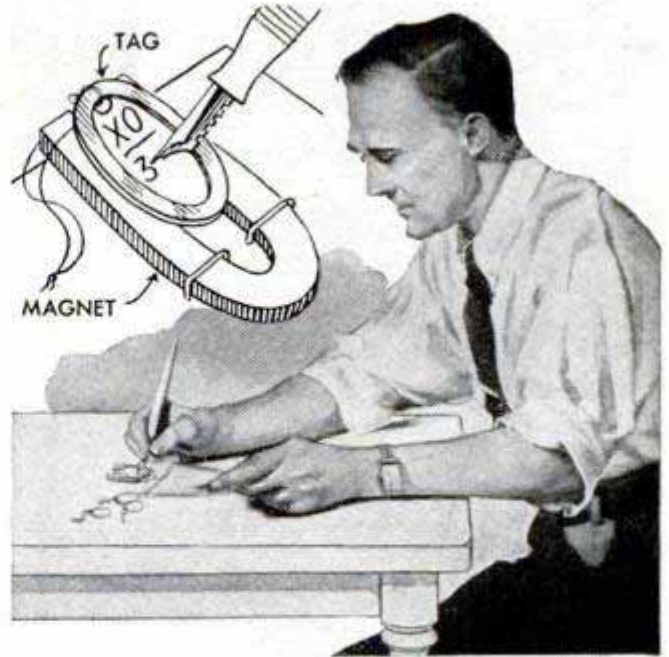
**Internal grinding:** Internal grinding on light work, Fig. 1, usually is done with small-diameter mounted wheels running at high speeds to maintain the required 5000 f.p.m. surface speed. Very light infeeds and a slow traverse are required. Allowances for internal grinding should be somewhat less than the .006 in. allowed for external grinding and a softer wheel must be used.

**Protect the lathe:** Most of the abrasive dust from the grinding operation can be trapped in a pan filled with oil, Fig. 8. An oil-soaked cloth placed below the work also will protect the lathe where it is not possible to locate the pan directly under the wheel. In any case, the lathe should always be thoroughly cleaned up after every grinding job.

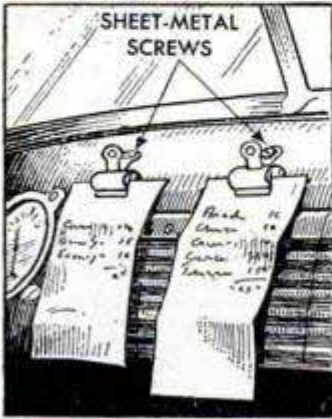


## Horseshoe Magnet Used as Anchor Simplifies Marking Metal Price Tags

Stapled to a board or worktable top, a small horseshoe magnet conveniently holds metal-bound price tags for marking. This leaves one hand free to handle the price list and thus permits marking the tags rapidly by eliminating waste motion.



## Paper Clips Fastened to Dashboard Hold Delivery Sheets and Maps

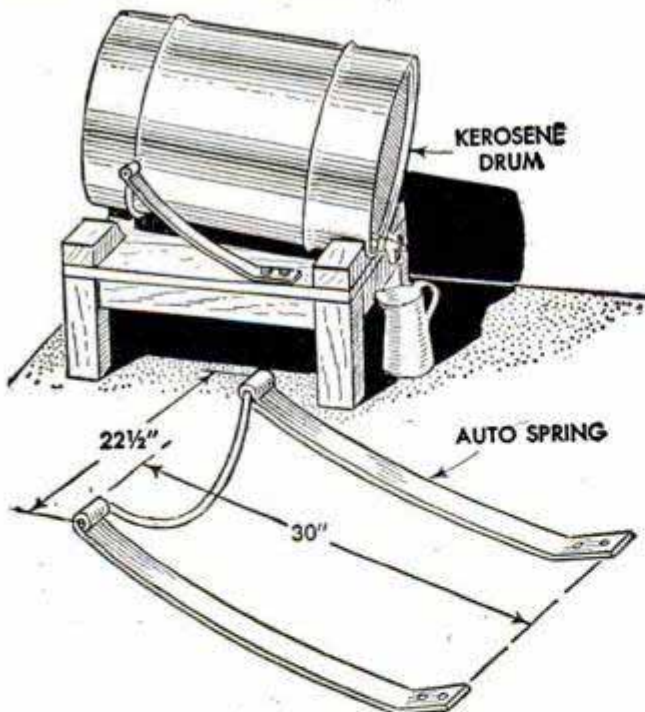


To permit checking delivery sheets and road maps at a glance, one truck driver mounted a couple of paper clips in a handy location on the dashboard of his truck. The clips, which are attached with sheet-metal screws, hold a sizable number of

orders plus a road map folded to show the particular territory which he is covering.

A. W. Ranniger, Carroll, Iowa.

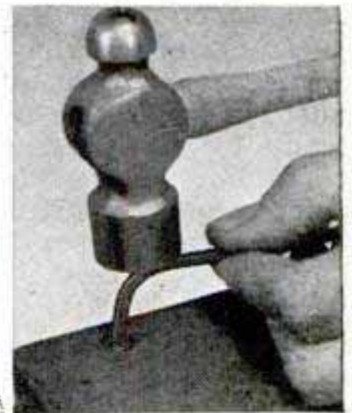
## Self-Tilting Kerosene Drum Rests on Auto Springs



As a kerosene, gasoline or oil drum is gradually emptied, this self-tilting rack slowly tips it forward without stirring up the sediment in the bottom. Two old auto springs and a saddle formed from a length of rod provide the tilting mechanism. After the springs are heated and bent as shown, they are drilled and bolted to a wooden rack.—W. P. Houser, Organ, N. Mex.

## Removing Broken Bolts or Studs

If a set of screw extractors is not available, removing a broken bolt or stud from a blind hole can be done with a socket-head wrench. Drill a hole in the top of the bolt slightly smaller than the diagonal width of the wrench. File the tip of the wrench to a taper and hammer the tapered wrench end into the hole. Sharp edges of the wrench will broach the hole and prevent slipping while the wrench handle is used as a lever to loosen the bolt.—Henry Hanscom, Elmhurst, Ill.



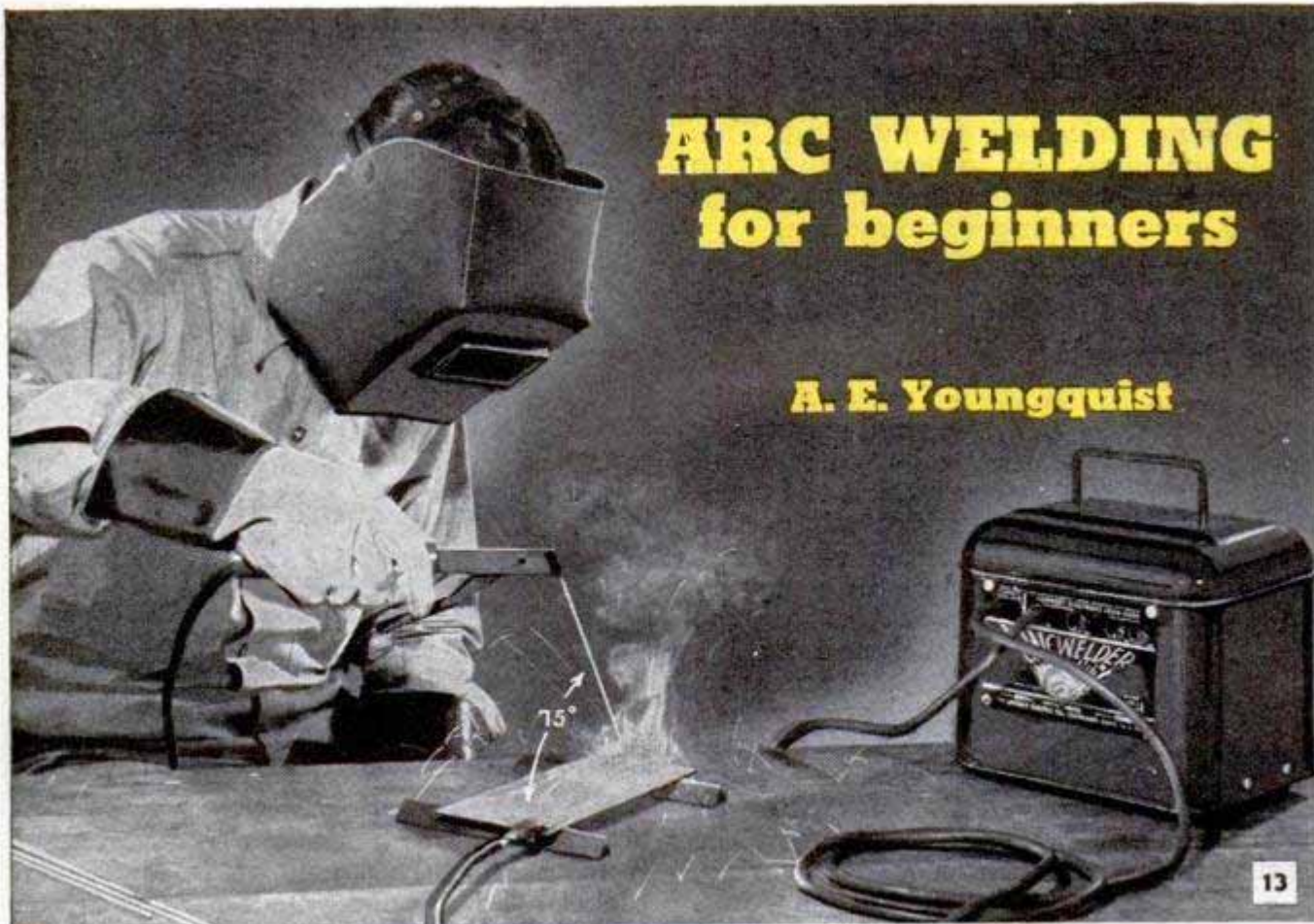
## Typing Gummed Labels in Quantity

When typing a number of small gummed labels, the job can be speeded by sticking as many as 25 or 30 of the labels to a sheet of paper and inserting the paper in the typewriter. Stick the label to the sheet by moistening a very small portion of the upper left-hand corner of the label. In this way, the latter will not be torn when it is pulled from the sheet of paper.—Mary Louise Stevenson, Davison, Mich.



# ARC WELDING for beginners

A. E. Youngquist



## PART II

**A**FTER purchasing the type and size of welding machine best suited to your particular needs, using the data given in Part I of this article as a guide, you will be ready to start teaching yourself how to weld. For best results, the welder should be connected to a separate circuit as close as possible to the current entrance switch box. The corner of the farm workshop or basement where welding is to be done should be kept clear of inflammable material and should have a concrete, cinder or crushed-stone floor. A workbench having a steel plate for a top and slightly lower than desk height will be needed, because a comfortable sitting position is important when learning to weld. A strained or awkward body position will result in fatigue and lack of control. All practice welding should be done on low-carbon-steel scrap such as angle iron and sheet metal. High-carbon and alloy steel, cast iron or non-ferrous metals should not be used by the beginner until he has mastered the technique of mild-steel welding.

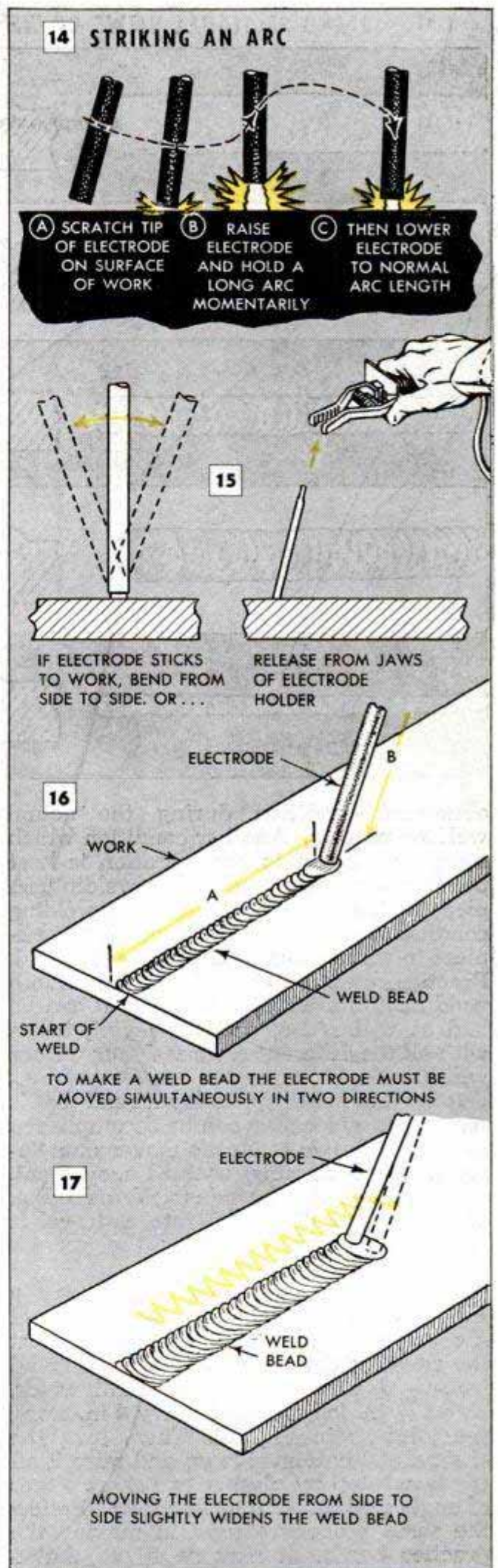
Practice starting or "striking" an arc first. If your welding machine is the small 60-amp. size, use a  $\frac{1}{16}$ -in. electrode and practice on a piece of 16-ga. sheet metal. If your welder is a 180-amp. size, use a  $\frac{1}{8}$ -in. electrode and a piece of 10-ga. sheet metal. First, fasten the ground cable of the welding machine to the steel top of the

welding bench. The entire bench top will then be grounded and any work or practice pieces placed on the bench top will also be grounded. If a steel-topped bench is not used, the ground cable must be fastened directly to the metal being welded. Regulate the amperage control on the welding machine to produce the correct amount of current for the size and type of electrode to be used. This information is supplied with each box of electrodes purchased. After regulating the amperage control to the proper setting, place the uncoated portion of the electrode between the jaws of the electrode holder so that the rod is clamped firmly at a 90-deg. angle to the jaws. Then turn on the power switch on the welder and lower the helmet to protect your face and eyes from hot sparks and arc-ray burns.

The welding arc is started by momentarily bringing the tip of the electrode in contact with the work and then raising the electrode slightly to form a gap of approximately  $\frac{1}{8}$  in. between the tip of the rod and the work. The beginner may encounter some difficulty when starting or striking an arc the first few times due to the tendency of the electrode tip to stick or freeze to the work. To avoid this, gently scratch the tip of the electrode across the surface of the work as if striking a match. The arc will start with a sudden burst of light and sparks. This is startling at first, but do not pull the electrode away suddenly as this

will extinguish the arc. Instead, raise the electrode slowly, as in Fig. 14, until the tip is  $\frac{1}{8}$  to  $\frac{3}{16}$  in. away from the work. Then slightly lower the electrode until the arc gap is approximately the diameter of the rod. Practice this until you can maintain the arc for a few seconds' duration. After some experience, the correct arc length can be controlled by looking at the puddle of molten metal and listening to the regular crackling sound given off by the arc. To stop the arc, simply move the electrode away from the work. If the electrode sticks to the work, immediately bend it from side to side, Fig. 15, and quickly jerk it away from the work with the holder. If this action does not free the rod, release it from the jaws of the holder. If you find that it is impossible to hold or maintain the arc, increase the welding current slightly. Also, check the ground connection for proper contact with the work piece.

After becoming proficient in starting and maintaining an arc, try running a weld bead, which is a continuous deposit of weld metal. To lay a bead, two movements indicated by lines A and B, Fig. 16, are used. First, strike an arc and then slowly and uniformly move the electrode to the right in a straight line while maintaining the correct arc length by steadily feeding the electrode down towards the work while the electrode tip melts away. Tilt the electrode toward the direction of travel as shown in Fig. 13. This will enable you to keep your eye on the molten crater and control the rate of travel by observing the width of the weld. The tilt of the electrode also tends to force the molten metal away from the direction of travel and keeps the flux or slag flowing over the deposited weld metal. After laying a weld bead 5 or 6 in. long, allow it to cool slightly, and then remove the slag coating with the chipping hammer and wire brush. Carefully inspect the surface of the weld bead and compare it with those shown in Fig. 18, A to E inclusive. Teaching yourself to weld is simply a process of trial and error. If, for example, the bead appears as in Fig. 18E, the rod speed or rate of travel was too fast. Try laying another bead at a slower speed. If, after cleaning this bead, it appears as shown in Fig. 18B, you will know the rod speed was normal but the current setting on the welding machine was too high. So, reduce the welding current and lay another bead. In other words, eliminate only one condition or variable at a time. Changing more than one variable at a time only results in confusion for the beginner. It is also a good idea for the beginner to deliberately lay a bead with too low or too high a current or too fast or slow a speed. In this way, he will learn to recognize an





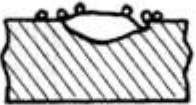
(A)



WELDING CURRENT AND ROD SPEED NORMAL. WIDTH OF WELD AND RIPPLES ON SURFACE ARE UNIFORM. PENETRATION IS FAIRLY DEEP AND WELL DEFINED. ARC HAS A SPATTERING HISS PLUS AN IRREGULAR CRACKLING SOUND



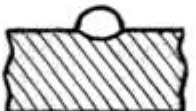
(B)



HIGH CURRENT, ROD SPEED NORMAL. WELD BROAD AND THIN WITH ROUGH SURFACE. CONSIDERABLE SPATTER AND UNDERCUT ALONG EDGES. CRATER IS LONG AND DEEP. ARC HAS A RATHER REGULAR EXPLOSIVE SOUND



(C)



LOW CURRENT, ROD SPEED NORMAL. WELD NARROW AND VERY HIGH. ROD BURNS SLOWLY. PENETRATION OR FUSION NOT VERY DEEP OR WELL DEFINED. ARC HAS FEW CRACKLING SOUNDS WITH IRREGULAR SPATTERING



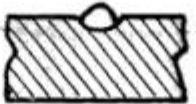
(D)



CURRENT NORMAL, ROD SPEED TOO SLOW. WELD IS EXCESSIVELY WIDE WITH OVERLAP ALONG EDGES. BASE METAL AND WELD BECOME HEATED OVER A CONSIDERABLE AREA WHICH OFTEN RESULTS IN CRATER BURNING THROUGH



(E)



CURRENT NORMAL, ROD SPEED TOO FAST. WELD IS NARROW WITH VERY ROUGH SURFACE. EDGES OF BEAD UNDERCUT. SIZE OF BEAD DEPENDS ON RATIO OF ROD SPEED AND AMOUNT OF CURRENT USED. NORMAL ARC SOUND

abnormal condition during the actual welding process. Another condition which must be taken into consideration is heat put into the workpiece due to welding. A piece of hot metal will alter the welding conditions. To avoid this, quench the workpiece in water after each weld bead is laid. Practice running flat beads until a smooth weld of uniform width and height can be laid at will. Also, practice laying beads with all the different rod sizes your welder will handle.

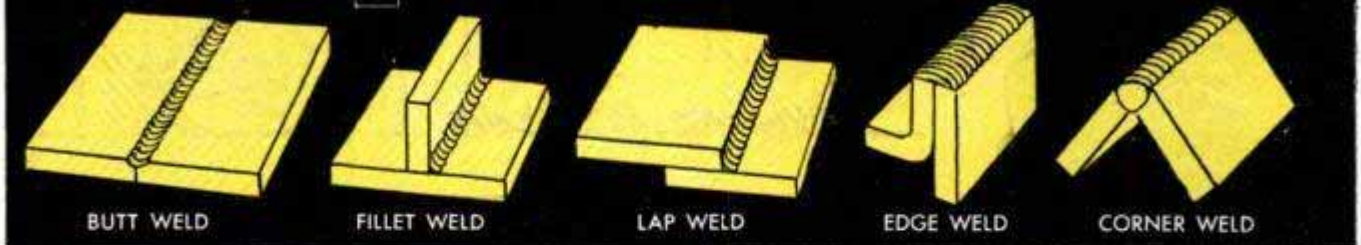
It is often necessary to lay a bead that is somewhat wider than can be accomplished by using the two electrode movements described. To do this, a third movement, weaving the rod from side to side as in Fig. 17, is incorporated. The rate of travel is reduced to compensate for the greater width of the weld.

After becoming proficient at laying a weld bead, practice joining two pieces of sheet metal with a butt weld. First, butt the edges of the sheet metal together and tack-weld with a series of small welds, about 1/4 in. long, spaced every 4 in. along the joint as in Fig. 20. Then, turn the sheet metal bottom side up and raise it off the bench top by placing two short pieces of angle iron under it as indicated. Follow the same procedure used in making the practice beads. It may be found that a

slightly lower current setting is necessary to prevent the molten crater from burning through in some places. If the sheet metal is fairly thin, a single pass or weld on one side will give 100 percent penetration. To test for complete penetration, turn the work over and inspect the other side. A good weld should have a small uniform bead here. If the two edges of the metal at the joint can still be seen, a larger electrode with an increase in welding current should be used. However, if this is beyond the limits of the welding machine on hand, a gap may be left between the edges of the workpieces or the edges can be beveled and a number of welds laid in as shown in Fig. 22. The size of the welding machine will determine when a bevel is necessary. For example, with a 60-amp. machine, thinner material will have to be beveled than with a 180-amp. machine. Fig. 21 shows the procedure to follow when a weld of 100 percent penetration from one side on heavy material is needed.

Although welding can be done in all positions, the beginner should thoroughly familiarize himself with making various joints in the flat position before attempting position welding. Flat welding includes all types of joints in which the weld can be laid in horizontally. Fig. 19 shows five types of joints that the beginner can very

## 19 TYPES OF WELDED JOINTS



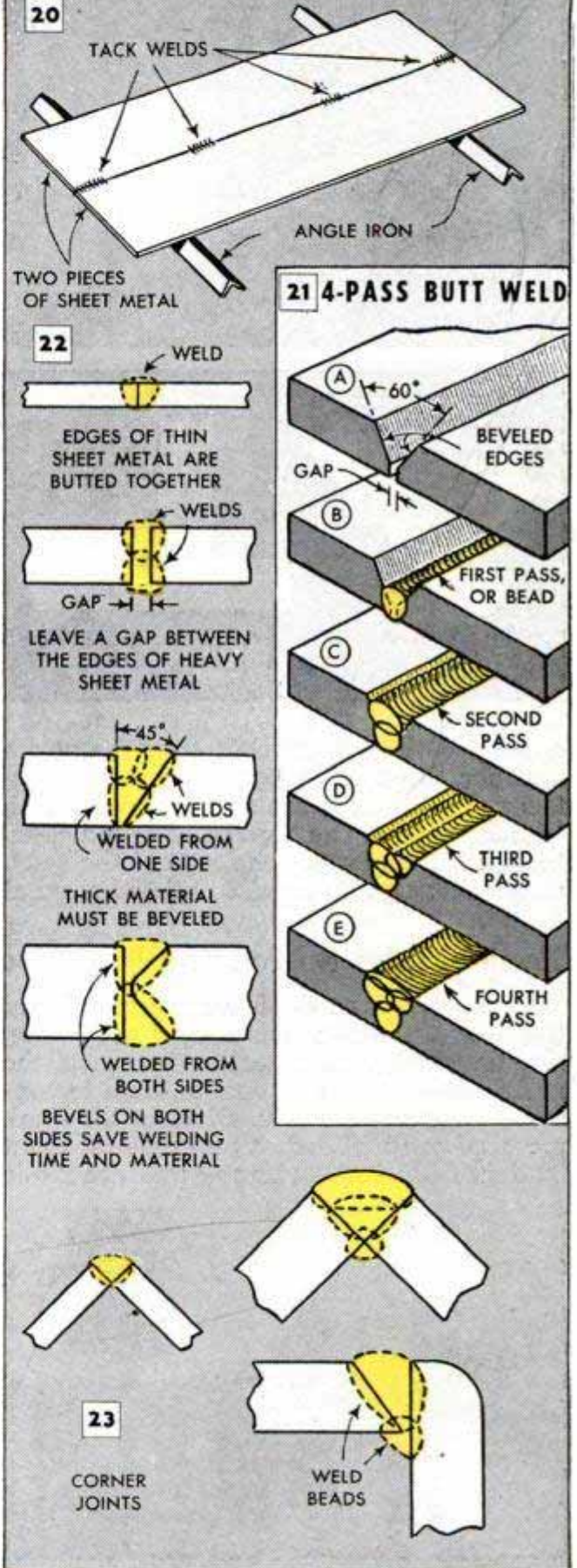
easily weld together in the flat position.

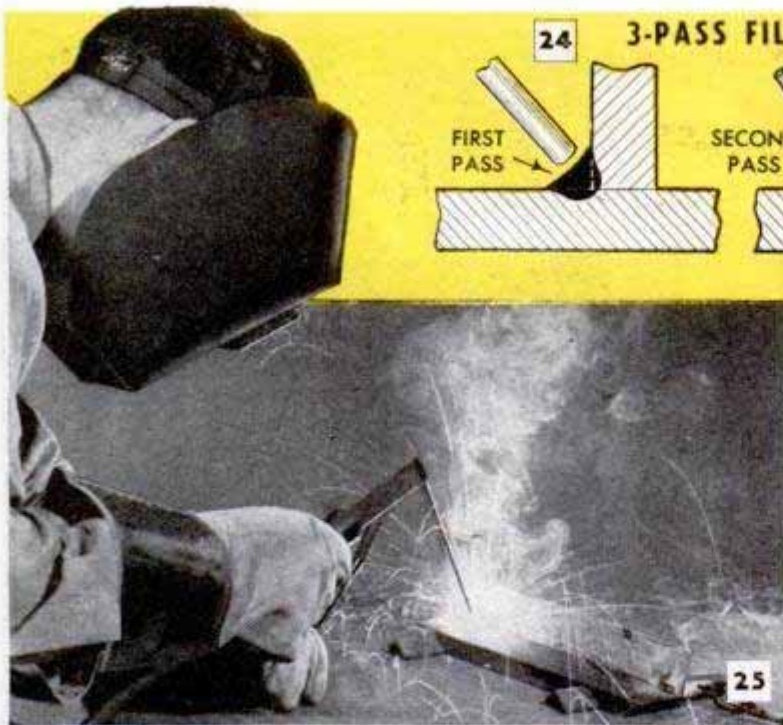
When welding light sheet metal, the most important requirement is good fitup. The two pieces of metal being joined should be held or clamped tightly together and then tack-welded. Also, lap welds, Fig. 19, rather than butt welds should be used wherever possible because proper fitup is much more readily obtained with a lap joint and the chance of burn-through is minimized.

Corner welds on various thicknesses of material are shown in Fig. 23. If the material is light sheet metal, the corner welds are made by running a fast, single-pass bead along the outside of the corner as indicated in the left-hand drawing of Fig. 23. On heavier metal, two or three passes or beads may be necessary and, when possible, a smaller bead welded along the inside of the corner, as shown in the right-hand drawings of Fig. 23, will greatly strengthen the joint. The corner weld, shown in the lower right-hand illustration in Fig. 23, can also be used on lighter metal by leaving a gap between the pieces instead of beveling as indicated.

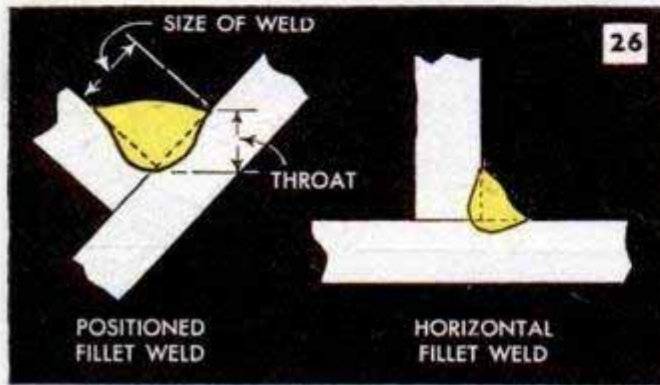
When the edge of one piece of metal is joined to the side of another so the two pieces are at right angles to each other, a fillet weld is required as shown in Fig. 19. The size of a fillet weld is determined by the leg length of the largest isosceles right triangle which can be inscribed within its cross-sectional area, as indicated by the dotted lines in Fig. 26. The strength of a fillet weld is determined by the throat dimension multiplied by the length of the weld. The length of a fillet weld should always be at least four times its size. For example, a  $\frac{3}{16}$ -in. fillet weld should be not less than  $\frac{3}{4}$  in. in length, unless the weld is simply to hold a number of pieces together during assembly. For a weld with strength equal to that of the material being welded, the size of the fillet weld should be equal to the thickness of the material. For maximum strength, both sides of the joint should be welded.

There are two methods of making fillet welds, positioned and horizontal as shown in Fig. 26. The easiest method for the beginner is positioned fillet welding. To do this, the pieces to be welded must first be fastened together at right angles to one





an even pace along the seam without any side-to-side movement. The surface contour of a good fillet weld should be nearly flat and have a slight concavity along the sides where the weld joins the metal pieces. Horizontal fillet welding is used when one member of the joint must remain in the vertical position as in Fig. 26. This method is especially useful for making small single-pass welds or when it is impractical to tilt the work. For practice, weld two pieces of sheet metal together at right angles to one another as before. Hold the electrode at a slight angle as for flat welding and at about 45 to 60 deg. from the horizontal, as shown in Fig. 25. Move the electrode at a steady, uniform rate of speed and point the rod at the corner of the joint. Use the highest welding current you can handle to assure penetration of the weld into the corner of the joint. Also hold a shorter arc than used when making positioned fillet welds. When fillet welds too large to be made with a single weld are required, several beads, one on top of the other, are built up until the desired size is obtained as shown in Fig. 24. Be sure to remove the slag that covers each bead before laying another bead.



another with tack welds. Both of the pieces are then tilted and propped up so the surfaces of the pieces are at approximately a 45-deg. angle to the horizontal as indicated in Fig. 26. The electrode is held the same as for making a butt weld and is moved at

Photos courtesy The Lincoln Electric Co.

## Sloping Sides on Feeding Bunks Permit Cattle to Reach Feed More Easily

Experienced cattle feeders have found that feeding bunks constructed with wide, sloping sides permit cattle to reach the grain more easily and enable them to consume it with less waste. Sides of the bunk pictured are inclined at an angle of about 30 deg. from the horizontal and are made



from two 2 x 12-in. planks, each 16 ft. long. The bottom is made from two 2 x 10-in. planks of the same length. The meeting edges of the side and bottom planks are beveled to make a smooth-fitting joint and the tops of the 4 x 4-in. legs are sawed to the same angle as that of the sides. Horizontal 2 x 6-in. stretchers space the legs and support the bottom. Angle bracing of 2 x 4-in. stock reinforces both the sides and the legs. Lengthwise braces extending from the lower stretchers to a point near the center of the bottom are spiked or bolted in place to prevent endwise movement. Two or more bunks can be placed end to end.

☐ Before painting a new eaves trough, wash it with a cloth soaked in benzine. This leaves a clean surface to which the paint adheres satisfactorily.

# RADIO *Television* ELECTRONICS

## Special-Purpose TV Antennas

**E**FFICIENT TV-antenna systems are important. Inferior TV sets operating on well-designed and properly installed antenna systems will outperform better receivers that are using poor antennas in the same locality. Of course, if you are near transmitting stations or in an area where the TV signals are strong, almost any type of TV antenna will work, at least on some of the stations. However, in practically every locality where television stations are on the air, the antenna problem must be given careful attention if maximum results are to be expected.

Special-purpose TV antenna systems are now making good picture reception possible in fringe areas, and in remote locations ordinarily beyond the expected range of TV transmitters. In these remote locations, height above ground becomes an important factor; also two or more bays, (or sections) of antenna units are usually stacked together for added gain to overcome losses due to distance. The height problem is easily solved by the use of specially designed, self-supporting aluminum-alloy towers now available from several manufacturers. A tower of this type with a two-bay Amphenol TV stacked array antenna is shown in photo A; this installation gave excellent results on Chicago TV stations over a distance of 60 miles. The height of the antenna array from the ground was 75 feet. A close-up of the two-bay array, with provision made for rotating it in any direction, is illustrated in photo C.

Where there is only one TV transmitting

(Continued to page 244)

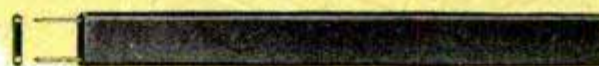
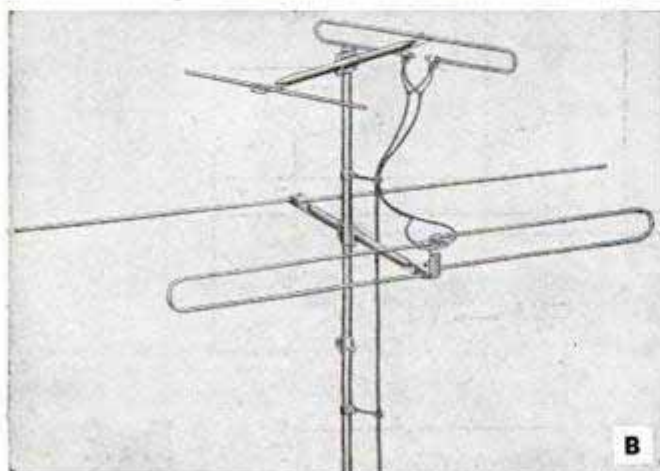


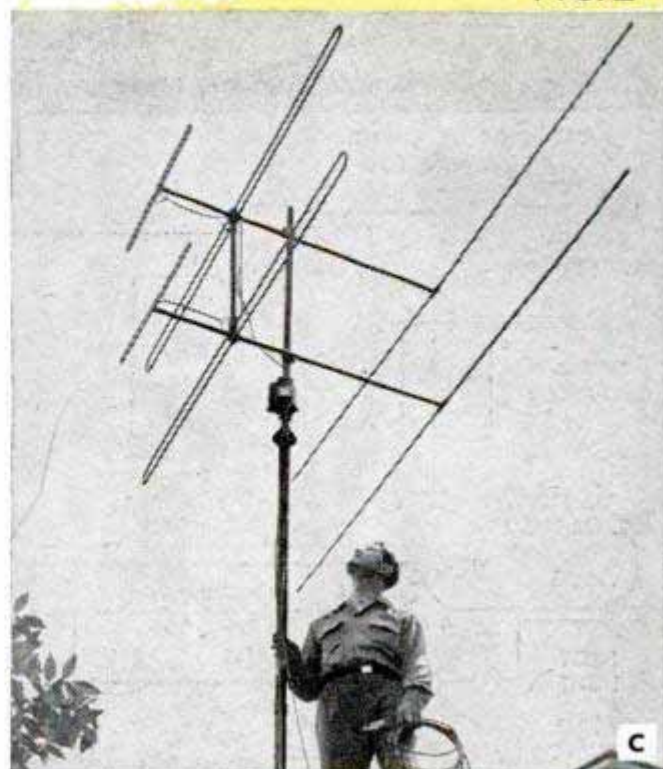
FIG. 1



FIG. 2



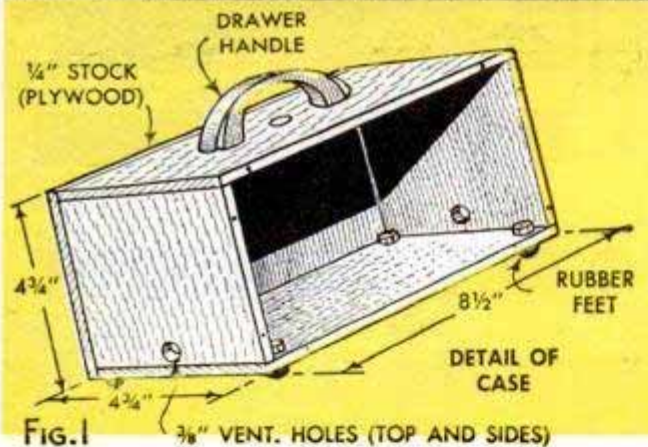
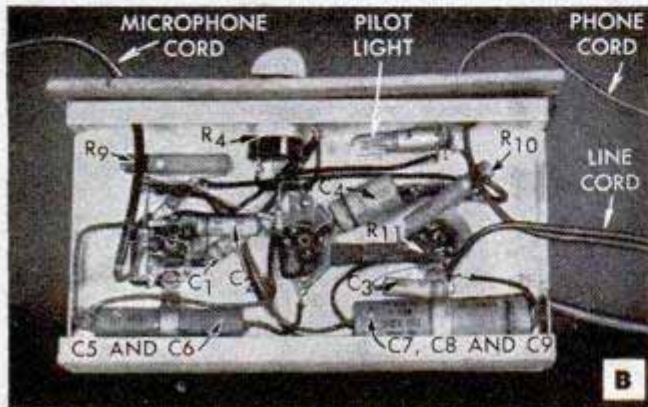
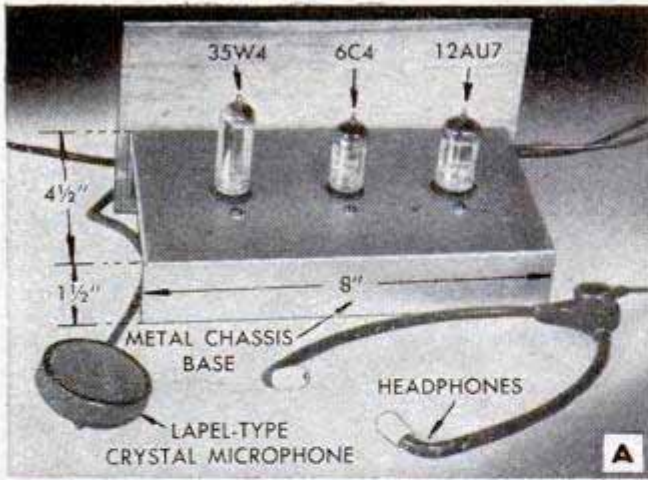
B



C

# INDOOR A.C.-D.C. AMPLIFIER

By L. M. Dezettel

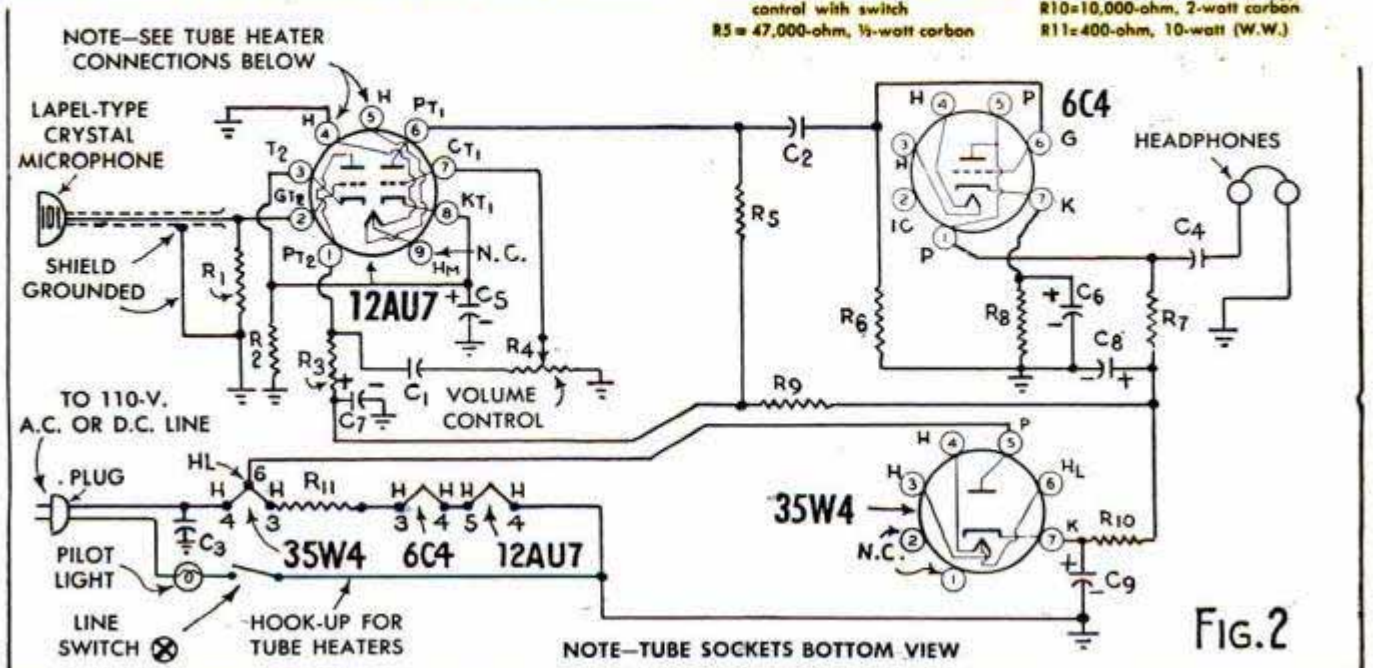


WHERE a hearing aid is intended for indoor use only, it may be designed to operate directly from the ordinary 110-volt house-lighting outlets, thus saving the cost of batteries. The one illustrated and described consists of a simple a.c.-d.c.-type amplifier that is easy to build from parts that are available from all radio supply houses. Designed for high gain, which is necessary when a crystal microphone is employed, this 3-tube amplifier is unusually sensitive and highly efficient. Three miniature-type tubes are used to keep the size at a minimum; however, a slightly oversize chassis was used so that the parts are well spread out to simplify wiring.

A type 12AU7 tube, which is a twin-triode amplifier, is used in this circuit with the two triodes in cascade. This, plus the 6C4 tube, which is the output amplifier, provides three stages of amplification. The rectifier is a type 35W4. The crystal microphone used is of the lapel type which is small, light in weight and has much better frequency response and quality characteristics than the cheaper carbon types. The output of the amplifier may be used to drive any type of high-impedance magnetic headphones of 2000 ohms or higher, or crystal headphones. During laboratory tests and for demonstration purposes a pair of Telex under-chin headphones were used as illustrated in photo C. This type of

### RESISTORS

- R1 = 1-megohm, 1/2-watt carbon
- R2 = 820-ohm, 1/2-watt carbon
- R3 = 47,000-ohm, 1/2-watt carbon
- R4 = 50,000-ohm, audio-taper, volume control with switch
- R5 = 47,000-ohm, 1/2-watt carbon
- R6 = 47,000-ohm, 1/2-watt carbon
- R7 = 47,000-ohm, 1/2-watt carbon
- R8 = 1500-ohm, 1/2-watt carbon
- R9 = 10,000-ohm, 2-watt carbon
- R10 = 10,000-ohm, 2-watt carbon
- R11 = 400-ohm, 10-watt (W.W.)

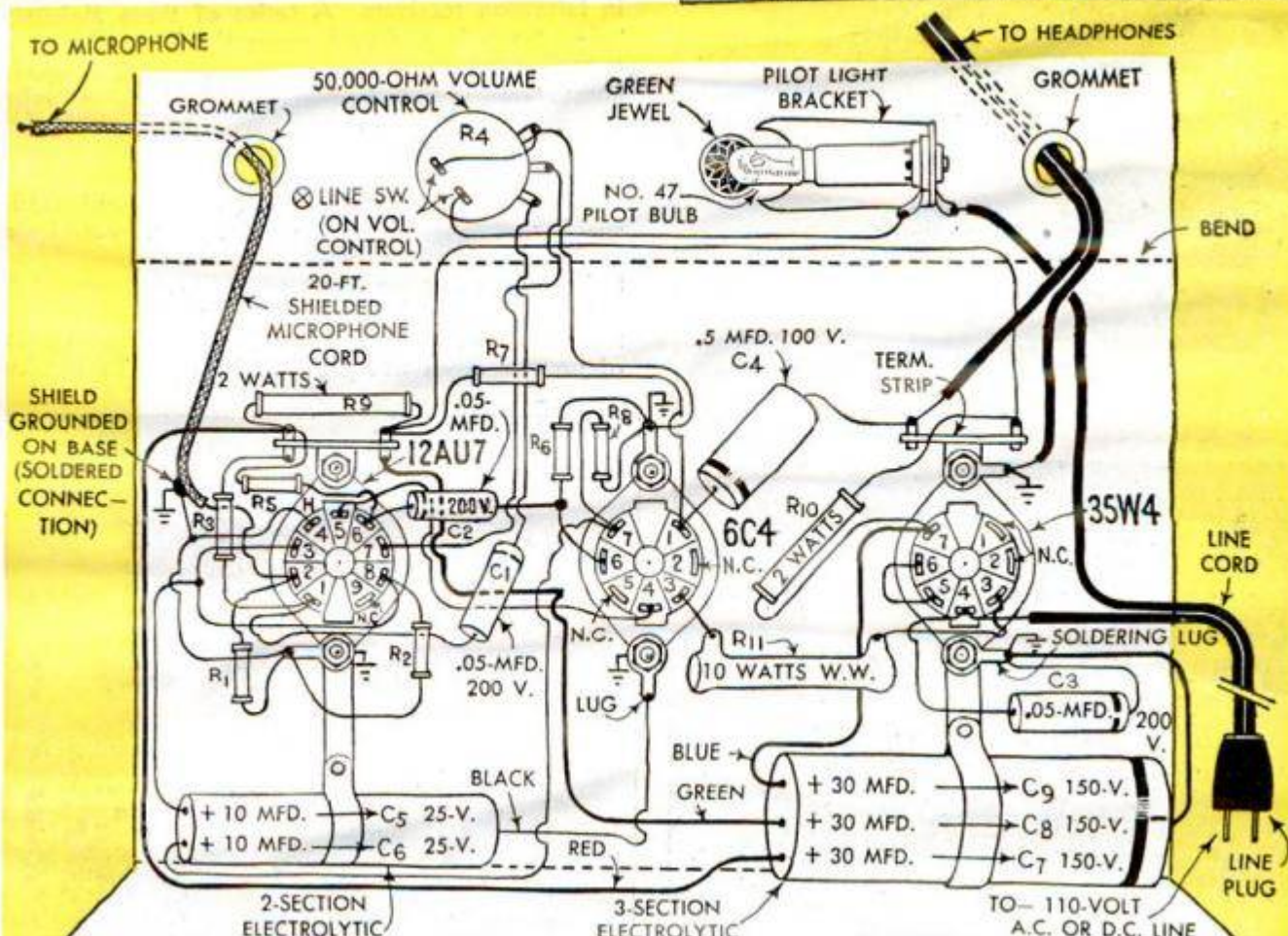
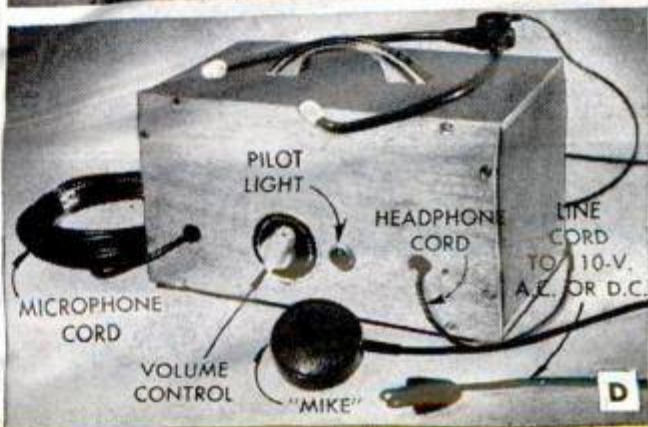




# FOR HARD-OF-HEARING PERSONS

popular with the ladies as it does with their hair. The chassis base is 5 in. long and 1 1/2 in. high. If a switch will be employed, the dimensions of the panel shown in photo E, Fig. 1; also the base is very simple and may be made from a sheet metal bent to shape between blocks of wood clamped in a vise. The holes for the miniature tube sockets are 5/8 in. in diameter. Before construction, study the schematic circuit diagram, Fig. 2, and the various photos carefully, and be sure that you have all the parts specified. The exact layout of the various parts on the chassis base is not critical. However, the approximate positions are clearly shown in the underside photo B and the pictorial wiring diagram, Fig. 3. Although not entirely necessary, the paper-type tubular condensers used were of the new midget variety. These are slightly more expensive, but they permit more compact construction and are easier to work with. In locating the position of

(Continued to page 242)



## RADIO AND ELECTRONICS TODAY



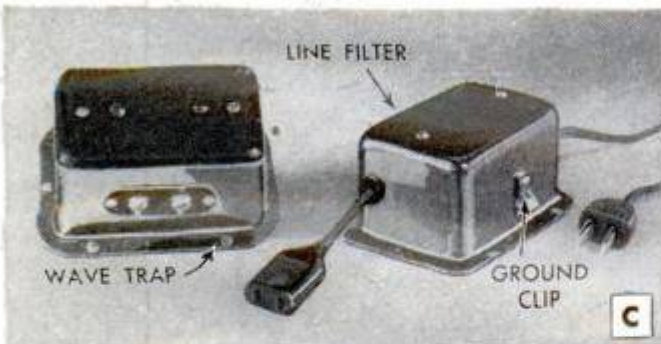
A

**A**—Three-speed automatic record player enables music lovers to enjoy the best of both worlds offered today. Two basic models are available for replacing existing changers or for new installations. One model employs a replaceable tandem-type cartridge designed to provide proper tracking of records at extremely low needle pressure required when playing the 78-r.p.m. groove records. This results in exceptionally long life for the 78-r.p.m. records. The proper needle tip is easily chosen by merely moving the tandem tip needle-selector lever to "Std" or "Micro." Another model features a special pickup arm with a pair of removable plug-in heads. These heads were designed especially for the G. E. type of variable reluctance cartridge and are color-coded for the particular type of record being played. A brass weight is provided with one of the heads to give the necessary additional needle pressure for proper tracking when playing the 78-r.p.m. records



B

**B**—Wake-up-to-music clock-radio features both "alarm" and "sleep" controls. The wake-up control on this 5-tube superheterodyne receiver permits the clock to be set at any time desired, or, it may be set to turn on any favorite radio program you wish. The sleep control allows you to preset the time that the radio will automatically turn off within a 60-minute range, if you wish to drop off to sleep



C

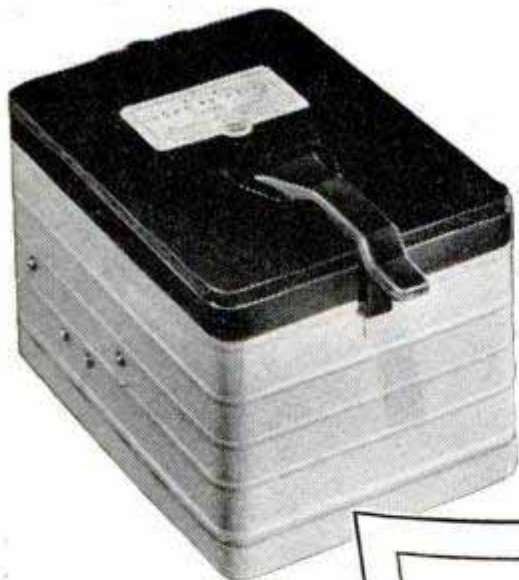
**C**—Wave trap and power-line filter combination eliminates many forms of troublesome interference in television receivers. A series of these Meissner wave traps is designed expressly for use in the reduction of unwanted signals of certain types encountered in both frequency modulation and television reception, and have proven highly successful



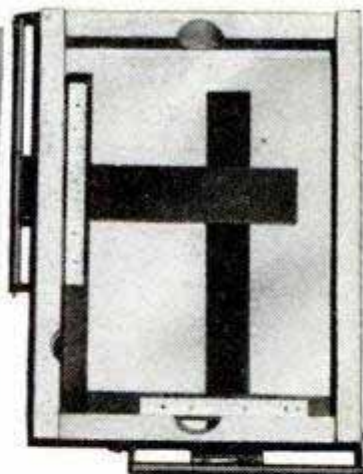
**D**—Table lamp includes a four-tube superheterodyne with a rectifier tube, built-in antenna and loud-speaker all housed in one compact plastic lamp base

**E**—Television in your home on a "pay as you see" basis is now available on a meter plan similar to the popular retail budget refrigerator purchase plan of prewar days; 25c provides 1 hr. of TV service





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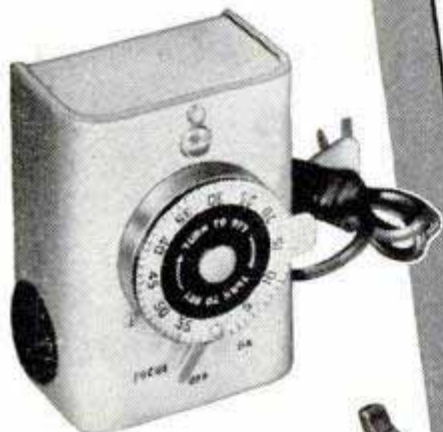


**Kodak Auto-Mask Printing Frame**—Clip holds negative firmly. Graduated scales on two sides also serve as paper guides. Price, \$3.25.

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**Kodak Printing Frame**—Offers a simple way to print. Three sizes available: 3¼ x 5½, 4 x 5, 5 x 7 inches. Supplied with a glass front—you use ordinary house lamp for light source. Price, from \$1.25.

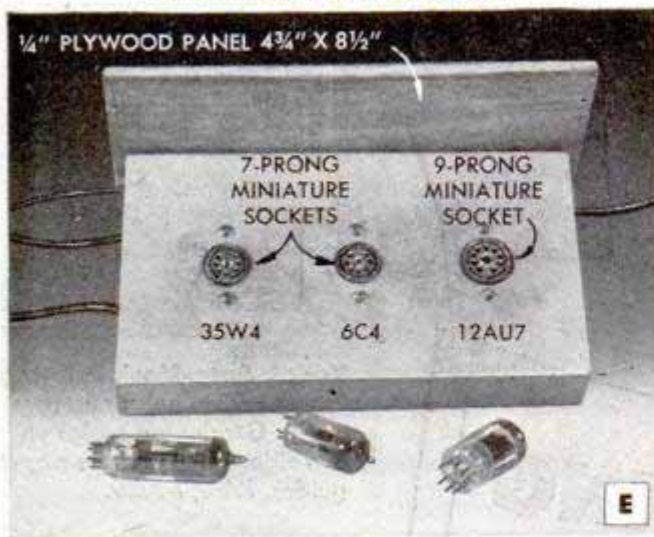
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**Kodak**  
TRADE-MARK

EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

# Indoor A.C.-D.C. Amplifier For Hard-of-Hearing Persons

(Continued from page 239)



the tube sockets on the chassis base, arrange them as shown in the pictorial wiring diagram, Fig. 3, so that all circuit leads will be as short as possible.

In order to keep hum at a minimum, the chassis is part of the a.c. circuit and must not be exposed. This is why plugs and jacks were not used in this amplifier, and it is also the reason that the microphone and headphone cords were run into the ampli-

fier proper and permanently wired. The case must be of 1/4-in. plywood or similar insulating material, as specified in the detailed construction diagram, Fig. 1. As a result of this type of construction and the use of adequate filter capacity, hum is inaudible. In use, it is only necessary to plug the line cord into any convenient 110 to 120-volt a.c. or d.c. outlet and put on the headphones. The microphone is on a long cord so that it may be handed to other persons for conversation, or placed near a radio receiver. With a flexible pickup of this type, the deaf person can always take part in general conversations. The closer the microphone is to the speaking voices or music source, the less extraneous noises it will pick up. There will be considerable strain on the microphone cord due to its length. Therefore, when connecting it in the circuit, strip the woven-wire shield back far enough so that you can solder the shield directly to the ground lug, which is placed under the 12AU7 socket-mounting screw. This will take the strain off of the small insulated conductor which goes to terminal 2 on the tube socket. Care should also be taken in soldering the headphone-cord terminals permanently in the circuit. In ordinary types of headphones, the black

(Continued to page 244)

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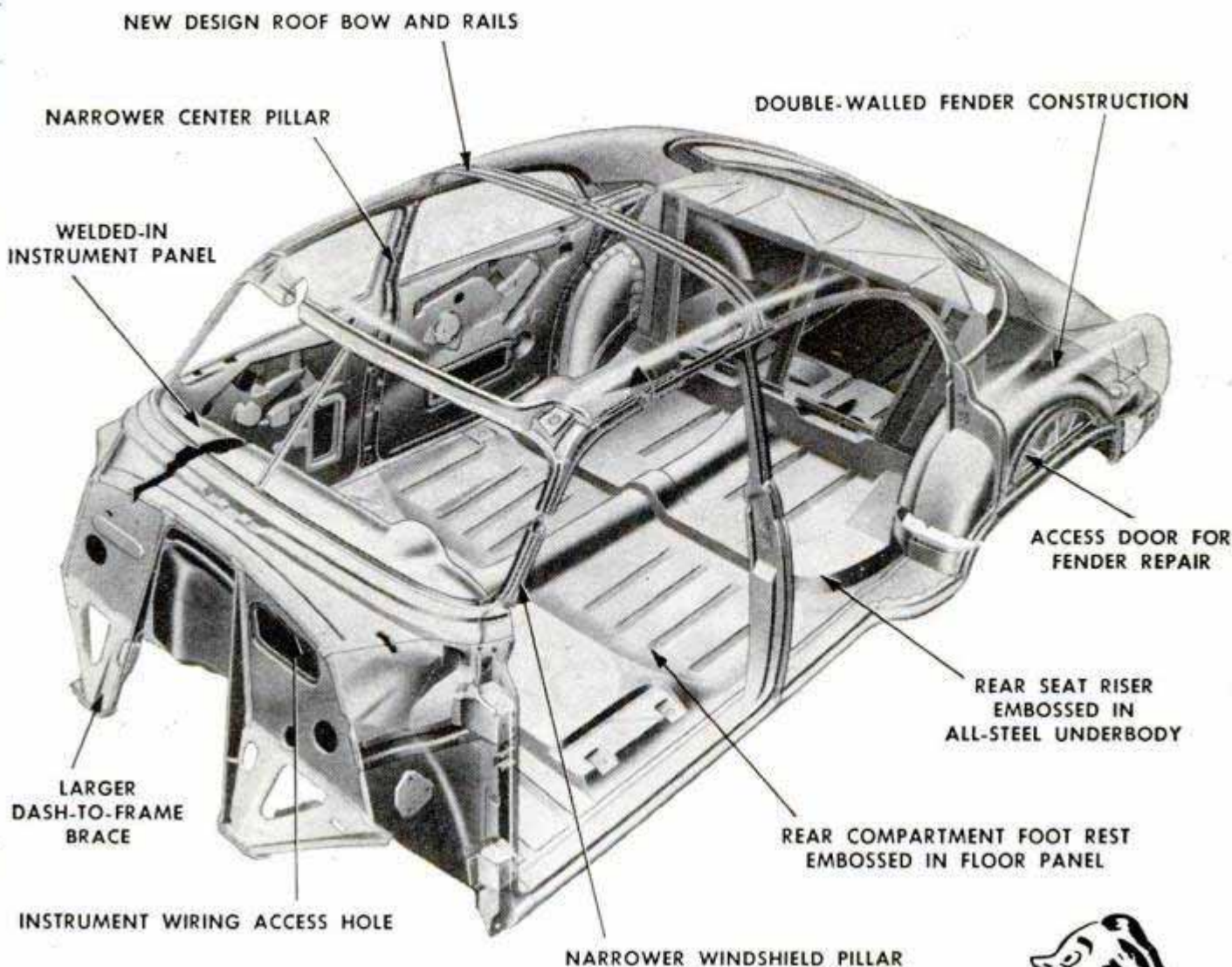


### Satinlac

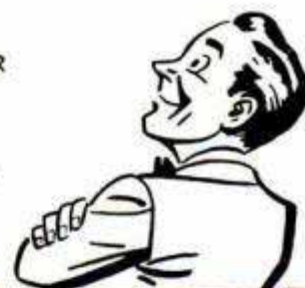
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lead goes to the ground side. The Telex under-the-chin-type headphones are provided with a miniature plug-in cord attachment so that the cord can be easily removed from the headset.

If you do not wish to build the portable plywood case for the instrument, you can house it in a small table-model wooden radio cabinet of suitable size. Blank cabinets of this type are to be found in all radio parts house catalogs. Do not house it in a metal cabinet. An inexpensive indoor hearing aid of this description serves many useful purposes in supplementing battery-operated devices for the hard of hearing, especially for use in the home, for shut-ins and for bench workers in stationary locations where ordinary line voltage is available. It has been estimated that approximately one out of every ten persons in the United States has a hearing defect, ranging from a slight impairment to almost total deafness.

Detailed student material list R-383 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

### Special-Purpose TV Antennas

(Continued from page 237)

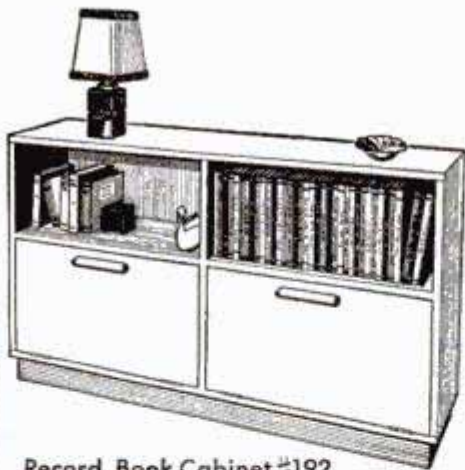
station in a locality, the antenna problem is not serious. Trouble begins when other TV stations go on the air in different locations in the area and operate on widely separated frequency channels. This situation calls for specially designed antenna systems with high and low-frequency sections that can be separately oriented. In other words, in some locations the TV antenna must look in two directions at once in order to receive the maximum signal in both the high and low TV band. The Piggyback type of antenna illustrated in photo B is designed for this purpose. It consists of a high-band folded dipole with reflector in one plane, and a low-band folded dipole with reflector underneath. Although built for locations receiving signals from two directions, this type of antenna may also be used in localities where the TV stations are in the same direction. It is designed to receive on all 12 TV channels, using only one common transmission line, of either the standard flat 300-ohm twin-lead shown in Fig. 1, or the improved Amphenol tubular 300-ohm twin-lead illustrated in Fig. 2. This tubular-type twin-lead is claimed to reduce wind resistance and losses due to dirt and moisture, an important consideration in long runs, or in locations of low signal strength. The fact that it retains its efficiency in wet weather makes it ideal for critical installations.



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Modern Cabinet #193



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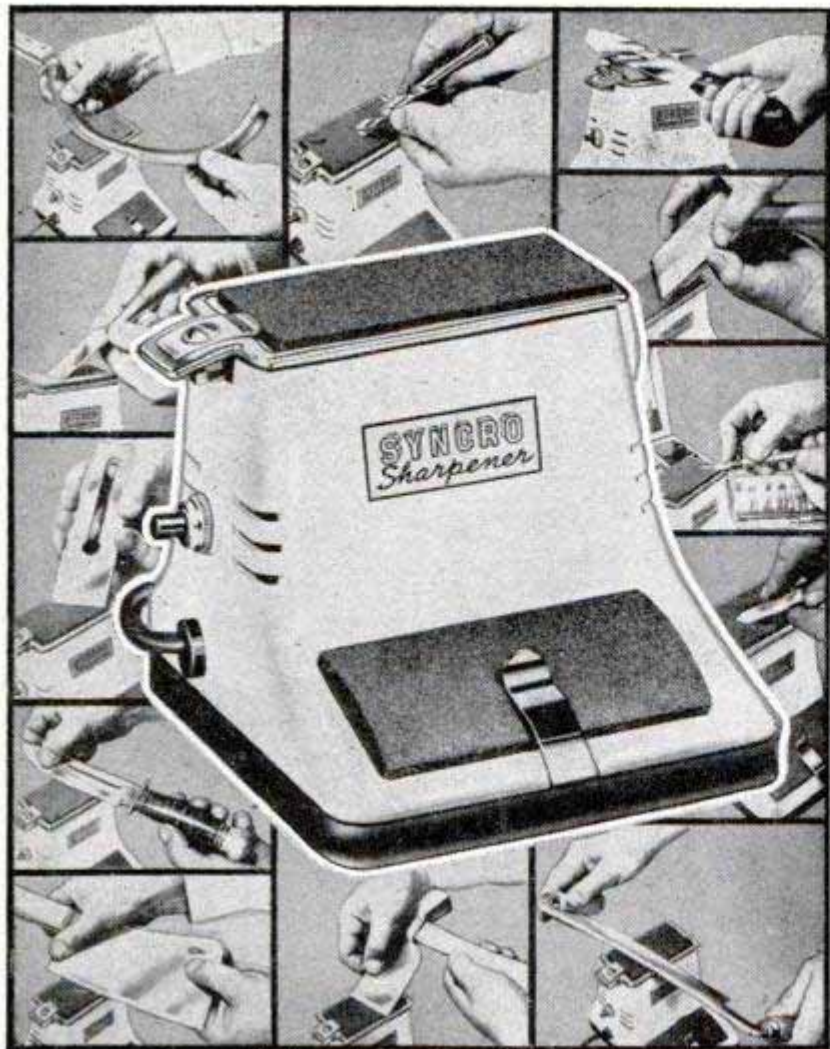
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**SYNGRO CORP., DEPT. H-119, ROCHESTER, MICHIGAN**  
World's Largest Makers of Safe Electric Jig Saws

## Army Hams to the Rescue

(Continued from page 101)

basis in a disaster or not, member hams are always ready to help people who are in trouble.

During "Operation Snowbound," when the prairie states were under a dozen feet of snow, several MARS boys were out pitching in an unofficial capacity.

WØHSO, which is M/Sgt. John McKinney, a National Guardsman in Grand Island, Neb., operated an Army mobile station for four weeks. He scouted and reported important roads blocked with snow, so rescue equipment could be sent to clear them. He found snowbound farm families and radioed for relief.

During this same disaster, the Pentagon stations were monitoring the frequencies, as were most of the members on the network—just to keep alert. AIR radioed WØIDR, 63-year-old rancher named Dominick Rolli, who was running a Jeep around the snowbanks, "fishing out Army boys from the drifts." Since power lines were down, Rolli used a put-put gasoline generator for his BC610 transmitter to keep rescue parties and the MARS net informed of his activities.

MARS members are always cooperating with other hams to do favors for people.

W2RGP is a building engineer with a ham shack on the 16th floor of a New York apartment house.

He uses his facilities to let Americans in the American-held zone of Germany talk to relatives in the States from ham stations over there. Recently, he put through a "telephone patch" for a man in South America, so he could talk with a brother in New York to whom he hadn't spoken for 40 years.

Even K4USA and K4AF get in on the act with this sort of thing. K4USA picked up one William Braud, broadcasting from W30ZA aboard the S. S. Joshua Tree in the Red Sea, 40 miles off Suez, not long ago. Braud said he had a wife and child in Baltimore whom he hadn't seen in months. So, while he waited, Master Sergeant Allyn, with an assist by a Baltimore ham, linked him into the telephone lines and Mr. and Mrs. Braud had a long, friendly chat.

On rare occasions, a sour note creeps into MARS, though it has never happened with a network member. Last spring, K4AF picked up a desperate QRR from a ham in Puerto Rico. Hurriedly, in broken English, the man stammered that a tidal wave had hit the island, washed away 200 homes, killed vast numbers of people and created a national emergency.

(Continued to page 252)

# NORWAY

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**Extra Strength** gives the most protection at the lowest cost.  
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**Long Lasting!** Safe, sure protection with only an occasional check-up.  
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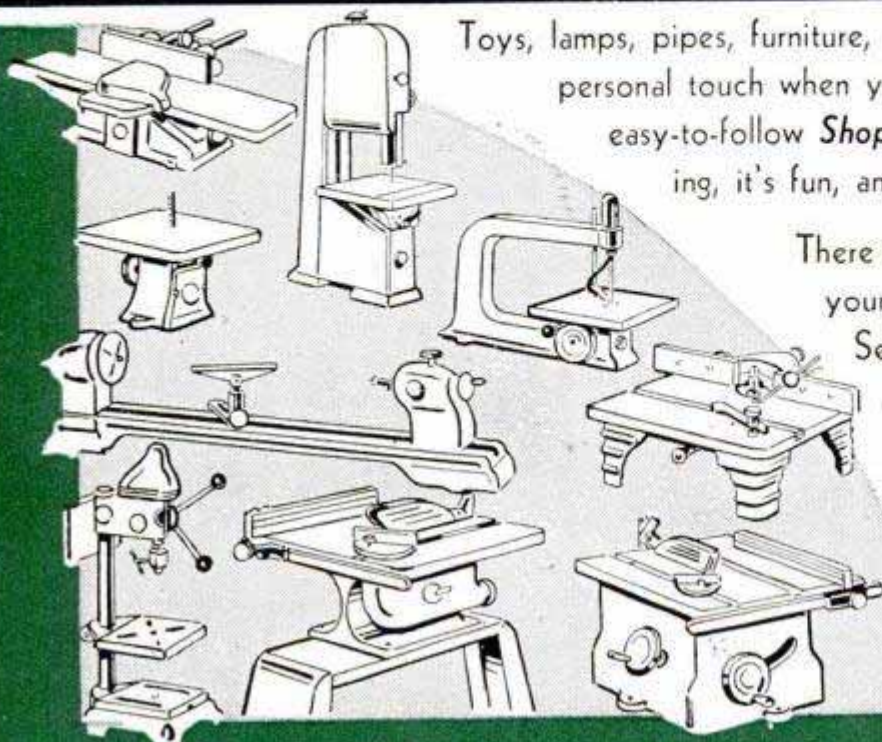
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| 65 Smoking Pipes            | 53 Child's Wagon        | 67 Picket Fences            |
| 66 Modern Table Lamp        | 54 Coaster Set and Rack | 71 Picnic Table             |
| 68 Five-in-One Coffee Table | 55 Toy Duck             | 72 Silver Chest             |
| 69 Lawn Chairs              | 56 Broom Holder         | 73 Baby's Crib              |
| 70 Modern Coffee Table      | 57 Novelty Tie Rack     | 74 Child's Table and Chairs |
| <b>25c Plans</b>            | 58 Bouncing Dog Toy     | 75 Child's Play Pen         |
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## 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.

### Hot-Water Heater

**Q**—I have an electric water heater and for reasons of economy I would like to install a heating coil in my boiler and connect it to the tank for part-time service. Is this considered advisable and, if so, what is the best way to go about it?

S.W., Trenton, N.J.



**A**—While we could not recommend this as a regularly approved procedure, the change-over can, of course, be made quite easily. Our suggestion as to the method of making the change would necessarily have to be governed by the local rulings of your power company regarding special rates applying to power consumption, and also any other rulings that might be in effect concerning such a change-over. Probably the simplest method of making the change would be to install a tee on the pipe at the cold-water inlet of the tank and hook the lower coil connection into the line at this point. Install a second tee in a similar manner at the hot-water outlet of the tank and connect the delivery end of the coil to this tee. It's a good idea also to install a shut-off valve in each line from the boiler so that the coil heater can be disconnected during the summer months when the furnace is not in use. With a hookup like this, the heating coil takes water directly from the cold-water line and delivers it to the hot-water line. When the faucet is open, hot water runs directly from the heating coil to the faucet and, when the faucet is closed, water circulates through the heating coil and into the tank, thus building up a reserve of hot water in the tank.

### Cold Chimney

**Q**—My outside two-flue chimney is about 25 ft. high and located on the north side of the house. In extremely cold weather, the draft is very sluggish both in the boiler and fireplace, so much so that it is difficult to hold a slow fire in the boiler. If I force the fire with all drafts open, it seems to burn freely but, when the draft closes with the thermostat satisfied, it dies out quickly and does not respond readily when the draft opens again. I burn a high grade of soft coal. What could be wrong?—B.G., Rochester, N.Y.

**A**—There always are several possible causes to consider when the boiler or furnace performs as you describe. These are: flue too small, flue coated or partially blocked with soot accumulations, an

(Continued to page 250)

# AMERICAN FLYER

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at the  
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Complete with transformer  
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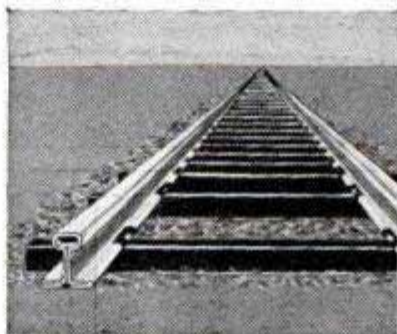


No. 4904T Pacific 3-Car Freight Train—22 pieces—40½" long. Remote control. Powered by famous Gilbert Electric Motor. Superpower worm drive. Real smoke and "choo-choo" sounds. 3 realistic cars. Automatic coupling. Electric uncoupling. Track makes 140" oval.

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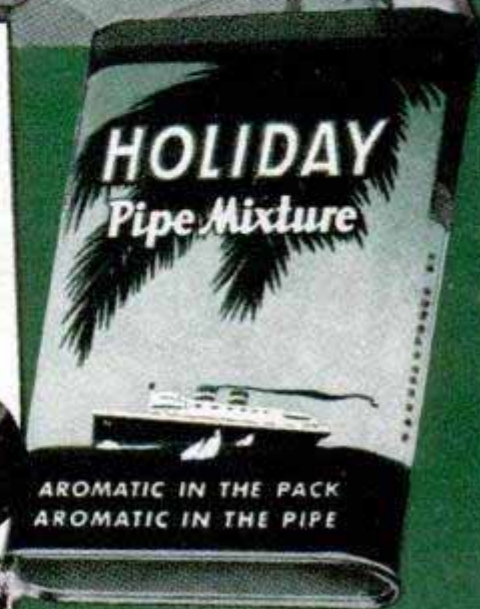
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## AN ADVENTURE IN GOOD SMOKING

opening into the flue somewhere above the smoke-pipe opening and obstructions to air circulation, such as an overhanging tree branch, above or near the top of the chimney. However, your description would seem to indicate that your trouble very likely is due to a cold flue. When the fire is forced with open draft, hot gases warm the air in the flue, causing it to rise and thereby creating a draft. On the other hand, when the draft is closed and the check opened on a cold day, heat is largely confined to the boiler and, because of the northern exposure, air in the flue cools quickly to the point where there is very little upward movement. This condition could account for the sluggish performance you experience on cold days. One remedy that has been successful in a number of instances is that of replacing the regular check damper with one of the automatic, or atmospheric, type. This damper, operating without the check damper, can be manually adjusted to maintain a somewhat higher flue temperature. Of course, the arrangement is not economical from the standpoint of fuel but by adjusting the damper manually to compensate for atmospheric changes it is possible to control the fire satisfactorily. In your case, this suggestion might be worth a trial.

### Hanging Wallpaper

Q—I wish to hang wallpaper over gypsum wallboard in two small rooms. Only the walls are to be papered, not the ceilings. The wallboard has not been painted and the joints have been finished as directed by the manufacturer. How should I prepare this surface for hanging wallpaper?

D.L., Pasadena, Calif.

A—Application of a glue size generally is considered sufficient, but some paper hangers first ap-



ply a varnish size. This should be given plenty of time to dry thoroughly. Then the wall is coated with a glue size made according to the instructions on the package. This double sizing usually seals the surface completely and prevents absorption of the water in the paste used in hanging the paper. Check the joints before sizing the wall. If the joints are rough or raised at any point these irregularities should be removed by sanding as otherwise they will show through the paper.

### Cleaning Brass

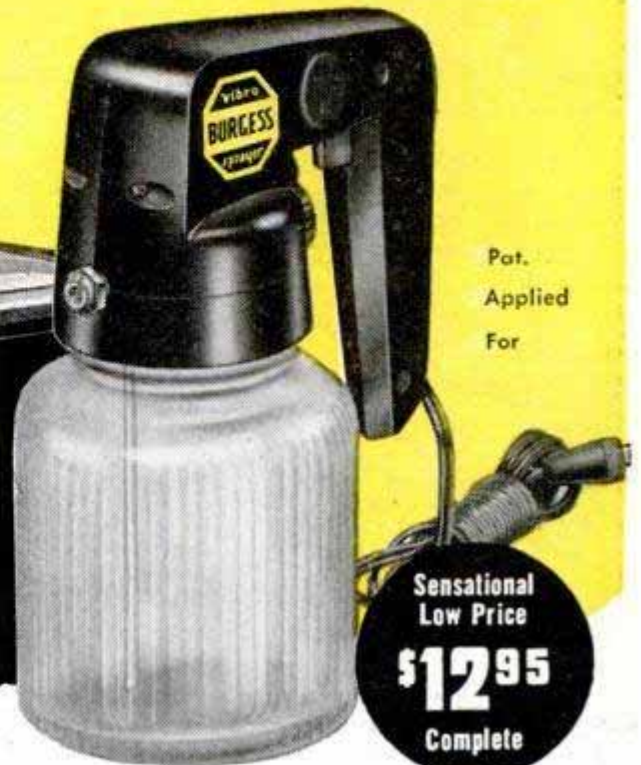
Q—Some time ago I purchased at an auction a pair of brass candlesticks and brass andirons. The candlesticks, or candelabra, are badly tarnished. How can I clean and polish both the candlesticks and andirons to get that smooth, bright finish one sees on brasswork?  
W.D., St. Paul, Minn.

A—Assuming that both the candlesticks and the andirons are solid brass and are not plated or colored, first clean the parts with a solvent or with ammonia suds. This cleaning must be very thorough to remove all accumulations of dust, oil or grime. Do the work outdoors to avoid any risk of fire or the hazard of an accumulation of fumes in a closed room. Next, make a saturated solution of vinegar and common salt and rub the parts with a soft cloth wet in the solution. Intricate parts which cannot be reached with the cloth may be rubbed with a stiff-bristle brush. Wash off the acid-salt solution with quantities of clear water. Then polish with a fine abrasive such as tripoli, rottenstone or jeweler's rouge. A buffing wheel driven by a motor and flexible shaft and charged with any of the abrasives listed will speed up the job. Areas that cannot be reached with the wheel can be polished with a soft-bristle brush.



# AMAZING NEW LOW-PRICED ELECTRIC SPRAYER

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**vibro-sprayer**

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*Just Plug In and Spray!*

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**POCKET DIAL GAGE.** Vest pocket size, measures sheet metal, wire, plastics, paper, leather, etc. Reads in thousandths, 0-1", range  $\frac{3}{8}$ " "Rev" counter, chrome plated case, stainless steel parts, non-breakable crystal.



**TOOLMAKER'S HAMMER.** With Built-In Lens. An ideal hammer for light precision work — spotting in layouts, model making, jewelry, etc. Built-in magnifier saves fumbling for hammer or glass. Offset head permits working in close quarters.



**POCKET SLIDE CALIPER.** 6" capacity — graduated 32nds on stock, 64ths and 32nds on slide. Reads inside or outside measurements. Serrated thumb piece and knurled locking screw located for easy one-hand use. Also available in 3" and 5" capacities.



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Sgt. James Williams, operator for K4AF, quickly notified the Red Cross and made his report. Hours later, the Red Cross announced that the report was false. "Probably just some bored ham trying to stir a little excitement," says Williams.

All told, MARS hams are pretty much the same as hams anywhere. The walls of K4USA and K4AF are papered with QSL cards from all over the world. QSLs are postcards, giving call letters and information, which hams send to each other after they have made contact. Many MARS stations have QSL cards, even from Russian hams. Every network member has one ambition—to get his "WAAFB" and "WAAP" certificates—which mean "Worked All Air Force Bases" and "Worked All Army Posts."

Meanwhile, the network is building fast. Eventually, the chiefs hope to supply key stations with facsimile and teleprinter equipment. With these, messages will be sent 10 times faster. The teleprinter transmits its impulses through an oscillator, the impulses are picked up on the other end and transcribed into print by the receiving machine at a rate of 60 words a minute. The signal transmitted over the air by the teleprinter sounds like a big diesel engine in the distance—a long, deep, wavering note with rapid, muffled breaks.

Until these speed demons do the work, MARS hams will continue to develop "sweet fists," and practice traffic handling for the day when a big emergency calls them out.

## Comes the Flying Assessor

(Continued from page 172)

land usage and bigger crops. They rarely object to assessments because they can compare the photographs with those of farms in their neighborhood and check relative assessments.

The first step in preparing the pictures for tax use is to mark off the area by sections, which are broken down to the usual 40-acre squares. Section corners are accurately located on the photo map by general survey data and known landmarks. The photograph is marked to show township, range and section. From the ownership records, property lines are laid out on an acetate overlay so they can be changed if necessary. Such data as soil type, slope, water resources including irrigation facilities, are entered right on the picture. This task is a gigantic one as there are 93 distinct soil types in western Oregon alone. Values range from 50 cents an acre in the

(Continued to page 254)

# SHOTGUN VALUES



## FIRST IN THE FIELD



Savage Models 755-775

Stevens Model 620

Stevens Model 820

Stevens Model 124

Stevens Model 530

Stevens Model 107

Stevens Model 59

Stevens Model 258

Looks . . . Performance . . . Dependability at *lowest cost* make Savage-built shotguns *the "first in the field" VALUES*. Look over this wide range of models. Take your pick from sleekly streamlined auto-loaders (standard and lightweight models) . . . fast-handling

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**"First in the Field" in VALUE**

**Savage Streamlined Automatics**—Models 755 (standard for long range shooting with heavy loads); 775 (lightweight for upland game and skeet). 12 and 16 ga.—3-5 shot. New, streamlined design. No changes in tested, service-proven functional design, but trigger and hammer mechanisms have been improved.

**Stevens Model 620**—Slide Action Repeating Shotgun. 12, 16, 20 gauge. 5-shot with one in magazine, making 6-shot repeater. Fast handling, smooth operating, dependable. Checkered walnut pistol grip; checkered slide handle.

**Stevens Model 820**—Slide Action Repeating Shotgun. 12 gauge only. The newest Savage "first in the field" value. Sensationally low priced. Natural pointing, smooth operating. Stock and slide handle of Tenite.

**Stevens Model 124**—Repeating Shotgun. 12 gauge only. Features a compactly efficient, simple to operate cross bolt action—a Savage pioneered design. A new value in the repeating shotgun field. Tenite stock and fore-end.

**Stevens Model 530**—Double Barrel Shotgun. 12, 16, 20 and .410 gauges. Hammerless . . . coil springs . . . forged steel barrels. Checkered walnut stock and forearm, full pistol grip. Well balanced, natural pointing, dependable. (MODEL 311 DOUBLE—same as above but with stock and forearm of Tenite).

**Stevens Model 107**—Single Barrel Shotgun. 12, 16, 20 and .410 gauges. Hammer style . . . automatic ejector . . . take-down . . . case hardened frame. Walnut stock and forearm. (MODEL 94 SINGLE—same as above but with stock and forearm of Tenite).

**Stevens Model 59**—Bolt Action, Tubular Magazine, 6-shot Repeater. .410 gauge. 2½ or 3 inch shells. One piece walnut finish stock with black tipped forearm. Lightweight, well balanced, attractively priced.

**Stevens Model 258**—Bolt Action, Clip Magazine 3-shot Repeater—20 gauge. 2 shells in clip, one in chamber. Walnut finish stock with black tipped forearm. Takedown. A fast handling, low priced model in a popular gauge.

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ranges of the east to \$2000 an acre in the Lake Labish onion-growing area.

Aerial photographs show at a glance any changes in tillable land. When a farmer clears some land and turns it into farm land, the assessor spots the change on his photograph. In one county, the assessor added more than 15,000 tillable acres to his assessment roll after studying the photographs. To detect such changes by ground inspection would require days of driving over rough terrain.

Although it cuts time and expense, aerial photography doesn't entirely eliminate the assessor's ground work. He still has to plod through woodlands and farm lands to check uncertain spots. Field inspection of timber is necessary to classify the quality of the growth. But the airborne camera has reduced field work by at least 70 percent and, at the same time, increased the accuracy of the assessments. Without it, the statewide reappraisal operation would be virtually impossible.

## **Logging "Cowboys" Ride The Sea Dozer**

(Continued from page 93)

down under the log. Then, he gives the engine full throttle in forward gear. The stern sinks, the bow rises and the end of the log is pulled upward.

Not all logs are light enough to float. The occasional heavy log contains excessive moisture and its density is greater than water. When a crib is broken up, there may be 15 or 20 logs that immediately sink to the bottom of the anchorage. These are recovered by Bob Forrest, deep-sea diver, who tours the bottom after each crib is broken up. He notes the positions of the sunken logs so that he can grapple for them from the surface, or he attaches wires to their ends so that they may be hauled up at once. Working in 40 to 60 feet of water, Forrest sometimes finds a giant octopus on one of the sunken logs. An octopus with a 10 or 15-foot spread between tentacle tips can be a nuisance even if it isn't actually dangerous and Forrest carries a small bag of blue vitriol crystals tied to his suit to ward them off. Dissolving slowly in the water, the chemical is repulsive to the devilfish and it usually moves away at once.

Puget Sound lumbermen, just like ranchers, have to contend with rustlers although the wholesale stealing of rafts and cribs has just about been wiped out. Occasionally, log thieves still raid an unguarded cove where logs are stored, round up as many logs as their boat can conveniently

(Continued to page 256)



# "Mr. Big"

## of Hand Guns

the

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"922"

.22 CALIBER, DOUBLE  
ACTION REVOLVER

Only \$24.75.

**BIG** new features . . . **BIG** new performance!

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**HARRINGTON & RICHARDSON ARMS CO., 446 Park Ave., Worcester 2, Mass.**

### SPECIFICATIONS

Solid frame; 9 shot; shoots long rifle, long, or short regular or high speed ammunition, both single and double action; 6", 4", or 2½" barrels; checkered Tenite stock.

### MODEL 923

Same as model "922" except all metal parts are of chrome finish. \$26.78

**FINE TOOLS  
NEED  
FINE OIL!**



• Lubricates



• Prevents Rust

• Cleans • Polishes

SOLD EVERYWHERE

**3-IN-ONE Oil**

**KING MIDGET**  
HOME ASSEMBLED MIDGET AUTO



**WORLD'S LOWEST PRICED AUTOMOBILE!**

80-90 MI. PER GAL.—45-50 MI. PER HR.

Drive this car for as low as 50c per week. Precision built parts direct from factory with beautiful all steel body. Get all the facts on this amazing small auto — send 25c for detailed circular with large picture, 4 view drawings and price of all parts, or send \$1 (refunded first order) for this plus actual assembly book with 42 photos, drawings; blueprints of snow and ice conversions, etc.

MIDGET MOTORS MFG. CO., ATHENS 1, OHIO

**SEND FOR FULL INFORMATION TODAY!**

King Midget is the ideal small car for errands, sports use, to and from work, short business or pleasure trips, delivery service or second-car utility for the whole family. Comfortable — room for husky six footer.



Fill cracks in floors—

Sands to a  
 swell finish,  
 stops annoy-  
 ing squeaks!



Fill nail and screw holes—

Replaces rotted  
 wood . . . dries  
 tight and hard!  
 Easy to apply!

Repair broken furniture—

Makes loose  
 joints firm,  
 steady!



Also useful in repairing broken balusters,  
 loose tiles . . . filling knot holes, gouges!  
 Handles like putty . . . hardens into wood!



IN CANS  
 OR TUBES



WON'T CHIP OR CRACK

handle, and tow them to another anchorage.

One way to discourage rustling is to brand every log just as if it were a cow, and that's the rule these days. Each company has its own brand, registered with the state. Instead of a hot iron, the lumberjack uses a heavy hammer with the brand embossed on its head. He marks the butt of each log with several blows. Some logs carry three or four brands by the time they get to the mill, each representing a successive change of ownership.

There are literally hundreds of protected anchorages and coves along the shores of Puget Sound in which logs can be stored, and there is constant traffic between the anchorages. Rafts are towed up and down and across the Sound as the logs are moved from the forests to the mills, to new owners or to storage areas. The traffic is so great that it forms the principal occupation for 75 tugboats that are operated by nearly 1000 crew members.

Some of the tows are for distances of only 45 or 50 miles, some rafts that are brought down the Inside Passage from Canada travel 600 miles before they reach their destinations. In round figures, about 2½ billion board feet of timber per year are rafted through the Sound for processing into plywood, other forms of lumber and into paper products.

With all this activity, some logs are bound to escape. Some float away from the booms in which they are corralled, some get loose from the rafts themselves. During heavy weather, there is always a chance that a raft may break up and if this happens, the storm then scatters the logs over square miles of water.

Rounding up these strays is the task of the log patrols, the private "beachcombing" outfits that are licensed to operate in assigned territories.

A big heavy log, low in the water, is a menace to navigation but fortunately the action of the tides usually beaches it in a few days. On the beach, it is no longer a danger to shipping but it remains a valuable piece of property. That's where the beachcombers come in.

Each salvage outfit makes frequent patrols along its stretch of coast, hunting for logs that have recently come ashore and noting their locations. Special searches are made after each big storm. Often, the patrol is made from small seaplanes because these craft are ideal for maneuvering in and out of the numerous small coves.

Periodically, the beachcombers tow a barge along the beaches and haul the stray logs out to it and lift them on board. Each

(Continued to page 258)

# BOYS! This coupon may send you to college!

It gets you started on a model car that can win a \$4,000 University Scholarship—a cash award—a tool chest — or all-expense convention trip! It's your first step in the 1950 Fisher Body Craftsman's Guild Competition — 734 awards — \$65,000!

SEND COUPON NOW FOR



**FREE**

Guild membership!  
Craftsman's button and card!  
Plans on building model!

If you were between 12 and 20 years of age on Sept. 1, 1949, this may be the biggest thing in your life.

For in the 1950 Fisher Body Craftsman's Guild Competition, you've a chance to win one of 8 University Scholarships, worth up to \$4,000. Also—expense-paid trips, generous cash awards, tool chests—altogether 734 awards worth \$65,000.

**No Entry Fees! No Special Tools!** Send in the coupon for your FREE membership in the Guild, FREE Craftsman's button, FREE instructions. Then, using balsa or any suitable material and the simplest tools, you simply make a solid scale model of your idea of a modern car.

**So Get Started Now!** It's not work—it's fun! Fill in and mail that coupon. It may make a college man of you!

### LOOK AT THESE AWARDS

8 University Scholarships—worth from \$1,000 to \$4,000 each. All-expense trips to the Guild Convention. Cash awards—up to \$150 each. Model Builders' Tool Chests.

**A Grand Total of 734, Worth \$65,000**

*Identical awards for Juniors and Seniors*

(If the son of a General Motors employe wins, a duplicate award is given.)

### LOOK AT THE EASY RULES

You're eligible if you were at least 12 but not yet 20 years old on Sept. 1, 1949. You compete against boys in your own age group—there is a Junior Division (12 to 15 years inclusive) and a Senior Division (16 to 19 years inclusive). You build a solid model of a car. No special tools needed.

**FISHER BODY CRAFTSMAN'S GUILD, Dept. J**  
General Motors Building, Detroit 2, Michigan

*Please enroll me in the Fisher Body Craftsman's Guild Competition for 1950. Also—send the Craftsman's button and membership card plus complete instructions for building a model. All this will be sent FREE and without obligation to me.*

Name \_\_\_\_\_

Address \_\_\_\_\_

City and Zone \_\_\_\_\_ State \_\_\_\_\_

I was born on the \_\_\_\_\_ day of \_\_\_\_\_, 19 \_\_\_\_\_

Parent or guardian \_\_\_\_\_

Name of my school \_\_\_\_\_

Town \_\_\_\_\_ State \_\_\_\_\_



Dealer Inquiries Invited

## SET THE PACE WITH THE

- Cruises at 45 MPH—with faster pickup than car
- 39" high, 71" long overall, wt., 190 lbs.
- 8 HP motorcycle engine
- 50 miles to the gallon
- Automatic clutch
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*Powell*

**P-81!**

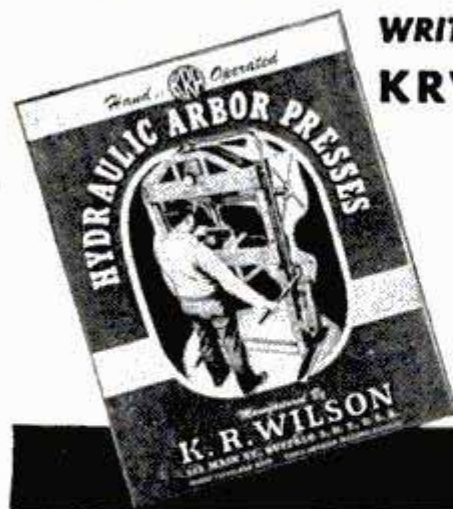
ONLY \$247<sup>34</sup>  
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EXCISE TAX INC.

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## WRITE FOR YOUR FREE COPY OF THE NEW KRW HYDRAULIC PRESS BOOK

Describes all manner of Production and Shop Work on KRW Hydraulic and Bench Type Presses. Illustrates the new KRW Hand-operated, Electric-operated and Air-operated Hydraulic Presses. 25 to 100-ton capacities.

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## M-SCOPE TREASURE-MINERAL LOCATORS

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M-SCOPE TREASURE-MINERAL LOCATORS. Low priced, unsurpassed efficiency, lightweight models. Factory guaranteed. Immediate shipment. Credit plan available. Write for free 16-page booklet.

GEIGER COUNTERS for finding Uranium ores. Several models, Simple operation. Low priced. Immediate shipment. Interesting free literature.



URANIUM



GOLD

**FISHER RESEARCH LAB., INC., PALO ALTO, CALIF.**

log, of course, carries the brand of its owner and the owner has the right to recover his property on paying a standard log-salvage fee. Logs that are unclaimed by their owners become the property of the patrol concerns.

Cutting down America's forests used to be an extravagant, wasteful business but now the logging industries believe that by careful management and conservation the forests can be cropped time after time, far into the future. Recovering logs that have sunk in the water and rounding up stray logs from the beaches are only two of many conservation measures that are part of the program.

## Rail Car's Three Heating Systems Maintain Even Temperatures

Three independent heating systems are combined into one installation in a new method of maintaining comfortable temperatures in railroad cars. Each wall of the car has its own hot-water radiator and thermostat, thus keeping an even temperature throughout the car when the sun is warming one side and a cold wind chilling the other. The third heating system is an overhead warm-air circulator. In addition, thermostats outside the windows anticipate inside temperature changes and regulate the heating systems accordingly.

# The Ideal Christmas Gift DREMEL *Electric* MOTO-TOOL

The "Pocket Size Machine Shop"

Grinds, Routs, Drills, Carves, Engraves, Cleans, Polishes, Finishes

APPROX. 27,000 R.P.M.



MOTO-TOOL KIT NO. 2 With 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishing Accessories) \$23.50



MOTO-TOOL NO. 2 with one emery wheel point \$16.50



Great for Hobbyists

Saves Time and Labor

### 10 REASONS WHY MOTO-TOOL IS A BETTER BUY

Here's what you get in a Dremel No. 2 Moto-Tool: Oil-less, sealed bearings • Patented automatic chuck lock pin • Oversize armature shaft, hardened, ground, polished • Shockproof, bakelite housing • Dust filtered air cooling system • Dynamically balanced armature (for vibrationless operation) • Exclusive hanger hook • Sturdy 110-120 Volt AC-DC motor • Weight only 13 oz. • Cutters in Kit No. 2 are made of high speed steel (not common high carbon steel) for longer life, faster cutting.

### Portable DRILL PRESS

Add all-around versatility to your Moto-Tool with this 12" high drill press. Just the thing for creating costume jewelry, model making, carving, routing, drilling, etc. Utilizes No. 2 Moto-Tool, which can be raised, lowered or swung in any direction. Weighs 3½ lbs.

Only \$9.95 (Less Moto-Tool)



Moto-Tools, Kits and Accessories should not be confused with "bargain offers." We invite you to compare Dremel Products feature for feature with other similar equipment. If you are not fully convinced ours are far superior in quality, design and performance, we don't want you to buy.

**WIDELY USED IN INDUSTRY** —Moto-Tool is a precision-built electric tool, backed by over 13 years of industrial use in such plants as: GENERAL ELECTRIC • FORD • REMINGTON ARMS • NASH-KELVINATOR • WESTINGHOUSE • DOUGLAS AIRCRAFT, etc.

### PRE-WAR PRICES STILL PREVAIL

MOTO-TOOL KIT NO. 2 with 23 accessories including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case..... \$23.50

MOTO-TOOL NO. 2 with one emery wheel point..... \$16.50

**WHERE TO BUY** —Buy Moto-Tool from your dealer. If he cannot supply you, send check or M. O. for items desired and we will ship postpaid. Or, send only \$2 now and pay postman balance plus postage on delivery. **MONEY-BACK** if not delighted after 5 days' trial. Catalog of Dremel Tools **FREE**.

DREMEL MFG. CO., Dept. T119-L, Racine, Wis.

### BIG VALUE!



MODEL NO. 1

MOTO-TOOL KIT Only \$17.50

Moto-Tool Kit No. 1 contains the lighter Model No. 1 Moto-Tool and 34 practical accessories (steel cutters, grinding wheels, etc.) in an attractive, lacquer-finish wood case. It's the biggest bargain \$17.50 in the field..... MOTO-TOOL NO. 1 with one emery wheel point... \$9.85

A Gift the Whole Family Can Use

# THREE TOOLS IN ONE



Patented

Only \$14.85

POSTPAID



## DREMEL *Electric* SANDER

Popular Labor Saver for the HOME and SHOP



MAKES PLAY OF WAX POLISHING



SOOTHES TIRED MUSCLES BY MASSAGE

## FUN FOR BOYS FROM 8 TO 80 DREMEL *Electric* COPING SAW

CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS



BLADE FACES 4 WAYS

SAFE!  
AS A  
HANDSAW

JUST  
GUIDE IT!

Only \$5.85  
with 3 saw blades

For men who harbor a hobby or do their own repair work . . . for boys who like to make things . . . no other tool will give as much pleasure and satisfaction in the home or workshop for the small amount of money invested as a Dremel Electric Coping Saw. It works in any direction . . . delivers 7,200 strokes per minute . . . so easily, there is no effort . . . so smoothly, work needs no sanding. Makes child's play of tricky scroll designs . . . saws through 3/4" medium hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Saw has only two moving parts . . . never needs oiling. Operates on AC current. Thousands and thousands of satisfied users.

**WHERE TO BUY IT**—Buy Dremel Electric Coping Saw from your dealer. If he cannot supply you, use the coupon to order direct from factory. We ship postpaid if you send check or money order in full. Or, send \$2 now and pay postman balance plus postage, on delivery. Money back if not delighted after 5 days' trial.

DREMEL MFG. CO. • Dept. S119-L • Racine, Wis.

FREE PROJECT PLANS

Plan for making six useful decorative projects packed with each Dremel Electric Coping Saw.

The popular Dremel Electric Sander is more than a sander . . . it's also a polisher and massager. This miracle machine is so easy to handle, a child can use it. It delivers 14,400 strokes per minute. (1) As a sander, it gets into tight corners, takes the effort out of sanding walls, woodwork, furniture, workshop projects, etc. Its straightline (non-rotary) action will not burn or scratch surfaces. (2) As a polisher, it does a professional job on waxed surfaces of cars, furniture, refrigerator cabinets, etc. (3) As a massager, it's ideal for tired or sore muscles of the back, legs or arms. Users testify it is more effective than machines made expressly for this purpose.

### LOOK AT THESE DREMEL FEATURES

Dremel Electric Sander does all the work . . . you merely guide it. It weighs only 2 1/2 lbs.; it's foolproof (has only two moving parts . . . never needs oiling). Quick-change clamps firmly hold abrasives and pads. Dremel Sander is sturdily built to give long, trouble-free service. Operates on 110-120 Volt, 60 Cycle, AC. Thousands and thousands of satisfied users prove its outstanding value.

**WHERE TO BUY IT** — Dremel Electric Sander comes complete with 6 sheets assorted grade Garnet Paper for sanding, plus felt pad and sheepskin for polishing. Buy it from your dealer. If he cannot supply you, use coupon below to order direct from factory. We ship postpaid if you send check or money order in full. Or, send \$2 now and pay postman balance plus postage, on delivery. Money back if not delighted after 5 days' trial.

**If Your Dealer Cannot Supply You  
USE THIS HANDY COUPON ORDER FORM**

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- Enclosed find \$\_\_\_\_\_ (Check or M. O.) in full payment for items checked below. Ship postpaid at once.
- Enclosed find \$2.00 in part payment for items checked below. I agree to pay postman balance plus postage, on delivery.
- Dremel Electric Sander \$14.85       Dremel Electric Coping Saw \$5.85
- Free catalog of Dremel Electric Tools.

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Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# MOTORISTS WISE SIMONIZ

T.M. REG. U.S. PAT. OFF.

MAKES CARS STAY BEAUTIFUL

*Better than 10  
"Here-today...  
Gone-tomorrow"  
Polishings!*



**Simonizing saves you time and effort . . . because it lasts longer!**

Don't waste your time with 'temporary polishings'! Simonizing gives long lasting beauty...protects the finish and keeps colors from fading. Do as millions of motorists...Simoniz your car. It's easy to do yourself.

THE SIMONIZ COMPANY, CHICAGO 16, ILL.



Use Simoniz Kleener (liquid or paste) to clean finish. Then Simoniz for lasting beauty. Sold everywhere!

## Mexico City Is Sinking

(Continued from page 138)

basement demonstrated the soundness of his basic idea, Cuevas built the companion hull in the way he desired. It was built and sunk similar to the way a caisson is put down. A complete six-foot section of the circular hull, 66 feet in diameter, was built of concrete above ground, at the same time that six feet of dirt were excavated from underneath it. During the night, the circular ring sank into the ground. Next day, another six-foot course was poured and more material was excavated out from below. Day by day the work proceeded until the hull was complete except for the pouring of a waterproof floor at its bottom. Meanwhile, its interstructure had been loaded with ballast equal to the weight of the soil that had been removed. This ballast was in turn removed in pace with the construction of the building.

The first method of creating a foundation hull, Cuevas points out, permits a temporary unbalance in the soil. The caisson method is more satisfactory because the plumb of adjacent structures is not disturbed and the soil remains at rest.

In theory, the National Lottery Building will always remain vertical but in actual practice there is a chance that it may be tilted, if a large building is constructed nearby with pile underpinnings.

To correct any such list, Cuevas provided a water ballast tank with a capacity of 1200 cubic meters under the stage of the auditorium, and another tank of 4800 cubic meters capacity under each of the building's two wings. Provision for a fourth tank directly under the main entrance, under the tower, also was made. In addition to the water ballast, an amount of concrete-brick ballast is stored in the hulls, to be removed if and when additions to the building are made.

One of the first things that Cuevas discovered when he began his experiments with the subsoil of Mexico City is that the entire city, including open spaces such as parks and plazas, is sinking. By means of bench marks on nearby mountains he ascertained that the city had lost some 13 feet of altitude in the last 70 years in some places. Then, by means of an ingenious system of underground bench marks, he learned that the rate of sinking has been accelerated and that today some parts of the valley floor are dropping as much as a foot a year.

A number of years ago when the Republic erected its tall Independence Monument on the Paseo de la Reforma in Mexico

(Continued to page 262)

Ready Now!



The New

# LIONEL CATALOG

## 40 FULL PAGES IN COLOR WITH NEW 1949 SURPRISES

Get your Lionel catalog early. The supply is hardly enough to go around, even though we print over one million. It tells all about the new Lionel trains for 1949 — the new Diesel Switcher, and the Big Twin-Diesels. And it shows

some of the most realistic and exciting accessories. Big *Special Offer* will bring you the catalog and all the items listed below. Remember Lionel Train sets are priced as low as \$15.95. Mail coupon and 25¢ now.



*Special offer consists of:*

- 1) 40-page Full-color catalog
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- 3) R.R. Planning Book for "Pop"
- 4) 8 Miniature Billboards, featuring Ford, Heinz, Kellogg's, Baby Ruth, Wrigleys, Kleenex, and Nash Cars, etc. Realistic outdoor boards for your model railroad.

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LIONEL TRAINS, P. O. Box 228  
Madison Square Station, New York 10, New York  
I enclose 25¢ for "Special Offer"—including 40-page full-color Lionel Train Catalog, Sound Effects Record, 8 Miniature Billboards, and Railroad Planning Book for "POP"

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Send 25¢ for special Catalog offer!

# PLUMB TOOLS



## Do Better Jobs With Ease and Speed

Get a Plumb Hammer. You'll feel the difference immediately. The non-slip handle fits your hand comfortably, absorbs the shocks. Perfect balance lets you strike quick, hard blows with ease and little effort—makes light work of your heavy jobs.

Made of special analysis steel, Plumb hammers are tempered to withstand constant, heavy pounding. For pulling nails, even headless ones don't slip through the spring-tempered claws.

You'll discover quickly why more people choose Plumb than all others combined.

*The red handle with the black head — exclusively Plumb.*

**Quality Comes First**  
**PLUMB**  
**—is First in Quality**

# PLUMB

HAMMERS • HATCHETS • AXES • FILES

City, wooden piles were first driven down into the ground to serve as foundations for the monument. As it happened, the piles were driven home on the surface of a shallow basin with a solid-rock bottom. The result is that the monument has remained fixed in space while the city has subsided around it. The base of the monument, once at street level, is now some two feet above the pavement.

What is happening, apparently, is that Mexico City is drinking up its own foundations. The population of the metropolis has been growing rapidly and today some 2½ million people live in the capital. In need of more water than can be provided by the municipal water system, numerous industrial concerns and the city government have dug wells down into the artesian layers that lie at depths of several hundred feet. Today, these layers still provide water but the flow has diminished. The water must be pumped from the ground. Meanwhile, water slowly migrates out of the *jaboncillo* to replace the fluid in the gravel layers. Bereft of its water, the *jaboncillo* shrinks and subsidence occurs.

In 1936 Cuevas offered as a possibility the idea that if pumping of underground waters continued, the city eventually would sink to a level at which its sewage system would no longer drain away from the city. Two years later he predicted that some sewers would cease to flow efficiently within 10 or 11 years. This year, to the consternation of health authorities, his prediction came true during periods of flood.

The general settling of the basin floor presents a terribly urgent problem and, unless drastic remedies are applied, one of the largest cities in the world is threatened with extinction. Already it is apparent that new sewage lines of steeper gradient must be built if the city is to continue to exist. Eventually, unless water to supply all needs is brought in from the mountains and unless every well in town is shut down forever, the beautiful floating City of Mexico will become the sunken, dead City of Mexico. On the contrary, with a well-planned preventive program, the entire basin will continue to serve as a fine site for a big industrial city.

## Plastic-Coated Starter Rope For Outboard Motors

Coated with a vinyl plastic, a new starter rope for outboard motors is said to wear as much as 15 times longer than the usual cotton rope. The fibers are impregnated with the plastic, making the rope resistant to mildew, grease and moisture.



# a new high...



## ● A New High in spark plug reliability.

Owners of cars, trucks, tractors, or boats will find that new AC Spark Plugs set a new high in reliability . . . because of AC's patented CORALOX Insulator\*.

They withstand the punishment of heavy going or day-to-day driving better than plugs have ever done before.

They give you the benefits of easy starting and reliable performance in all seasons.

Get a set . . . and enjoy the new high in spark plug reliability.

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

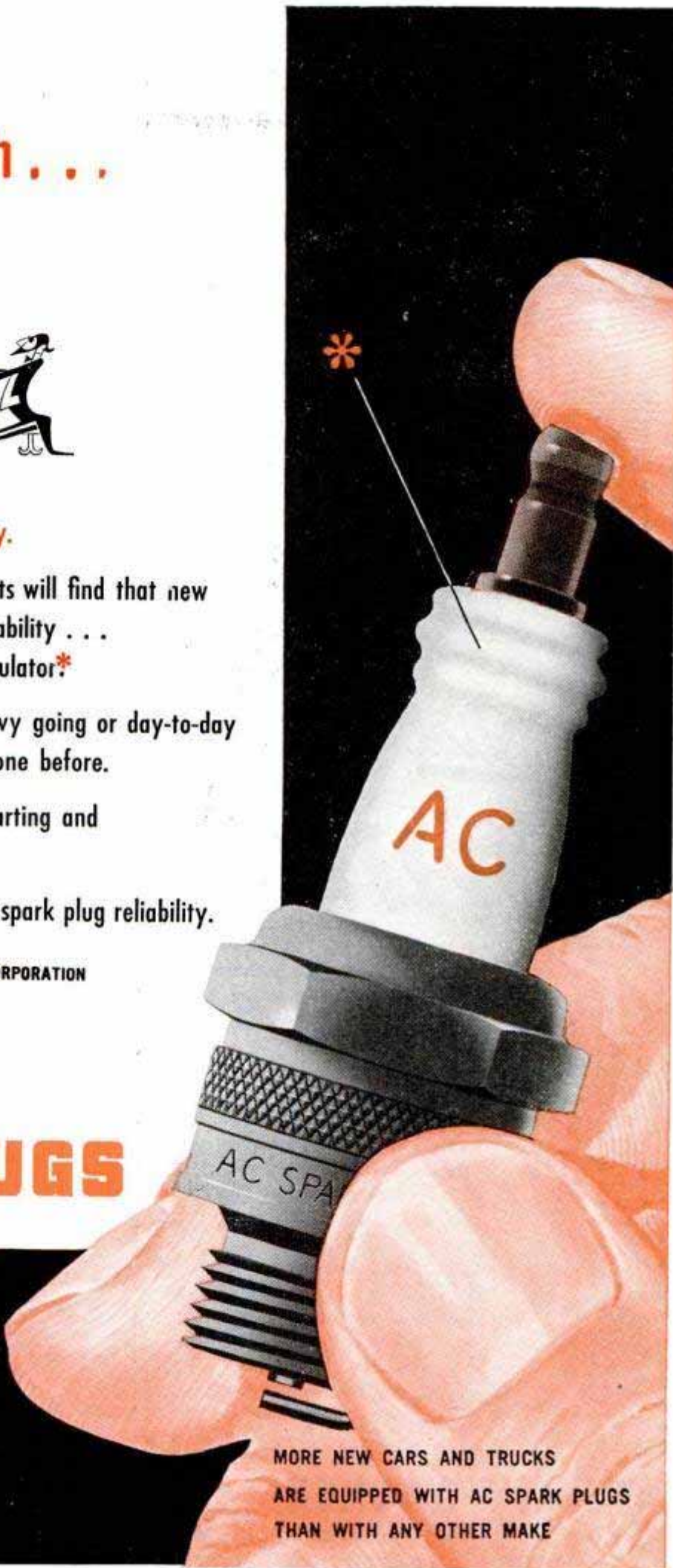


# SPARK PLUGS

BUY WHERE YOU SEE THIS SIGN



\* AC's patented processes make Coralox the finest insulator in spark plug history. Improved electrical insulation, no matter how high the temperature. Better heat conduction. Maximum resistance to heat shock. Less fouling. Harder, stronger, longer-lived.



MORE NEW CARS AND TRUCKS  
ARE EQUIPPED WITH AC SPARK PLUGS  
THAN WITH ANY OTHER MAKE



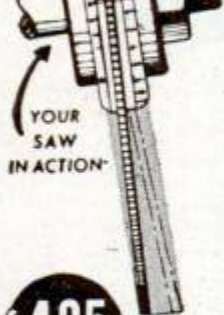
*Just dial* ANY WIDTH CUT  
ON YOUR SAW



WITH

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**DADO SAWING WASHERS**



\$4.95  
SET

Cut clean, accurate, parallel grooves—12 widths, any angle. No chatter, burning, chewing—or sanding! No more blade vibration—no screws to fuss with—just four balanced washers. Simply dial desired width with Micro-matic adjustment. Can be left on blade for straight cuts. Available in 5 sizes— $\frac{1}{2}$ ",  $\frac{3}{4}$ ",  $\frac{5}{8}$ ", 1",  $1\frac{1}{8}$ ". A perfect gift for woodworkers. See your dealer or write—

**WARREN WASHERS CO.**

Dept. 31 • 70 Medbury • Detroit 2, Mich.

## Bail-Out Rehearsal

(Continued from page 123)

almost 2000 "bail outs" into wind-whipped nets from the cockpit of the stationary plane, while high-speed cameras above them recorded every mistake. Automatic timers clocked each jump.

Jumpers soon learned that the best method of exit was executed by grabbing the side of the cockpit, keeping the head low, and diving over the side perpendicular to the line of flight. The slip stream easily carried them back over the trailing edge of the wing.

Tests turned up a number of unsuspected facts. Of more than 50 bad bail-outs, most were caused by 'chutes and paraaft kits snagging on projections inside the cockpit. One pilot's foot caught in the rudder gear. Three others got nervous and pulled the rip cord before they were out. If they'd been in actual flight, the shrouds would surely have fouled the tail surfaces.

Each man made eight jumps. The slowest took nine seconds, and one man whipped out in three. Significantly, each man made his last jump an average of three seconds faster than his first. As a consequence, the "wind tunnel—jump plane" rig has been set up in several air stations throughout the country, where regular scientific jump-training programs have been started. Navy authorities are redesigning parachutes, rafts and radio-headset wire connections to eliminate snagging and catching parts.

There is still much to learn. Crippled planes can't be counted on to fly straight and level. In a spin, for instance, the rule is to go out on the inside of the spin. But there are many instances, like that of a Navy pilot who lost a wing in a mid-air collision. Centrifugal force of the spin was so great he could not turn his head to the left, much less pull himself over that side. He went on the outside, lost his goggles, a shoe and a leg when the wind and a stabilizer hit him.

The tests at Cherry Point, however, have set the pace for further experiments that will lead to scientific rules for bailing out of slow-speed aircraft, instead of relying on the word of pilots who were lucky enough to "get out alive" once or twice, but might not be able to maintain their record.

## Spray-On Paint Remover

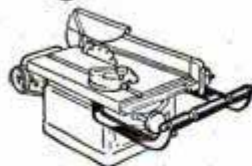
Spraying on a fluid developed by the U. S. Air Force speedily removes aircraft camouflage enamels that resist ordinary removal techniques. All the paint can be stripped from a C-47 transport in half a day.

# **CRAFTSMAN** Tilting-Arbor Bench Saw REG. U.S. PAT. OFF. Sale-Priced for November only!

COMPLETE! This CRAFTSMAN saw is completely equipped... NOT a stripped model as are many saws on the market!



**Saw Table  
ONLY  
\$9.75**



## **Bench Saw Table Extensions**

Available separately to give your CRAFTSMAN bench saw more table surface. **Side Table Extension** (upper view), 8½x20 in., of cast semi-steel, for either or both sides. One extension enlarges table working area to 25½x20 in. **New roller type Front or Rear Table Extension** (lower view), increases the capacity of the table without disturbing rip-fence set-up on the saw.

**See this sensational saw and accessories at your nearest Sears, Roebuck Retail Store TODAY! Sears Easy Terms make it much easier to own the tools you need NOW... pay as you use them!**

## **CRAFTSMAN "80" Tilting-Arbor Bench Saw**

**NOW ONLY \$49<sup>88</sup>**  
Cash

without motor

(\$52.88 West of Rockies)

**\$87.25 with motor, table,  
motor-pulley, and V-belt**

(\$91.25 West of Rockies)

As low as \$5.00 Down  
on Sears Easy Terms

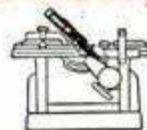
## **Feature for Feature, CRAFTSMAN gives you more for your money!**



**NEW! Exclusive!** Tilting, raising and lowering of blade all controlled by a **SINGLE** hand wheel at front of saw!



**NEW! Floating motor mount** fastens to bench for easier tilting. Controls belt tension; reduces saw vibration; lessens strain on saw!



Work stays level! Blade and guard (not table and work) tilt any angle up to 45°, for much faster, easier, more accurate operation!

## **Look at these extra-value features for more accurate, better work!**

**Double-row, sealed precision ball bearings NEVER need further lubrication!**

**Rip fence locks on both ends with ONE handle; usable on either side of blade!**

**Special mechanism tilts saw arbor much faster without any loss of accuracy!**

A superb heavy duty CRAFTSMAN tilting-arbor saw... exceptionally accurate! Big, 20x17-in., smooth-ground table of cast semi-steel, with removable insert for dadoing or sanding. Depth of cut, up to 2½ in. Over-all length, 26-7/32 in.; width 17 in.; height 14¾ in.; Complete with automatic leveling guard, non-kickback pawls and splitter; accurate miter gauge; motor mount; 2½-in. machine pulley; and 8-in. combination blade (½-in. bore). (½-H.P., 3450 R.P.M. ball bearing capacitor motor for 110-120-volt, 60-cycle, A.C.; 2½-in. motor pulley and ½x40-in. V-belt recommended and sold separately, at extra cost.)

Saw may be purchased either with or without new, streamlined, sturdy table... specially designed for this CRAFTSMAN bench saw.

**CRAFTSMAN** Hand and Power Tools by **SEARS, ROEBUCK and CO.**  
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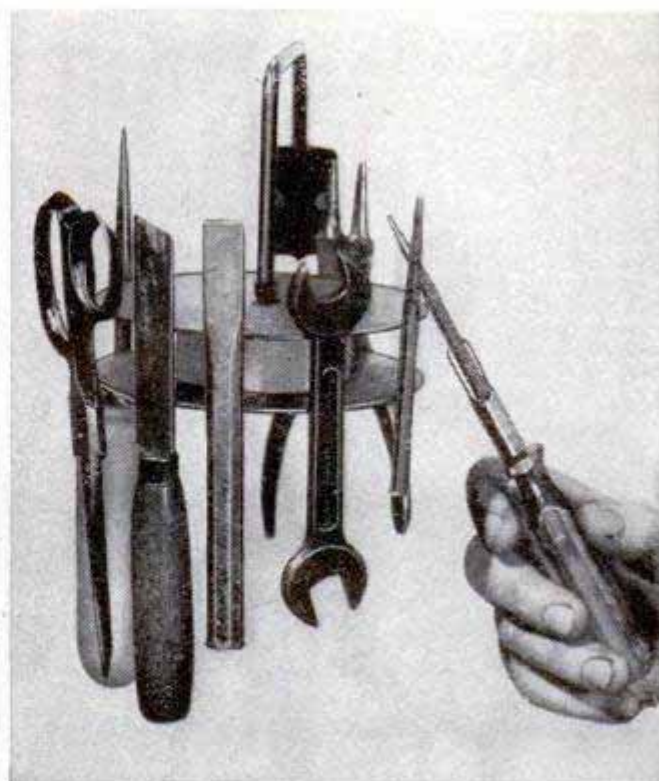
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Tools, knives and instruments can be quickly removed or replaced on a magnetic holder that accommodates all steel implements regardless of shape. It rotates on its bracket, making any tool readily accessible and providing a large holding capacity in a minimum of space. To replace a tool, you simply touch it to the holder.

### Stoves That Eat Their Own Smoke

(Continued from page 118)

the Lennox Furnace Company of Marshalltown, Iowa, has been actively pushing the development, and 700 of Fellows' furnaces were in use last winter. Homeowners report that more than 90 percent of the smoke is consumed, that fuel consumption is reduced by 25 percent or more, and that the cheaper grades of soft coal can be used.

In Professor Fellows' furnace, a sloping firebox floor provides gravity feed from the magazine area to the burning area, and the two areas are partially separated by a vertical baffle wall suspended from the firebox roof. Through a passage in this hanging baffle wall comes the secondary air feed, which mixes with the volatile gases given off by the coal, consuming them before they can be carried up the flue.

Because the furnace is equipped with automatic controls, and is built in a size which permits it to burn eight hours without attention, its cost is considerably higher than that of a conventional furnace, but Professor Fellows expects that it will be

(Continued to page 268)



## Piston rings need replacing, too...

OIL-PUMPING is a symptom of piston ring wear. And by the time you notice it, your rings will be pretty badly worn. They should be replaced immediately.

Hastings Rings are designed especially for replacement service. So ask

your motor serviceman for Hastings—the replacement ring that *stops* oil-pumping, *checks* cylinder wear and *restores* performance. It's the best money you can spend on your car.

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"TOUGH . . . BUT OH SO GENTLE"

TOUGH on Oil-Pumping

GENTLE on Cylinder Walls

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## NEW POWER TOOL AND WELDING EQUIPMENT BOOK

Beautiful rotogravure 52-page book contains hundreds of illustrations, descriptions and specifications of Wards well-known Powr-Kraft line of tools for wood and metal, and motors. Also shows the nationally-known Logan Metal Lathes, Mall Electric Saws, Burke Milling Machines, Burgess Hand Tool Kits, deluxe quality Beaver Power Tools, etc. Book features the popular Shopsmith, a complete 5-tool-in-1 workshop. All tools may be purchased on convenient monthly payments at Wards Mail Order Houses, Catalog Order Offices or Retail stores.

Every power tool beginner, advanced hobbyist and production shop should have a copy of this money-saving catalog. Use coupon for your free copy now!

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adopted by many homeowners who cannot afford the still more expensive automatic stoker. He has built the same idea into a smokeless stove, not yet in production.

Somewhat similar principles have been applied elsewhere in designing more efficient, slow-burning wood stoves and furnaces. Several types are in use in Europe, and D. E. Howes and F. G. Smith of the Bureau of Industrial Research, Norwich University, Northfield, Vt., have tested and modified foreign stoves to develop a new experimental wood furnace which has several advantages. It contains two fuel magazines, mounted side by side. One magazine burns continuously, the other intermittently, according to the demand for heat. When the temperature demand is satisfied, the drafts on the "spare" side are automatically closed and combustion dies down. Gaseous products of distillation pass through a hot zone and are thoroughly consumed. Firing is done at 8 to 12-hour intervals, and the inventors have been able, as a stunt, to maintain combustion for five days without adding fuel. Because of thorough combustion, there is no gumming of furnace or flue with creosote. It has been estimated that 90 percent of rural residents burn wood, and more efficient heaters are long overdue.

The Northeastern Wood Utilization Council has conducted considerable research on wood burners and aided in the development of the Woodomat warm-air furnace. This furnace has been built by the Pantex Manufacturing Corp., Pawtucket, R. I. It is designed to heat an eight-room house and can be connected with ordinary warm-air flues, or used as a space-heater or pipeless furnace. The fuel magazine needs to be filled only twice a day.

Research in domestic heating is continuing in these institutions and many more, and we may safely predict that in a few years the monster in the cellar will be man's servant, not his master.

## Fog Machine Aids Science

Scientists at the University of California have developed a fog machine that will produce any kind of fog they want for their experiments which may soon result in better fog lights and beacons. The scientists were unable to rely upon the elusive natural fog, so they built a machine that provides fogs of any type and density at the turn of a switch. The machine is a double-walled tank with windows for observation and photography. Warm or cold air is circulated through the jacket and fog results when cold or warm, moist air is pumped into the inner tank.

# NEW WAR SURPLUS BARGAINS

## MODEL 252 ARC WELDER 250 AMPS.

FOR ANY WELDING JOB, LIGHT OR HEAVY

Designed for Many Years of Trouble-Free Service! Handles Anything From Light Gauge Sheet Metal to 1/2" Plate.

This precision-engineered direct current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly, where and when you need it.



(ITEM No. 65)

The War Surplus generators for these Arc Welders were built by General Electric, Westinghouse, and Delco-Remy at a cost of over \$300.00. They are light in weight; have oversized lifetime grease-sealed ball bearings; air-cooled commutator; dial type rheostat for easy pin-point control; high-low range switch; reactor coil for even arc; handles 1/15" and 1/16" rods.

Runs welder at 2500 R.P.M. from drive pulley or power take-off of tractor, 7 1/2 H.P. electric motor or a 10 H.P. gas engine. Use one or two V-belts, or flat belt (on pulley). Continuous welding rating—200 amps; intermittent rating—250 amps. 0-40 volts.

**NOW AT A FRACTION OF ITS VALUE. Price includes double V or flat belt, pulley and instruction book. \$99.50**

Remember, Satisfaction is Guaranteed. ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp, and 5 lbs. of assorted welding rods. F.O.B. Chicago (ITEM #66) \$10.50

## HANNA AIR CYLINDER

**Brand New** Used for heavy duty industrial applications on shop air lines or with low pressure systems. With 100 lbs. of air pressure, will deliver 1900 lbs. pressure at the ram shaft. All steel construction. Adjustable cushions at both ends of cylinder. Shaft dia. 1 1/2". Foot mounting with clevis on ram shaft. 26 1/2" double-acting stroke; 5" bore, 40 1/2" overall length closed. 7" overall width. 89 1/2 lbs. net wt. **\$39.50**



F.O.B. Chicago

## G-I STAINLESS TANK

Use these tanks on compressors, for tie inflators, pulsation chambers, floats, buoys, hydraulic reservoirs, fluid and milk containers, fuel containers, etc. Tough, light, shatterproof. 450 lbs. P.S.I. Aviator's Breathing Oxygen bottles, type G-1. 2100 cu. in. (approx. 9 gallons) int. vol. 24"x12". 1/4" threaded openings at ea. end. Wt. 19 lbs. (ITEM #63) **\$4.95**



## BRAND NEW GEAR TYPE

### INSECTICIDE PUMP

All Manganese Bronze for spraying D.D.T., 2,4-D, Sulphur Compounds, Etc. Pressures up to 200 lbs. and 14 gallons per minute—at 1200 RPM. Will not rust, pit, foul or freeze up. Use rubber hose inlet, pipe or tubing outlet. Equipped with intake flange for easy use. Wt. 24 lbs. Dimen. 8" x 7" x 10". Standard 1" manganese bronze shaft with keyway. U.S. Gov't. Acquisition cost \$62.00. **NOW ONLY \$15.00**



## LOGAN HEAVY DUTY OIL Hydraulic Control Valve

**BRAND NEW** control valve with built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or a reversible hydraulic motor. Valve handle latches in neutral position. Made of rugged cast aluminum alloy. Open center unloads the pump in neutral position. Throttling control allows operator to regulate the speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes, 3/8" pipe thread connections. Overall dimen.: 12 1/2" H x 8 1/2" D x 8" W. Ship. Wt. 17 lbs. Gov't. Acquisition Cost over \$100.00. **\$21.95**



(ITEM #37) An Excellent Buy for F.O.B. Chicago

## Brand New GENERAL ELECTRIC 8" Sealed Beam

### SPOTLIGHTS

300 Watts, 110 Volts, A.C.-D.C.

Has countless uses for • Homes • Garages • Workshops • Driveways • Outdoor advertising • Displays • Beach lighting • Private air ports • Photography. Wherever you need flood-lighting! Bought by the U. S. Army for signal use. This is the greatest surplus bargain ever offered. Lens, reflector and electrode vacuum sealed in one dustproof, air tight unit. 300 Watts, 110 Volts. Weighs only 2 1/2 lbs. List price \$10.50. **\$2.75**

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(ITEM #8) 12 or more \$2.50 ea. postpaid



## A. C. LIGHT PLANT GENERATOR

Ideal for: Home Lighting, Hunting Lodges, Stand-by Electricity, Running all A.C. Electrical Appliances, including Fans, Motors, Electric Razors, Refrigerators, Incubators, etc. **110 VOLTS—60 CYCLE A. C.** 750 watts at 1800 R.P.M. using 1 1/2 H.P. gas engine. 1000 watts at 2400 R.P.M. using 2 1/2 H.P. gas engine. **Supplied with V-Belt Pulley Drive—0-150 Voltmeter with Regulator.** Protection for emergencies to operate oil burner, stoker, freezer, water pump and lights. These units, built to exacting Signal Corps specifications, are the answer to your lighting needs. Shipping weight 60 lbs. **\$59.50**



F.O.B. Chicago AN OUTSTANDING VALUE

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### AIR OR OIL

Use hydraulics on arbor presses, hydraulic presses, hay lifts, manure loaders, lift trucks—push or pull, tilt or turn, press or squeeze, open or close, lift or lower—and other hydraulic and industrial applications. Use with either air or oil . . . of finest workmanship.

**ITEM #33—Double action, 1 1/2" bore, 5" stroke, will lift 1760 lbs. in one second with Logan Pump. Wt. 3 lbs. A \$35.00 value. **\$8.95****

**ITEM #32—Double action, 1 1/2" bore, 9" stroke, will lift 1760 lbs. in one second with Logan Pump. Wt. 4 lbs. A \$45.00 value. **\$10.95****

**ITEM #16—Use these cylinders on farm trucks, bulldozers, hay lifts, manure loaders, etc. Double action, 1 1/2" bore, 27" stroke. (Will lift 1760 lbs. in 2 seconds with Logan Pump). Wt. 8 lbs. A \$55.00 hydraulic cylinder value. **\$12.95****

**ITEM #15—Double action, 3" bore, 8 1/2" stroke. All steel hydraulic cylinder, will lift up to 12,000 lbs. in 3 seconds with Logan Pump. Complete with fittings. Wt. 12 lbs. A \$78.00 value. **\$19.50****

**ITEM #17—Double action, 2 3/4" bore, 8" stroke. (Will lift 4400 lbs. in one second with Logan Pump). Will withstand 1500 P.S.I. against wall. Wt. 7 lbs. A \$65.00 value. **\$14.50****

**ITEM #6—Double action, 3" bore, 23" stroke, hydraulic cylinder will lift 7070 lbs. in 3 1/2 seconds using Logan Hydraulic Pump. Especially suited for farm and construction machinery. Clevis mounting for easy use. Wt. 22 lbs. \$145.00 value. F.O.B. Chicago **\$27.50****

**HI-PRESSURE FITTINGS for cylinders and valves at 35c ea. for 3/4" pipe and 50c ea. for 1/2" pipe**



## Hydraulic CONTROL VALVE

**ITEM #24—Four way control valve for use with double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders. Brand new. Ship. wt. 4 lbs. A \$38.00 value. **\$7.95****

**ITEM #26—Four-way control valve for use with two hydraulic double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Brand new. Ship. wt. 6 lbs. \$60.00 value. . . . . **\$10.95****

**ITEM #28—A two cylinder double action valve with a unique arrangement, allowing the operator to raise both cylinders simultaneously, to lower them simultaneously or to raise one and lower the other at any predetermined rate and speed. Brand New. Ship. wt. 8 lbs. **\$14.95****

A \$75.00 value. . . . . **\$14.95**



## CENTRIFUGAL BELT PUMP DRIVEN

Ready for use on any Liquid Pumping Need. USE it for DRAINING BASEMENTS • HOME WATER SYSTEMS • IRRIGATION • STOCK WATERING • FIRE PROTECTION DRAINING PONDS, TANKS, etc. **MOVE LARGE VOLUME QUICKLY**

When operated at 1750 RPM, will pump 42 gallons per minute on a 23 foot head; at 3600 RPM on 52 foot head will pump 58 gallons per minute. May be run with electric motor, gas engine or power take-off on tractor.

**COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP** Pump has cast aluminum housing—accurately machined bronze impeller vanes. Complete with mounting bracket and 3 1/2" V belt pulley. Shaft rotates on sealed ball bearings with grease gun fitting. Has 1 1/2" threaded intake flange, two 1/2" outlets. Use one or both, as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines.

**GREATEST PUMP VALUE IN YEARS** Shipping weight 23 lbs. You can't beat this value at anywhere near this price. Satisfaction guaranteed.

**INDUSTRIAL PUMPING.** Com. (ITEM # 64) plate with Pulley and Mounting Bracket—Ready for Use. **\$29.75**

Original Cost Approx. \$147.00. F.O.B. Chicago



## LOGAN 4-Way Foot Operated AIR VALVE

**MODEL 6520**

**BRAND NEW.** For double acting pneumatic devices. Fine for operating air vices, presses, air machinery of many types. Heavy cast construction. Threaded for 1 1/2" pipe. Dimensions of valve body: 8 1/2" L x 5 3/4" W x 7 1/2" H. Net Wt. 28 lbs. Gov't. acquisition cost \$42.00. **\$15.00**

**AN OUTSTANDING BUY AT. . . . . F.O.B. Chicago (ITEM #59)**



## LOGAN HEAVY DUTY OIL HYDRAULIC PUMP

**BRAND NEW . . .** for operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 H.P. Has 3/4" pipe thread inlet, 3/4" pipe thread outlet, 3/4" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/2" H x 5 1/2" W. A \$105.00 value. **\$22.50**

FOR ONLY . . . . . (ITEM #29) F.O.B. Chicago



## ROPER LUBE PUMP

**MODEL C-75 — BRAND NEW**

This reversible pump is especially designed for delivering at least 50 gallons per minute of lubricating oil, Diesel fuel, molasses, tar, pitch, lacquer, and similar fluids at 80 P.S.I. pressure at 400 R.P.M.; 1 3/4" keyed shaft. Select any two of the four flanges for inlet and outlet. **\$377.00**



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Small parts are thoroughly washed and dried in an automatic laundry that spins them in three solutions and finally air-dries them in a chamber in the base of the machine. The parts to be cleaned are placed in a wire basket which is snapped on the motor shaft. A push button starts the 12-minute cleaning cycle. Automatically, the parts are agitated in one wash solution and two rinse solutions and then spun dry.

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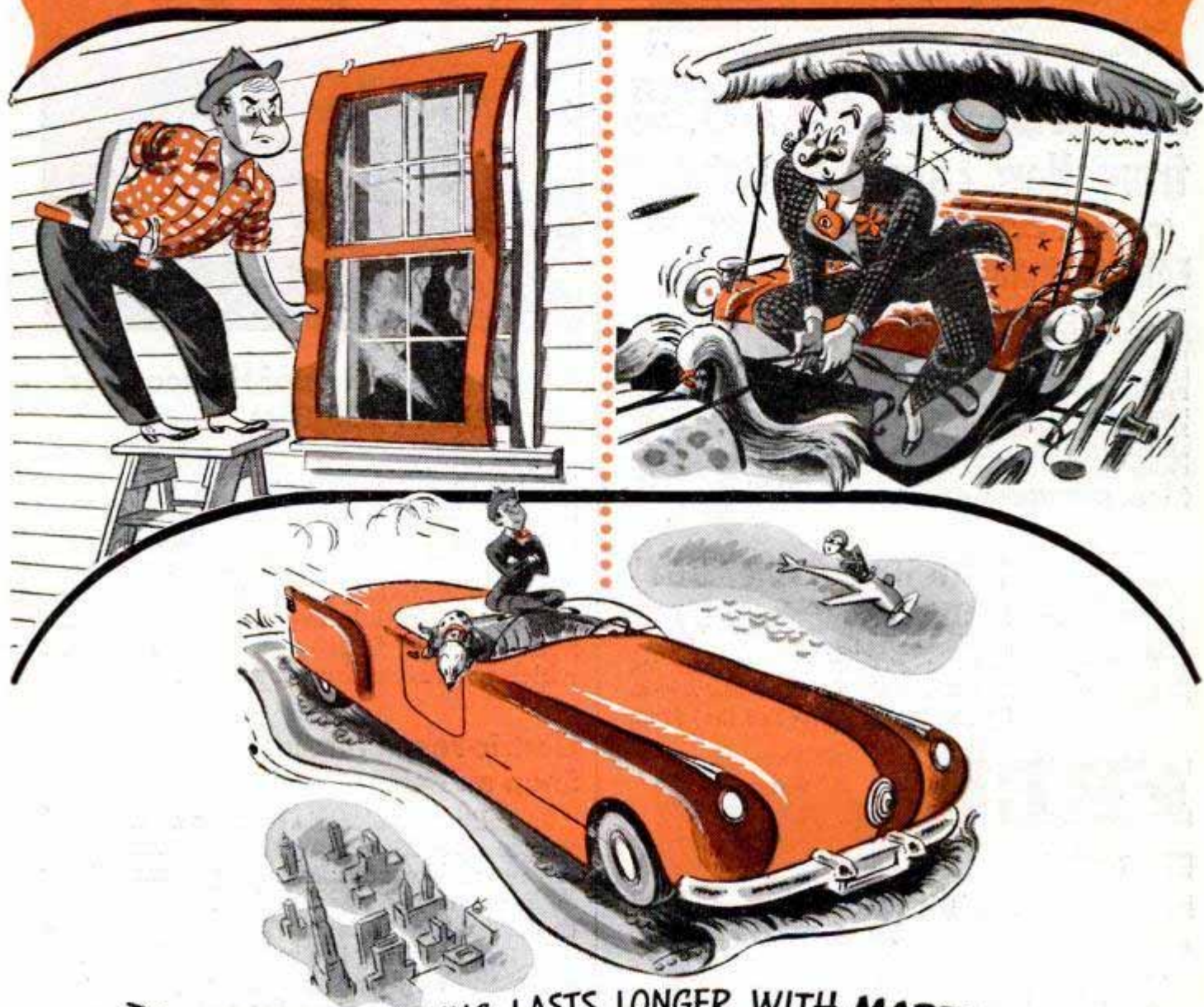
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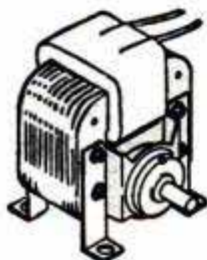
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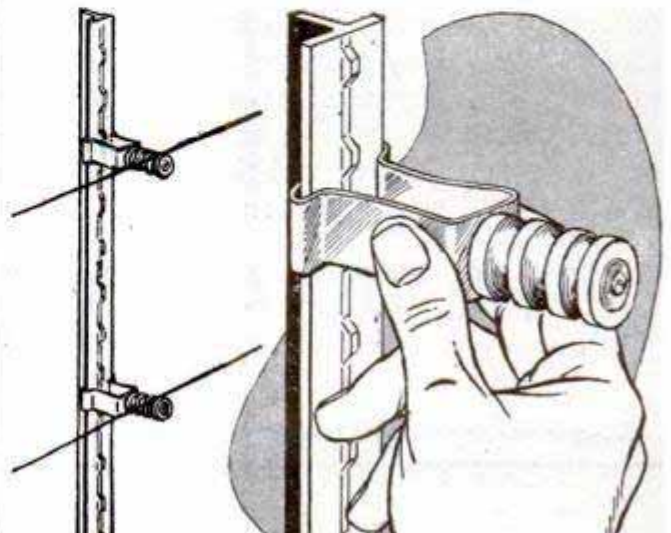


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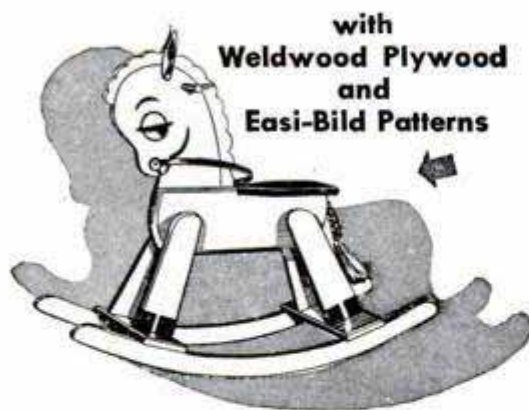
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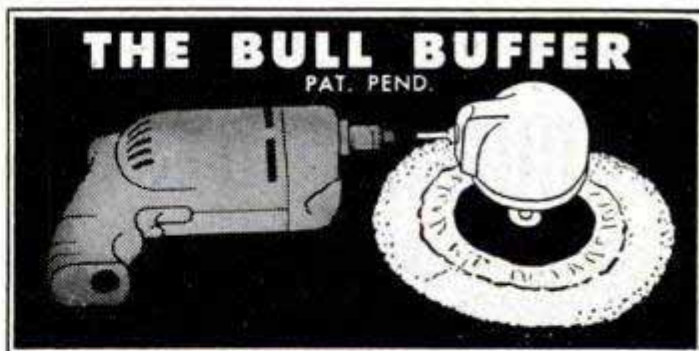
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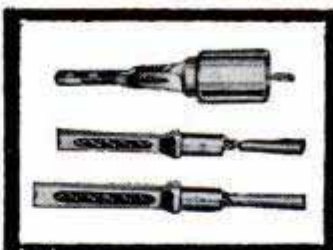
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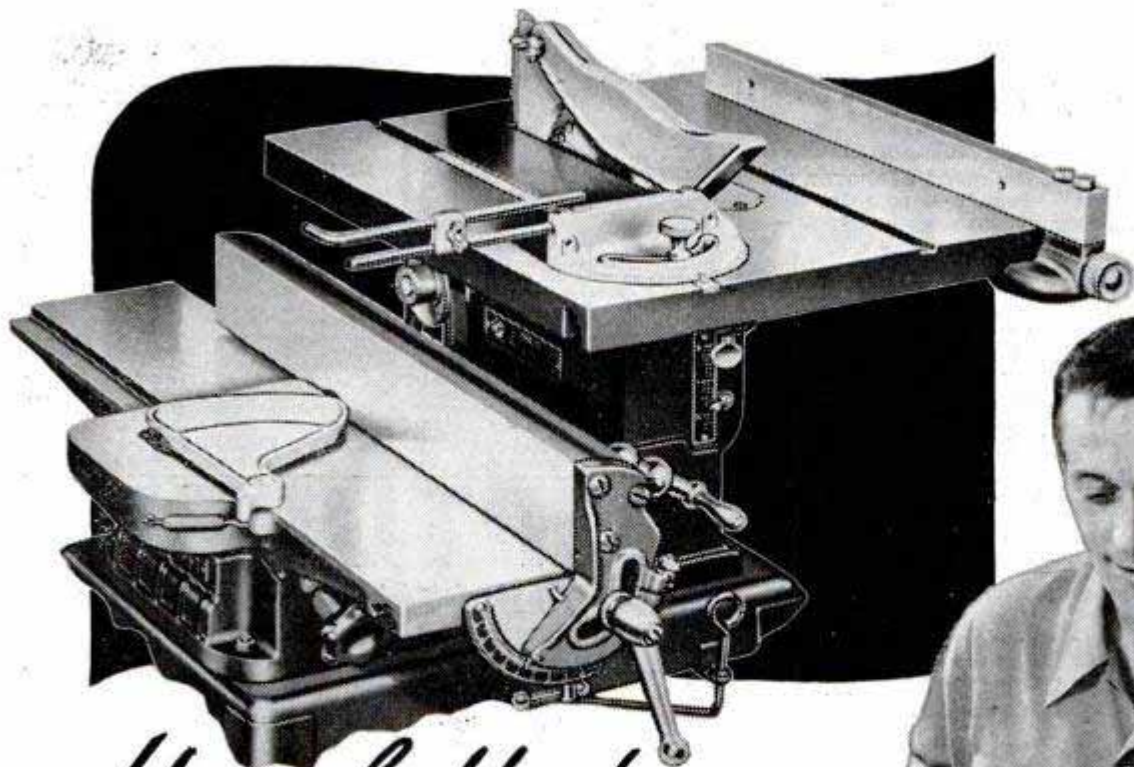


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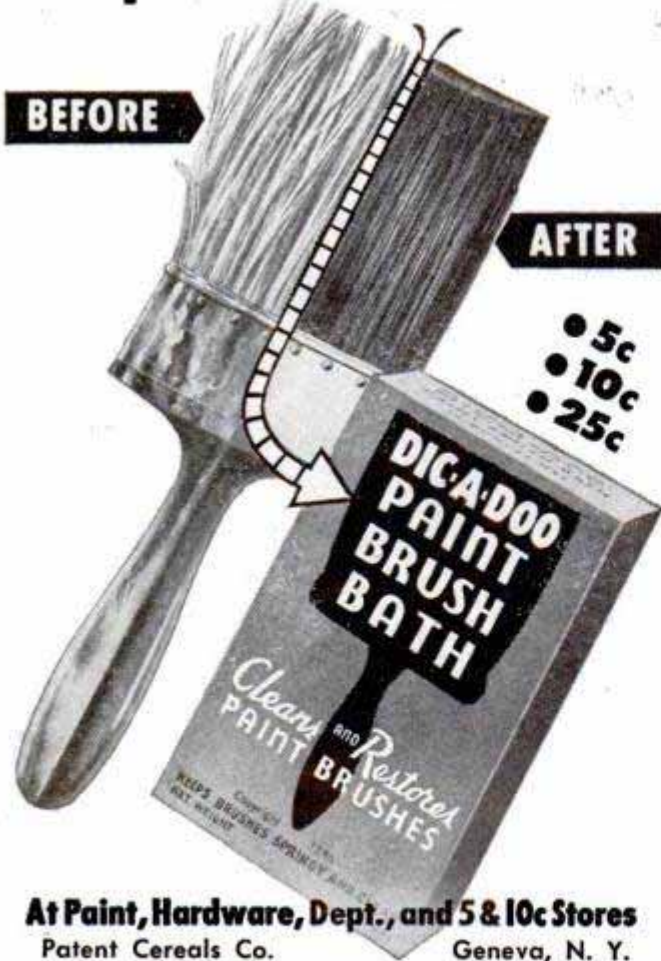
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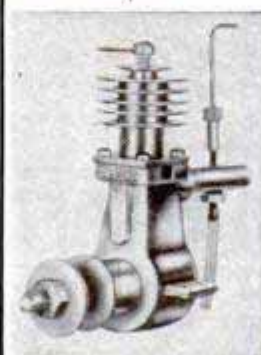


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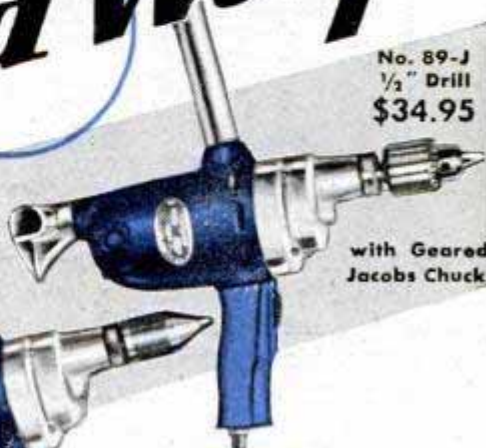
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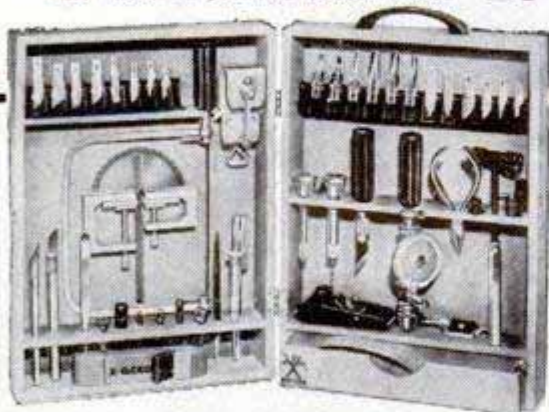


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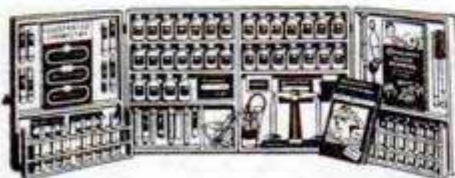
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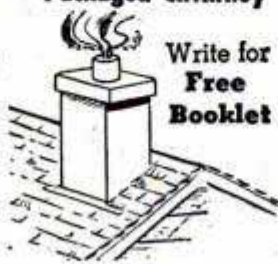
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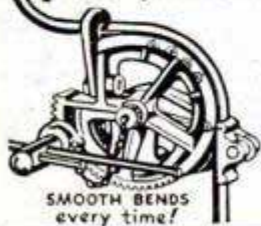
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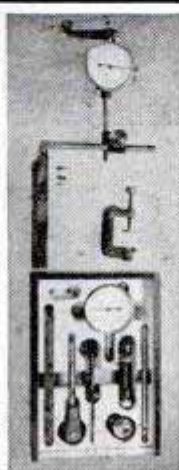
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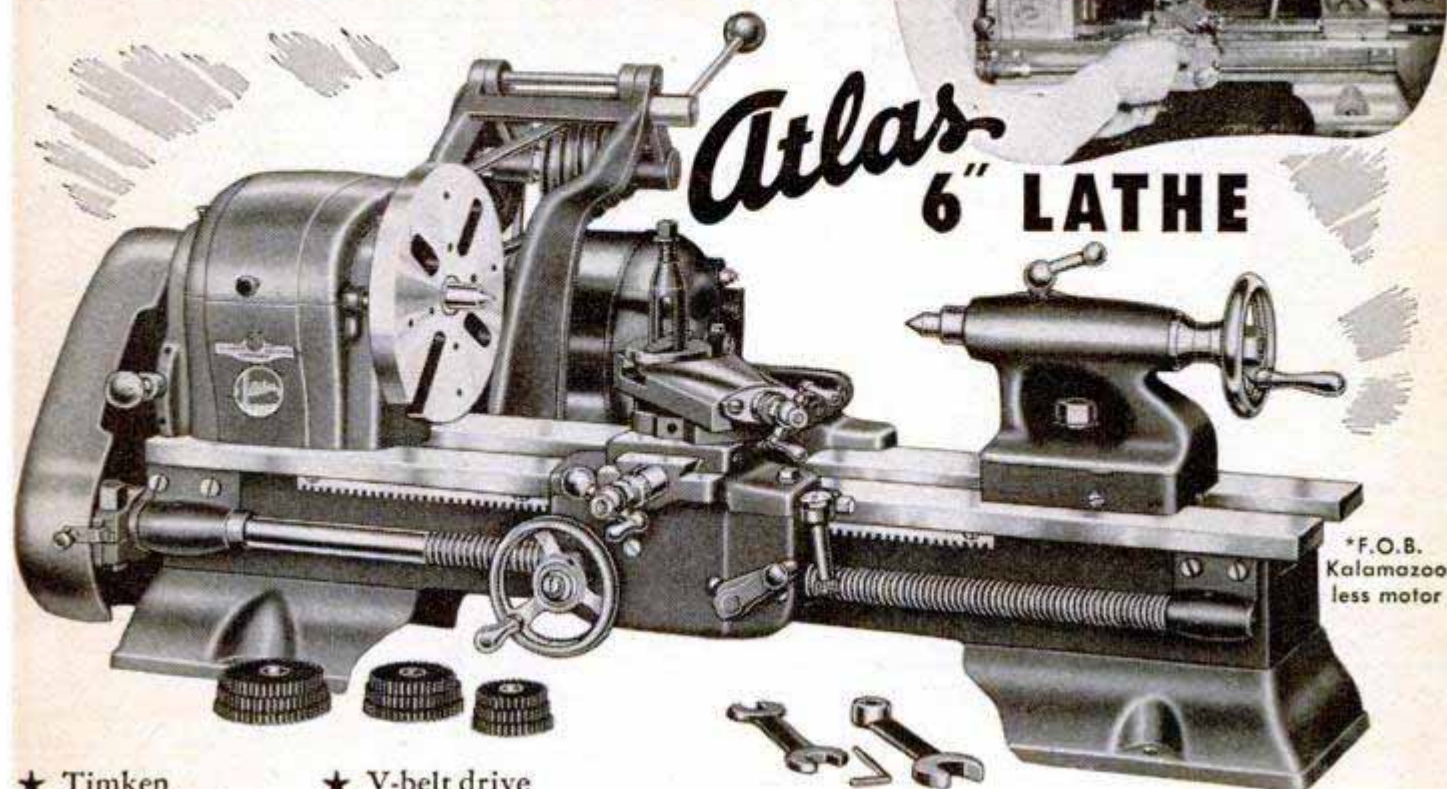
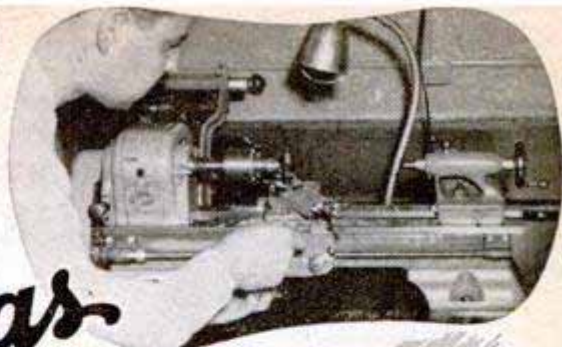


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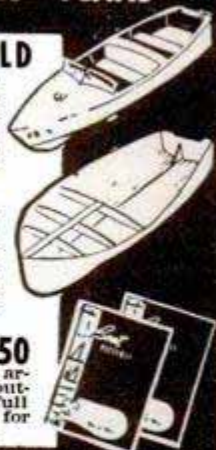
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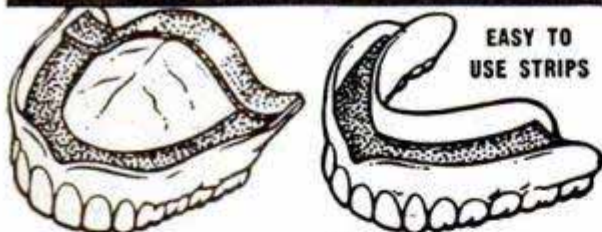
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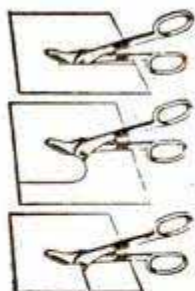
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10 ft. PRE-BILT ROW BOAT **\$59.50**  
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**STEEL TABLE SAWS** 10" high, 1 1/2" thick table 13 1/2" x 27". With 7" combination blade, 6" grinding wheel, double end ball bearing arbor 1/2" shaft & steady rest for grinding. Makes 2 1/2" cut. Will take a 10" blade. All holes drilled, saw is ready to assemble. Stock #556. Your price... **\$9.95**

**TABLE SAW** Steel table top 3/4" thick with solid hardwood veneer center, 19 1/2" x 22" x 10" high. 7" Comb. blade, 6" grinding wheel, double end ball bearing 1/2" shaft arbor & steady rest for grinding are included. All holes drilled, ready to assemble. Will take 10" blade. Stock #555. **\$11.95**

**BUILD YOUR OWN SAW.** Saw table top only with legs, hardware, grooved for 10" blade. 22" x 35" **\$6.95**

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**1/2" ELECTRIC DRILL** Mfg. & advertised at nationally known concern, it's the buy of the year and includes all the features you look for. Has motor power Jacobs 33" geared chuck, key gears, and all features of drills priced as high as \$18.00. SEPCOS Universal motor AC-DC, 115 V. HD switch. Ball, roller, oilite bearing. Helical cut gears. Aluminum alloy frame. Stock #565. Your price **\$29.95**

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**3 WIRE #10 super cable.** Stock #351. 65' **\$13.00**  
with lugs. Value \$26.00. Our price...  
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**YOUR PRICE**  
100 ft. .... \$24.00  
250 ft. .... \$55.00  
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2 conductor rubber cable #4-stranded-75 ft. length with connectors. Stock #543. List price \$177.00 **\$80.00**

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50 ft. .... \$30.00  
100 ft. .... \$55.00  
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225 ft. lengths 3 wire #10 rubber cable, two male connectors. Value \$109.50. Stock #554. **\$35.00**

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3 phase motors. All models 1/2 HP to 1 1/2 HP. 220 volts. Motors totally enclosed-ball bearing. Stock #541. 40% off list prices.

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All bronze corrosion resistant gear pump. Lifts water 25'. Delivers 1020 gal. per hr. at 1200 RPM. Develops 110 lbs. pressure or 250' head. Self locking packing nuts, drain cock, reversible head. Will pump brine, salt water, oil, vinegar, gasoline, etc. Dimensions: 10" L x 7" H x 5 1/2" W. Base holes 1 3/8" x 3/8". Shaft 1 1/8". 1" x 1" inlet & outlet. Wt. 24 lbs. Mfg. by Sherwood Brass Works. All pumps belt driven. All bronze gear pump with 8" V pulley. PUMP ONLY. **\$24.00**

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Same pump with Briggs & Stratton gas engine. Stock #550.  
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Half ton wagon with plate aluminum body 24" x 42", 3/8" steel axle. Stock #332. Write for details.

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New 1000 WATT, 110 volt, 60 cycle AC plant with Briggs & Stratton directly coupled to a Leland generator. Stock #351 **\$189.50**

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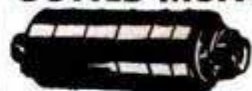
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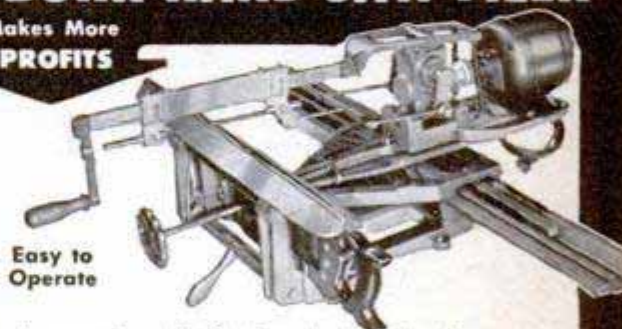
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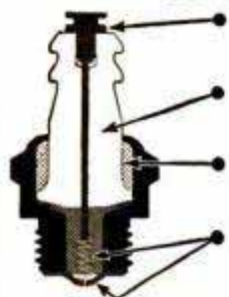
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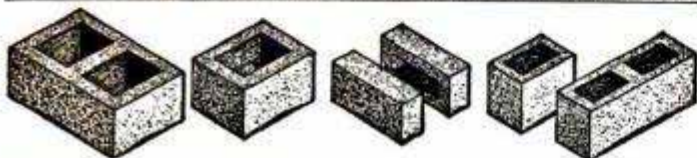
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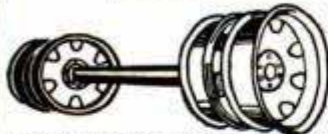
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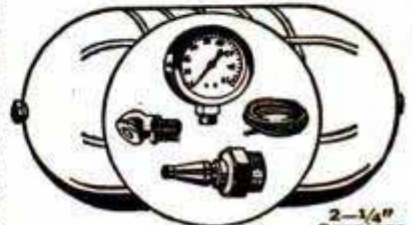
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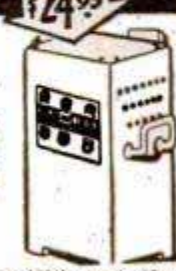
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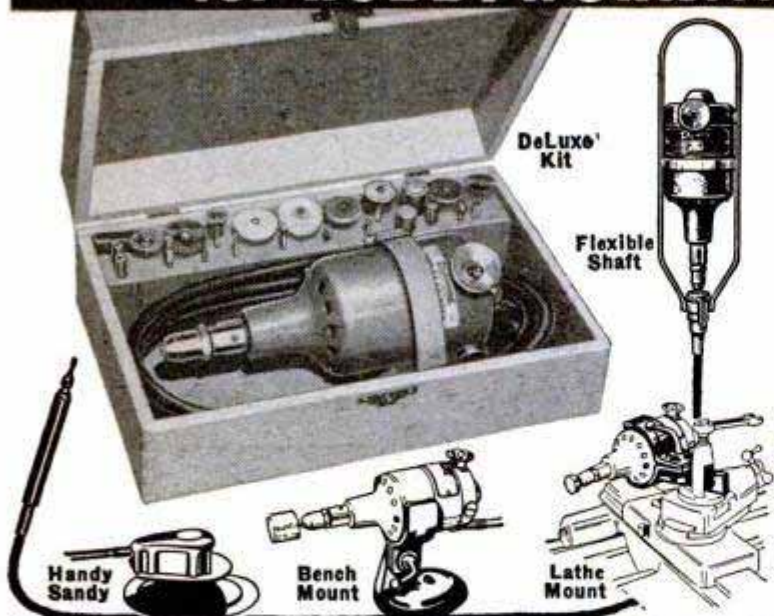
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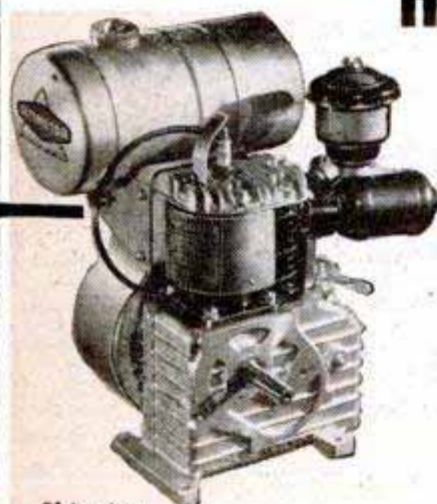
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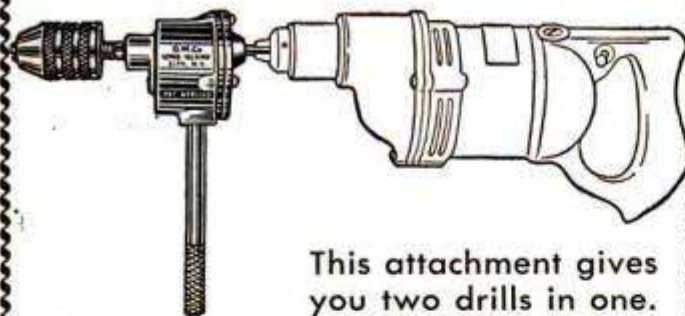
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**\$12.** POST PAID

Complete with 3 Blades, 3 Project Patterns and 2 Pieces of Wood

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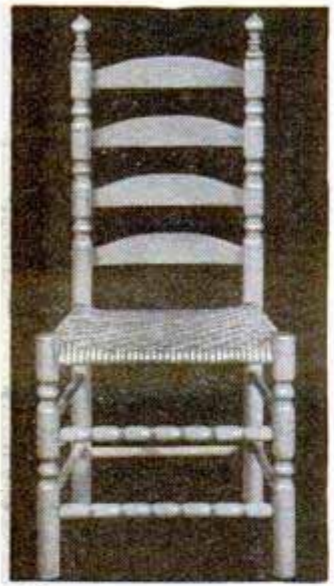
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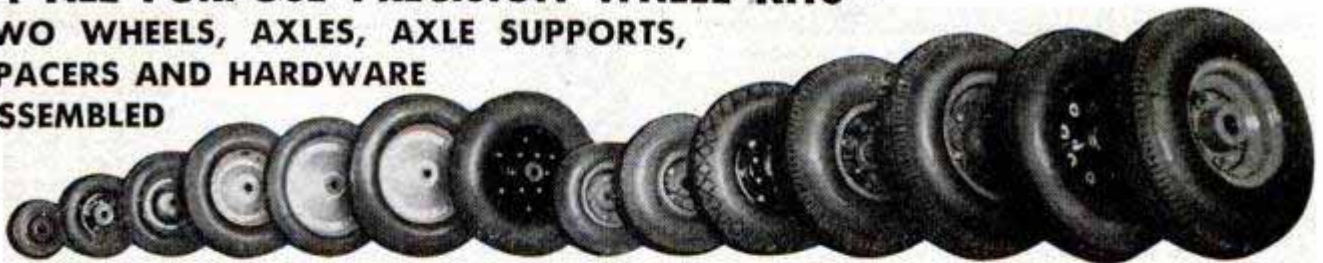
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E	10 x 1.75	Cushion	Ball	1/2 x 20	250	7.10
F	12 x 2.50	Cushion	Ball	5/8 x 30	450	12.20
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H	8 x 3.00	Pneumatic	Ball	5/8 x 30	500	17.70
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J	12 x 4.00	Pneumatic	Ball	3/4 x 30	700	26.90
K	14 x 4.50	Pneumatic	Ball	3/4 x 36	700	26.60
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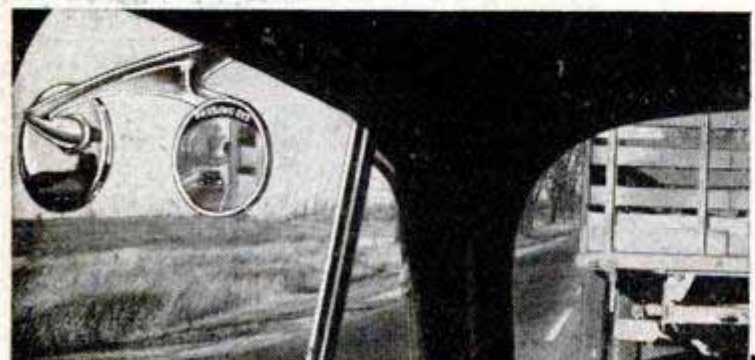


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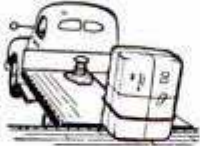
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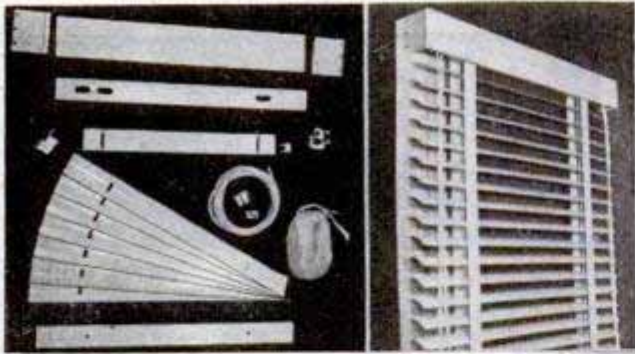
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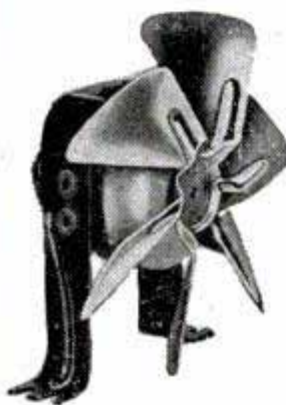


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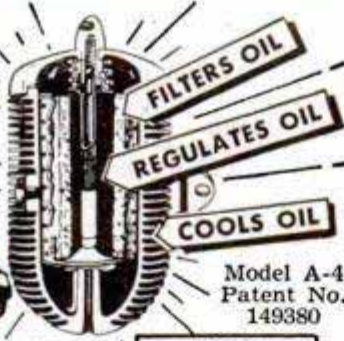
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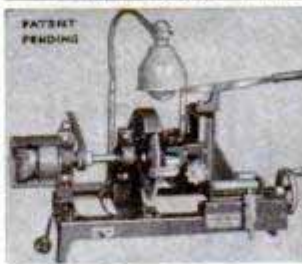


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Car owners who are wasting money and not getting proper gas mileage due to over-rich mixtures will be pleased to learn how to save gasoline by VACU-MATING over-rich mixtures. VACU-MATIC fits all cars, trucks and tractors. It is automatic and operates on the supercharge principle. Easily installed in a few minutes.

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**Work on curved**  
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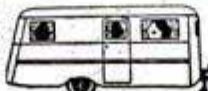
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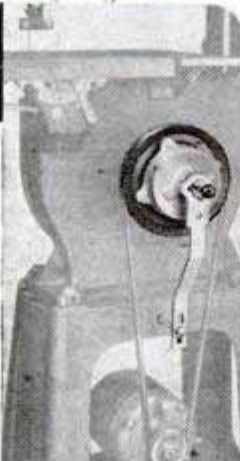


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Brand new surplus; 0-2000 p.s.i.; Black plastic case with luminous numerals. Measures 3/4 in. in diameter, AAF type. AN5771-4. Ea. only **\$1.95**

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5" x 7" x 11" 22 ga. Steel  
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Sizes 1/16" to 1/4"  
Drill rack provides holes for 8 intermediate 32nd sizes.  
For Iron, Steel, Wood, Plastic, etc.  
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Compartment designed to hold all popular priced 1/4" electric drills.

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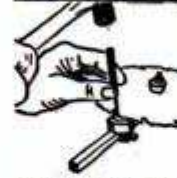
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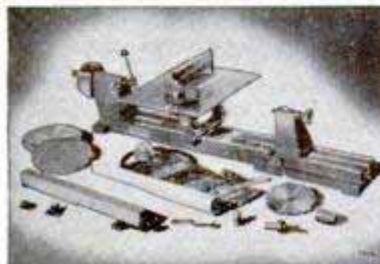
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**Project on Table, Wall or Ceiling—No Screen Necessary** Project almost anywhere necessary—any blank wall or white paper will do. Wonderful for classroom, clubs and salesmen. Complete except for lamp bulb; use any household 60 to 100 watt lamp bulb. Steel construction, handsomely enameled in brilliant colors. Easy carrying: 7 1/2-in. high, 10-in. long. Optically ground and polished lenses; slide focusing, so you can PROJECT FROM VARIOUS DISTANCES to make picture large or small. Takes pictures up to 3 1/2x4-inches. With illustrated instruction booklet, views, price list for additional supplies, etc. (3 for \$10.50).

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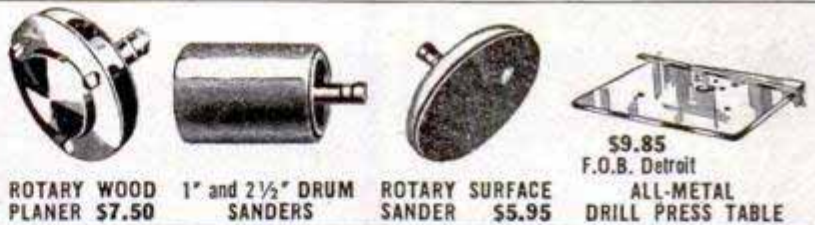
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MODEL #60—Originally designed for heavy industrial use, now priced for home workshop. Can be attached directly in chuck of your drill press. Exclusive pilot bearing (see illustration) eliminates side thrust, chatter and vibration—assures smooth cutting action. Blades can't come out—set screws hold them securely. Complete, with YOUR CHOICE OF ANY 6 PAIR DOUBLE-GROUND BLADES SHOWN BELOW, only \$12.95.

MODEL #50—Same as Model #60 but without exclusive pilot bearing. Designed for intermittent shaping; over 100 different shapes can be cut. Complete, with ANY 6 BLADES OF YOUR CHOICE SHOWN BELOW, only \$8.95. All Aladdin tools are guaranteed. Postage prepaid with all cash orders. C. O. D. plus postage. GET YOUR ORDER IN TODAY.

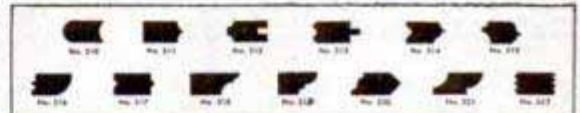


For Your Circle Saw  
Complete WITH ANY 6 PAIR OF READY-GROUND BLADES SHOWN BELOW, only \$14.95.

MODEL SA-10—Heavy-duty, industrial-type shaper of solid steel, now priced in home workshop range. Absolutely safe—blades locked in position with screws all the way through. In ordering, state diameter of shaft.

## ALADDIN WOODSHAPING BLADES

Specify by number the blades you want. Additional blades \$1.50 each, \$3.00 per set.



ALADDIN A. MFG. CO., INC.

3121 Main Street Kansas City, Missouri  
Dealers Write Today

# "Wellworth" Sensational Offer! Reg. \$60.50 WESTINGHOUSE AIR COMPRESSOR

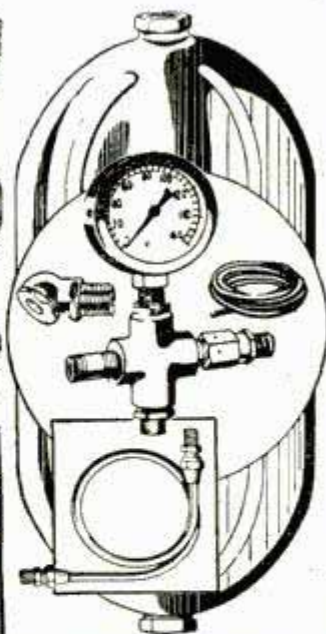
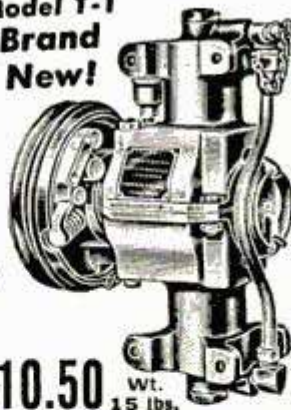
## 2-CYLINDER PISTON TYPE

Operates with 1/2 H.P. Motor or equivalent gas engine.

Complete outfit consisting of compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. Complete outfit of 7 items..... **ONLY COMPRESSOR SEPARATELY..... \$21.50**

**\$29.95**  
SHIPPING WT. 40 LBS.

Model T-1  
Brand  
New!



Equipment less compressor.... **\$10.50** Wt. 15 lbs.

### THE COMPRESSOR

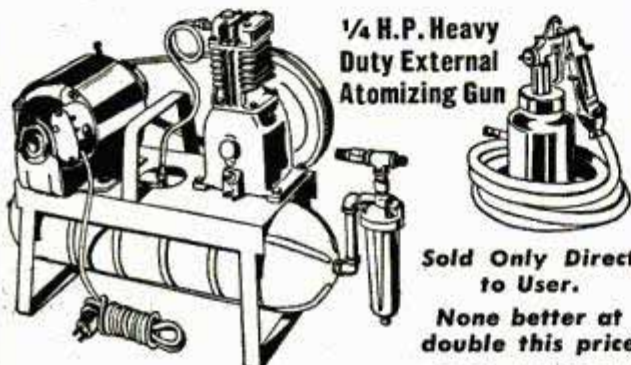
Piston Type, 2-cylinder, 2 inch bore, 1 1/2" Stroke Ball Bearing. 3.27 C.F.M. at 600 R.P.M. Capacity up to 6.54 C.F.M. Suggested operating pressure 75 P.S.I. DIMENSIONS: 9" wide, 11 1/8" high, 6 3/8" deep. Wt. 26 lbs.

### TANK and ACCESSORIES

6" x 24" stainless steel tank suitable for 150 lb. pressure. Two 1/4" openings. Air gauge, pop valve, air chuck, 20 ft. hose, Copper tubing and fittings as shown. Wt. 15 lbs.

**THE BEST BUYS OF THE YEAR  
ARE ON THIS PAGE**

## PORTABLE SPRAY OUTFIT



1/4 H.P. Heavy  
Duty External  
Atomizing Gun

Sold Only Direct  
to User.

None better at  
double this price

Paint Sprayer mounted on 6 x 24 inch tank, 1/4 H.P. 110 V. 60 cy. Heavy duty motor with overload relay, 19 ft. cord and plug, V Belt drive. Piston type Compressor with 2 Compression rings, 1 oil ring, 2 inch Bore, 1 1/2 inch stroke, displacement 2.86 C.F.M. at 60 lbs. pressure, Safety Valve. Gun external atomizing. Flat and round spray, quart cup; maintains 30 to 35 lbs. working pressure. Oil and water extractor, 1 air gauge, 20 ft. heavy duty 2-braid air hose with leak proof fittings, complete with carrying handle. Net weight 54 lbs., ship. wt. 60 lbs.....

**\$57.50**

**OUTFIT LESS MOTOR. Wt. 30 lbs.....\$47.50**  
**COMPRESSOR ONLY. Wt. 14 lbs..... 17.50**  
**SPRAY GUN AND 20 FT. HOSE. Wt. 7 lbs... 12.95**

## 140 CFM "WELLWORTH" BLOWER



Single-inlet blower that gives top performance on heating, ventilating, exhausting, cooling, drying and similar applications. 5 1/8 x 4" mounting flange with 2 1/2" square discharge. 3 1/2" dia. blower wheel powered by direct-connected 1/15 H.P., 110V., 60C., A.C. motor with conduit box and 20' leads. 7 1/2" wide less flange by 7 1/4" H. x 6 3/4" D. Suited for hundreds of new and replacement uses. Shpg. wt. 6 lbs.....

**\$16.50**

## PNEUMATIC AIR TOOLS

USED, GUARANTEED LIKE NEW.



**CHICAGO PNEUMATIC RIVETER & CHIPPING HAMMER**

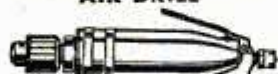
CP4X Pistol grip handle. Takes up to 3/16" rivet. Weight 6 lbs. List price \$73.00.

**SPECIAL PRICE..... \$14.50**

Same as above, brand new..... **\$22.50**

Size CP3. Takes 5/32" Rivet... **\$10.95**

Chicago Pneumatic Lever Type  
**AIR DRILL**



With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$55.00. Only..... **\$17.50**



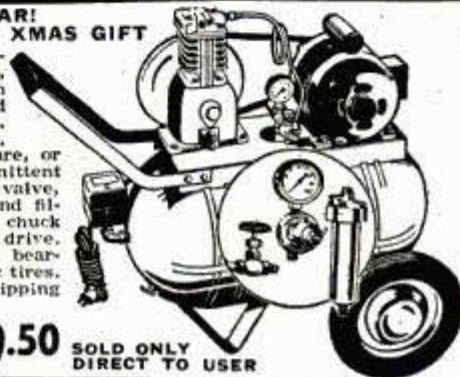
**Ingersoll Rand  
AIR DRILL**

With 1/4" Jacob Chuck. Wt. 2 lbs. List price \$53.00. Only..... **\$17.50**

## AUTOMATIC COMPRESSOR UNIT

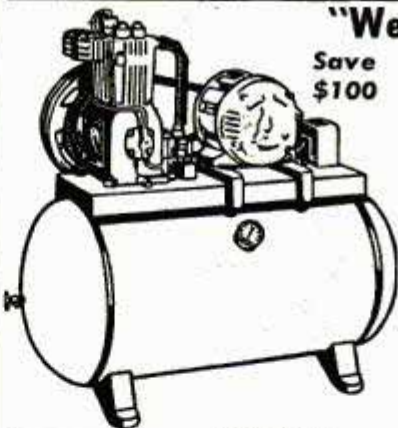
**BEST BUY OF THE YEAR!  
A PRACTICAL XMAS GIFT**

1/2 H.P. heavy duty capacitor motor, AC 110/220 volt, 60 cycle, 2x1 3/4 inch piston type compressor, splash feed lubrication, 12x24 inch tank, automatic pressure switch, CFM 2.8 at 100 lb. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V belt drive. Mounted on 2 wheels, ball bearing, with 2"x10" pneumatic tires. Portable, with handle. Shipping wt. 90 lbs.



**SPECIAL PRICE..... \$89.50**

**SOLD ONLY DIRECT TO USER**



Save  
**\$100**

## "Wellworth" TWO-STAGE COMPRESSOR UNIT

Tank mounted unit 20x48 inches, 60 gal., A.S.M.E. 400 lbs. test. Compressor: Timken Bearing, size 3 1/2x2 1/2 with unloader for continuous pressure service; 10 c.f.m. at 200 lbs. pressure. Unloader set at 150 to 165 lbs. Compressor idles when 165 lbs. is reached, starts pumping again when pressure is down to 150 lbs. Wisconsin air cooled gasoline engine. 3 1/2 H.P. at 1800 r.p.m. 4.1 H.P. at 2400 r.p.m. 2 V belt drive, safety valve, drain cock, probe valve, pressure gauge, 20 ft. heavy duty air hose, tire chuck.

Model AK: Same unit furnished with 2 H.P. 220/440 V. 3 phase 60 cycle a.c. motor, with automatic pressure switch - same price. Unit complete as shown. All Brand New Equipment. Regular \$400.00 value..... **\$298.00**

**SOLD ONLY DIRECT TO USER**



**AUTOMATIC PRESSURE SWITCH with UNLOADER**

Double pole, with 2 way release valve. Set at 125 to 150 lbs. pressure. Wt. 4 lbs. Only..... **\$10.25**

Same without unloader..... **\$7.50** Switch-20 to 40 lb. adjustable unloader..... **\$5.50** to 80 lbs. For air or water..... **\$5.50**

## "Wellworth" 1/4" REDUCING VALVE & GAUGE



Oil resistant, pressure 0-to-200 lb. Reduced pressure 0-to-75 lb.; 3 outlets 1/4". **\$5.75** Wt. 2 lbs..

## 6 FT. STOW FLEXIBLE SHAFT



Heavy Duty, 3/8" Core. Best piano wire. Ball bearing handle and arbor, rubber covered housing; for 1/2" motor shaft; for 1/2" bore wheels. Operates on 1/4 H.P. Motor at 1725 or 3450 R.P.M. \$29.00 Value, **\$14.50**. Wt. 8 lbs.

Prices f.o.b. Chicago. Immediate delivery. All items sold on money back guarantee. Send check or money order today. Catalog FREE.

# WELLWORTH TRADING CO.

1831 S. STATE ST. DEPT. D-11 CHICAGO 16, ILL.

**GADGETEERS! HERE ARE THOSE TERRIFIC MIX VALUES**



**GADGET MIX** Especially prepared for the HOBBYIST. Rivets, Spacers, Bolts, Screws, Gears, Etc. A Gold Mine. #106. 5 lbs. . . . . \$1.19



**BEARING MIX** #170A A PALLEY SPECIAL!! Approx. 20 Needle, Ball & Roller Bearings, New & Used - Sizes 1/2" to 4". Some of these cost Gov't \$10 apiece. Never such a value! \$1.59 5 lbs. . . ONLY



**HINGE MIX** #170H. 12 pairs of strap & butt hinges. Sizes 1" x 1" to 1 1/2" x 4" in length to 8" strap. A \$3.00 VALUE for ONLY . . . . . \$1.09



**ABRASIVE AND GRINDING WHEEL MIX** 50 Pieces including honing stone, pencil rolls, wheels, Abrasive sheets, etc. A sharp value. #170AG 99c



**SPRING MIX** #206 Torsion, Compression & Tension Springs, asstd. sizes. A treasure trove for emergencies. 2 lbs. for ONLY . . . 89c

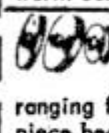
**COMBO-MIX** Comb. of all above in one pkg. Special deal. CB-2 \$5.59



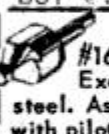
**SWITCH MIX** #SM-1 12 assorted types of Aircraft Switches, including double & single throws, double & single poles & multiples. Voltage ratings from 5 to 20 amps, 125 Volts A.C., 35 amps, 24 Volts D.C. 1001 Uses . . . \$2.95



**FILE MIX** Ten Assorted Files of 6", 8", 10", 12", includes 3 Vixens, half rounds, bastards, mills, etc. in seconds and used but in good condition. 1 Vixen alone worth our price for entire mix. #F-1 99c



**PULLEY MIX** #PM-1 You'll want this one around. 10 micarta and metal pulleys ranging from 1" to 5" with ball and one piece bearings. These are aircraft pulleys, the best made, with 100's of uses. A WONDERFUL BUY @ . . . . . \$2.95



**COUNTERSINK MIX** #168 - Countersink Assortment. Excellent condition. High speed steel. Assortment of ten 100° and 110° with pilot sizes ranging from 3/32" to 3/16". . . #CM-1 \$2.69



**15" MONKEY WRENCH** Adjustable 4" Jaw opening Drop forge Auto type. Cad. Plated .89c Black 79c

**PALLEY SUPPLY COMPANY**  
6321 SAN FERNANDO RD.

DEPT. P.M. 11 GLENDALE 1, CALIF

# SAVE UP TO 85% IN WAR SURPLUS



**WHEELS** For Wagons, Dollys, Handtrucks, Wheelbarrows, etc. 10" dia., with 7/16" center hole. (can be drilled out to take 5/8" axle) Wheel is 1/8" steel with 10 x 1.75 heavy duty, semi-pneumatic cushioned rubber tire. . . . . EA. \$1.75

**PNEUMATIC AND AIR TOOLS** 10,000 in various popular makes, sizes, types, Cleco, Aro, Ingersoll Rand, Chicago, Pneumatic, Buckeye, etc.

**RIVET GUNS** Pistol & Gooseneck Type



101 Uses, Chipping, Riveting, Hammering. Breaking cement. Auto body work. Chicago Pneumatic, Cleco, Ingersoll-Rand Makes, E3, E2, 3X, 2X, 0Y. \$55 VALUE \$8.95 #180 Gooseneck \$80 Value \$15.95 #186 Squeezer PNEUMATIC ALLIGATOR SQUEEZER

## PALLEY NOVEMBER BARGAINS



**HYDRAULIC JACKS** Heavy duty steel For Truck or Auto Jack is Complete with Handle. 5 Ton. . . J-1 \$9.50 Hyd. Jack - Same as above - 3 Ton. . . 7.95



**TWO HEAT SOLDERING IRON** Has Two Operating Heats!! Just push the button & select 150 Watt or 300 Watt Heat. Complete with tip & bench holder. Ideal for light or heavy work. Operates on 110 V. AC. . . . . \$3.95



**OXYGEN & ACETYLENE REGULATORS**  
**OXYGEN REGULATOR** - - Bottle Press. Gauge - 0-3000 PSI. Regulating Press. Gauge - 0-400 PSI  
**ACETYLENE REGULATOR** - Bottle Press. Gauge - 0-500 PSI. Regulating Pressure Gauge - 0-50 PSI.  
AIRCO & Other Popular Makes to fit ALL Standard Bottles - - ALL NEW!! A Real Buy at . . . . . \$12.95 or Both for . . . . . \$25.00



**No. 100 WINCH HOIST** Thousands of Satisfied Users!! Capacity 2500 lbs. with 24 to 1 ratio. Controlled Bronze Worm Gear. Has 19 ft. of 1/4" alloy steel cable with hook and two-speed handle. Ideal for Boats, Factories, Shops, Garages, Tow Trucks, etc. A Real Holiday Special. . \$15.99



**NEW PRESSURE TANKS** Stainless steel - Shatterproof. Rustless. 10,000 available in 6 different sizes. 1001 Uses.

G-1... 1 1/2" x 24 inches - 2100 Cu. In. capacity 29 Cu. Ft. . . . . \$4.75  
D-2... 6 1/2" x 24 in. 500 Cu. In. capacity 7 Cu. Ft. Corrosion resistant steel. . . . . 2.49  
D-2... Stainless Steel . . . . . 3.49  
F-2... 6 x 45 in. 1000 Cu. In. capacity 14 Cu. Ft. . . . . 3.95  
A-4... 5 x 8 in. - 104 Cu. In. capacity . . . . . 1.35  
Ideal for painting, cooking, spraying, ocean buoys, underwater fishing, or diving.

### PIANO HINGE

Overall Width Length Price Ea.  
1 1/4" (5/8" side) 72" alum. \$1.00  
1 1/2" (3/4" side) 53" cad. steel \$0.75

SASH BRUSH - Handy for cleaning parts in home & Mach. shop. 27c

### REAMER MIX

168 - Reamer Assortment: Special Taper line finish Reamers - High Speed Steel. Slightly used but in excellent condition. Ten assorted sizes ranging from .168 x .165 and .244 x .215 to .425 x .385 and .432 x .403. One alone worth our selling price of ten. For set of ten Reamers. . . . . \$4.49

THE LARGEST FIRM OF ITS TYPE IN THE WORLD

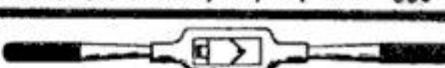
**AIR DRILLS OR MOTOR SPECIAL** ARO PISTOL \$15.00 with 1/4" Jacobs Chuck

**THOR #210R Model 4526 2300 RPM REVERSIBLE AIR DRILL** Excellent for Tapping. \$19.95

**\$12.50 PNEUMATIC ANGLE DRILL** each With Terry Adapter Send for Catalog and List of Other Sizes, Types of Pneumatic Tools.

### NAVY Sealed Beam LAMP

US Navy Portable Pistol Grip, Sealed Beam, Search, Spot or Emergency Lite. 12 volt. Light weight. Ideal for Auto, Boat, Trailer, Farm, etc. Cost Gov't \$35. OUR PRICE \$2.95 Set of 3 extra filters, Red, Grn, Amber . 99c



**ADJUSTABLE TAP WRENCHES** Jaws are made of tool steel, hardened & tempered. Won't break or get out of line.  
#7 Threadwell Cap. 1/4" to 1 1/8" Length 19" @ . . . . . \$2.49  
#8 Vermont Cap. 3/4" to 1 5/8" Length 40" @ . . . . . \$3.49  
#24 Greenfield Cap. 1 3/4" to 4" Length 72" @ . . . . . \$6.49

### AIRCRAFT CABLE

Alloyed steel, rust resistant. 3/16" ea. 18 ft. long, with turnbuckle ends. 99c ea. Preformed 7 x 19 strand - on reels In any length . . . . .  
1/16" . . . . . 3¢ ft. 1/4" . . . . . 8¢ ft.  
3/32" . . . . . 4¢ ft. 9/32" . . . . . 9¢ ft.  
1/8" . . . . . 4 1/2¢ ft. 3/8" . . . . . 12¢ ft.  
5/32" . . . . . 5¢ ft. 1/2" . . . . . 15¢ ft.  
3/16" . . . . . 6¢ ft. 1/4" Bronze 10¢ ft.

### OXFORD BRG & TOOL SCRAPERS

Complete set of 6 Tools packed in Grained Wood Case. Contains 1 ea. 8", 10", 12", 14" half round scraper. 1-6" Three square Scraper. 1-12" Double end Scraper. Made of Finest Tool Steel. Forged, Tempered, and Hollow Ground. An Unheard of Price! \$2.49



**New Hydraulic Cylinders, Valves, Pumps, Fittings, Hose and Tanks**  
**51 SIZES AND TYPES. WORLD'S LARGEST SUPPLY.** 1001 Labor Saving Adaptations for Pulling, Pushing, Lifting Operations. Finest Precision workmanship and materials. Liquid and/or Air Operation.  
 20,000 Available. Write for Catalog. Priced to sell at 15% Gov't Cost.

**Hydraulic PUMPS**  
**MP-5-HYDRAULIC MOTOR OR PUMP.** Logan Gerotor type. For operating hyd. systems on tractors, trucks, industrial machinery, etc. Delivers 8 GPM. at 1200 RPM. at 1000 PSI with 5 HP. Can also be used as Hydraulic Fluid Motor. Has 3/8" std. pipe parts. 1/2" splined shaft for pulley or direct attachment. 5 1/2" dia. x 7" long. Used but guaranteed condition. . . NOW ONLY. . . **\$17.50**

**P-1 PESCOTYPE**-Positive displacement gear type. Capacity: 1 gal. per minute, at 1500 RPM at 1500 PSI. Operating speed: 3700 RPM intermittent max. 4500 RPM. Rotation: either direction with slight adjustments. **\$9.49**

**ROME C FUEL PUMP**  
 800 GPH at 30 PSI, can also be used as hydraulic for 4 GPM at 400 PSI or for Vacuum drawing 15" mercury at 1500 RPM. **\$6.29**

**VALUABLE GEAR BARGAINS!**  
 #110 8 to 1 ratio, spindle drive \$2.98  
 #110 6 to 1 with screw shaft \$4.98  
 #111 85 to 1 (can be used for radio, antennae, etc.) . . #112 . . \$3.95  
 #G-11 - 10-1 gear ratio . . . . . \$3.95

**D. C. GENERATORS**  
 Suitable for adaption to home welding units, portable and rural lighting, power plant on boats, etc

TYPE	AMPS	VOLTS	
New T1	25	12	<b>\$13.95</b>
Used but Guaranteed Condition			
G1	140	27	<b>\$17.95</b>
P1	200	27 1/2	<b>\$22.50</b>
R1	300	30	<b>\$29.75</b>
E5A	50	12	<b>\$17.95</b>

**D. C. METERS**  
**AMMETERS** 0 - 120 **VOLTMETERS**  
 -30 - 0 - 30+ 0 - 240 0-30 **\$3.95**  
 -60 - 0 - 60+ 0 - 300 **\$3.95 ea.**  
 -60 - 0 - 60+ 0 - 350 **\$3.95 ea.**

All 2" face except 0-300 which is 3" face.  
**COMBINATION VOLT-METER - AMMETER**  
 30V - 30 AMP **\$4.95**  
 30V - 60 AMP  
**SHUNTS** - Required for use with D.C. Ammeters 30-60-120-240-300-350.  
**SOLD ONLY WITH METERS. . . \$1.00**

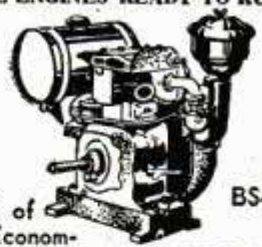
*Palley* **POWER PARADE**

**NEW BRIGGS & STRATTON MOD. "A"**

**GAS ENGINE** That nationally known "workhorse" of single cylinder engines! 2.10 HP-4 cycle, air cooled. Economical & Easy to Operate. Drives small pumps, boats & farm equipment. Brand New - Still in Original Crates. . . . . **BS-A ONLY. . . \$62.95**

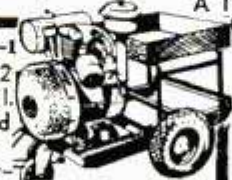
**CONTINENTAL** The famous 4 cycle, aircooled-"L" head gas engine, 1 1/2 to 2 HP. Cheap power for Farm, Factory, Shop---ONLY **\$47.95**

**Ellinwood "44"** A Real Buy!! 4.4 to 5 HP with optional power take-off from crankshaft, 1-1 speed from camshaft 2-1 reduction. Lightweight & of finest component parts-Bendix, Timken, Air Maze, etc.  
 A Terrific Gas Engine Value . . . **\$69.95**



BS-A

**POWER UNIT PU-1**  
 Complete Model GKB 12-24-100 consists of sgl. cyl., 4 cycle, air cooled Briggs-Stratton Gas Engine directly connected to 2800 watt generator. Engine is 6 HP governed between 2500-3200 RPM. Generator rated 28.5 V - 100 A. Unit mounted 4 rubber shock mts., channel iron base & wheels. Use as Lighting or Power Plant The Buy Of The Century **\$109.89** Good Cond.



**BENDIX HYDRAULIC HAND PUMP**

Provides a quick immediate source of tremendous power for almost any heavy work. Double action stroke. Delivers .30 cu. in. per cycle at 3000 PSI. Max. press. 5000 PSI. Built-in Reservoir cap. 2 1/4 qts. 3/8" pipe outlets. Has Pressure Release Valve. 7 1/2" dia. by 23 3/16" overall ht. Weight 15.2 lbs. A **\$15.95** \$40.00 Value for...NEW Used - In Good Condition... **11.95**



**New Electric Motors**

#500 new 1/2 HP - 27 Volt DC 24 Volt AC.. This motor can be readily adapted to deliver up to 1/2 HP on 110 Volts AC by the simple method of rearranging armature brush-leads. Free diagram with each order. A Sensational Value . . . . . **\$5.95**  
 #500A Converted to 110 Volts-AC. Equipped with plug and 3 1/2 ft. Heavy Duty Cord . . . . . **\$8.49 ea.**  
 #501 - 1/6 HP - 24 Volt DC. Motor. Series wound. NEW- **\$3.95 ea.**  
 #502- 2 HP- 24 V DC used **\$8.95**



**GYRO COMPASS**

Precision made for Positive Direction. 360° swing calibrated in 1/10° (6 min). Built in bank indicator, lum. dial. 4 1/2" sq. with 3" dia. face. Vacuum operated. Ideal for autos, planes, boats. Can be used in autos and boats by attaching one tube to intake manifold. Complete with reset and caging knob. . . . ONLY **\$449**



**Black & Decker ELECT. DRILL** Drills all

materials, polishes, buffs, sands & grinds, Strong, light die-cast Aluminum housing, fast operating Jacobs hex-key type chuck, instant release trigger switch, hard wearing gears, pinions & bearings, Operates on 110 Volt AC or DC 7-5/8" long-wt. 3 1/4 lbs **\$18.95**



**Vickers Hydraulic Transmission**

Self contained, 2 H.P. constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output R.P.M. - 0 to 1/3 input R.P.M. in both directions. Input R.P.M. 1800 continuous 4000 intermittent. Dash pot can be removed for greater R.P.M. Ideal for Lathes, Duplicator Setup on Mills, Conveyors, Small Cars, Drives, Gearing, etc. **\$19.50** COST GOV'T APP. \$400.00.



**FIRE EXTINGUISHER**

Kiddie Lux C-2 Type. Built to Gov't Spec. Shatter-proof, heavy case. Fully re-charged, with Horn.  
 4 lb. 18" x 5" - Wheel Control with horn... 4-TB Type. **\$14.25** A \$25.00 Value. #601-B  
 7 1/2 lb.-\$35 Value. #602A **\$19.75**  
 10 lb.- A \$65.00 Value - # 603 **\$25.75**  
 15 lb. - New. Break Disc Type. - A \$75.00 Value. #605-A **29.75**  
 15 lb. Wheel Control Type. #605-B **32.95**  
 15 lb. New. Squeeze Grip Type.- \$85.00 Value. - #605-C **\$39.95**



**GEAR BOXES** VTG-1 - 90°,

bevel gear 1 1/2 to 1 reduction, size 7" x 6". A Lifetime Value. . . . . **\$3.95**  
 VTG-2 - Inline spur gear 16 to 1 reduction, thru 4 gears. Final take-off 4 1/2" dia, 26 tooth. 3/4" Alum. spur gear. . **\$6.49**  
 Both above gear boxes have lever control for engaging & disengaging positive clutch. Dust proof housing. Prelubricated bearings. Both can be adapted to Vickers Transmission.

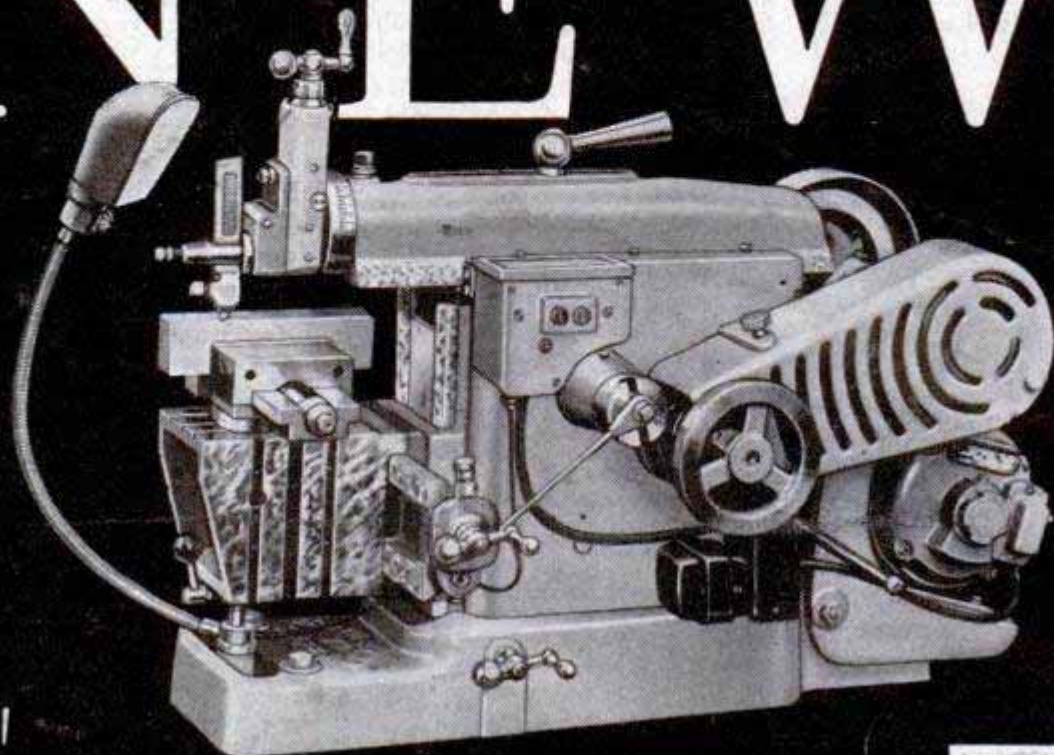


**92 PG. 1949 CATALOG**

10,000 Bargains in War Surplus Tools, Machinery, Raw Materials, Clothing, etc. 92 Pages, Illustrated with valuable information tables, charts & data. Send 25¢ to cover handling and postags.

Order from this Ad. All sales final. All Prices F.O.B. Los Angeles. Pay by M.O. or Check P.O.'s. Acptd. from D & B firms. 1/2 deposit with C.O.D.'s.

# NEW!



## 7" PRECISION SHAPER by SOUTH BEND

### *Fast... Accurate*

This new 7" Bench Shaper is a highly accurate, fast and rugged tool. It is easy to operate and is readily adaptable to a wide variety of small work. This production tool is ideal for any type of shop requiring close-tolerance machining, dependable service, and economical operation. *Write for literature.*



### **SOUTH BEND LATHE WORKS**

Building Better Tools Since 1906 • 455 E. Madison St., South Bend 22, Indiana

#### SPECIFICATIONS

**RAM**—0 to 7" stroke, 42 to 195 per minute in 4 steps. 3 to 114 feet per minute cutting speed.

**TOOL HEAD**—3" vertical feed, 180° rotation.

**TABLE**—Size 5-7/16" x 5" x 6". Travel—9-1/2" horizontal, 5" vertical. 1/2" to 5-1/2" ram clearance. Six power cross-feeds—.002" to .012".

**WISE**—Jaw width 4", depth 1", max. opening 4".

#### PRICES

7" Precision Bench Shaper . . . . . \$425

(Above shaper price includes light fixture, vise, drive unit, motor pulley, V-belt and switches. Stand for shaper, and motor are extra.)

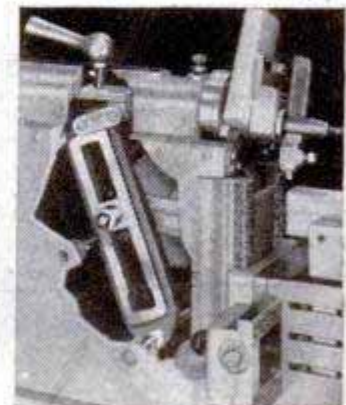
Steel Stand . . . . . \$125

Motor—1/3 h. p., 115 volt, 1 phase, 60 cycle, A. C. . . . . \$31.30

*Prices f. o. b. factory • Time Payment Terms can be arranged.*



Steel stand for shaper—3 drawers and built-in chip pan.



Rocker and crank assembly with graduated eccentric adjustment for ram stroke.

Printed by Popular Mechanics Company, Chicago, Ill., U. S. A.

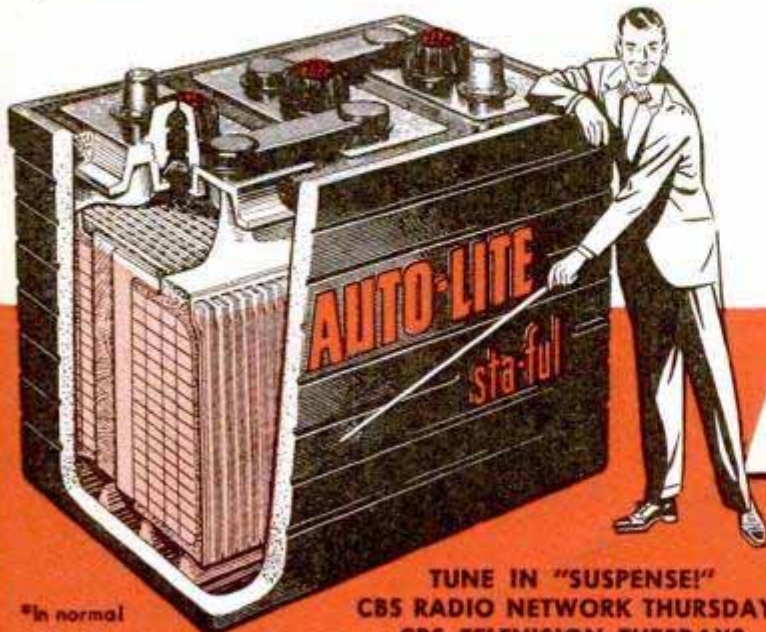
What's **NEW**  
in Batteries?

# AUTO-LITE **Sta-ful** BATTERY...needs water only 3 times a year\*

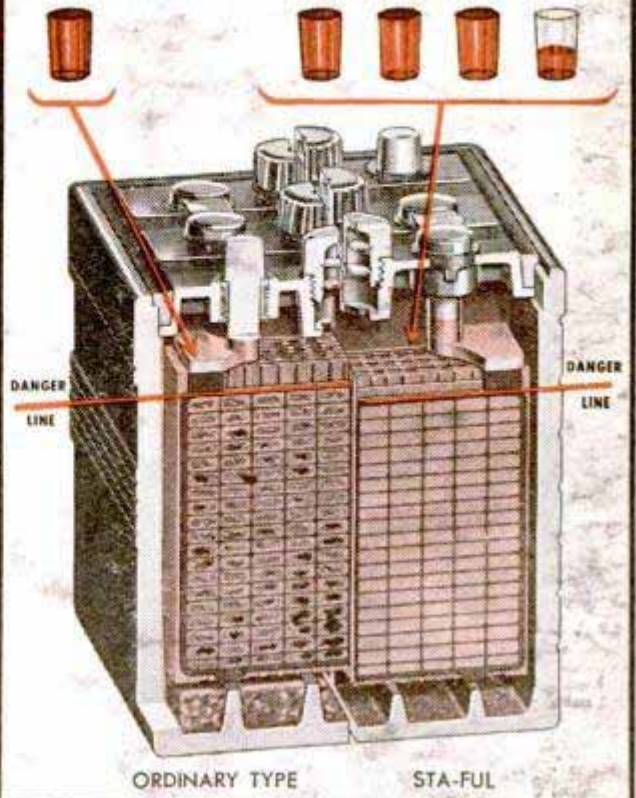
A revolutionary new development, the Auto-Lite "Sta-ful" Battery, protects you against a major cause of battery failure . . . damage to plates due to liquid loss. This new "Sta-ful" Battery design permits a liquid reservoir with 3 times the capacity of ordinary batteries . . . keeps plates fully covered and active months longer in normal car use.

In addition, "Sta-ful" has Fibre-glass mats to hold the power-producing material in the plates for longer battery life. To get more for your battery dollars, replace with an Auto-Lite "Sta-ful". Money cannot buy a better battery.

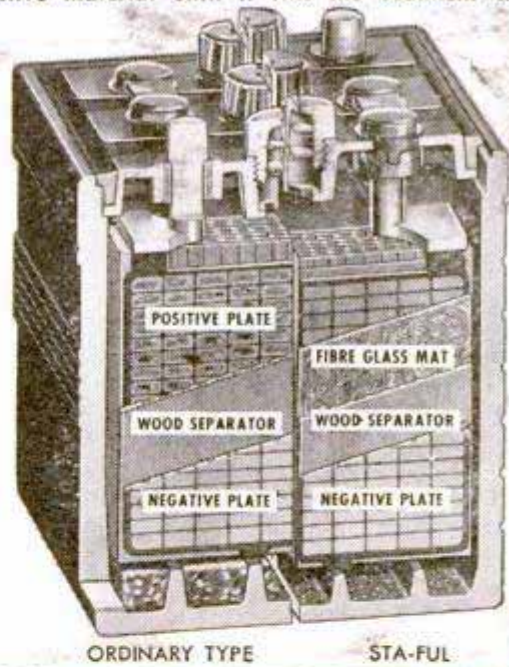
AUTO-LITE BATTERY CORPORATION  
Toledo 1 Ohio



Because of a unique construction, the new Auto-Lite "Sta-ful" Battery holds more than 3 times the liquid reserve of ordinary batteries.



Note how the protective Fibre-glass mat retains the power-producing material in the positive plate while ordinary battery plates shed the active material until it fills the sediment well.



# AUTO-LITE **Sta-ful** BATTERIES

\*In normal car use

TUNE IN "SUSPENSE!"  
CBS RADIO NETWORK THURSDAYS  
CBS TELEVISION TUESDAYS

# When safety's a must, it's "PRESTONE" ANTI-FREEZE

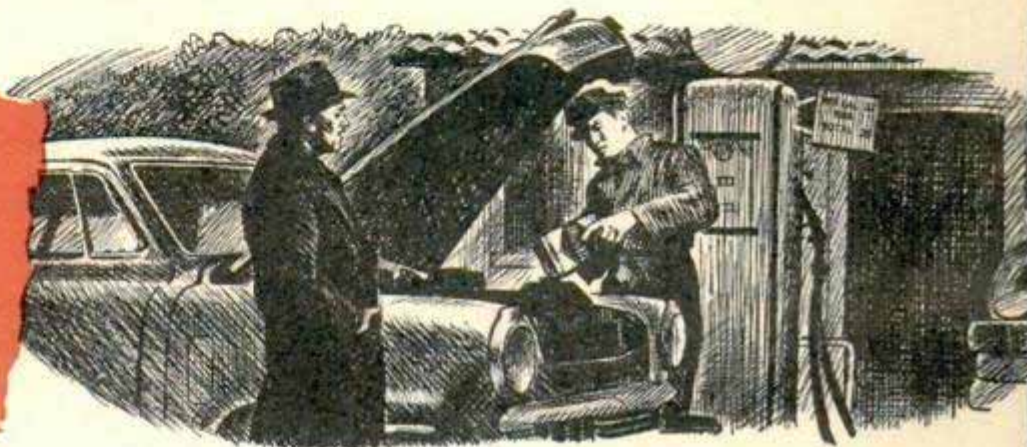


**YOU'RE SAFE  
IN EMERGENCIES**

You know your car won't freeze  
up when you need it most!

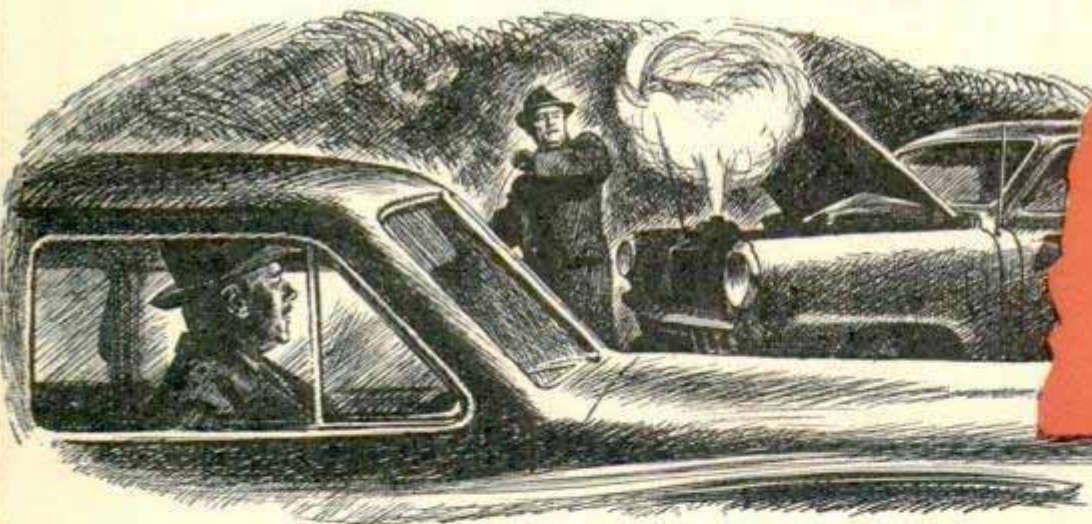
**YOU'RE SAFE  
FROM WORRY**

One shot lasts all winter; put 'Prestone'  
anti-freeze in your car... and forget about it!



**YOU'RE SAFE  
FROM BOIL AWAY**

You're safe no matter how warm  
it gets between cold spells!



## One shot lasts all winter!

Give your car the same, safe, all-winter protection that fire chiefs, ambulance drivers, police chiefs give theirs. Insist on "Prestone" anti-freeze.

## There's nothing else like it!

"Prestone" anti-freeze, America's Number One Brand, is made to an exclusive formula. Year after year, more motorists depend on "Prestone" brand anti-freeze for safe, sure, all-winter protection.



**NO RUST • NO FOAM  
NO FREEZE • NO FAILURE**

**\$3.50  
PER GAL.**

### GUARANTEED!

Ask your dealer to show you the guarantee. It's your assurance of all-winter safety.

The registered trade-marks "Prestone" and "Eveready" distinguish products of  
**NATIONAL CARBON COMPANY, INC.**  
30 East 42nd St., New York 17, N. Y.

Unit of Union Carbide and Carbon Corporation