

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, No. 410426

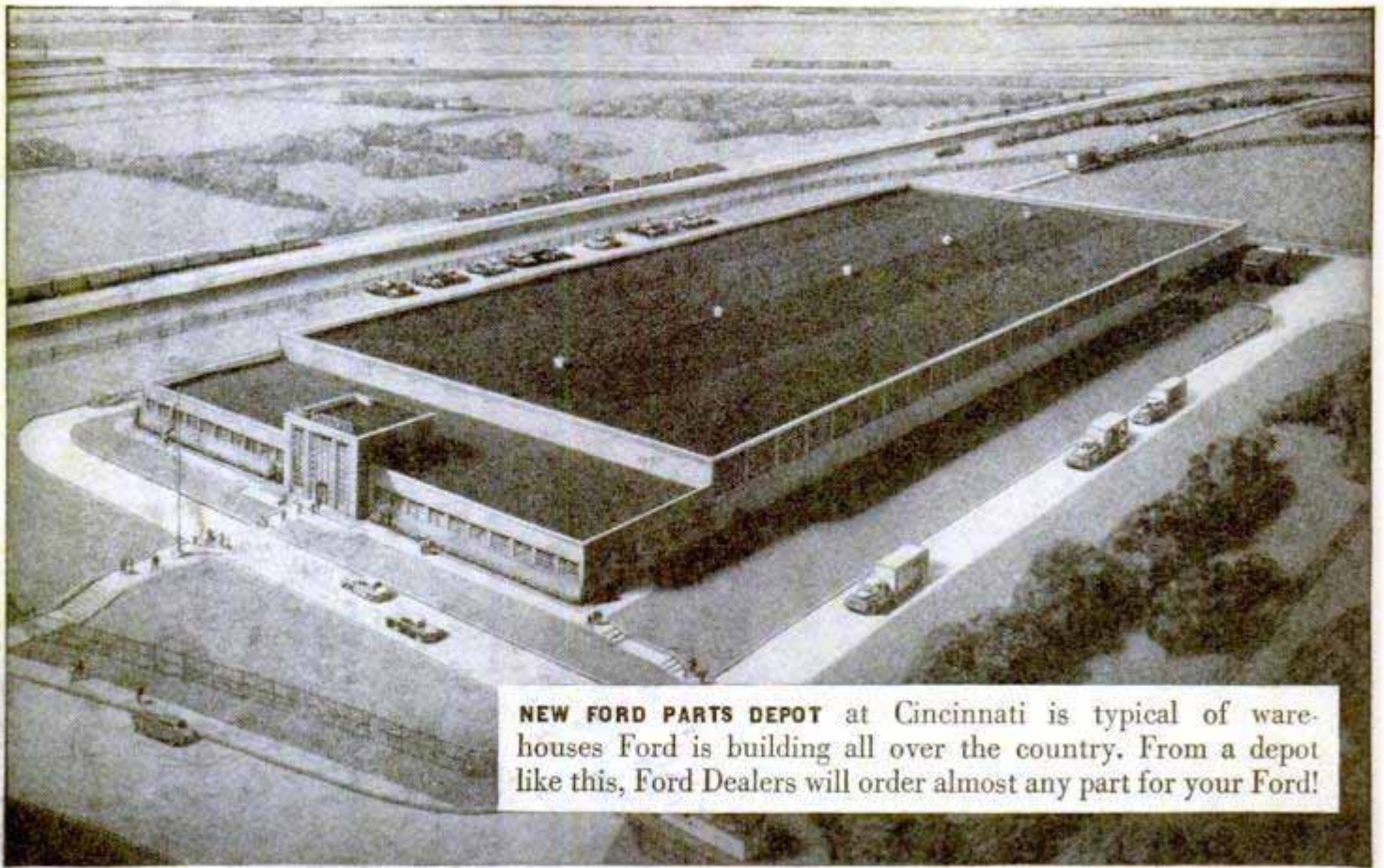
REG. U.S. PAT. OFF.

See page 65



**How Owners
Rate the
'51 CADILLAC**

For the Home Owner
**How to Install
Attic Ventilating Fans**



NEW FORD PARTS DEPOT at Cincinnati is typical of warehouses Ford is building all over the country. From a depot like this, Ford Dealers will order almost any part for your Ford!

TO SERVE FORD OWNERS BETTER THAN EVER!

Ford's \$500,000,000 expansion program will make Genuine Ford (FoMoCo) Parts easier to get than ever. The depot (above) is only one of ten new parts depots built or being built. Nineteen others are being expanded. This expansion program, designed to triple stock space, is part and parcel of Ford's "Look Ahead" policy to better serve Ford owners.



MADE RIGHT for Fords, Genuine Ford Parts, like this muffler, are specified by wise motorists to save time, money and trouble. They're *right* because they're duplicates of the parts in your Ford—they keep Fords *all Ford*.



FIT RIGHT in your Ford—a "must" for important parts like the Genuine Ford Carburetor above. It's typical of the parts designed by Ford engineers, to work right in your Ford . . . to keep your Ford young longer.



LAST LONGER in Fords. This sign is displayed wherever Genuine Ford Parts are sold . . . at all Ford Dealers and selected independent garages. Specify Genuine Ford Parts . . . made right . . . to fit right . . . to last longer.

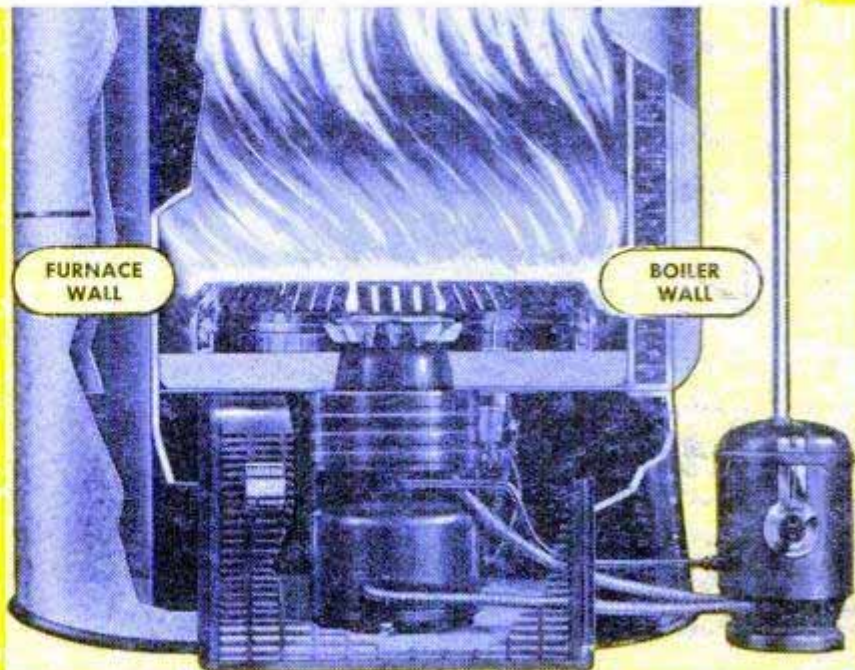
KEEP YOUR FORD ALL FORD!

MAKES *Gas* FROM *Oil!*

TIMKEN
Silent Automatic

**WALL-FLAME
OIL BURNER**

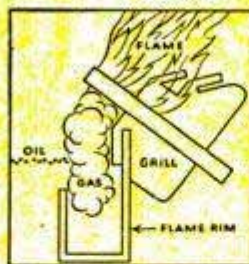
**CONVERTS FUEL OIL
INTO A GAS, THEN
BURNS THE GAS WITH
AMAZING EFFICIENCY!**



Scientific flame placement, as illustrated in the sectional view above (left side shows furnace, right side boiler), is a major factor in the extraordinary operating efficiency of the Timken Silent Automatic Wall-Flame Oil Burner, famous for fuel oil savings up to one gallon in every four used by ordinary burners.

Every useful Btu. of heat is extracted from every drop of fuel oil—thanks to the exclusive design of the Timken Silent Automatic Wall-Flame Oil Burner. This is the one and *only* type of automatic fuel burner that combines all the best features of oil heat with the clean-burning efficiency of gas heat. Your local Timken Silent Automatic Authorized Dealer will be glad

The unique chrome-steel flame rim shown at right converts fuel oil into a gas, *thus*: Oil droplets strike glowing-hot flame rim and are instantly vaporized. Resultant mixture of oil-gas and air rises through grills, is superheated, and burns with same blue color characterizing a gas flame.



to show you operating units as well as cut-away models. See for yourself the exceptional efficiency of this advanced development in heating science; ask for free literature with detailed data for your further study. Without any obligation on your part, your Dealer will make a scientific heating survey of your home, using approved laboratory-type instruments—and give you a written guarantee of fuel oil savings if you are changing over from an ordinary burner. Examine his findings and then decide for yourself whether you can afford to remain without Timken Silent Automatic Oil Heat. *Phone him today!*—or use coupon below.

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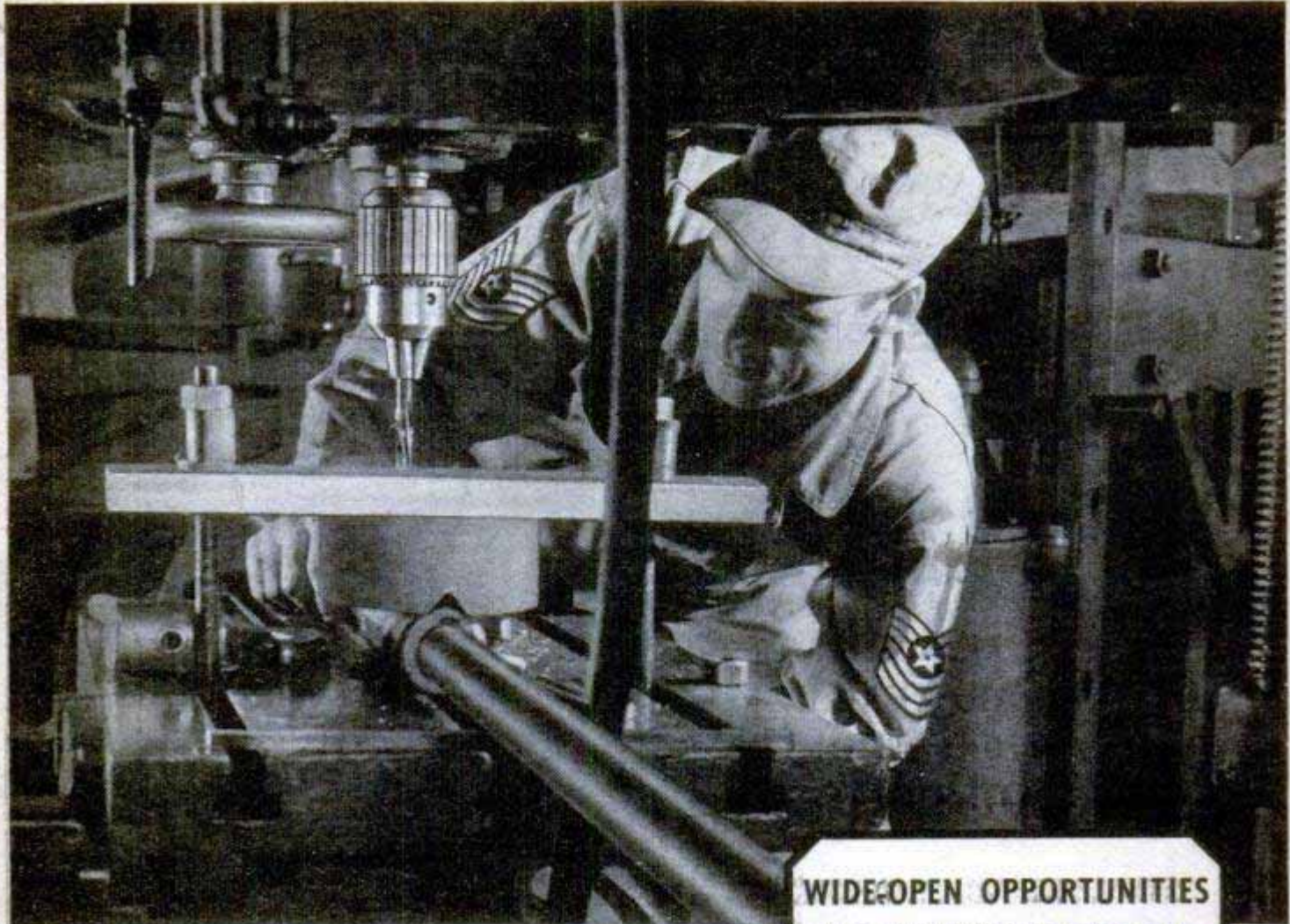
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Silent Automatic
HEAT

TIMKEN SILENT AUTOMATIC DIVISION
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The Timken-Detroit Axle Company of Canada, Ltd., Toronto, Ont.

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PM-861





Metal Working is but one of the many technical fields in which the Air Force offers unusual opportunities today.

WHAT THE AIR FORCE OFFERS VETERANS

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If you are a veteran of any branch of the Armed Forces—with an essential technical skill—find out what the U. S. Air Force can offer you today!

Here are just four of the reasons why so many veterans with special skills have been moving into the Air Force:

FIRST, if qualified, you can enter the Air Force at your old grade or better, according to your present ability.

SECOND, the Air Force will tell you exactly what your initial rating and pay grade will be, before you join up.

THIRD, you will skip basic training, and be assigned initially to a nearby Air Force base.

FOURTH, today's fast-growing Air Force offers better pay, and more chances for rapid advancement, than ever before.

Hear the whole story. Tell the Air Force what you have to offer . . . ask the Air Force what it can offer you.

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RADIO

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U. S. AIR FORCE

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Popular Mechanics Magazine

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H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

IN THE EERIE light of the ocean floor the Navy's famous "frog men" cut a hole in an enemy submarine net and slip silently through toward the shore. Our cover is taken from a scene shot for a Hollywood epic. The man who masterminded the movie is Louis Witte, Hollywood's ace authority on celluloid warfare. He's created everything from the dramatic sweep of an amphibious landing to the plunk of a bullet into a tree near Shirley Temple's lovely head. For the movie about the frog men Witte shattered the air, earth and water with some 90 cases of dynamite, 500 pounds of blasting powder, 250 pounds of flash powder and two tons of TNT. "My masterpiece," Witte says, in discussing this magnificent barrage. Even the Marines consider him an authority on depicting warfare—during World War II the Corps called on him to create super-real battle effects for troop training. To see how Witte stages a modern celluloid war, turn to page 65

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Read these interesting facts about your own automobile

Listen to what the men who build automobile engines have to say about your car. At 40 miles an hour on a smooth, level highway, 50% of your gasoline is used up to overcome engine friction. Yes, half of the power your gasoline produces never gets to the rear wheels to make your car go faster or farther or climb a steeper hill.

Friction eats a lot of gas, doesn't it?

Now just suppose you can *reduce* that friction. Then some of the power that was being used to overcome it will be *released to help* drive your car ahead.

And that's exactly what happens!

In hundreds upon hundreds of scientific Dynamometer tests using cars like yours, the average motorist got 8% more *usable* power from the same amount of gasoline after he had changed from whatever oil he had been using to Macmillan Ring-Free Motor Oil.

The minute you change to Macmillan, you'll get an increase in power and gasoline mileage. You cut down on "drag"—your gasoline "pushes" easier than before. After the second or third drain, the average motorist gets an increase in gasoline mileage of 8%!

That's because Macmillan has not only reduced engine friction but also has reduced carbon and gum deposits in the combustion chamber, on rings, valves,

and valve stems. This results in higher compression because of better piston seal—smoother operation, and less tendency for the motor to ping.

Let's figure what 8% means to you. First, it means an 8% saving on your gasoline bill—that's about 2¢ a gallon on every gallon you buy. 8% means an average of 20 extra miles on every tankful. Or, look at it this way: over a normal oil drain period, your gasoline saving is \$2.00—enough to *pay for your oil*.

And don't ever forget, it's friction that wears out motors. With Macmillan Ring-Free Motor Oil you *reduce* friction—you save on wear and repair—your motor lasts longer, runs sweeter, uses less oil. New motors stay newer longer.

You'll find Macmillan—the original carbon-removing oil—at independent garages, car dealers and service stations where you see the sign of the big red "M." Drive in, try the *OIL* that makes your *GAS* go farther.

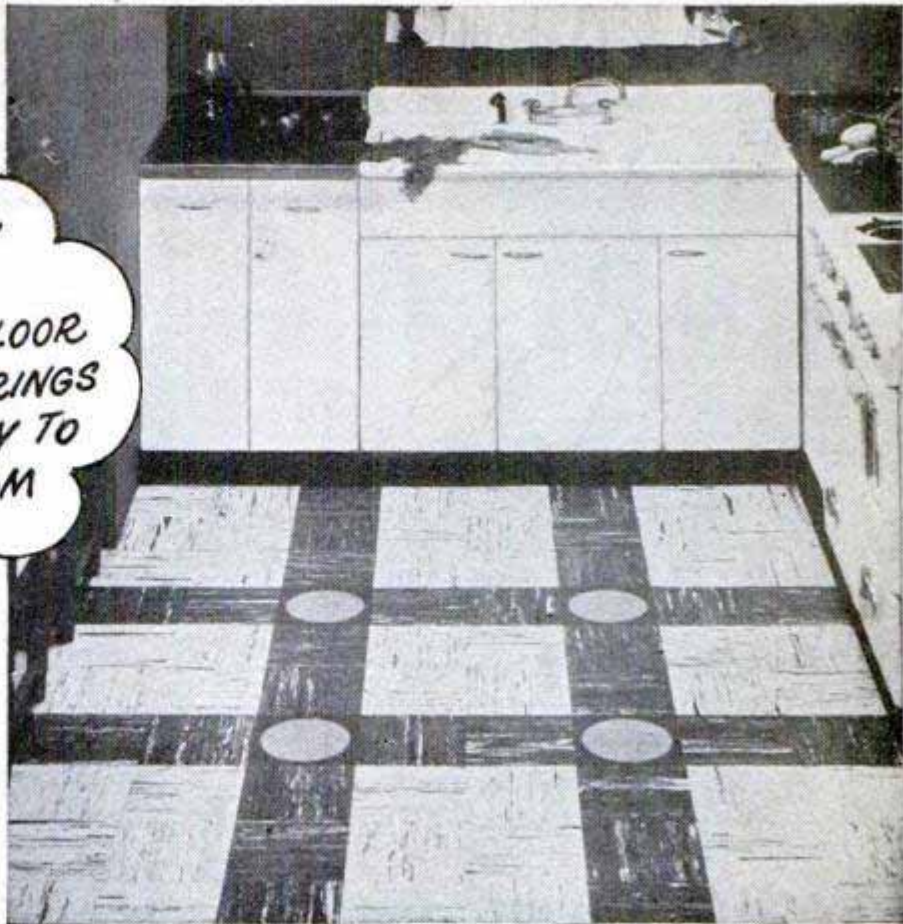


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President

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A long-lasting colorful floor like this for only \$22⁵⁰*

IT'S MONEY-SAVING FUN TO

INSTALL YOUR OWN KENTILE FLOOR

Home handymen (and women) of all ages are finding that it's so easy to lay their own Kentile Floors! The tiles go down one by one ... a few at a time or whole rooms all at once. And, as soon as it's down, the floor is ready for immediate use.

The smart, modern beauty of the 26 light bright Kentile colors lasts for the life of the floor ... colors are permanent because they go clear through to the back of each tile. And, no floor is easier to clean ... just mild soap and water plus an occasional no-rub waxing brings out all the sparkling, decorator beauty.

To find out just what it will cost you to lay a Kentile Floor in any room of your house, consult your Kentile Dealer. He's listed under FLOORING in your classified phone directory.

*Price quoted is for a 8' x 9' kitchen. Your floor may cost considerably less or slightly more depending on the colors you choose and the size of your room.



This handy
KEN-KIT gives
me all the tools
I need to do a
real workman-
like job

FREE BOOKLETS. Send for your copies of the Kentile Self-Installation Folder and the Kentile Color Line. Learn how easy it is to install your own Kentile Floor and see the 26 modern colors you can choose from. Kentile, Inc., Dept. G-2, 58 2nd Ave., Brooklyn 15, N. Y.



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in this corner.....

THE EDITORS

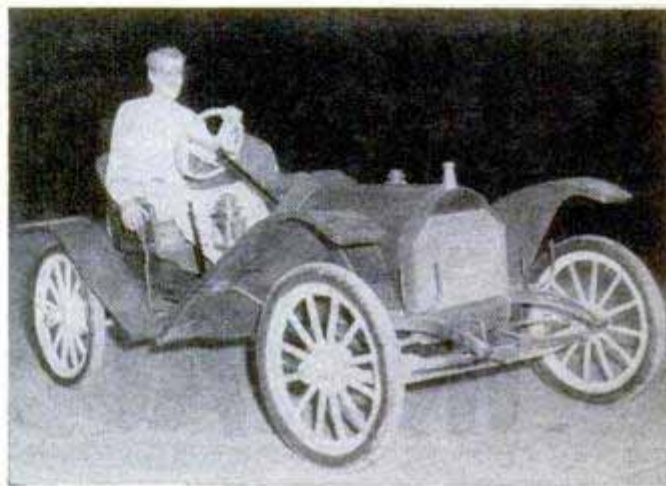


THE WEATHER is hard to beat!

There are some things you can do, however, to make your home livable in a hot summer.

This month, in the Craftsman Section, you'll find a timely article on how to install attic fans that will pull the August day's heat right up from your living floors and pour it outdoors.

Next month another perennial problem is solved for you in an article telling how to defeat condensation, that eternal bugaboo of damp homes. Don't miss this September feature.



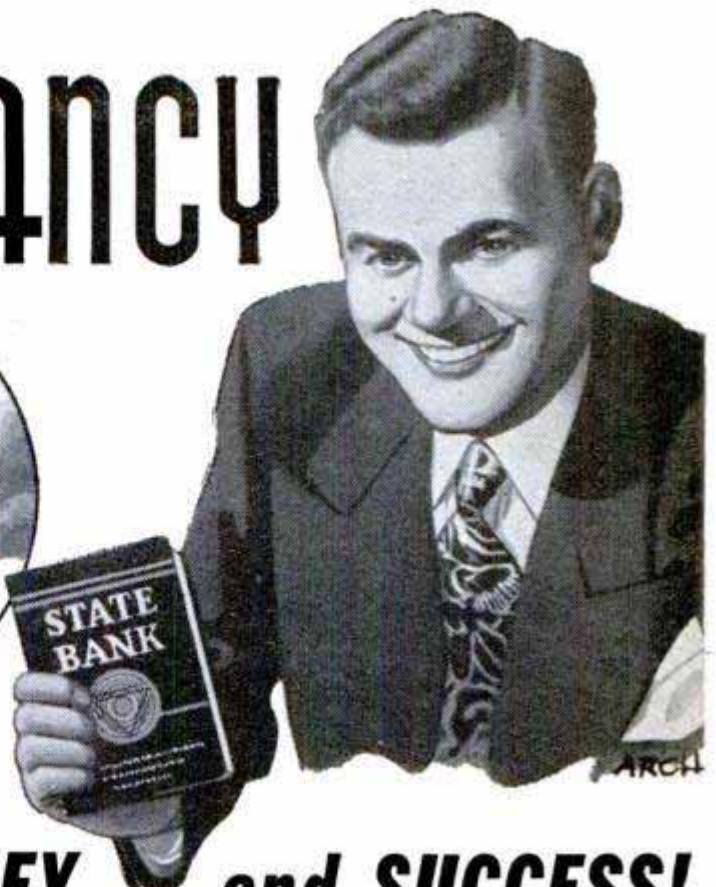
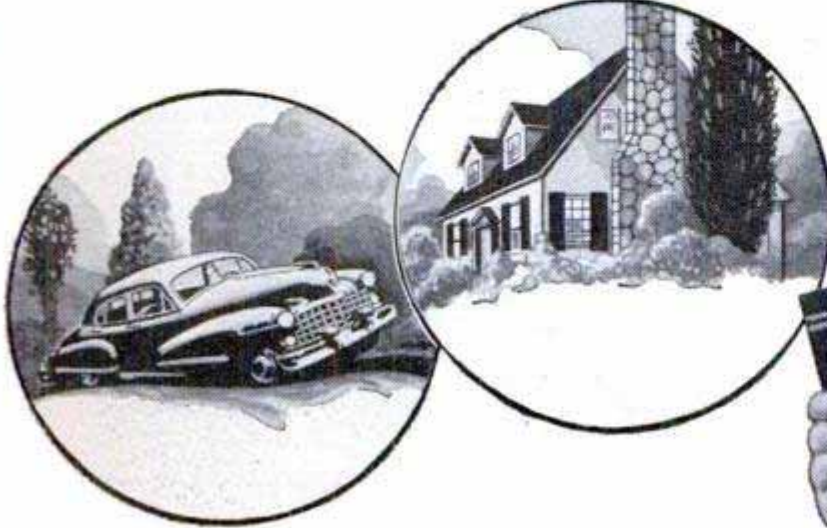
Letter to the Editor

Roger Ellis, a University of Texas student majoring in petroleum engineering, found a 1908 Hupmobile about 60 miles from Austin. A farmer had owned the car, keeping it in a dry barn where it stood the years very well. In 1918 the farmer had a small accident in it and bent a headlight, which he gave to the scrap-metal drive during World War II. The car had bad tires which he will have to get on special order; other than this, and having to reline the brakes he has done little to it. He cleaned the motor out when he first got it and has had to do little in the way of repairs. Parts are next to impossible to obtain and most of them will have to be made if he ever needs them.

He and his wife drive the car every day and it is running well. It is mainly a car to use in town, for it will only go 30 miles per hour and has a four cylinder, 20-horsepower motor. The car is a Hup 20, sports sedan seating two. It has a fan blade and

(Continued to page 8)

5 reasons why ACCOUNTANCY



offers you MORE MONEY... and SUCCESS!

REASON #1. If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Even back in "depression years," surveys showed that accountants earned more on the average than men in other major professions.

REASON #2. The demand for accountants is great—everywhere. All businesses must have trained accountants to cope with ever-growing requirements. It's a profession offering wide opportunity—always—to the man who knows.

REASON #3. You can fit into any business, anywhere in the country—because accounting principles are universal. Think what this means in terms of security and independence!

REASON #4. Accountancy is open to all. Any man or woman of good intelligence, who enjoys figure work and is willing to follow LaSalle's systematic "problem method" plan, can rapidly qualify for a highly profitable, enjoyable lifetime career... and he doesn't have to finish his training before beginning to "cash in."

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ever they had been
using. About 80% of
the men had a prefer-
ence. Of these, the
votes were in the
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ground! And *only* these
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EST SHAVES OF YOUR LIFE—
OR YOUR MONEY BACK,
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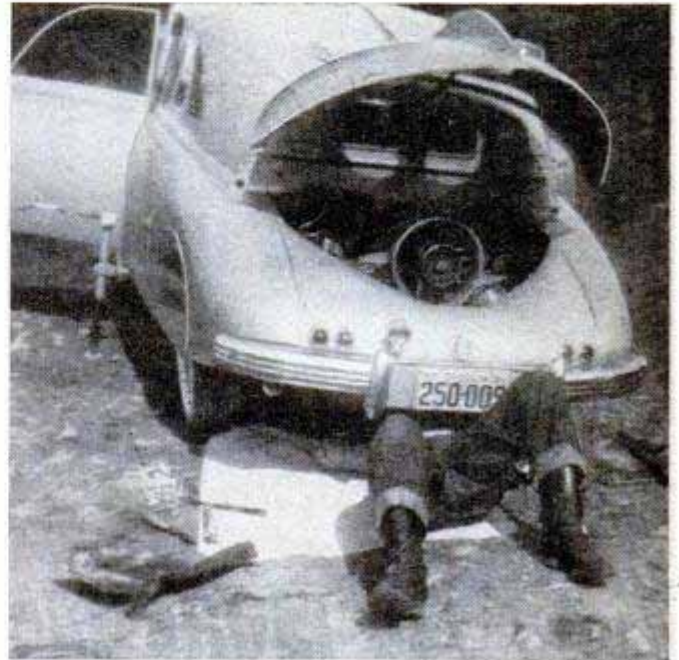
SCHICK INJECTOR RAZOR & BLADES

(Continued from page 6)

flywheel combined, brass lights and radiator, starts with crank, burns regular gas cut with kerosene (1-1).

He is a member of the Horseless Carriage Club, and a fellow member has given him a set of head and tail lights for it.

Nolan Borden,
Austin, Tex.



Letter to the Editor

Looking through the May Editor's Column I read the comment on the rear-engine car. I beg to differ with Mr. Cady that an engine cannot be put in the rear. Here is a picture of our 1950 Tatra with the motor in the rear . . . they have been making them for about 28 years. We haven't found any hill it has had any trouble on. There isn't an American car that can keep up to it on curves.

E. K. Wooldridge,
Enumclaw, Wash.

Letter to the Editor

While reading my favorite magazine (*Popular Mechanics*), I was very much interested in this little clipping:

"If you don't bind or store your back issues of *Popular Mechanics*, do you burn them? America's defense effort requires a vast number of paper products. Call your local Boy Scouts or veterans' organization to pick up your wastepaper."

I thought you might be interested in what I do with my magazines. As a Gray Lady of the Red Cross, I save my issues to take to the Army hospital, Fort Bragg, N. C., at which time I present them to the Korean casualties. The boys eagerly await their

(Continued to page 10)

With spare-time study, he paved a

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SAM P. TURNBULL
Florida Highway Engineer

From rodman in a road crew to top engineer in the Florida State Road Department — that's the spectacular story of Sam P. Turnbull.

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<input type="checkbox"/> Ship Fitting
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<input type="checkbox"/> Toolmaking
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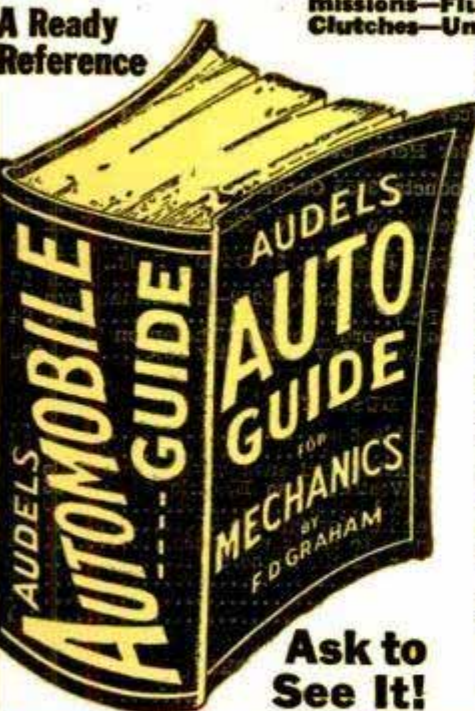
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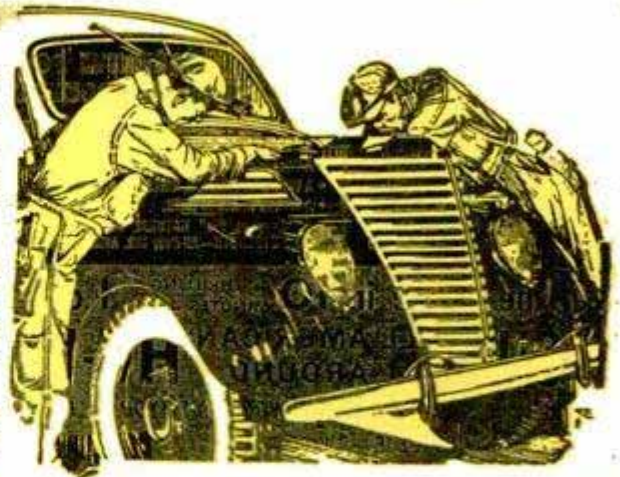


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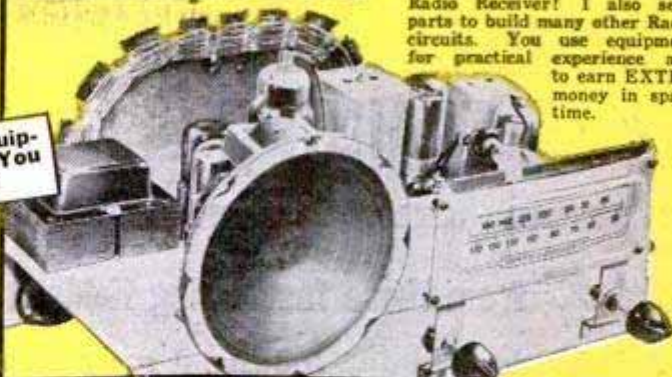
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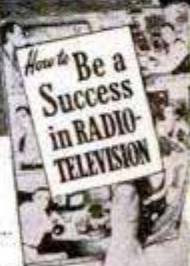
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THE SOONER YOU START, THE SOONER YOUR GOAL CAN BE REACHED

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Moon Rocket in Sections?

Probably the first rocket to be fired toward the moon will shed pieces from itself during the trip. That's the verdict of Anthony Nerad of the General Electric Research Laboratory. He suggests that with fuels now available, the best way to make a long-distance flight would be by a rocket with sections that would drop off as the fuel in each was consumed. Hydrogen gas offers some theoretical advantages as a propellant for such a rocket, Nerad says.



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- Practical Telephony
- Telegraph Engineering

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- Industrial Electrical Engineering
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- Power House

Internal Combustion Engines

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- Aviation
- Diesel Engines
- Gas Engines
- Diesel-Electric
- Flight Engineer

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- Heat Treatment of Metals
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- Locomotive Machinist
- Foundry Work

- Mechanical Drafting
- Mechanical Engineering
- Machine Shop
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- Reading Shop Blueprints
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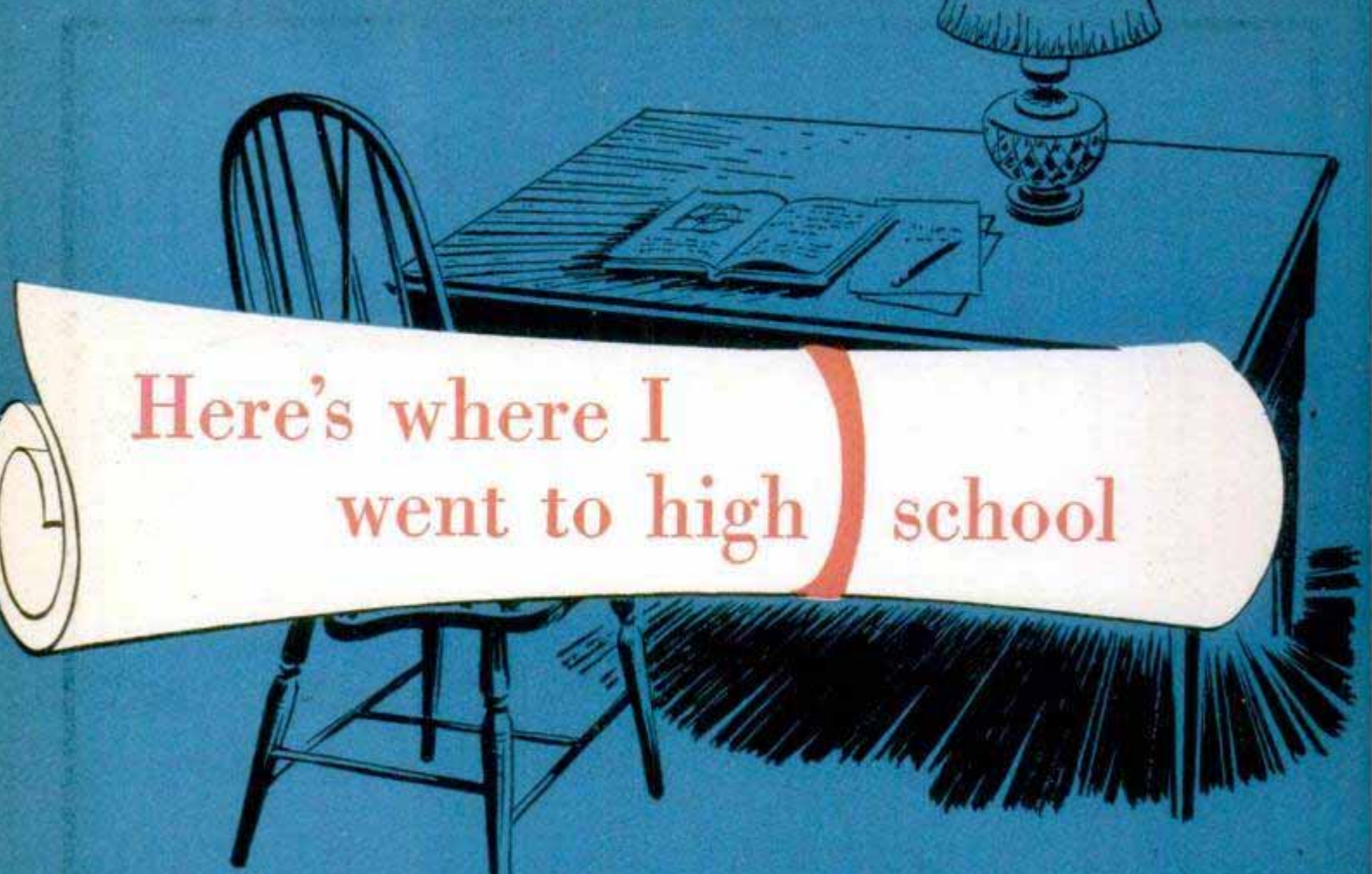
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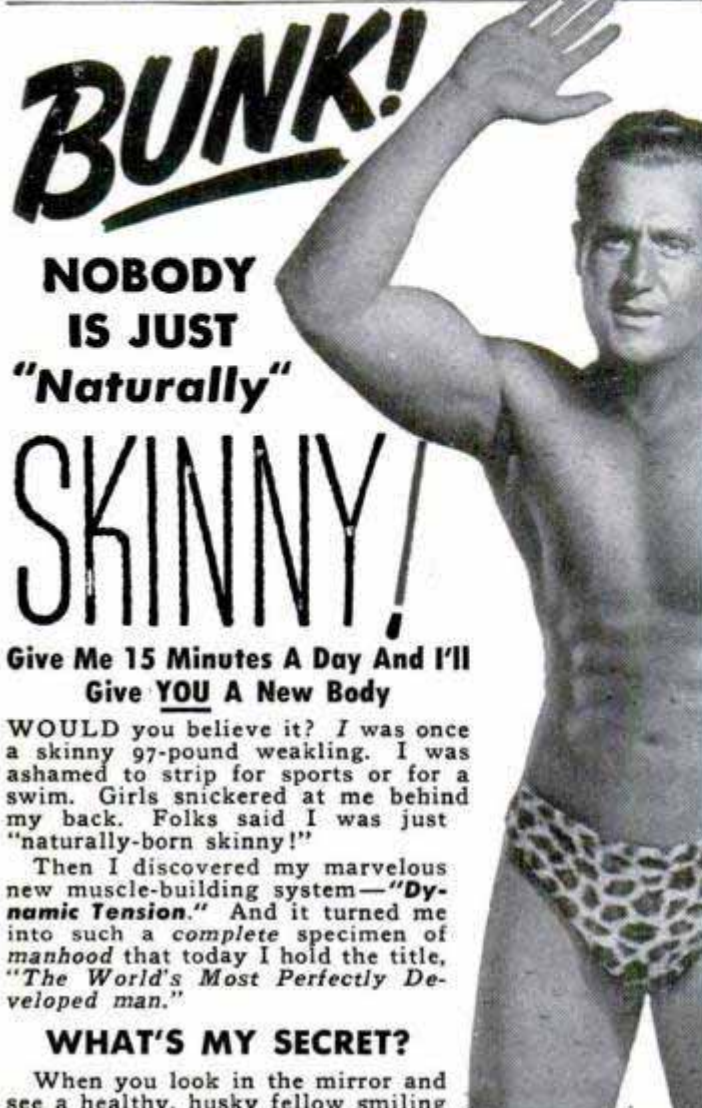
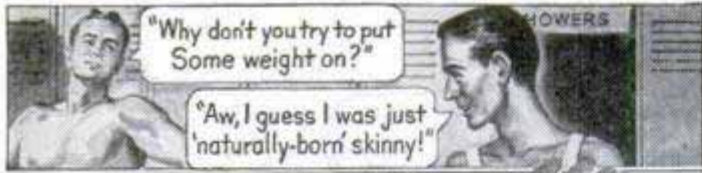
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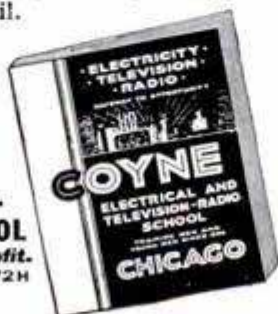
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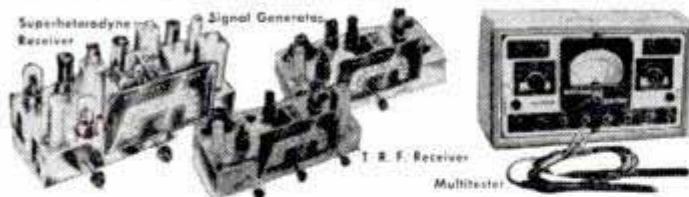


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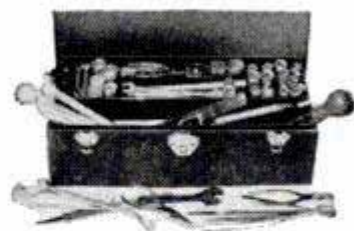
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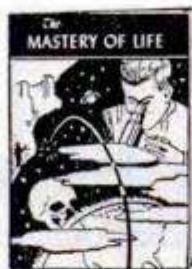


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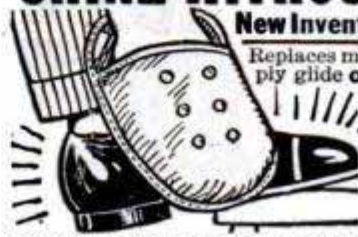
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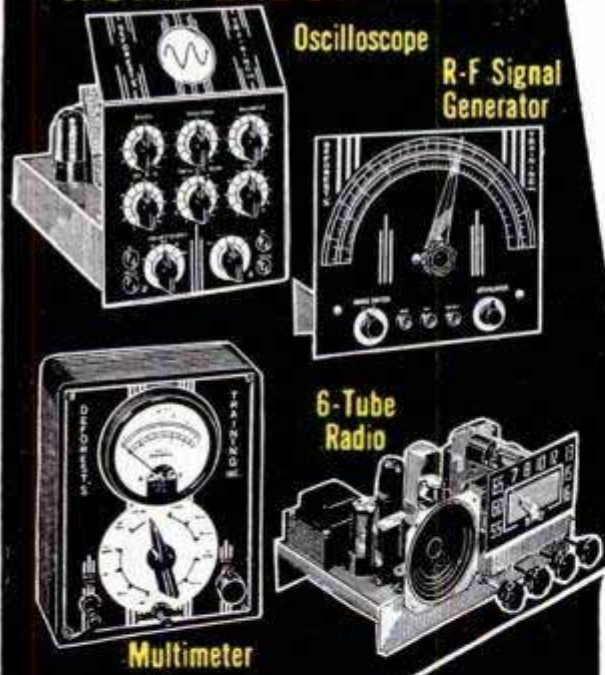
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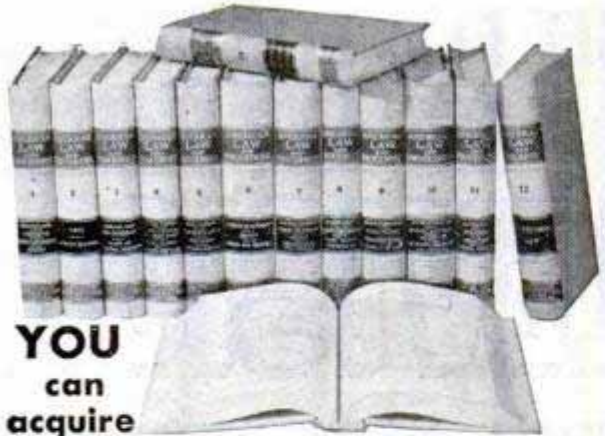
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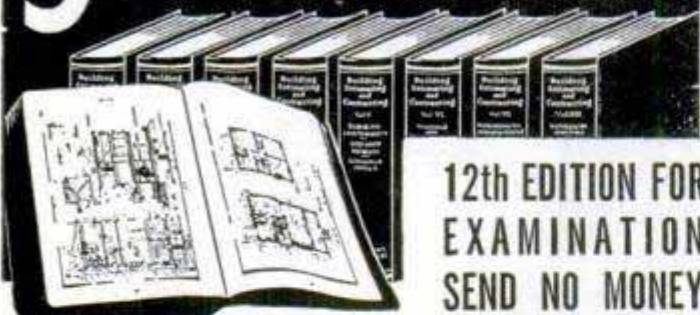
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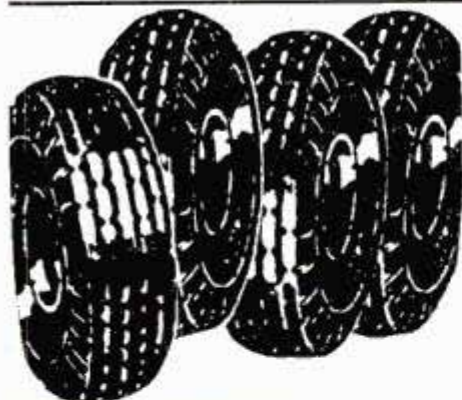
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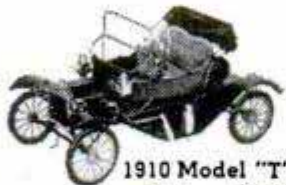


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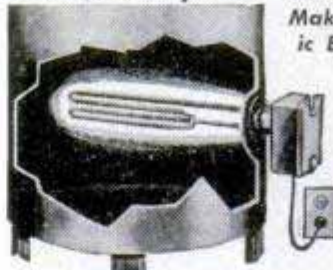
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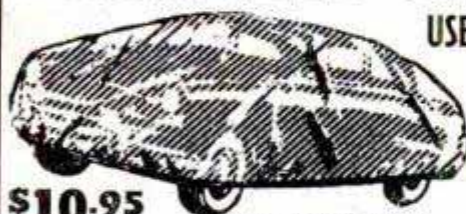
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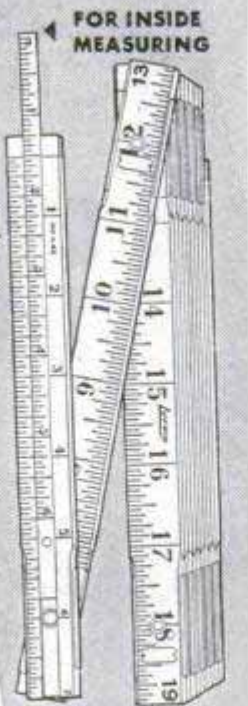


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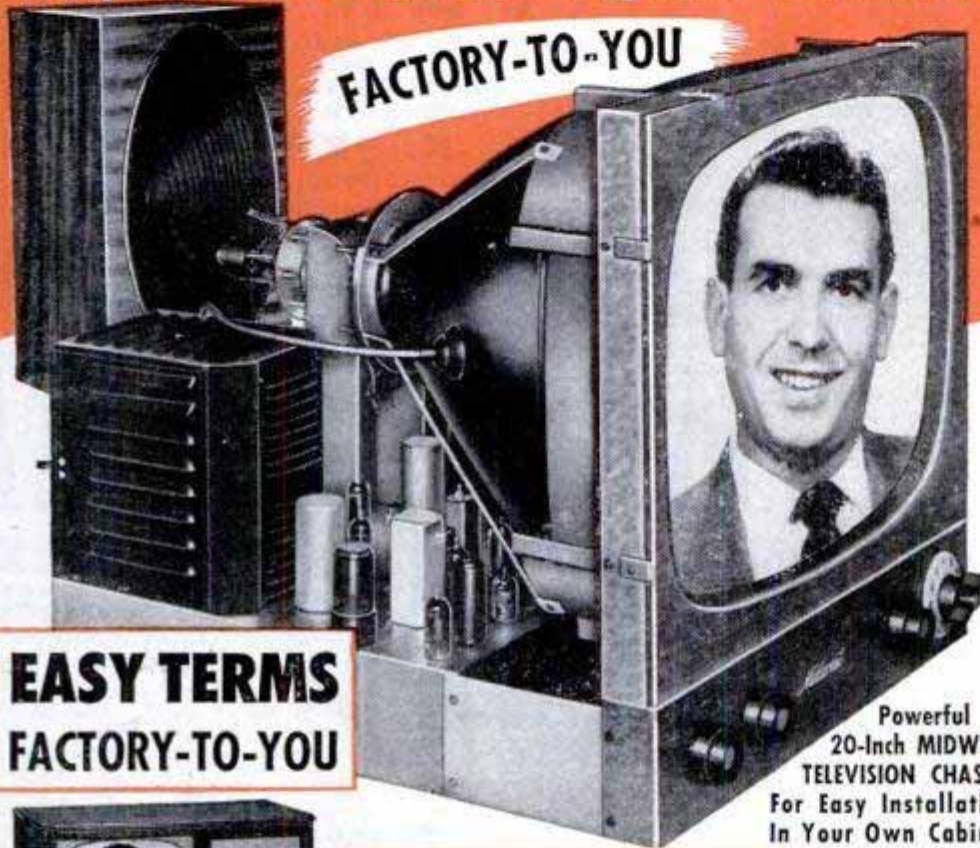
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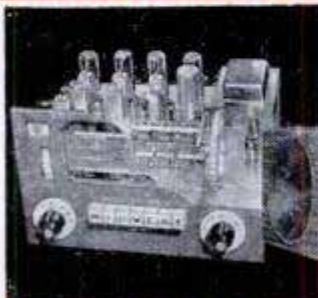
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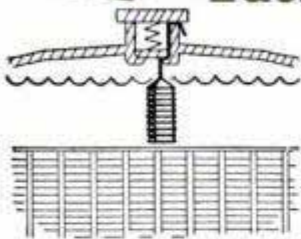
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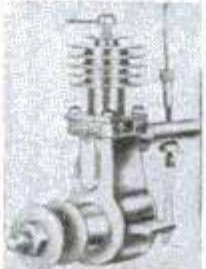
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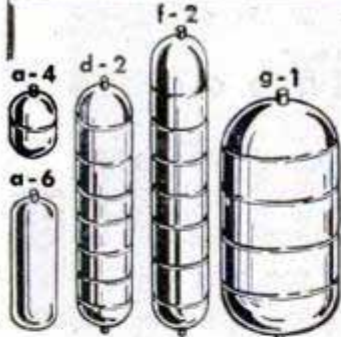
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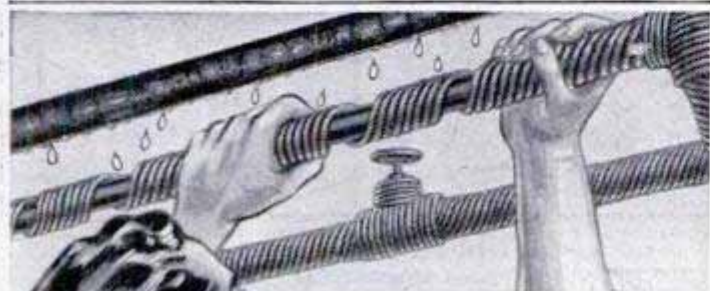
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JUST Out! New, thrilling sensation in Christmas cards. Make big money! Show lustre foils, satins, brilliants. Amazing values bring easy orders! Christmas cards with name 50 for \$1.25 up. Also imprinted book matches, stationery, many gifts. Get 30 free samples with name; several \$1 boxes on approval. Joy Greetings, 507 N. Cardinal, Dept. K-60, St. Louis 3, Mo.

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MAKE Money fast. Sell big value Christmas and everyday card assortments to friends, others. 7 leading 21 card \$1.00 boxes. Religious, metallic, comic, secret pal cards. Gift wrappings, ribbons, scented stationery. Many gifts; rain sandals, automatic telephone pencils, totebrushes, napkins. Over 100 items. Amazing profits. Bonus plan. No experience necessary. Write today for samples on approval and special "get started" offer. Hedenkamp, 361 Broadway, Dept. PM-14, New York.

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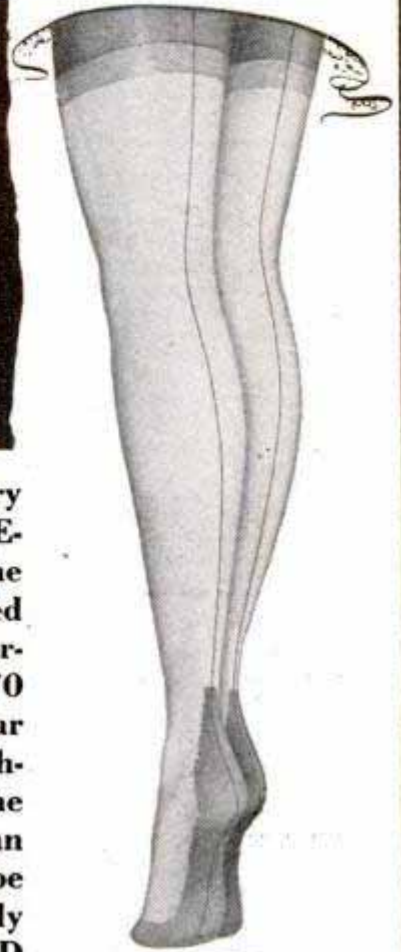
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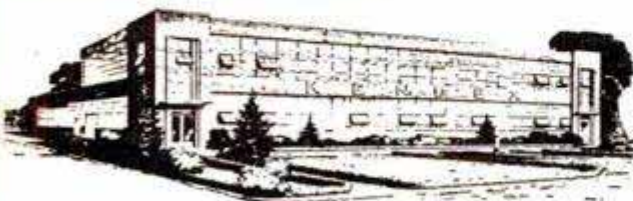
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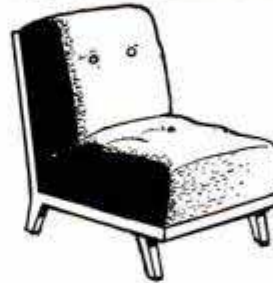
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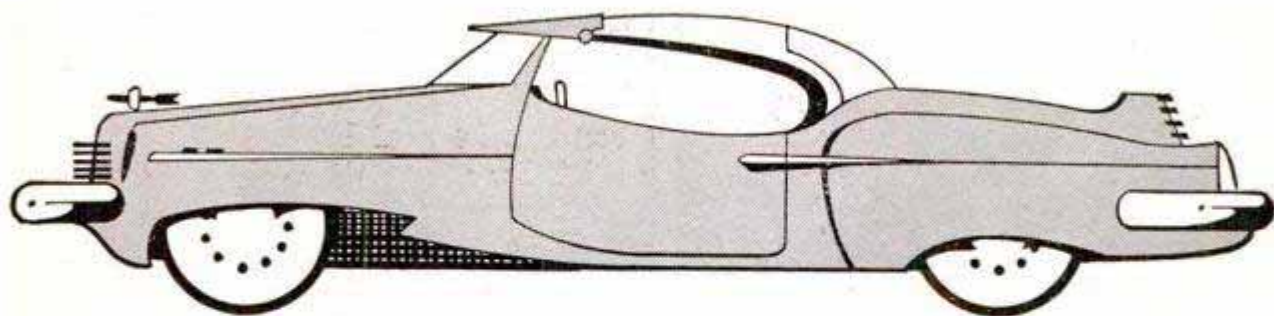
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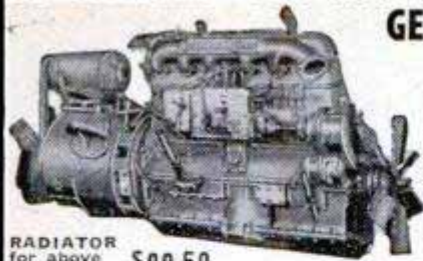
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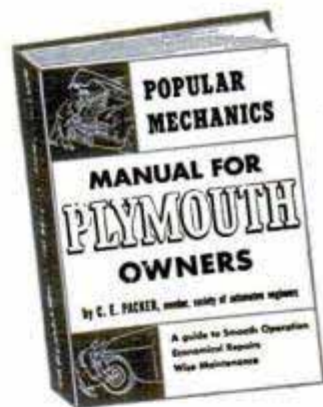
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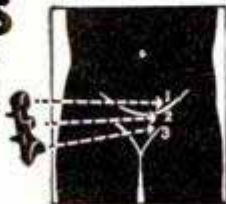
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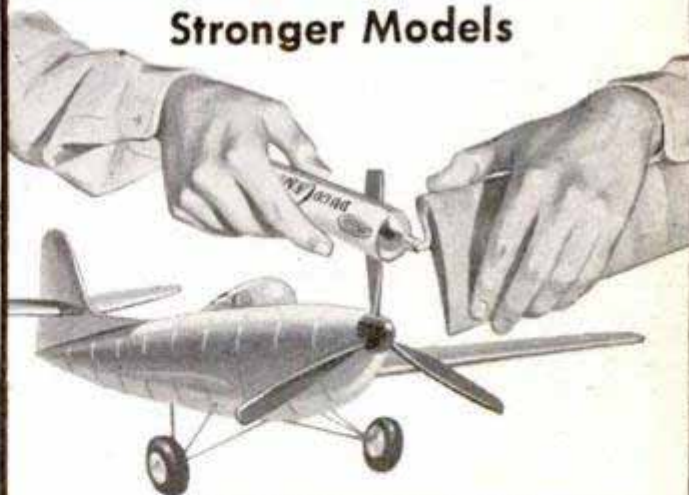
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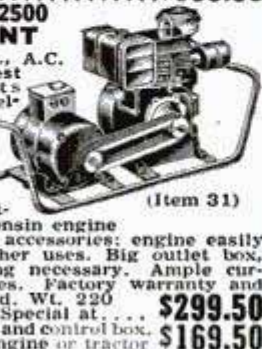
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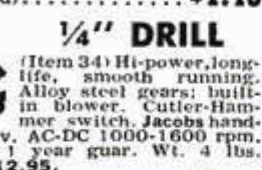
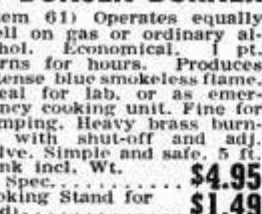
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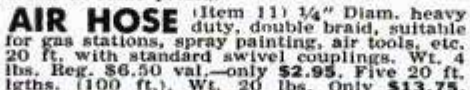
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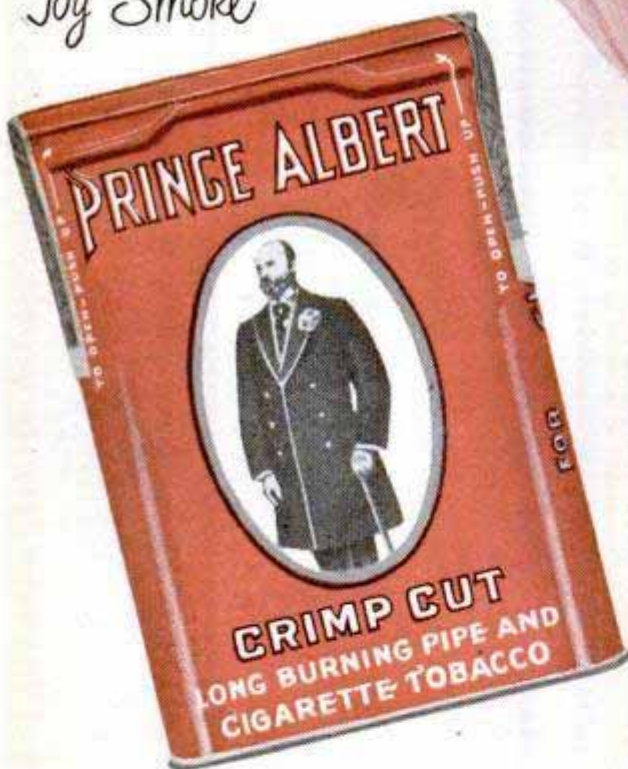


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Staging 200 movie wars has skilled Lou Witte, below, in the use of props like this flame-throwing tank

Mastermind for Hollywood's WARS



By Andrew Hamilton

WHEN THE Marine Corps general spotted the machine gun, he loosed a string of profanity. "Why isn't that gun in Korea," he demanded, "instead of being used in a blankety-blank movie?" He quickly cooled off when told it was a dummy gun, run by electricity, compressed air and acetylene-gas flame.

Shirley Temple crouched against a tree in a movie about the French and Indian wars, while bullets splintered the bark around her. Film fans shivered, but she was as safe as in her Santa Monica home.

More recently the quiet waters and tropical air of the Virgin Islands churned with huge splashes, flared with bursts of flame,

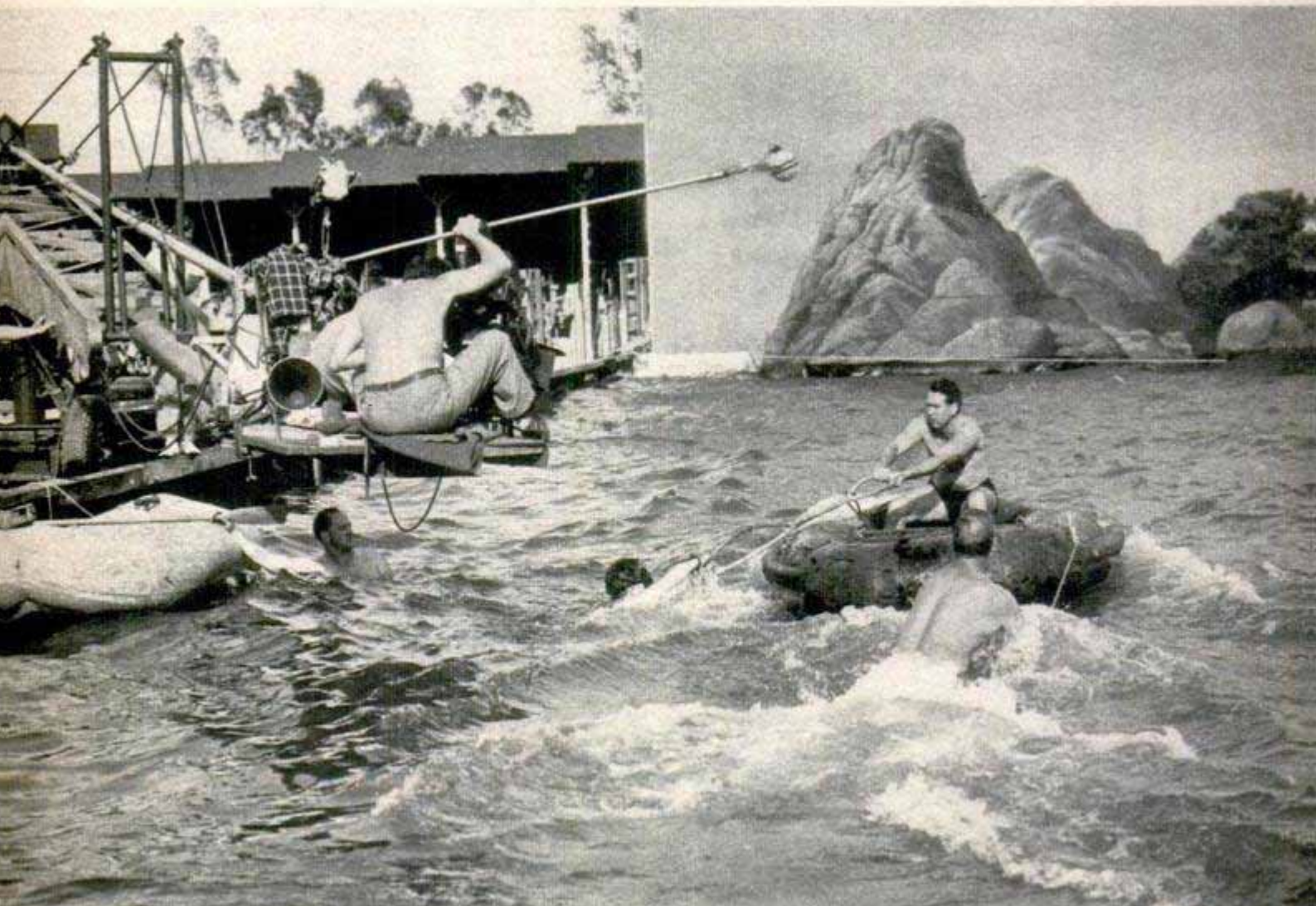
blackened with towering columns of smoke and reverberated to ear-shattering explosions. It was a motion-picture crew making "The Frogmen," and a Navy officer acting as technical adviser muttered, "Just like Iwo Jima!"

The man who gets such realism onto celluloid is Louis Witte of Twentieth Century-Fox. He's Hollywood's ace authority on the arts of war, and has probably masterminded more military movies than any man in the business.

Around the studio he's commonly known as a "special effects" man. But his full title is Head of the Mechanical Effects and Arsenal Department.



For film life of General Rommel of North African fame, Witte set up the desert-bombing scene, above. Close-up water action, like that, below, from "The Frogmen," can best be shot in a reservoir on the studio lot



Tall and soldierly, Witte was once an engineering student at the University of Washington, fought with the Army engineers in World War I, worked for DuPont as a powder expert and came to Hollywood in 1925. His first picture was the famous "What Price Glory," and he's done more than 200 since then.

He can create the dramatic sweep of a tank charge, an amphibious landing or an artillery barrage. Or, he can give you small, intimate vignettes of war—the exploding of a hand grenade, men cowering in a foxhole, the squirt of a flame thrower.

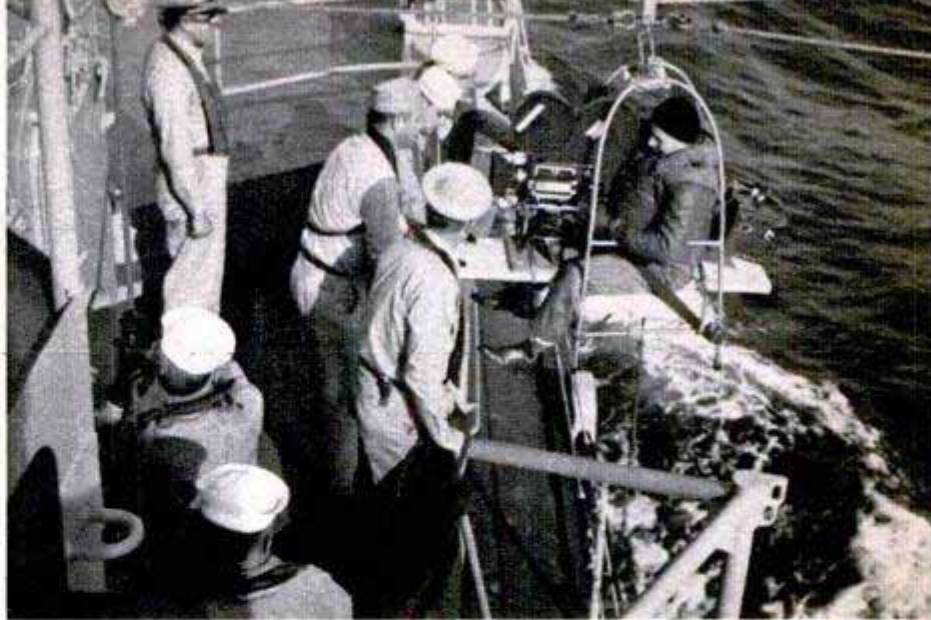
When Witte wants to create the effect of exploding shells, he mixes dynamite, black powder and TNT with such material as chunks of cork, whiting, lamp-black, fuller's earth, black loam and magnesium flash. "That kind of an explosion is more photogenic than the real thing, and there's less chance of killing someone," he says.

Witte is also an expert on weather—rains, fogs, winds, lightning, thunder and hurricanes. He can produce a gentle, misty type of rain or a raging hurricane. Sometimes his fogs are the "pea soup" variety, sometimes the "low rollers" that swirl about your legs. He once perfumed a fog for a finicky female star and flavored another with wintergreen for a child actress. His snow scenes would fool the hardiest New Englander.

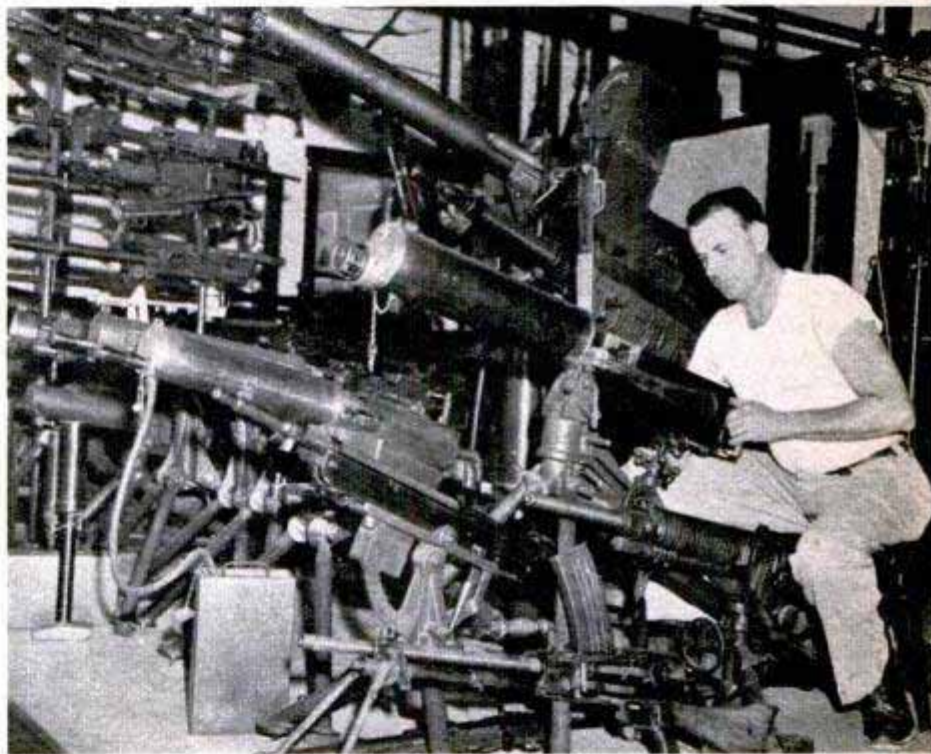
But in 26 years of creating special effects, Witte considers "The Frogmen" his greatest achievement. "It took more skill and ingenuity to make that one come off to the satisfaction of the studio and the Navy than anything I've ever done," he says.

For example, that scene filmed in the Virgin Islands—which is supposed to represent a Navy "softening up" barrage of an enemy-held seacoast before the underwater demolition teams go in to dismantle mines, booby traps and beach defenses.

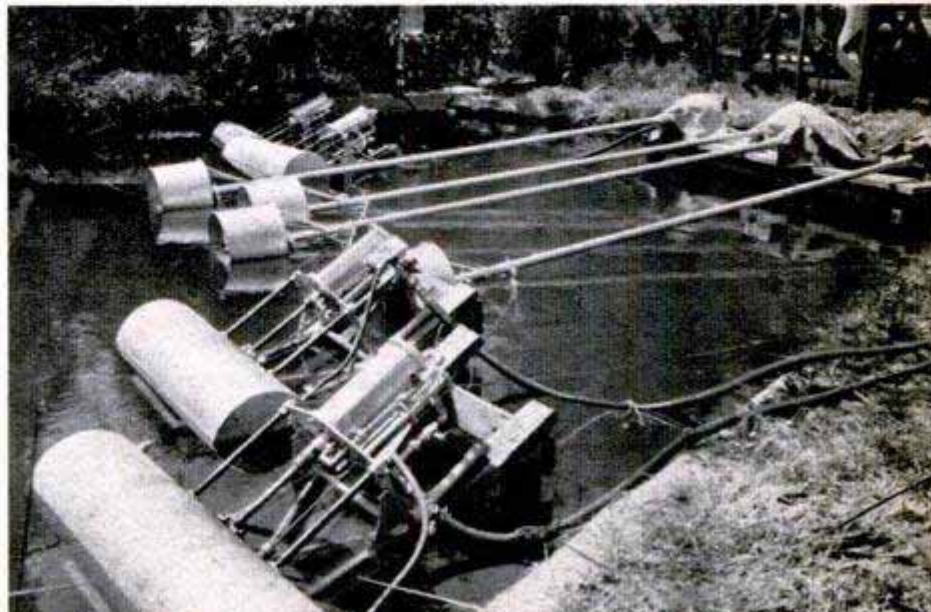
Setting it up required a crew of seven special-effects men, 25 Navy frogmen and 45 natives working 12 hours a day for two weeks in picturesque Bovini Bay near St. Thomas. They used more



For added realism, cameraman prepares to get close-to-the-water footage from a breeches-buoy line suspended between two ships



A corner of Witte's \$135,000 arsenal of 4000 guns, one of the largest collections in the world. Some of it was used to guard Los Angeles during the war. Operated hydraulically, the devices below churn and agitate water in the reservoir into wave motion



than 200,000 feet of electrical wiring (connecting individual explosions to a central control panel), 90 cases of dynamite, 500 pounds of black blasting powder, 250 pounds of flash powder, 1000 gallons of gasoline, 700 gallons of diesel oil and two tons of TNT.

The scene called "Hollywood's Biggest Boom," required thousands of man-hours to construct—yet it lasts only 62 seconds on the screen.

About 90 percent of the picture is shot on, in or under the water. For storm sequences filmed off Cape Hatteras, a unique under-seas diving bell was used. The seven-ton steel structure is, in effect, a small, under-seas studio. Two king-sized pontoons rest on the water and a steel ladder leads down to the below-water compartment, fitted with four 30-inch-square windows of inch-thick optical glass. Cameras may be aimed from these portholes.

When it was necessary for the camera to move around, though, and follow the swimmers underwater, the new Aquaflex camera was used—the first time by any motion-picture studio. It was employed both on location scenes in the Virgin Islands and in Twentieth Century-Fox's "tank" on the studio lot.

The Aquaflex is a 107-pound camera entirely independent of air supply or electric cables running to the surface. It has its own battery-powered lights and is fitted with fins and a rudder—in appearance almost like a stubby little toy submarine. One man can operate it with one hand, leaving the other free for swimming.

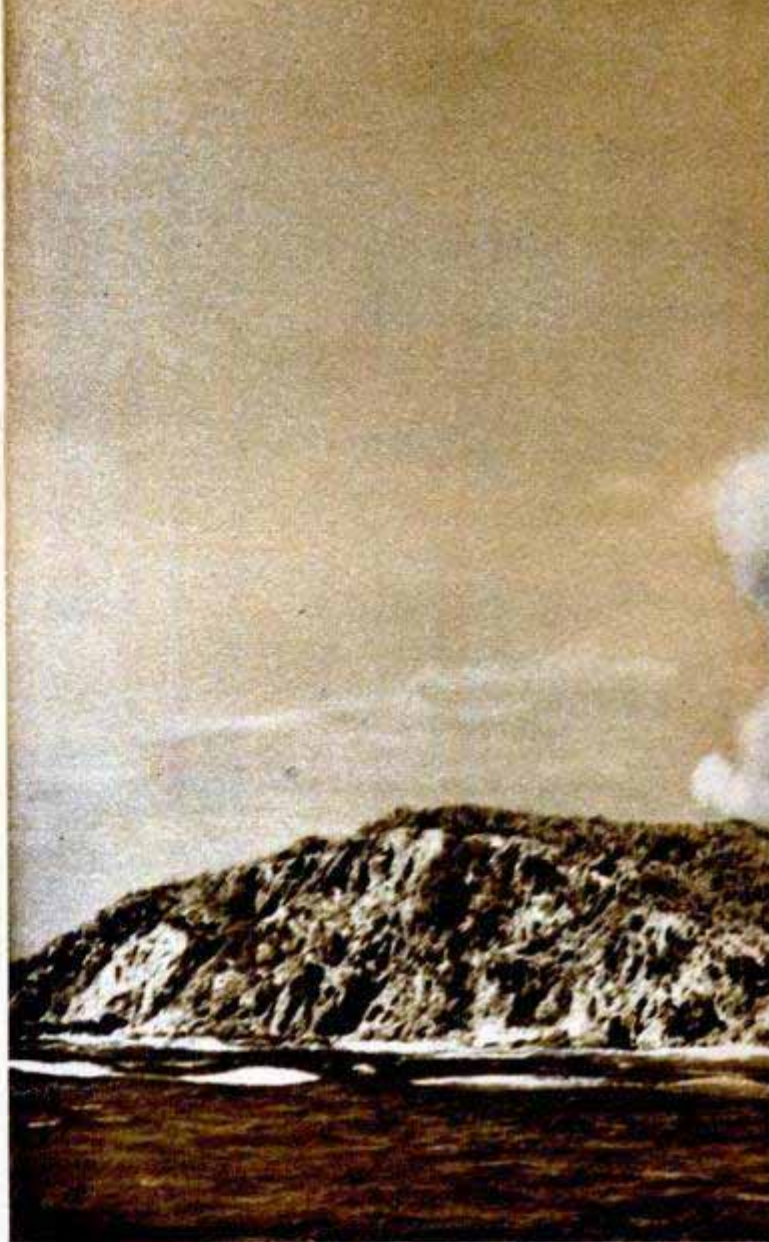
Sound problems were licked, too. For example, it was demonstrated for the first time that ordinary microphones could be used to record sound underwater. Regular mikes, sealed in rubber balloons with waterproof tape, were found to be five times more efficient submerged than when operated in dry air.

Nearly 100 new sounds were added to the studio library during the shooting—voices of actors through diving masks, the threshing of giant sharks, the eerie hissing of the submarine aqua-lungs worn by the actors. Also used for the first time was a gyroscope-balanced platform to keep the camera on an even keel at all times.

Although the entire crew—actors, technicians, prop men and special-effects experts—were chosen because of their swimming ability, Navy-tested precautions to prevent loss of life were rigidly observed. For example, when anyone went into the water on location, he was required to wear a sack of cupric-acetate tablets around his neck—the best known shark repellent.

In some of the close-up scenes taken in

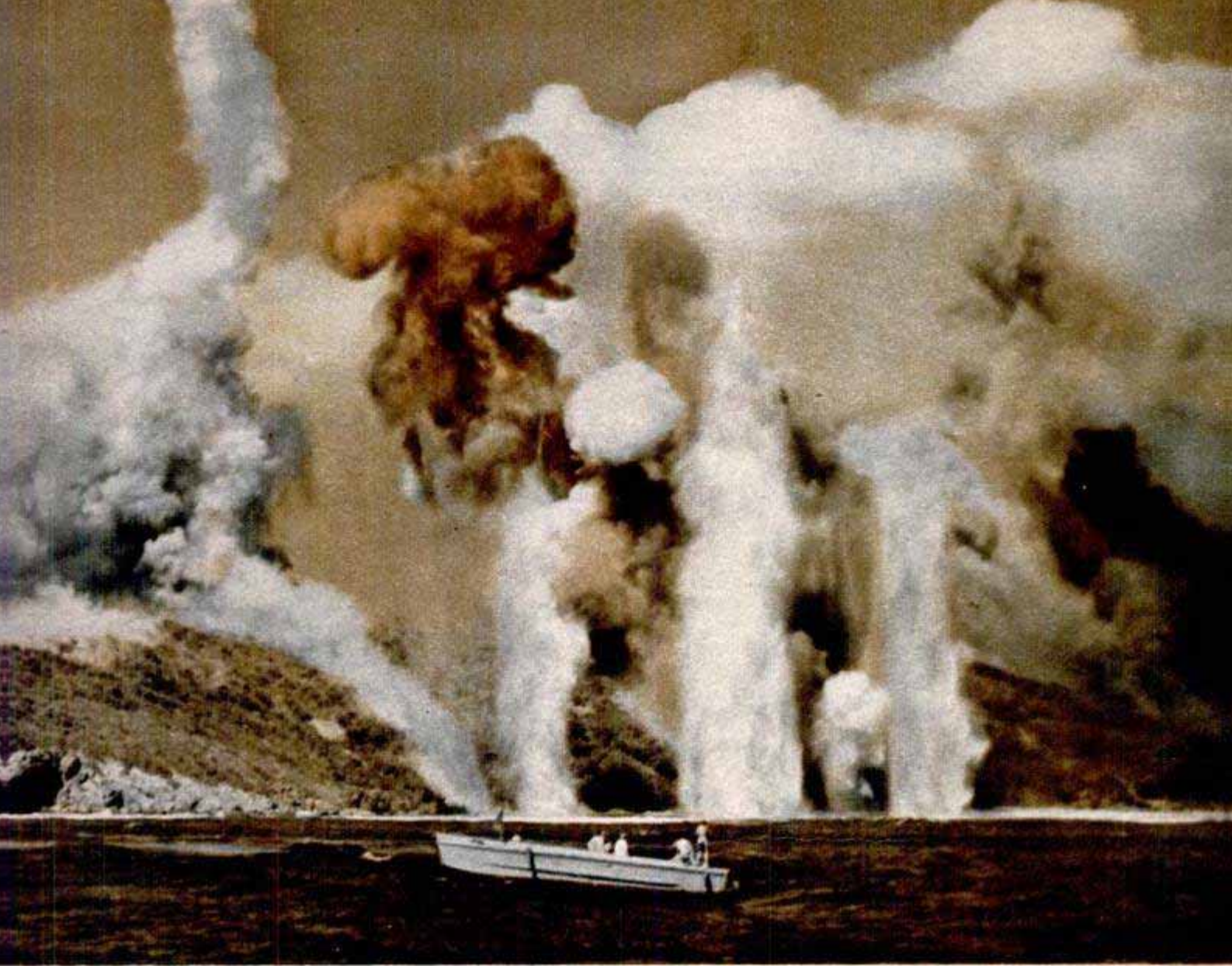
(Continued to page 226)



Termed "Hollywood's Biggest Boom," 1000 gallons of gasoline, 500 pounds of blasting powder and 90 cases of dynamite were used to create the explosion above

Underwater scenes in "The Frogmen," below and on the opposite page, were shot with a new submarine-shaped camera with fins and a rudder. A man can operate it with one hand, leaving the other free for swimming. Camera carries air and lighting supplies







H. M. Beard, 810 Saxe St., Beaumont, Tex.

Street "Stethoscope"

With the aid of a homemade street "stethoscope," city authorities in Beaumont, Tex., are "prospecting" for 3500 water valves hidden beneath the paved streets. The lost valves are just a few inches beneath the surface. H. M. Beard, assistant superintendent of water distribution, patterned the instrument after a mine detector. He found that if the operator used a headset, the lead wire picked up electrical body discharges in sufficient quantity to affect the squeal of the detector, so he placed the headset in the instrument box and ran a stethoscope tube to it. Now the operator listens like a doctor while the instrument picks up the "pulse" of the hidden water valves.



Murray Mfg. Co., 63 Rock St., Avon, Mass.



Portable Neon Sign

Going the sandwich sign one better, a portable neon sign is the newest idea in advertising in Tokyo. The sign, powered by a small battery, will remain lighted for several hours.

Algae Factory

Algae are simple plants that provide us with the best way of capturing the sun's energy and, because of this, are often thought of as the food of the future. News that makes this possibility more likely comes from the University of Texas where a highly efficient algae-growing apparatus has been developed. For each gallon of water in the apparatus, $\frac{1}{2}$ pound of algae is produced. Under natural conditions, such as in a pond, it takes about 50,000 gallons of water to produce that much algae. Scientists expect algae to be a future source of animal food and of raw materials for the making of fats, oils and other organic materials.

Phone Guard

When a new guard is installed on a telephone, children won't interrupt phone service if they remove the receiver or play with the dial. The child can play with the telephone without actuating the dialing mechanism. The guard is slipped in place over the contact points of the receiver. Lifting the receiver will not release the points until a button is pushed. Returning the receiver to the cradle automatically locks the contact points again.

☐ Reversible bifocal glasses allow the user to rotate the lens at will to move the bifocal portion to the top.

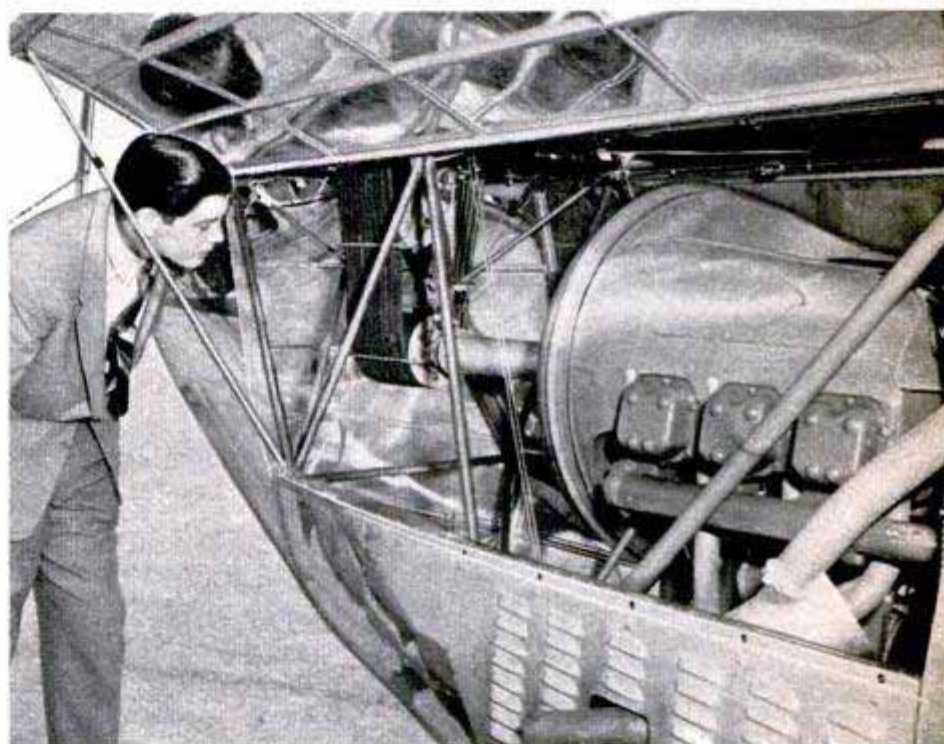


Rising straight up, the twin-rotored helicopter, above, travels 1520 feet a minute. Its horizontal speed is 100 miles an hour

TWO-PASSENGER TWIN-ROTOR HELICOPTER

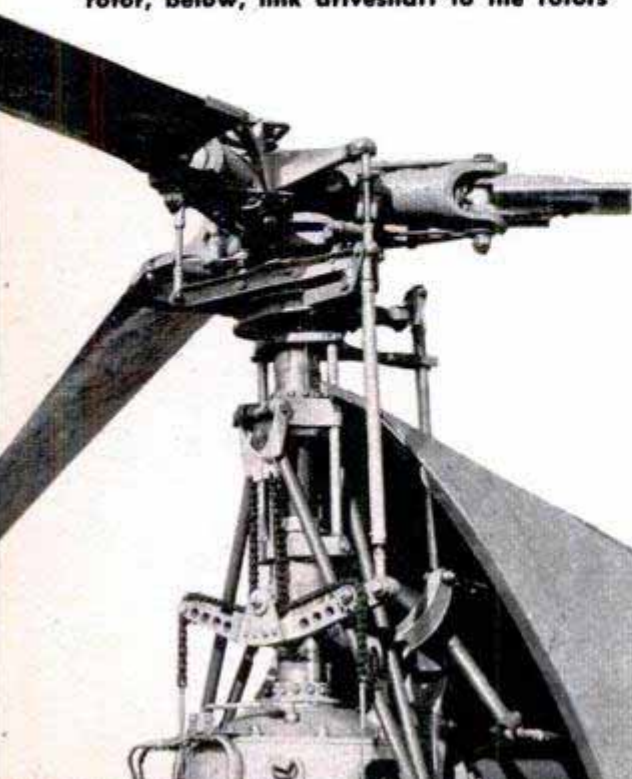
DESIGNED for relatively large production, a twin-rotor helicopter that carries two people and baggage is undergoing final flight tests in Los Angeles. It has a top speed of 100 miles per hour and a cruising range of 260 miles. The rotors use automotive-type gears and bearings. The blades are formed without rivets from simple extrusions, an economy made possible by their small size. No antitorque propeller is needed. The upholstered cockpit has standard dual controls, with instruments and switches on a pedestal in front of the two occupants.

Automotive-type gears and bearings in each rotor, below, link driveshaft to the rotors

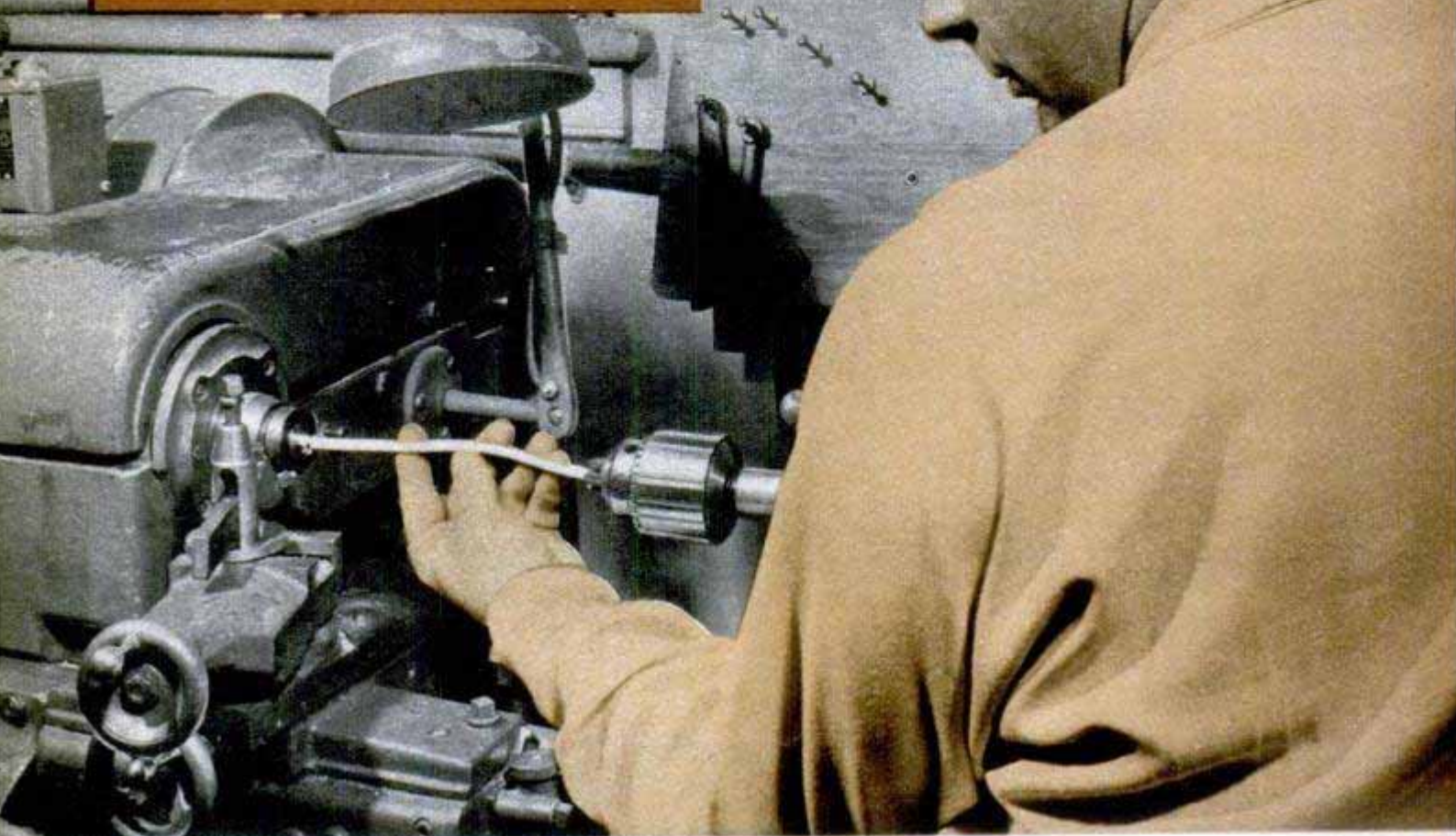


McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles, Calif.

Ten V-belts connect engine, above, to main driveshaft. Switches and instruments are on pedestal, below, between two occupants



LOCKHEED'S *Handyman*



By Sam Lynch

THEY LAUGHED when Bill Shott opened his homemade electric lunch box—but none of his co-workers were surprised. In the electronics laboratory of Lockheed Aircraft, Burbank, Calif., they have learned in 15 years to expect the unusual from him.

He had cut the bottom out of a conventional lunch box and replaced it with a metal grill. Underneath he attached an insulated frame holding two Nichrome wires unwound from electric-heater elements, connected in series to reduce the heat. Inside the box, a Pyrex dish held an "entree" of beans and sausage.

At noon he plugged the container into a power outlet and enjoyed a hot meal.

Along with innumerable gadgets for his own television-repair shop, Bill has developed many ingenious time and money-saving devices for Lockheed. One is a method of threading wires through long lengths of flexible plastic tubing, commonly called "spaghetti." Hundreds of feet of it are used to protect wiring in a large plane.

Formerly, it had been a slow, tedious process to hand thread a string or thin

To hold flexible plastic "rope" to .001-inch tolerance, Bill Shott rigged up a method of feeding it, above, through a reamed-out drill rod with teeth cut on it

Shott has a hot meal at noontime by plugging in an electric lunch box he made from a conventional container. The dish is Pyrex. "Danger" label is a gag



"pull" wire into 30 to 40 feet of tubing and threading longer lengths had been impractical. Bill devised an air gun that, in a few seconds, blows a string through as much as 100 feet of tubing.

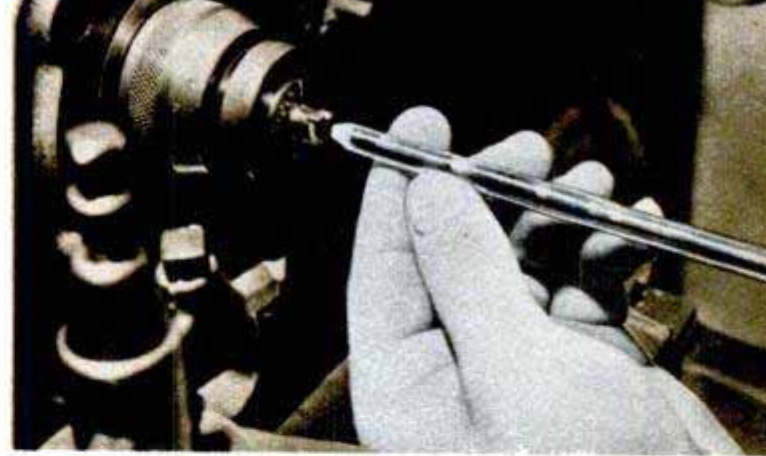
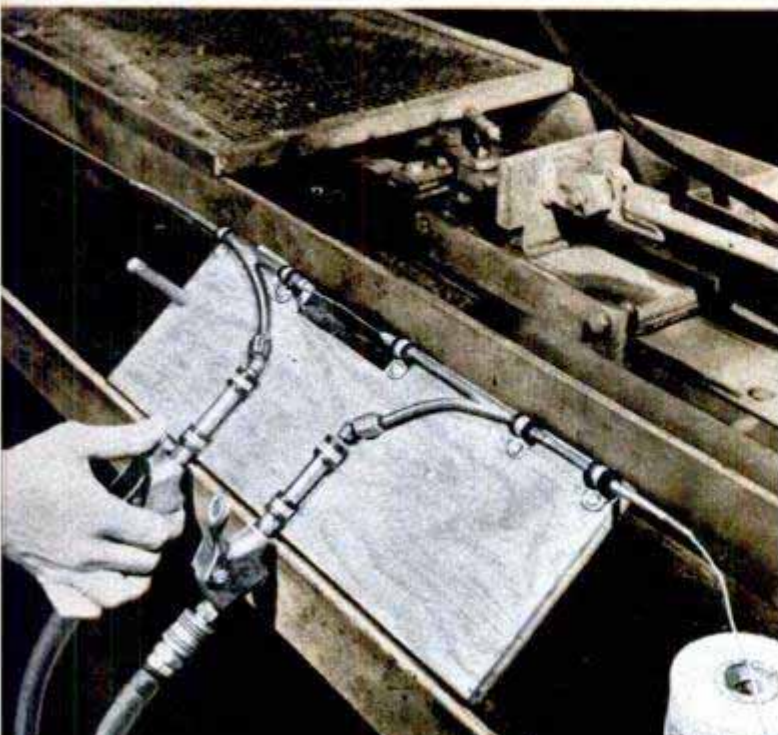
Another device of his is appreciated by workers who have to crimp any quantity of lugs onto electric wires. Previously, it was done with special pliers. Bill, nursing tired hands, sawed off the head of the pliers, drilled a hole in each jaw to which he attached a coiled spring to hold them open, and then welded a bolt to the bottom jaw so that it could be bolted into the hole where the stationary set in an air-operated rivet gun is usually mounted. Onto the top jaw of the pliers he welded a small round plate (head off a bolt) against which the movable set in the rivet gun squeezes. Now air pressure squeezes the lugs on.

When Bill came to Lockheed, it was frequently necessary to change the voltage of battery carts from 12 to 24 volts. This meant unbolting several bus bars. Bill devised a throw switch to do it. Then he noticed that some generator-control boxes in Hudson bombers were defective, necessitating removal for repair. So Bill built a test board to determine quickly, before installing a box, whether it was defective, and if so, what part was at fault.

On another production line, when four feet of insulation had to be hand-stripped from thermocouple wires in each plane, taking up to 10 minutes and often damaging the wires, he drilled a hole in a Micarta block the size of the covered wires. He inserted a razor blade the depth of the insulation in the hole and, as fast as he could pull the wires through, stripped them without a scratch.

During the war Bill was concerned over

Air gun for blowing string through long lengths of plastic tubing. String will later pull wire through



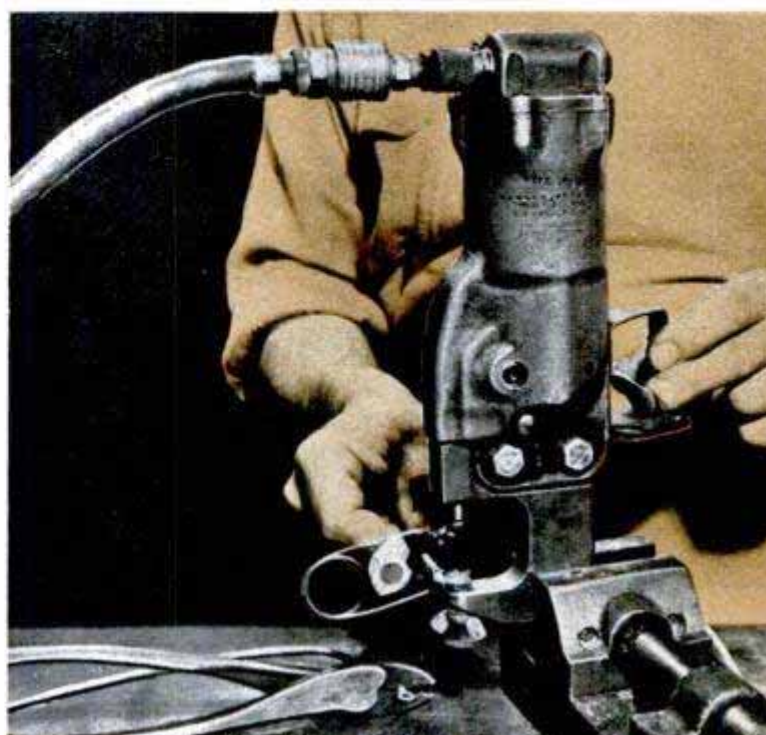
Close-up of flexible plastic tubing being fed through reamed-out drill rod for an ultrafine "shaving" job

punctures in precious tires, caused by packing-case nails lying around overcrowded freight terminals. Using rejected aircraft solenoids and generators, he devised a magnetic bar, attached it to a tractor and drove it around the hangars and warehouses picking up the nails.

In the laboratory he was handed a piece of semiflexible plastic rod and asked to shave it down to a slightly smaller diameter. It was to be used as the core of a tiny coil and had to be within .001 inch of a certain diameter. Bill realized that shaving what amounted to plastic "rope" in a lathe would be impossible, let alone keeping it to a tolerance of .001. So he took a short piece of drill bar, reamed a hole in it the exact size desired, cut teeth in the remaining "shell" and, mounting it in a lathe chuck, fed the plastic rod through it as it turned slowly.

On his last birthday, Bill's wife clipped his horoscope from the paper. It read: "Your mind teems with all sorts of new ideas for improving duties."

Replacing pliers, another timesaver devised by the "Lockheed handyman" crimps lugs onto electric wires



SCIENCE "FACTORY" PRODUCES IDEAS

GONE ARE THE DAYS when basic scientific research can be done while sitting under an apple tree (like Newton) or while lounging in a bathtub (like Archimedes). Science has grown too complex for that. Today, the scientist requires complicated and expensive equipment to carry on his work of probing the unknown.

Providing such facilities are the Research Institutes of the University of Chicago. These institutes are idea "factories" where scientists explore the unknown, seeking basic knowledge. America, far ahead in applied sciences, depended on Europe for most basic science before World War II. Today, this dependency is being eliminated by scientists like those in the institutes.

Three broad fields of study are included: 1. Nuclear studies; 2. Radiobiology and biophysics; and 3. Metals. The University hopes to add others in the future.

The nuclear-physics program is the largest privately supported research program in the field today. The research is nonsecret and devoted to peacetime applications.

Appropriately, the institute buildings are across the street from the west stand of Stagg Field where, on Dec. 2, 1942, the first controlled chain reaction was accomplished in deepest secrecy. Many scientists who took part in this epoch-making experiment are continuing their research on more peaceful matters at the institutes. Included are such outstanding men as Enrico Fermi, designer of the Stagg Field pile, Harold C. Urey, discoverer of heavy water and James Franck, photosynthesis expert, all of whom are Nobel prize winners.

Cost of the institute buildings and equipment is about \$11,000,000, of which the biggest chunk was for the synchro-cyclotron, a \$2,500,000 atom smasher. A major part of the cost of this machine was paid by the Office of Naval Research. The buildings, covering a block, have complete facilities for research, including built-in systems to provide steam, hot and cold water, gas, compressed air and vacuum to each lab. Special precautions were taken, such as a battery of 86 blowers, to remove dangerous gases from the buildings.

Operating costs are paid in part by industrial concerns that are listed as sponsors. The companies receive no direct help from the institutes (no tests or product experimentation, that is) but contribute because they know that a continued expansion of basic knowledge is essential in our industrial world.



Aetna Casualty and Surety Co., Hartford, Conn.

Drive-Yourself Test For Motorists

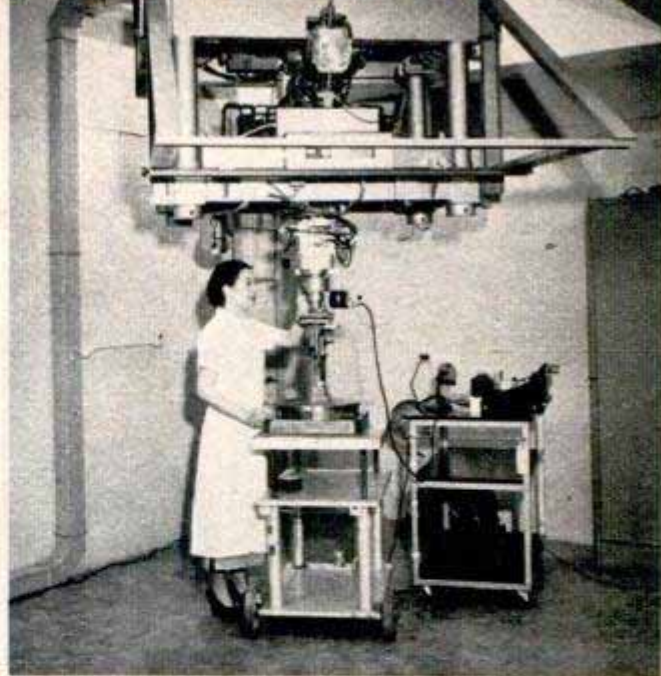
In three minutes, an unprejudiced test machine decides whether or not you are a good automobile driver. The driver, seated behind a conventional steering wheel, sees a series of traffic situations projected on a screen in front of him. The film accurately simulates what he might see when actually operating his car. During the test the driver must jam on his brakes, steer around road barriers, slow down to avoid a truck, use a turn indicator, sound the horn for a careless pedestrian and avoid speeding. When the three-minute drive is over, the machine dispenses a report card that rates the driver for each situation.

Microwaves Aid Power Distribution

Microwaves are carrying messages to aid in the smooth distribution of electric power through the Pacific Northwest. The Bonneville Power Administration has over 200 miles of microwave circuits in operation and expects to have at least 1400 miles within five years. The microwaves are reflected and beamed from one station to another. Up to 20 or more simultaneous conversations can be carried over the same radio waves. The communications system is used to keep the load dispatcher apprised of load conditions, to send instrument readings and to tell within seconds the exact location of a power breakdown. The circuits are not affected by weather conditions such as heavy snow and ice.



Above, using the scanning technique of television, an electron-gun X-ray device being developed at the institutes gets brighter pictures with less exposure

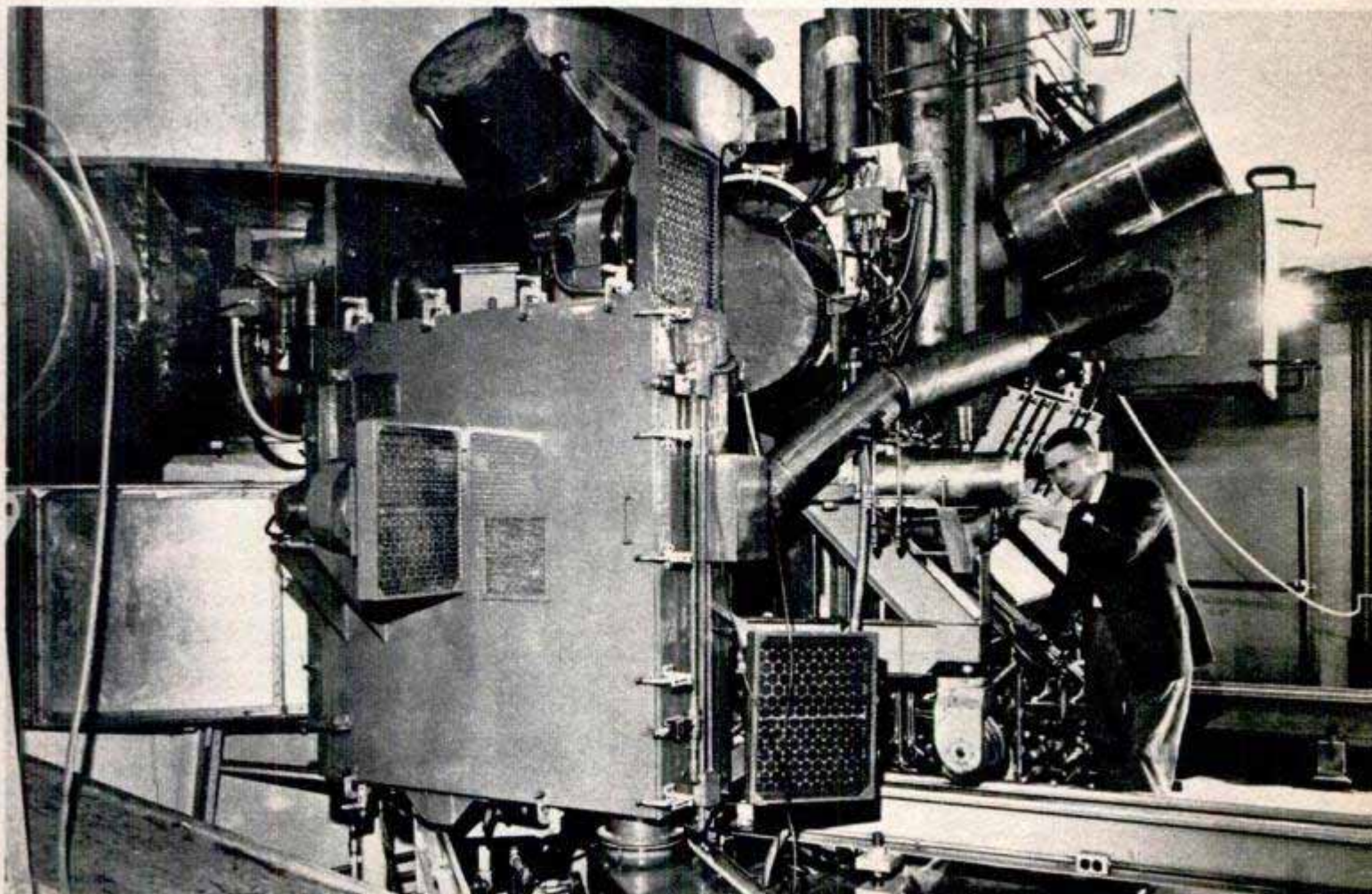


Above, right, the beam from a huge two-million-volt accelerator is aimed at a part of a live cell only 1/12,000 inch square with this precise apparatus

Right, under construction at the institutes is the kevatron, oldest type of atom smasher, with which scientists produce fission in the lighter elements



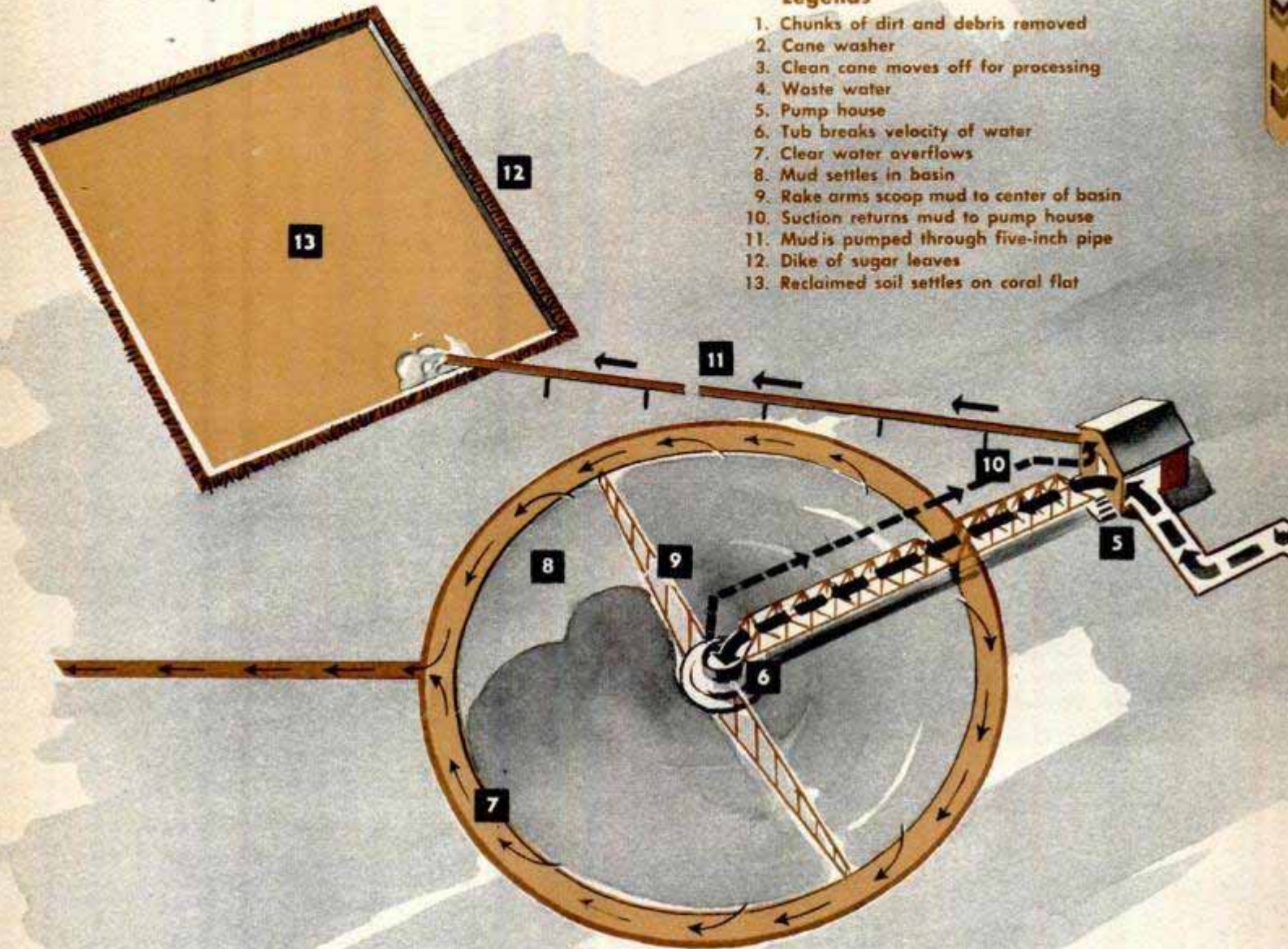
Below, pride of the University is the 450-million-volt synchro-cyclotron, most powerful atom smasher known. It produces a beam of the mysterious mesons



NEW LAND FROM OLD

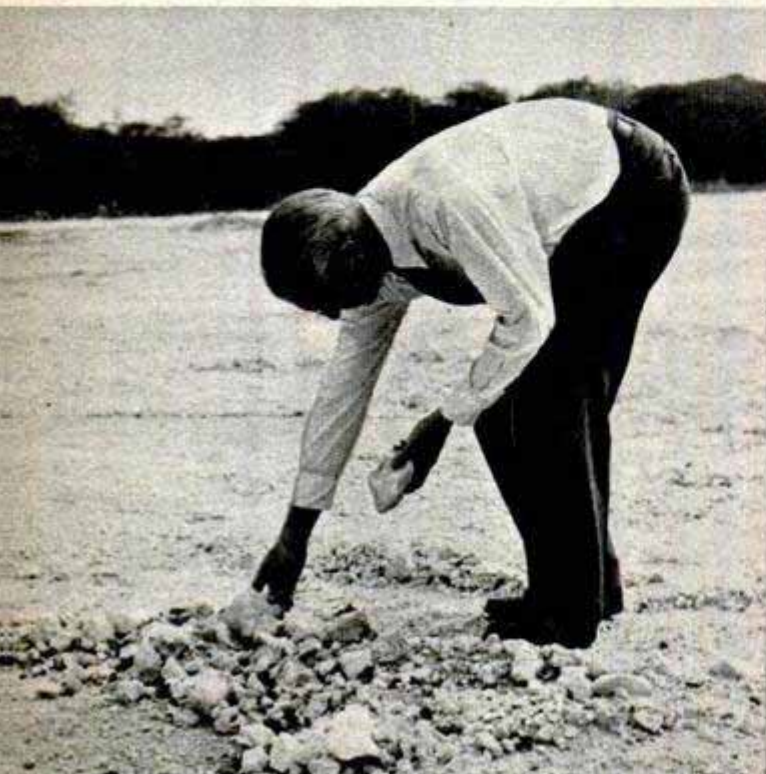
Legends

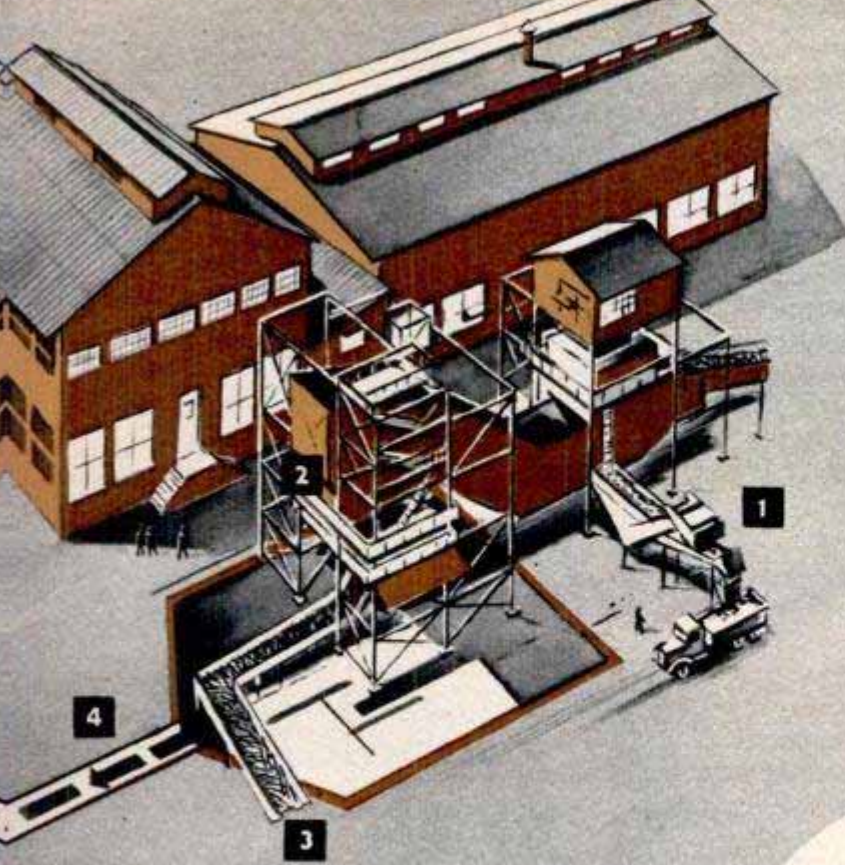
1. Chunks of dirt and debris removed
2. Cane washer
3. Clean cane moves off for processing
4. Waste water
5. Pump house
6. Tub breaks velocity of water
7. Clear water overflows
8. Mud settles in basin
9. Rake arms scoop mud to center of basin
10. Suction returns mud to pump house
11. Mud is pumped through five-inch pipe
12. Dike of sugar leaves
13. Reclaimed soil settles on coral flat



BEFORE: Nothing can grow on the hard-packed white coral flats. The land is useless for agriculture

TREATMENT: Water laden with rich silt pours out across the flat. The result is mud two feet deep





but a white coral reef where not even weeds would grow. Now look at it.”

All this is possible through a new and novel, but somewhat expensive, machine called a Hydroseparator being used on several Hawaiian plantations. So well has Ewa's \$125,000 Hydroseparator worked, however, that Frank is looking forward to converting another 300 acres of once useless coral land. At about 30 acres a year it will take 10 years to complete the job.

Land reclamation in Hawaii, however, happened almost accidentally.

In Hawaiian cane fields, virtually every phase of operation from planting to harvesting is done mechanically. Instead of hand-cutting, as in most parts of the world, weird mechanical harvesters of various types are used.

Unfortunately, these mechanical contrivances, not being human, couldn't distinguish between cane, earth or rock. So, a lot of trash as well as cane was sent to the mill.

In recent years, plantations have built huge washers to clean the cane before processing. These washers resemble large Escalators—the cane moves up the “escalators” and is continually washed. The water washes off the rich red dirt which has stuck to the cane stalks; the large boulders, rocks and trash are removed elsewhere in the washer. A mill like Ewa uses about eight to ten million gallons of water each working day just to wash the cane—enough to supply a city of 100,000 people!

The dirty mill-waste water then either ran off to sea and was lost forever, or was

By Richard M. Botts

IN HAWAII, sugar men like big Frank Wiley, superintendent of Honolulu's huge Ewa Sugar Plantation, are performing land-reclamation miracles that have the experts gasping. They're getting soil out of water!

At Ewa, for instance, Frank points with pride to a new field of young cane tossing saucily in the trade wind. “Just a few months ago,” he tells you, “this was nothing

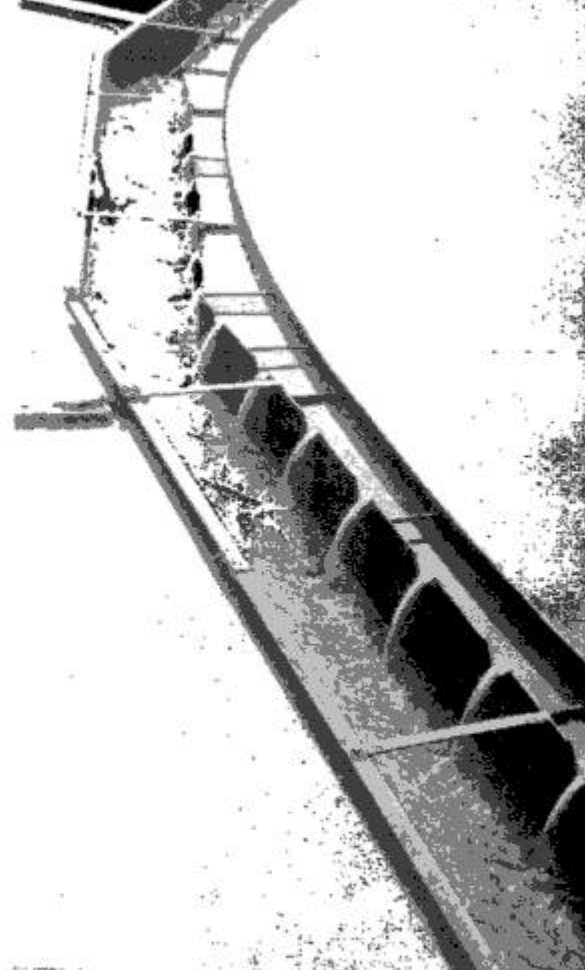
AFTER: At left of trash dike is a new field ready for planting. At right, muddy field is not yet dry

HARVEST: Here's young cane growing on the brand-new field. Equipment yields 30 new acres every year





With basin dry, blades of a rake arm can be seen. They scoop the mud to the center of the big basin



Clear water, with mud settled out, overflows around rim of basin, is used to irrigate the cane fields

used for irrigating the near-by cane fields.

When the plantation used the water for irrigation, they found the system soon clogged so heavily with sediment that the water would not flow properly. This was due to the high silt content in the water after washing the cane. The plantation had to send men continually to the fields to clean out the irrigation system, which resulted in large added expense each year. And when you see miles and miles of tall waving sugar cane that has to be irrigated, you get some idea of the plantation-men's problems.

Some years ago Frank Wiley tried to alleviate this problem by building a U-shaped settling basin which allowed some of the mud to settle, and the free water to drain off into the irrigation system. Unfortunately, this didn't work too well. The basin soon became clogged with mud and could only be dredged out when the mill stopped work over week ends. This was costly and the slimy mud which was hauled away in the trucks dripped all over the roads, causing a traffic hazard. And the water used to irrigate the fields still contained sediment and continued to clog the irrigation system—but not so quickly as previously.

Frank decided to tackle the problem of cleaning the mill waste water with Allan Duvall, engineering representative of The Dorr Co., of Stamford, Conn., a firm special-

izing in machines to remove solids in water.

The first step was to build a pilot plant which they operated for months. The final result was that they not only created silt-free irrigation water with their Hydroseparator machine, but they found they could build about 30 to 50 acre-feet of new land each year from soil reclaimed from the mill waste water.

Frank Wiley recalls the final findings of the work with considerable amusement today.

"The fact that we could produce siltfree water was proven and easy to understand," says Frank. "But I began to wonder if the owners of our plantation wouldn't seriously doubt my sanity if I also announced that I proposed to put 30 acres of new land through a five-inch pipe each year. So, in the report to the owners, we stressed the point that the Hydroseparator could easily and cheaply create siltfree water which would end the troubles in the irrigation system."

These figures were enough to convince the owners that the machine would save its cost in a very few years, so Frank and his engineers went ahead with work on the Hydroseparator.

The engineers first constructed a large bowl-shaped basin in the earth about 150 feet in diameter and 13 feet deep at the center. This was constructed for a high

enough water level so the clear water would flow, by gravity, into the irrigation system. In the center of this bowl is a round center pier and on this a turntable-like structure. Attached to the pier are large rake arms that extend 60 feet out from the center of the basin.

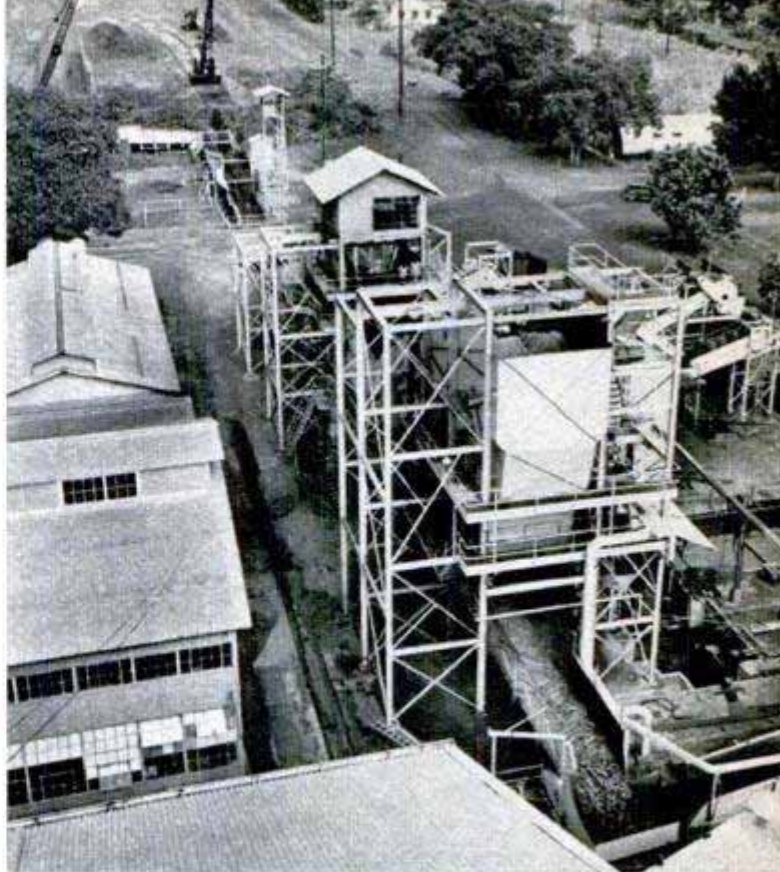
As the waste water leaves the cane washer it flows by gravity through an open cement canal and then by overhead pipe, attached to a steel truss, to the center of the basin. Here the water pours into a center "feed well" which is nothing more than a huge steel tub with holes in it. This breaks the velocity of the water and allows it to remain still while the dirt settles out.

In use, the rake arms turn slowly. It takes about 15 minutes for each rake to complete a revolution. It takes about three hours for the water to pass through the basin. By that time the dirt has settled out. The cleaned water overflows into the V-notched circular flume, which runs around the outer side of the basin, and flows down this flume by gravity to the irrigation system for the cane fields.

In the meantime, the muddy slime has settled to the bottom. The rake blades slowly scoop this slime along the bottom of the basin. As each revolution proceeds, the outer blade on one rake passes the slime along to the path of the next inside rake blade on the following arm until the slime reaches the center.

Here a suction pipe draws the slime away as the rakes bring it to bottom center. This pipe reaches out under the basin from suction sludge pumps in a pump house just outside the basin. The pumps deliver the settled slime into a sludge tank.

Not all the suspended matter in the dirty cane-washer water sinks. Some of it floats. So this is skimmed off the basin and it too goes into the pump-house sludge tank. From the sludge tank there is a continuous feed into high-pressure centrifugal pumps.

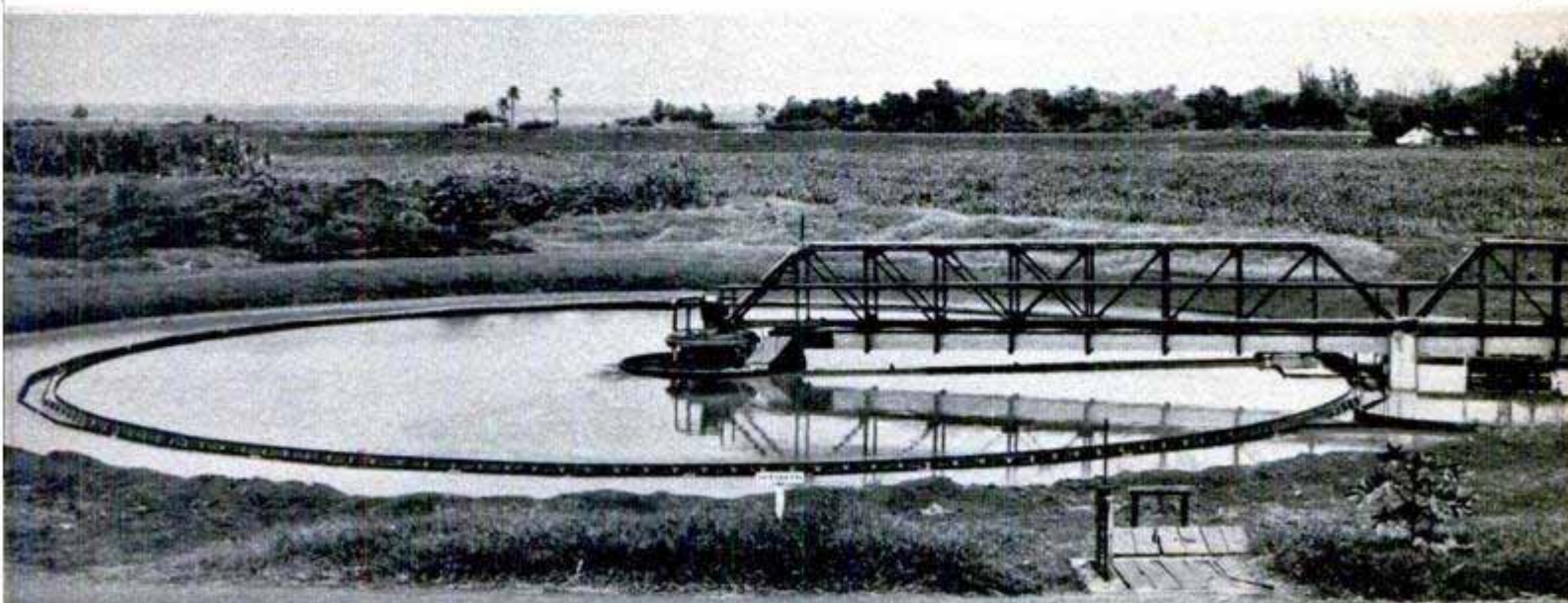


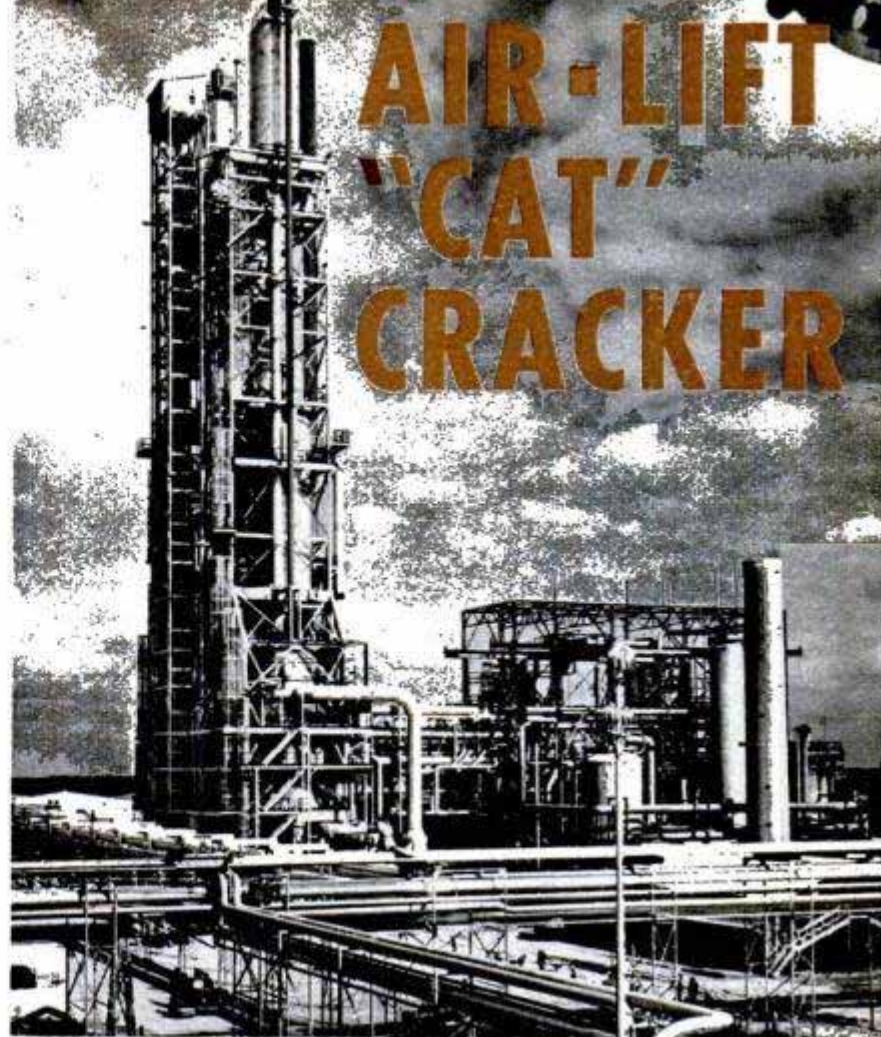
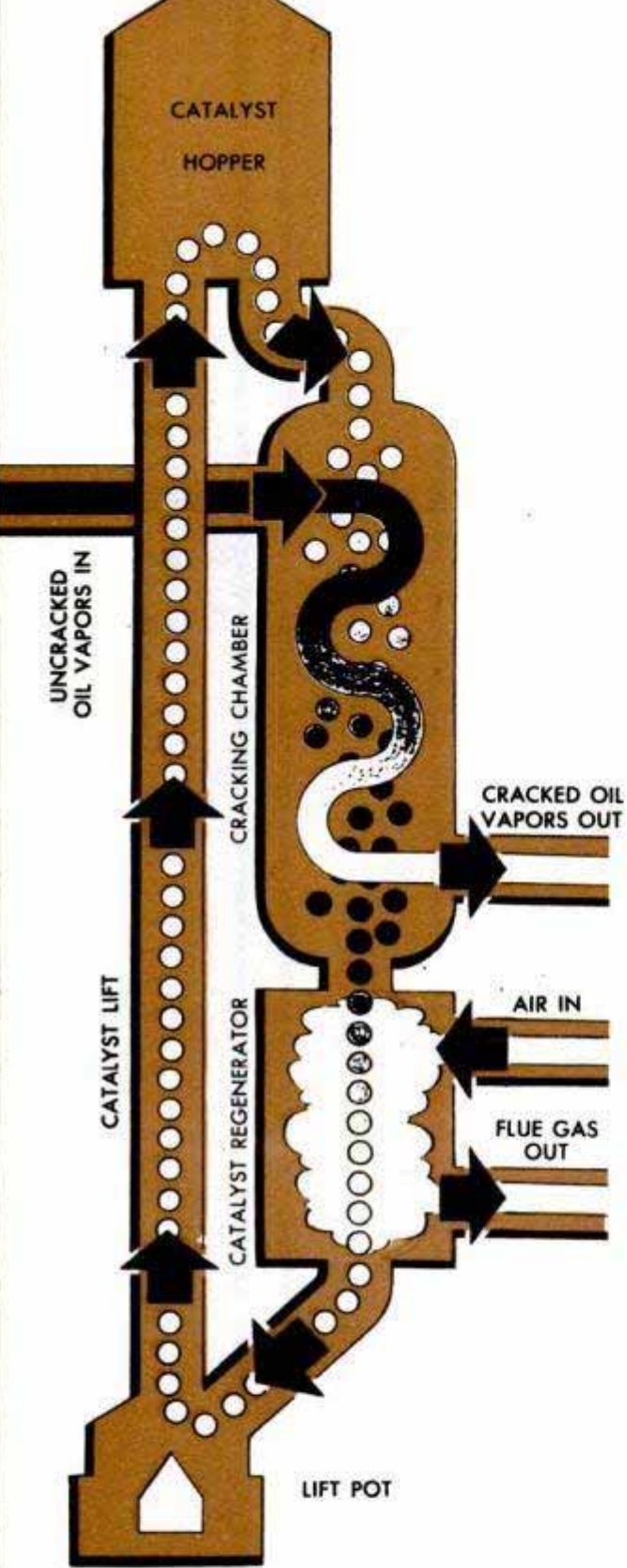
Ten million gallons of water flow through washer daily. Cane moves in one end, emerges clean at other

From the pump house the reclaimed soil is now pumped by five-inch pipe to the coral flats about two miles away. When the mud has dried it takes on a curious color. The top of the new land looks almost fuzzy—as if an earthquake had occurred—for some of it is the light chewed-up part of the cane stalk. Below this are layers of good earth—a mixture of topsoil from various fields. Beneath this is a little sand. When the area is filled to a depth of about two feet and dried up, it is plowed. It is then a rich brown color, and a new field is ready to grow new cane.

As a Bureau of Soil Conservation man puts it: "This is really a fabulous project—erosion in reverse."

Unit 150 feet in diameter separates earth from the water. Earth builds new fields, water irrigates the old



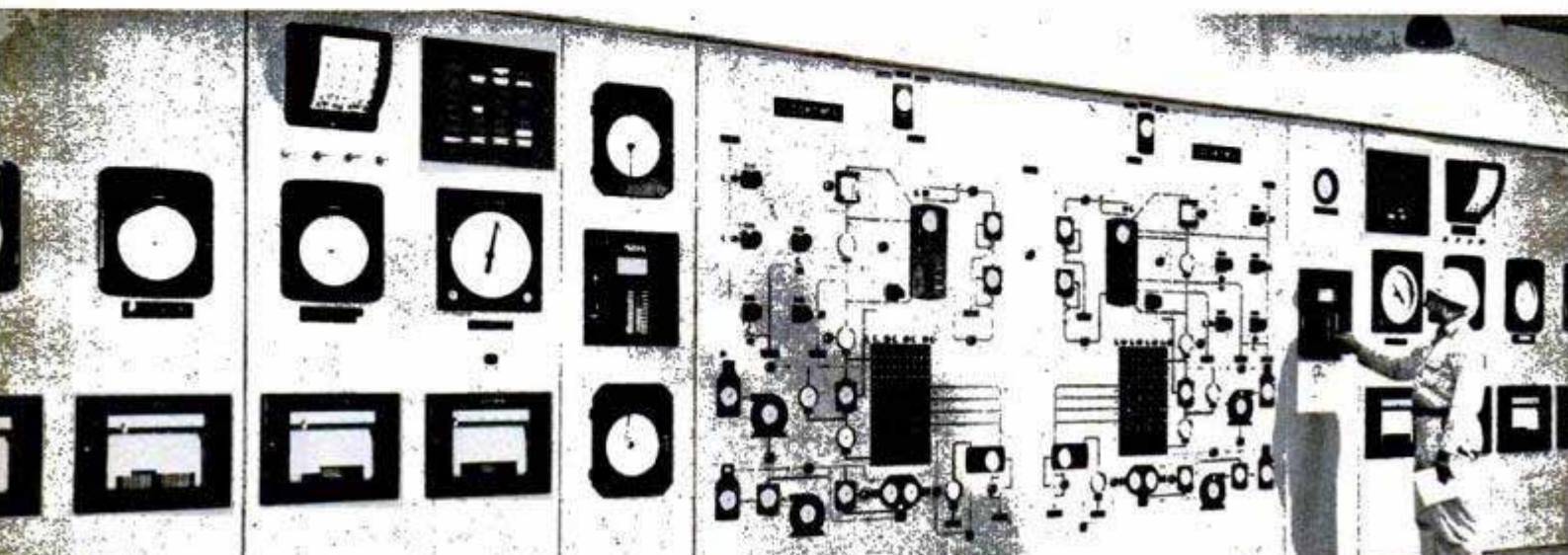


AIR-LIFT "CAT" CRACKER

First of the air-lift crackers is operating at Beaumont, Tex.

LIKE THE daring young man on the trapeze, beads of catalyst "fly through the air with the greatest of ease" to produce 50 percent more high-octane gasoline. In use at the Magnolia Refinery, Beaumont, Tex., the air-lift process eliminates shutdowns for catalyst recharging. Beads are continuously recharged as they pass through the regenerator portion of the cycle. The beads are caught in an air flow at the base of the unit and carried to the hopper at the top. From there they fall through the cracking chamber to the regenerator where the air lift picks them up to swirl them to the top again. Uncracked oil vapors flow around the beads in the cracking chamber. The process is called modified, air-lift Thermoform "cat" cracking.

Left, explanation of process. Below, one man runs the cracker





Detroit Listening Post

By Siler Freeman

UNLESS the National Production Authority changes its mind about allowing the automobile industry to come out with new models for 1952, the ranks of the small-car producers will be swelled by at least one new candidate.

From all indications, Willys-Overland is about to return to the passenger-car field with a small-wheelbase car of new design. The car, which has been completed for some time, will be larger than its two competitors, the Nash Rambler and the Henry J, which are both on 100-inch wheelbases, but smaller than the popular triumvirate of Ford-Chevrolet-Plymouth.

The new Willys will be on a 108-inch wheelbase. It will be more customized than the Henry J but less decked out with a standard accessory group than the Rambler. Unlike the latter, it will be brought out in the closed models first.

Willys-Overland has been in Washington to ask for a better percentage of the automotive steel than it was allotted under the third-quarter setup for the industry. It was given only one percent, at the bottom of the list of passenger-car makers. The tooling for the car is said to be completed and all Willys needs to go ahead with its plans is the green signal on steel.

The Willys passenger car has been a dream of Barney Roos, executive vice-president, for many years. Roos is a great advocate of the light car as the ideal transportation for the masses. He believes the time is ripe for launching his theory, with gas prices, taxes and the cost of living all soaring.

Another potential for this market is Nash's real small car, the NXI. The company, which flashed it before the public more than a year ago, conducted a unique survey to test public reaction to a two-passenger car with a lightweight engine. The idea has not been abandoned.

Nash has several different ideas which it is testing in this field. The original NXI has been lengthened and broadened somewhat. The thinking now is of a car which can seat three and will have about an 85-inch wheelbase. The 18-horsepower power

plant has been definitely supplanted by a 40-horsepower. But whether it still remains at the \$1000 price level at which the company was shooting is hard to say.

General Motors Research Laboratory, which devotes about 50 percent of its varied interests to engines, is now engaged in intensive research on paint finishes. A process is being developed that will help keep the shiny finish on automobiles from "chalking" indefinitely.

The answer is not found in silicone polishes or waxes, according to Ralph J. Wirshing, head of the research-chemistry section. His experiments have been going for 11 years, but it was not until recently that Wirshing saw real progress.

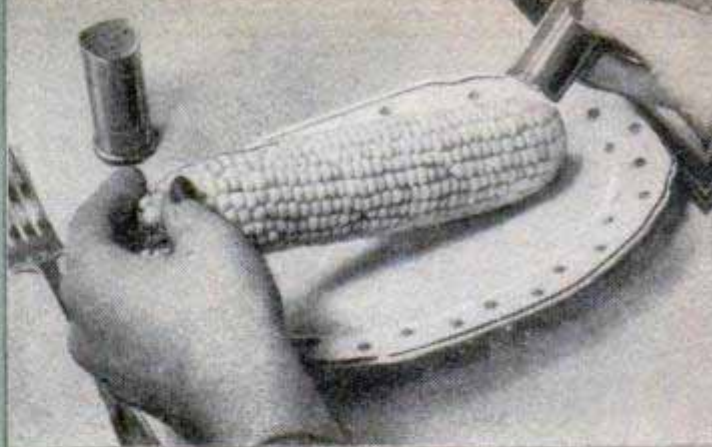
GM's experimenters went from Chile to Miami to find the answer to chalking. They evolved a new theory that a reducing action, not oxidation, causes finishes to deteriorate. This knowledge, said Wirshing, literally forces finishes to fade in a hurry and should aid chemists in trying new formulae to retard dulling of luster.

GM is still interested in engine research. C. L. McCuen, head of the laboratories, revealed recently his engineers are planning a gas-turbine engine to develop around 300 horsepower. The gas turbines, which are now used primarily in aircraft, develop over 5000 horsepower.

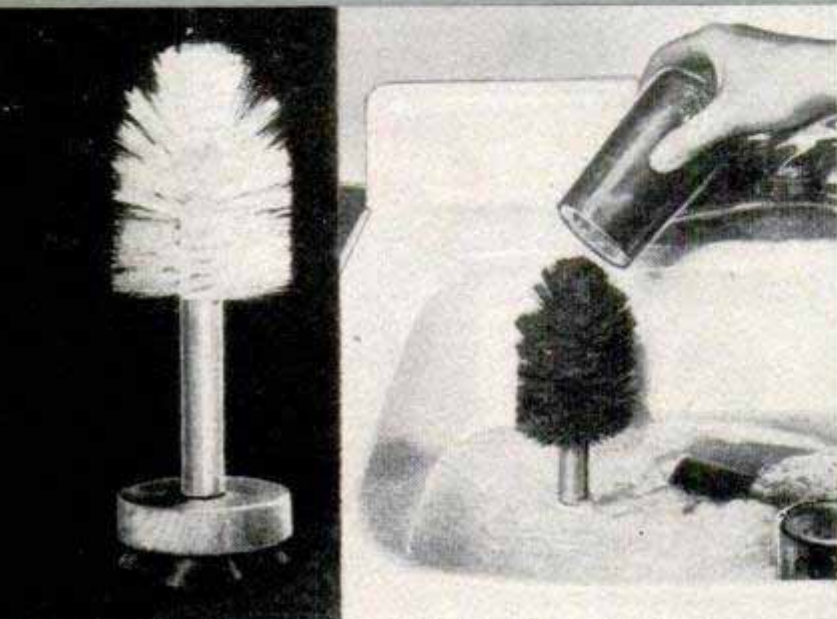
McCuen explains the engine is not designed for automotive use. It will be tested in a Greyhound bus "just to see what it can do." McCuen does not see a gas-turbine engine for passenger cars in any foreseeable future, nor a diesel for that matter. But GM is missing no bets and its program of continuing research takes in gas turbines.

Effortless operation of motor cars is still the objective of the industry. Gears are being shifted automatically, and steering is being aided dramatically by a hydraulic device which is going to be extended in use by the end of the year. Next year, air brakes may make their bow in the passenger-car field. One company is trying out a power brake coupled with the engine. Very little pressure on the brake pedal brings the car to an immediate halt.

WHAT'S NEW For Your Home

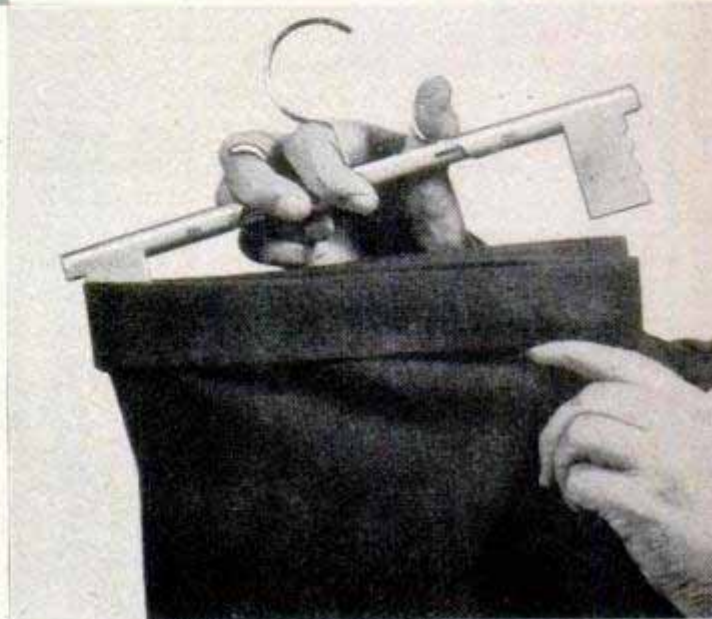


Elron Products, 156 W. Chicago Ave., Chicago 10
CORN BUTTERER eliminates balancing butter on a hot knife! Simply put butter into cylinder, press plunger and spread butter evenly on corn



The Wallace, Davis Co., 2813 Dixwell Ave., Hamden 14, Conn.
GLASS BRUSH is held vertically in the sink by a set of suction cups on its base. You slip the glass over the brush, twist it back and forth and it's clean

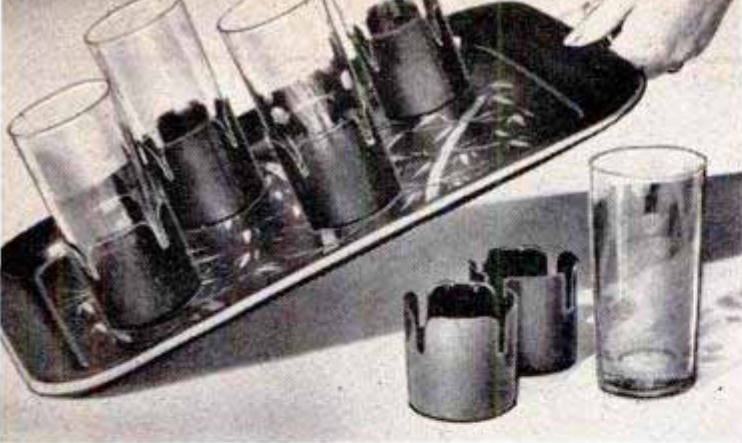
MARKING KIT is a quick means of labeling personal articles, including tools and equipment. The permanent fluid can be used on fabrics, leather, wood and metal
Identi-Kit, 1739 Townsend St., Cincinnati 23, Ohio



Holdapres, 9106 Woodward Ave., Detroit, Mich.
PANTS HANGER slips inside the trouser legs and expands by spring pressure to hold both the press and the trousers. It is of all-metal construction

FILLER FUNNEL guides food into freezer packages, keeping tops of bags clean for tighter seal. It's used with jars, too, and it stores in small space
The Speedex Co., 129 East 159th St., South Holland, Ill.





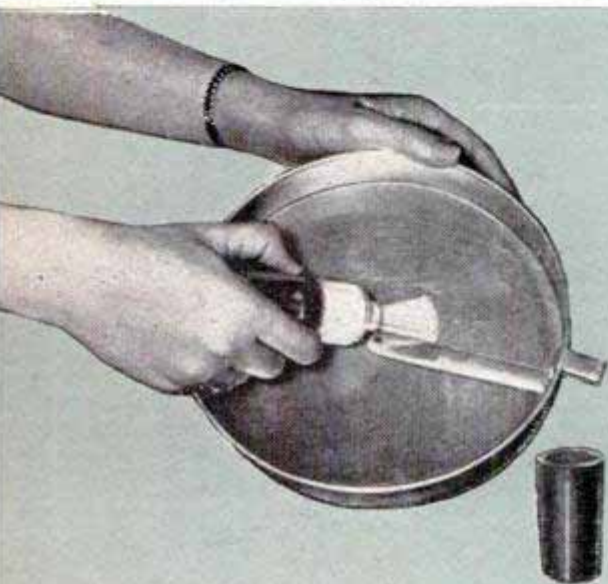
Kelcey Products, 1687 McDonald Ave., Brooklyn, N.Y.

NONTIP COASTERS work like magic. Magnets concealed in plastic coasters cling to metal tray and hold glasses upright even when tray is tipped



Alexander Hertz Co., 94-15 69th Ave., Forest Hills, N.Y.

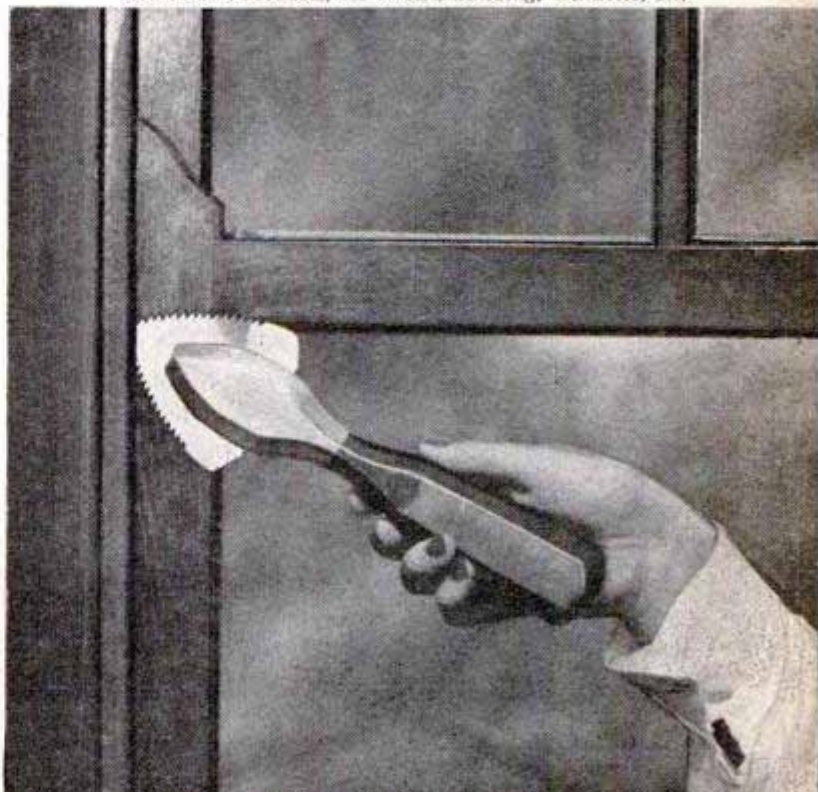
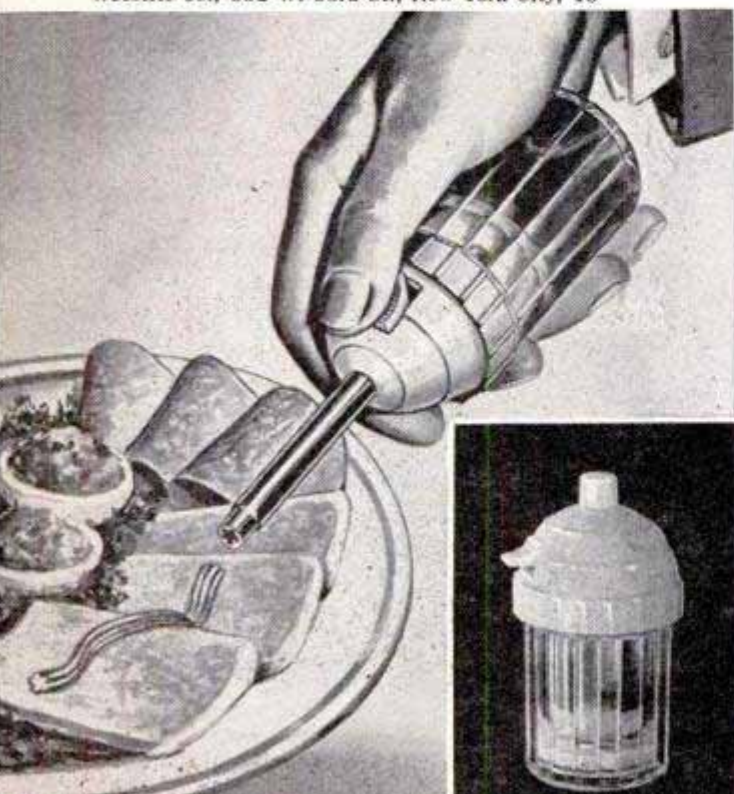
PERSONAL TRAY for the man of the house mounts on the closet door and has sections for coins, glasses, pen and pencil, keys and other pocket-filling items



GREASE BRUSH spreads shortening, butter or oil over pans, waffle irons and food. There's no mess and you cut waste, too. The grease is placed inside the plastic handle and the cap screwed on. This forces the grease into the vegetable-fiber bristles. Used at room temperature, it flows smoothly from bristles to pan

CATCHUP DISPENSER ends bottle pounding. You press button, catchup flows smoothly from nozzle. It is also used with mayonnaise, mustard and icing
Weolite Co., 552 W. 53rd St., New York City, 19

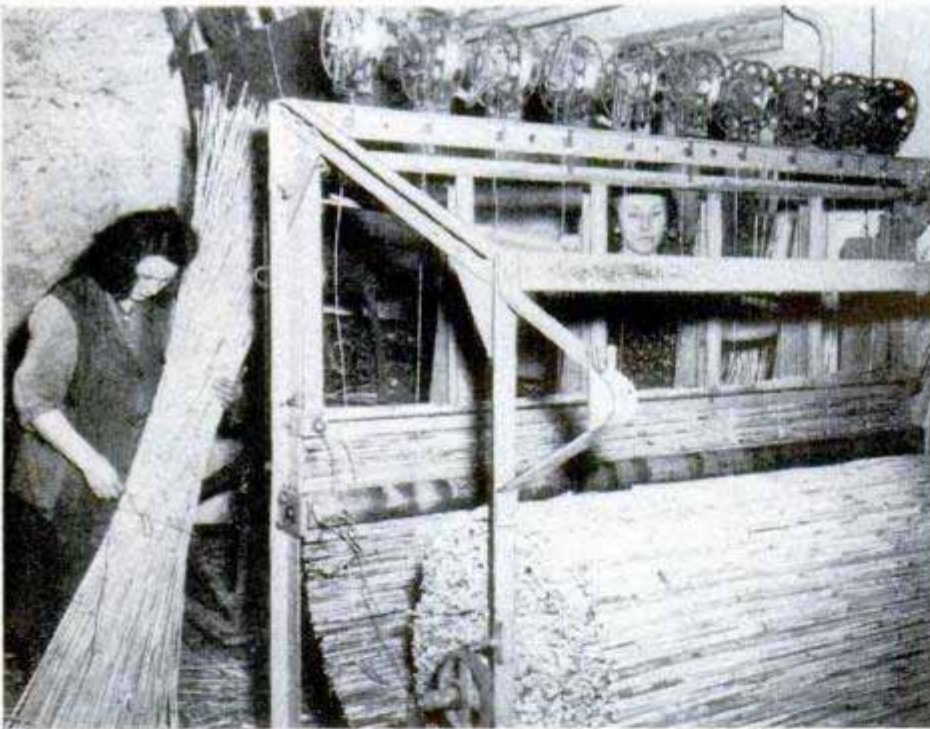
WINDOW OPENER saws stuck windows free with its double edges of saw teeth. Whether window is warped, swollen or paint-stuck, the tool will cut it loose
Rene-Craft Products, 21 Owen's Building, Wilmette, Ill.





Reed Harvest

In Berlin, Germany, reapers harvest their crops in the dead of winter on the frozen surface of Havel Lake. The crop consists of frozen reeds that grow straight and tall in the lake. A large scythe, attached to a pair of runners, is pushed over the ice by the worker, cutting the reeds off a few inches above the ice. The reeds are then dried and fastened together by wire to form a strong mat, which is used as awnings, fences or even as insulating walls or roofs of small huts.



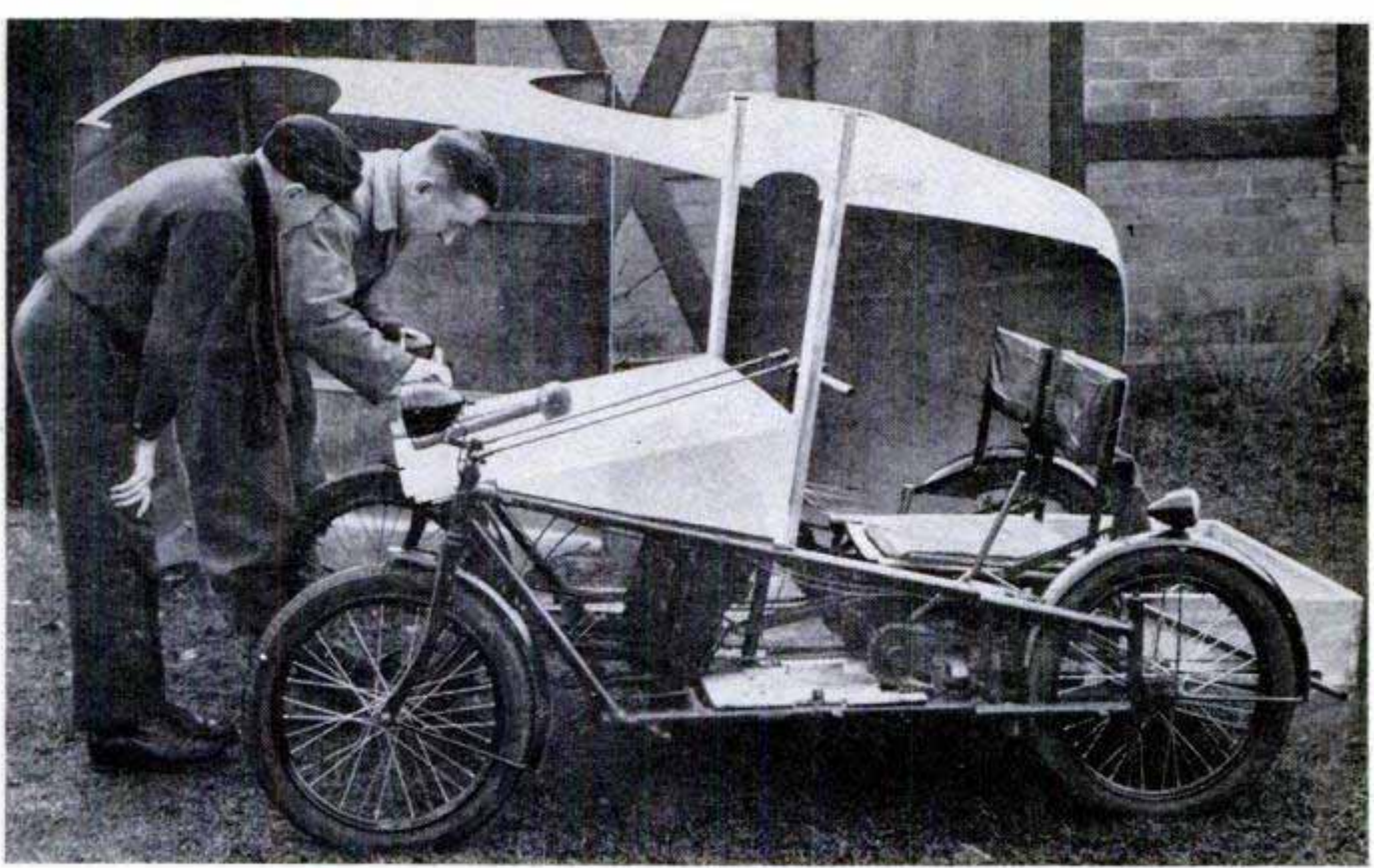
Adhesive-Cloth Signs

Signs printed on cotton cloth with a self-adhesive backing will stick to glass, metal, wood or masonry. A silicone plastic coating protects the extra-strength cloth from dirt, grime, grease and weather, permitting indoor or outdoor applications.

Our defense effort requires thousands of products made from wastepaper. Don't throw it away. Your local Boy Scouts or some other civic organization will pick up your wastepaper, sell it and use the money for a good cause.



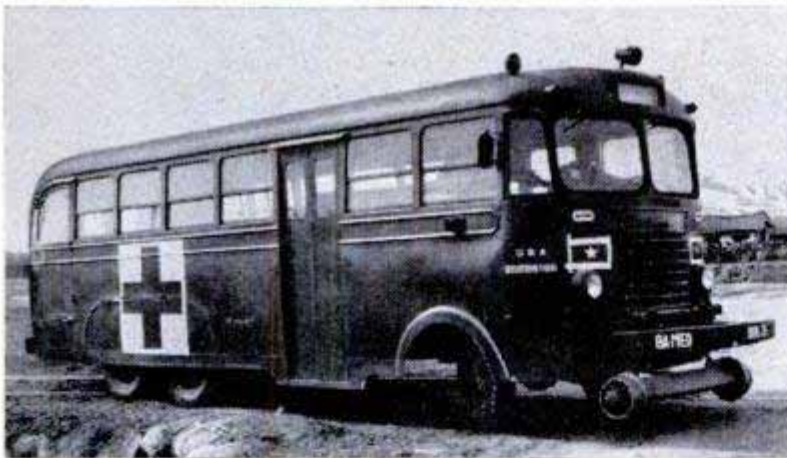
W. H. Brady Company, Chippewa Falls, Wis.
POPULAR MECHANICS



Pedal Car

"Driverpower," not horsepower, moves a small vehicle developed in Berlin. The driver and his passenger pump four pedals

with their feet to move the vehicle along the street. A chain drive transmits the pedal motion to the two rear wheels. According to the inventor, it takes less energy to pedal the vehicle than a bicycle.



Guide Wheels Keep Ambulance on Rails in Korea

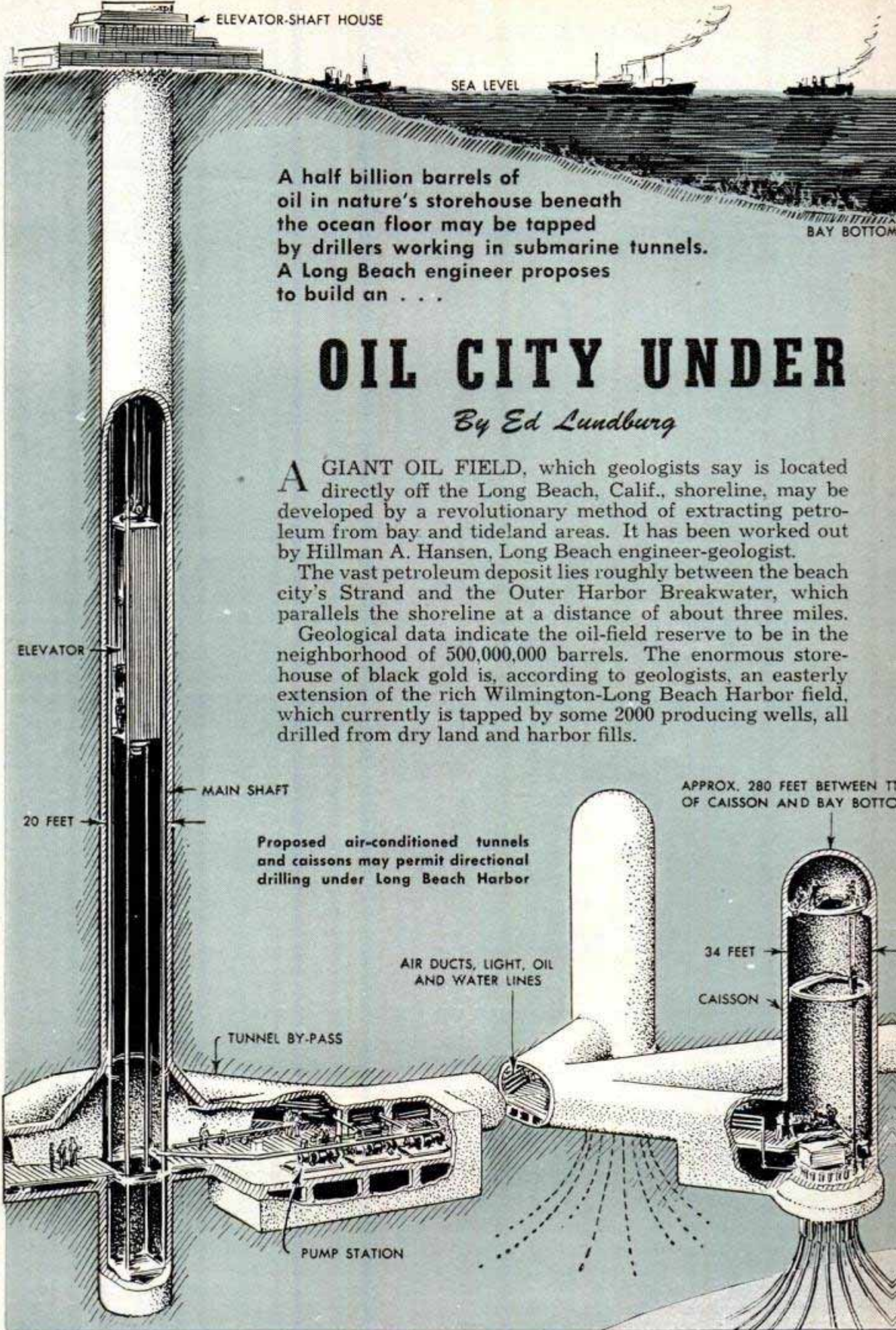
Transporting wounded over rough Korean roads is a slow and uncomfortable operation, so mechanics of the 765th Transportation Railroad Shop Battalion adapted a van for rail driving. Auxiliary guide

wheels, retracted when the van operates on the road, keep the wheels of the van on the tracks. Driving over the rails is a lot more comfortable for the wounded men than the bumpy ride over Korean roads.

Private Conversations Now Possible in Fleets of Radio-Equipped Cars

Individual drivers can be singled out for messages and replies with an all-electronic radio-communications system developed by General Electric. At present all drivers in a fleet equipped with two-way radio hear all messages from the dispatcher and all "talk back" conversations, many of which

are of no interest to most drivers. The new system is for two-way communication involving large numbers of radio-equipped vehicles, such as taxicabs, fire engines and police cars. By pushing buttons the dispatcher can talk to a single driver, to a group of drivers or to all cars at once.



ELEVATOR-SHAFT HOUSE

SEA LEVEL

BAY BOTTOM

A half billion barrels of oil in nature's storehouse beneath the ocean floor may be tapped by drillers working in submarine tunnels. A Long Beach engineer proposes to build an . . .

OIL CITY UNDER

By Ed Lundburg

A GIANT OIL FIELD, which geologists say is located directly off the Long Beach, Calif., shoreline, may be developed by a revolutionary method of extracting petroleum from bay and tideland areas. It has been worked out by Hillman A. Hansen, Long Beach engineer-geologist.

The vast petroleum deposit lies roughly between the beach city's Strand and the Outer Harbor Breakwater, which parallels the shoreline at a distance of about three miles.

Geological data indicate the oil-field reserve to be in the neighborhood of 500,000,000 barrels. The enormous storehouse of black gold is, according to geologists, an easterly extension of the rich Wilmington-Long Beach Harbor field, which currently is tapped by some 2000 producing wells, all drilled from dry land and harbor fills.

ELEVATOR

MAIN SHAFT

20 FEET

Proposed air-conditioned tunnels and caissons may permit directional drilling under Long Beach Harbor

APPROX. 280 FEET BETWEEN TOP OF CAISSON AND BAY BOTTOM

AIR DUCTS, LIGHT, OIL AND WATER LINES

34 FEET

CAISSON

TUNNEL BY-PASS

PUMP STATION



Maintenance man descends steps to check an underground producing oil well at Long Beach, Calif.

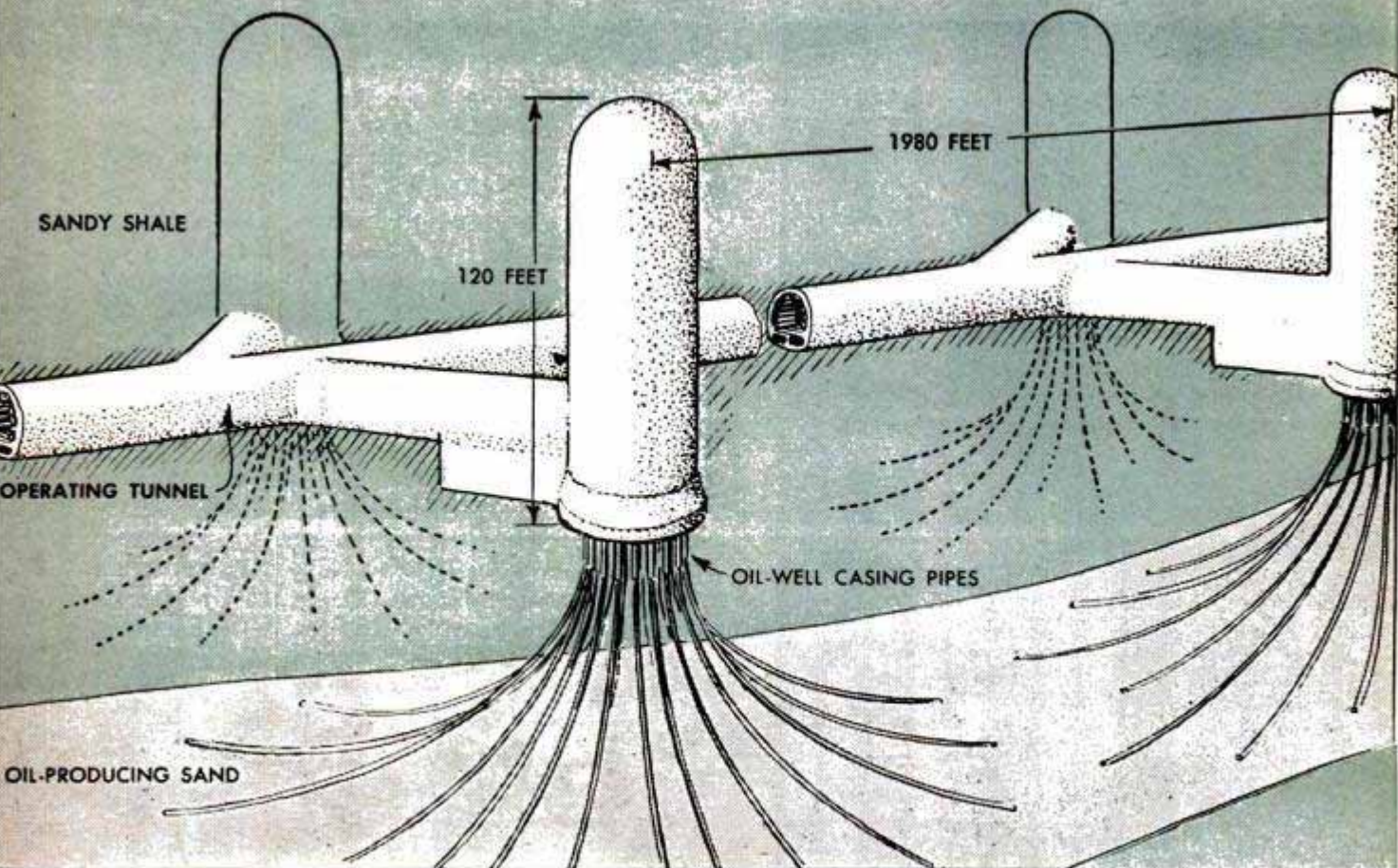
THE SEA

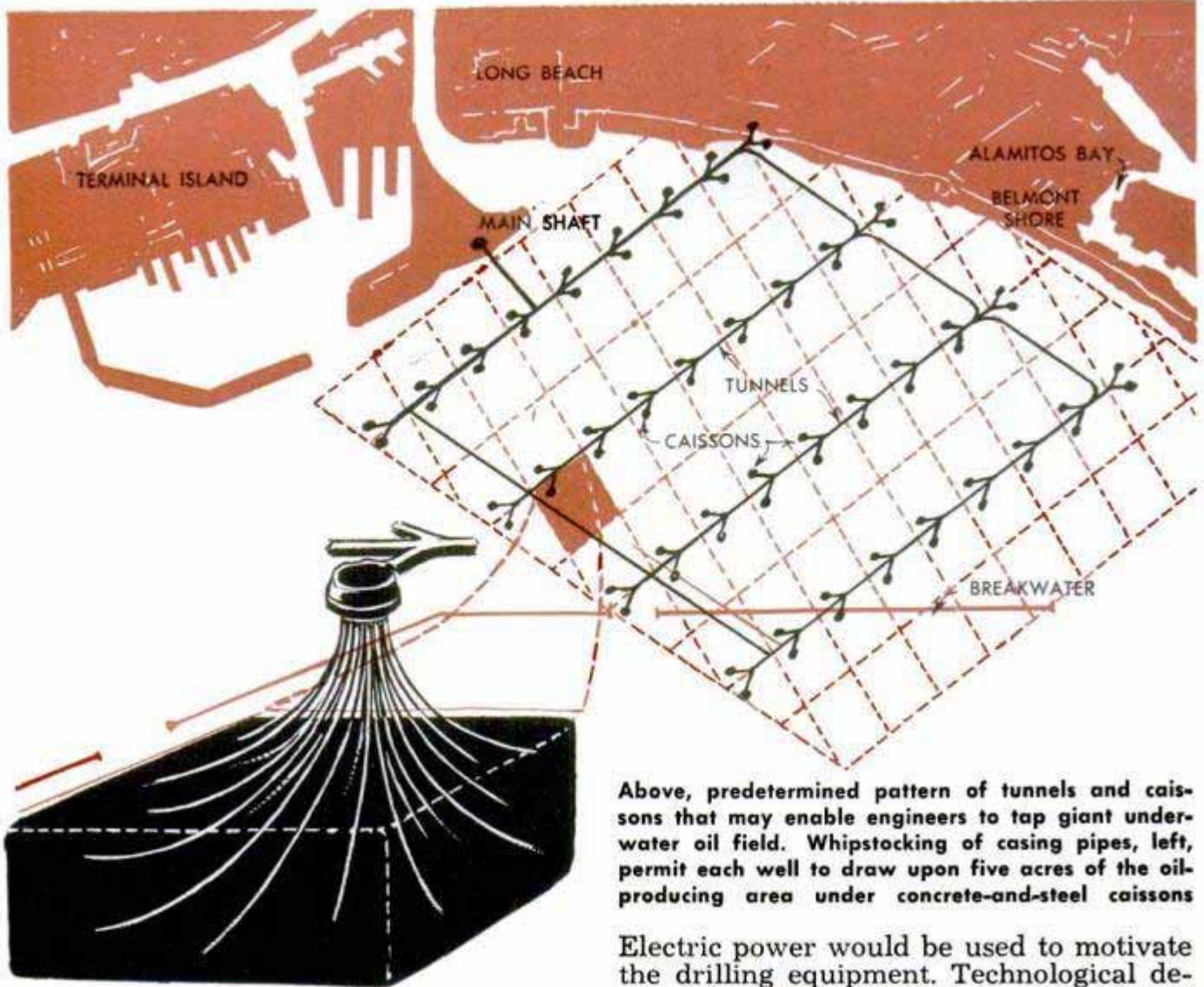
The unprecedented method of developing oil fields which lie beneath water involves the use of a technique familiar to mining engineers. The plan envisions sinking a vertical shaft into the earth to a depth of 400 feet below the bottom of the bay. From this depth, a network of tunnels, conforming to a predetermined pattern, would be driven laterally.

Drifting out from each side of the subway tunnels would be short access tunnels leading into caissons constructed of steel and concrete. The caissons, 34 feet in diameter and 120 feet high, would provide necessary

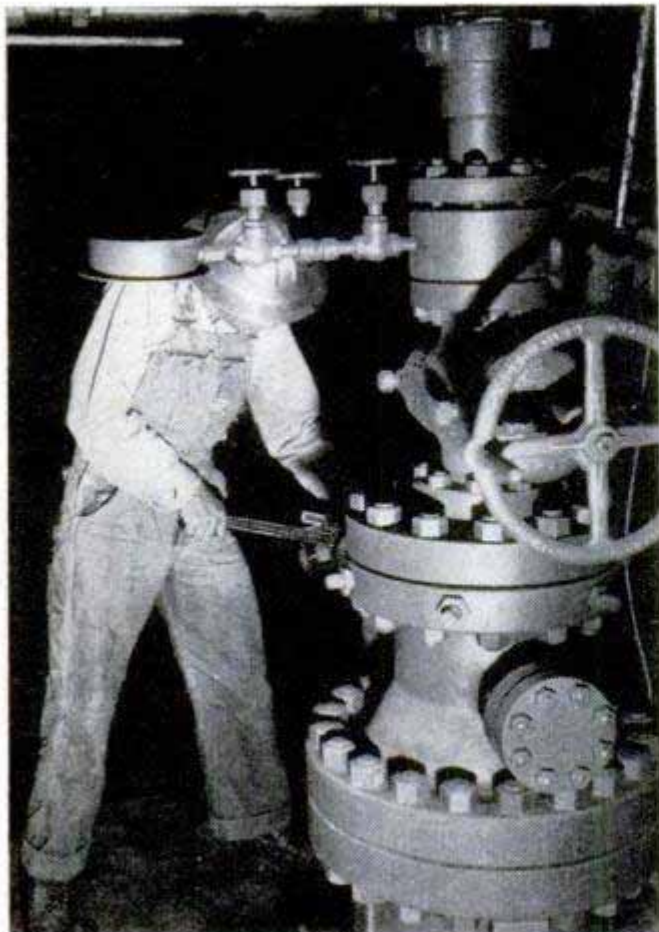
room for installation of standard oil-well drilling equipment. Each caisson would accommodate the drilling of 20 wells in an adjacent 100 acres of "field," as projected downward from the surface of the harbor waters. The wells would be whipstocked (an oil-field term for directional drilling) so that each would draw upon five acres of the projected oil-producing area.

The master plan calls for construction of about 50 of the subterranean caissons.





Below, heavy installation on top of an active oil well indicates high gas pressure in producing sands



Above, predetermined pattern of tunnels and caissons that may enable engineers to tap giant underwater oil field. Whipstocking of casing pipes, left, permit each well to draw upon five acres of the oil-producing area under concrete-and-steel caissons

Electric power would be used to motivate the drilling equipment. Technological developments, such as the modern shutoff valves and sparkproof electric motors like those used on seagoing tankers, make the tunnel-and-caisson method of underwater oil-field development both safe and practical, engineers claim.

Military experts have studied Hansen's tunnel-and-caisson method and expressed interest in its bombproof aspects.

Two other suggested methods of drilling the Long Beach offshore field have also been advanced. These are (1) constructing a series of concrete islands which would dot the bay with drill sites, and (2) attaching "blisters" (drill sites) to the existing offshore breakwater.

While the proposed island-platform plan would meet the engineering needs of the drilling problem, the plan is presently prohibited by state law on the grounds that it would constitute obstructions to commerce and navigation within the port. Experts agree that the Outer Harbor Breakwater would be a suitable base for anchoring drill sites, but point out that it would permit too limited development of the oil field.

Meanwhile, Hansen continues his study into the problem of drilling bay and tideland oil fields, firmly convinced that he has come up with the logical answer in tunnels and caissons.



Cyclone Motorcycle Breaks Speed Record

Streamlined beyond recognition, a German motorcycle zoomed along the super-highway from Munich to Nuernberg at a record-smashing speed of 180 miles an hour. Wilhelm Hertz, 39-year-old speed enthusiast, drove the racer. The former record, set in 1937, was 173.5 miles an hour.

Converter Adds Power To Your Hand Mower

Any hand mower can be converted into a power mower in five minutes by replacing its handle with a self-driven power unit. The small tractor is a single-wheel unit and is installed by tightening four bolts. Maneuverability with the converted power mower is greater than many ready-made power mowers, according to the manufacturer. It even backs up, something that many standard power mowers cannot do. The unit can be purchased with or without a motor. It is designed for use with either gasoline or electric motors.

LeJay Mfg. Co., 2912 South Emerson Ave., Minneapolis 8, Minn.



Prone Rider Sets Speed Mark On Streamlined Motorbike

Riding prone on a streamlined motorbike, E. Dotterweich of Germany set a new world speed record on a highway near Munich. His time was 48.9 miles per hour. Pamarozzi, an Italian racer, held the previous record of 45.3 miles an hour.

Mechanical "Traffic Cop" Clips to Accelerator Pedal

Quickly attached to the accelerator pedal, a calibrated speed control helps the driver maintain a steady, safe speed of his own choosing. The device, made of spring steel, can be set at any speed. When the pedal is depressed to that speed level, the spring speed control strikes the floor board. To make the car go faster, the motorist has to push against the spring and thus has to make a conscious effort at overspeeding. Another feature of the control is that it provides a restful stop for the accelerator foot at cruising speed. When fast acceleration is needed, or when more power is needed to climb a hill, the driver simply applies extra pressure to depress the pedal.

Speedminder Laboratories, Inc., Box 3496,
Merchandise Mart Station, Chicago 54



THE FARM SHOP

KEEPS PACE

By Rafe Gibbs

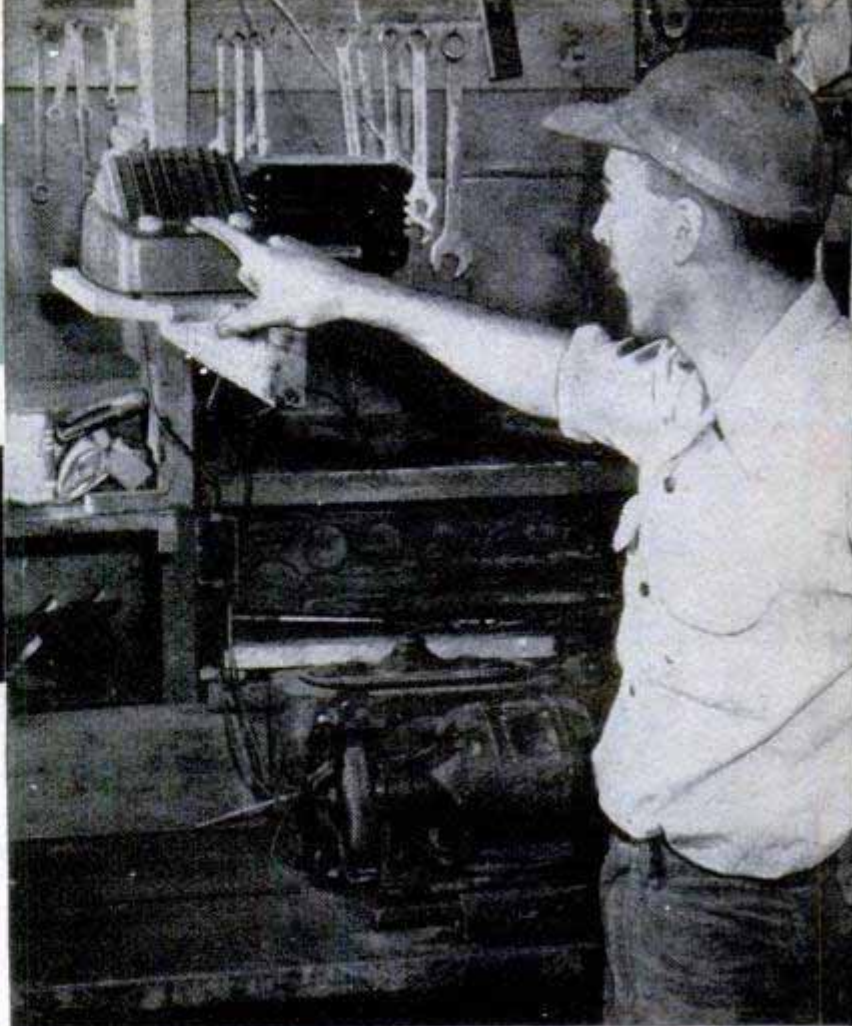
BETWEEN the sounds of hammering, we heard a baby's cry. We were in the machine shop of Gene Hagedorn, young wheat farmer of Latah County in Idaho. And there was no baby to be seen.

Then we heard the cry again. It came from the speaker of an intercommunication set perched on a stand above the shop's workbench.

Hagedorn stopped hammering and grinned:

"My wife had to run into town and I'm baby tending today along with tractor repairing. That was Eddie you heard—just waking up from his nap. The intercom in the house is near his crib. Guess I'll have to go down to the house and pick him up. He's getting louder."

Today the farm is a highly mechanized establishment. It used to be merely grand-



That old dinner bell of yesterday's farm is gone—replaced by an intercom system, like the one at Gene Hagedorn's place

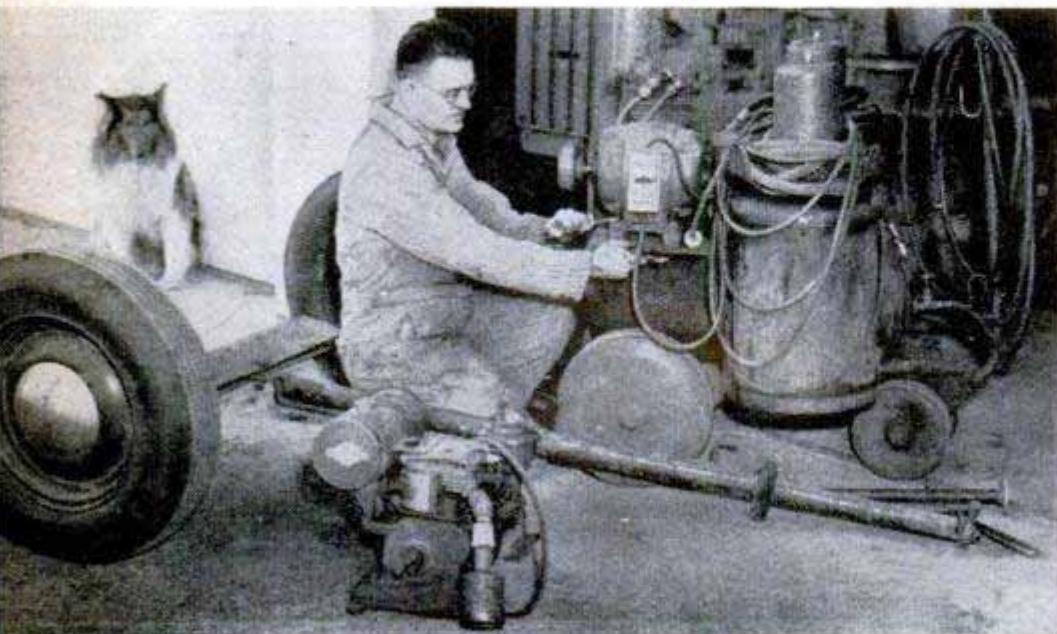
pa's wrists swelling. Now it's the milking machine ceasing to function. A horse would develop a collar sore and would be turned out to pasture to be replaced by another. Now a shaft on the tractor cracks and farm work ceases until it is repaired. Too many things go wrong for a farmer to be running to town for repairs. So efficiency-minded farmers like Hagedorn are setting up shops in the barnyard.

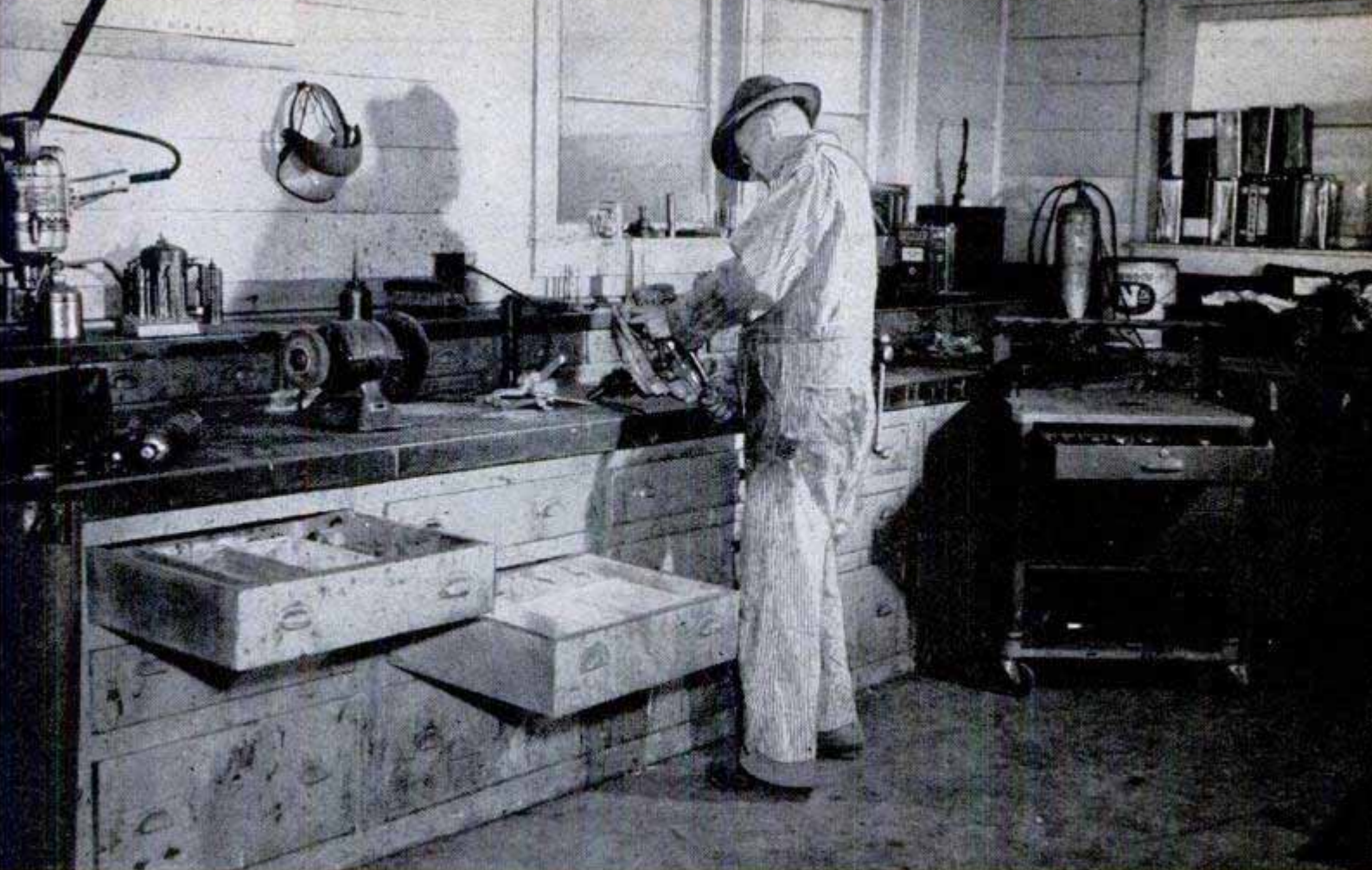
Over at Genesee, Idaho, we visited the farm shop of John Luedke. He recently equipped it with fluorescent lights.

"They cast fewer shadows," he said. "And shadows are no help when you're trying to get a quick grip on a bolt."

Originally, Luedke's shop was equipped with nothing but 110-volt leads and he had trouble with heavy-duty power equipment stalling.

Farmer's war-surplus lubricator keeps his equipment rolling. It is electric so he powers it with a small gas engine for field use





Drawers partitioned for different types of tools are more efficient than wall tool racks, says farmer Luedke

Now he has installed 230-volt branch circuits for all his permanently installed equipment and has no more trouble.

We have seen shops where farmers have hung their tools on nails, then outlined them with crayon or paint for ready identification of position. We have seen walls covered with racks, walls with clips for the tools. But Luedke doesn't go along with these ideas.

"I've installed drawers—lots of drawers," he said. "There are drawers for hammers, drawers for wrenches, pliers and welding tools. They make it easy to find a tool, easy to toss it back."

Keeping the right-sized bolt quick at hand is equally important.

"I was wasting too much time in my farm shop hunting bolts," said Melvin Hattan, Moscow, Idaho, farmer, "so I built shelving and labeled all compartments with sizes."

When Hattan completed the shelving, he spent almost two days sorting bolts from his bolt box, then gave up and bought new bolts already grouped to size. Some day—whenever he gets time—he will complete the digging in the bolt box.

The University of Idaho has conducted

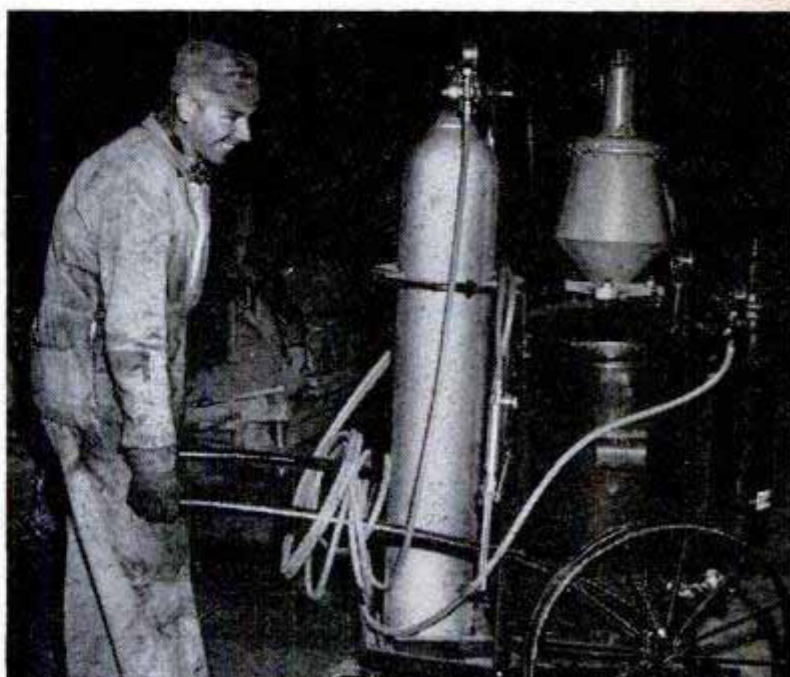
Made of parts salvaged from the scrap pile, a welding cart saves Clarence Steelsmith time and energy

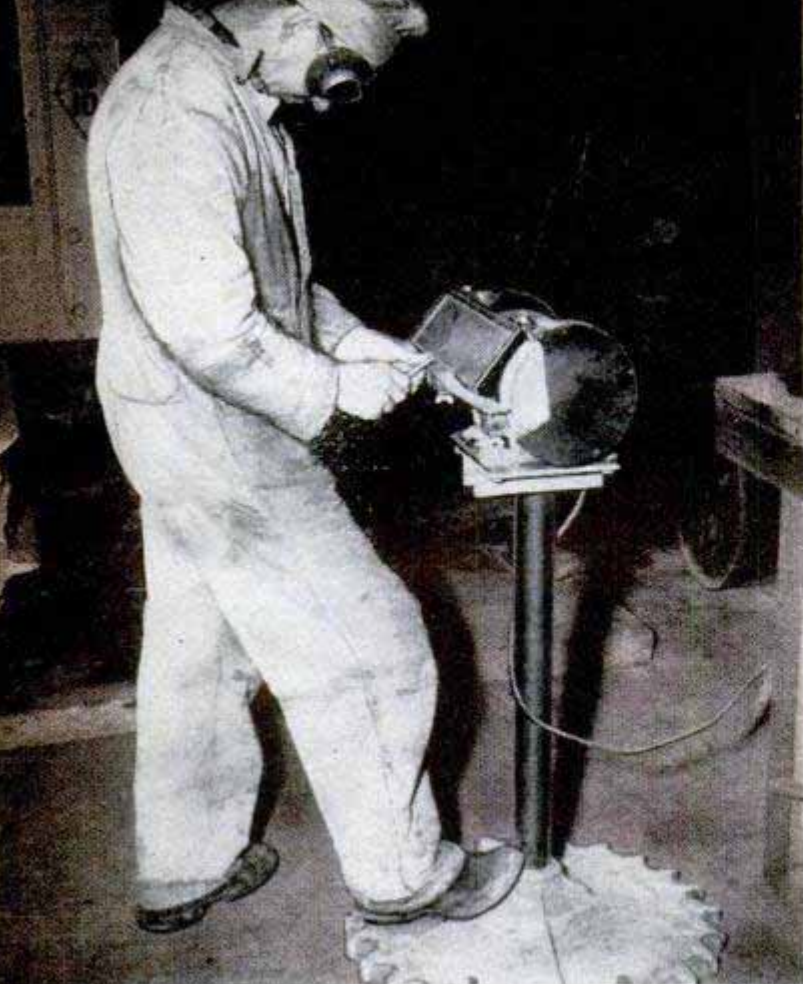
extensive studies on the farm shop. William H. Knight, farm-electrification project director, provided these special tips:

1. A portable $\frac{1}{2}$ to $\frac{3}{4}$ -horsepower electric motor with a four-step pulley and V-belt can be used both inside and outside the shop for many seasonal or short-time jobs such as grinding, buzz sawing, elevating grain or hay and similar jobs.

2. An anchor hook installed flush with the floor near the rear-center of the shop is valuable for snaking in heavy machinery.

3. A pressure line running from the





Steady but movable is the grinder base made with a discarded tractor sprocket wheel and a short pipe



One western farmer found a dust-covered lathe in an old blacksmith shop and put it to work on his farm

compressor to the workbench area will prove of value for spraying and cleaning.

4. If you have a center crane track and a small door, you can project the crane track outside for five or six feet (like a hay-barn track) for lifting heavy machinery.

Knight is a strong believer, however, in getting the right-sized door—and shop—in the first place. For the small truck gardener or orchardist, a shop 16 by 26 or 18 by 30 feet is probably big enough. But the farmer

with heavy acreage and corresponding equipment usually needs a shop perhaps 24 by 36 or 26 by 42 feet. The rule is that it should be at least big enough to handle the largest equipment on the farm.

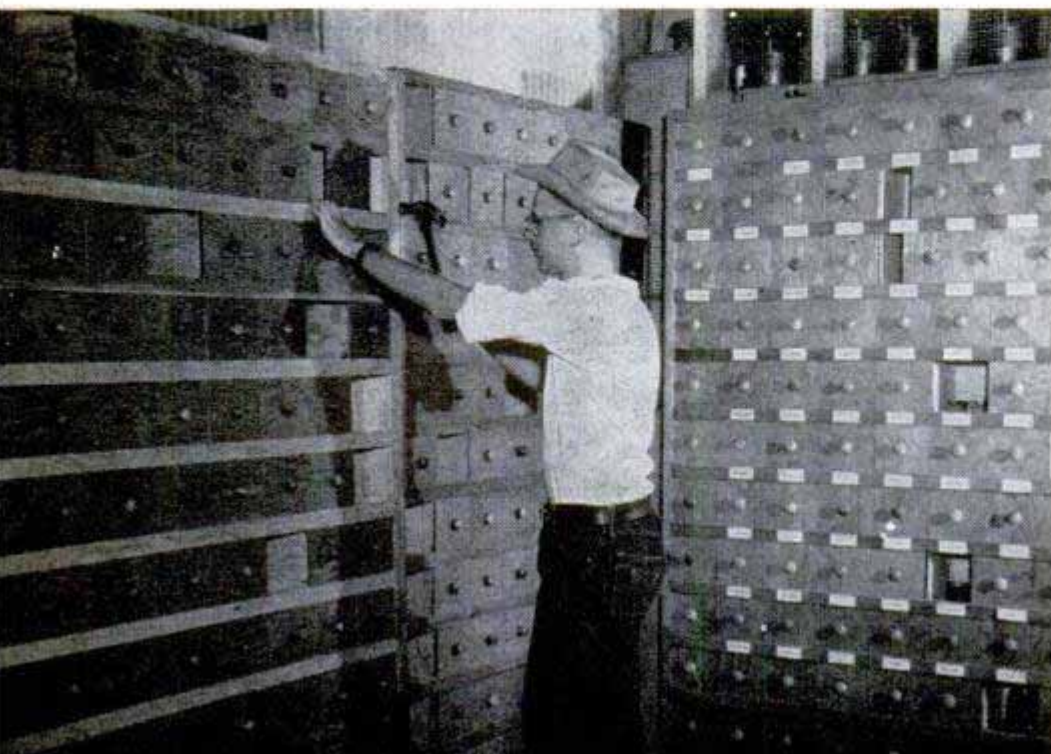
That's how the door size is determined, too. Snowbelt farmers need a big door if they want to work on their combine in December.

Sufficient working room is also important from the safety angle. Actually, we

have yet to see a farm shop with too much room, although we visited a big one on the farm of the Steelsmith brothers, Laurence and Clarence, of Troy, Idaho.

They had converted a 32 by 60 foot abandoned horse barn into a shop; knocked out the stanchions and uprights, bolstered the haymow floor with trusses. The haymow itself was converted into a storage room for parts and equipment.

Experts in farm-shop techniques at the University of Idaho say this storage unit with sliding doors is ideal for small parts



"We can work on a variety of equipment at one time without backing into a torch or grinder," said Laurence.

Good lighting is essential. Over in Washington, near Pullman, Carl Boyd has a shop with windows on the back and sides with just enough free space for shelving. Natural light is good—even on a cloudy day.

Many farmers are realizing that light-colored walls are as important in the shop as in the home. Drab, unpainted interiors are giving way to white walls.

If fluorescent lights such as in Luedke's shop are not used, one incandescent ceiling light of at least 100 watts should be provided for each 200 square feet of floor. In addition, there should be at least a 100-watt light over each piece of fixed equipment—drill press, lathe and welding table. Every eight feet of work bench calls for another 100-watt light.

In wiring the shop, consult a local wiring contractor or power-company farm representative. But here is an important tip—wire adequately, leaving room for expansion. Fundamental rules stressed by the University of Idaho farm-electrification experts are:

1. Plan special branch circuits for lighting only. Use no wire smaller than No. 12.

2. Plan special branch circuits for convenience outlets only. Use no wire smaller than No. 12.

3. Allow no more than 10 outlets per circuit.

4. Keep circuits as short as possible; otherwise use larger wires.

5. Plan special 230-volt branch circuits for all permanently installed motors over ½ horsepower, and for appliances of 1000 watts and over.

6. A special welder circuit of two No. 6 wires and one No. 8 wire on 230 volts is satisfactory for farm welders of 180-ampere capacity.

7. Allow a double convenience outlet for each six feet of bench length and one for each permanently placed piece of equipment less than ½ horsepower.

University researchers have found that where a line shaft is used to drive several machines, approximately 50 percent of the horsepower of the motor is lost to friction. Individual motors increase efficiency.

Then there's the matter of comfort in the shop—summer and winter. For summer cooling and for exhausting smoke and odors, a 12-inch ventilating fan, placed above the windows at the end of the shop, is almost indispensable. For heating, the 50-gallon drum-type stove is popular.

Commented Hattan:

"Guess my stove is the most important piece of equipment in the shop. I would hate to go through a summer of farming without a winter of shop work."

When Hugh Vandemark, Washington farmer, made his nonwobbling grinder, he used a brake drum for the shield





Dutch Treat Shop, 5932 Germantown Ave., Philadelphia 44, Pa.

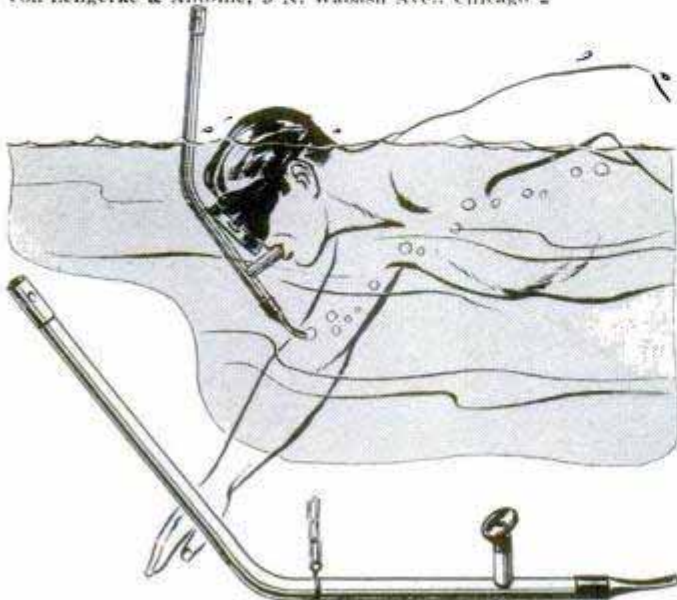
Lunch-Box Liner

For the breadwinner of the family there's a new plastic lunch-box liner which permits him to carry "soupy" salads and vegetables as well as sandwiches and fruit. The liner will fit any standard-size lunch box. Two of the three compartments are airtight and spillproof, while the third is designed for sandwiches and other large items.

Swimmers' Snorkel

Swimmers, as well as submarines, can now use a snorkel breathing device to lengthen the time they can spend underwater. Made of clear plastic, the tube has a shaped mouthpiece and an exhaust valve.

Von Lengerke & Antoine, 9 N. Wabash Ave., Chicago 2



West Point Lawn Products, West Point, Pa.

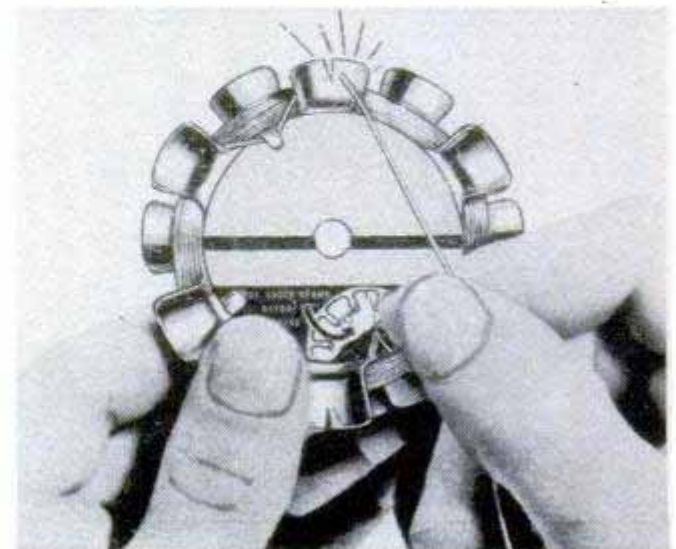
"Fork" Aerates Soil

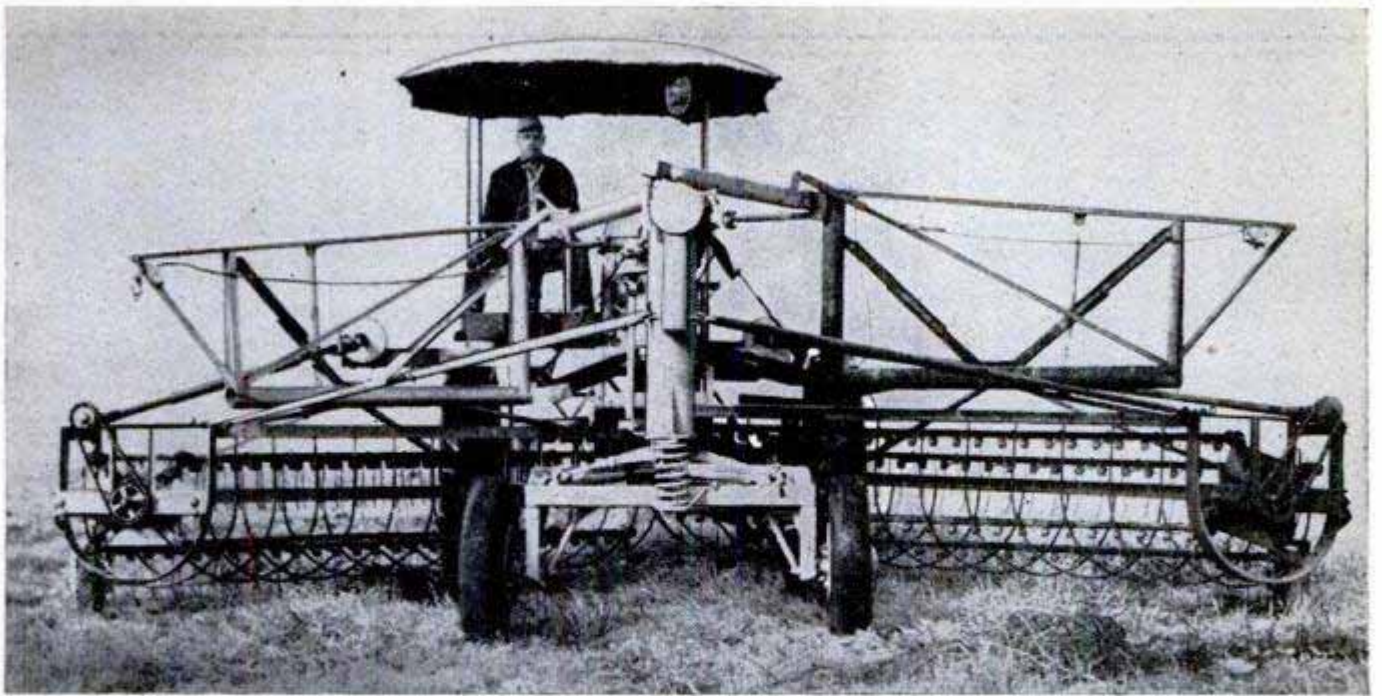
To provide better absorption of water, plant food or fertilizer, a forklike device digs up cores of soil and breaks them as they are pulled from the ground. The unit, which is designed for use on small lawns or for spot treatment of larger areas, permits reseeding of limited sections without digging up the complete lawn.

Fishing-Leader Dispenser Has Built-In Cutters

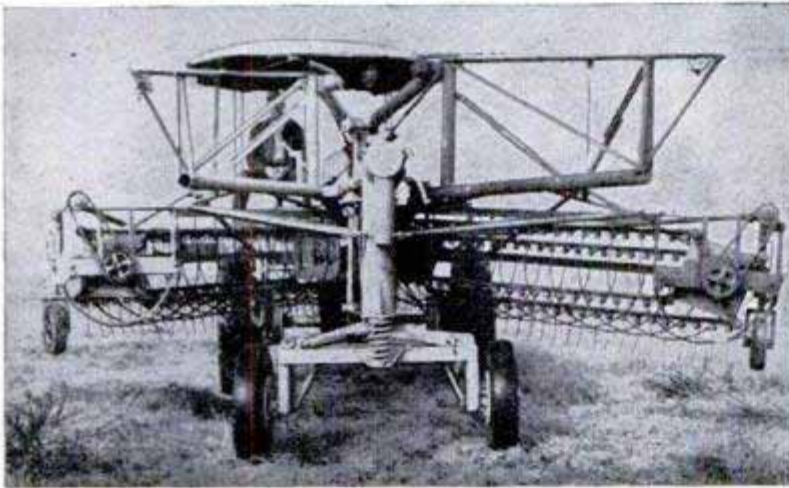
Nylon fishing leader now is marketed on a convenient dispensing spool with built-in cutters. The dispenser, made of aluminum, is two inches in diameter. Before the leader is cut, the line is snubbed under a clamp on the spool to prevent the remainder of the coil from unwinding.

Weber Lifelike Fly Co., Stevens Point, Wis.





Head-on view of the double side rake ready to go to work. The hay is drawn in to the center and piled between the wheels by the two rakes. Below, the rakes retract for highway travel

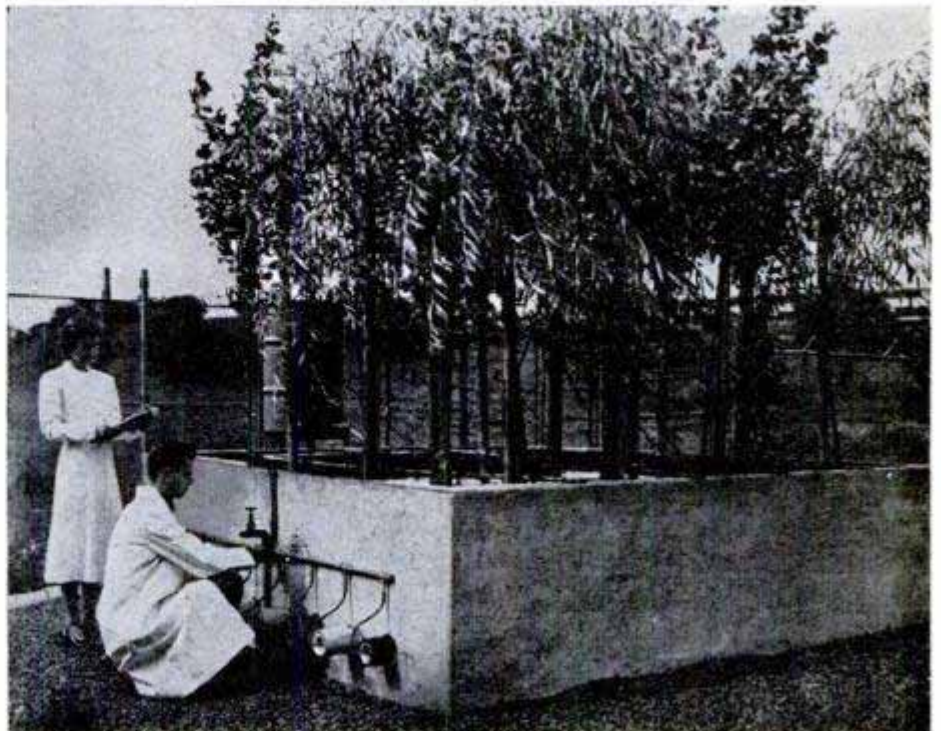


Double Side Rake Windrows 16 Feet of Hay

Windrowing about twice as much hay as the conventional rake, a double side rake enables one man to work 45 acres in eight hours. A hydraulic lift raises the two rakes to decrease the width of the machine for travel on the highway. Power is furnished by a Model-A Ford truck engine mounted on the driver's platform. Both rakes and wheels are driven by chains. The two rakes pile hay between the wheels. The machine was built by Jay Clark of Modesto, Calif.

Outdoor Laboratory Checks Roots in Sewer Pipe

What causes tree-root tendrils to penetrate and clog home sewer pipe? Technicians are seeking the answer to that question in a unique outdoor laboratory at Manville, N. J. Various types of sewer pipe are installed in a concrete basin which is filled with sand. Trees with aggressive roots are planted in the basin. It has previously been assumed that roots would enter crevices in pipes even though no moisture were present. The research indicates, however, that roots enter sewer pipe only where water has leaked out.



IT'S NEW

For Your Tackle Box



1. Plastic oxygen generator hangs on the side of a live-bait bucket and diffuses oxygen through the water to keep minnows alive. One "charge" of fluid generates oxygen for 90 hours

2. Interchangeable spools on a new reel permit the angler to use the same equipment for spinning, casting, fly fishing. Different types of line are carried ready to use on various spools

3. Lure made of a flexible material looks, feels and moves like a live minnow. The transparent fins, soft body wriggle as lure moves in water

4. Container made of Tenite plastic permits angler to cast live bait without injuring it. There's a bobber on one end, trap door on the other. When the container strikes the water, door opens and bait sinks to desired depth

5. Wiggly artificial worm looks and feels like the real article, yet even milady won't mind baiting her own hook. It's made of a flexible material that won't get stiff in the water

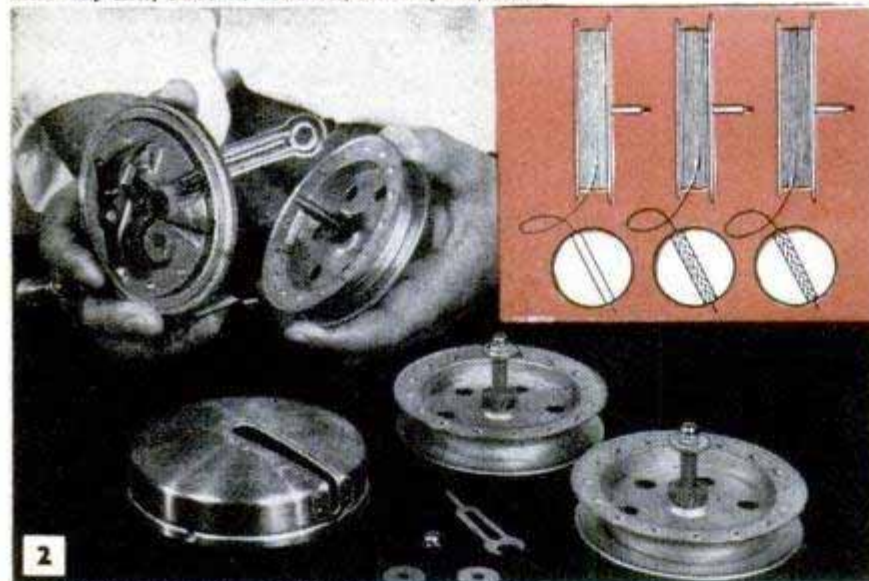
6. Double lure increases the angler's chances of catching fish. The twin minnows both wobble, their tails spinning, as the lure is retrieved

7. Two hooks connected with spring-wire yoke are baited together. When the fish strikes, the yoke slides down the leader and the hooks spring apart to give a double grip in fish's mouth

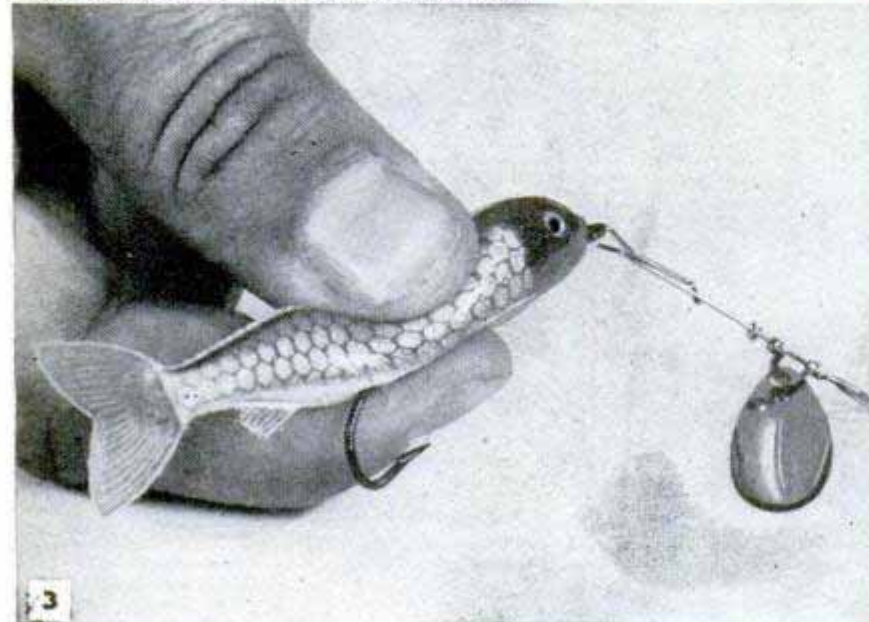
8. Transparent-plastic minnow bucket collapses to pocket-size, yet holds 6½ quarts of water. When a tube at the top is inflated, bucket can't sink

9. One-cell flashlight clamps to any fishing rod, signals a strike. After the cast, the line is slipped into a clip. When the fish bites, flashlight comes on, line springs out of the clip

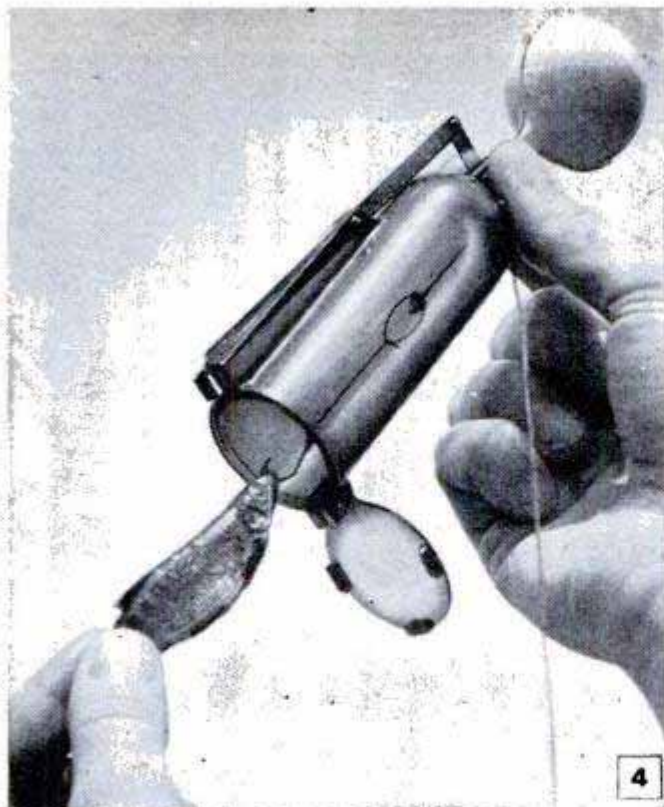
Minn-Oxy Inc., 3105 E. 42nd St., Minneapolis, Minn.



Magic Fishing Reel Co., 3500 Walnut, Denver, Colo.



Lif-Lik Lure Co., 3814 Independence Ave., Kansas City, Mo.

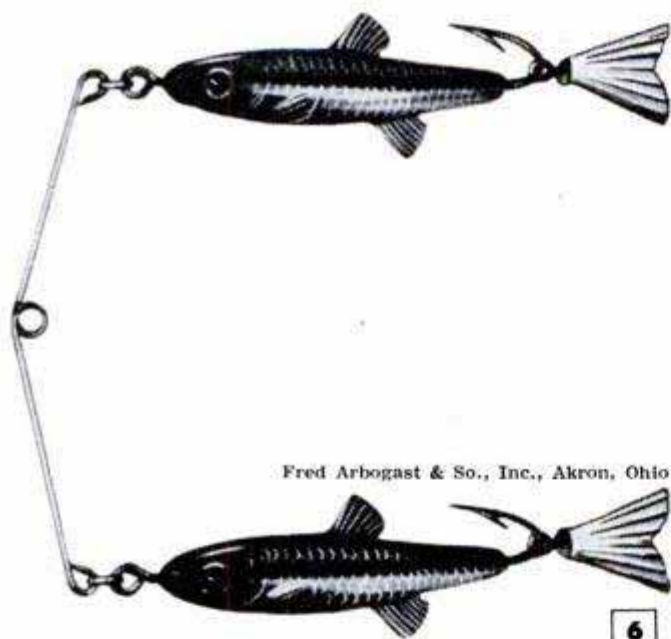


Mackenzie Tool & Engineering Co., 88 Andrew St., Springfield, Mass.

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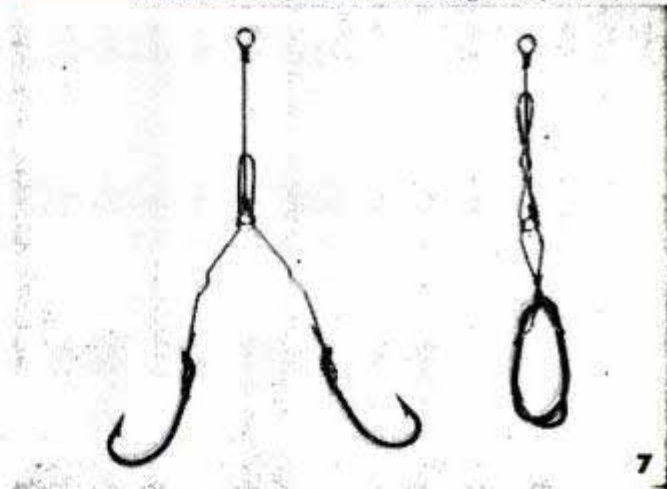


Fred Arbogast & So., Inc., Akron, Ohio

6



Creme Lure Co., 1005 E. Tallmadge Ave., Akron, Ohio



7

Scientific Research Co., 1618 N. Vancouver Ave., Portland 12, Ore.



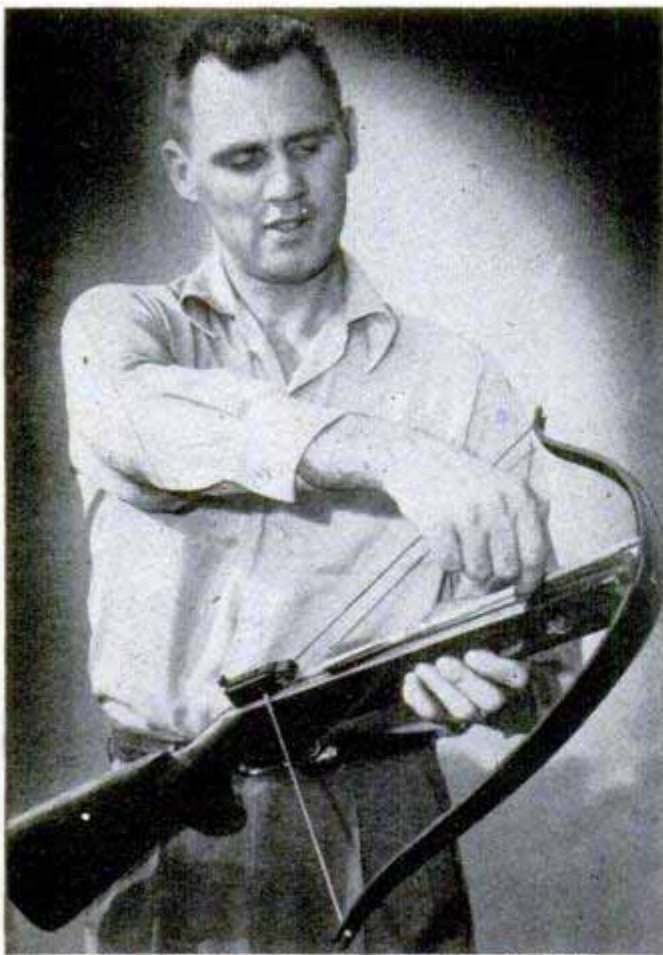
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Walco Products, 2300 W. 49th St., Chicago 9



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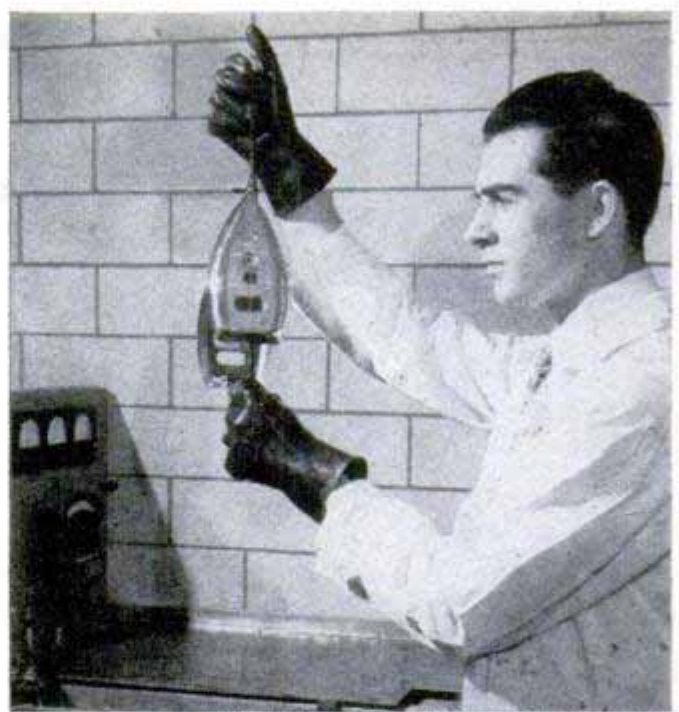
Fish-O-Matic Manufacturing Co., 19 Railroad Ave., Kingston, N.Y.



Schmid & Co., 1513 N. Gardner St., Los Angeles 46, Calif.

Sportsmen's Crossbow

Sportsmen who like to hunt with a bow and arrow will find a 20th-century version of the ancient crossbow a dependable and accurate weapon. The hunter's model has a 125-pound-pull bow that is accurate up to 100 yards. A target version of the crossbow has a 75-pound pull and is designed for back-yard bowmen. The stock, shaped like those on rifles, is equipped with an accurate sight that provides height and windage adjustments. Either bow can be used with the same stock, thus providing an all-purpose crossbow for archery fans.



Westinghouse Electric Corp., Pittsburgh, Pa.

"Give and Take" Chrome Plating Will Save Critical Materials

New automobiles and appliances may continue to gleam with shiny chrome despite defense demands for critical nickel because of a new process for metal plating. The technique, called periodic reverse plating, permits the use of a copper layer beneath the chrome, eliminating all nickel in many appliances. In parts where the use of nickel is allowed, as in car bumpers, an extremely thin layer of nickel is added to the copper layer, affording additional nickel saving. Key feature of the system, developed by Westinghouse, is an electrical "back stroke" that alternately deposits metal then takes some of it away until a smooth surface is achieved. This removes inferior metal deposits, providing a sound plating of superior brightness and strength with a minimum of critical metals.



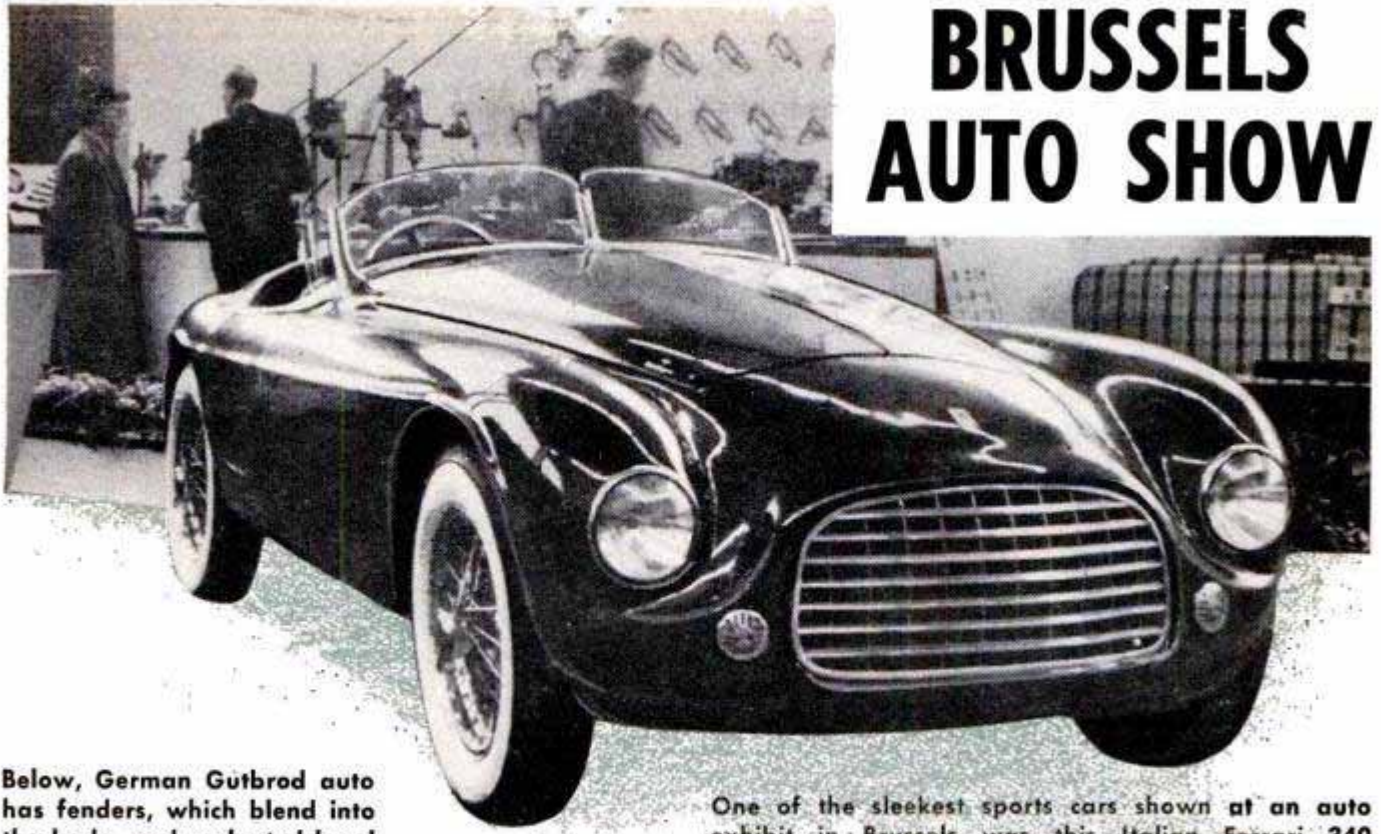
Swift and Anderson Co., 952 Dorchester Ave., Boston, Mass.

Layman's Weather Indicator

No scientific knowledge is needed to predict the weather 12 to 24 hours in advance with the aid of a stiff-paper dialing device. The user dials the current barometric pressure reading to a marker below the prevailing wind direction. The arrow on a smaller inside dial is then lined up with these two values and three forecast code letters appear in a window on the card. Final selection of the appropriate code letter of the three is based on whether the barometer has been rising, steady or falling.

Ⓛ During periods of peak production, the U. S. aluminum industry consumes more electricity each day than a city of 60,000 homes normally uses in an entire year.

BRUSSELS AUTO SHOW

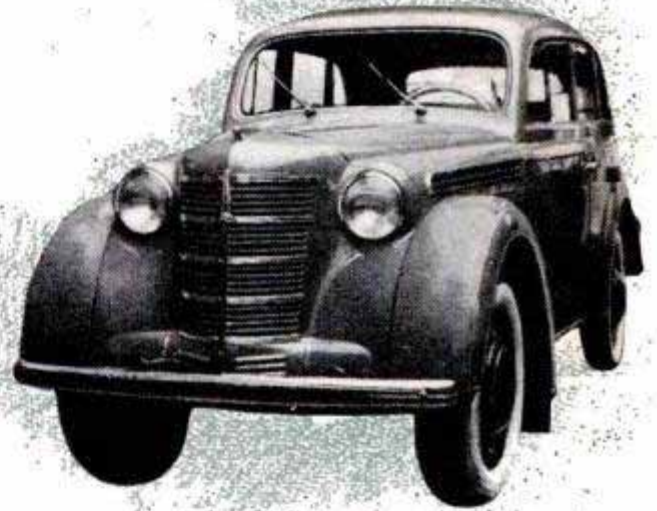


Below, German Gutbrod auto has fenders, which blend into the body, and a slanted hood

One of the sleekest sports cars shown at an auto exhibit in Brussels was this Italian Ferrari 340

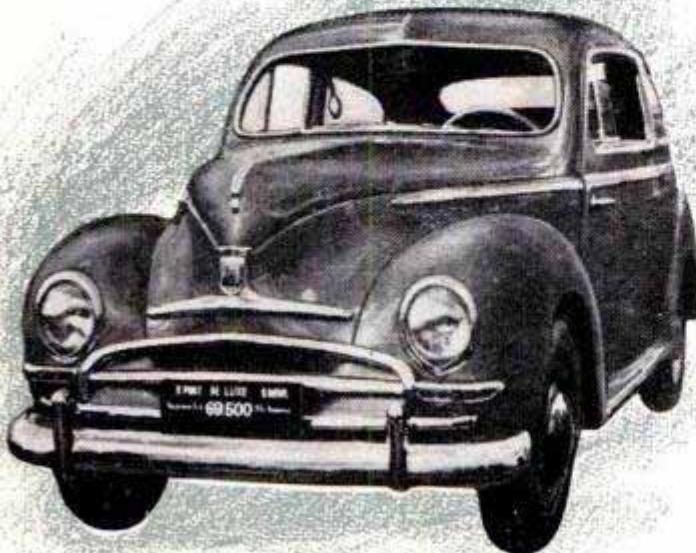


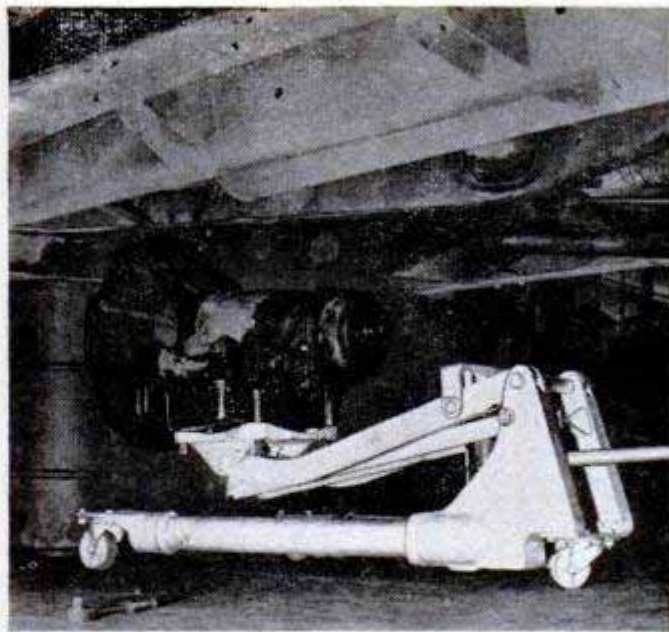
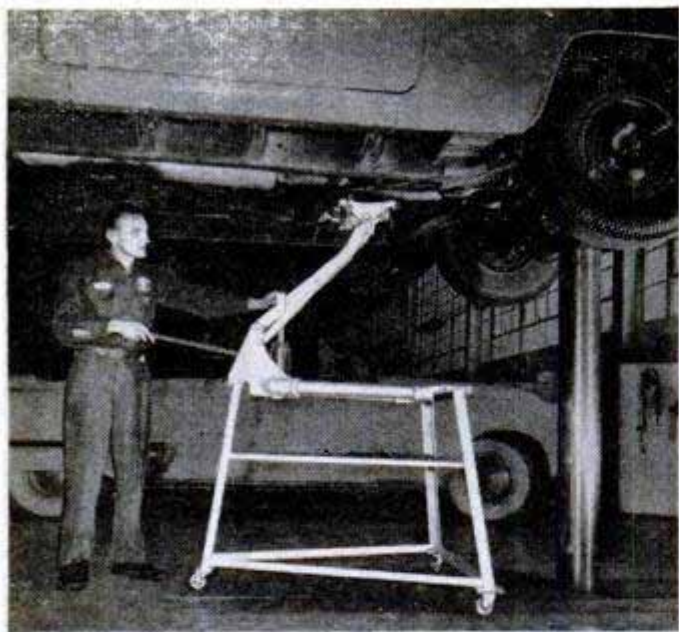
Hood and front end of this German Taunus auto are similar in appearance to our Ford of a few years ago



Russian six-seater Moskitch sedan has protruding fenders with no running board. It sells for about \$1043

Below, here's a scale model of the Ford Vedette. It shows American influence in hood and grille design



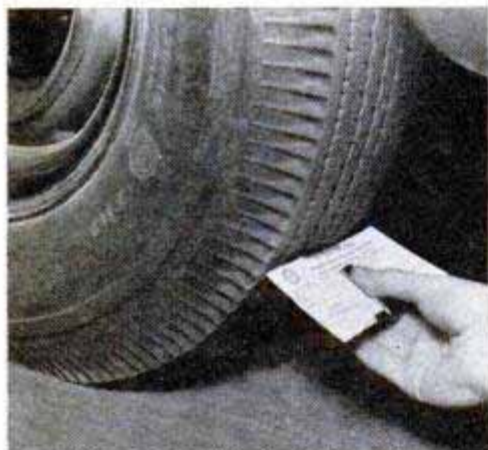


The Cleveland Pneumatic Tool Co., 3781 E. 77th St., Cleveland 5, Ohio

Lift Enables One Man to Remove Transmission

With a capacity of 1500 pounds, a tilting-cradle lift handles transmissions, motors, axles and other heavy automotive parts during major repair jobs. Powered by any standard five-ton hydraulic jack, the lift

is mounted on casters so it can be rolled around the shop. With it, one man can remove or install major parts. A stand for the lift raises it to 70 inches, high enough for the mechanic to work under the car.



Pure Oil Co., 35 East Wacker Drive, Chicago 1



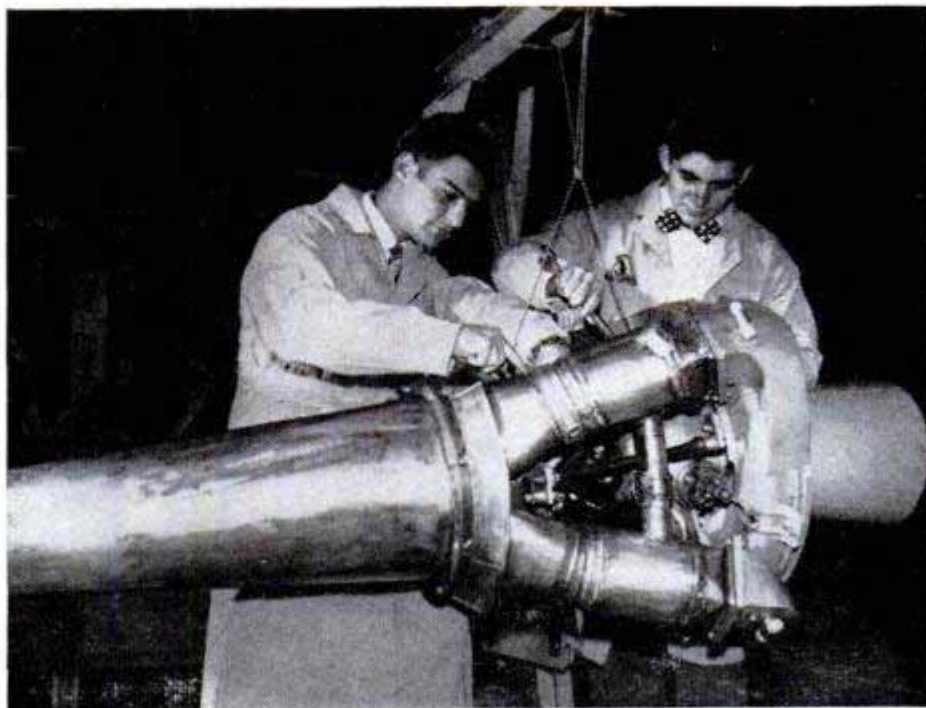
Tire-Tread Gauge

Service-station attendants keep an accurate record of their customers' tires with a measuring device that records tread thickness on a card. A metal finger is pushed into the tire groove and then the marker arm is depressed to punch the card, automatically recording tread thickness.

School-Made Jet Engine

Starting by modifying a supercharger from a wartime fighter, Northrop Aeronautical Institute students have built a jet engine that can power a light plane in the 200 to 300-mile-an-hour range. Weighing 168 pounds, it is believed to be the first four-burner type ever built. The engine develops an estimated 320 pounds of static thrust.

☐ About 50 tons of aluminum are used in the construction of a single B-36 bomber.



50th Anniversary

\$5,000

What does America mean to you?**Answer that question with a photograph
and win one of these big prizes!****American
Way of Life****PHOTO CONTEST****prizes**

	Black and White	Color
1st Prize	\$1,000	\$1,000
2nd Prize	\$ 500	\$ 500
3rd Prize	\$ 300	\$ 300
4th Prize	\$ 100	\$ 100
5th Prize	\$ 100	\$ 100
6th Prize	\$ 100	\$ 100
7th Prize	\$ 100	\$ 100
8th Prize	\$ 100	\$ 100
16 Prizes—Black and White Only	\$ 25 each	

rules

1. The "American Way of Life" photo contest is open to all persons except employees of Popular Mechanics Company and their families.

2. There will be a Black-and-White Competition and a Color Competition with separate prizes in each. Hand-tinted prints are not eligible.

3. Photographs must illustrate your own conception of the "American Way of Life," but the subject you pick can be in any field — industry, agriculture, government or any other. You may see it in a country store, a view, a man at work, a city street or a thousand places. Winners will be selected on (a) how well the picture illustrates the "American Way of Life" and (b) its all-around photographic excellence.

4. All entries must be postmarked not later than midnight, September 1, 1951, and must have been taken between April 1, 1951, and September 1, 1951. No entry fee is required and there is no limitation on the number of entries you may submit. Data sheet, giving information listed at the bottom of this page, must be attached securely to the back of each entry. When submitting transparencies, attach data sheet to the top of the transparent sleeve.

5. All prints and transparencies will be held until after winners are announced in the 50th Anniversary Issue of Popular Mechanics, January 1952. Non-winning prints and transparencies will be returned as soon as possible thereafter, provided that a self-addressed and stamped envelope is enclosed with the entries.

6. Black-and-white prints must be no smaller than 8 by 10 inches and no larger than 11 by 14 inches and must be mailed flat and unmounted. Color prints submitted must be 5 by 7 inches or larger. Color transparencies must be 2¼ by 2¼ inches or larger.

7. All prize-winning photographs become the exclusive property of Popular Mechanics Company. Original negatives of prize-winning prints must be submitted upon request.

8. Judges will be selected by the editors of Popular Mechanics Magazine. Their decisions will be final. In case of ties, duplicate prizes will be awarded.

9. Mail all entries to PHOTO CONTEST, POPULAR MECHANICS, 210 East Ontario St., Chicago 11, Ill.

10. Popular Mechanics Company will use all reasonable care in handling entries, but it can assume no responsibility for loss or damage of any entry.

**Attach to each photograph
the following information:**

- | | | | |
|-------------------|---------------|------------------|----------------|
| 1. Your name | 4. Subject | 7. Shutter speed | 10. Film |
| 2. Street | 5. When taken | 8. Lighting | 11. Lens stop |
| 3. Town and state | 6. Camera | 9. Where taken | 12. Other data |

The OWNERS REPORT on

The true test of an automobile begins when the owner takes the wheel. This is another report from owners of 1951 cars who answered questionnaires sent by Popular Mechanics to 1000 Cadillac owners from coast to coast

By Floyd Clymer

This enthusiastic Cadillac owner tells Floyd Clymer he gets 19 miles per gallon on his '51

Typical questionnaire filled out by an Indiana owner agrees with big majority in the survey

The average was 17.9 m.p.g.

97% in survey are happy with Hydra-Matic

Only a few complaints like this one

He agrees with 82% in Poll

THE POPULAR MECHANICS MOTOR SURVEY
AS CONDUCTED BY FLOYD CLYMER

I am the owner of a 1951 Cadillac. Model: 61 62 60 Special 75
I have owned it about 3 months. Speedometer mileage is 1612 mi

I use only regular gasoline - I use premium (high test) gasoline Gulf + Shell
My approximate gas mileage in the city is 13 MPG; in country, 17 MPG

I CHANGE OIL every 1000 miles; I ADD OIL - one quart every _____ miles.

How does the car handle on the road? Excellent Average Unsatisfactory
Maneuverability seems to be: Very good Average Poor
Acceleration is: Outstanding Satisfactory Too high Too low
Curb and road clearance is: Satisfactory Too high Too low

Why did you buy a Cadillac? Because I believe they are the best

What features about the car do you especially like? Automobile built. The American that it shifts gears with - also the body lines are good. Also good seats.

Do you like the length of wheelbase? Just right Too long Too short
Do you like Cadillac's HYDRA-MATIC DRIVE? Yes BODY STYLING? Yes
VISIBILITY? Fair FIN-TYPE REAR FENDERS? good INST. PANEL? good

What is your opinion of the new overhead-valve-V8 engine? Very good

What do you dislike about the car? The front seat is a little high causing me to rest down in front seat to get good visibility.

Have you ever owned a Cadillac before? Yes No If so, how many? one

Would you buy another Cadillac? Yes Possibly No
Do you secure good dealer service? Yes Fair No
How would you rate your new Cadillac? Excellent Good Average Poor

GENERAL INFORMATION

What type of engine would you prefer in your car of the future? In-line V-type
Cylinders: 6 8 Overhead Valves: Side Overhead Like it or now
Based on my present experience, I want my next car equipped with: Standard transmission
Overdrive Cadillac Hydra-Matic Drive Other type of automatic transmission
Please state reasons: I've owned approx 25 to 30 different cars and this is the best.

Do you like the new low-pressure, super-cushion tires? Yes No How much more? _____ lbs.

Do you carry the recommended pressure? Yes No

Please check all answer boxes (✓).

Your name will be held in strict confidence.

My Name: _____
Address: _____
City & State: _____
Occupation: Sandwich Shop's owner

(Use other side for additional remarks.)

Please mail promptly to:
FLOYD CLYMER
1268 SO. ALVARADO ST.
LOS ANGELES 6, CALIF.

Best shifting and driving car of them all.

the '51 CADILLAC



MORE PEOPLE are driving Cadillacs today than ever before and here are some of the reasons gleaned from *Popular Mechanics'* nationwide survey of '51 owners: Performance. Dependability. Beauty. Pride of ownership.

Eighty-two percent rated their cars as excellent (when given a choice of excellent, good, average or poor), and 90 percent said they will buy another Cadillac. One man added on the end of this line "unless I go broke." Like scores of other owners, a junior executive from Grand Island, Neb., says he enjoys "the distinction of owning a Cadillac" and "the courteous service I receive."

Although most Cadillac owners do not profess to know much of what goes on under the hood of a car, they are highly critical of its performance. They demand perfection in operation, servicing repairs and guarantees.

Some are dubious about the new overhead-valve engine. They seem to prefer the old faithful side-valve V-8 which, although it had less power and gave less gasoline mileage, was considerably more quiet. A surprising proportion of owners (79 percent) have owned Cadillacs previously; 26 percent have owned five or more. One man had owned 20.

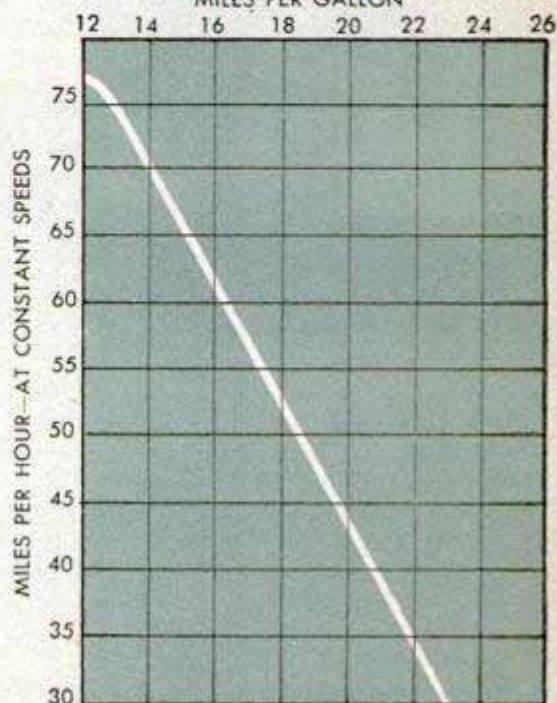
Ninety-eight percent of all who answered the survey desired automatic transmission; because they said the Cadillac Hydra-Matic functions so smoothly, 97 percent would want Hydra-Matic on their next car.

A great majority of Cadillac owners are very well satisfied, and either neglected to mention any dislikes on their questionnaires or simply wrote, "No dislikes."

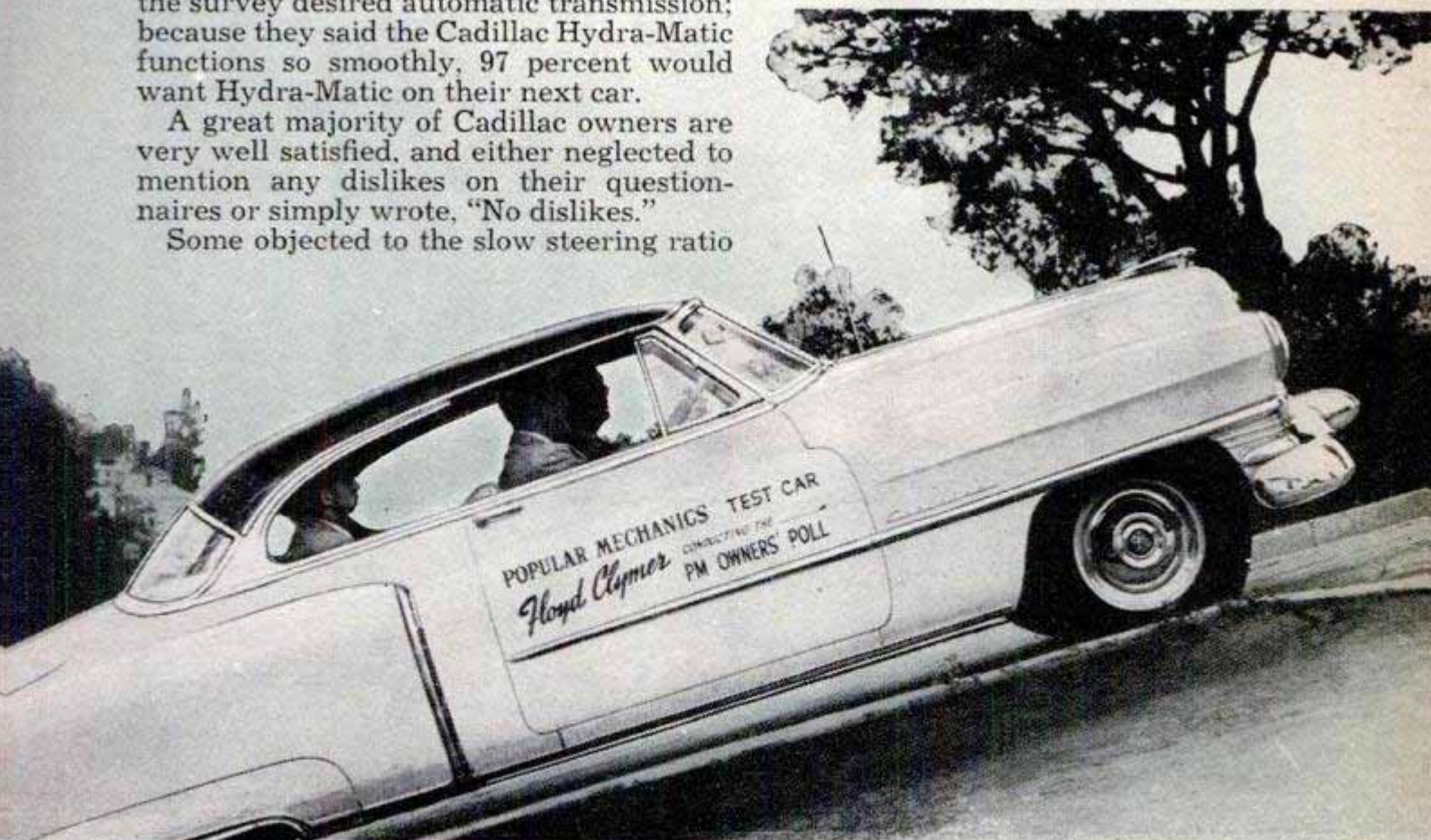
Some objected to the slow steering ratio

ECONOMY TEST

1951 Cadillac 62 Coupe de Ville
with Hydra-Matic Drive
MILES PER GALLON



Below, Clymer gives the Coupe de Ville used in his test a workout on steep hill in Los Angeles





"For size and horsepower," Clymer reports, "the Cadillac high-compression engine undoubtedly is one of the world's best and, for the size and the weight of the car, the gasoline mileage is remarkable . . . the engine weighs only 60 pounds more than many V-8s in the lighter cars"

1951 CADILLAC 62 COUPE DE VILLE WITH HYDRA-MATIC DRIVE



Ninety-two percent of the owners polled in survey rated the '51 Cadillac's acceleration either "outstanding" or "very good." These figures explain why

Percentages from P. M. Poll

Owners of Series 62	70%
61	18%
60 Special	11%
Average gasoline mileage (in country).....	17.9 m.p.g.
Average gasoline mileage (in city).....	14.0 m.p.g.
Use premium gas	98%
Use regular gas	2%
Change oil	99%
Average mileage for change of oil.....	1591
Add oil (and also change periodically).....	6%
Average mileage for adding oil	1144
Maneuverability excellent	88%
average	11%
unsatisfactory	1%
Acceleration outstanding	56%
very good	36%
average	8%
Road clearance satisfactory	95%
too low	4%
too high	1%
Wheelbase just right	92%
too long	5%
too short	3%

FEATURES

Owners who like Hydra-Matic Drive	97%
Owners who like the body styling	94%
Owners who like the fin-type rear fenders.....	92%
Owners who like the visibility offered	93%
Owners who like the interior finish.....	85%

(These percentages are based on the fact that some owners commented on more than one feature.)

OWNERS' RATING OF CAR

Excellent	82%
Good	14%
Average	3%
Poor	1%

GENERAL INFORMATION

Prefer V-type engine	98%
Prefer in-line engine	2%
Prefer eight cylinders.....	99%
Prefer six cylinders	1%
Prefer overhead-valve system	89%
Prefer side-valve arrangement	11%
Prefer automatic transmission.....	98%
Prefer standard transmission with overdrive.....	2%
Prefer Hydra-Matic Drive	97%*

*(The above figure means 97% of the 98% preferring automatic transmissions.)

Prefer makes other than Hydra-Matic	3%
Owners who like low-pressure tires.....	92%
Previous Cadillac owners	79%
Will buy another Cadillac	90%
Might buy another Cadillac	7%
Will not buy another Cadillac	3%
Dealer service good	73%
average	19%
poor	8%

Most frequent objections:

location of rear-view mirror, slow steering ratio, driver's seat position.

(too much movement of the wheel) and complained of the difficulty in parking and turning with low-pressure tires. Some complained of the front-seat adjustment and sitting position, and some wanted more headroom in the rear seat.

In answer to the question "What features about the car do you especially like?" the reply of a retired Oklahoma City, Okla., man was typical. He said, "All of them." One other fairly prevalent reaction was that of a milling-company owner in Kenilworth, Ill., who said he bought a Cadillac because of "previous satisfactory service and family tradition."

A Kentucky physician said he bought one "in answer to prayer!"

An Indianapolis sales manager complained strongly about the doors. They are entirely too hard to close, he said, remarking that the person sitting on the right side has a tough job slamming the door while sitting in the seat.

An Air Force officer in San Antonio, Tex., said "I feel like I'm driving a truck or tractor when I'm behind the wheel of a '51 Cadillac," but commended the new overhead-valve V-8 engine as "a step in the right direction needed a long, long time in engine development for the future."

A Short Hills, N. J., securities trader bewailed the fact that, being six feet three, he knocks his hat off every time he gets in the car. But a manufacturing printer of Atlanta, Ga., likes Cadillac so well he buys one every year and "keeps two always."

One of the minor complaints of a few owners is that the rear-view mirror is too large and obstructs the vision at times. But a large percentage had high praise for the car's ease in handling. A food-company official of Omaha, Neb., commented that his Cadillac 62 "has plenty of power, gives a smooth, quiet ride and handles fine in mountains."

An Oklahoma City, Okla., statistician was disappointed because "you have to look twice to tell whether the car is a Chevrolet or a Cadillac; one should expect something more for the money than a big Chevrolet."

A soft-drink dealer in Jackson, Tenn., should make the Cadillac people happy with his comment that "it costs less to operate and less to own." An enthusiastic res-



From a standing start the Cadillac Coupe de Ville tested by Clymer topped this 500-yard, 32-percent grade hill at 23 miles per hour

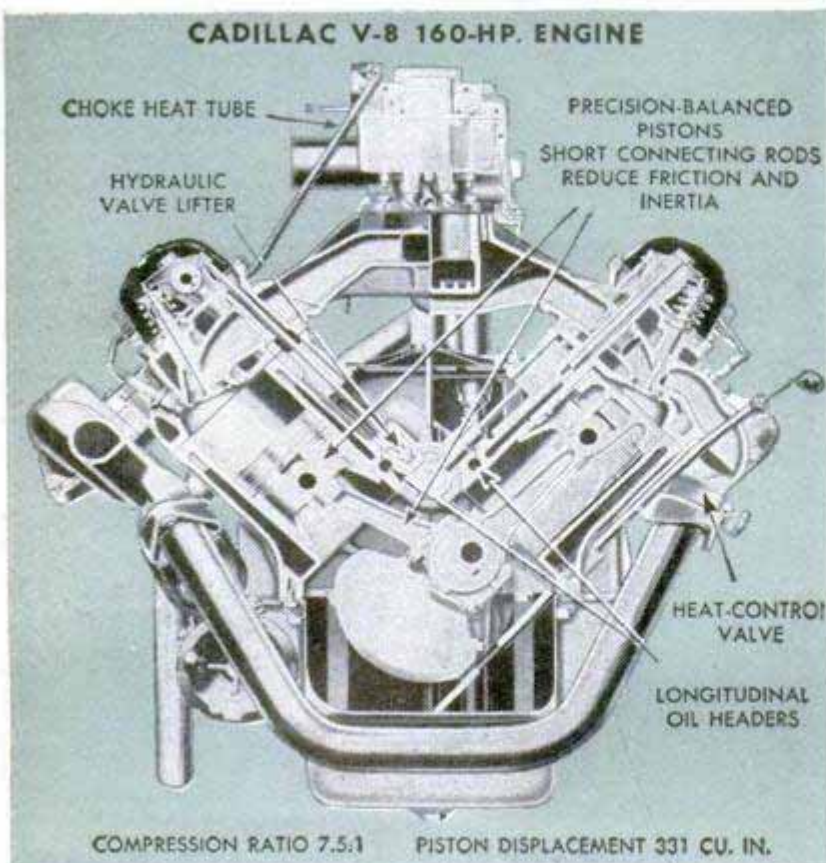
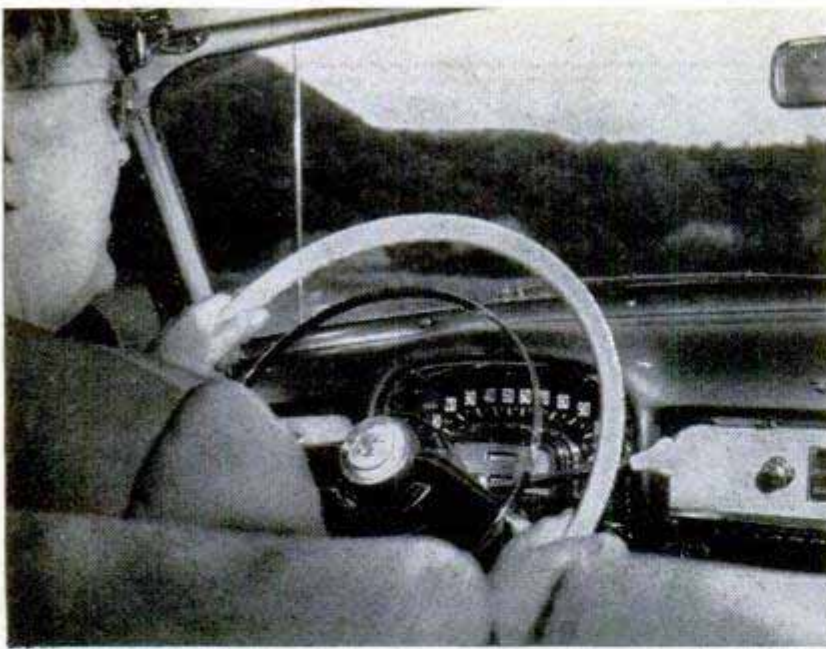
taurant owner in New Castle, Ind., stated: "I've owned approximately 25 or 30 cars and this is the smoothest shifting and driving car of them all." From a Baltimore, Md., bakery proprietor came the compliment that "This car is classed as the best. It seems to be the goal of every car owner. Besides this, to me there is no finer-looking car made."

The general opinion of the Cadillac Hydra-Matic drive was summed up by an automotive machinist in Mobile, Ala., who said: "I think Hydra-Matic gives you longer engine life and less transmission trouble." Many owners reflected this sentiment in much the same words.

A manufacturers' agent in Birmingham, Mich., was among several owners who said they bought a Cadillac because it was the choice of their wives. Daughters also influenced the choice occasionally.

A retired Palm Beach, Fla., man said: "I believe Cadillac is the buy today for all the car you get. A Cadillac 15 years ago cost around \$4000 and was not near the car of today. You had to have the car overhauled after driving it 35,000 miles—not today, if given care at all and regular service every 1000 miles."

A Michigan businessman had his own safety in mind when he said one of the best



Clymer at the wheel agrees with the 93 percent who like Cadillac's visibility. Center, he inspects master control that operates all windows from driver's seat

features he liked about the car was its weight "when hit by another." An Orlando, Fla., man pointed out that the hood no longer locks from the inside and that the air horns, battery or other under-hood equipment can be stolen. He liked the previous inside hood lock better.

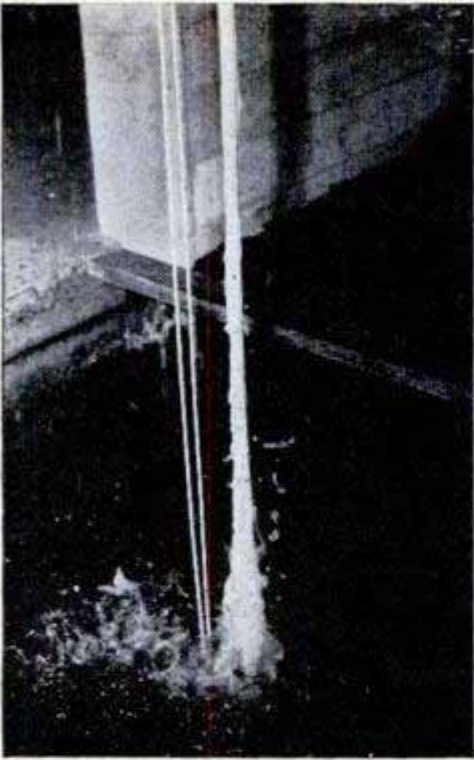
Although 73 percent of the owners replying in the poll said they receive good dealer service, an Omaha, Neb., sales executive was one of a few who noted that "an overcrowded garage services local Cadillacs." A San Antonio, Tex., man said he got good dealer service, but that it was "too expensive . . . that goes with a Cadillac, I guess."

The new low-pressure, super-cushion tires were generally popular, but one impression came from an Indianapolis man who likes them "For riding, yes; for steering, no." Most owners agreed that they give a better ride. (92 percent like them, yet 36 percent exceed the recommended pressure by an average of three pounds.)

Here is a comment from a Spokane, Wash., executive: "I like the 1951 Cadillac very much. It should, however, have a top gear ratio of about 3.7:1. The car is sluggish in acceleration and power at speeds up to 35 miles per hour with the higher gear ratio. The steering is so slow that it is dangerous at high speeds when a sudden change of direction is necessary. The big tires give too much sidesway on curves . . . Brakes should be stronger and motor should develop at least 25 or 35 more horsepower. Valve springs should be stronger to prevent fadeout at high speeds. But I like the dependability, comfort, driver's position, quietness and quality throughout."

A Florida physician said he likes the overhead-valve V-8 engine, but suggested that it be made more powerful so that regular gas could be used. (We can't have high-powered engines

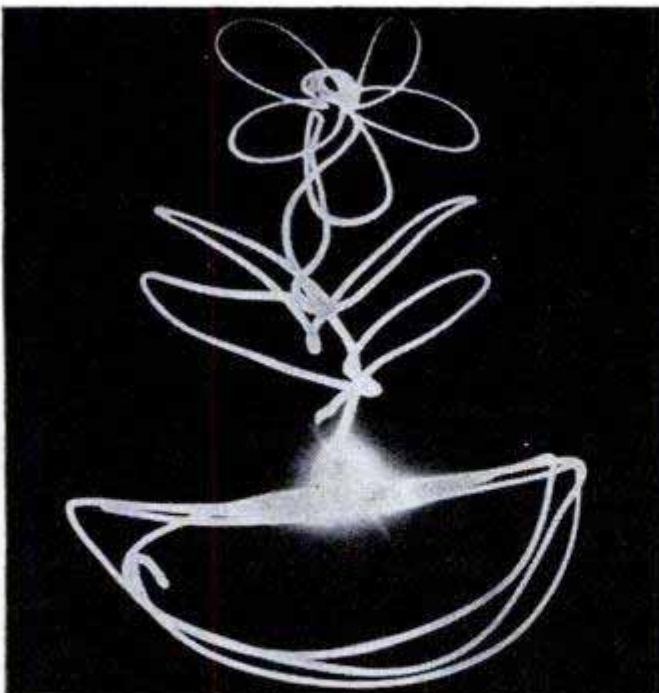
(Continued to page 232)



Clothesline Pumps Water

With a clothesline, two pulleys and a small electric motor, engineers at the University of Illinois are pumping water by the bucketful. The rope pump lifts 12 gallons of water a distance of 25 feet every minute, a job that would do credit to a pump costing several hundred dollars. The rope is doubled around the pulleys so two strands are rising while two others move downward. The water clings to the upbound ropes and splashes off at the top pulley.

The bottom pulley, weighted by a piece of scrap iron, simply is dropped into the water. The engineers came across the idea in an old book on hydraulics, didn't think much of it, but decided to investigate it anyway. They were amazed at their success. They feel the idea could be of considerable interest to farmers, soldiers or anyone else who might need a single pump that could be improvised from materials found almost anywhere. They see no reason why the rope pump can't raise water considerably higher than 25 feet.



"Painting" With a Flashlight

Using the air as his canvas, George Daly, a Vermont illustrator, "paints" unusual sketches with a pencil flashlight. By setting

his camera for a time exposure, he captures the sketch on photographic film. Each sketch is made in four or five seconds and is, of course, made by a continuous stroke of the flashlight.

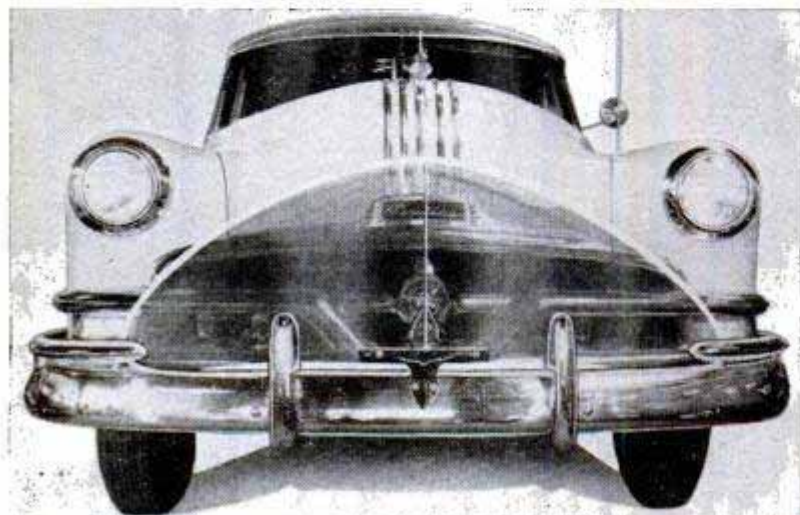


Car From Lawn Mower

Larry Melear's grass may not get cut this summer, but the neighborhood kids will have a lot of fun. Melear, of Atlanta, Ga., decided last winter to convert his power mower into a miniature car. Now—no mower, but a car that runs 16 hours on a gallon of gas. The frame and body are made of wood. The motor is connected to the rear wheels by a series of chains and gears and operates through a friction belt. The harder a pedal is pushed the tighter the belt is pulled to make the car go faster. The car has a top speed of 15 miles per hour and can carry an 800-pound load.

Pier With Conveyor Belt Handles Foreign Ore

More than 2000 tons of foreign ore can be unloaded from ships and reloaded on railroad cars each hour at a new \$5,000,000 pier in Baltimore, Md. The pier, built by the Baltimore and Ohio Railroad, is the first specially designed to handle foreign ores, which are being imported in increasing quantities to offset the depletion of domestic ores. Six hundred and fifty feet long, the pier has two unloading machines on movable towers. The ore is scooped out of the ship's hold by huge 15-ton buckets and deposited into bins which feed it onto a conveyor belt. The belt carries the ore to a scale house where it is weighed and then dumped into waiting railroad cars. The rubber belt is 1812 feet long and weighs 45,000 pounds. It travels 400 feet per minute.



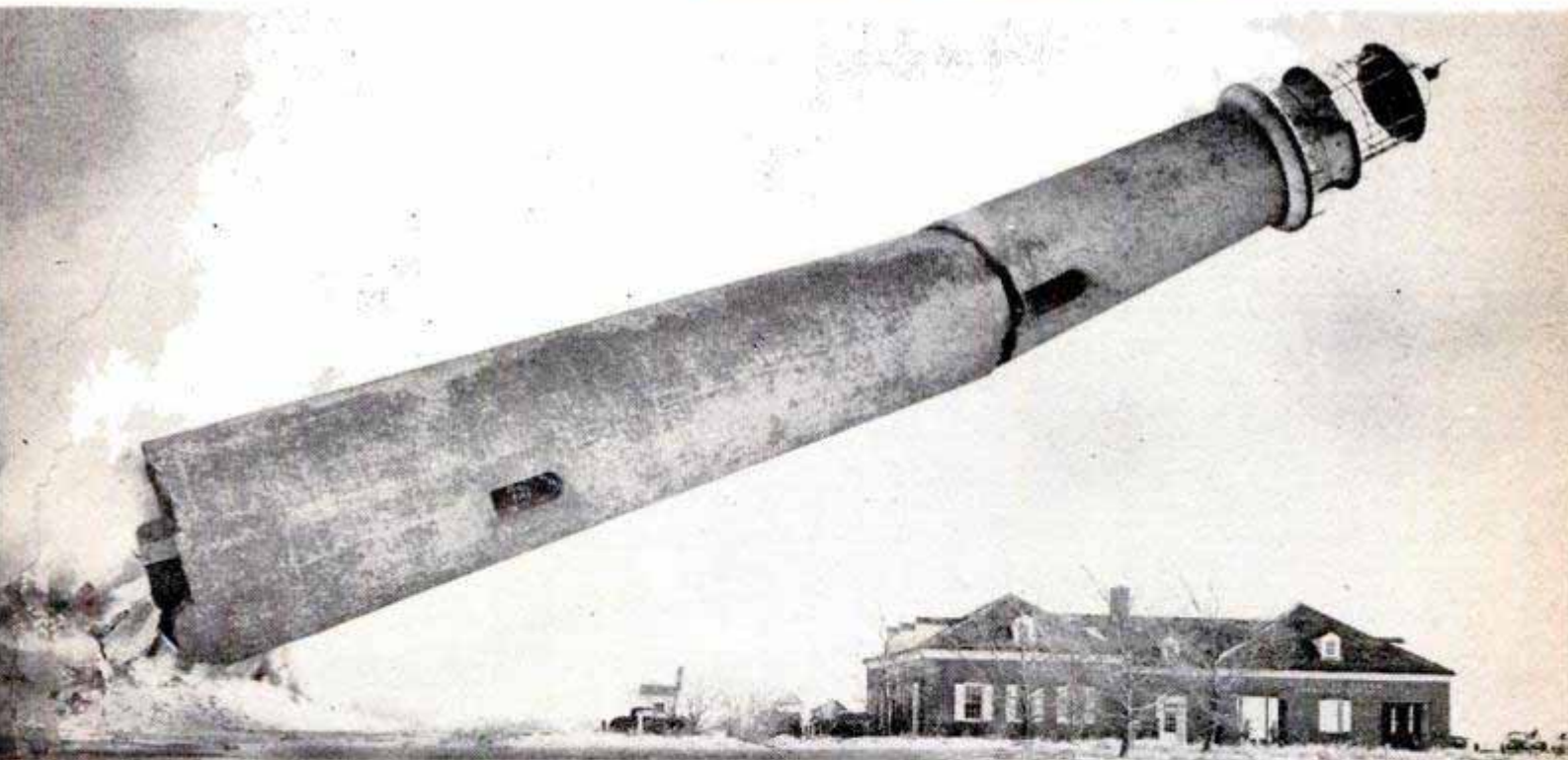
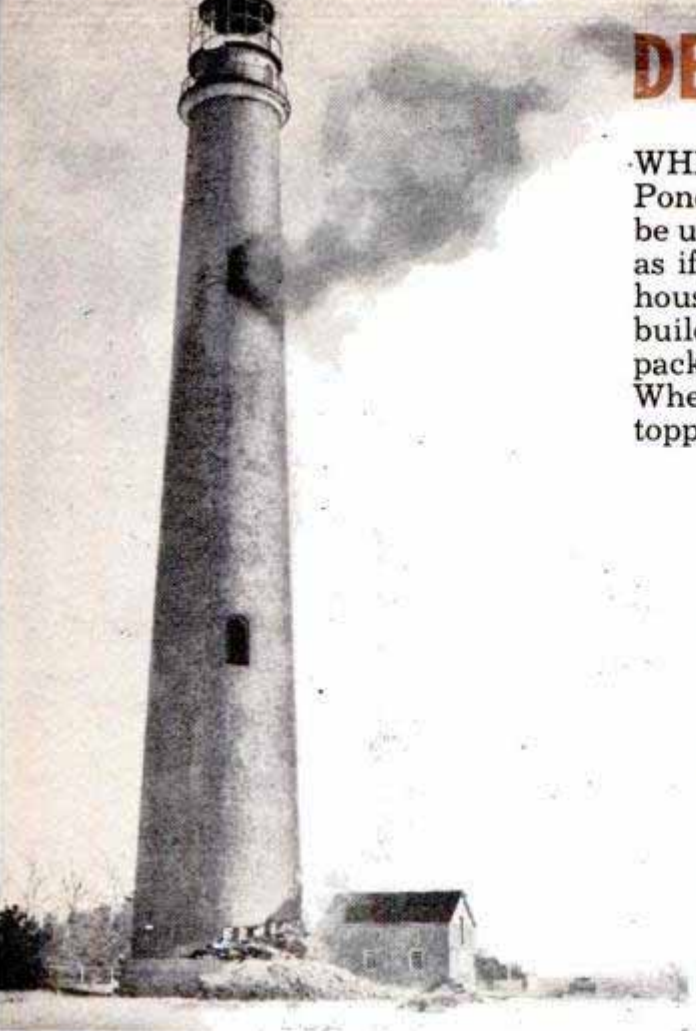
Bug Screen Protects Car

Mounted on the front bumper, a plastic screen keeps bugs from clogging radiator pores and marring grille finishes. Quickly installed, the screen is wide enough to protect the entire grille from damage by flying stones and gravel. Being plastic, the screening will not rust or bulge and requires no upkeep.

☐ A one-shot vaccine capable of giving dogs lasting immunity against distemper is now available.

DEATH OF A LIGHTHOUSE

WHEN demolition workers, assigned to tear down the Ponquogue Lighthouse on Long Island, found it would be unsafe to use dynamite, they felled the tall structure as if it were a huge tree. Along one side of the lighthouse they cut a hole six feet high, shoring up the building with timbers. Then logs and brush were packed into the hole, soaked with gasoline and ignited. When the timbers burned through, the lighthouse toppled in exactly the right direction.



Top, smoke from the burning timbers pours from window of the doomed 135-foot structure

Top, right, members of a demolition crew pour gasoline on logs in the hole cut in the base

Above, down she goes! Line of fall had to be carefully planned because of near-by buildings

Right, all that was left of the unwanted lighthouse was a long line of broken masonry

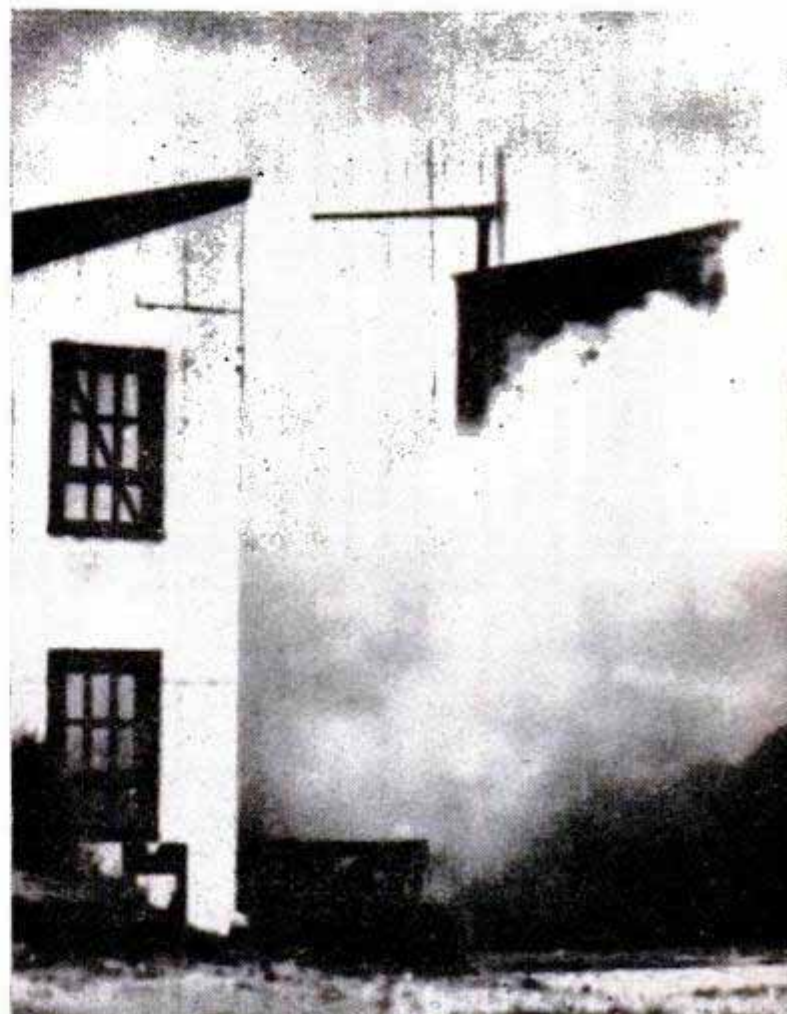
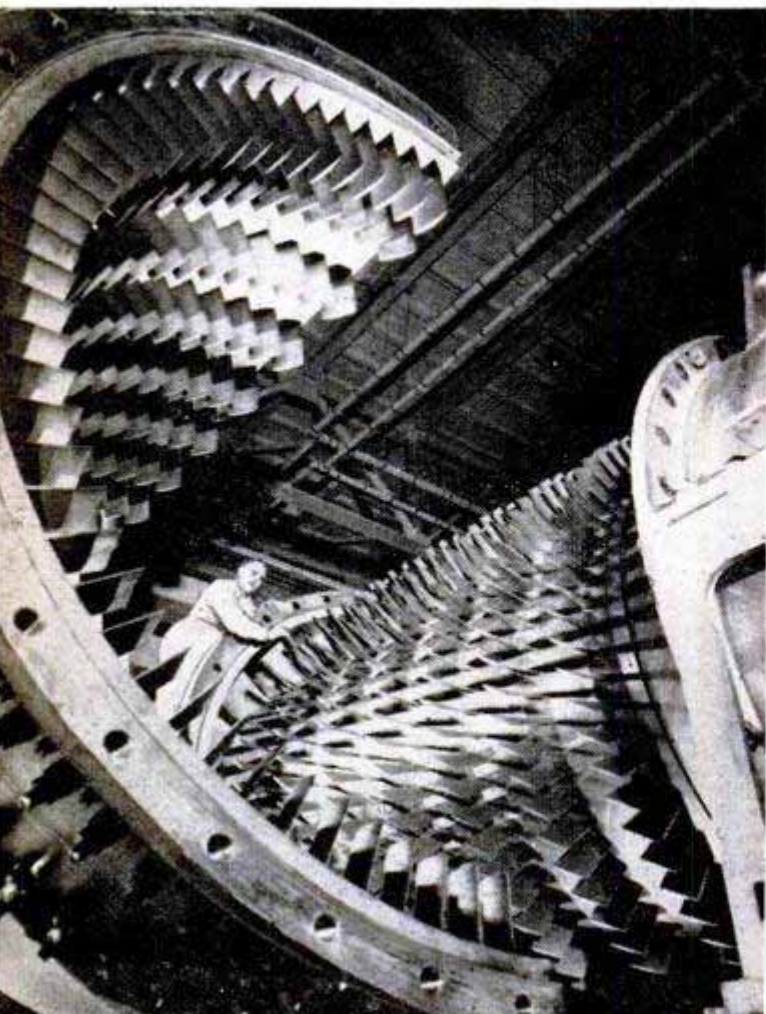
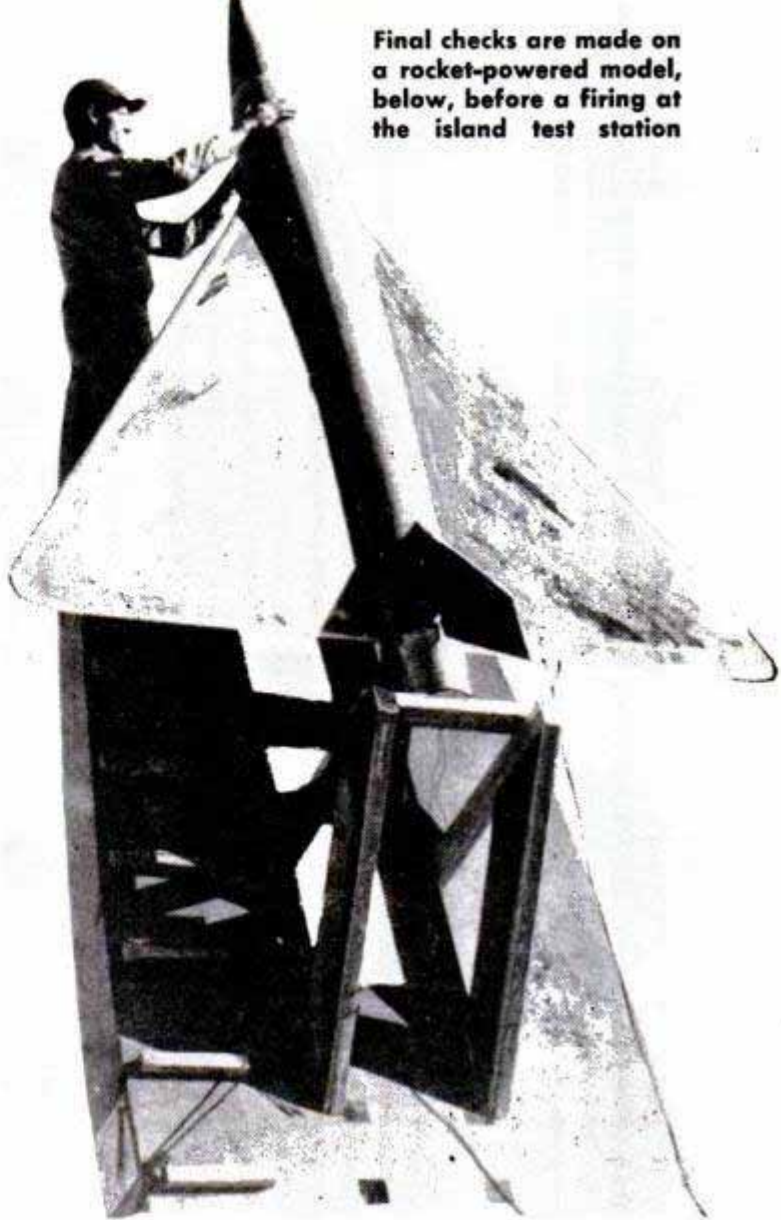


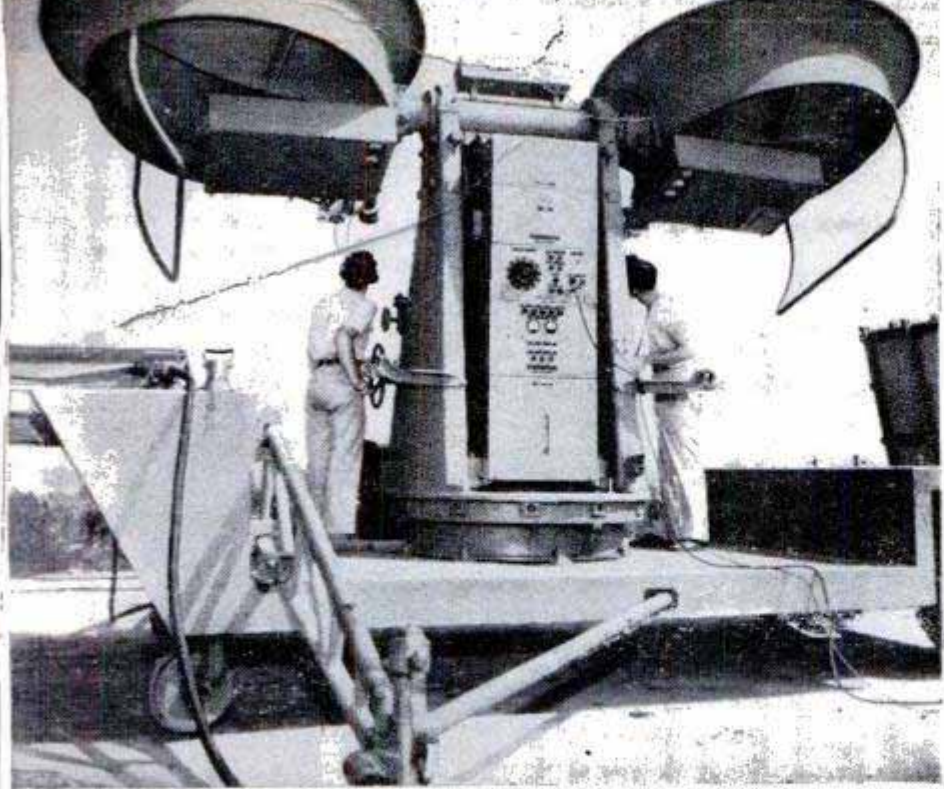
SUPERSONIC PROVING GROUND

ROCKET-POWERED models fired out over the Atlantic from an island off Virginia's coast are helping determine the best shapes for tomorrow's airplanes. Some fly as high as 100,000 feet and as fast as 40 miles a minute before plunging into the water a few miles from shore. These experiments in aerodynamic behavior are conducted by the National Advisory Committee for Aeronautics with models 4 to 12 feet long that are preset to roll, dive, climb and turn like an airplane. Though the models are lost, their records are not. Radar tracks them and provides a running record of their velocities. The latter is obtained through Doppler velocity radar, using two large saucer-shaped antennas that are side by side and move as a unit. Continuous radio waves from the transmitter antenna are reflected back from the model to the receiver antenna, with the increasing time interval of their return revealing the model's speed. Additional data comes from tiny electronic telemeter instruments within the model which relay back 10 different kinds of flight information to be used in designing high-speed aircraft and missiles.

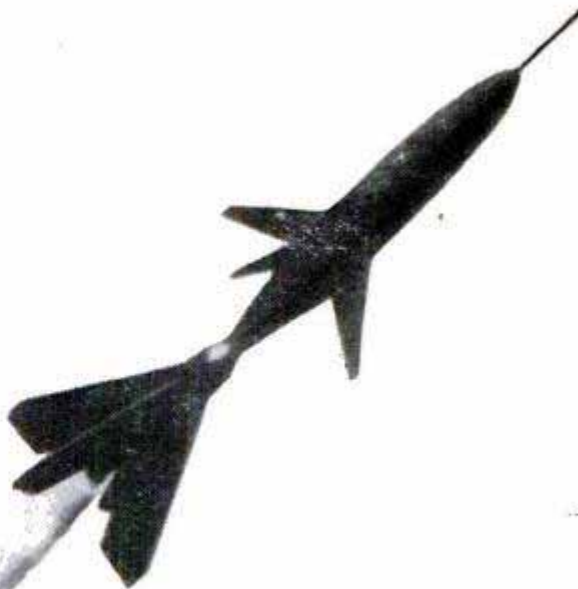
Air is pushed through the NACA's supersonic pressure tunnel at Hampton, Va., at a rate of 860,000 cubic feet per minute by the rotor shown below. It weighs 55 tons

Final checks are made on a rocket-powered model, below, before a firing at the island test station



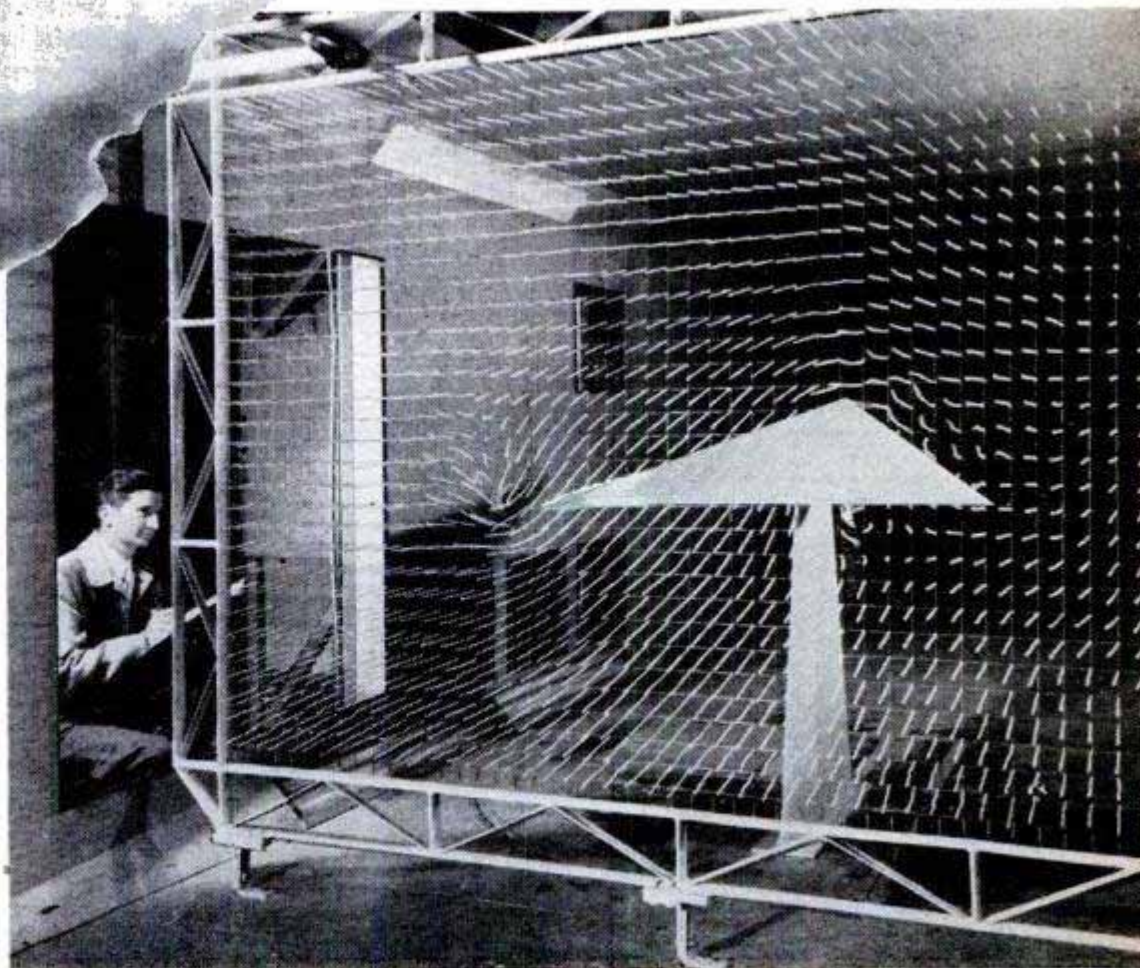


Operators aim the Doppler velocity radar, left, at a flying model. Continuous waves from one antenna are reflected back to the other from the model, with the intervening time indicating the object's flight speed



With a rocket-booster unit at the rear, a Tiamat missile, above, speeds out over the ocean for a two-minute test flight

Graphic information about the turbulence behind each wing tip is provided by a wire grid with white wool tufts, placed in wind tunnel behind a delta-wing shape

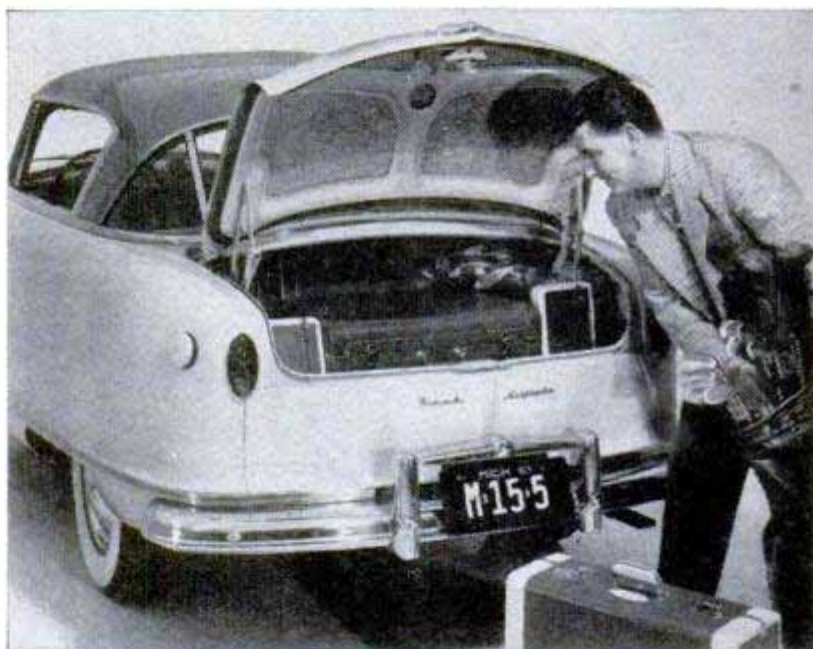




Nash Rambler Hardtop

Nash has brought out its candidate for hardtop honors in the Rambler. It calls the addition the Country Club, and like the others in that styling has a steel top and full-vision windows that drop into the sides. This is the fourth model that Nash has introduced in the Rambler line. Like the convertible, which was the first of the Rambler line, the hardtop will have complete accessories, including radio, clock, directional signals, custom upholstery and trim and Nash's famed Weather Eye, as standard equipment. The Country Club will have an L-head, six-cylinder engine. The windshield is one piece and curved. The luggage compartment offers 14½ cubic feet of space. The body is unitized, with body and frame welded together. It has sweeping front to rear fender lines, a low hood for

Latest addition to the Nash Rambler line is the Country Club, a hardtop model. A one-piece windshield and "wrap around" rear windows give wide visibility. Below, roomy luggage compartment



better visibility and a low center of gravity. Overdrive is offered as optional equipment. Two-tone colors are available.



Jointed Oars

Jointed oars designed by Manuel Lopez Dafonte of Ferrol, Spain, permit the user to face the direction he is rowing. Boatmen using the conventional straight oar in the usual manner have their backs to the direction of travel.

☐ A paper-pulp plant located in Algeria soon will start processing the bark of eucalyptus trees into high-grade paper, book paper and newsprint.

THE PATIENTS ARE PETS

... in this ultramodern hospital, where neurotic cats and movie stars, expectant poodles and alligators with ulcers bring their troubles. A dog's life is not bad!

By Clifford B. Hicks

Surgery at Speyer is as serious, as delicate as surgery at any hospital for humans. Sterile equipment is the finest

Who's hurt the most—the boy or his dog? Mongrels and thoroughbreds get the same treatment, regardless of owner's ability to pay for the top-notch care

Richard Averill Smith photos



THEY'VE CURED a monkey with the city jitters and a neurotic cat that would eat only if it heard a certain tune played on the harmonica. They've stopped the nose-bleed of a tiny hamster and restored the health of a punch-drunk kitten that sneaked too much Christmas eggnog.

White-garbed doctors at the Speyer Hospital for Animals wouldn't bat an eye if you dragged a kangaroo with a sore pocket into the waiting room. They'd diagnose the trouble, then probably prescribe such modern drugs as penicillin and aureomycin for your ailing marsupial.

The New York hospital has a phenomenal record. In its 40-year history it has treated more than a million animals, from alligators to ocelots, and restored an amazingly high percentage of them to health. No animal in distress ever has been turned away from Speyer. A millionaire's poodle and a stray mongrel get exactly the same treatment—the finest in the world, according to some authorities on veterinary medicine. The equipment at Speyer would do credit to an up-to-date hospital for human beings; dogs and cats, squirrels and rats get the works, from oxygen tents to X-rays, fluoroscopes and pretty nurses.

Each year, about 25,000 animals of all





Big collar for Tabby; a huge ruff keeps this cat from licking its wounds, thereby infecting them

sizes and species check into Speyer and are treated in the clinic or assigned "bed" space for an indefinite stay.

"We'd treat a sick horse if we could find one," says Mrs. H. Thomas Richardson, assistant director of the hospital. To prove her point she'll take you to the basement where, sure enough, there's a stall waiting for a sick horse. Hasn't been occupied for many a moon, but someday an ailing equine will "sign" in, and his bed will be waiting.

Dr. James R. Kinney, director, and his staff of six assistant veterinaries perform some 4000 operations each year. About 450 of these operations are classified as major surgery, and an unusually high percentage of the patients pull through. Doctor Kinney continually warns that the hospital can't perform miracles, but he is nationally known for his uncanny ability to diagnose and successfully treat ailments in animals.

Modern oxygen tent frequently saves patients that might otherwise be lost



Under his guidance, Speyer has made such an outstanding record that the State Department's Voice of America recently broadcast a description of the hospital and its work to more than 2,000,000 people in Europe.

There are seven vets and 45 attendants on the staff, and each is guided by the same basic belief. Doctor Kinney puts it into words: "To many people—especially the poor, young and old—a pet isn't a luxury but a necessity. In many cases, a pet is the only comfort in a person's life."

The wealthy New York suburbanite pays a flat \$2.00 to have his blue-blood poodle treated in the Speyer clinic, \$2.50 a day for a bed in the hospital. The ragged little boy living in New York's worst slum district doesn't pay a penny if his pup needs the same treatment. In both cases, the ailing animal is given a warm welcome, assigned a spotless, individual cage with a sterile blanket on the floor, fed the best food and given treatment as fine as any amount of money could buy. A whopping 60 percent of the animals which check into the hospital are given free care.

Speyer's sparkling equipment would impress the most sophisticated of poodles. Purifiers wash germs from the air to prevent contagion. The hospital has its own laundry for sterilizing the bedding of the patients and the clothing of the attendants. Special operating tables are designed specifically for animals, and the dispensary is filled with the latest antibiotics. If you read the patients' record cards, fastened to their beds, you'd find many being treated with aureomycin, penicillin and chloromycetin.

Manhattan's traffic is rough on dogs' legs, and Speyer is full of pups and kittens with broken bones. The bones are set in novel splints—metal loops of various sizes which fit up over the hip of a dog or cat. The loop binds the bone, keeping it straight while it mends, and at the same time serves as a crutch so Rover or Tabby can walk. Many of the patients sport fluffy collars—ruffs designed to keep the ailing animals from licking wounds and thereby infecting them.

Doctor Kinney and his staff have a personal interest in each animal, for they know you can't measure the affection between a human being and his pet. For many months a shriveled man, so old he

might have been Father Time's own grandfather, brought his great Dane to the hospital for treatment. Actually, the great Dane brought the man to Speyer, for the huge animal literally jerked the old-timer up the steps and into the waiting room. Despite the finest treatment, the dog eventually died, and members of the staff were heard to murmur that in this particular case there was one redeeming feature—at least the old man wouldn't be dragged along the streets of Manhattan by an animal twice his weight. The following week, though, the old man came flying through the door again, this time jerked on the leash of a great Dane much larger than the former pet.

Caesarians are common at the hospital. Some of the other ailments frequently diagnosed and treated include tumors, cancer, tuberculosis, odd breaks in bones, distemper and skin diseases. Doctor Kinney and his six able assistants operate daily to remove an amazing variety of items from the pet's stomachs. They have recovered, intact, a roll of paper money, bones, safety pins (open and closed), handkerchiefs, stockings, stones, peach pits, rubber toys, a threaded needle, keys and rings. One big dog swallowed a large drinking glass without breaking it; another registered at the hospital, hiccuping from the twitch of a metal spring 10 inches long in its stomach. Not long ago a dog was suspected of harboring a valuable diamond ring, but Doctor Kinney conclusively proved the animal wasn't the culprit.

The hospital has an international flavor. In the waiting room, placards carry instructions in five languages on how to handle animals to avoid contagion. Though most of his patients are from the New York area, Doctor Kinney has treated animals from the southern and western states, Canada, Cuba and Puerto Rico. One dog traveled all the way from Africa for treatment, and the daily mail usually brings an inquiry from Central or South America, England, India or China, requesting advice. Servicemen, sometimes forbidden to keep pets, have sent animals to Speyer from all over the world, and the hospital has found a good home for



Here's how Speyer attendants recommend giving your dog a bath: First put ring of ointment around eyes to prevent infection

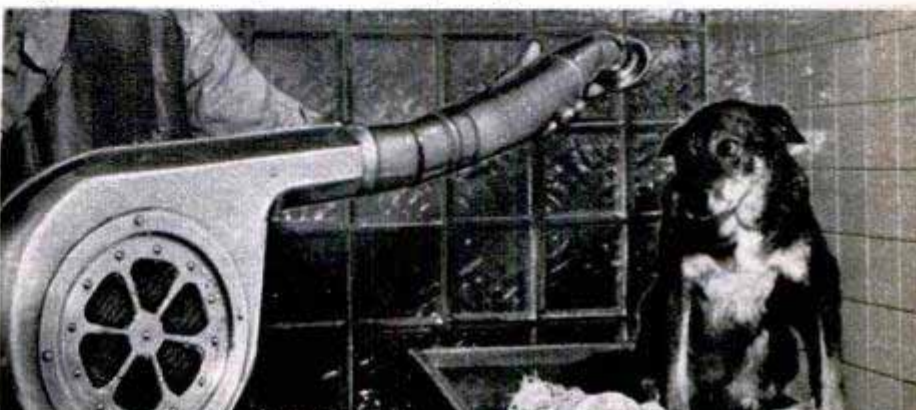


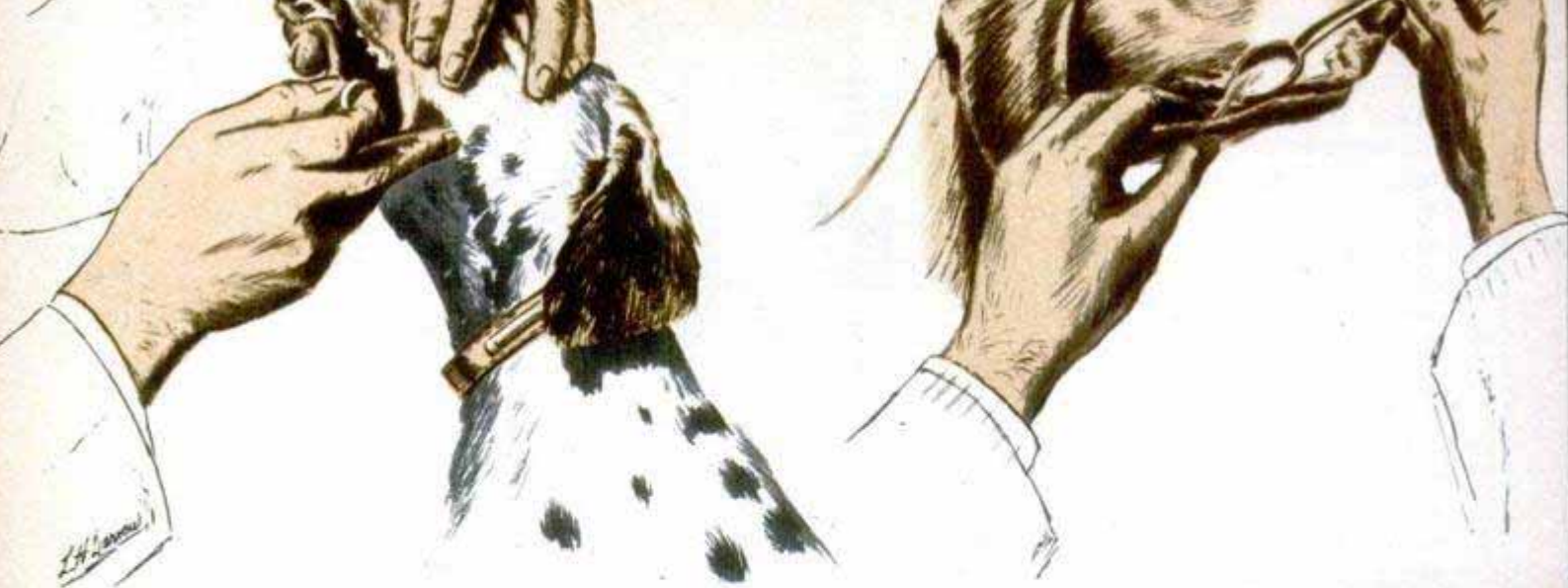
Plain soap flakes are best for the bath. Dog's paws should be scrubbed well, but not his face—he'll take care of that himself



Rinse is the most important step of the bath. If even a speck of soap remains on the dog's skin, an irritation may develop

In the final step at Speyer, hot air from a blower dries the dog. Towel will do just as thorough a job if owner is careful





To give pet a pill, squeeze jaws open, then place pill as far back on tongue as possible. To administer liquid medicine, merely pull out the lower lip to form a funnel and pour in the medicine with a spoon

every one of them. Free service is extended any Seeing-Eye dog. Also, there's no charge for firehouse mascots, and Mrs. Richardson figures the hospital has treated about every smoky Dalmatian along the East Coast.

The pride of the hospital is its gleaming new \$40,000 distemper ward. About 2000 cases of distemper are brought to the hospital annually. According to Doctor Kinney, it now is known definitely that the villain which causes distemper is a virus. Distemper can flare like a runaway fire through any group of animals. Any animal suspected of harboring the disease is hustled into a private elevator at Speyer and whisked to the top floor where the new ward is located. There it is immediately as-

signed to one of 61 roomy cages. The walls of the cages are made of glossy ceramic tile, and the bars across the top and front are stainless steel. Fluorescent lights and Venetian blinds cast a soft light across the big ward. The terrazzo floors are coved to eliminate corners that might hide infection. Attendants' uniforms and the pads are washed in the ward's own laundry, and food is prepared in a separate kitchen. Actually, it's a hospital within a hospital.

According to Doctor Kinney, the best treatment yet developed for distemper includes the use of aureomycin, sulfa, penicillin, terramycin and biologics, together with intravenous feedings to build up the animal's strength.

Spotless new distemper ward is a hospital within a hospital, has its own kitchen, laundry, private elevator

Richard Averill Smith photo



Odd animals with odd ailments frequently pop up at Speyer. The staff has taught a beakless parrot to eat. No one knows where a certain stray monkey came from—when it was brought in, burns were found on its feet. A wild possum was picked up in Long Island, of all places, and taken immediately to Speyer. Hamsters, alligators, squirrels, marmosets, pigeons, white rats and chinchillas all have been restored to health. A duck with a leg injury was put back on its feet.

Probably no institution in existence has treated so many famous animals. The fawn which starred in the movie "The Yearling," stayed at the hospital for several days, complete with its own green carpet. A tiny marmoset named "Skippy," mascot of a TV program, was successfully treated for abscesses under the eyes. Two white mice that had been mascots of the cast of "Two Blind Mice," ended up at Speyer, where Mrs. Mouse gave birth to a family.

You can find famous people prowling the corridors of Speyer, too. A good many worried celebrities bring in their pets for treatment. Fannie Hurst, Eva LeGallienne and Russel Crouse have nervously paced the halls. Leon Janney brought his dachshund to the hospital—a maternity case—and Lillian Gish brought a dog that was suffering from a tumor. Lilli Palmer, playing the part of a witch on Broadway, came to Speyer to find a Siamese cat to perform in the production.

The hospital itself made one animal famous. The New York Women's League for Animals owns Speyer, and will do almost any wacky stunt to raise the \$150,000 required to operate the hospital annually. A

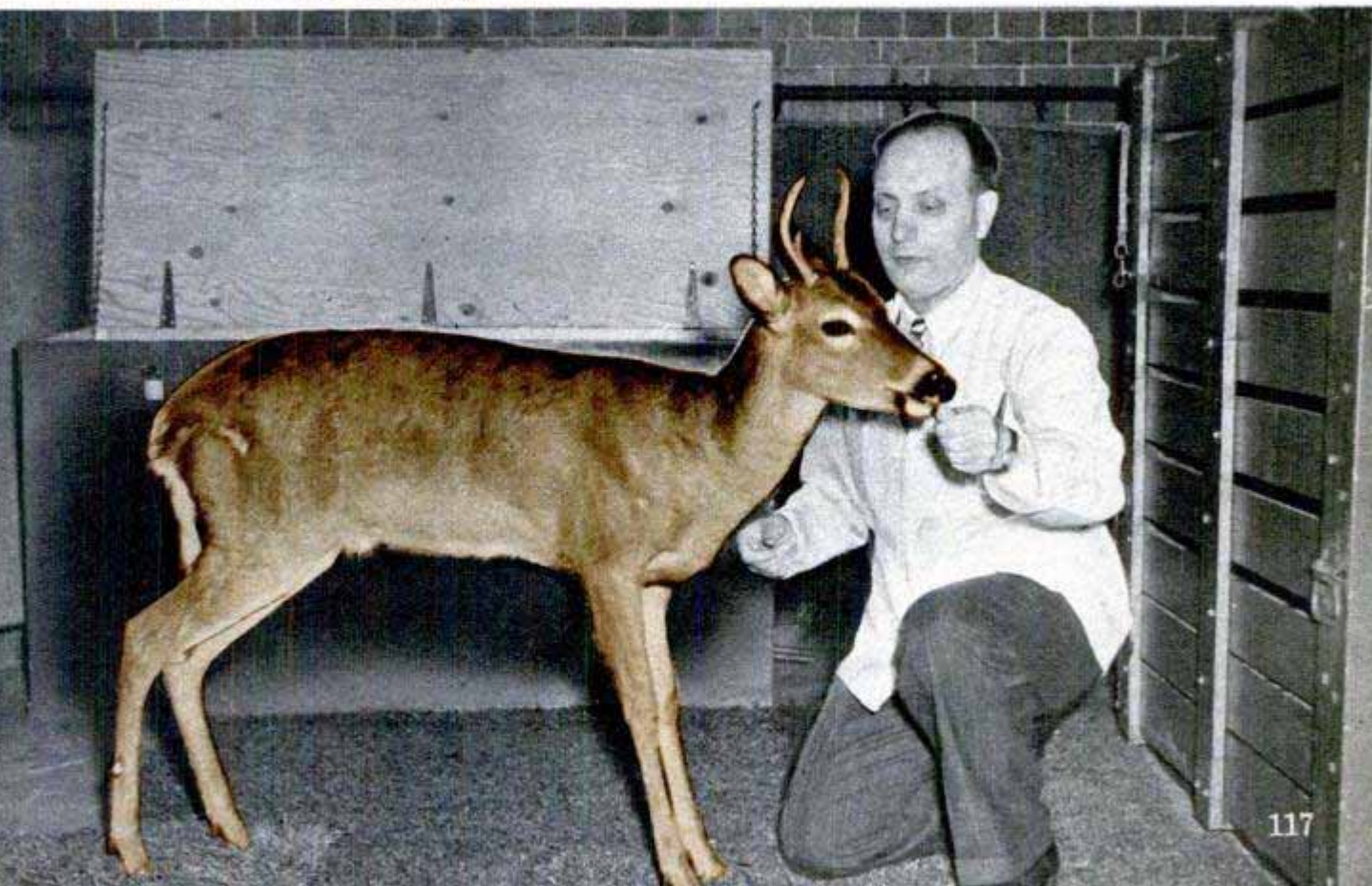
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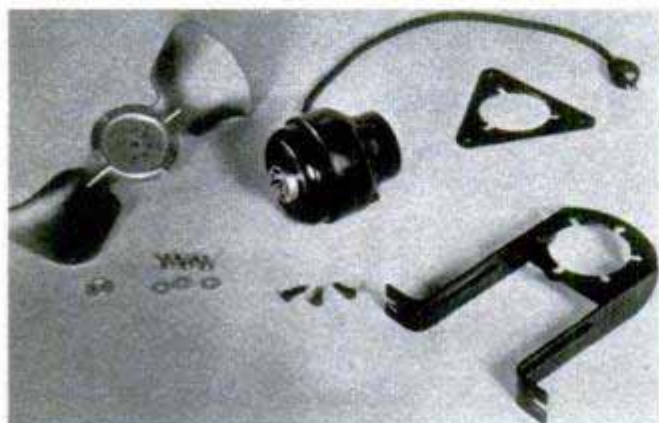


Modern X-ray and fluoroscope instruments are available to help the doctors diagnose animal ailments
Richard Averill Smith photo



Metal-hoop splint binds broken leg and also acts as a crutch. Below, famous animals often come to Speyer. Here Dr. Kinney meets fawn, star of "The Yearling"





General Electric Co., Schenectady 5, N. Y.

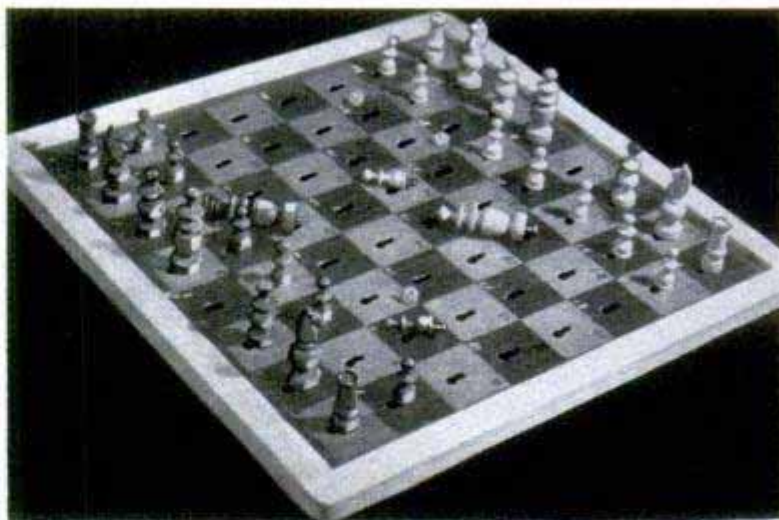
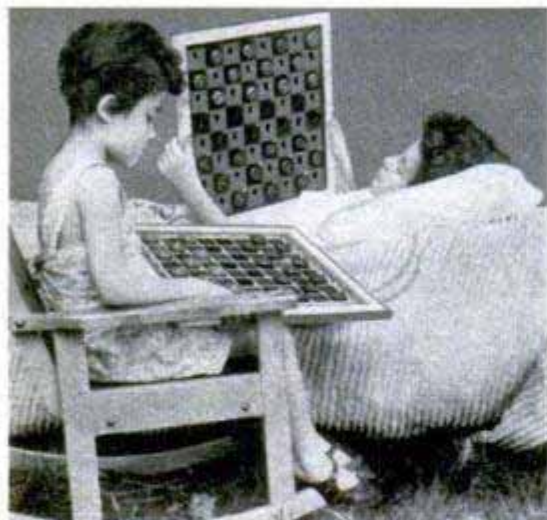
Electric-Fan Kit

You can assemble an electric fan yourself with a new kit that contains the necessary parts. The fan is designed for permanent installation in kitchens, attics or farm buildings. Included in the kit are the motor, 10-inch blade and two mounting brackets. The fan is capable of moving about 360 cubic feet of air per minute.



One-Handed Dog Snare

Dogcatchers are protected from vicious animals by a one-handed snare that holds the dog in a rubber-covered noose at a safe distance. The snare is composed of a hollow metal rod with a rubber-covered piano-wire loop. When open, the noose has a 12-inch diameter. By touching the trigger on the handle, the warden releases a spring which retracts the loop to fit snugly around the animal's neck. The noose does not hurt the animal, says Mayor F. Edward Bier-tuempfel of Union, N. J., who invented it.

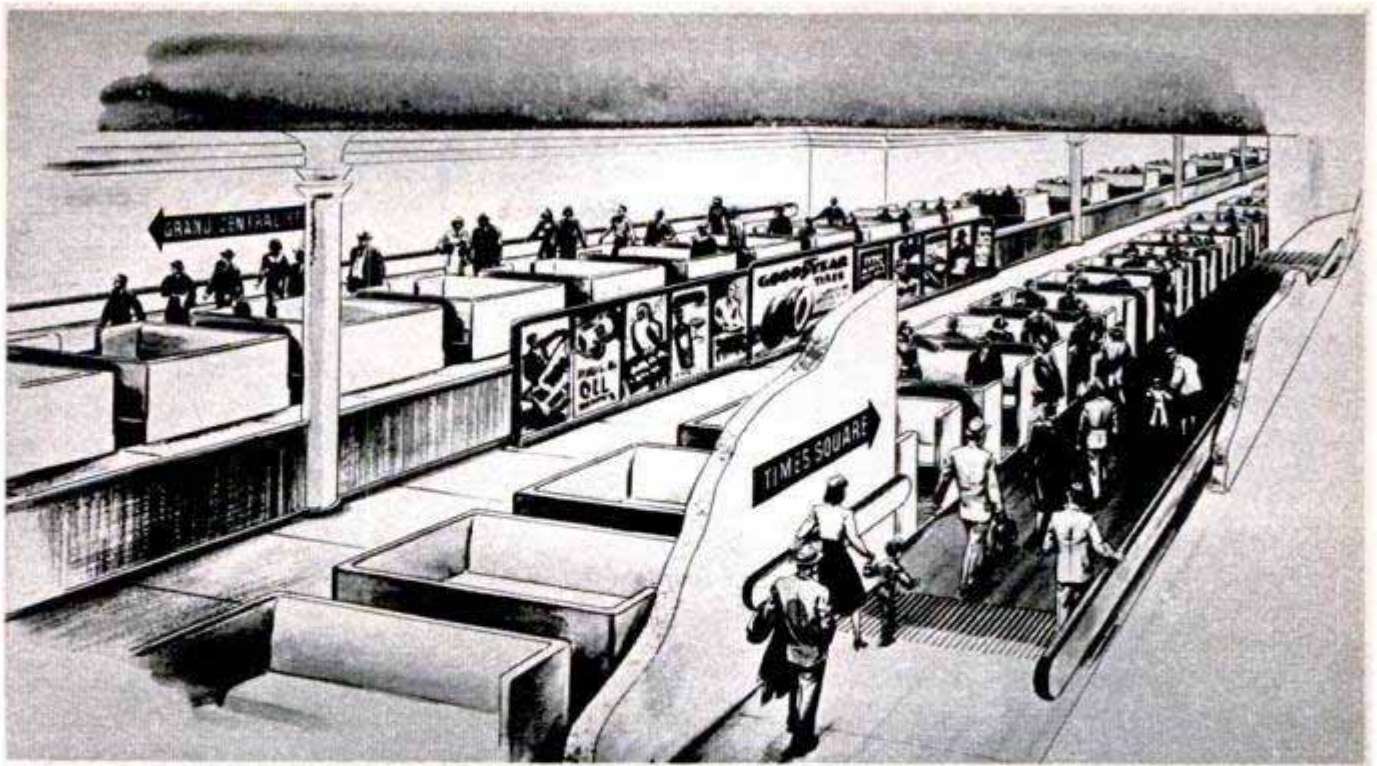


John H. Wheat, 345 McClelland, Pueblo, Colo.

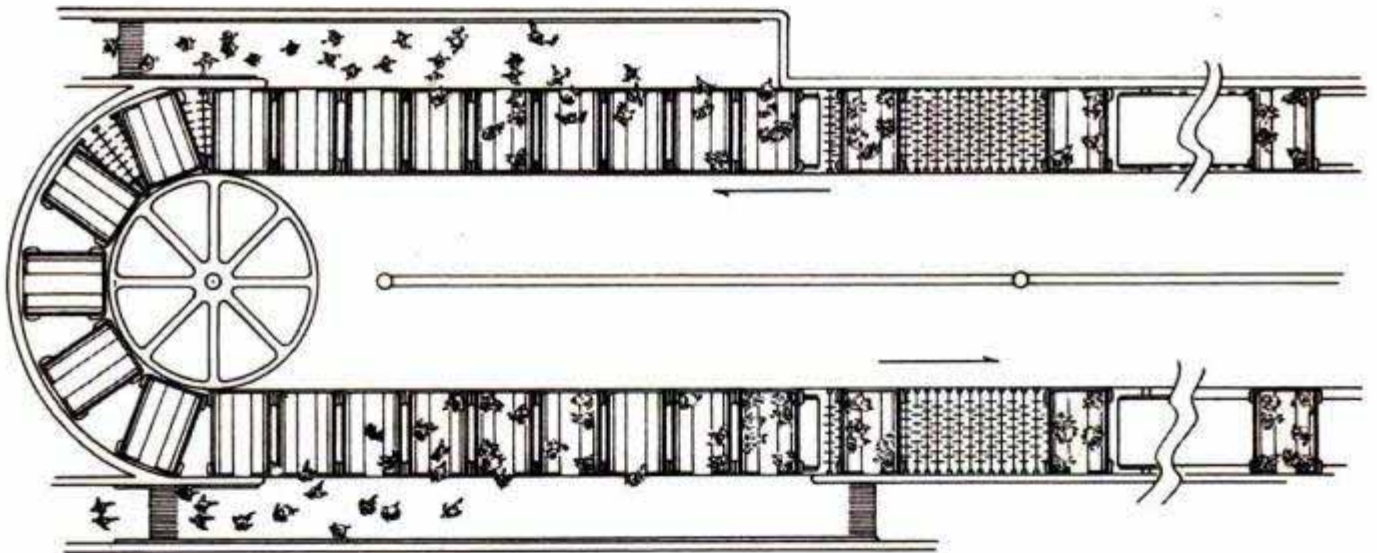
Checkers for the Invalid

Checkers or chess can be played by invalids and blind persons with slotted boards that hold the pieces in place. Each square is numbered with raised numerals so the

blind can identify them. The black pieces have one flattened side for identification by touch. The key slots hold the pieces in place even though the board is tilted as it would have to be when used by many bed-ridden persons.



There's no waiting for a car here. Shown with the tops and doors removed for clarity, the cars roll past the moving platform continuously. Below, a plan view of the turnaround and the banks of accelerating wheels



Passengers May Ride Conveyor Belts on New York Subway

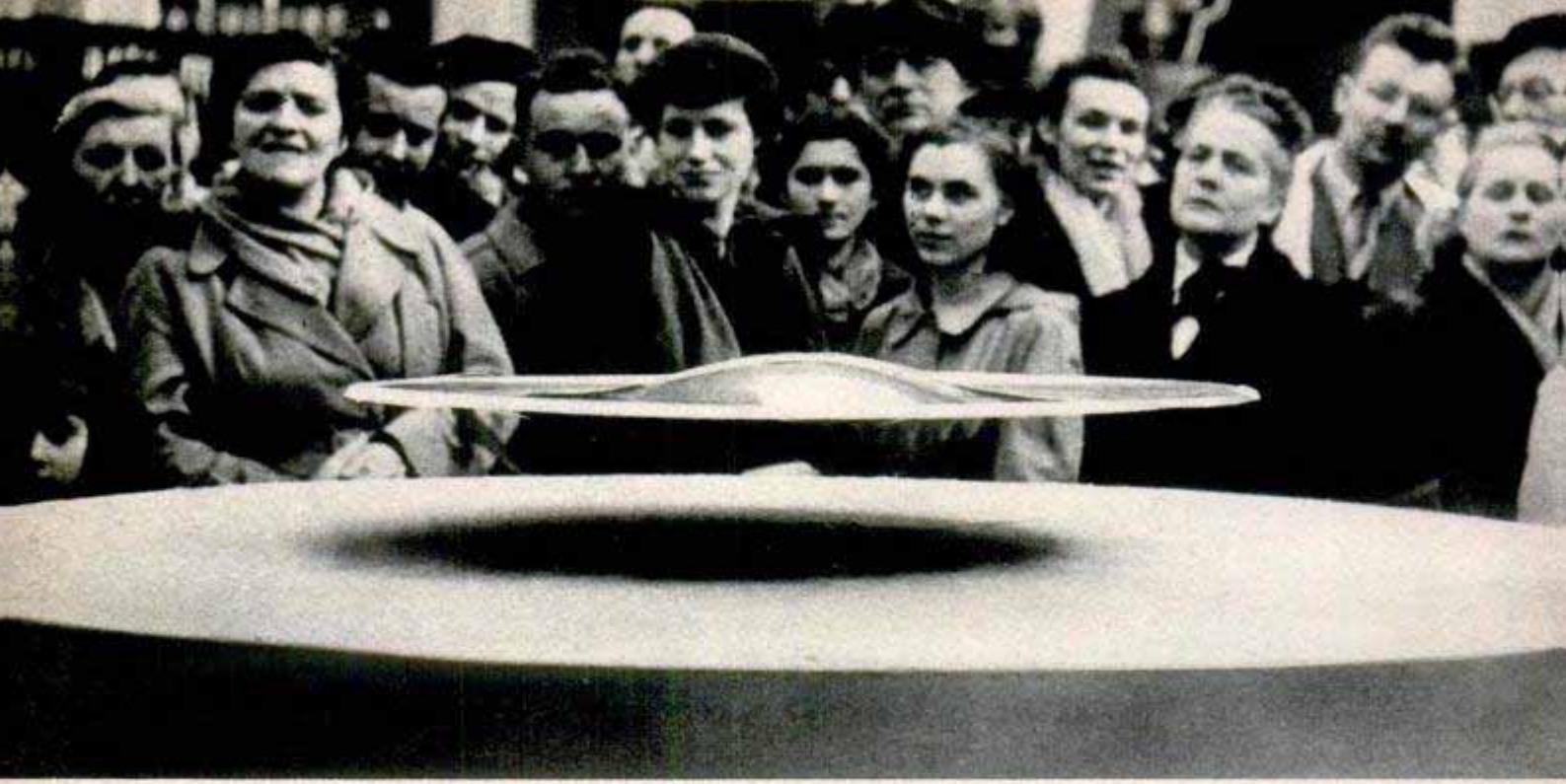
Capable of hauling 32,000 passengers an hour in each direction, a conveyor-belt subway system has been proposed as an efficient replacement for the present shuttle between Times Square and Grand Central Station in New York. The system, unlike previously suggested moving sidewalks, would use moving platforms for loading and unloading and small, closely spaced cars. These passenger cars ride on an end-

less track of conveyor belts and rubber-tired banks of accelerator wheels. Passengers walk on a loading platform that moves at the same speed as the stream of cars. Twenty-five cars pass the platform each minute. Once past the platform, the cars move over banks of accelerator wheels which speed them up and carry them to another conveyor belt that moves them along at 15 miles an hour.

Science Makes Synthetic Foods to Study Real Ones

Chemists at the University of Delaware have created synthetic fruits and vegetables, not for eating but for experiments with dried foods. Real fruits and vegetables are so complex that the role played by their various materials can't be isolated,

so chemists have combined pure cellulose, fruit acids, salts, sugars and pectins to form simulated foods with natural texture and appearance. Their research has proved that pectins are most important in swelling the dried product when it is heated with water.



You don't believe it? These Parisians seem skeptical, too. The metal plate is actually floating in the air

PARIS has its flying saucer, but it is called "The Magic Plate." It is a two-pound aluminum disk that floats in air without apparent support.

It moves up and down. It rotates. It lifts an ornate chandelier with bulbs burning continuously as it spins. If such trickery doesn't prove that the plate is magic, it will fry eggs to a golden brown with nothing between it and the table but air!

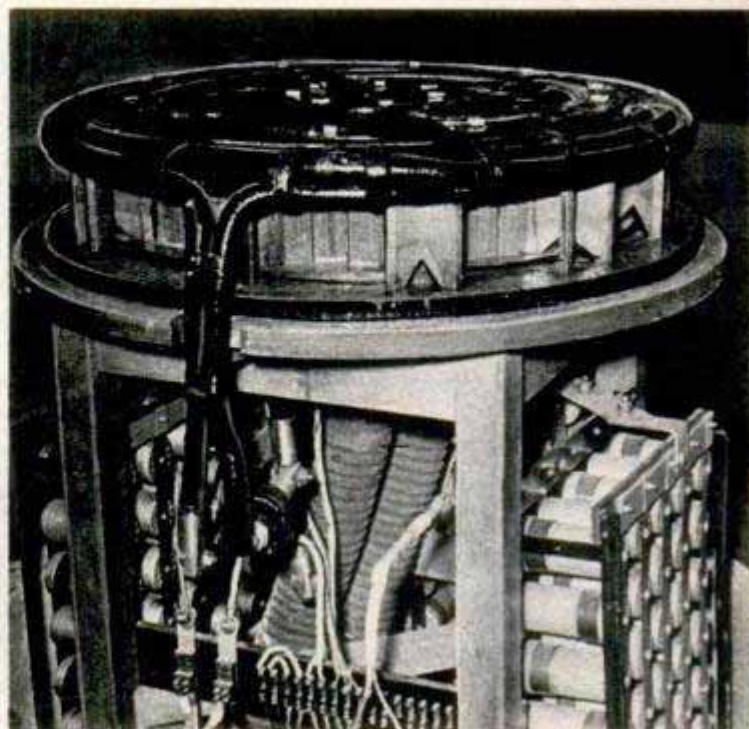
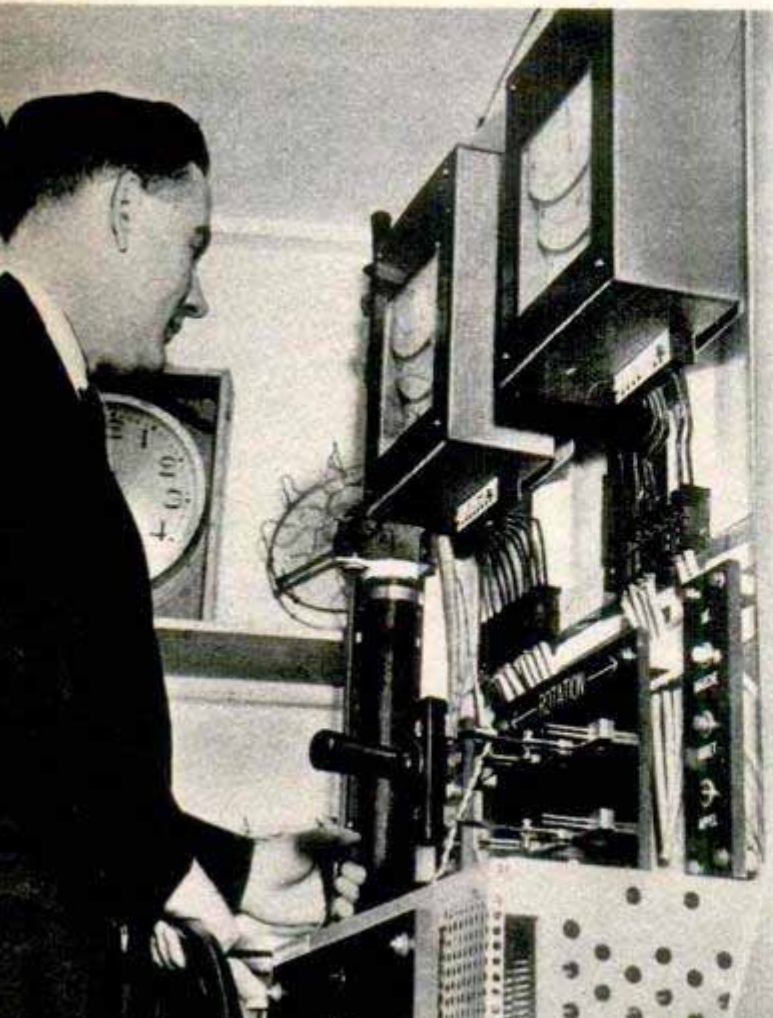
LOOK! IT'S

Actually, of course, it is no more "magical" than the magic of electricity and the phenomenon of induction.

Below the plate, concealed in the table, are two concentric coils. The inner coil sets

Left, it takes all these controls to make the plate perform by regulating the current entering the coils

Below, inside the table or pedestal above which the plate hovers is a complex maze of metal and wiring





Like your eggs fried lightly? These are so light they fly! Magnetic fields heat plate enough to fry the eggs

FLYING DISKS AGAIN!

up a magnetic field that repels the tray, forcing it into the air. To keep the tray from slipping sideways out of the lifting field, a large outer coil is used. This develops a conical field, tapering toward the top, to keep the plate centered.

A third field makes the disk rotate. Four coils create it. Once the tray starts spinning, it does so for a long period even after the rotation coils are turned off because

the drag of friction is almost nonexistent.

The chandelier weighs one pound. Its bulbs are lighted by induced current. The aluminum tray gets hotter than an ordinary electric iron, providing ample heat for egg frying.

What's it all for? It is strictly a stunt used in Parisian store windows to attract customers and impress them with the magic of electricity.

Best trick the "magical" plate does is to rotate a chandelier in air, its bulbs burning by induced current





British Aluminum Co. photo

Aluminum Launch

Made entirely of aluminum-magnesium alloy, a 60-foot launch has a draft of only two feet nine inches. The launch was built in England for the Pakistan government, which will use it to survey estuaries. The craft has a speed of 12 knots and can travel

1500 miles on the fuel it carries. Twin diesels power the launch. A unique system was used in constructing the craft. The skin of the boat was laid out flat with the longitudinal framing attached. Then the skin was bent up into shape, which stressed it in two directions to give the craft exceptional strength.



Fastest PT Boat

Speed tests of a new motor torpedo boat made of aluminum show it is the fastest craft of its kind that Navy officials have

found. Figures for the tests have not been released. The aluminum boat, with an overall length of 105 feet, is considerably larger than its predecessors. It was designed and built at Philadelphia Navy Yard.

Rubber Processing Headed for All-Time Record

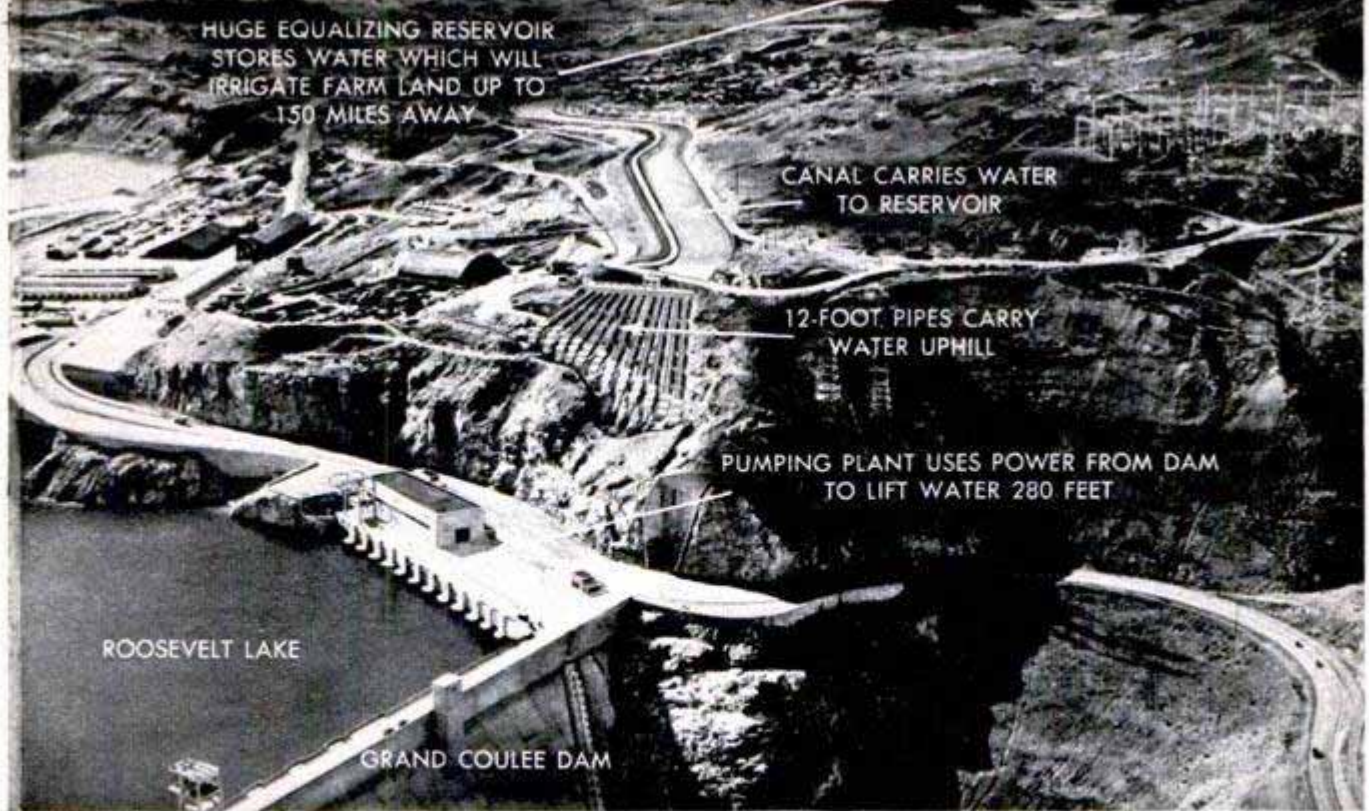
You'll be watching 2½ tons of rubber flying the next time you see a B-36 overhead. This is one of the growing new uses, the B. F. Goodrich Company points out, that this year may result in the industry processing an all-time record 1,260,000 tons

of man-made and crude rubber. About 600,000 tons last year went into automobile and tire manufacture, the big users, and nearly 80,000,000 pounds are annually made into garden hose. Girdles and golf balls account for more than 10,000,000 pounds yearly.

Metal in Engine Lowers Igniting Point of Oil

In seeking more fireproof lubricating oils for jet engines, University of Cincinnati chemists found that the catalytic effect of

metals used may lower the igniting point. The research is being done for the National Advisory Committee for Aeronautics.



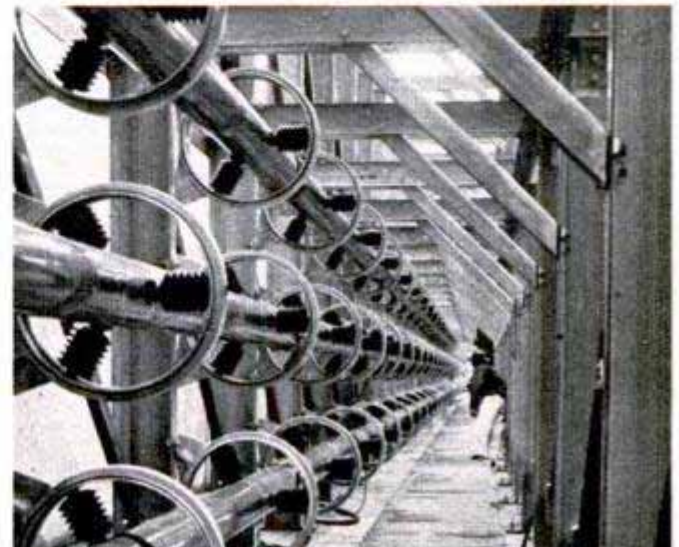
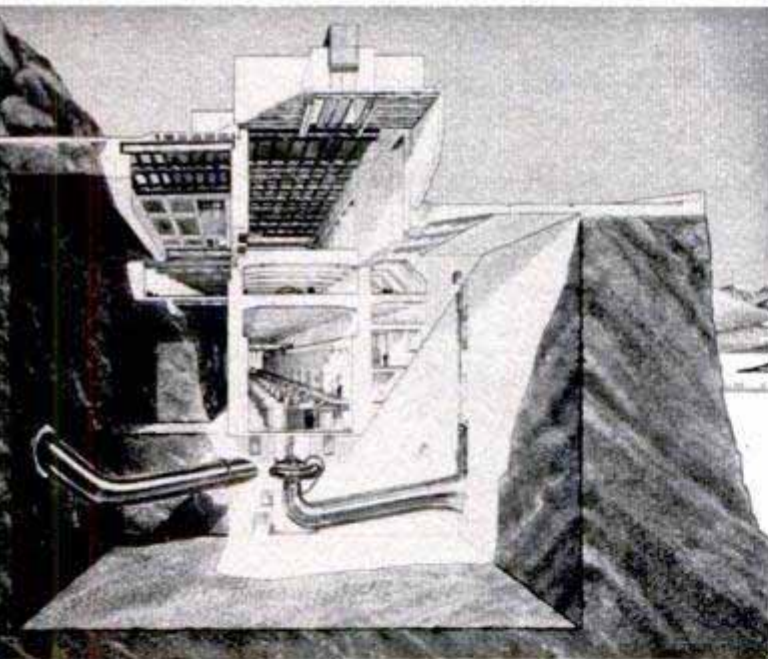
Bureau of Reclamation photos

Water from dam generates power, which in turn raises water up the cliff to irrigate farm land 150 miles away

UPHILL RIVER

"OPERATION BOOTSTRAP" at Grand Coulee Dam is scheduled to start this summer. Power generated at the dam will be used to drive enormous pumps which will lift a river of water 280 feet up the face of a cliff on the Columbia River. From there the water will be distributed to irrigate a million acres of farm land, some of it 150 miles away. Each of the 12 giant pumps has a capacity of a billion gallons of water a day, enough for all the people of New York City. This year, all the canals, siphons and gates of the distribution system will be tested and primed. Actual irrigation will start in the spring of 1952.

Above, left, sectional view shows how water from behind dam is drawn into pumps, then forced uphill. Below, left, 12-foot pipes carry water to top of cliff. Below, power flows to top of dam through large tubes



OUT ON THE tossing North Atlantic last summer, a fleet of small ships seemed to be zigzagging aimlessly like a bunch of kids looking for a lost penny on a ball field. If you'd passed them on a liner, your curiosity might have been aroused by one of them, at least. She was a 142-foot ketch, and might have been under full sail or, even more perplexing, hove-to and rolling deep in a trough of the Atlantic swell.

The ship was the research vessel, *Atlantis*, out of Woods Hole Oceanographic Institution in Massachusetts. Standing off her, at about 100-mile intervals were the *Caryn*, the institution's 96-foot ketch; *Albatross III* of the U. S. Fish and Wildlife Service; the U. S. ships, *Rehoboth* and *San Pueblo*; and a Canadian craft. Using a new combination of loran, to get accurate bearings every half hour, and a tricky underwater thermometer known as a bathythermograph, which instantly measures

changes in ocean temperature as deep as 900 feet, this little fleet was tracking down the baffling meanders of the Gulf Stream over vast areas with pin-point accuracy never before possible.

From the ships, new recording echosounders bounced sound waves off the ocean bottom. By measuring the time lag between sound and echo, scientists could chart contours of the sea's floor, locating undersea mountain ranges and valleys that might affect the course taken by the Gulf Stream.

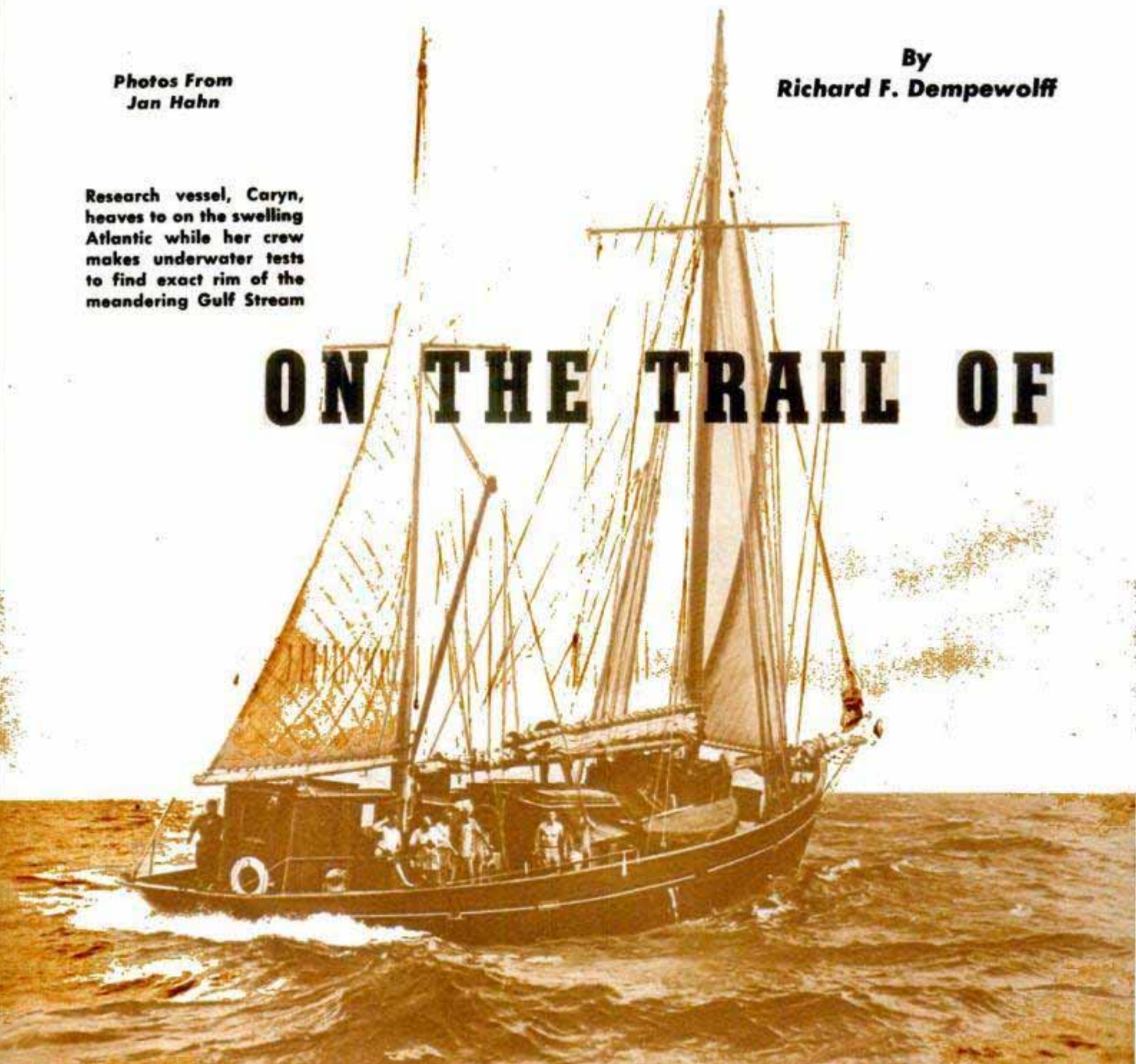
And there's a new underwater coring device which drills 60 feet into the ocean floor to bring up samples of sediment layers laid down a million years or more ago. These samples will tell scientists much about the world's history but, even more important, will reveal the great climate cycles that the earth has undergone since the beginning of time—a possible clue to the climate cycles

Photos From
Jan Hahn

By
Richard F. Dempewolf

Research vessel, *Caryn*, heaves to on the swelling Atlantic while her crew makes underwater tests to find exact rim of the meandering Gulf Stream

ON THE TRAIL OF

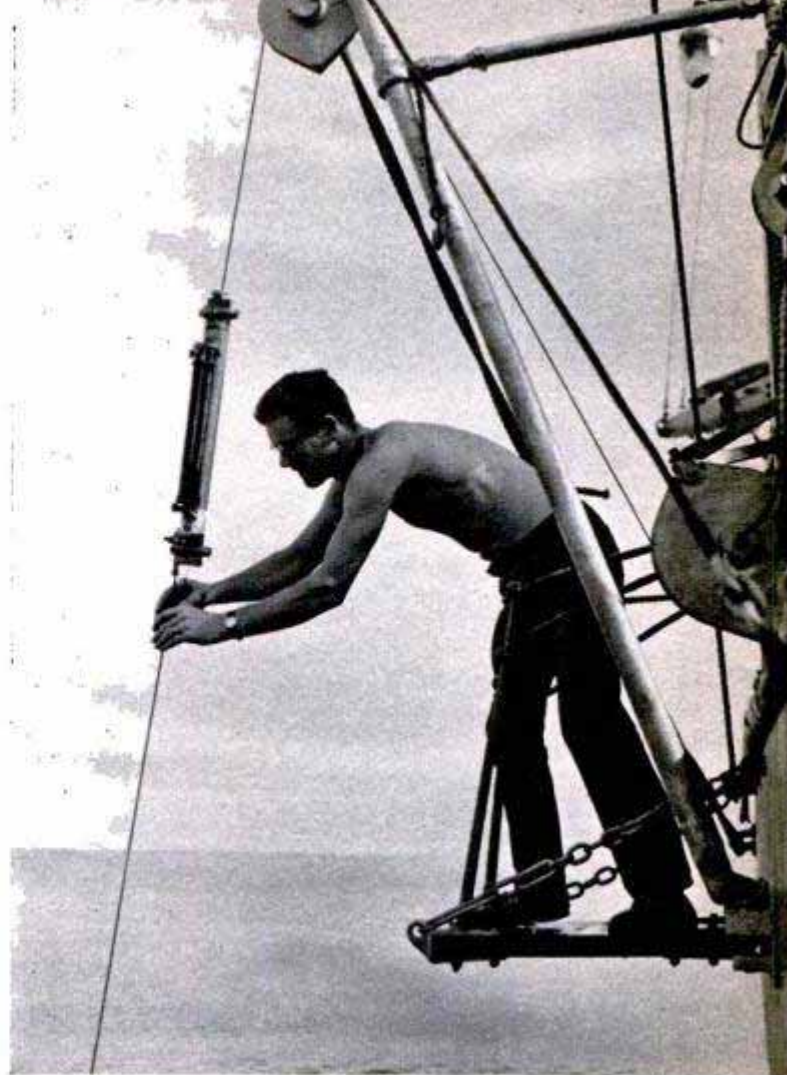


we may expect at sometime in the future.

All this work is part of a far-reaching project aimed at solving mysteries the oceans have kept locked for eons in their green depths. Besides the Woods Hole groups and government agencies, laboratory ships of Scripps Institution of Oceanography at the University of California, Yale's Bingham Oceanographic Laboratory, oceanographic laboratories of the University of Washington, the Marine Laboratory of Miami University, and Chesapeake Bay Institute of Johns Hopkins University, also are out helping pry the lid from the oceans' secrets. Several loran-equipped oil tankers, which ply the Gulf Stream route, are contributing by reporting records of the currents they follow.

Whimsies of the ocean currents have long puzzled scientists. "We know that currents like the Gulf Stream shift around, meander, break off to form eddies," says Dr. Arnold Arons, top physicist at Woods Hole. "We want to find out why."

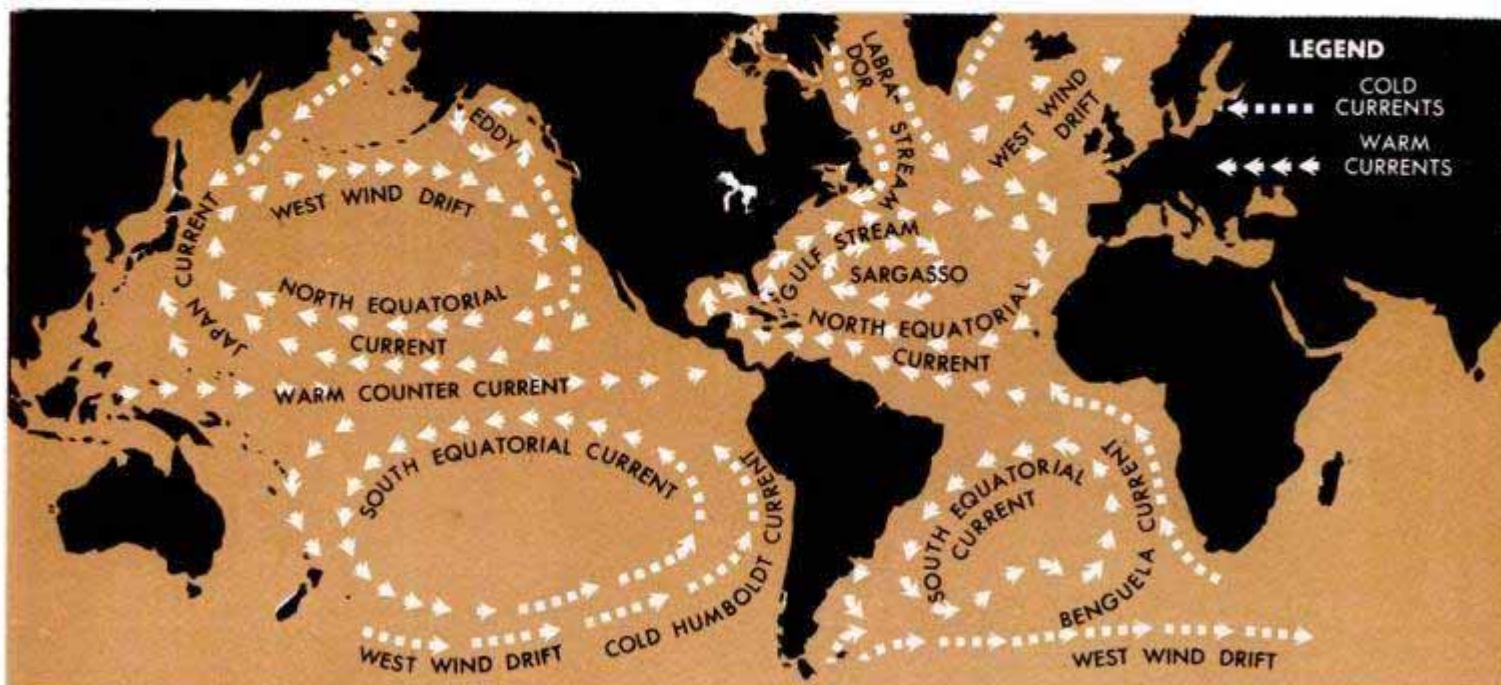
Ships depend more and more on rigid timetables. It costs \$1000 a day to operate a big tanker or freighter. If skippers knew that by moving starboard or port a mile or two they could pick up a four or five-mile-an-hour boost, instead of bucking a similar current from a backlash or eddy, millions of wasted hours and dollars could be saved each year. Radio and communications are affected by weather, generated in large part by air masses passing over large warm



Crewman takes a reading from an Ekman current meter. Propeller tells speed of flow, pellets in bottom of the instrument indicate direction of the current

THE GULF STREAM

World's basic currents flow clockwise in Northern Hemisphere, counterclockwise in Southern Hemisphere





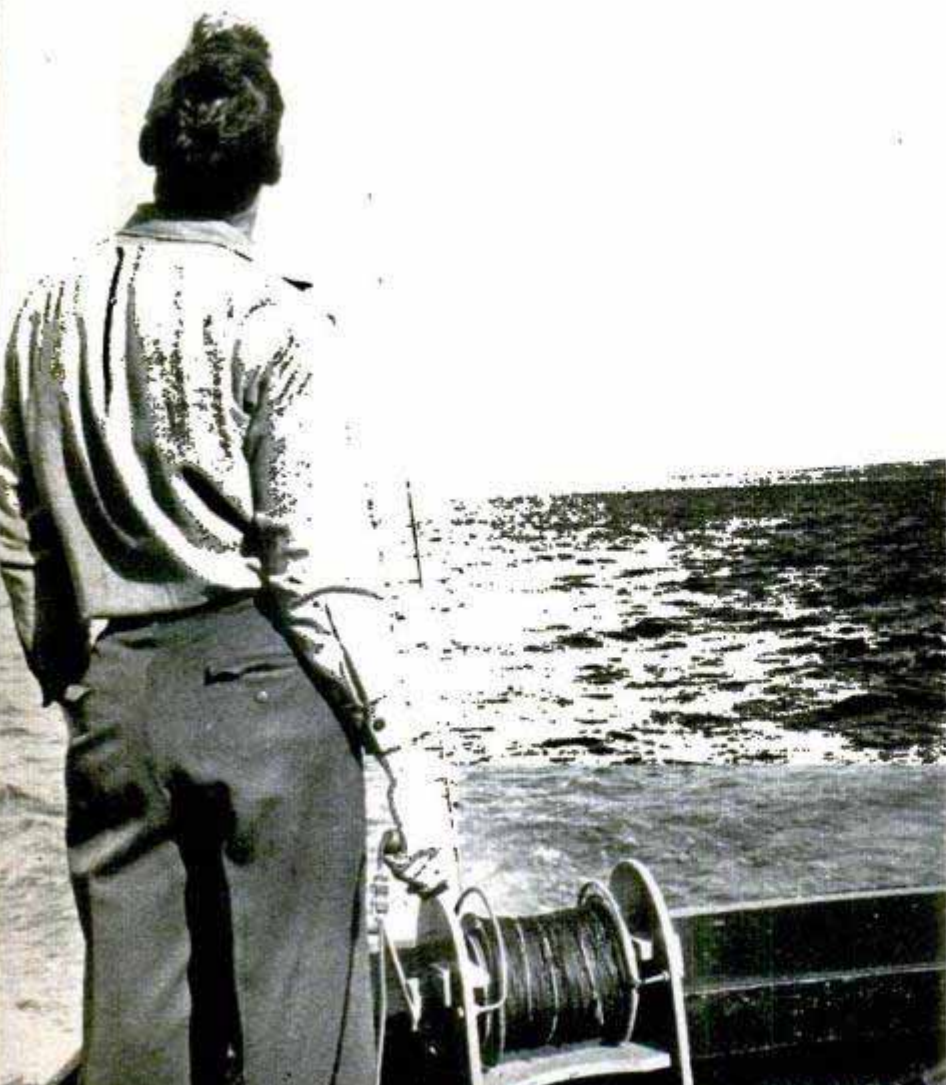
Balloon carries aloft a psychograph, shown above, which measures wet and dry-bulb temperatures of air. These readings, with others from planes and underwater instruments, will tell the heat exchange between water and air

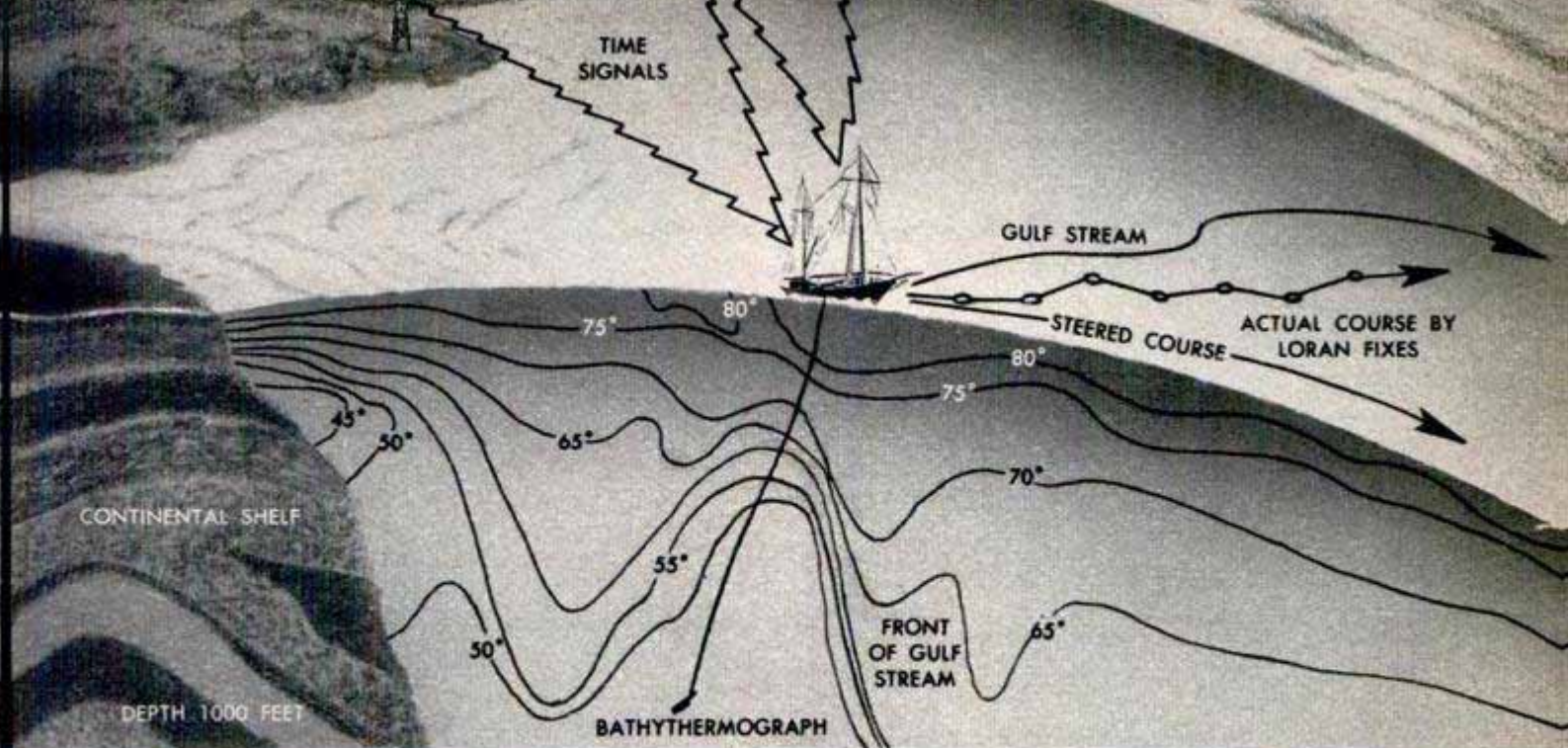
or cold areas of sea surface carried by the currents.

One of the big things that may come out of oceanographic research in the next 10 years is a tremendous advance in long-range weather forecasting—important not only to mariners and airmen, but to the farmer raising potatoes in Idaho. "Seventy-eight percent of the atmosphere borders on the ocean," explains Woods Hole meteorologist, Dr. Bernard Haurwitz, "and is affected by the exchange of heat, moisture and salt particles between its lower layers and the ocean surfaces—which makes the seas the biggest weather breeders on the globe."

In all of these projects, a complete knowledge of ocean currents plays a big part.

Each of the seven seas has currents that revolve slowly around it like the rim of a monstrous wheel. What keeps the currents turning? Winds, for one thing. But the currents are also spun by the rotating earth, which makes them flow clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. Each of these ocean currents is





deflected by continental shores, submarine topography, local winds and weather to form its own peculiar pattern of eddies and streamers. To complicate matters, tropical suns warm these currents, and arctic fridgidity cools them. This creates vertical currents that turn the revolving oceans over and over.

Here's how it works in our familiar North Atlantic: The big spinning water wheel is made up of the North Equatorial Current moving eastward from the Canary Islands, which Columbus rode on his voyage to America. It swings up toward the Caribbean Sea as the Florida Current and is swept northward into the Gulf Stream to become a rushing torrent larger than 10 Mississippi squeezed through the narrow strait between Cuba and the Keys. Here, the currents have created a huge and ancient 1000-mile eddy—the Sargasso Sea.

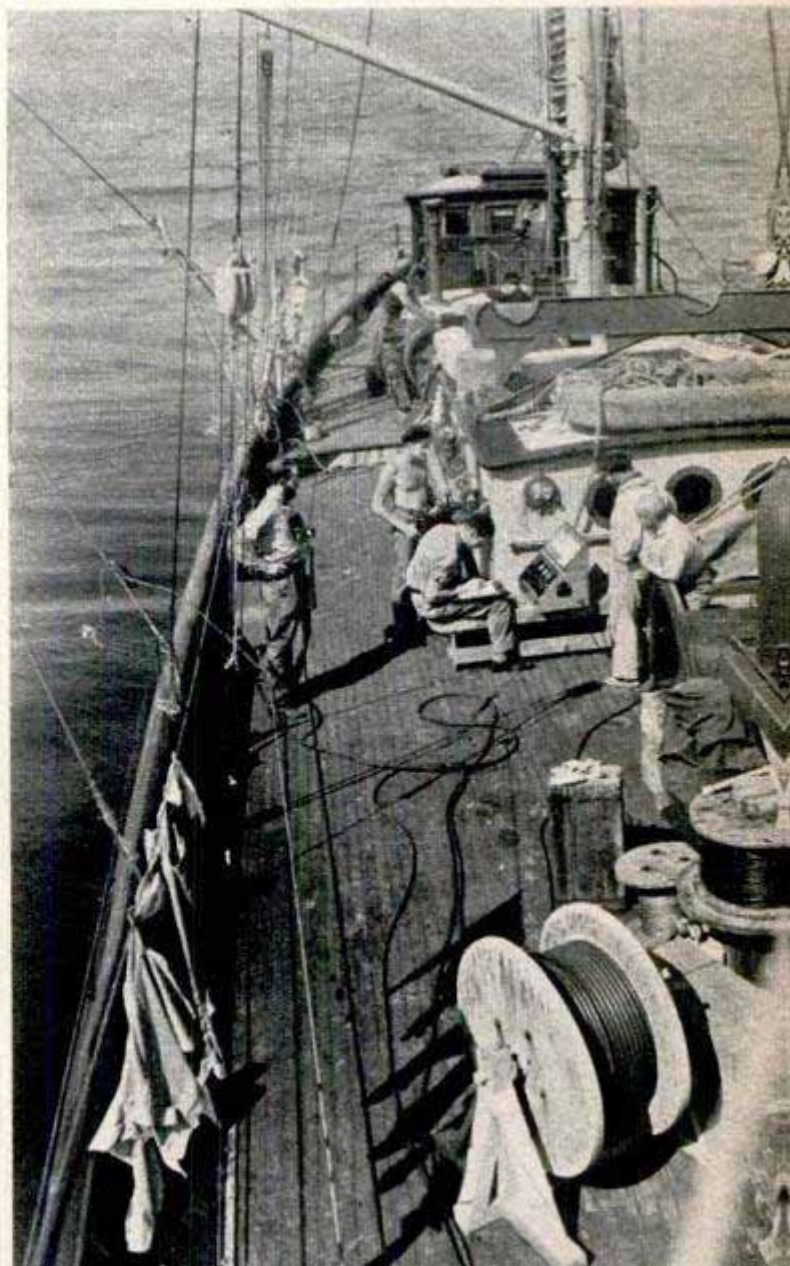
The familiar Gulf Stream flows northward along the Continental Shelf, becoming the West Wind Drift as the turning earth presses it eastward, carrying temperate weather to western Europe and coasting down the shore to become the Canaries Drift and start all over again.

Up in the northern latitudes, cooled in the Arctic "refrigerator," the water becomes dense and heavy. Hence it sinks below the surface and slowly creeps southward along the primeval ocean-bottom ooze toward the Equator, where it rises again, as surface water is warmed by the sun, and flows back north with the currents.

The persistence and steadiness of these currents are something to reckon with in any ocean study. Oceanographers tell incredible tales about them. In a 1900 hurricane, the coffin of actor Charles Coghland

Aided by loran fixes, vessel plots edge of Gulf Stream. Profile of temperatures helps indicate current's front

Deck of the Atlantis is loaded with electronic gear. Underwater measurements are read on dials topside





By measuring heat exchange between water surface and air, scientists hope to forecast fog conditions

Gulf Stream shifts constantly. Lines show its edge on various dates. Heavy line shows stream last summer

was swept off a ship near Galveston, Tex., drifted into the Gulf Stream and wound up in the Gulf of St. Lawrence, 2000 miles away. In another case, a test bottle, cast adrift at Nova Scotia, landed in Australia after following the Gulf Stream to Europe, down the coast with the Canaries Drift. Then, probably swept by a storm into the South Equatorial Current, it was caught up in the Brazil Current, traveled the South Atlantic counterclockwise currents around to Cape Horn, where it was snatched away by the Antarctic West Wind Drift and carried to its final port.

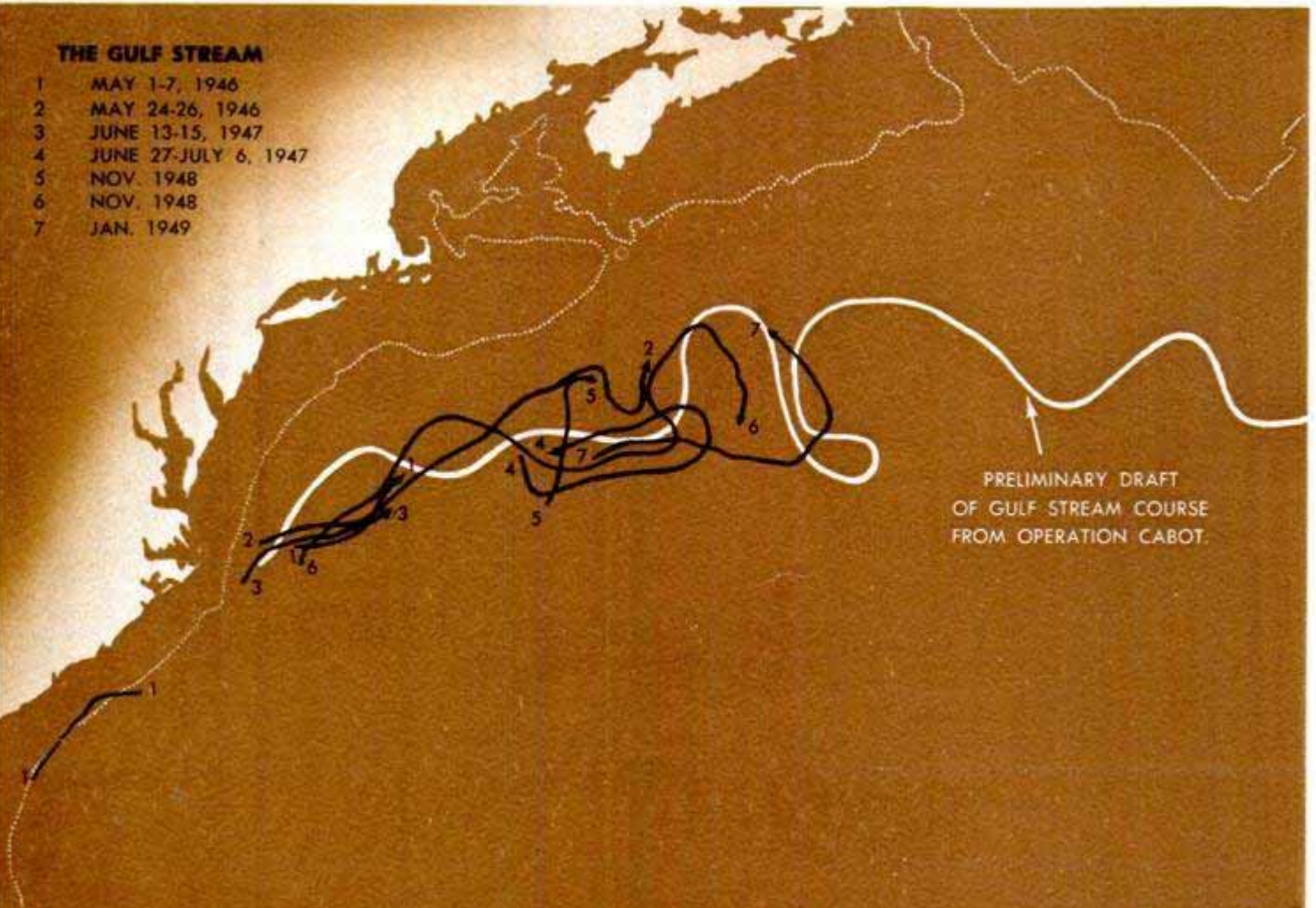
How these currents affect the lives of men is clearly seen in the record. In 1930, a microorganism attacked and killed all the eel grass along the Florida coast. Geese and other fowl that inhabited the grass died off. Within two years, the microbe had been carried north by the Gulf Stream, destroying the grass and taking a toll in birds all the way up to Nova Scotia and, moved eastward by the West Wind Drift, wrought its damage in northern Europe as well. With the grass gone, banks of land in England's sheltered waterways slumped into the sea, killing off other vegetation as well.

Even more startling is the periodic disaster that occurs in Peru. Here, the Humboldt Current of the South Pacific sweeps north along the west coast of South America, carrying icy Antarctic water rich in organic matter. This supports many fish,

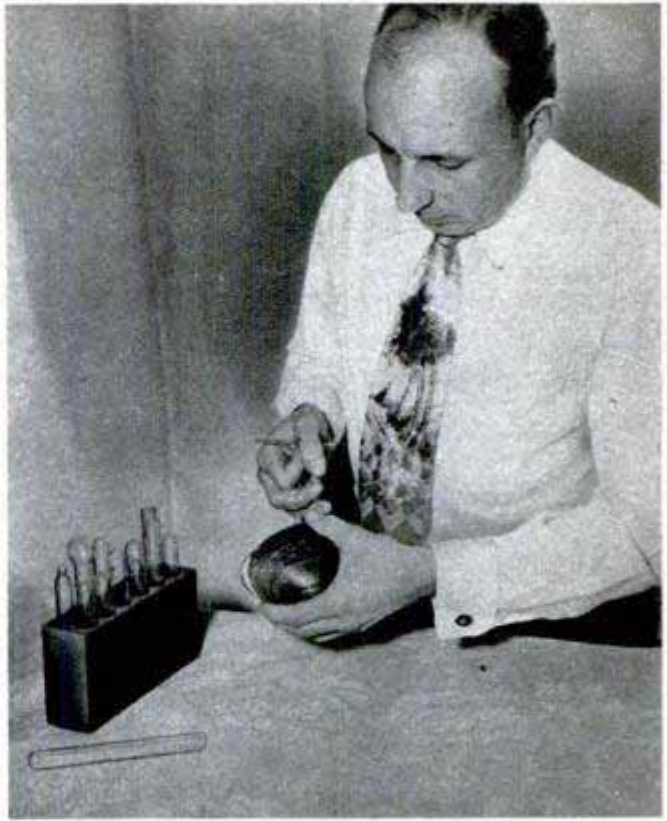
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THE GULF STREAM

- 1 MAY 1-7, 1946
- 2 MAY 24-26, 1946
- 3 JUNE 13-15, 1947
- 4 JUNE 27-JULY 6, 1947
- 5 NOV. 1948
- 6 NOV. 1948
- 7 JAN. 1949



PRELIMINARY DRAFT
OF GULF STREAM COURSE
FROM OPERATION CABOT.

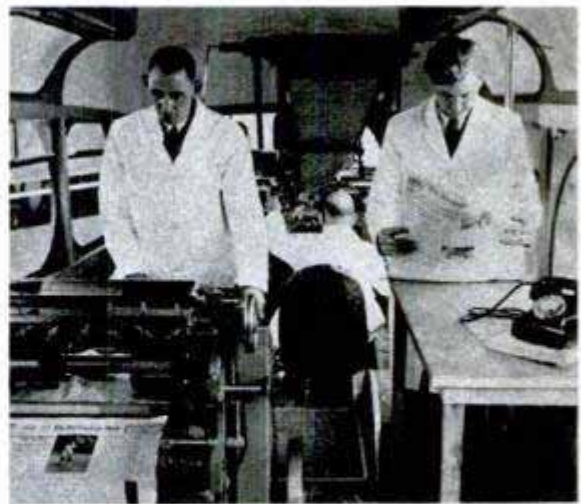


Top, Heckenkamp siphons water from a clam jar to check it for foreign matter. Just below he finds a pearl in clam shell. Right, he uses instrument similar to hypodermic needle to inject sand particles into a clam

Hobbyist "Grows" Clam Pearls in His Basement

In the basement of his home, Andrew C. Heckenkamp raises beautiful pearls. Furthermore, he "grows" them in fresh-water clams instead of in oysters. Heckenkamp, president of the St. Louis Aquarium Society, developed the pearl-producing process himself. He first opens the clams with electrical impulses; he discovered early in his hobby that clams which are pried open usually die. Into the opened clam he injects sandlike particles with an instrument re-

sembling a hypodermic needle. It takes four or five years for the clam to develop the pearl and during this period it must be tended frequently or it will die. The water is chemically treated, and parasitic leeches must be removed from the younger clams from time to time. In a two-month period recently, Heckenkamp "seeded" 50 to 60 small clams. If all goes well he'll have a harvest of pearls in another four or five years.



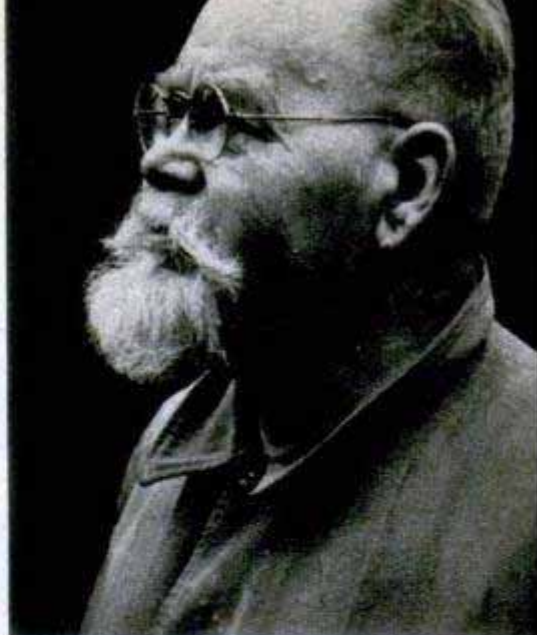
Mobile Newspaper Plant

Last minute news is furnished out-of-town readers of the Birmingham (England) Post & Mail by a mobile printing plant. It produces late editions of the newspaper at points of distribution. What at first glance

appears to be a luxurious motor coach actually contains all the facilities for printing. It has a Linotype machine, Teletype, radio photo transmitter, small press, photographic darkroom and two generators to operate the equipment. The chassis was specially built by Wilsdon & Co., Ltd., Birmingham.

Jens Olsen, a little Danish craftsman — you'd have taken him for Santa Claus — died before he finished the incredible task he set for himself. His countrymen have completed his life's work for him—

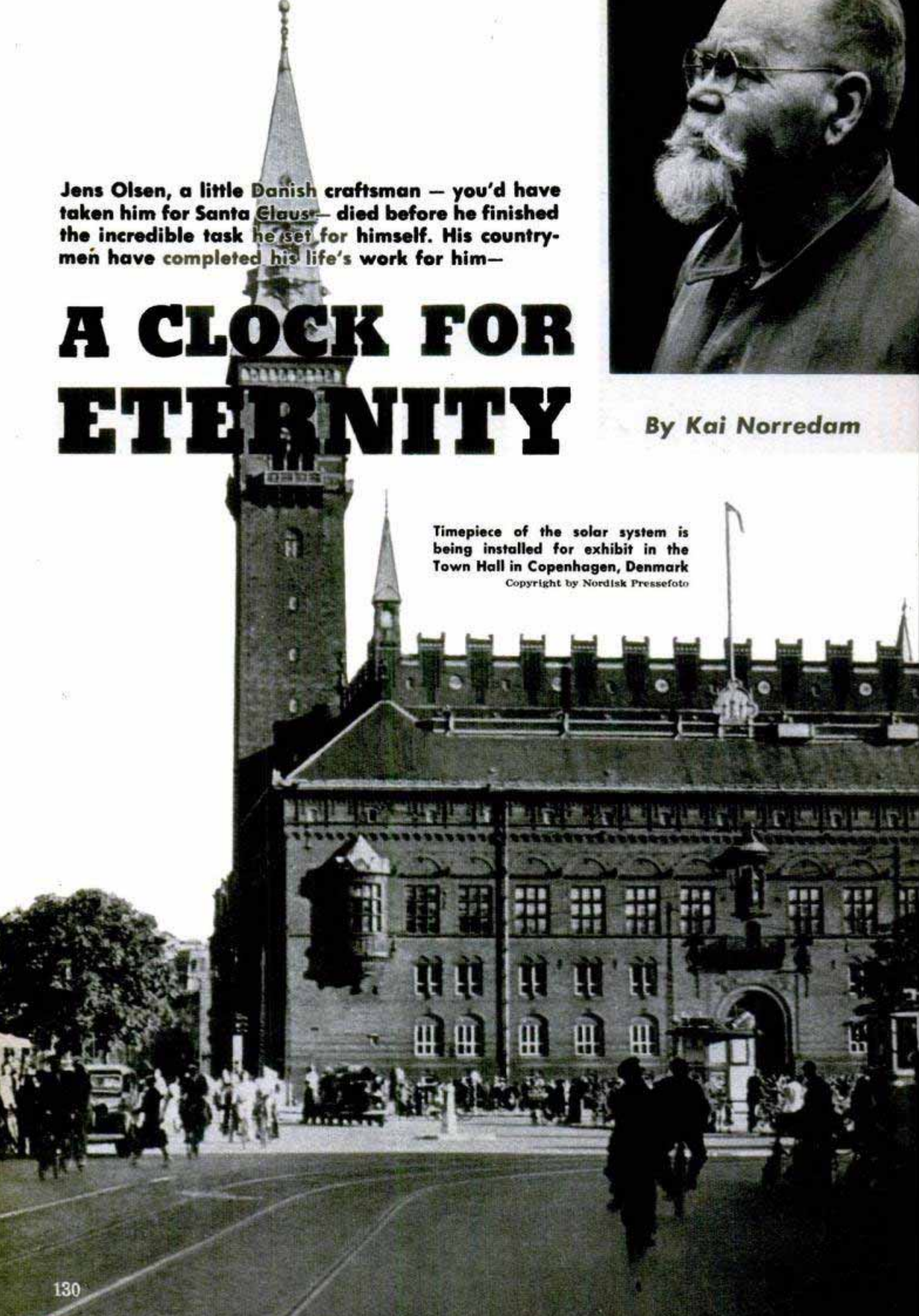
A CLOCK FOR ETERNITY



By Kai Norredam

Timepiece of the solar system is being installed for exhibit in the Town Hall in Copenhagen, Denmark

Copyright by Nordisk Pressefoto



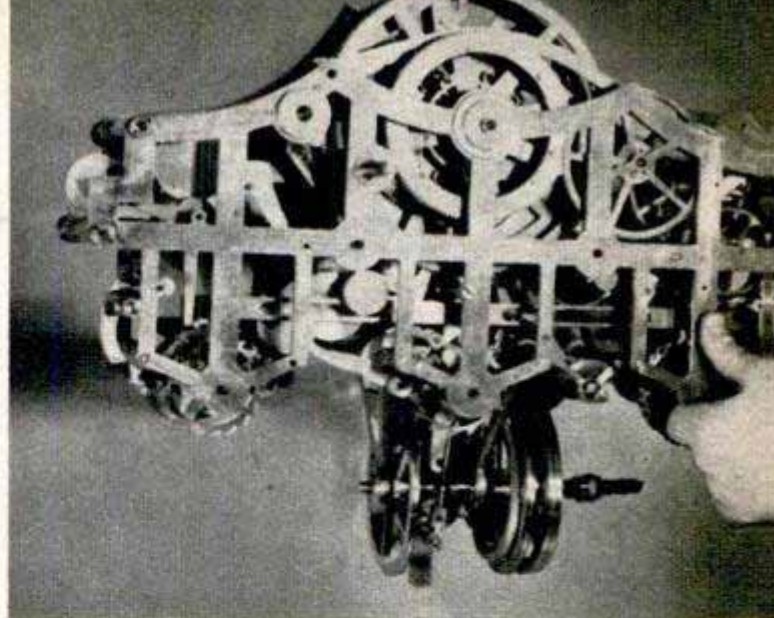
LATE THIS YEAR a new clock will start ticking away in the old Town Hall at Copenhagen, Denmark. It is not an ordinary clock, for this is a timepiece built for eternity, a mechanism that will keep an accurate record of the time throughout the solar system, a clock we expect to tick away for three or four thousand years.

The maze of gears and shafts in our clock is so accurate that the pointer showing the eclipses of the sun and moon makes one revolution in precisely 6798.36152 days!

The clock is a finer timepiece than even the famous astronomical clock at Strasbourg, according to engineers and astronomers who have studied it. It is the lifework of Jens Olsen, a locksmith's apprentice who died shortly before the clock was finished.

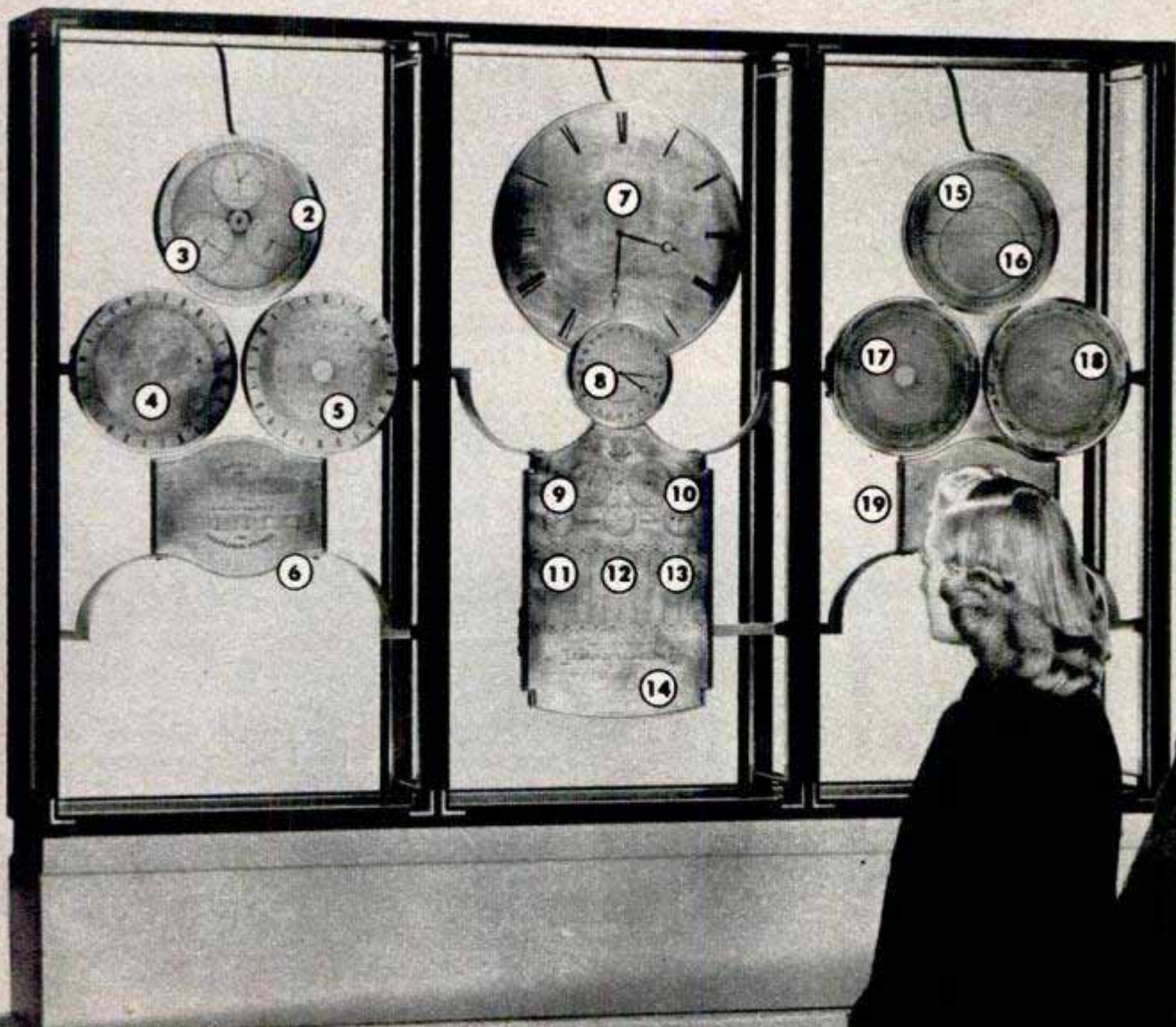
Olsen was born nearly 80 years ago. When his journeyman's probation as a locksmith was completed, he strapped a knapsack on his back and started wandering throughout Europe. In every town he studied the old clocks and read every book in the local library on the subject of timekeeping. He was determined to make the finest clock in history.

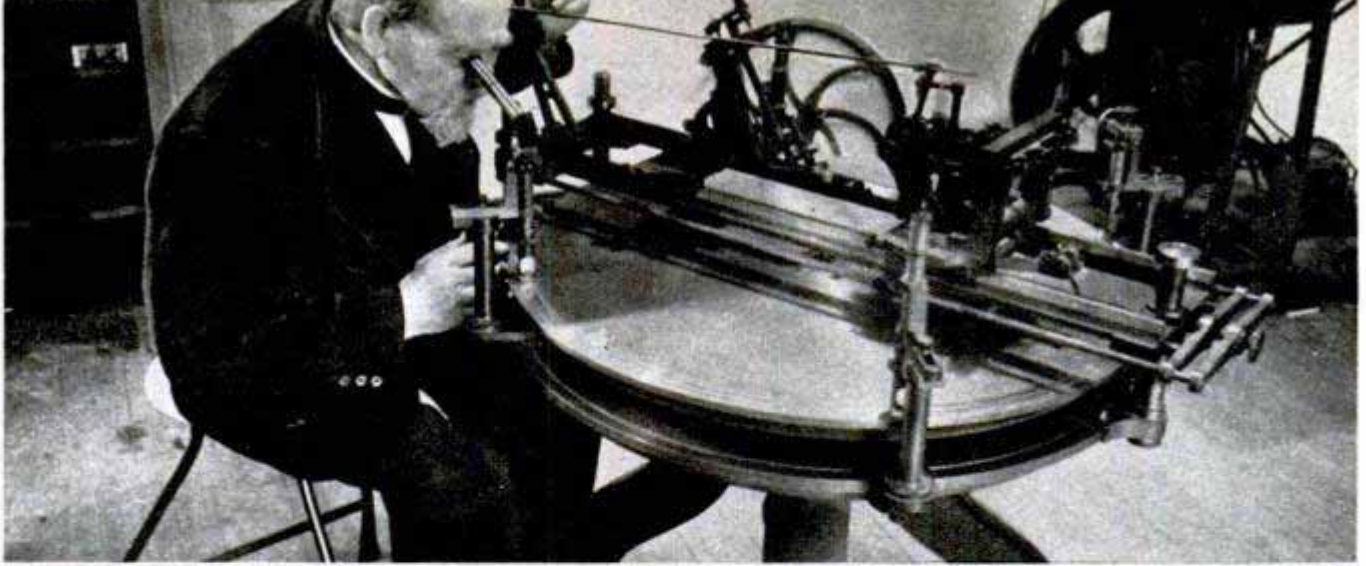
In 1902 Olsen returned to Denmark and, between odd jobs, worked on the plans for his masterpiece. For 30 years he toiled over



Main calendar mechanism functions only on New Year's Eve when it sets movable feasts and calendar for year. The calendar period lasts 570,000 years

Below, though not yet completed, clock will have a face with multiple dials. They indicate: 1—Time equation. 2—True solar time. 3—Local time. 4—Time around the world. 5—Sunrise, sunset. 6—Gregorian calendar. 7—Mean time. 8—Sidereal time. 9—Sunday letter. 10—Epect. 11—Golden number. 12—Indiction. 13—Lunar cycle. 14—Main calendar. 15—The sky. 16—Stars and movement of the pole of the sky. 17—Sun, moon. 18—Planetary system. 19—The Julian period





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Jens Olsen spent a lifetime on the intricate clock. Here he works at an instrument for dividing a circle

drawings of the mechanism. Then in 1935, the drawings were completed and he already had constructed some of the clock's thousands of intricate parts. An article in a scientific journal, in which he described the astronomical clock in detail, astonished the astronomers. Immediately a committee was set up to back the construction of the clock, and an excellent engineer appointed as an aid to Olsen.

For 16 years the work has gone forward on the clock. Not long ago Olsen died. But the important element of his work, the drawings which had been traced for a lifetime, remained. Now our clock is complete except for the details of mounting it.

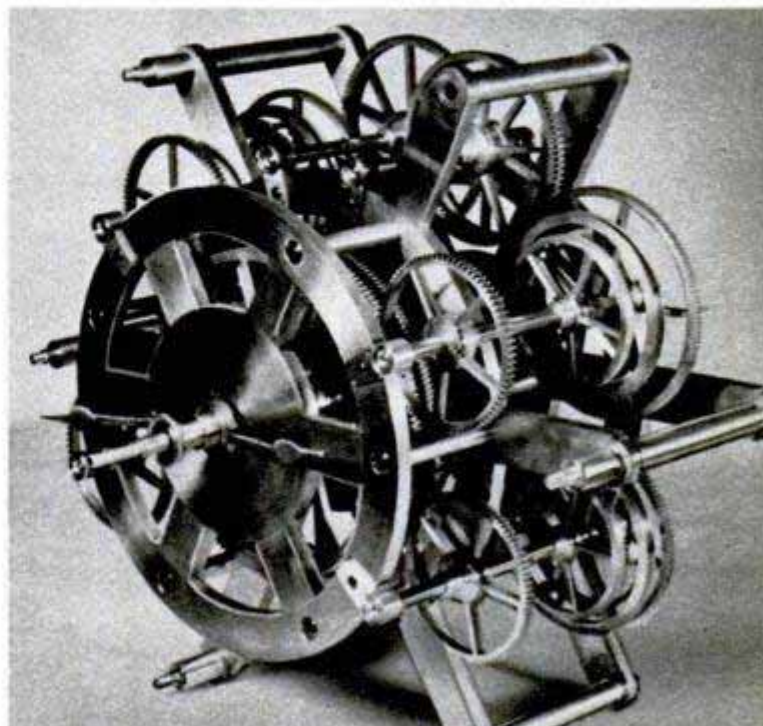
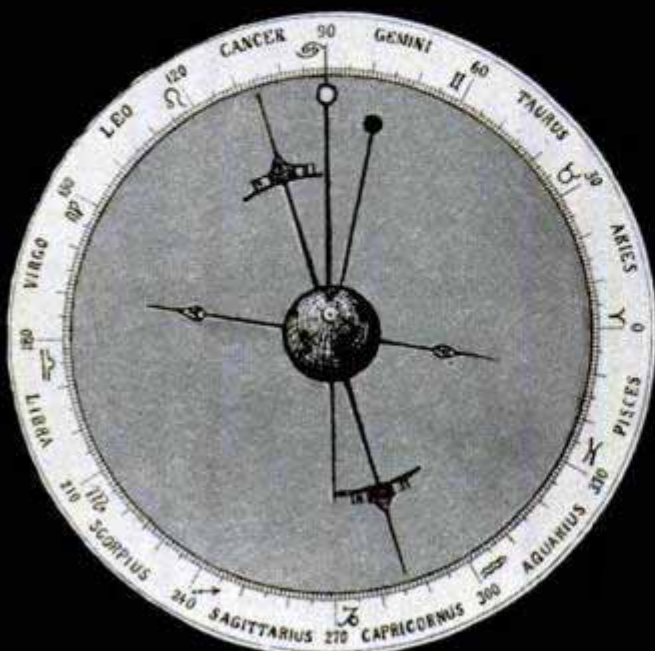
Once it starts ticking away the centuries, here is what the face of the clock will tell:

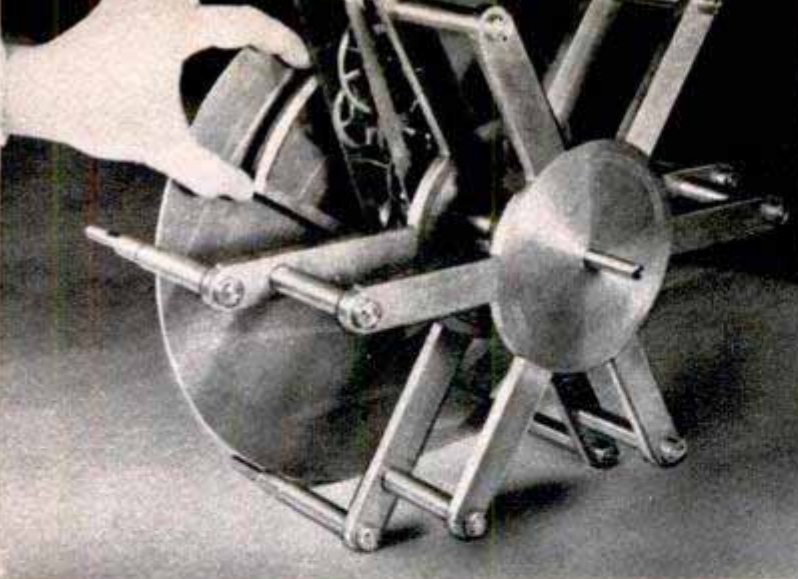
1. Standard Central-European time.
2. Mean solar time, true solar time and sidereal time for the locality where the clock is erected; also the difference between mean and true solar time.

On the sun-and-moon dial, the small globes on the pointers illustrate the eclipses as they occur

3. Mean solar time at different longitudes.
4. The times when certain stars rise and set, and when they cross the meridian.
5. The precession, and the extent to which this influences the rising and setting of the stars.
6. The time when the sun passes the meridian; sunrise; sunset.
7. The phases of the moon.
8. The geocentric longitudes of the moon and sun.
9. The longitude of the lunar nodal line and the time of future eclipses of the moon and sun.
10. The longitude of the lunar line of apsides (line coinciding with the axis of the moon's orbit).
11. The varying distances of the great planets from the sun.
12. A fully automatic Gregorian calendar that, on every New Year's Eve at 0.00 hours, calculates all the chronological elements of the calendar, such as: the

Here's the mechanism which calculates solar and lunar eclipses, transmits movement to globes on pointers





In next 3000 years, mechanism for planetary movements will move only the distance between fingers

cycle of the sun (a period of 28 years); the Roman indiction (a fiscal period of 15 years reckoned originally by the Romans); the golden number (after each period of 19 years, the new and full moons return on the same days of the month as before); the epact (the excess of solar over lunar year); the Sunday—or Dominical—Letter (days of the month on which the Sundays fall during each year of the cycle); the weekdays and holidays of future years.

13. The year, the day of the week, the date, the month and the number of the day in the Julian period of 7980 years.

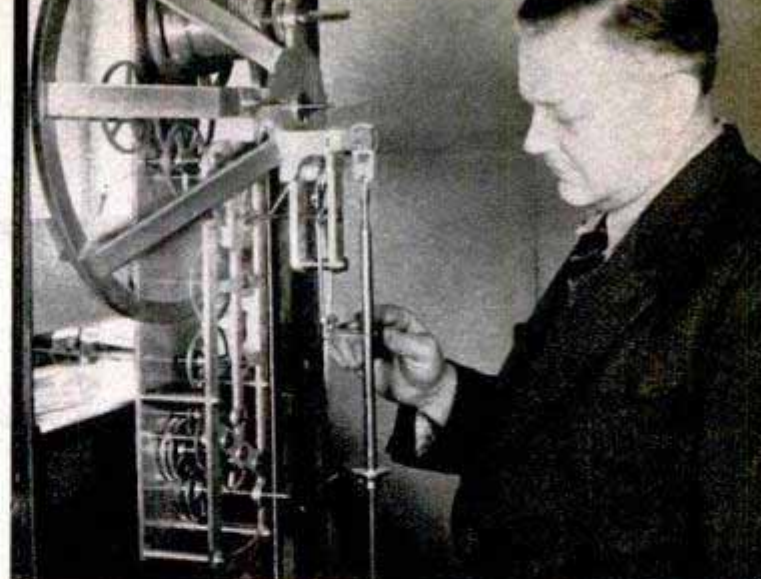
Several astronomical clocks have been constructed in the past. The finest is the clock in Strasbourg, justly famous throughout the world. It is far surpassed, however, by Jens Olsen's clock in astronomical exactness. The calendar is much superior in the Danish clock, and what is of great importance to the observer, the astronomical phenomena are so clearly presented as to be readily seen and understood by everyone.

The clock is mounted on a green granite base and enclosed in a large glass case. The mechanism cannot stand the slightest vibration so it is necessary that the foundation go deep into the earth to the firm under-soil. Warm, dry air is let through the case, thereby creating slight pressure inside and preventing the entrance of dust.

The timepiece is made of 12 independent mechanisms; they are, however, mutually connected by axles or gearing, or by a steel band.

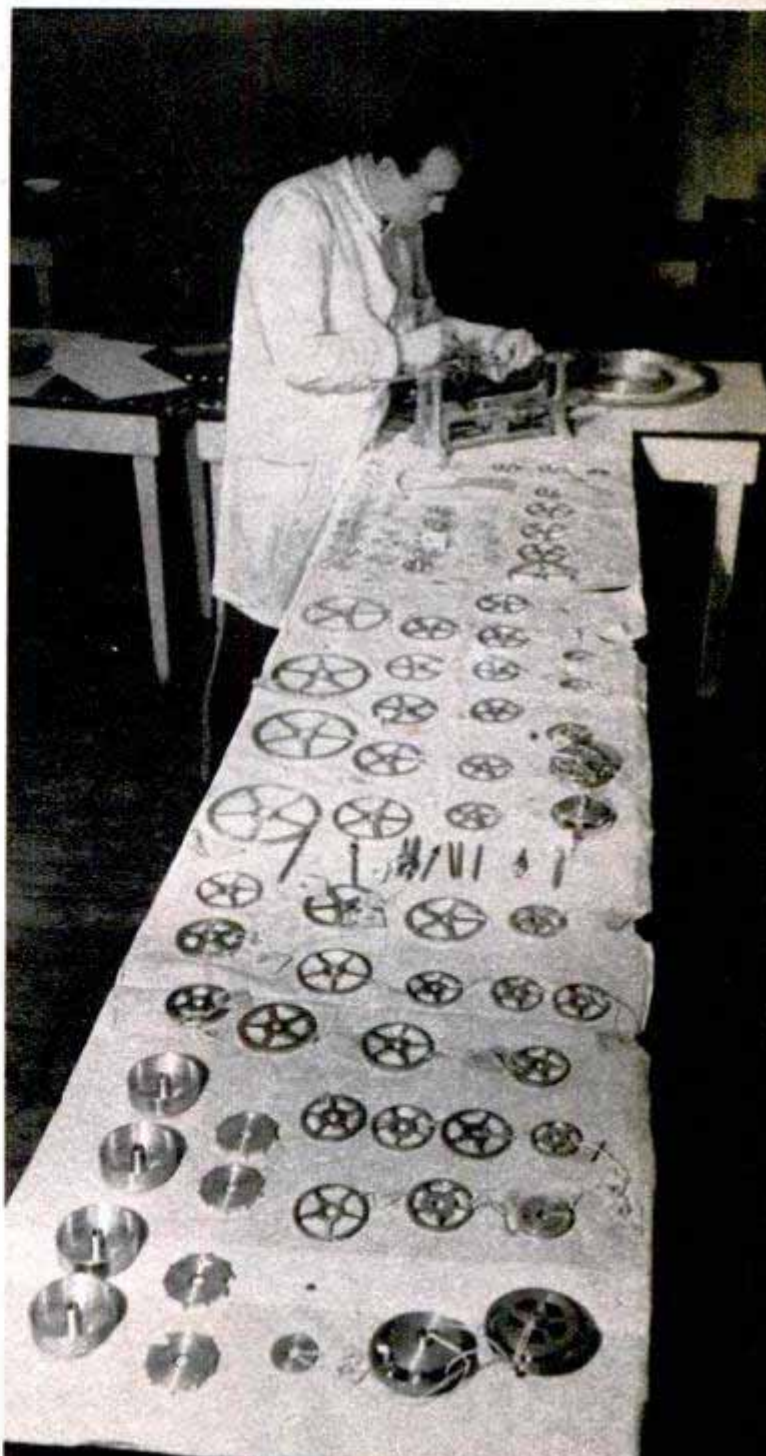
Just beneath the ordinary clock dials is a smaller dial which shows sidereal time in hours, minutes and seconds. Sidereal time

(Continued to page 230)



Technician examines the main works which show the mean time and sidereal time, govern the other works

Otto Mortensen, the skilled clockmaker who took over after Olsen's death, checks some of the delicate parts
Copyright by Nordisk Pressefoto





Swimmers Hear Music Underwater in Hotel Pool

If you like music while you swim, you'll enjoy swimming at the Beverly-Wilshire Hotel in Beverly Hills, Calif. There, the swimming pool is wired for sound. A special underwater speaker, suspended in the

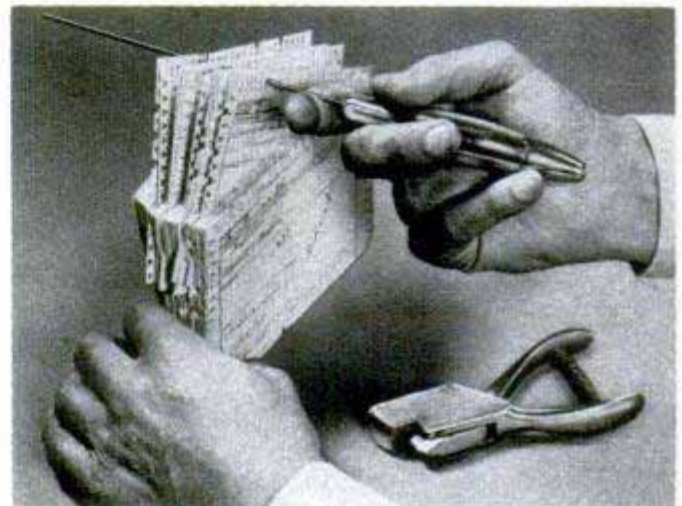
water, enables underwater swimmers to hear the music in any part of the pool. The speakers are so powerful that they will blow themselves apart if removed from the water while in use.



Helicopter Saves Steeplejack Time

By using a helicopter as a "sky hook," a Boston steeplejack made his rigging ready for painting a smokestack in less than 30 minutes. To accomplish the same job with the lashed-on ladders usually used would have required a day and a half. The steeplejack was flown by helicopter to the top of the stack. He simply leaned out, dropped his staging hook over the chimney edge and played out the rigging. Returning to the ground, he hooked up his swinging chair and went to work.

☐ Wastepaper is needed for America's defense. Don't throw it away.



Boeckeler Instrument Co., Box 181, Tucson, Ariz.

"Punchboard" Sorting For Accounting System

Holes punched along the margins of a filing card provide a speedy sorting system that does inexpensively what complex machines do in large-scale operations. To record certain data for future reference, a particular hole is punched open to the edge on all cards in the category being recorded. That hole is not punched open on cards not in the category. Then when you want to pick out the cards in that grouping, you slide a spindle through the correct holes and lift up the cards. Those cards with opened holes drop out and the sorting is accomplished.

Sources of available products described in this issue are listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Ill.



Crude foundation consists of wood frame covered with rabbit wire. Paper pulp will give it attractive lines



Wire mesh was used as foundation on this chair. Student covers frame with paper strips soaked in paste



Finished chair, under construction at top, is strong and comfortable

Paper Chairs

OLD NEWSPAPERS have been converted into durable chairs by students at Southern Illinois University. The idea came from Kenneth Ervin, art instructor, who decided chairs would be a good subject for a contour-designing project by his students. Plastic would have been too expensive as the basic material, so Ervin and his students turned to paper. Some of the students made chair frames of wood, then wrapped them with rabbit wire and added the paper pulp for modernistic lines. Others used only wire as the base. Later they discovered that the paper alone could be made extremely durable, eliminating the need for any kind of base. The newspaper simply is mixed with flour or wheat paste until it forms a pulp, then is molded to the desired shape. The finished chairs are as strong as most conventional types.

Paper chairs can be produced cheaply in infinite designs, are attractive enough for living room or porch



TWIN-HULLED RACERS SAIL SPANISH SEAS

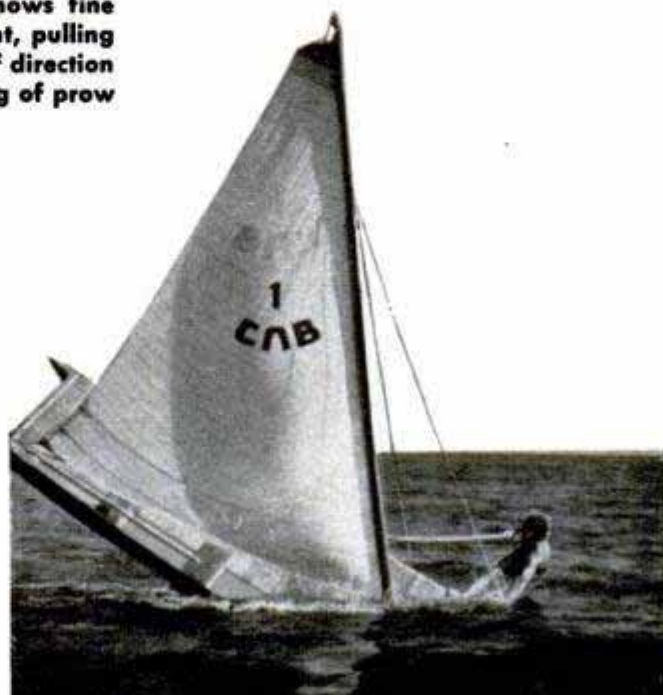
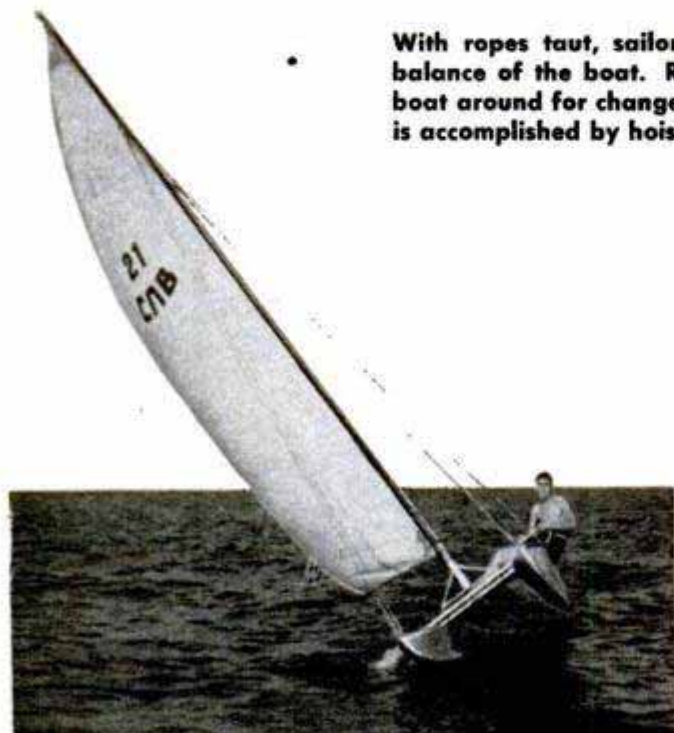


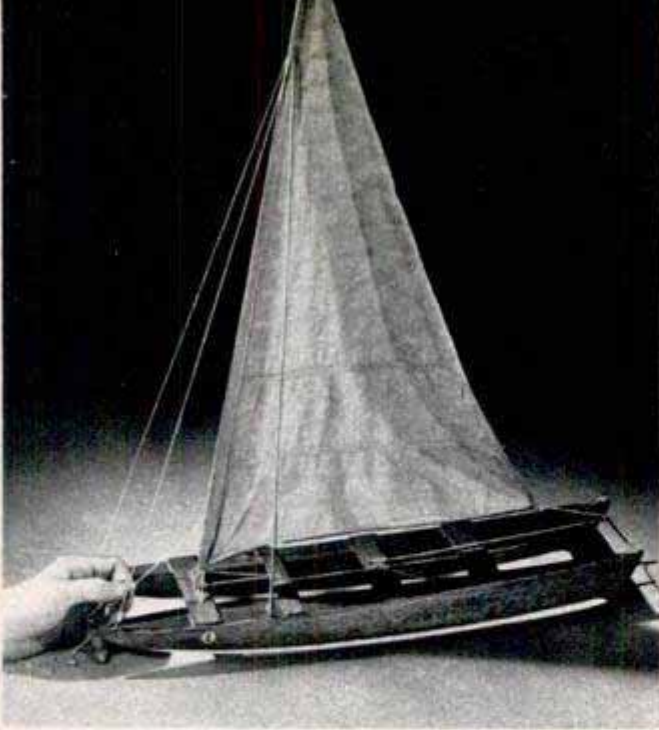
Catamaran-type sailboat balances on one hull, making sharp turn in demonstration off the coast of Spain

SAILING enthusiasts off the coast of Spain are adding new thrills to an ancient maritime sport with a boat that is a cross between a catamaran and a sailboat. A one-man boat, it is noted for its speed and maneuverability. The boat has no keel or centerboard and can navigate in shallow water; in fact, it can be sailed right up on a beach. It makes sharp turns on one pontoon and makes a complete reversal of di-

rection in a jiffy by sinking one end and pulling the forward section around with a rope. The craft is built of lightweight wood (scarce in Spain) and weighs only 187 pounds. The favorite model with Spanish fans is 18½ feet long, 3 feet 4 inches wide and has a mast height of 21½ feet. Its pontoonlike twin hulls have a height of only 1 foot 10 inches. There are 140 square feet of canvas in the sail.

With ropes taut, sailor shows fine balance of the boat. Right, pulling boat around for change of direction is accomplished by hoisting of prow





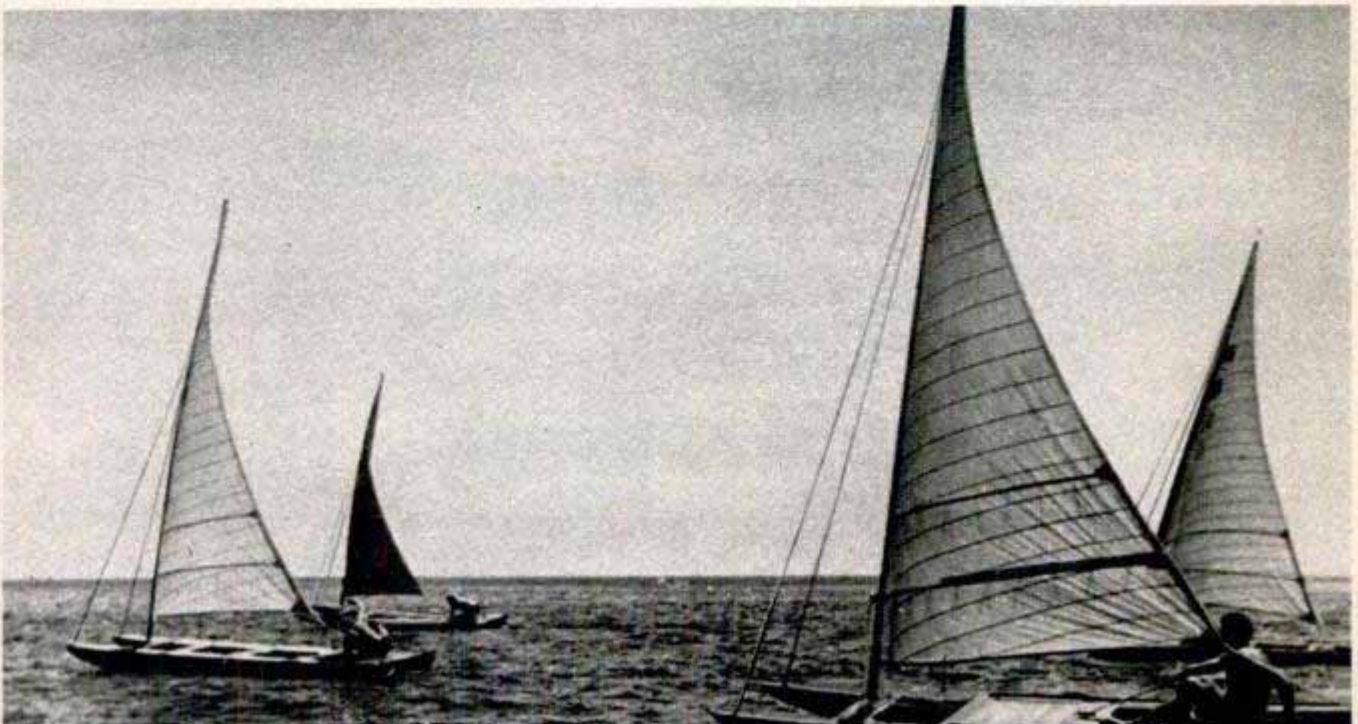
Small model of Spanish catamaran shows the cross-pieces used by catlike sailors to climb over boat

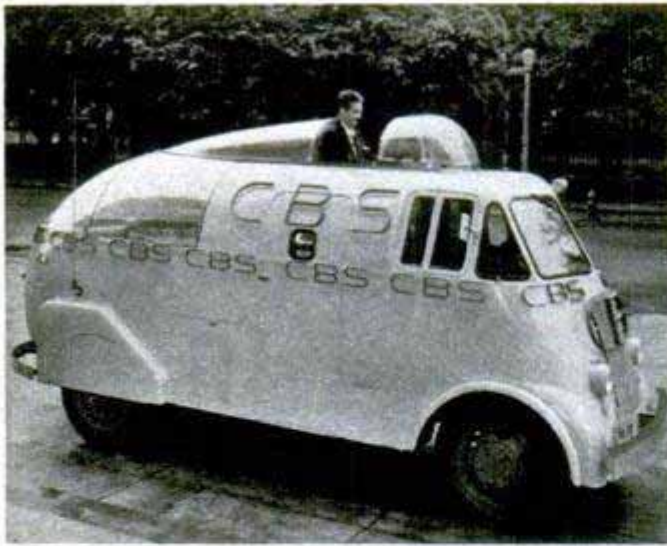


This picture (says its builder) is just to prove that the twin-hulled Spanish racer will sail on even keel



Expert sailor shows that it only takes one hand to maneuver the vessel while it makes a turn on one hull. Below, getting under way for a Mediterranean race under auspices of Spanish Federation of Nautical Clubs





Mobile Broadcasting Booth

Radio reporters and commentators view news events at firsthand from the weather-proof press box built on a truck chassis for the Columbia Broadcasting System. As many as four commentators can broadcast simultaneously from the observation plat-

form at the rear of the truck. The Plexiglas windows provide full vision on three sides. A plastic bubble atop the truck gives full forward vision. The truck has a high-frequency transmitter powered by its own generator. It has a range of 35 miles from the home station and can tie into telephone cables for longer transmission.



"Pigeonhole" Parking Lot

Four times as many cars are parked in a Spokane, Wash., parking lot with a rampless garage in which cars are delivered to parking stalls by elevator. The customer drives up to a receiving stall. A platform reaches out, lifts the car onto the elevator which rolls along a track between the two parking racks. The elevator lifts the car to the desired level and rolls it into the parking stall. The unit parks a car in the most distant stall in 60 seconds!

Stick-On Traction Mats Stop Record Slippage

Warped phonograph records are played without distortion of sound due to slippage when traction mats are applied to the record labels. Provided with an adhesive backing, the mat has a semicircular cut-out to permit reading the label. In addition to keeping the record spinning at the correct speed, the mats also act as cushions to prevent damage and noise when the record is dropped by the changer mechanism.

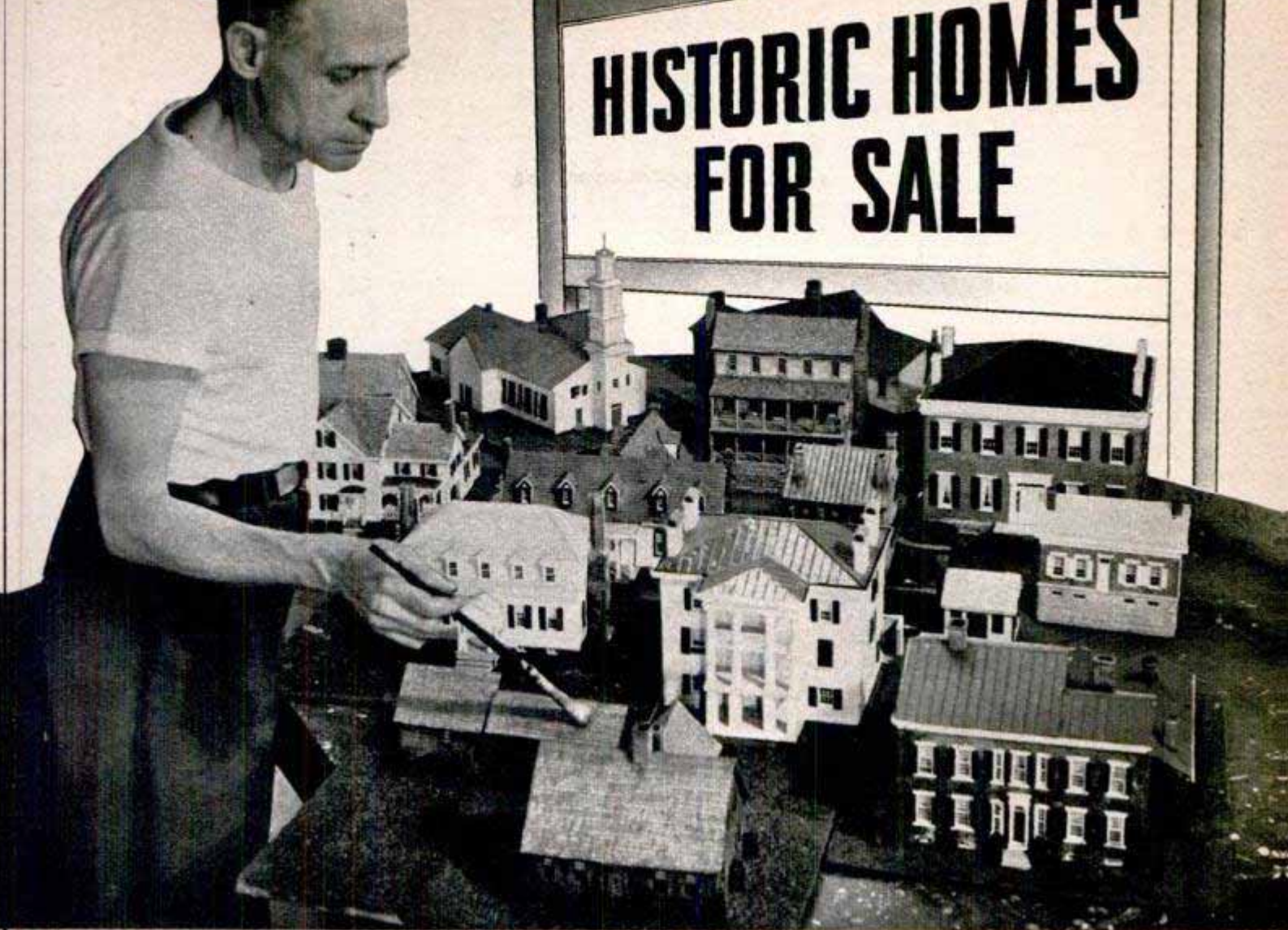


☐ American household refrigerators are being produced in Brazil for the first time.

Thompson Traction Mat Co., 516 Fifth Ave., New York City 18

POPULAR MECHANICS

HISTORIC HOMES FOR SALE



L. L. Tucker photo

Hutton and some of his models. Impressive, four-columned building in center is Woodrow Wilson's birthplace

By Ross L. Holman

EVERYBODY'S BUILDING new houses these days, but Fred Hutton has put a double twist in the house-building business—he builds old houses and builds them right on his workbench! He can do this

because the houses he builds are scale models of historic shrines. Begun as a hobby, this unusual activity has been paying the grocery bills for the Nashville, Tenn., craftsman for many years.

To make his model of Mount Vernon, Hutton measured and photographed every important detail of the original
Howard Bryan photo



Fred didn't intend it that way. But when his baby "Mount Vernons," "Hermitages" and other miniature reproductions became so realistically like the originals as to make other history fans want them, the money he got out of them enabled him to devote his entire time to his hobby.

It usually takes Fred five to eight weeks to complete a single model like Andrew Jackson's Hermitage, Woodrow Wilson's birthplace at Staunton, Va., General Grant's home and others like it. He is such a rabid perfectionist in every detail that his models duplicate the original buildings even down to the weatherbeaten texture of the shingles on the roof or the weatherboarding on the walls.

If he can get blueprints or the building plans for an historic structure, his reproductions come much easier. He is able to secure a few of these from the Library of Congress and other places.

But when he modeled Mount Vernon he found there were no building plans of it in existence. So he made several trips to the George Washington mansion and cased it, down to the last detail. He photographed it from several angles, took exact measurements of every door, window, floor, window blind and dormer in order to reconstruct every part to his scale of $\frac{3}{16}$ inch to the foot. He even measured the lap of the shingles over each other to get the proportionate lap on his model.

It ordinarily takes many thousands of individually placed pieces to construct each model completely. After documenting Mount Vernon thoroughly Fred went back home. Six weeks and 10,000 pieces later he had a miniature likeness of the Washington home with which George himself couldn't have found any fault. Many of his other models have had to be laboriously



worked out in research like Mount Vernon because no building plans were available.

Naturally, assembling a multithousand-piece building in baby size is a whale of a job requiring infinite patience. Among other things, Fred applies each tiny model shingle one at a time. Most of the wooden parts of each historic building such as shingles, weatherboarding and floors are reproduced in the model with artist paper secured from an artist-supply shop. This paper is cut in strips of right width and length for the part to be duplicated. Three or more strips of such paper glued together make a rigid plank, studding, rafters or what have you.

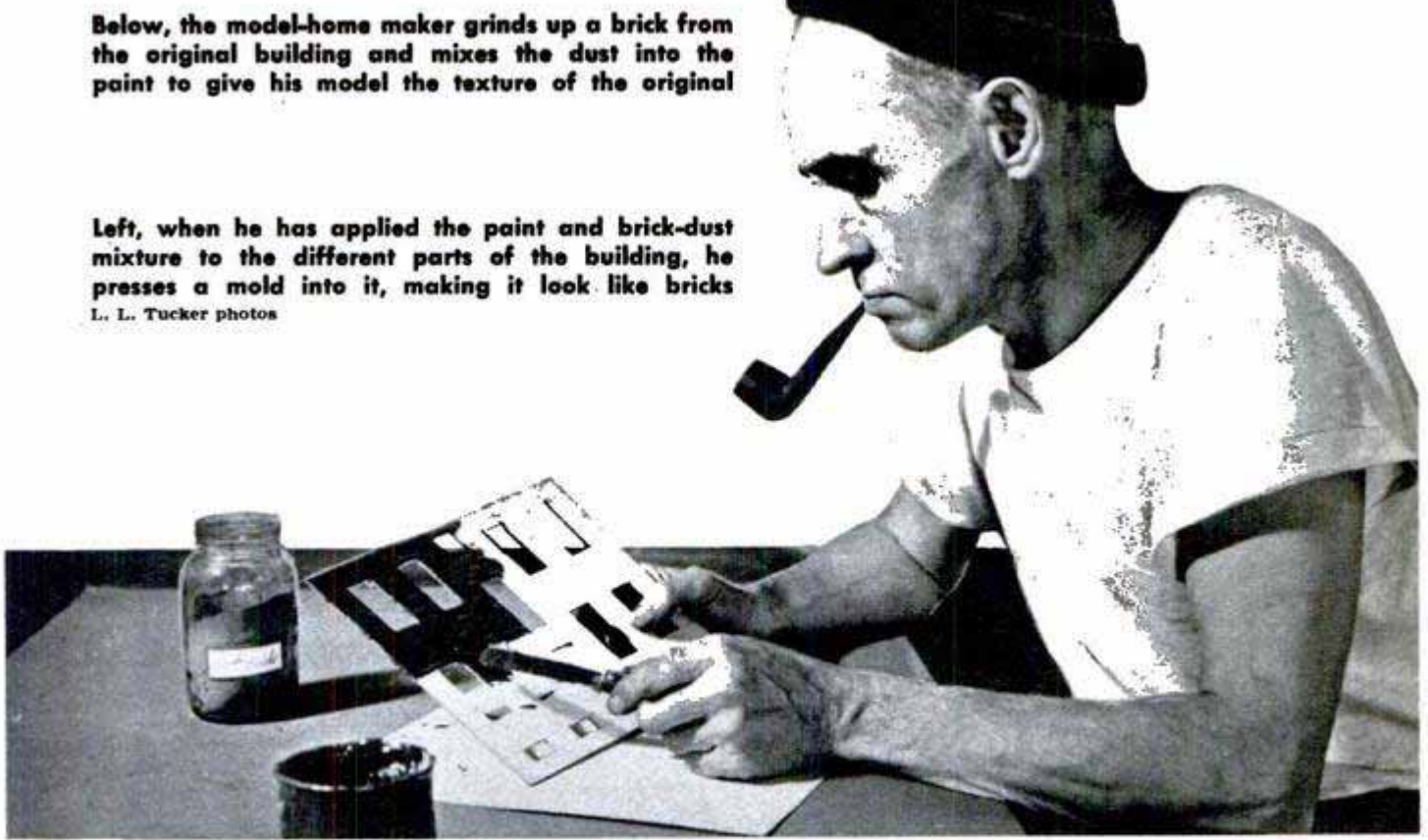


Many of the tools used by Hutton are surgical instruments. He often has to use a magnifying glass in his work

Below, the model-home maker grinds up a brick from the original building and mixes the dust into the paint to give his model the texture of the original

Left, when he has applied the paint and brick-dust mixture to the different parts of the building, he presses a mold into it, making it look like bricks

L. L. Tucker photos



The shingles, however, are cut from a single strip to the tiny scale size.

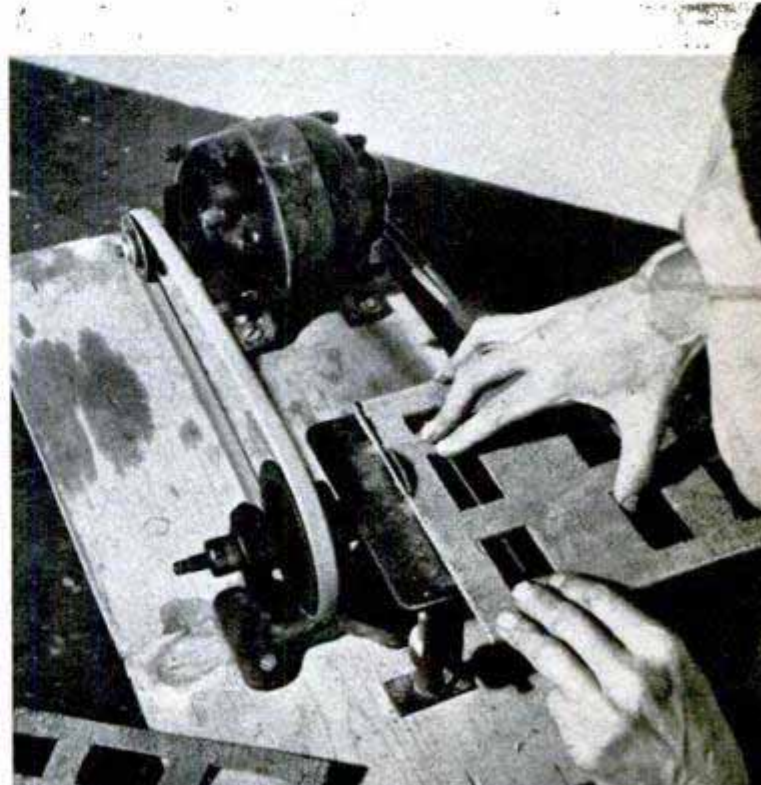
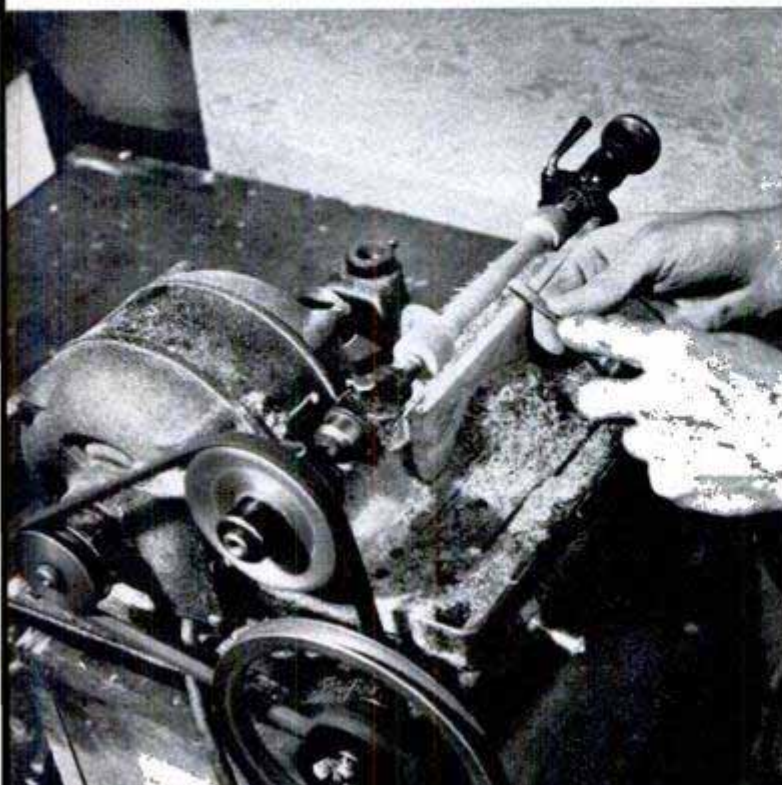
Fred makes the model roof and covers it with a cardboard sheeting. Then he spreads a thread of glue across the roof to which he sticks his first row of shingles, one at a time. He picks up each shingle with a pointed instrument and sticks it in place on the glue in shingle-row formation. Each succeeding row of shingles is applied in similar manner and it usually requires a little more than a day to shingle an entire model structure. To get the correct weatherbeaten texture on shingles or weatherboarding, Fred

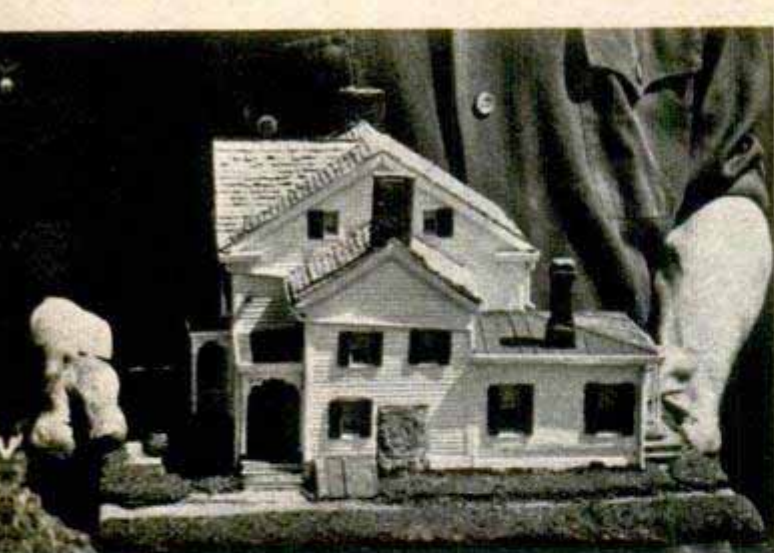
Although most of the work is done by hand, there is need for power tools. Here, he turns a porch column

uses an artist's paint—burnt umber or ocher.

Other materials used in his models are plaster, poster board, white-pine wood and some metals. When he reproduces a brick structure like The Hermitage near Nashville, or My Old Kentucky Home at Bardstown, Ky., he insists on getting the exact brick texture of the original. To do this, he obtains a brick from the original structure, powders it thoroughly and sifts the brick dust through a silk sieve. The sifted powder is mixed with a matching paint and this mixture is spread over the model. While

Naturally, the power saw is small—it has to be to cut the "boards" that are used in model construction



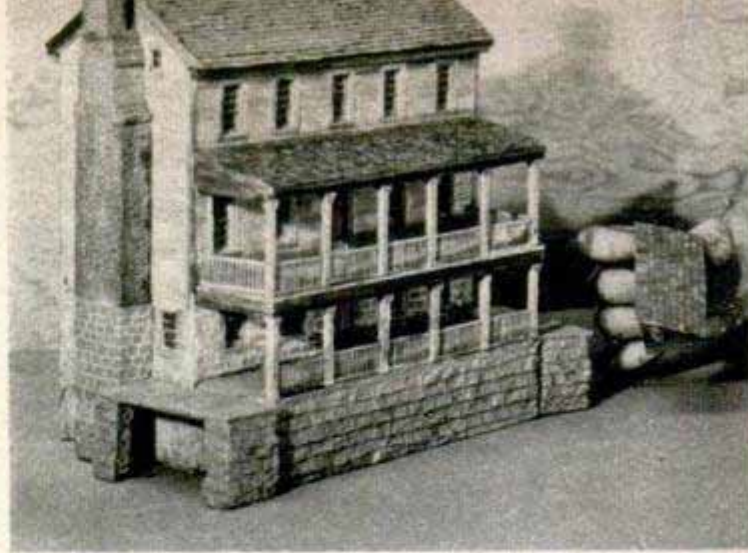


There's a real American look about the model of the house in which President Grover Cleveland was born

this paint is still soft he presses against it a brick-outline mold which leaves the walls with a realistic brick-surface effect.

To shape out the difficult or ornamental parts of a building, Fred uses delicate surgical and dental precision tools. In addition, he has a tiny motor-driven saw to cut out the small wooden pieces. When he got ready to make the porch columns for *The Hermitage*, he made a little jig with which he turned out the 5½-inch pieces. He has tiny vises and other miniature model tools.

The work of cutting out porch railing, ornamental molding and other small pieces is tedious. Some of the parts are so small they have to be tooled under a large magnifying glass. For example, an old-time window blind sized to a ⅜-inch-per-foot scale is small enough in the first place. But when each blind has 15 or 20 different slats to be put in place, one by one, to correspond with



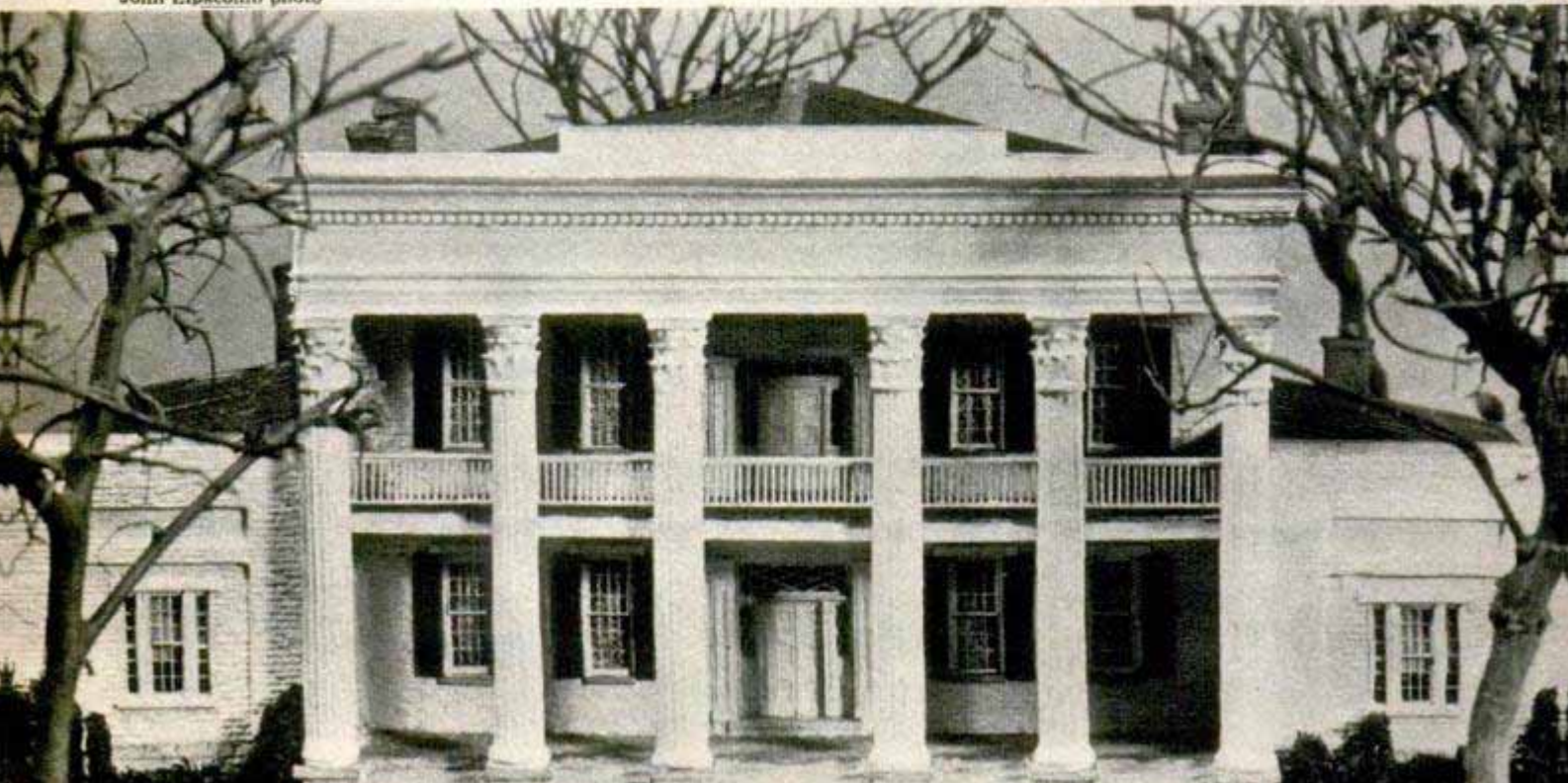
Another example of an architectural style common in early America is Chisholm Tavern, Knoxville, Tenn.

the number and scale-size of the original, it requires the utmost skill and patience.

Fred has in his shop collection a scale model of an old Spanish mission building built by Indian labor in Solvang, Calif., in the 18th century. The walls of the original are five feet thick. But the feature that created the biggest problem was reconstructing the mission's clay-tile roof of varicolored tiles. He solved this by using split soda straws painted in the same hues of browns, reds and greens as in the original. These were cut into the tiny model-tile lengths and put into place on the roof. Soda straws are also used for guttering on many models.

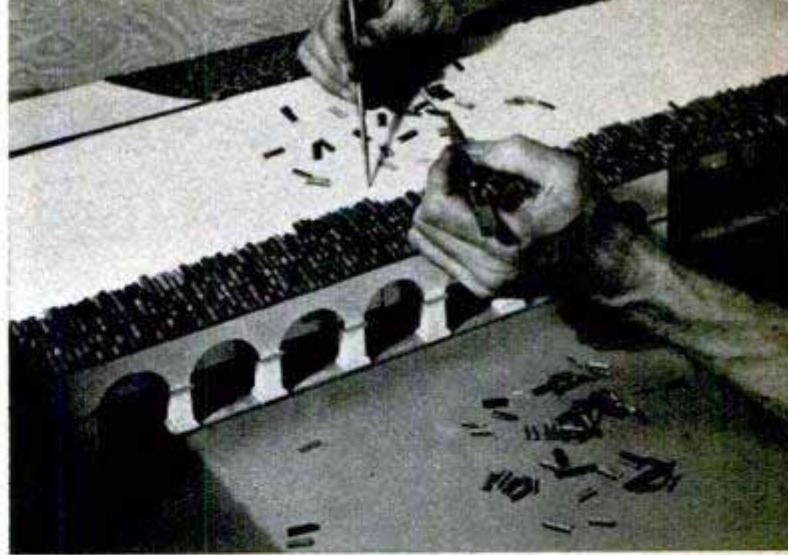
In his collection are scale models of antebellum and colonial homes that date back almost to the time when a man by the name of Columbus discovered there was something west of Europe besides ocean water.

Even the shrubbery and landscaping look real around *The Hermitage*, home of Andrew Jackson near Nashville
John Lipscomb photo



Among the reproductions are Uncle Sam's Plantation Home at Convent, La., Woodlawn Plantation, St. Charles Parish, La., and Crosskeys Tavern between Shelbyville and Louisville, Ky. These three structures were destroyed years ago and Hutton's scale models were made from the building plans. Another destroyed historic building of which he made a model is the James K. Polk home at Nashville. Still other reproductions are Edison's birthplace, the house at Greenbush, Mass., that inspired "The Old Oaken Bucket," the home in which U. S. Grant was living when he was called to command the Union troops in the Civil War, the house at Appomattox, Va., in which Lee surrendered, the Mary Washington home in Fredericksburg, Va., the house at Yorktown, Pa., in which Cornwallis surrendered to Washington, and the St. John's church at Richmond in which Patrick Henry uttered his immortal "Liberty or Death" sentiments. The models are fastened to a wooden base and some even have reproductions of the shrubbery, which is accomplished with pieces of sponge dyed a foliage green.

Fred's insistence on exacting similarity has aroused the admiration of the history minded world. A former executive of the New York World's Fair said no exhibit at the fair approached the intricate detail of Hutton's work. This perfectionist concern has created an outside demand for his models he didn't anticipate. Right now he is creating miniature model exhibits for the Tennessee Historic Association and other historic societies. He is making other model exhibits for the Children's Museum at Nashville. The National Council of Churches of Christ in America gave him an order for three buildings symbolizing the



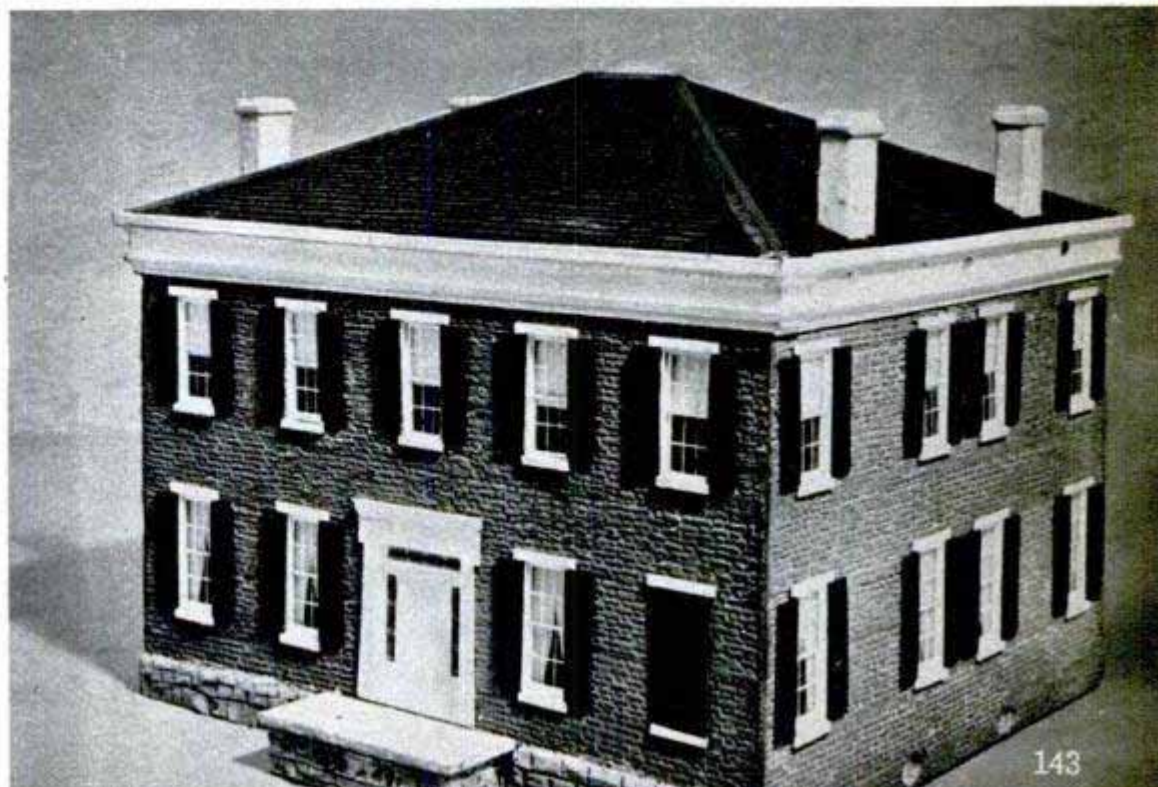
Patience is needed here! Hutton cuts up soda straws and glues them down individually to form a tile roof

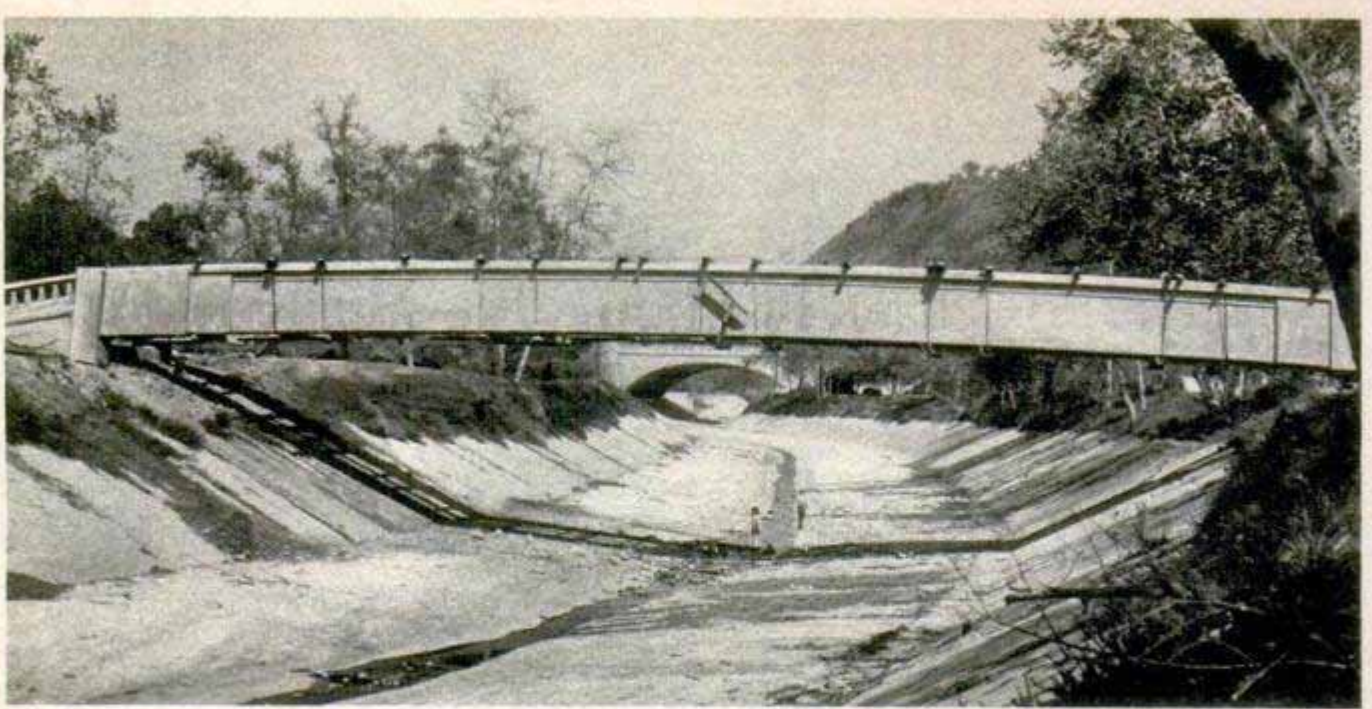
tie-in between church, school and home. The Memphis Home-Builders' Association, made up of Memphis building-supply dealers, is paying him handsomely to display at its annual exhibit a number of old homes and churches. Contractors and building-trade interests are dickering with him for historic re-creations.

Recently, he has taken up the study of sculpture and is now shaping out men, horses and other animal life contemporary with the architecture he is reproducing. In the back of his head is a plan to reproduce in models enough old-time buildings to show every change of architecture in the nation's history. Since different sections of the country have had architectural designs that differ from each other, he would like to have scale-model reproductions of at least three shrines in every one of the 48 states.

A lot of work? Of course, but that won't bother Hutton. It's a hobby with him—a hobby that pays the grocery bill.

One of Hutton's best is the pre-Civil War home in Memphis. Each detail is realistic, including the bricks in the walls
L. L. Tucker photos





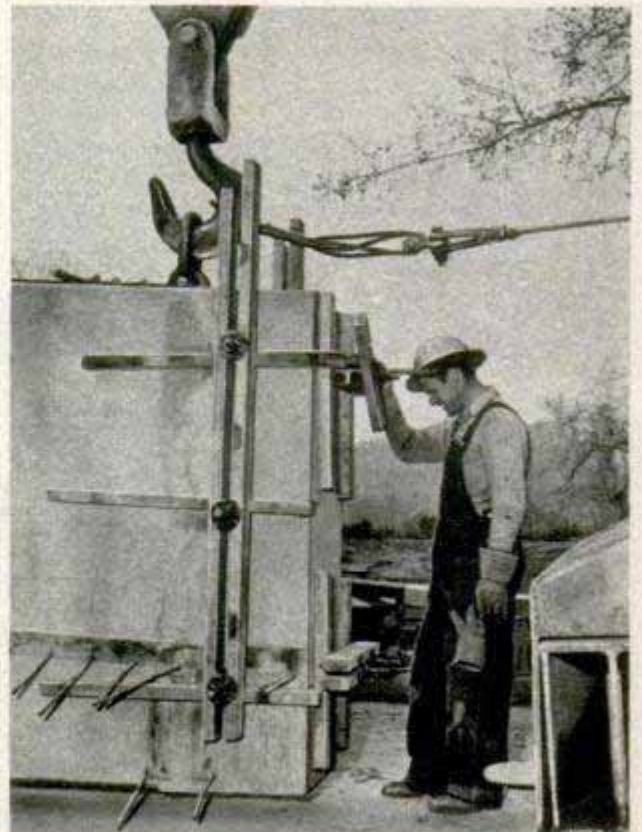
Taut wires inside girders strengthen bridge in the same way a row of books can be lifted by pressing on ends

Cranes pick up graceful girder and swing it into place. Wires have been installed and placed under tension

PRESTRESSED CONCRETE FOOTBRIDGE

Spanning a channel in Los Angeles is a graceful little footbridge, built with a new construction technique applicable to larger structures. During construction, steel wires were pulled taut through holes in each hardened concrete girder. The wires strengthen the bridge by holding it under tension.

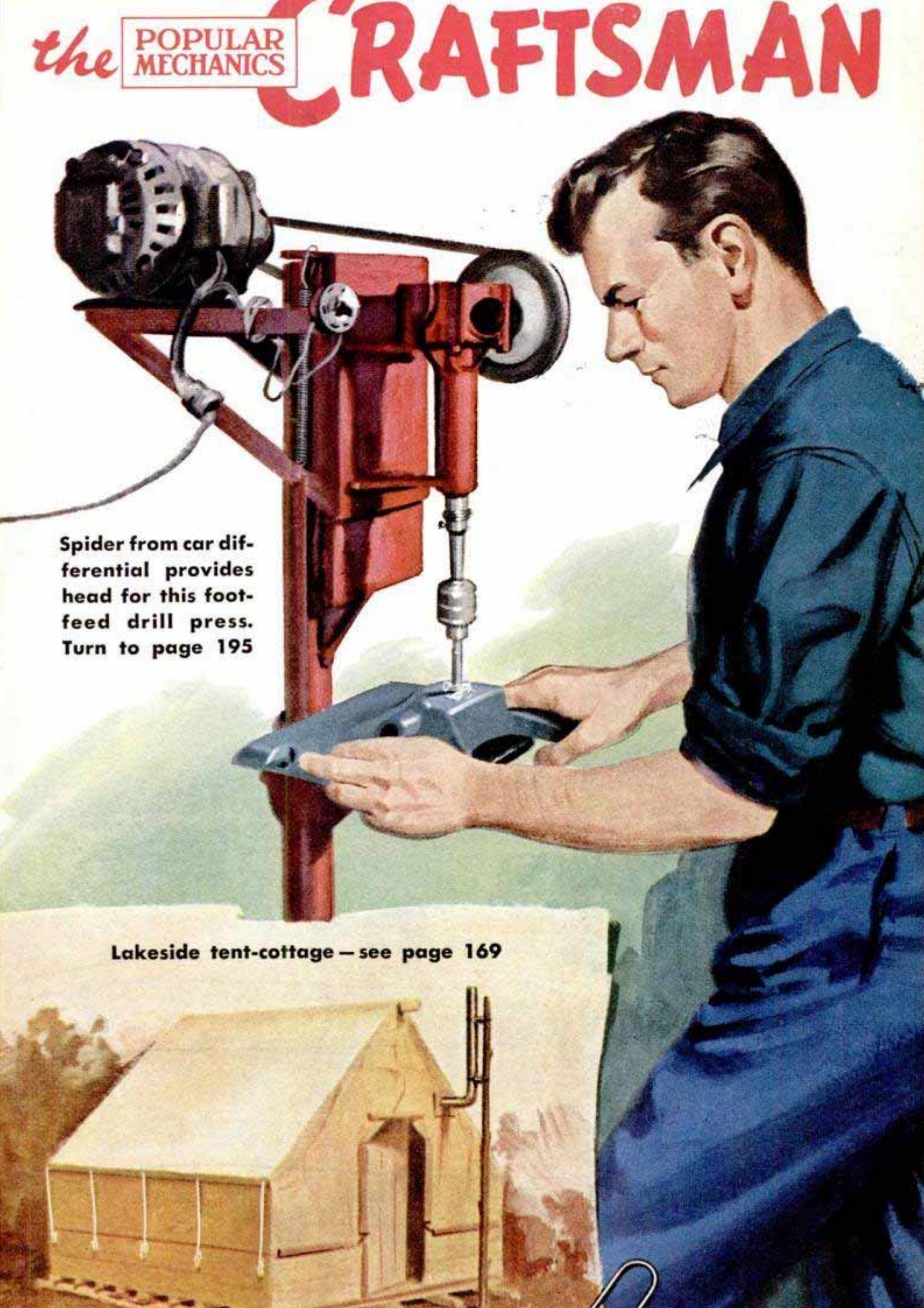
Concrete cap conceals wires anchored at end of girder. Method may be applied to larger buildings



the

POPULAR
MECHANICS

CRAFTSMAN



Spider from car differential provides head for this foot-feed drill press. Turn to page 195

Lakeside tent-cottage — see page 169

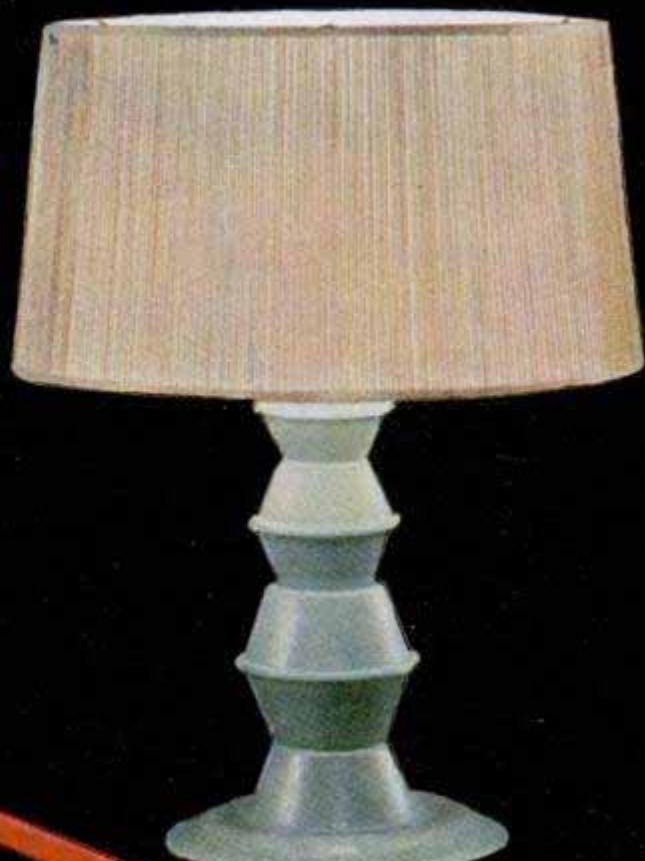




Money-Making

PM color photos by Paul T. Hutchinson

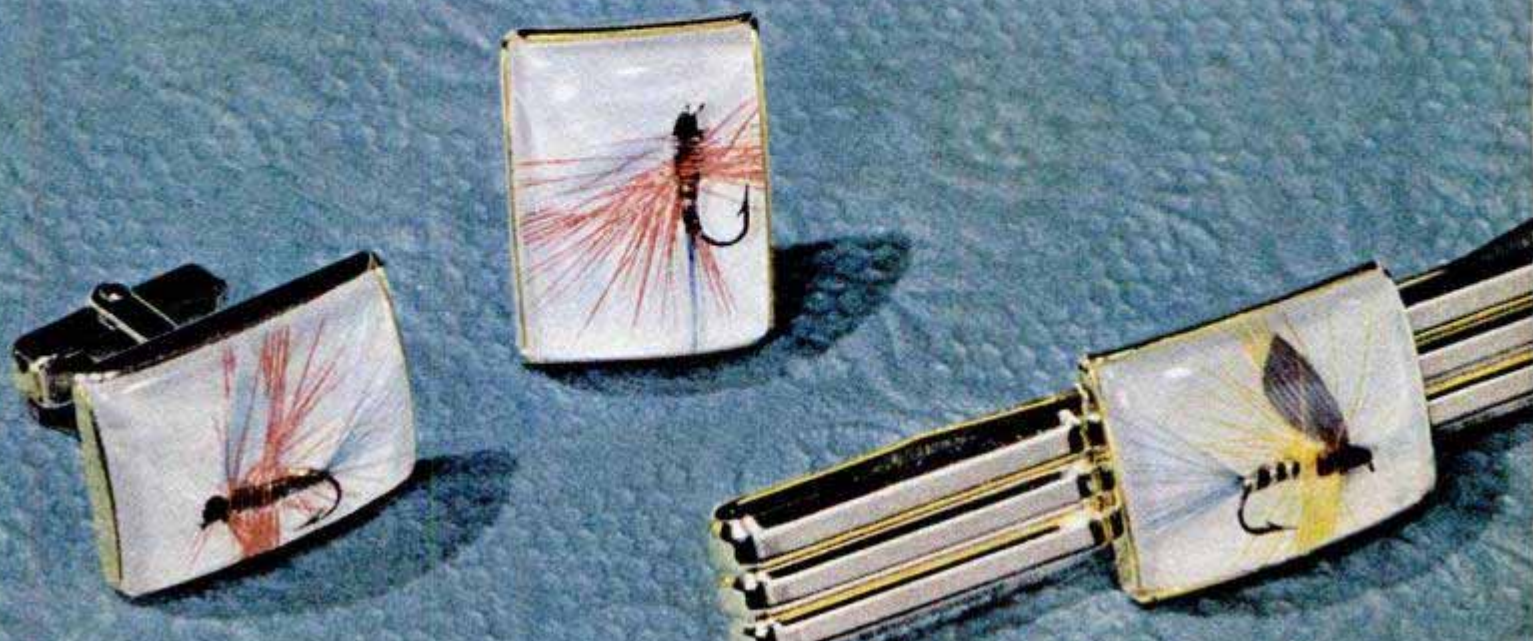
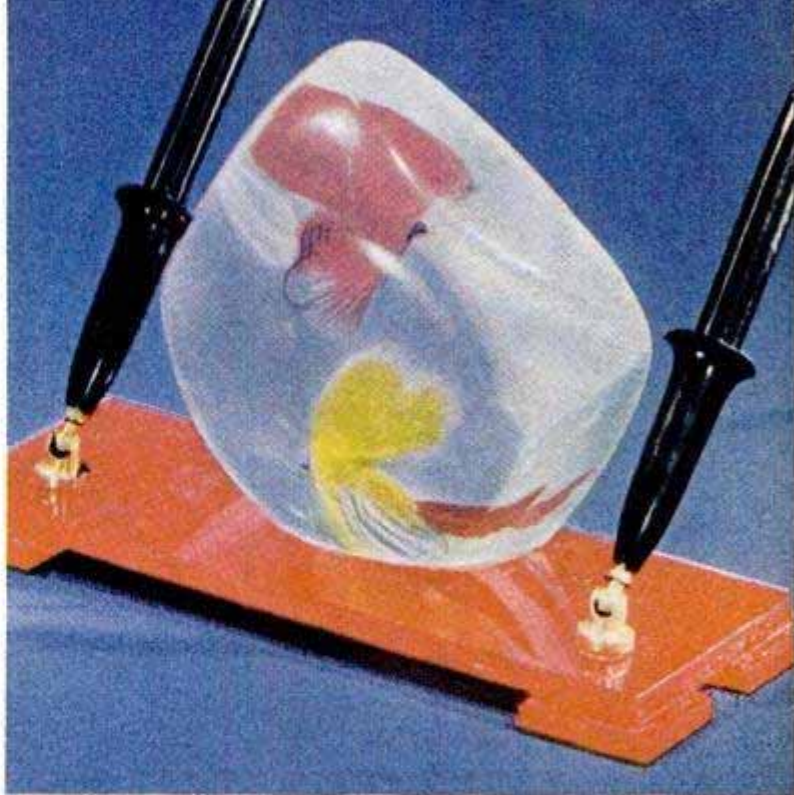
If it's spare-time income you are after, producing colorful novelties from paper plates and preserving mementos in liquid plastics are two good home enterprises that will set you up in business. Small outlay and inexpensive materials make business prosper with low overhead

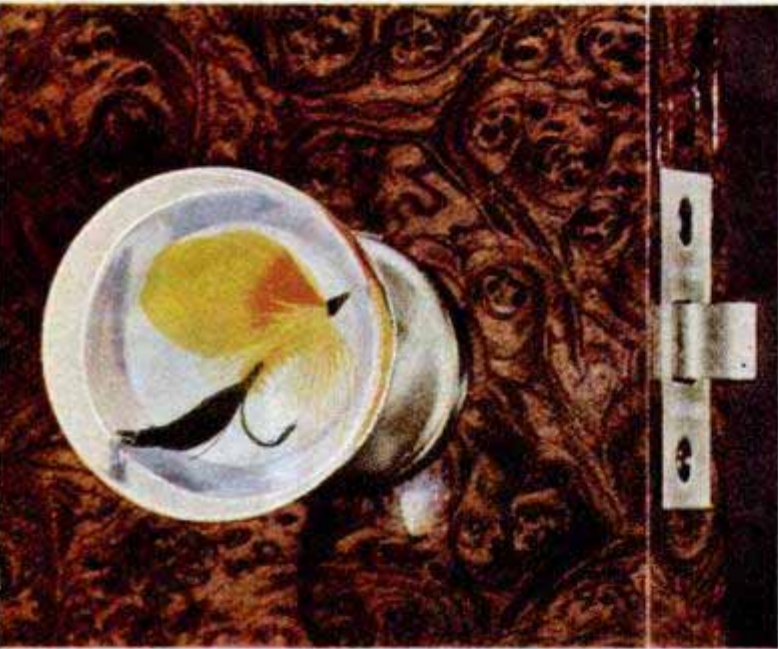


PROJECTS

FEW HAVE LOOKED upon the common paper plate as worth-while craft material, but Albert Belanger of Alton, Ill., an expert in craftwork development, has applied his ingenuity to transform these lowly picnic items into attractive and useful articles, some of which are pictured on the opposite page. Stiffened by gluing together several thicknesses and then painting, the molded-paper plates make novel, durable projects that are practically as solid as if they were made of wood. The items shown at the left and detailed on page 149 should serve to get you started in this profitable hobby and offer suggestions for other good sellers of your own design. Possibilities are limited only by your imagination and ingenuity and you'll be surprised at the number of different projects that can be made by combining plates and cups of varying sizes and shapes.

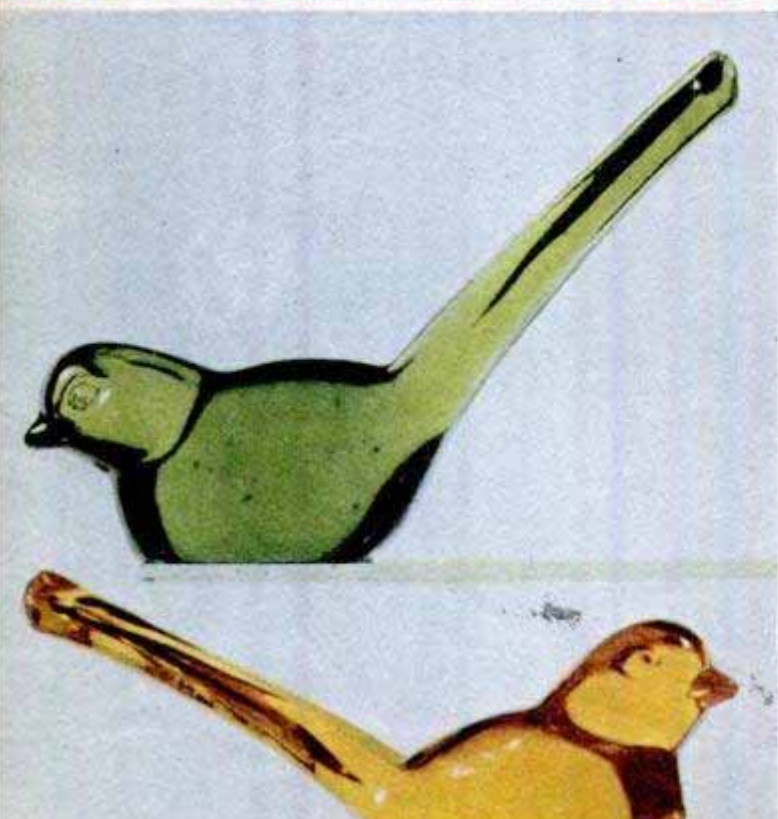
Some of the projects shown can be made from paper plates of the kind sold in dime stores. Others require standard cups and shapes that can be ordered from manufacturers of fiber products. There are two types of molded-paper products, one being rather porous, while the other is fairly hard. Usually, two thicknesses of the hard type are sufficient to give the desired stiffness. The porous variety requires as many as three or four layers. The new plastic-type glues have been found to give best results, and the work should be clamped or, at least, weighted to keep the work flat and straight while the glue dries. Before the paper is painted, all rough places are sanded smooth. One prime coat of lacquer,





followed by an enamel undercoater and a final coat of enamel, gives a satisfactory finish. The drawings on the facing page, which are self-explanatory, show how most of the sample projects are made. Note how the fixture pipe in the lamp base is centered in the ends of each section with a wooden disk and supported with wooden spacer blocks, which are inserted inside the sections before the latter are glued together. The body of the toy wagon is made of four tray-shaped containers of the type in which meat is sold, while the wheels are built up from molded-paper hot pads.

The second money-making idea consists of preserving mementos and keepsakes by casting them in liquid plastics. Like the bronzing of baby shoes, this hobby offers real opportunities for extra cash, as nearly everyone is a potential customer. For example, a fresh flower from a bride's bouquet or other memorable occasion can be



Chinese Temp Base

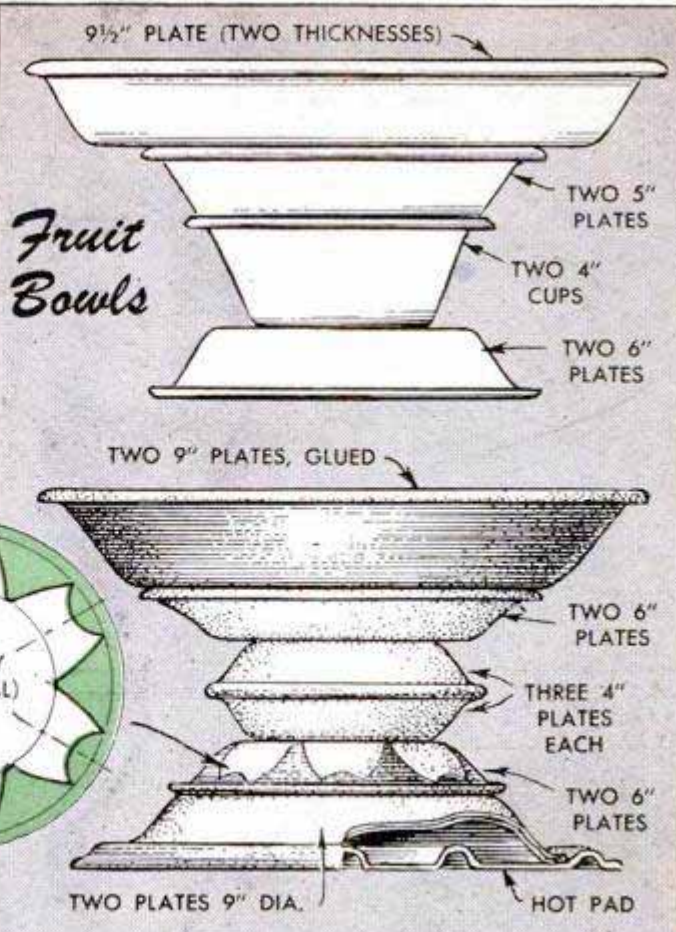
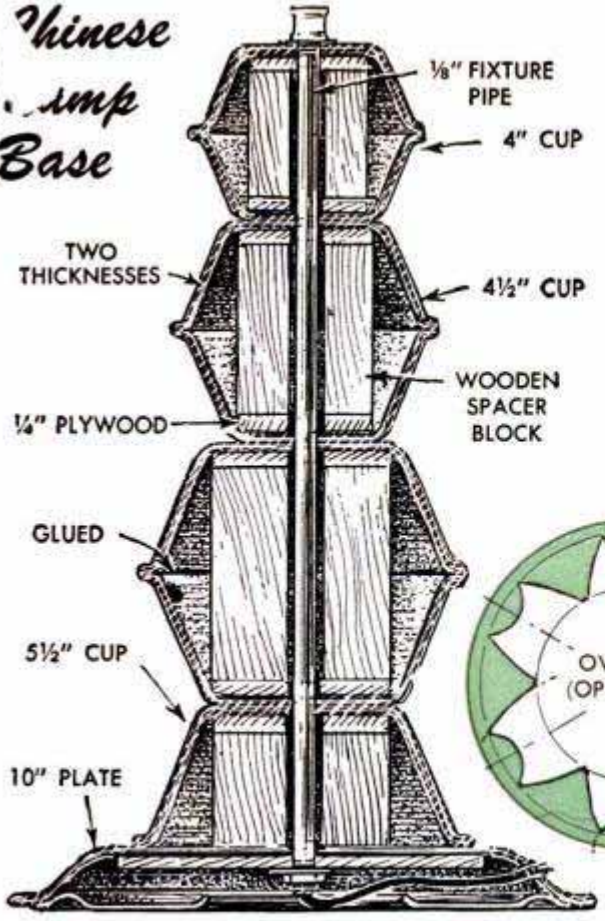
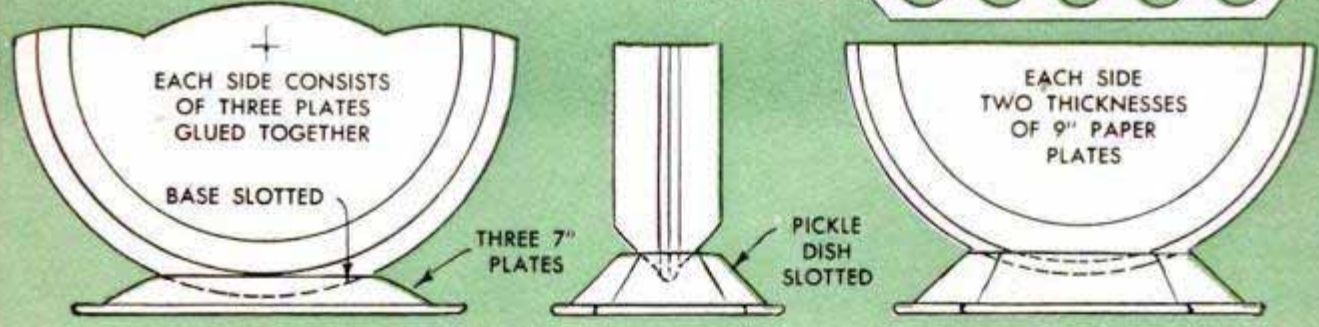
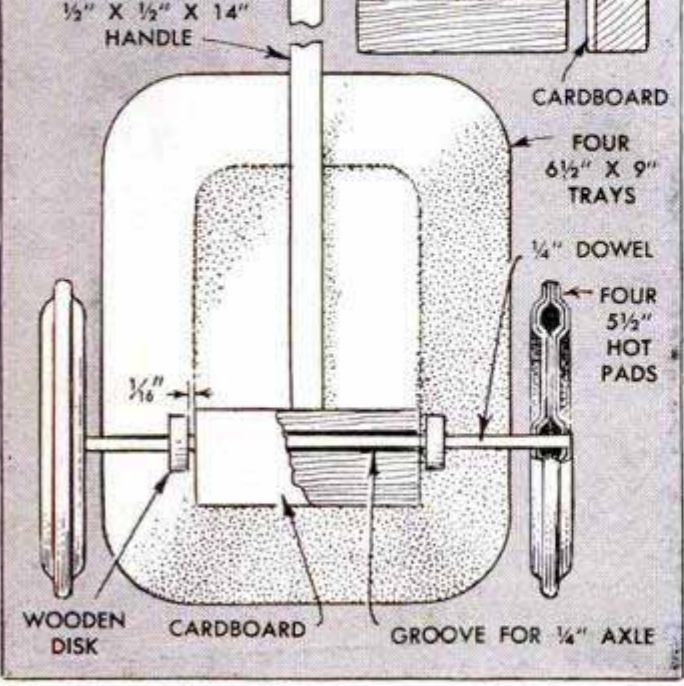


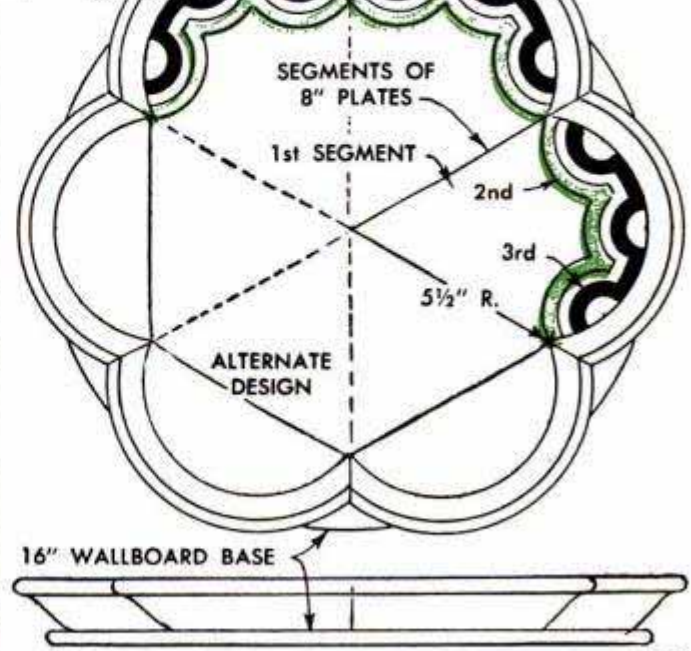
Table Centerpieces



Toy Wagon



Serving Tray



CASTING WITH LIQUID PLASTIC



1st
POUR $\frac{2}{3}$ OF ESTIMATED
AMOUNT OF PLASTIC RE-
QUIRED INTO GLASS CUP



2nd
ADD FEW DROPS OF
CATALYST (HARDENER)
AND STIR 1 MIN.



3rd
POUR MIXTURE INTO
MOLD AND ALLOW TO
STAND UNTIL IT JELLS



4th
PLACE OBJECT TO BE
EMBEDDED ON TOP OF
THE JELLED PLASTIC

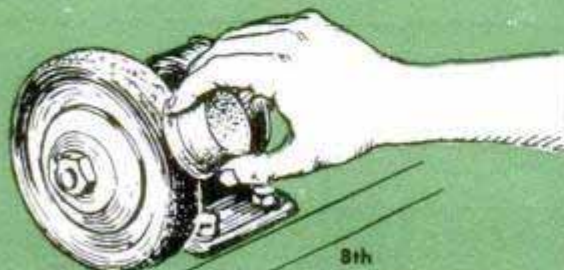


5th
FILL REMAINDER OF MOLD
WITH LIQUID PLASTIC AND
LET STAND UNTIL FIRM

6th
PLACE IN OVEN FOR
30 MIN. AT 150° F.



7th
INVERT MOLD AND GIVE
SHARP RAP ON TABLE TO
REMOVE THE CASTING



8th
SAND FACE OF CAST-
ING FLAT AND BUFF
ON WHEEL CHARGED
WITH JEWELERS' ROUGE

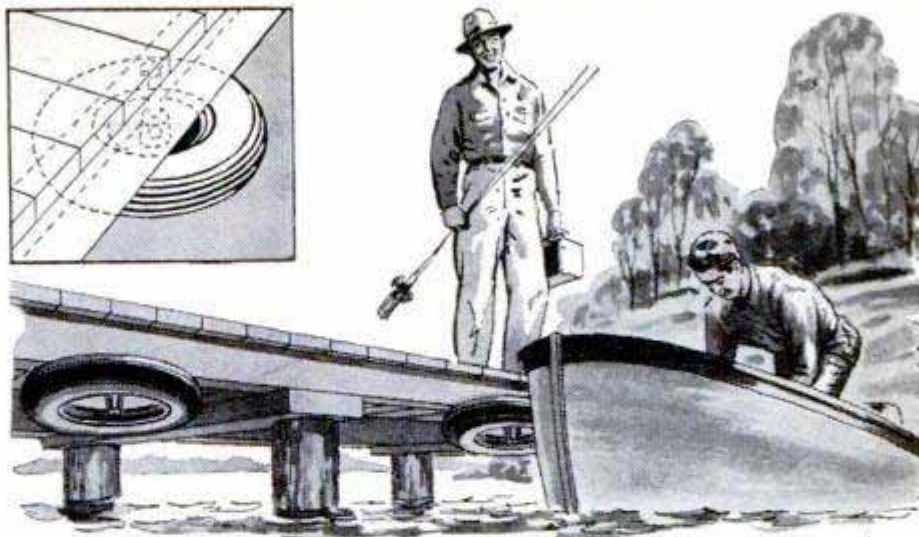
encased in a plastic paperweight to become a daily reminder. And, what mother wouldn't be thrilled to have baby's first photo or a lock of hair preserved? Rare coins, lodge emblems and prized medals are other items that can be set in plastic for safekeeping. Unlike pressing a flower, embedding a blossom in plastic preserves its coloring and makes it look as if it were suspended, thus retaining its third-dimensional quality. The examples pictured are only a few of the many possibilities. The little night lamp, shown at the top of page 148, transmits light from below through the edge of a cast-plastic upright to illuminate an embedded floral spray. The doorknob pictured on the same page is a unique example of how the door to a trophy room or den can be fitted with a knob in which a colorful bass fly has been embedded.

As its name implies, liquid casting plastic comes ready prepared in liquid form and is poured cold. Until recently, the art of casting the transparent plastics was limited to such common molds as dishes, glasses, cups, ash trays, etc., as the material could not be cast satisfactorily in rubber molds. Now, thanks to the Plasticast Company, makers of liquid casting plastics, a wide selection of inexpensive glass-lined molds is available to the hobbyist. In these, the plastics can be cast in a variety of forms, such as doorknobs, coasters, cabinet knobs, wall-switch plates, picture frames, etc.

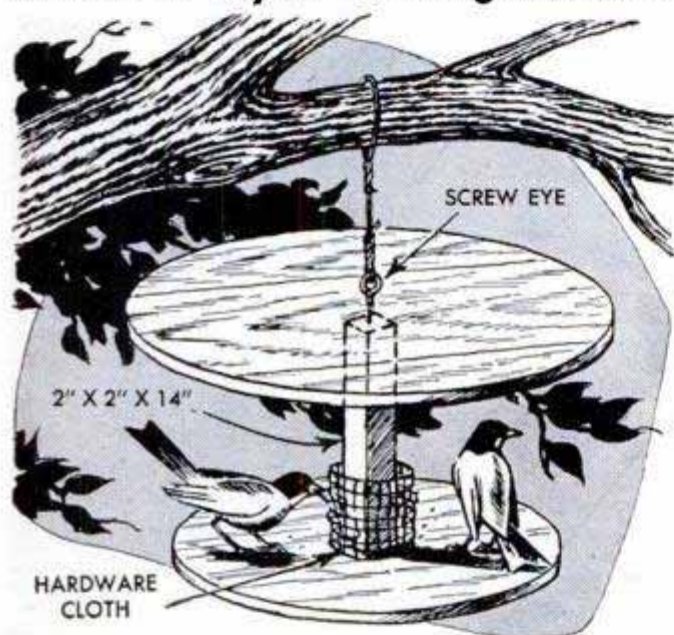
The basic steps in casting liquid plastics are illustrated at the left, and take you through the steps of making a doorknob. Obviously, if you are not embedding an object, for example the birds shown on page 148, the mold can be filled in one operation, thus eliminating steps four and five. Occasionally, it is desirable to make two-color castings. In this case, the second portion of the plastic can be colored by adding a few drops of dye, using either a transparent dye or one that is somewhat opaque to produce a background for the embedded object. Unless the top surface of the casting is to be exposed, such as the doorknob, the casting requires no additional finishing, when removed from the glass-lined mold, as the highly polished surfaces already possess the appearance of glass. However, if the top of the casting is to be exposed, the surface can be easily sanded off flat and buffed to match the rest of the polished surfaces, as shown in step eight. The finished knob is finally cemented to a tapered plastic base piece which is drilled and fitted with a setscrew for attaching it to the lock. When earrings, lapel buttons and other pieces of costume jewelry are cast, the plastics can be easily drilled for attaching eyelets, clips, etc. In fact, the material can be worked much the same as hardwood.

Semipneumatic Barrow Wheels Utilized as Fenders on Boat Dock

Boatmen who wish to equip their docks with fenders that will prevent damage to their boats when docking, will find two or three barrow wheels excellent for the purpose. The wheels are provided with long bolts to act as axles, which extend through holes bored vertically in the stringer of the dock. Hung in this manner, clearance is left below the stringer so that the wheels will turn.



Build This "Fly In" Feeding Station for Your Feathered Friends



Here is a suitable feeding station for birds which can be made quickly and easily from scrap materials. The wooden bottom and top are built up from odd pieces and screwed to the ends of a 14-in. length of 2 x 2-in. stock. A screw eye, which is turned into the center of the top disk, is threaded with a length of wire to provide a means of hanging the feeding station. A piece of hardware cloth, wrapped loosely around the center post, serves as a holder for suet or other food.—L. G. Gibson, Oakton, Va.

Sleeve Gauges Depth of Hole

When using an electric drill, there is often need of some method to control the depth of the hole being drilled. A wooden stop for this purpose was devised by one man who wanted to drill holes in the windshield pillar of his car without damaging the electric wires located therein. A short, 1 x 1-in. wooden block was drilled through the center lengthwise and then cut to a length about $\frac{1}{4}$ in. shorter than the portion of the drill exposed from the drill chuck. Slipped over the drill, the block acted as a stop between the face of the work and the drill chuck to limit the depth of the hole.

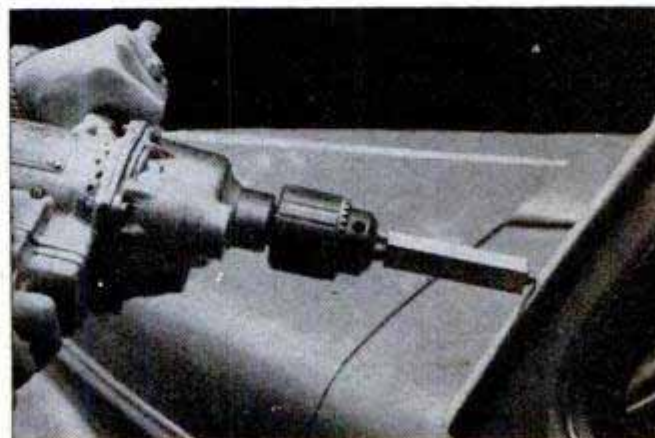
Cork Disks Form Fishhook Guards

To guard against possible injury from treble hooks carried loosely in the tackle box, one fisherman uses a cork disk, which is notched on one side, to slip over the shank of the hooks. The points are embedded in the cork. For small treble hooks the cork disk in a beverage-bottle cap is just the right size.

For larger units, cut the disks from $\frac{1}{8}$ -in. sheet cork or from large cork stoppers of the type used in gallon jugs.

William B. Eagan, Louisville, Ky.

☐ The next time you prune thorny bushes, use a spring-type clothespin to grasp the cut branch and discard it, thus protecting your hands from painful scratches.



Novel Home-Window Beautifier Is Roller-Type Fabric Shade

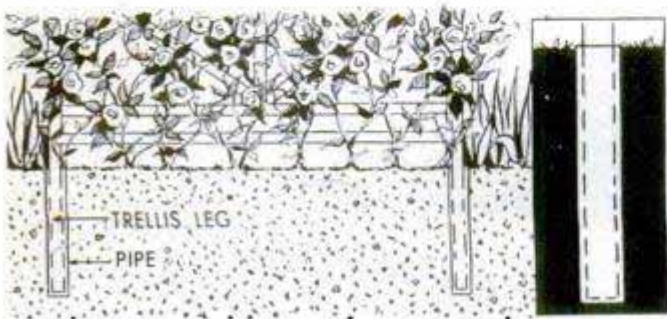


A unique way to gain a pleasing effect in the windows of your home is by replacing the window-shade material with a colorful fabric. The expense is small. Perhaps some material left over from recently made draperies can be used, in which case each shade will match the draperies exactly. To convert a shade, first remove the old material from the shade, leaving it intact so that it can be used as a pattern for cutting the fabric. Cut the fabric a little oversized to allow room for a hem at each edge. The hem at the bottom should be large enough to permit inserting the wooden slat from the old shade. Attach the fabric to the roller with small tacks and transfer the pull cord.

Ervin L. Strayhorn, Beebe, Ark.

Trellis Legs Kept From Rotting By Inserting in Steel Pipe

When the legs of garden trellises are embedded in the ground without protection, they will rot in a comparatively short time, making it necessary to repair or replace

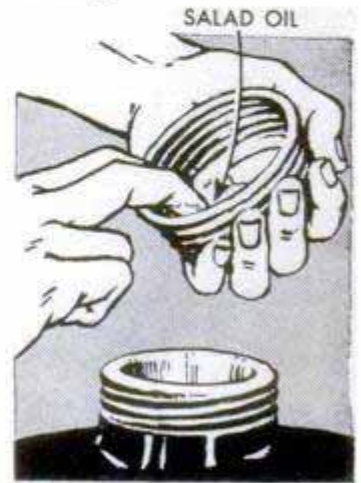


them. To prevent this deterioration, cover the portions of the legs that will be below ground level with a roofing tar or other waterproofing compound, and insert the legs into lengths of steel pipe before setting them in the ground.

J. Rosenberg, New York City.

Greasing Cap on Insulated Jug Helps Prevent Sticking

Instead of fretting and straining to remove the screw cap from an insulated jug the next time you are on a picnic or other outing, spread a little fresh lard or salad oil on the threads before the cap is put in place. It will then come off easily. However, don't forget to wash the cap because the lard or oil may become rancid before the jug is used again.



Paul Will, Chicago.

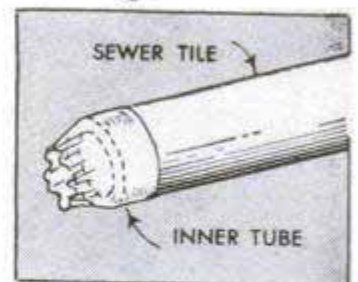
A Primer for Asbestos Shingles

Paint can be made to spread evenly on asbestos shingles if they are first primed with a mixture of spar varnish, 1 part, to exterior primer, 4 parts. Mix the solution thoroughly before using. Be sure to use no more than one part varnish. Otherwise, the result will be a surface too glossy to provide a good bond for the finish paint.

D. B. Owens, Toledo, Ohio.

Minimizing Tile Breakage

Truckers, or others who handle sewer or well tile, will find that breakage can be minimized by slipping a section cut from an inner tube over the ends of each tile section. Easily put on and removed, the "rubber bands" act as insulators for the tile at points that are most likely to be chipped.



Tubing Held Without Flattening

A short length of copper tubing can be held for sawing, without danger of being crushed, by chucking one end of the tubing in an auger brace. The brace is then clamped in a vise.

"Bench Build"

POPULAR
MECHANICS

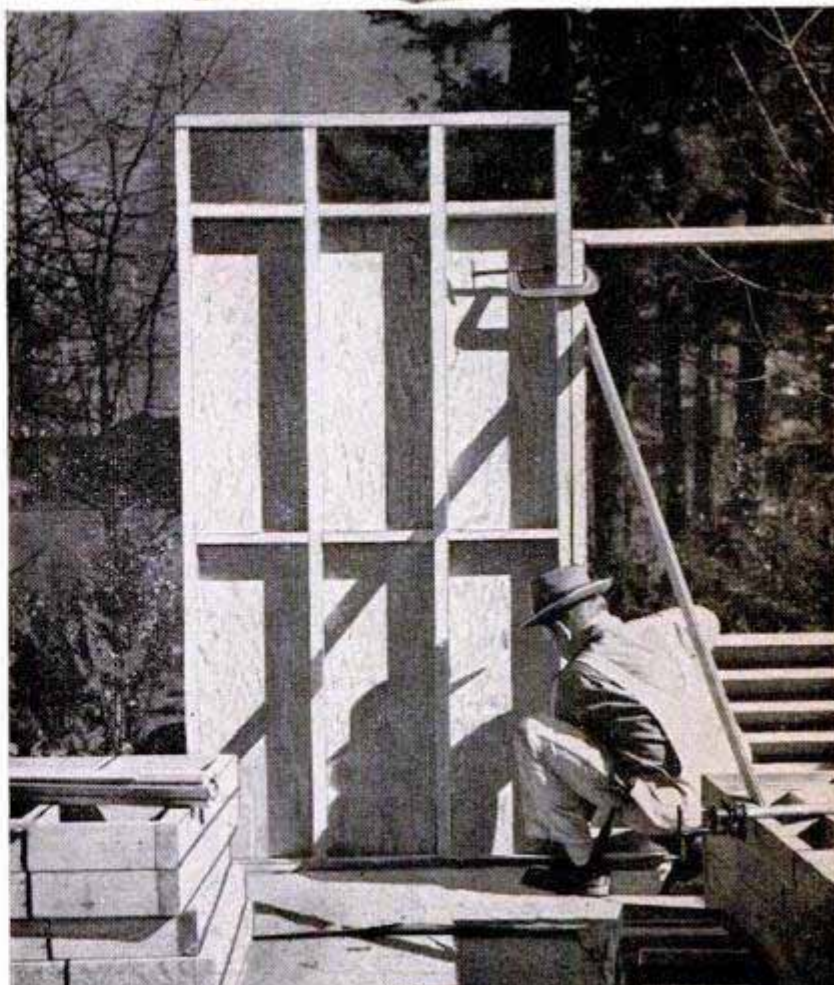
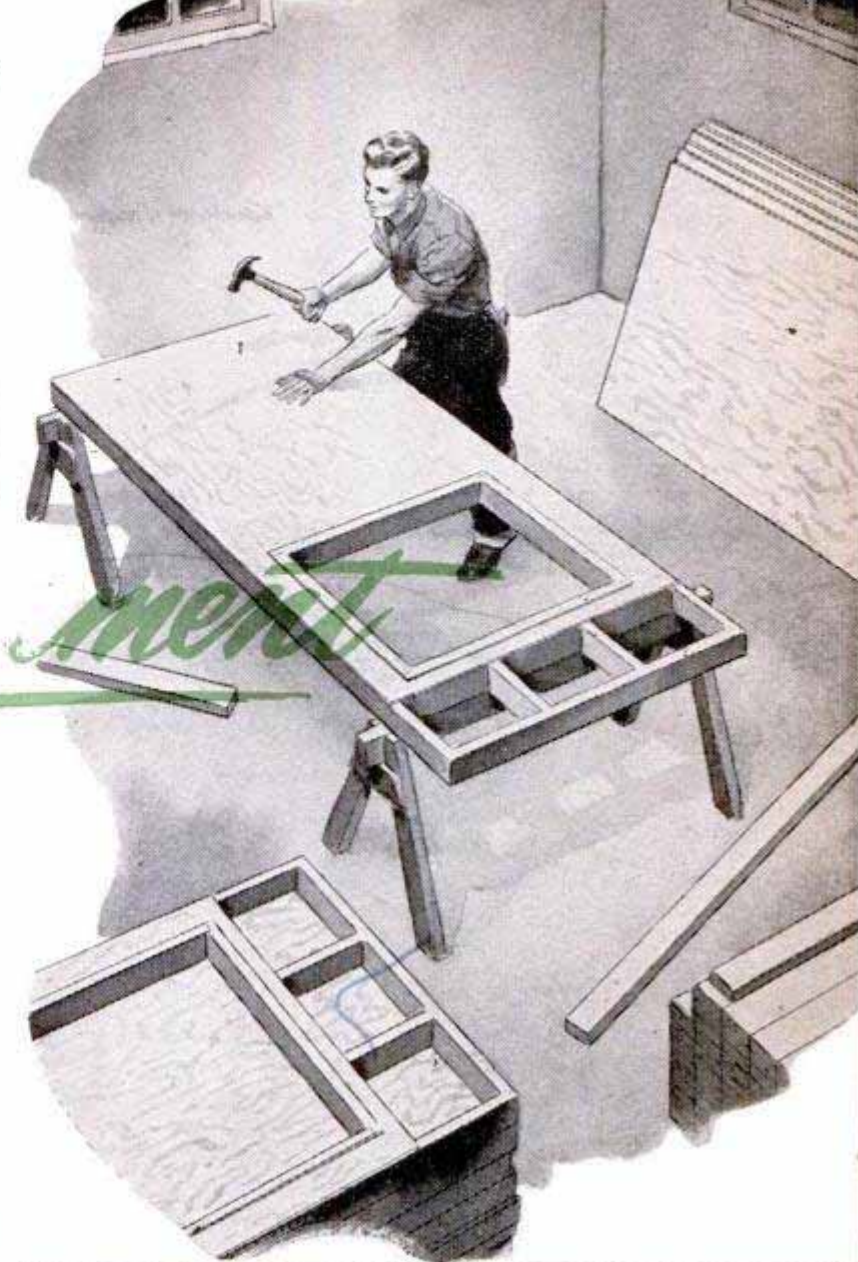
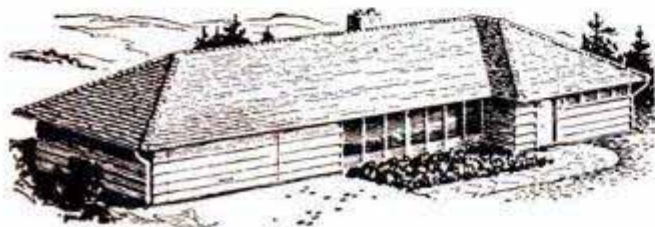
RANCH HOUSE

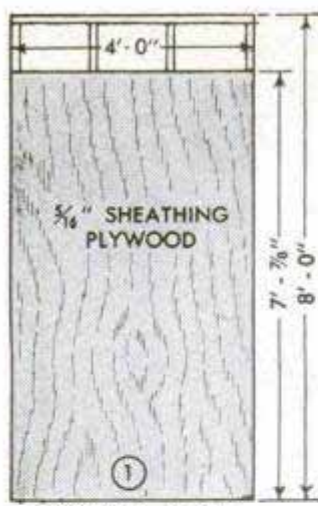
EDITOR'S NOTE: Now that Tom Riley has told you how he devoted his full time to building the P.M. Ranch House, this concluding article explains how the same house can be erected in a minimum of spare time by prefabricating most of it indoors during winter days in readiness for spring

Part IV

By Tom Riley

TIME, more than any other factor, is probably the most critical "item" facing the man who attempts to build a home himself. Discounting the time lost due to bad weather, the man who spends every free moment, week ends, plus vacation time, does exceptionally well if he gets his home under cover during the normal building season. Realizing that those who can devote their full time to building a home are comparatively few, the Craft Editors of *Popular Mechanics* suggested to John J. Whelan, noted architect who designed the P.M. Ranch House, that he keep the week-end carpenter in mind when planning the home. Accordingly, he designed the home so that a good part of it could be prefabricated indoors during winter months to help save precious time on the building site. Starting out with a floor plan of 4-ft. interior module, architect Whelan adapted it to his famous "bench build" system of construction which has had wide use on the West Coast and in

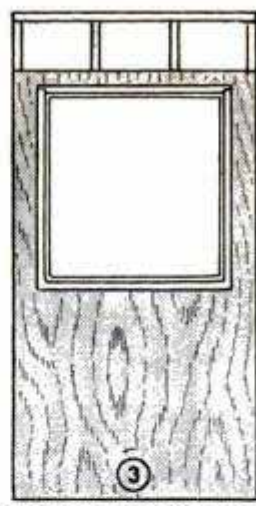




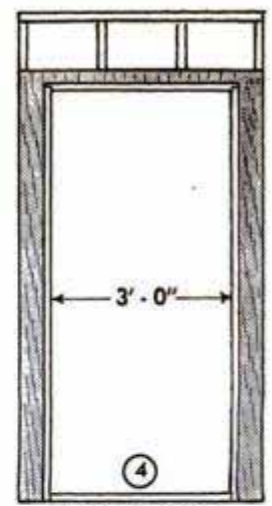
EXTERIOR — SOLID PANEL



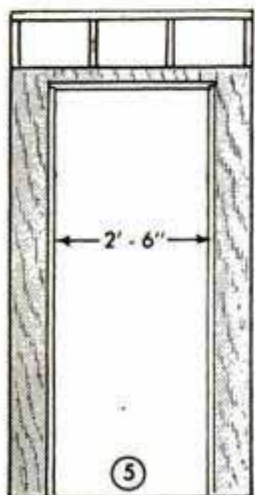
BEDROOM-WINDOW PANEL



KITCHEN-UTILITY-GARAGE WINDOW PANEL



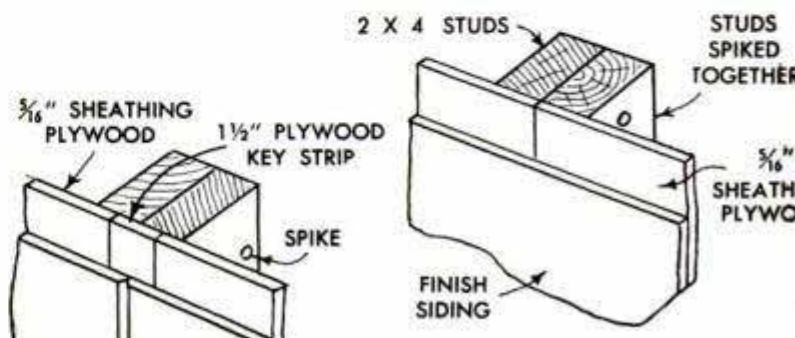
FRONT-DOOR PANEL



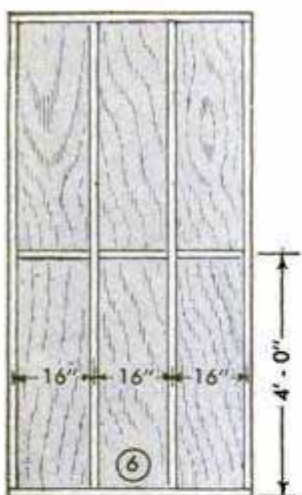
REAR-DOOR PANEL



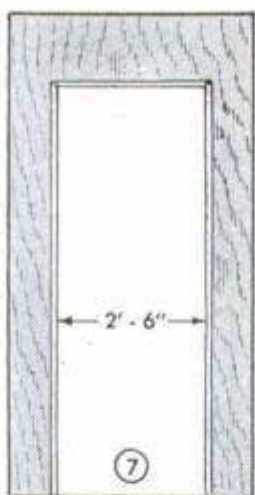
FRONT SIDE OF SOLID PANEL



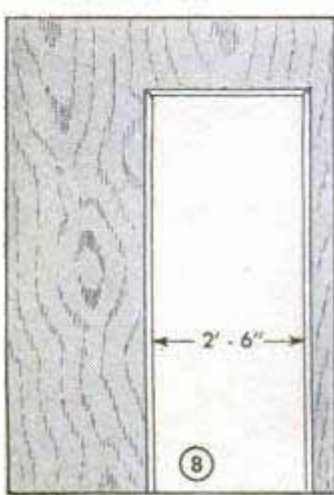
Two methods of joining sections. When both sheathed and sided, key strip between sections seals joint to make it both weather tight and secure



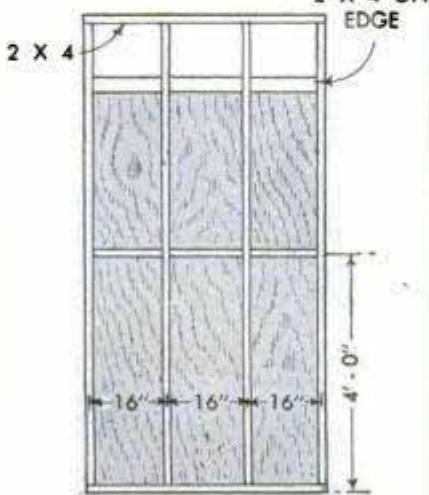
REAR SIDE OF — SOLID PANEL



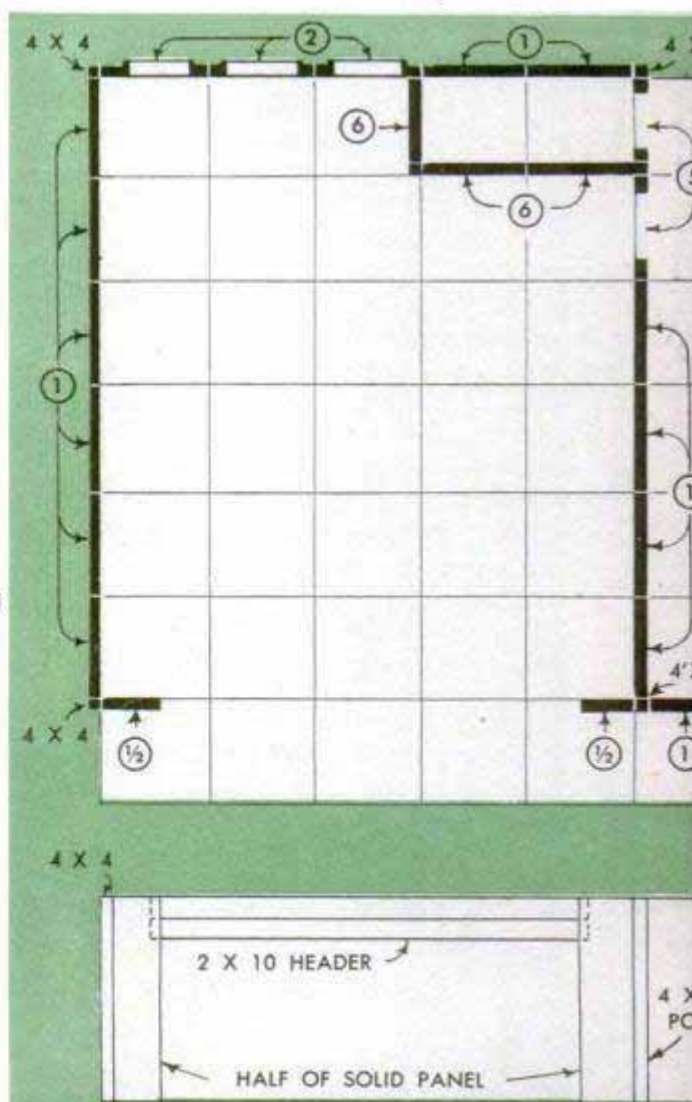
DOOR PANEL, 4' WIDE



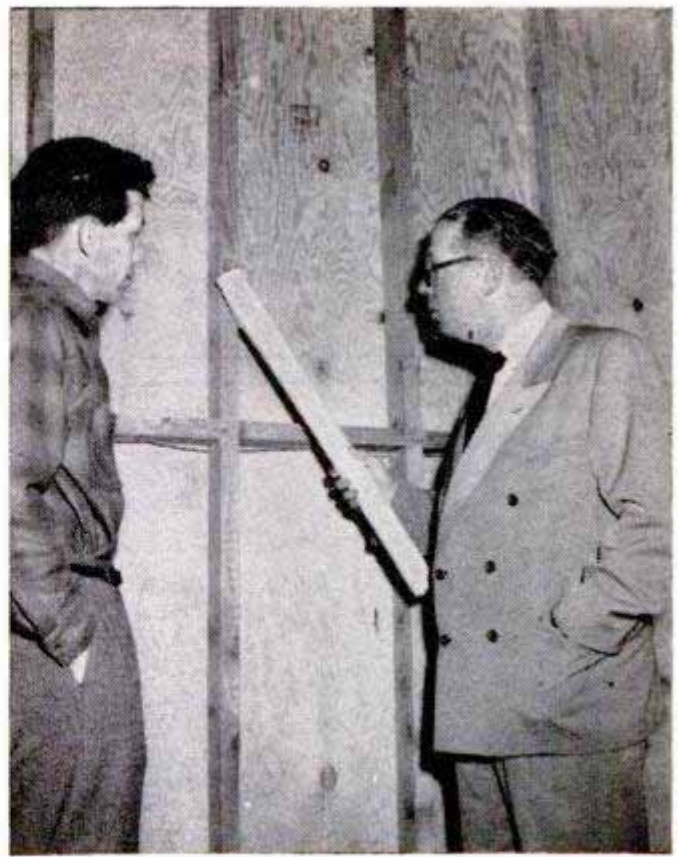
5'-6" DOOR PANEL



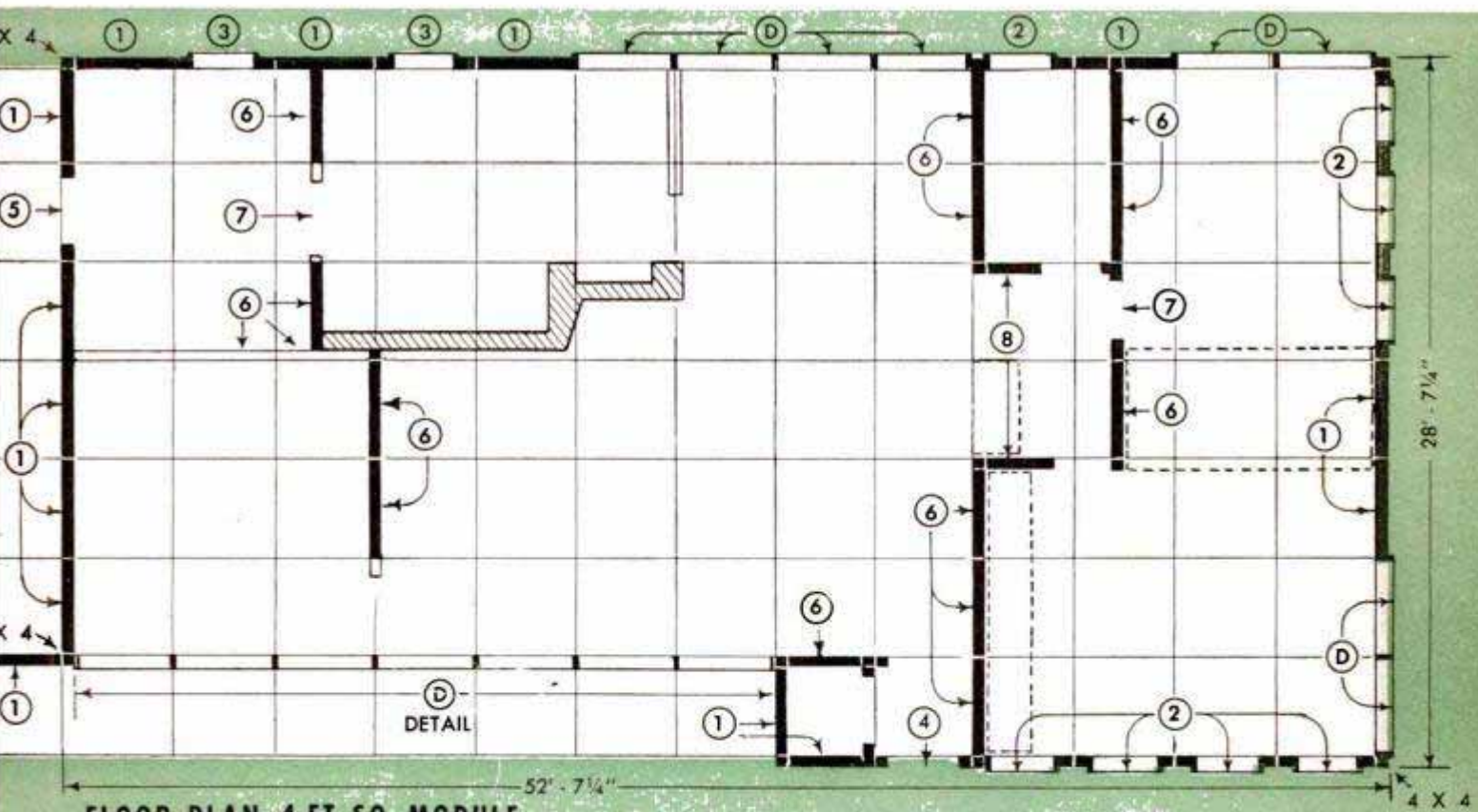
REAR SIDE OF SOLID EXTERIOR PANEL



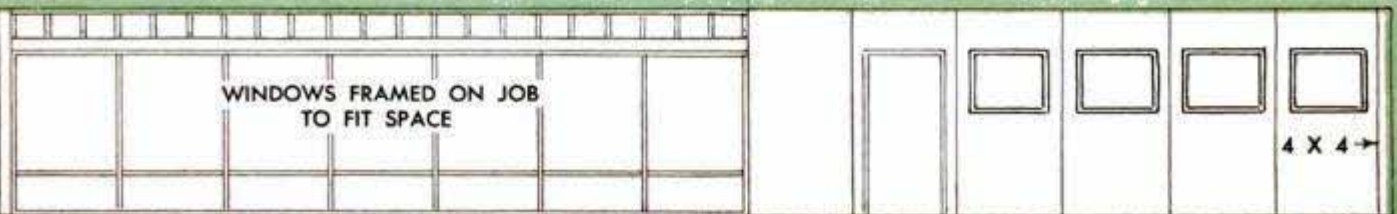
Alaska. Making use of standard 4 x 8-ft. sheets of plywood, both interior and exterior walls are prefabricated in individual 4-ft. sections, standardized in size and shape to permit them to be mass-produced with common tools in the basement or garage. The sections can be merely sheathed, which is sufficient to enclose the house, or they can be completely finished with siding and door or window frames. Thus, during the winter, all the wall sections can be assembled and the roof trusses put together and then stored until spring. With this much of your house ready-built, early spring week ends can be devoted to pouring the foundation and laying the subfloor in the same way as described in Part I. Then, your summer vacation can be spent in setting the wall sections and roof trusses in place and completing the finished roof. In this way, you'll have your home fully enclosed and protected before cold weather arrives. Only 69 wall sections are required, including garage and breezeway, and these can be stored in a single-car garage or outdoors along with the roof trusses until ready for use. If limited space does not permit assembling the long roof trusses at home, at least the various parts can be pre-cut and assembled later at the site. Renting a small trailer will solve the problem of transporting the sections to your lot or



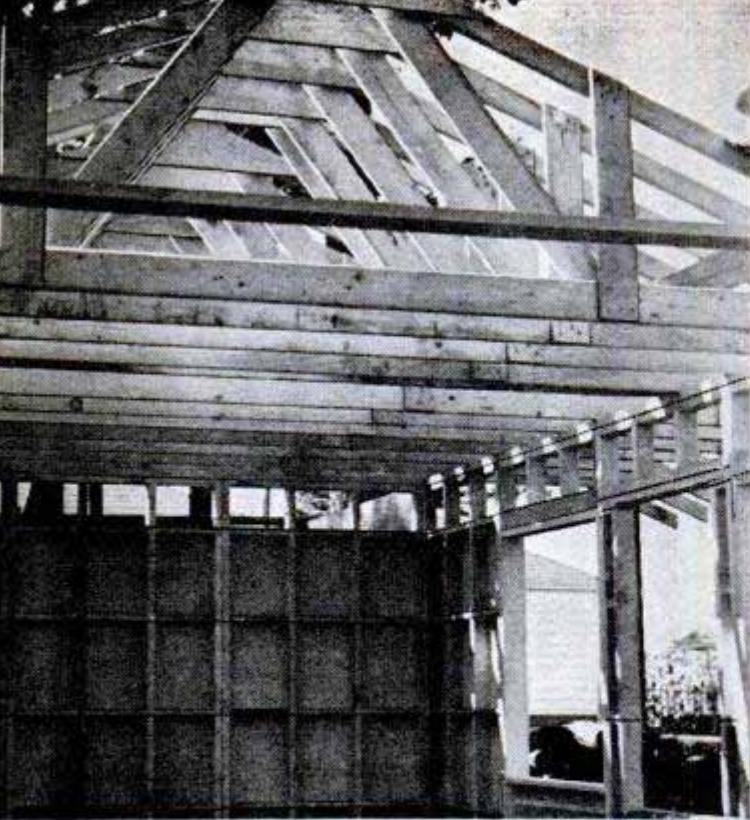
Here, architect Whelan who fathered the bench-built prefab system, points out to Tom Riley how walls of his ranch house could be easily built up of individual sections, preassembled before trucking to the building site to save construction time on the job. Permits getting house under cover in minimum of time



FLOOR PLAN, 4-FT.-SQ. MODULE



ELEVATION VIEW OF ASSEMBLED BENCH-BUILT WALL (FINISH SIDING NOT SHOWN)

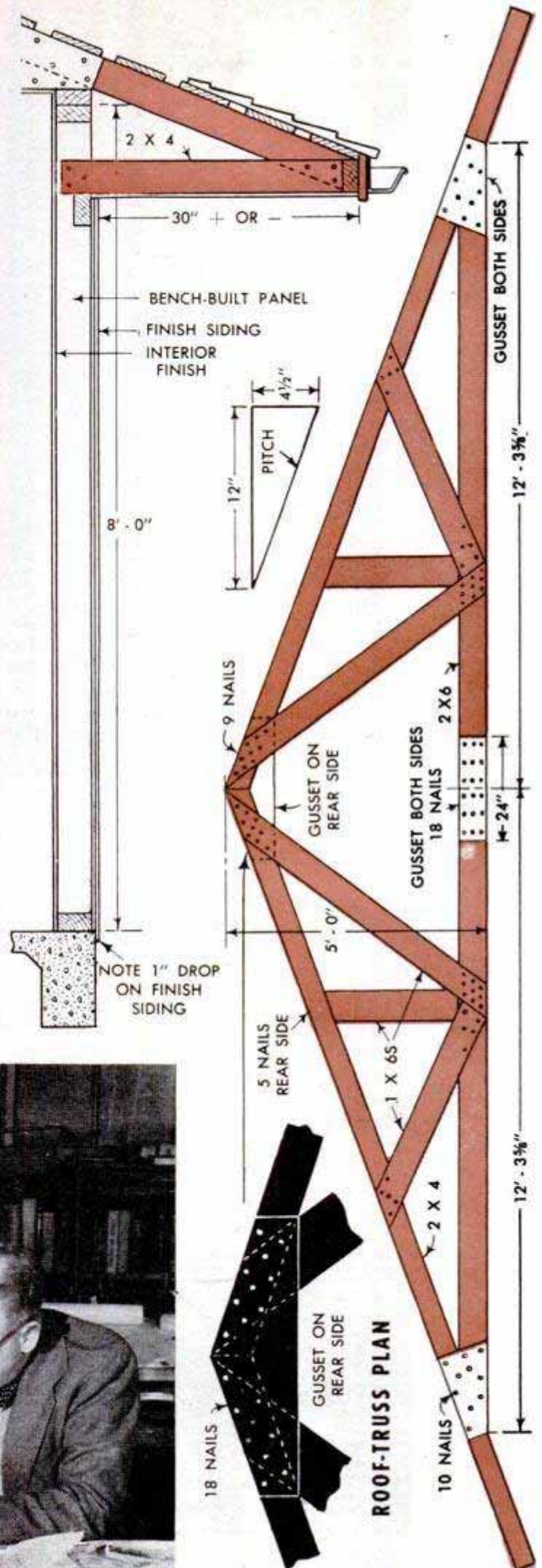
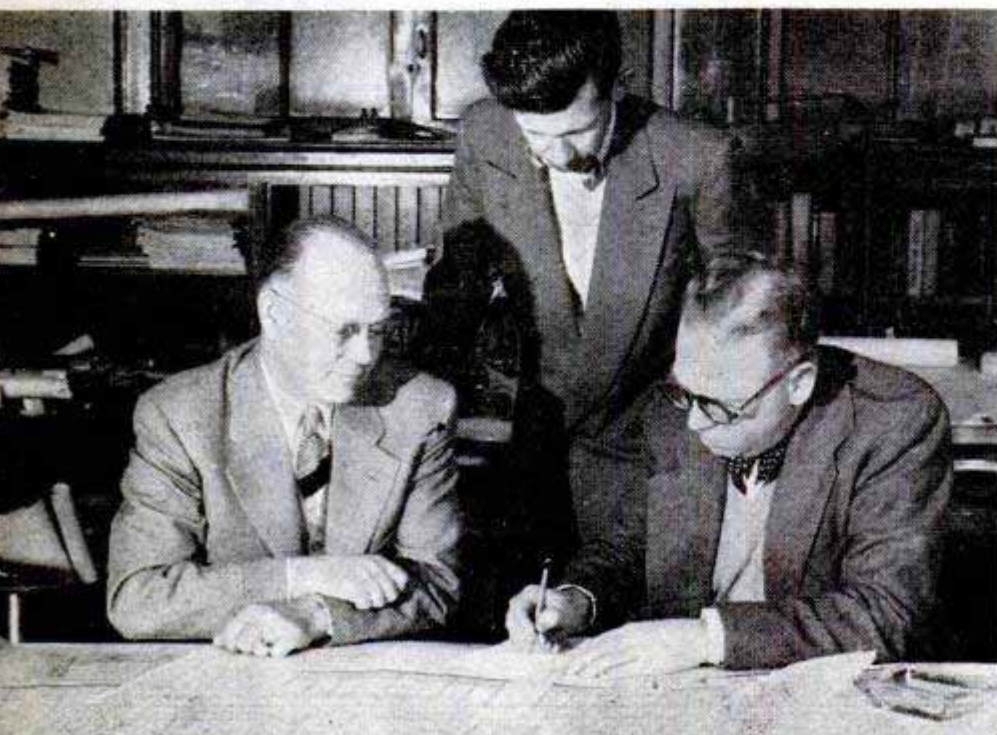


Same type of roof trusses as used in original construction speed framing of prefabbed home and help save time when erecting the roof

you can hire this done. If the sections must be stored outside, cover them with roofing paper or tarps.

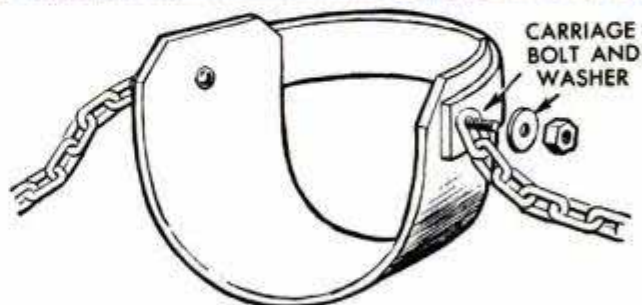
The inner framing of the wall sections is equal in strength to that of standard construction. A study of the keyed floor plan will show the location of each section in relation to the modular plan and from it you can determine the number of each particular section required. If the wall sections are covered with sheathing only, the sections are joined together at the site by

John J. Whelan, architect, right, explains his "bench build" construction to James R. Ward, P.M. Craft Editor, as Tom Riley, builder, looks on



merely spiking abutting edges with 16d nails. However, if you plan to completely finish the sections in the basement, a 1½-in.-wide strip is ripped off the edge of each plywood sheet beforehand and then the plywood sheet is centered as shown in the detail on page 154. The 1½-in. waste strip is later used as a key to form a weather-tight joint. Each section is spiked to the subfloor as you would in conventional framing. Standard ¾-in. exterior-grade plywood, used vertically to cover the panels, makes an excellent siding material. When this is used, either 1-in. batten strips can be nailed over the joints, or as a second method, each plywood panel can be scored vertically on the outside face to simulate planking. Another material that can be used is 1 x 8-in. redwood, rerun at the mill with a shiplap edge. Rabbeted to the proper depth, seven boards placed edge to edge will measure exactly 48 in., the width of a single wall section. Assembly of the roof trusses is detailed in the drawings at the left. Note how the overhang of the roof is tied to the wall sections by resting the 2 x 4 soffit-framing members on the built-in headers of the sections and spiking them to the face of the studding members. The 2 x 6 frames for the large louver-type windows, labeled D in the keyed floor plan, are of the same construction as described in Part II. It's best to frame these in place right on the job, although the louver sections can be made ready beforehand. From here on, facing the walls on the inside with plywood and completing the rest of the construction is done in the same manner as previously described in the May, June and July issues of the magazine.

The End

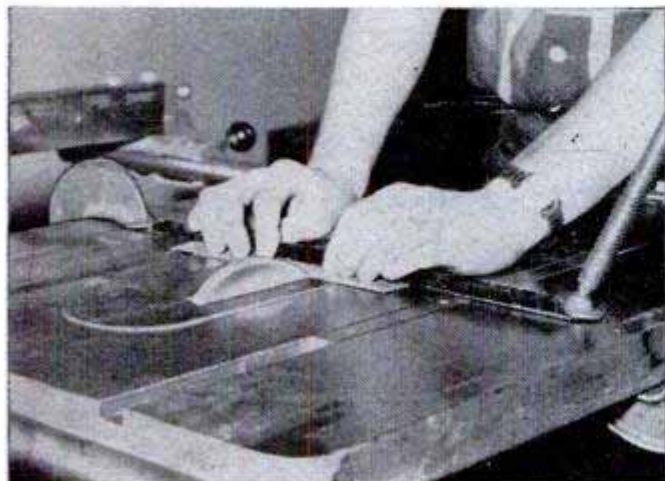


Swing Seat From Worn Belting Is Safe for Toddlers

A safe and comfortable swing seat for toddlers can be made from scraps of heavy belting material and two bolts with washers and nuts. The seat and backrest, which are cut from the belting, are joined by a single bolt on each side. The lengths of chain, from which the seat is suspended, are slipped over the same bolts before the nuts are turned onto the threads. If desired, a "double seater" can be made by bolting two swings together and using three lengths of chain to hang them. After the nuts are drawn tight, peen over or upset the ends of the bolts so the nuts cannot work loose and allow the chains to slip off.

Grinding Wheel on Circular Saw Sharpens Planer Blades

Mounting a high-speed grinding wheel on the arbor of a circular saw provides a convenient setup for sharpening jointer-planer blades. After replacing the saw-table insert with a piece of plywood slotted



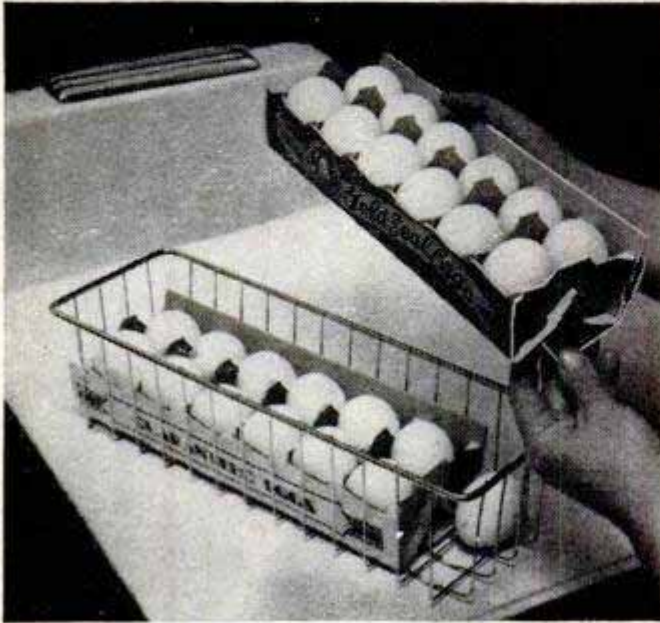
to fit over the grinding wheel, clamp a straightedge to the table perpendicular to the face of the wheel. The straightedge will serve as a fence for moving the planer blade back and forth while grinding. By adjusting the straightedge and raising or lowering the saw table, the blade can be ground to the desired bevel. For planing average stock, it is recommended that the face of the bevel be twice as wide as the thickness of the blade. As the grinding proceeds, move the straightedge forward slightly by tapping it at the points where it is clamped to the table. *Caution:* Be sure that the indicated speed of the grinding wheel is at least as great as the speed of the saw, and that the wheel is properly bushed.

Melvin Ham, Choteau, Mont.

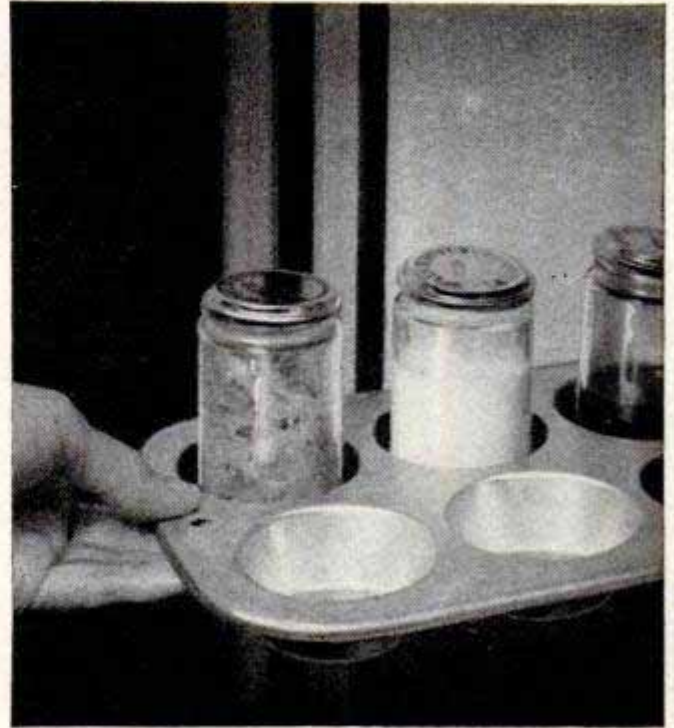
☞ To clean tufted leather furniture, use a soft paintbrush dipped in warm castor oil.

★ Solving HOME

3 REFRIGERATOR STUNTS



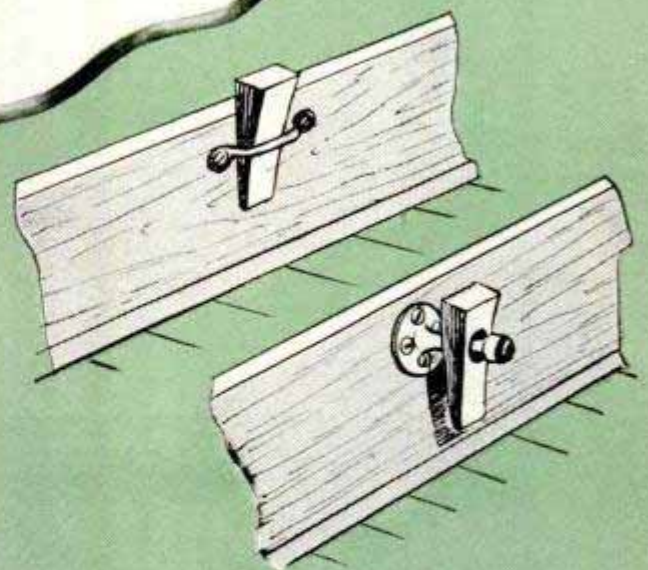
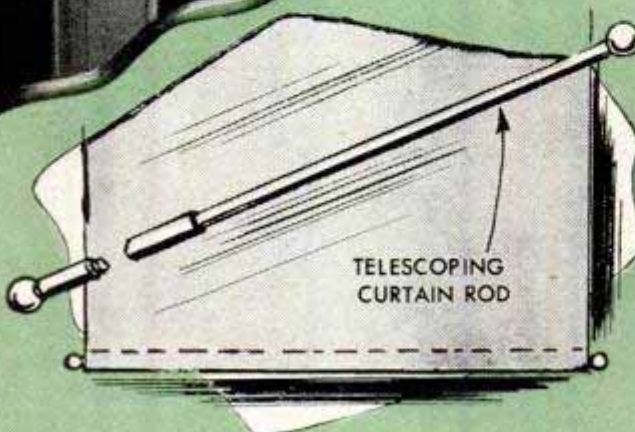
DANGER OF BREAKING EGGS stored in a wire basket is minimized by leaving the eggs in their carton and simply folding the cover back and under the carton



THERE'S NO SEARCHING through the refrigerator for partially used jars of baby food if the jars are set upright in compartments of an ordinary muffin tin



NONDRIP ICE for cooling picnic foods and beverages is made by freezing water in milk cartons. Top is sealed, and ice is left in carton which retains the water



WEDGE-TYPE DOOR HOLDER, above, won't be mislaid if placed in rack formed by sash lift, or drilled to fit over the doorstep. Left, telescoping curtain rod comes in handy to replace broken window-shade slat. The rod is adjusted and the sections are taped together

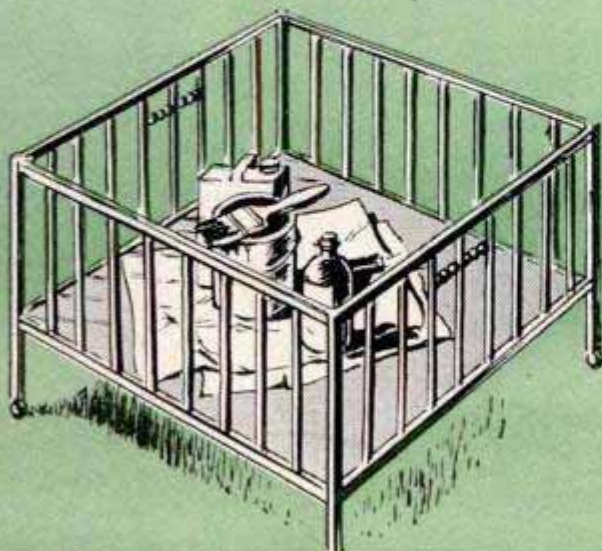
PROBLEMS

POTATO-CHIP CANS are just the thing for storing brown sugar to prevent caking, or silverware to keep it from tarnishing. Pieces of silverware are wrapped individually in tissue paper before packing in can. Lid may be sealed with cellulose tape

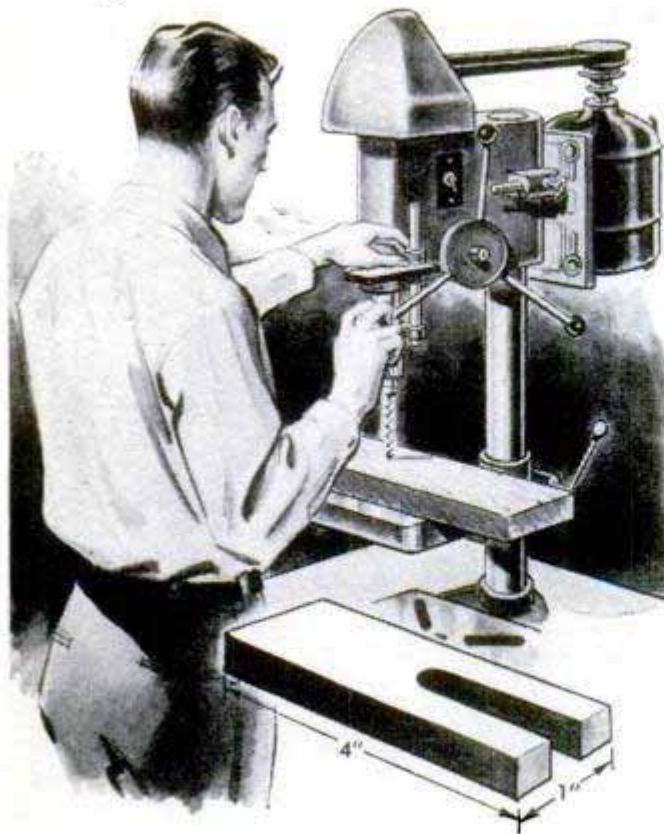


TO SAVE REMOVING SPOOL from spindle when threading bobbins with different-colored thread, just place a tumbler over spool, as above. Below, while painting your home, a playpen can be used to keep painting supplies out of reach of small children

CLEANING UP SCRAPS from paper-doll cutouts or children's sewing kits is easy if the youngster sits in a tray cut from a large carton, as above. Mulching flower boxes with lawn clippings, below, keeps mud from splattering adjacent window panes



Gauge Blocks Permit Accurate Setting of Drill-Press Depth Stop



On some small drill presses the depth-stop rod is not graduated and, because of this, settings for repetitive depth drilling and countersinking are often rather difficult to make with the accuracy required. One home craftsman solved this problem by making a number of stops from hardwood strips of varying thicknesses. The thickness determines the depth of the hole. The strips are 1 in. wide and 4 in. long and each is slotted half its length from one end, the slot being just wide enough to permit slipping the stop over the stop rod. In use, the knurled stop nuts are run up on the rod to clear, the bit is brought down until the cutting edges touch the work and the wooden stop is slipped over the stop rod. Then the knurled nuts are run down against the stop and tightened. This will limit the downward travel of the quill, or sleeve, to a distance equal to the thickness of the stop. If desired, several stops can be drilled and stored conveniently together on a bolt in the manner of blades on a feeler gauge.

R. L. MacLean, High Bank, P.E.I., Can.

Sandpaper on Phonograph Records Prevents Slipping While Playing

Playing one lightweight phonograph record on top of another record on the turntable sometimes results in sound distortion. This is due to a lack of traction between the records which allows the lower record to turn faster than the one being played. Suf-

ficient traction can be furnished by cementing a $\frac{1}{4}$ -in. square of 2/0 sandpaper near the edge of each record label. When stacking the records to be played, alternate the positions of the squares.

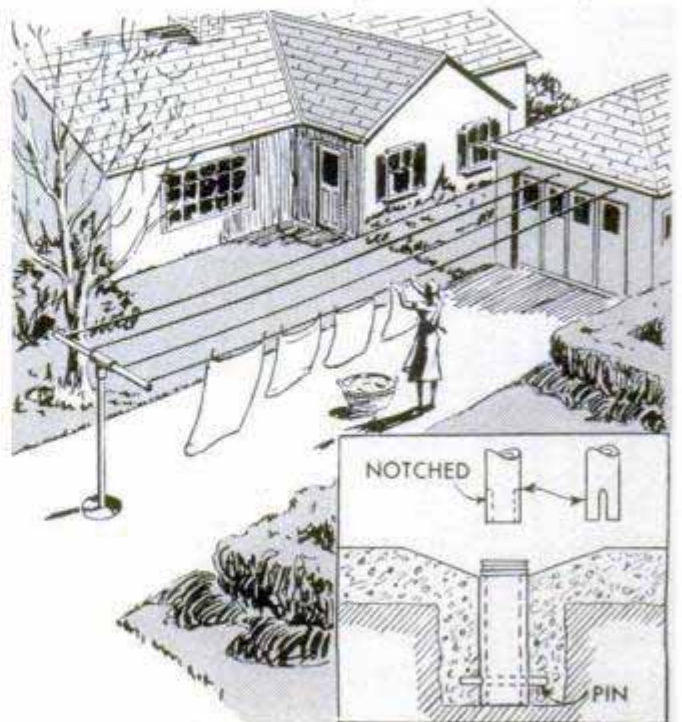
Jack H. Lewis, Willow Run, Mich.

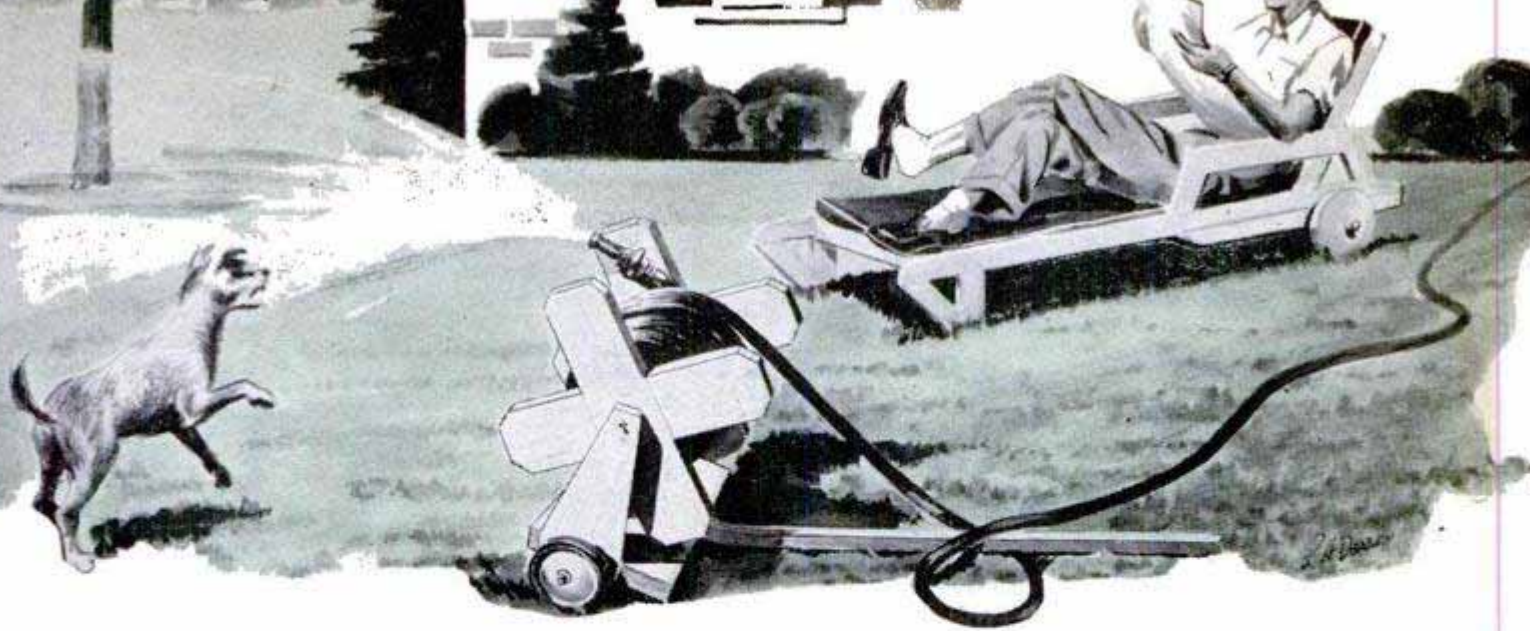
Portable Clothesline in Driveway Provides Dry Hanging Area

A portable clothesline, which can be set up quickly on a concrete driveway, will be appreciated by the housewife who finds on some washdays that she has to walk in the mud in order to hang up the clothes. An added advantage is that the garage can be used to support one end of the line. A short length of pipe is threaded on one end and embedded in the center of the drive to serve as a socket for holding a T-shaped pole. The pole is made from three lengths of pipe, which are simply turned into a tee. One end of each clothesline is attached to the cross member of the pole while the other end is formed into a small loop which can be slipped on and off a screw hook driven into the garage. Note in the detail that the concrete around the socket is countersunk. This is to permit the threaded end of the socket to be capped when not in use, but remain flush with the surface of the drive. A metal pin, driven transversely through holes drilled in the socket, engages slots cut in the end of the pole to keep the pole from turning. The pole is easily taken down. The lines are unhooked from

the screw hooks, wound together and the complete unit stored in the garage or basement.

Thomas P. Ramirez, Fond du Lac, Wis.



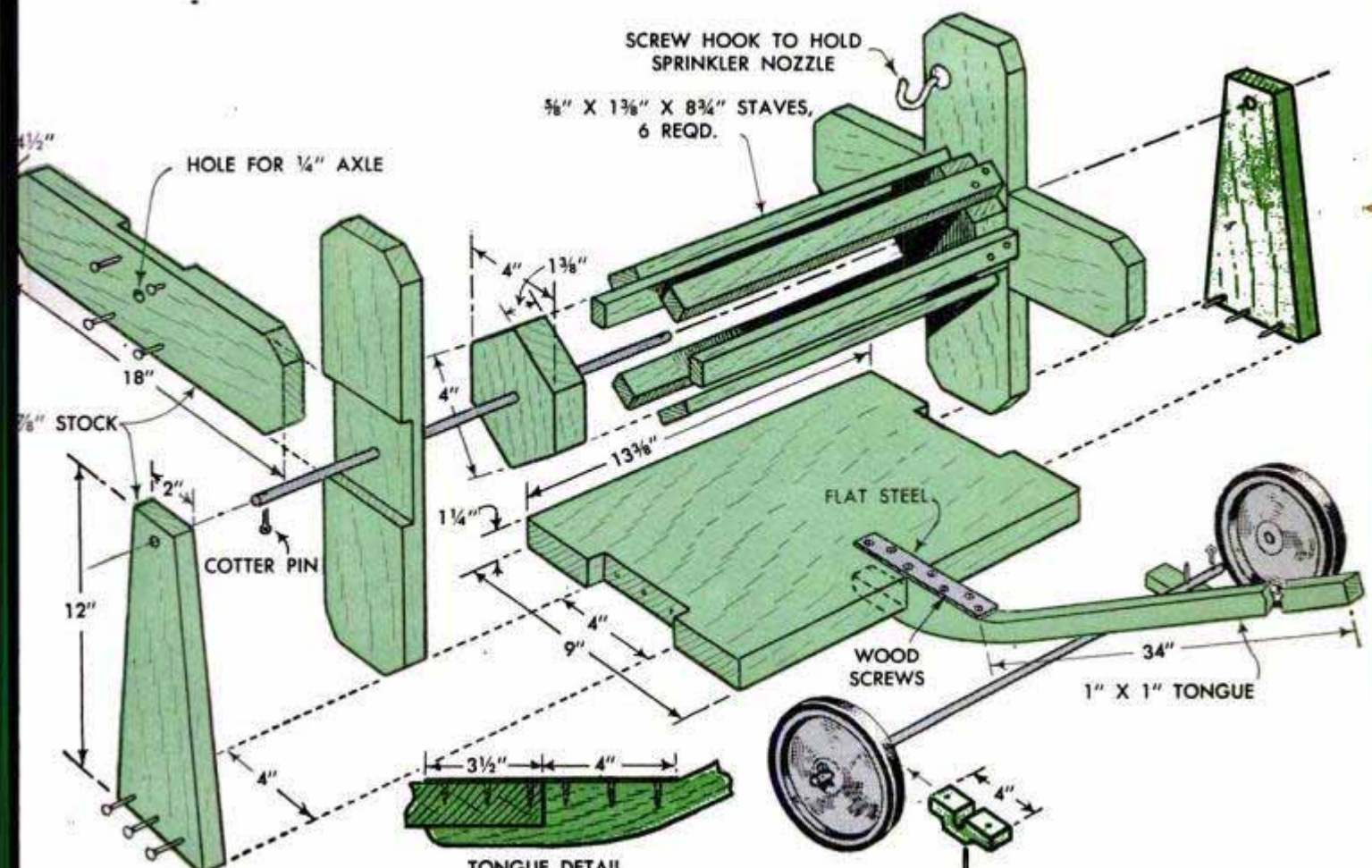


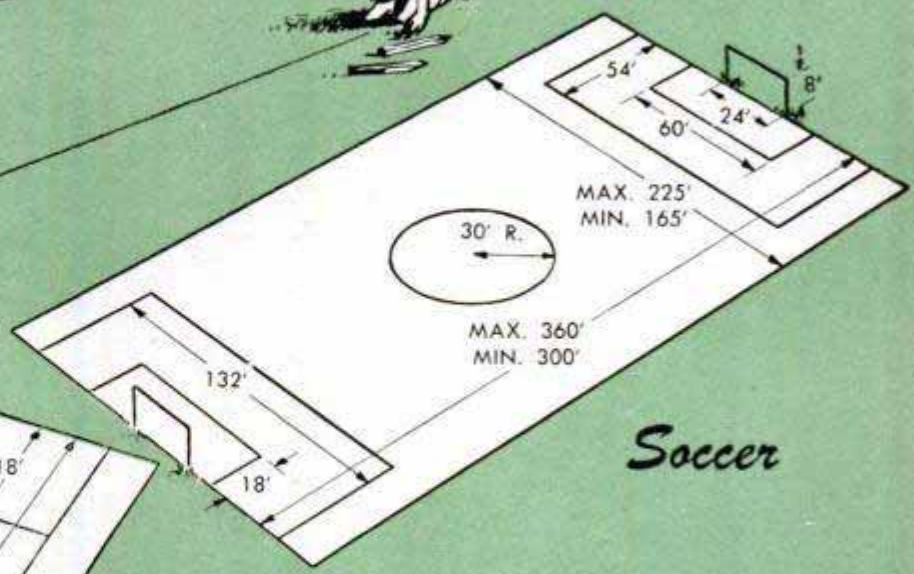
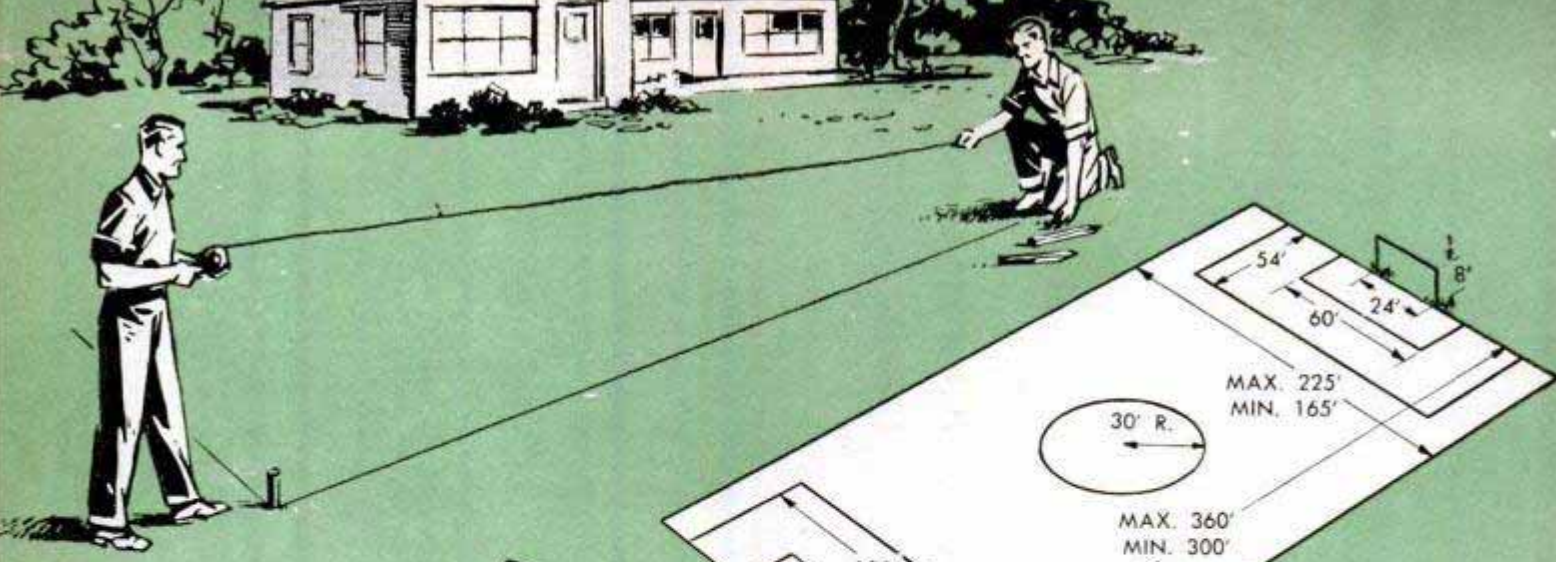
Hose-Reel Cart for Lawn Sprinkling

By Dick Hutchinson

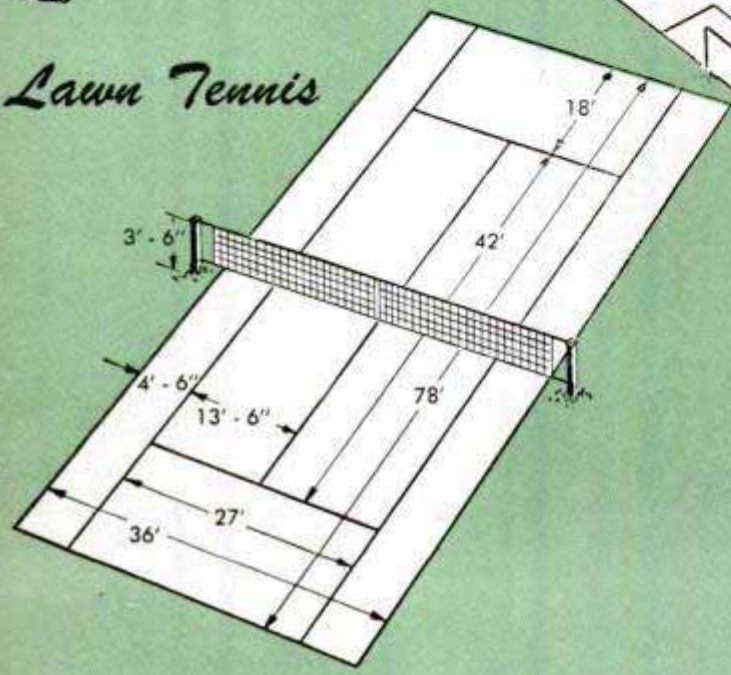
WHY DRAG a heavy hose over the lawn when you can build a combination reel-cart that provides storage facilities and the convenience of a wheeled sprinkler head in a single unit? The cart wheels and axle may be purchased or adapted from a discarded stroller and the reel, cart frame and handle can be made from scrap stock. Each end of the reel is formed from two pieces half-lapped at the center, joined with brass screws and center-drilled for the reel shaft. If desired, 1 x 4-in. stock can be used for these parts. The reel drum consists of six

strips, or staves, of $\frac{1}{2}$, $\frac{5}{8}$ or $\frac{3}{4}$ -in. stock joined to hexagon blocks with screws or nails. In assembling, the hex blocks are first center-drilled and screwed to the half-lapped ends. Then the strips are attached. As dimensioned below, the reel will accommodate 50 ft. of hose. The reel supports are notched into the bottom board as shown and are attached with nails or screws. The handle, or tongue, is notched over the edge of the bottom board and attached by means of a flat-steel strip fastened with a staggered line of screws.





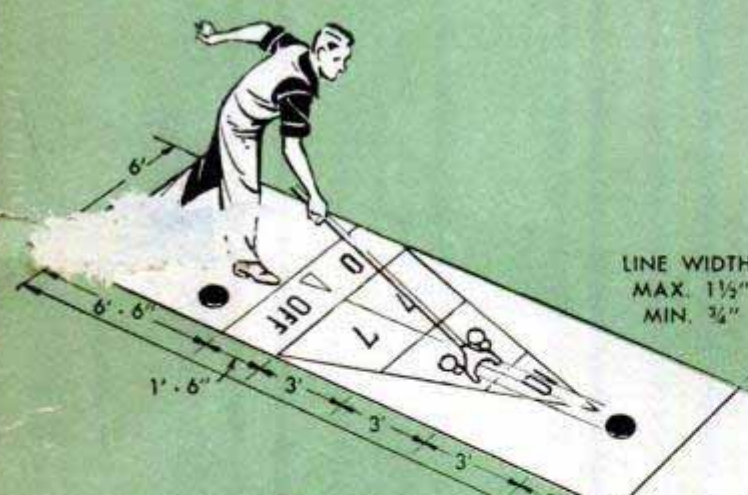
Lawn Tennis



Soccer

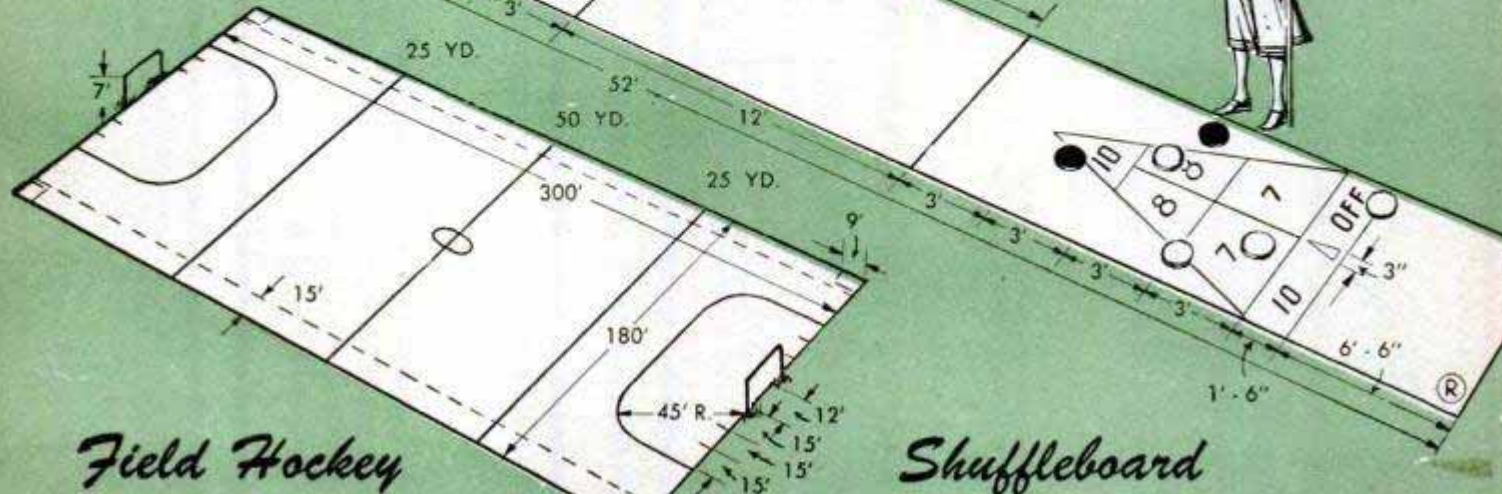
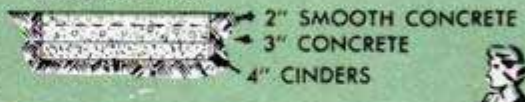
OUTDOOR

NO DOUBT you have wondered how large the playing court should be for a particular outdoor game. To make sure that the court is regulation size, dimensions are given here for laying out several popular games. The letters R and B in the corners of the shuffleboard court stand for red and black and designate the playing positions of opponents when playing doubles. The regulation court requires a very smooth concrete playing surface which generally is waxed, although, if necessary, the court can be laid out on a driveway. Over-all size of the horseshoe court should measure 10 x 50 ft., and the outside wickets of a croquet court are placed 7 ft. in from the boundary lines.



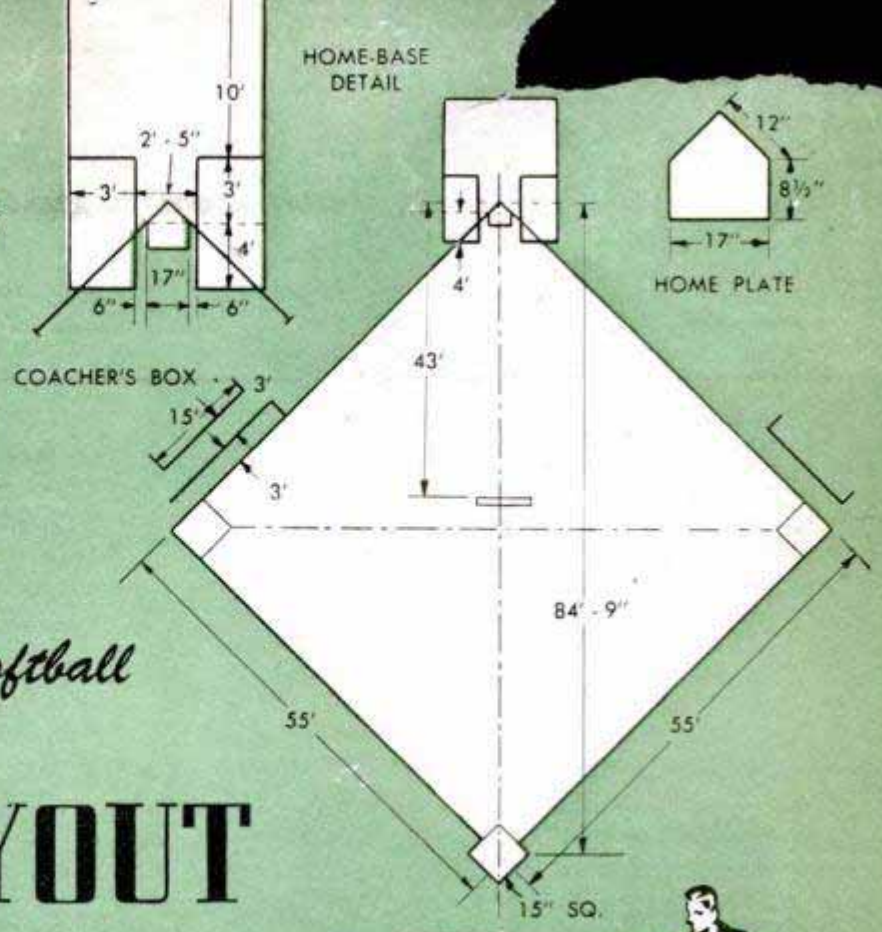
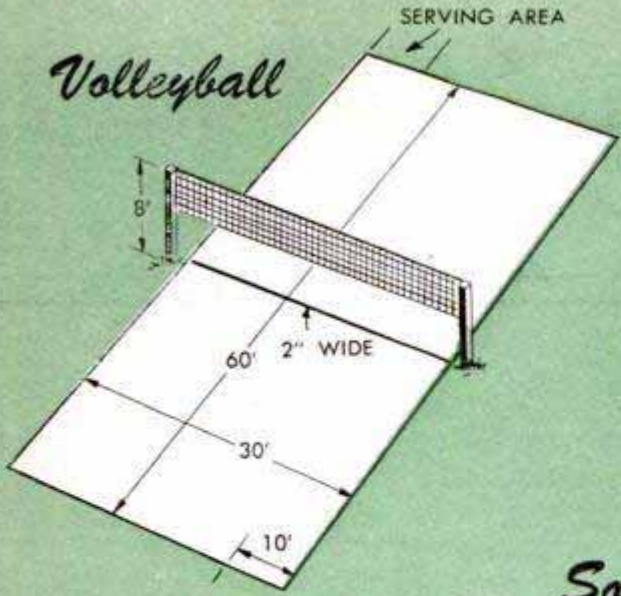
LINE WIDTH:
MAX. 1 1/2"
MIN. 3/4"

CROSS SECTION

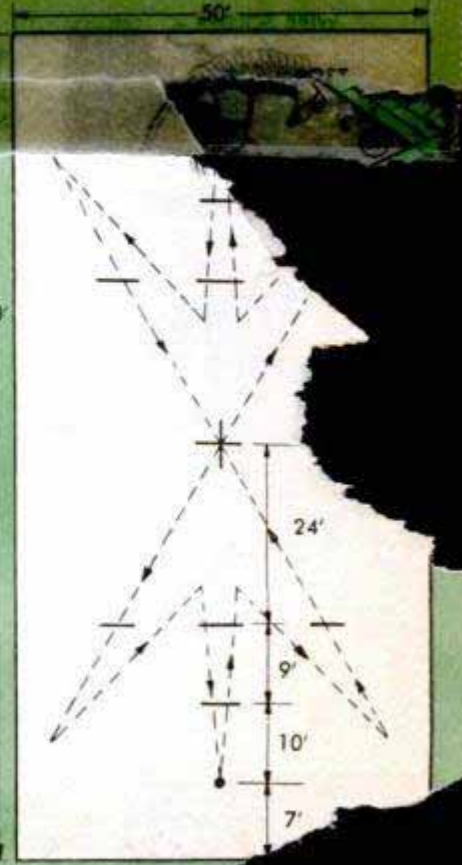
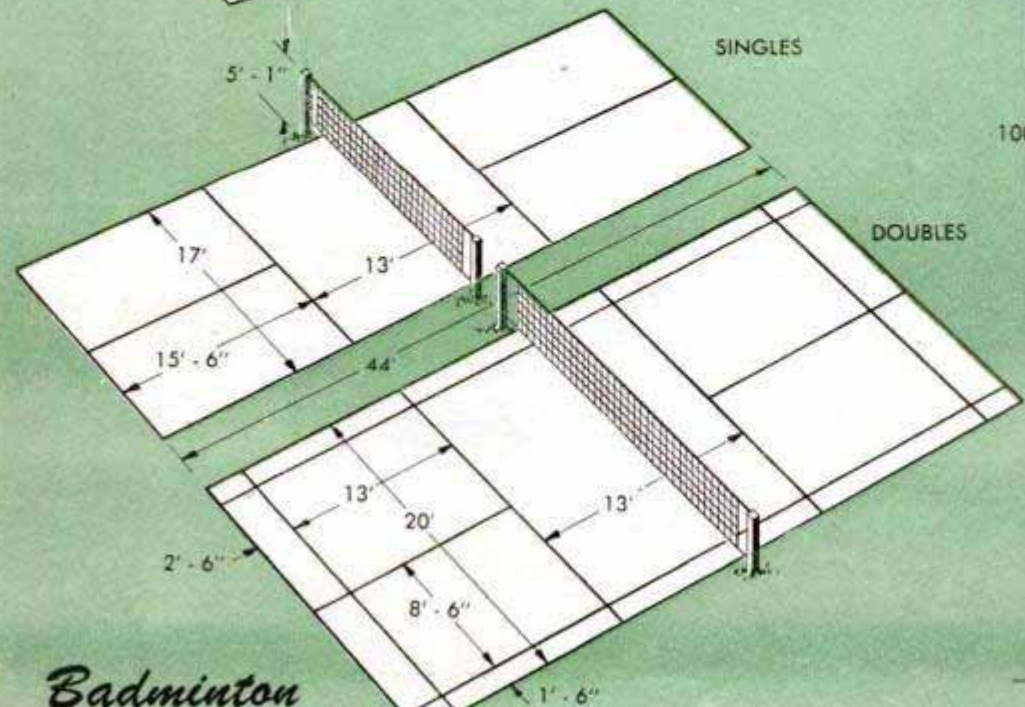
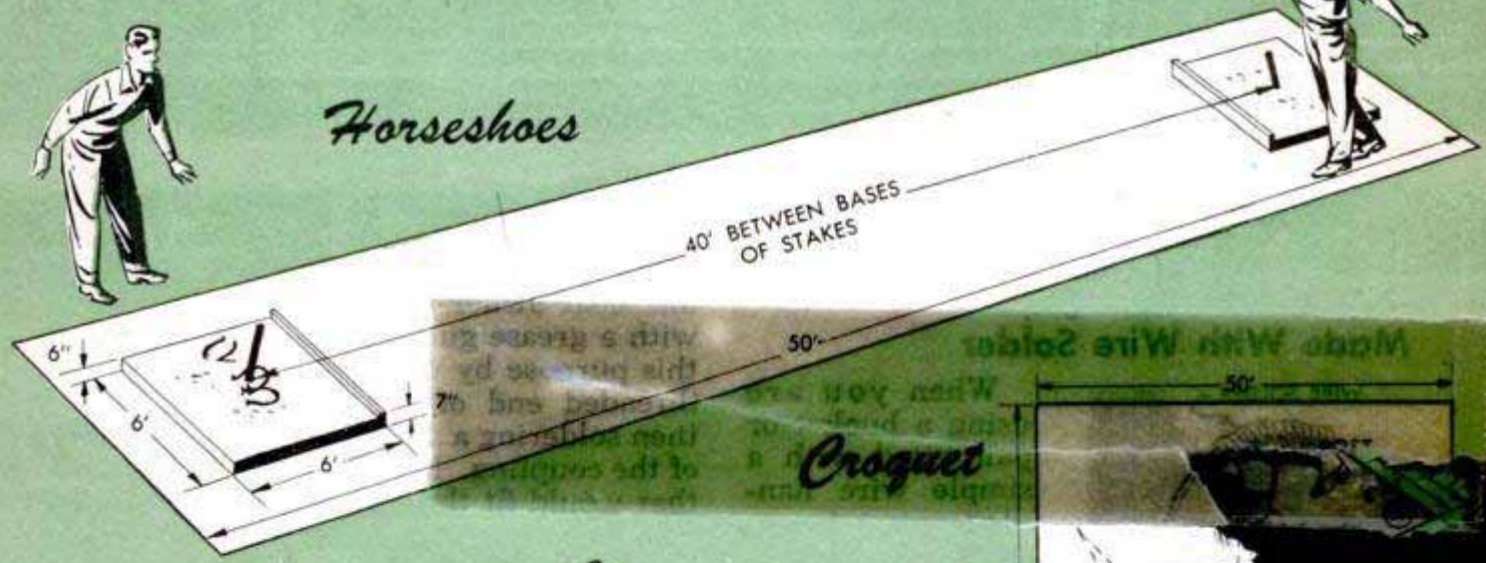


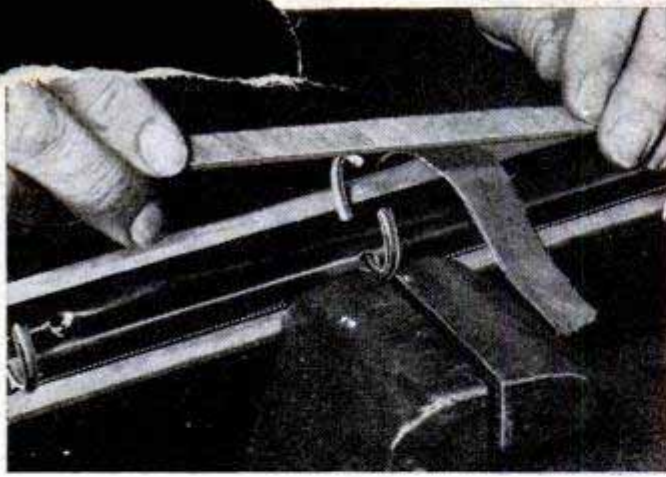
Field Hockey

Shuffleboard



GAME LAYOUT





Tips to Make Looseleaf Binders Work Better and Last Longer

Sharp burrs, sometimes found on the rings of looseleaf binders, can be removed by touching them lightly with a file. Follow by rubbing with fine emery cloth to smooth out the file marks, and sheets will turn smoothly on the rings without tearing. The cover of a looseleaf binder can be protected by a Manila-paper jacket, attached in the same manner as the jacket on a book. Leather covers should be given frequent treatment with saddle soap and a high-quality oil. When opening a three-ring binder, pull only on the two parts of the center ring, as opening the rings from the ends may spring the mechanism. Overloading a binder will keep the rings from closing all the way, with the result that sheets are sometimes lost.

Bucket-Bail Handgrip Made With Wire Solder

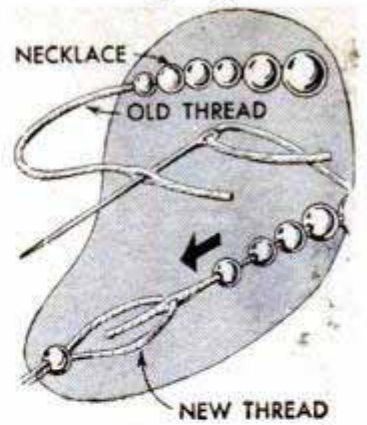
When you are using a bucket or pail fitted with a simple wire handle to carry heavy loads, you can prevent the bail from injuring your hand by providing a larger grip. Such a grip can be made quickly by merely wrapping the bail with wire solder, using one or two layers to get the desired size. When the job is finished and you have no further use for the pail, the solder can be removed and kept for its regular purpose.

G. E. Hendrickson, Argyle, Wis.

☐ To avoid cracking the cylinder block, allow your car engine to cool off for a half hour or so after overheating before you add water to the cooling system.

Quick Method of Restringing Beads

If you have a worn strand of beads, try this easy method of restringing them. With a needle, pull the new thread through the old one, as in the upper detail. Use a thread that is twice as long as the old thread, pulling it through far enough to double it. Then, restring the beads by sliding them from the single thread to the doubled one. Naturally, the size of the holes in the beads determines whether this method can be used.



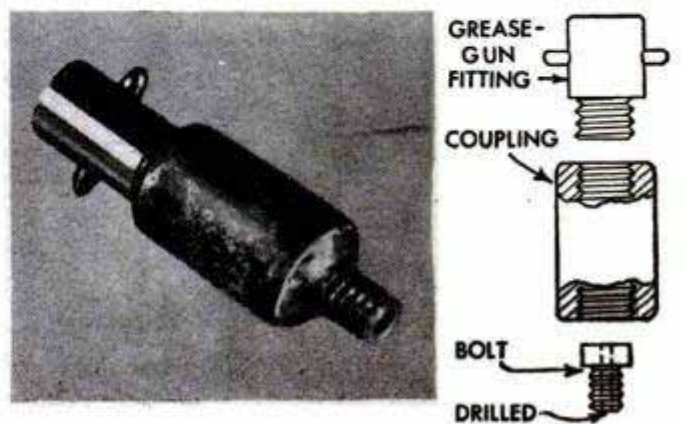
Rabbitproofing Young Plants

Dry lime sprinkled on tender plants will protect them from damage by rabbits. Use a discarded flour sifter for uniform distribution with a minimum of waste. It should be remembered that continued use of lime, for more than one season, will tend to "sweeten" acid soils.

Clara Goldammer, Newport, Ark.

Extension for Grease-Gun Fitting Aids Lubricating Outboard Motor

Finding it difficult to lubricate the propeller gears on his outboard motor by squeezing grease directly from the tube, one boat owner does a more efficient job with a grease gun. He adapted the gun to this purpose by turning a coupling on the threaded end of an Alemite fitting, and then soldering a small bolt to the other end of the coupling. For this, he selected a bolt that would fit the tapped hole in the gear housing, and drilled the bolt lengthwise through the center. The head of the bolt was ground to fit inside the threaded hole in the coupling. In use, the extension simply serves as a reducer to adapt the Alemite fitting to the lubrication hole in the gear housing.—E. G. Pilcher, Rochester, N. Y.

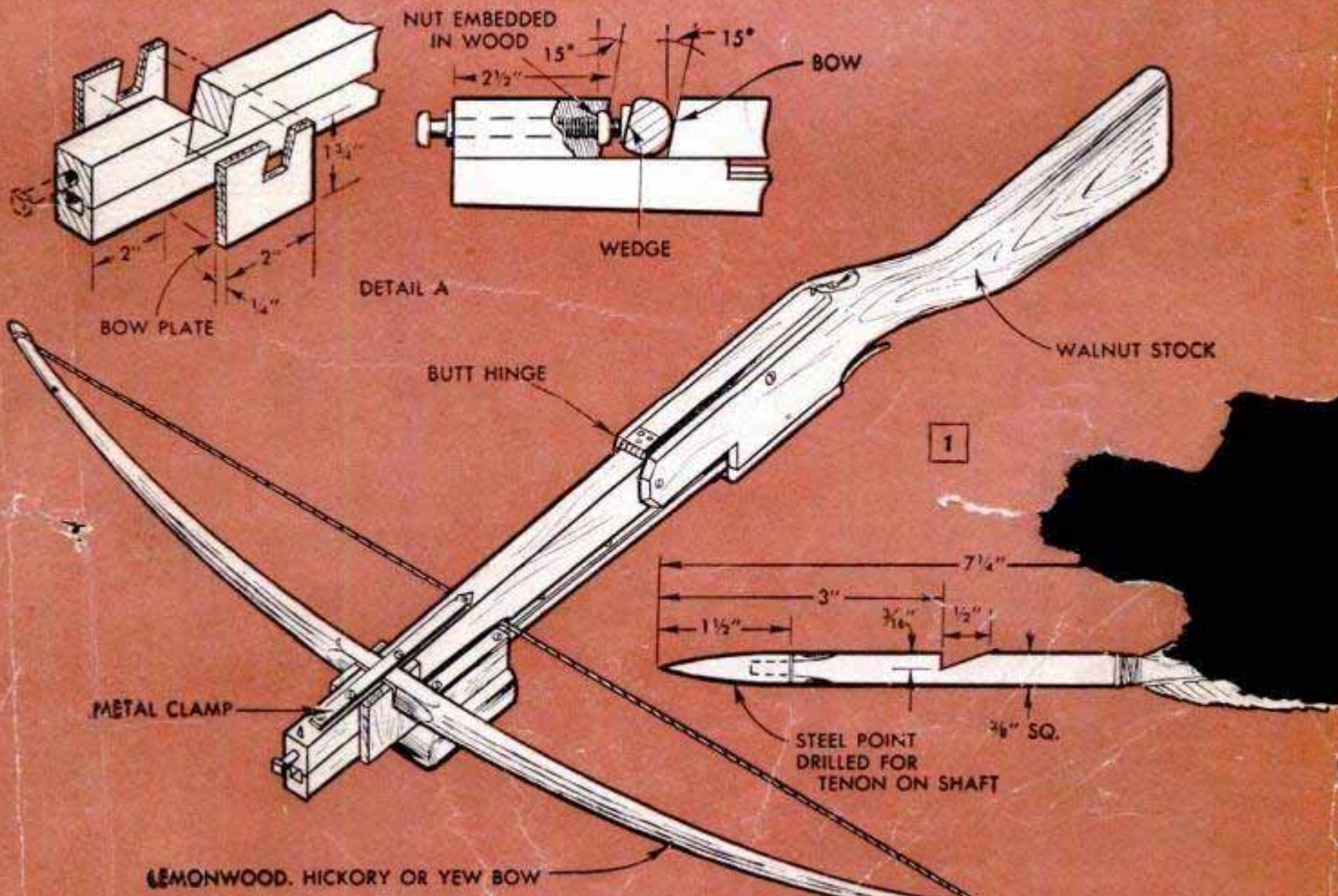


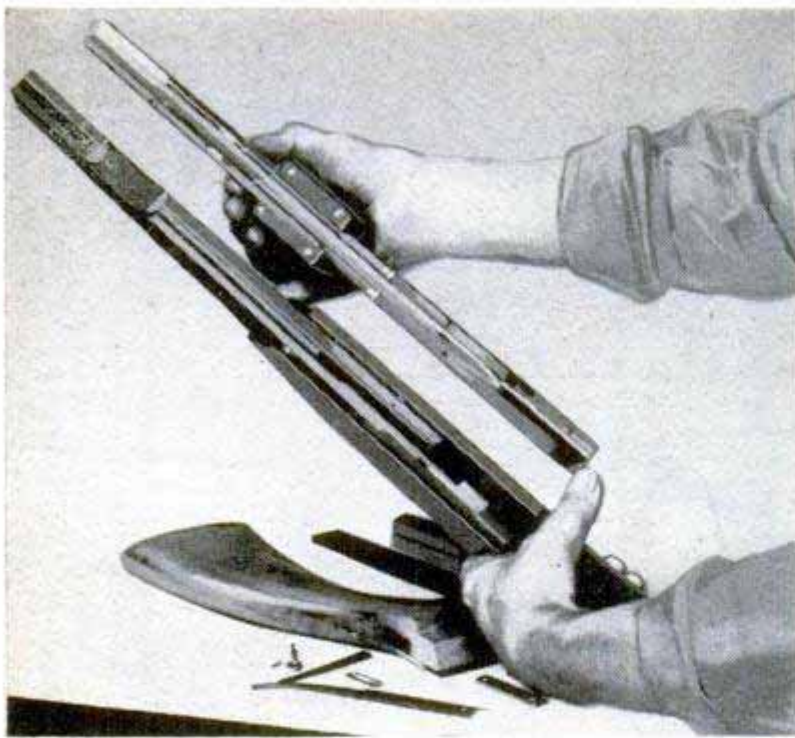
REPEATING CROSSBOW

By Austin H. Phelps

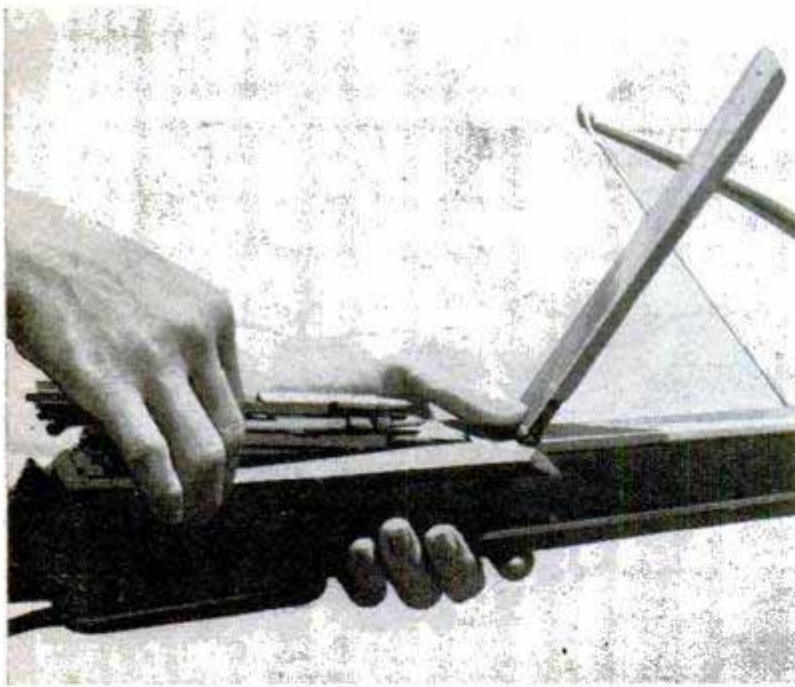


THIS REPEATING CROSSBOW has all the handling characteristics of a fine repeating rifle of the slide-action type. In the hands of an experienced crossbowman it will deliver five shots in five seconds with near-rifle accuracy over ranges up to 40 yards. The steel-pointed arrows, or quarrels, as they are correctly called, are loaded from the top into a magazine just as are the cartridges in a bolt-action rifle. After loading, the bow is cocked by a slide, and the quarrel is fired by pressing a trigger which releases the bowstring. Nocking of the five quarrels in the magazine is done automatically by the repeating mechanism as shown in the lower detail in Fig. 3. The two-piece barrel, Figs. 1 and 2, has a square bore, the groove being cut to full

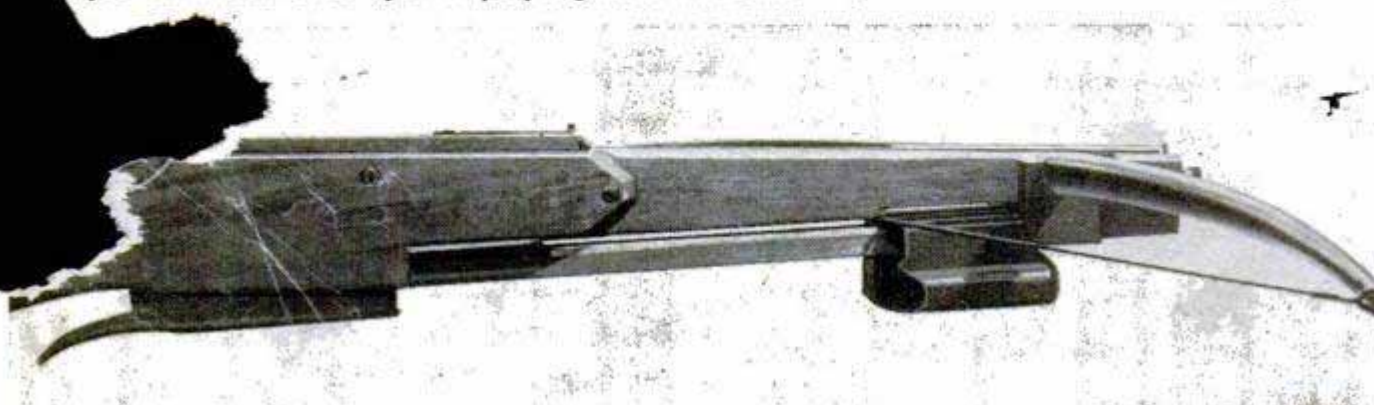




An assembly view of the two-piece barrel showing the pump slide, brass runners, and the top barrel in position. Stock should be handmade to specifications that fit individual user in the same way as a rifle or shotgun stock. Use hardwood for all parts

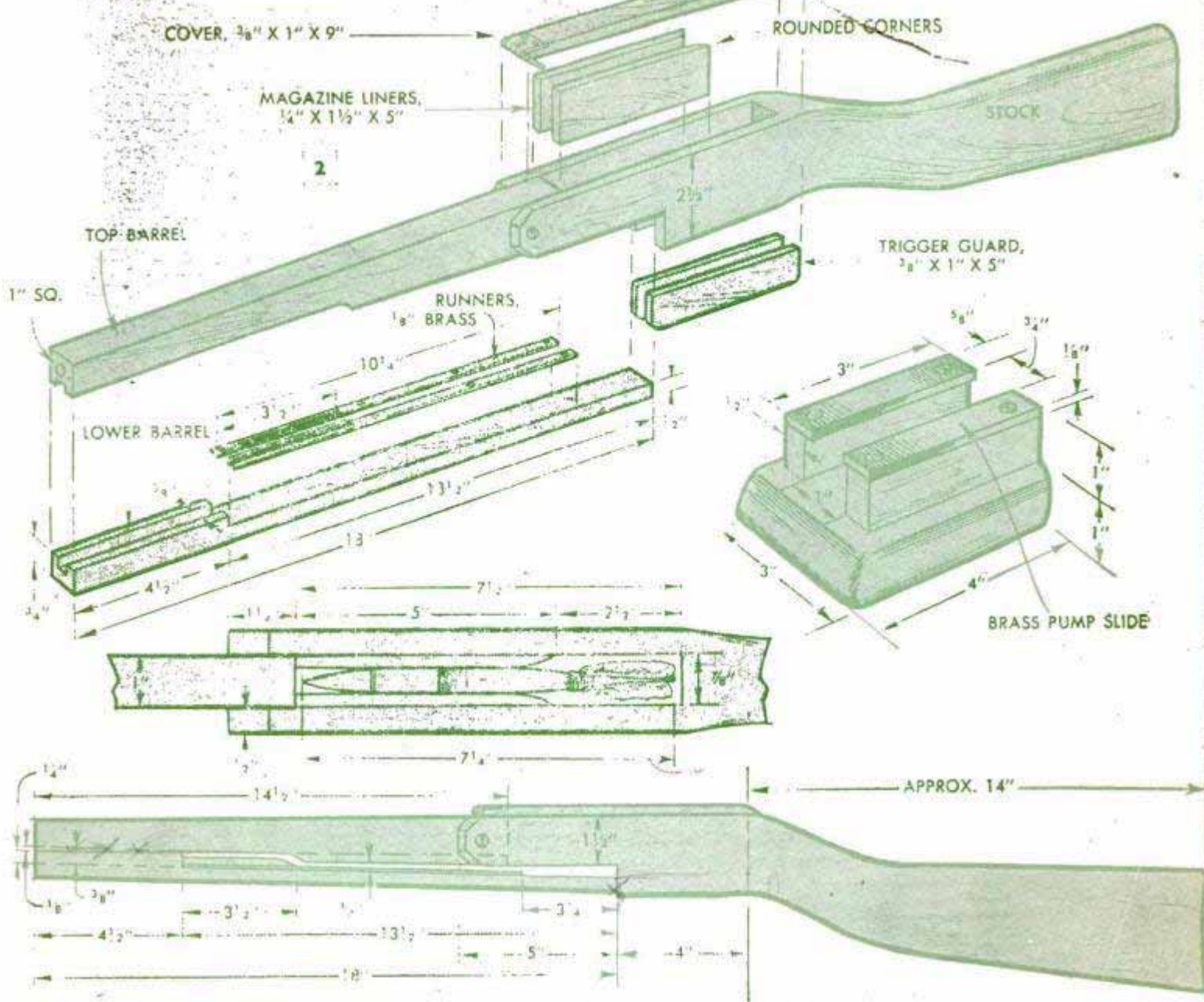


Above, this repeating crossbow is loaded just like a bolt-action rifle, five quarrels being placed in the box magazine at one time. Below, note the trim lines of the finished job. If desired, you can install either open or peep sights on the barrel

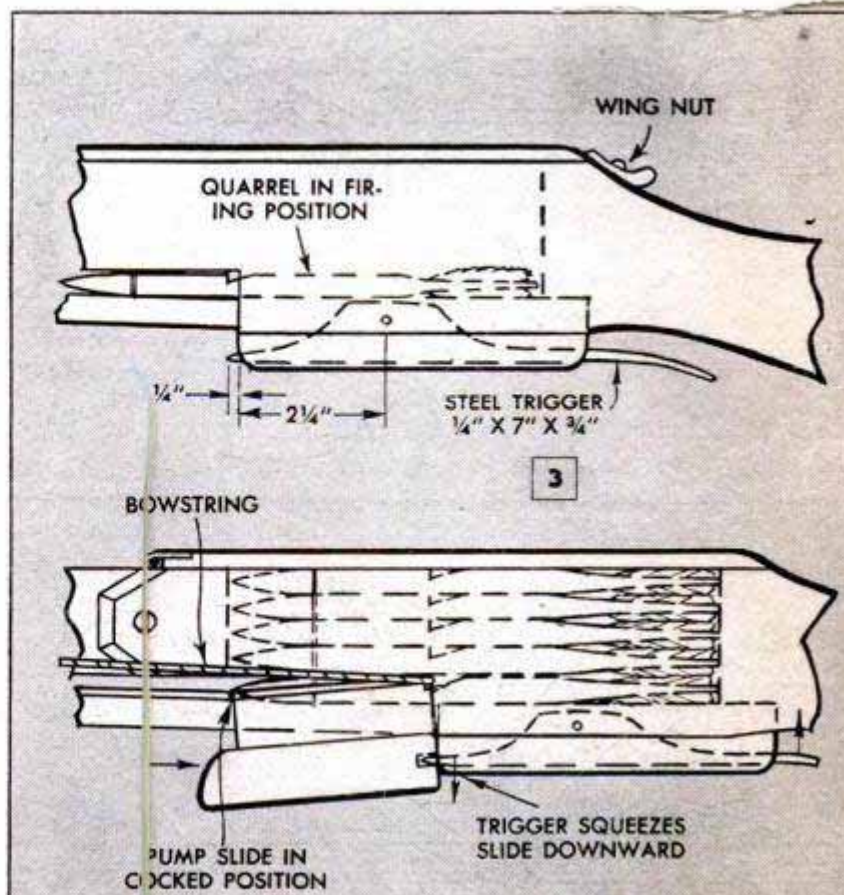


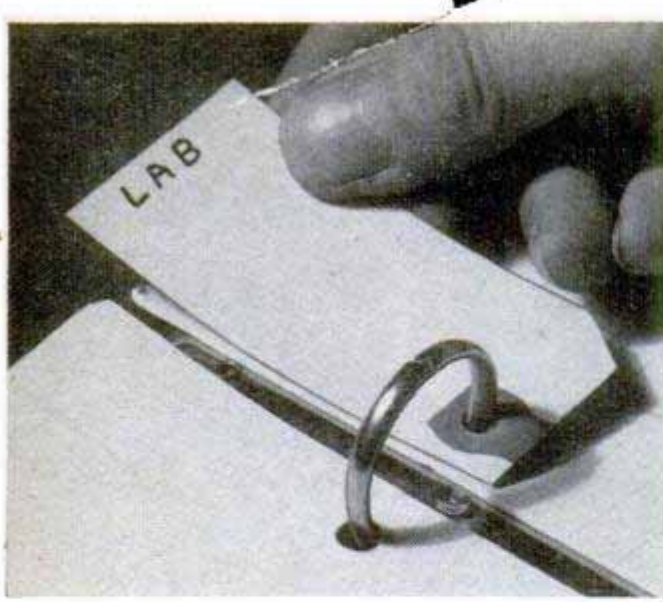
depth in both halves. Then parts of both halves are cut away so that when assembled there will be an offset slot for the bowstring as in the lower detail in Fig. 2. Brass runners, fitted with $3\frac{1}{2}$ -in. brass strips soldered edgewise to them, are screwed to the lower barrel as in the center left-hand detail in Fig. 2. Care must be taken to space the runner strips so that the inner edges are exactly flush with the inner edges of the magazine liners. After making a trial assembly, it may be necessary to file the slanting ends of the $3\frac{1}{2}$ -in. strips or the underside of the upper barrel to permit free passage of the bowstring through the offset slot. The purpose of the offset in the slot is to force the bowstring upward sufficiently to release it from the notch in the quarrel, permitting the latter to enter the bore in free flight.

In making the stock, it's a good idea to copy a rifle or shotgun stock that fits you and has a grip and tang shaped to your liking. Bandsaw the wood to the rough outline of the stock selected, then finish to contour with wood rasps and sandpaper. Care must be used in cutting and finishing the magazine slot in the stock, as the magazine liners must be spaced accurately so that the quarrels drop freely into firing position, Fig. 3. The inner rear corners of the liners are rounded to a smooth curve. To assure free movement of the quarrel in firing position, it may also be necessary to round the inner corners of the brass runners. The pump slide, Fig. 2, engages the bowstring as in Fig. 1 when in the forward position. Overhanging brass strips, which are screwed to the guide blocks, Fig. 2, ride on the brass runners. In cocking, the slide is drawn back as far as it will go and the forward end is pulled



down slightly so that the ends of the brass strips on the slide engage the ends of the runners. This movement locks the slide in firing position and a groove cut across the rear end of the slide engages the trigger sear, as shown by dotted lines in the lower detail, Fig. 3. Simultaneously, the bowstring passes between the first and second quarrels, and the lower quarrel is automatically nocked ready for firing. Provide a hinged cover for the magazine and a trigger guard. Then fit a lemonwood bow of 30 to 50-lbs. pull, using bow plates and a clamp made as in the upper details in Fig. 1. Although the dimensions of the quarrels in Fig. 1 specify that the shaft shall be $\frac{3}{8}$ -in. square, it is best to finish the shaft slightly under this dimension to allow correct clearance. Practice quarrels should be blunt pointed.



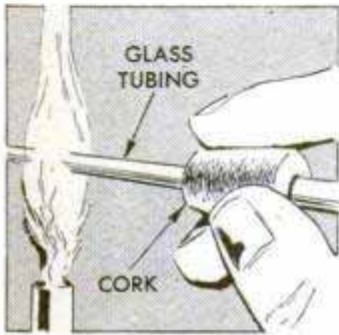


Shipping Tags Form Index Tabs On Looseleaf Binder

Tabs for indexing looseleaf binders can be made from shipping tags. These are cut to the size and shape indicated, and slipped over one of the rings to project beyond the pages of the binder. A drop of mucilage or a piece of cellulose tape will stick the tab to one of the pages, keeping it from turning on the ring where it cannot be seen when the folder is closed.

Corks Aid in Bending Glass Tubes

The inexperienced person who has to bend a glass tube can do a better job if he slips a couple of corks over the ends of the tube as indicated.



The corks will serve as finger grips and also as protection against the hot glass, thus permitting the fingers to be placed close to the desired bend in the tube. The corks will also enable you to bend

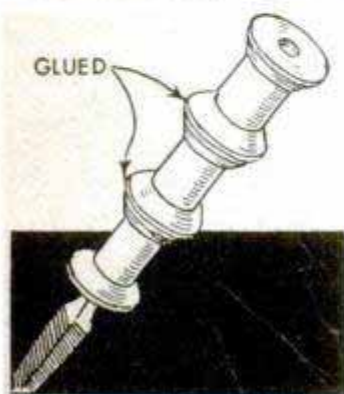
the glass right in the flame and, consequently, shape it accurately.

Ralph Ellison, Alum Creek, W. Va.

Drawer Pulls for Tiny-Parts Bins

Inverted and screwed to the sides of hanging tool cabinets, drawer pulls of the type which is formed like a half cup make convenient bins for storing small parts, such as nails, screws, etc. If the pulls are attached in such a position that the contents cannot be seen, staple a sample part beside each bin.—George Kapitan, Bronx, N. Y.

Spools Used as File Handle



Thread spools, glued end to end, form an excellent file handle. To attach, press the tang of the file into one of the spools. The spool flanges will provide a convenient handgrip.—Fred Cornelius, El Paso, Tex.

Shop Ash Tray From Flowerpot

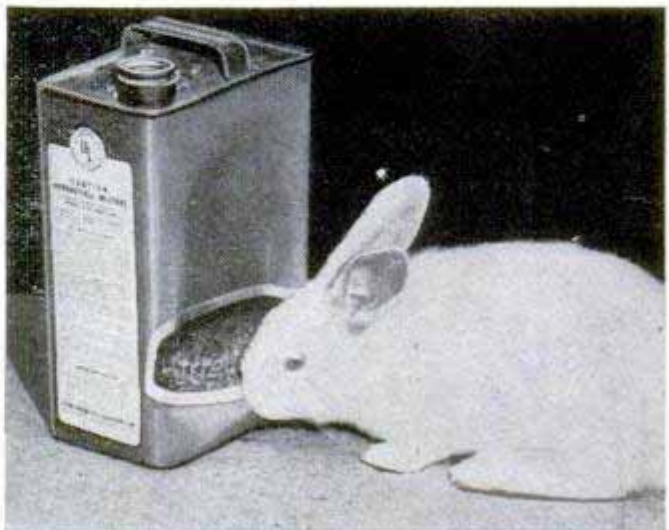
When smoking at your workbench where there is danger of a fire being started by smoldering butts or by matches dropped in sawdust or wood shavings, use this "snuffer" ash tray improvised from a flowerpot and saucer. Inverted and placed in the saucer, the flowerpot quickly smothers glowing cigarettes and matches.

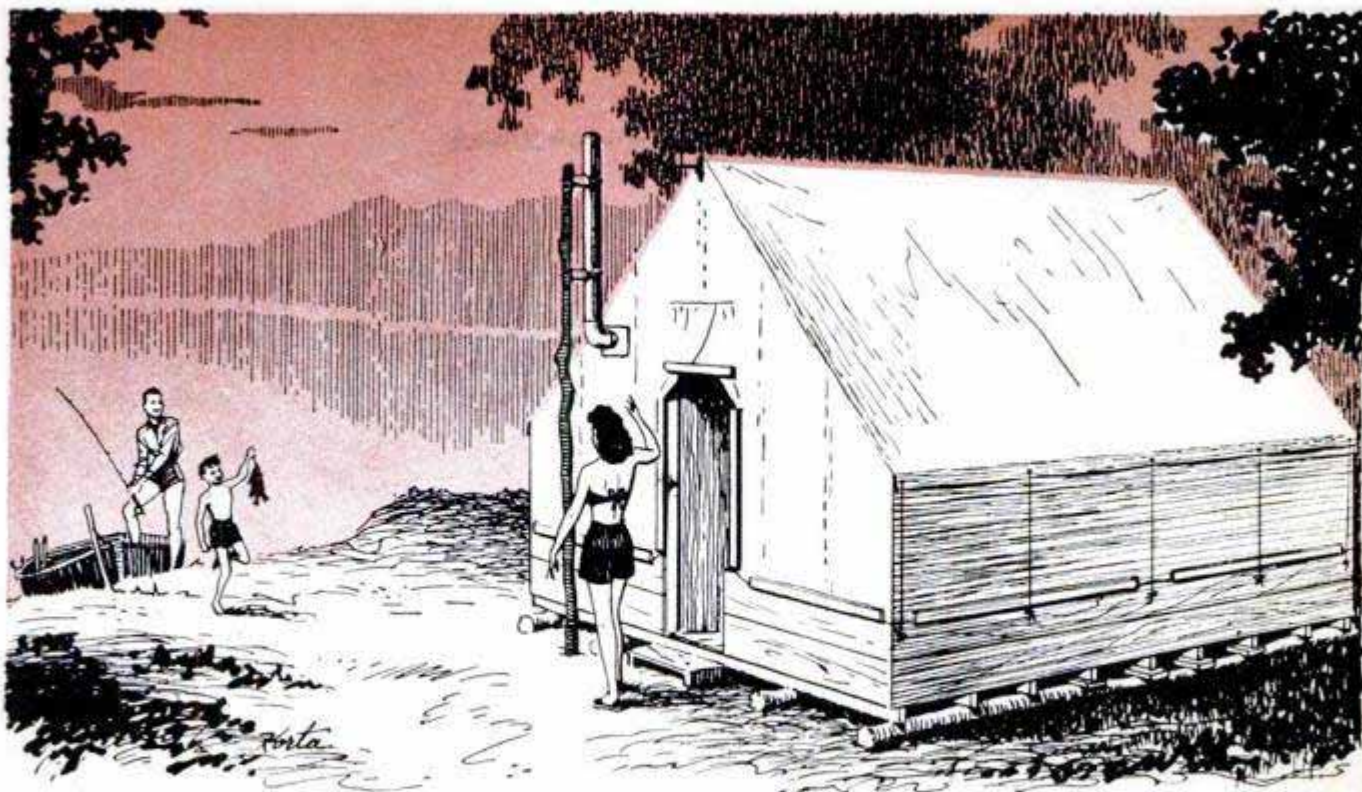


Gallon Can Provides Self-Feeder

A rectangular-shaped, 1-gal. can is easily converted into a convenient self-feeder for a pet rabbit or other small animal. Cut across the width of the can at a point about 3 in. from the bottom, extending the cut approximately halfway around each corner. Then, push the side of the can inward above the cut and pull outward the portion below the cut to form a pocket, as shown in the photograph. Tape the edges of the opening to prevent injury to the pet. If desired, the top of the feeder can be cut off and fitted with a wooden lid, thus making the feeder easier to load.

Bill Dugovich, Tacoma, Wash.



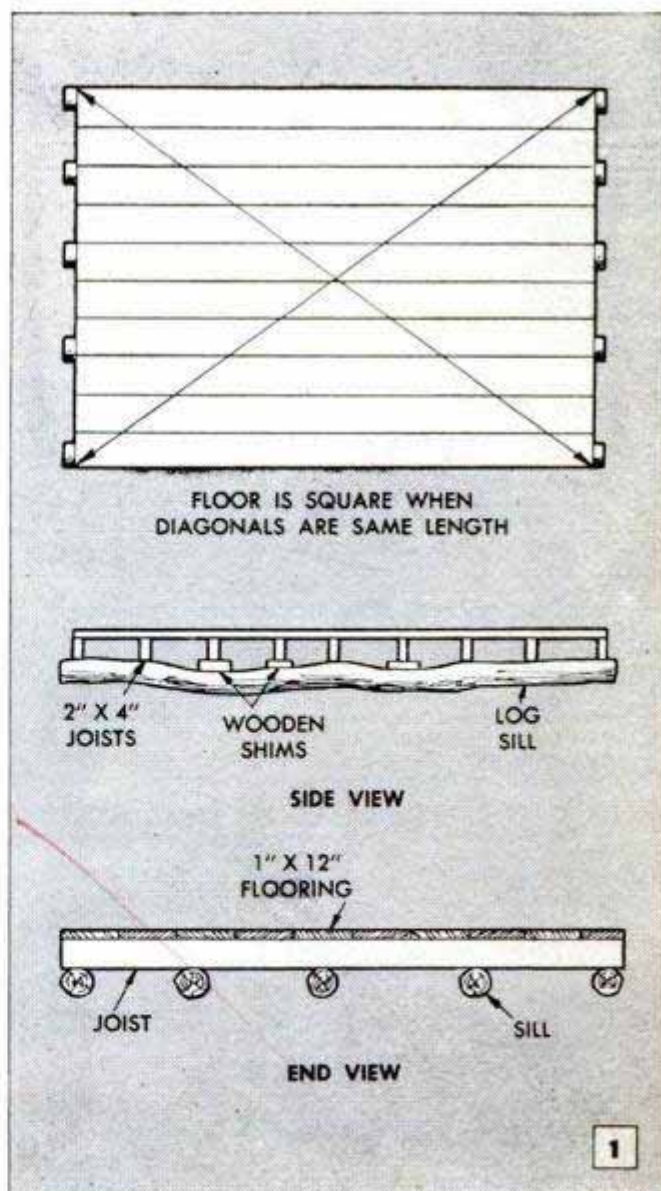


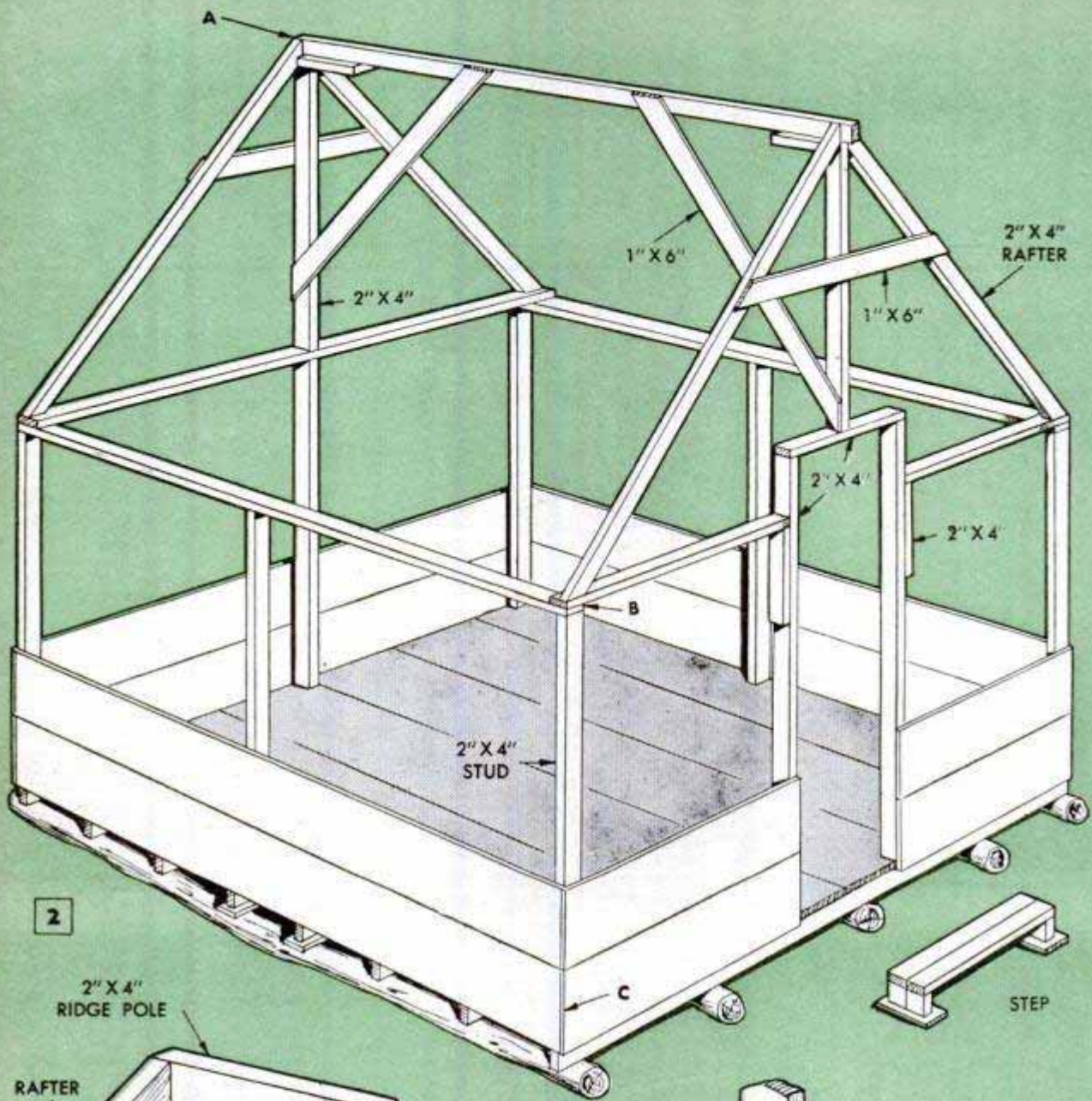
LAKESIDE TENT-COTTAGE

By Rafe Gibbs

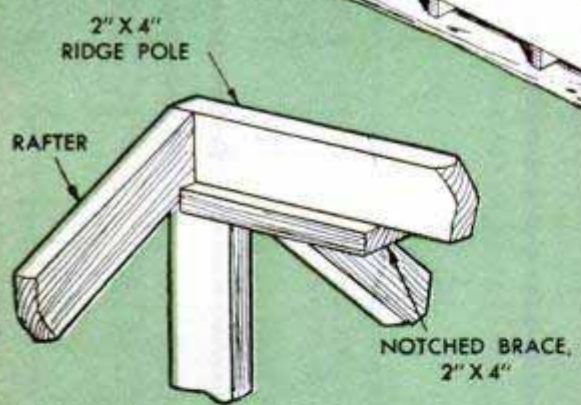
DESIGNED at the suggestion of forest rangers by Horace F. Ralph of the U. S. Forest Service, this tent-cottage meets the requirements of hunters, fishermen and vacationists who like to set up comfortable living quarters beyond the trailside at a fraction of the cost of a permanent camp or summer home. It provides a warm, dry room in cold, stormy weather and the braced roof framing and half-height wooden walls give the structure exceptional resistance to high winds.

First, the floor is built on the desired site as in Fig. 1, by nailing floor joists across log sills, or sleepers. Spacing of the joists should be 16 in. on centers and they should be shimmed with blocks or wedges where necessary to bring the top edges flush. Although the specifications call for 1 x 12-in. floor boards to be laid with butted joints, you can use 1 x 6-in. tongue-and-groove flooring if desired. In placing the joists and laying the floor, be sure to dimension the latter 1 in. less in width and length than the floor size of the wall tent you are to use as a covering for the framing, Fig. 2. Figure the height of the corner posts by adding the height of the 1 x 12-in. siding, two boards high (about 23¼ in.) to the height of the tent walls, allowing for a 3-in. overlap so that the fabric wall can be fastened with cleats as in Fig. 3. Cut the corner posts and the center studs to the same length. Toenail the four corner posts and

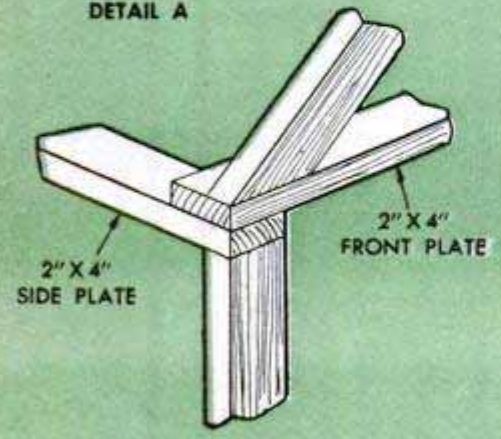




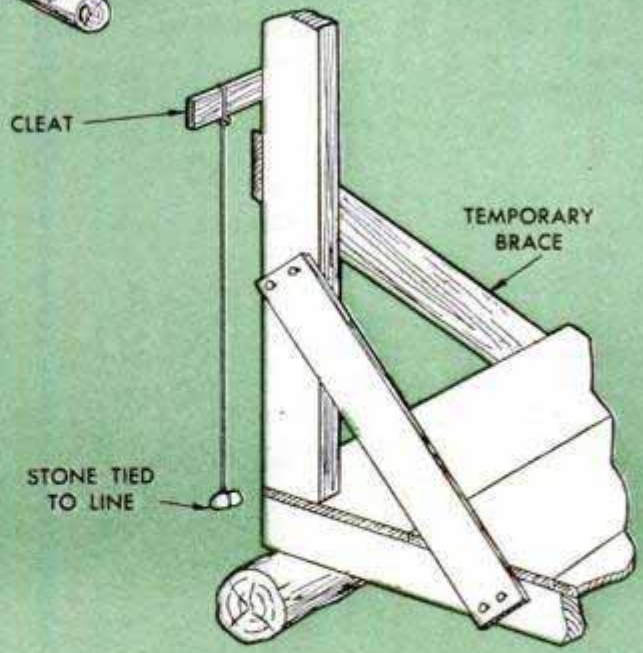
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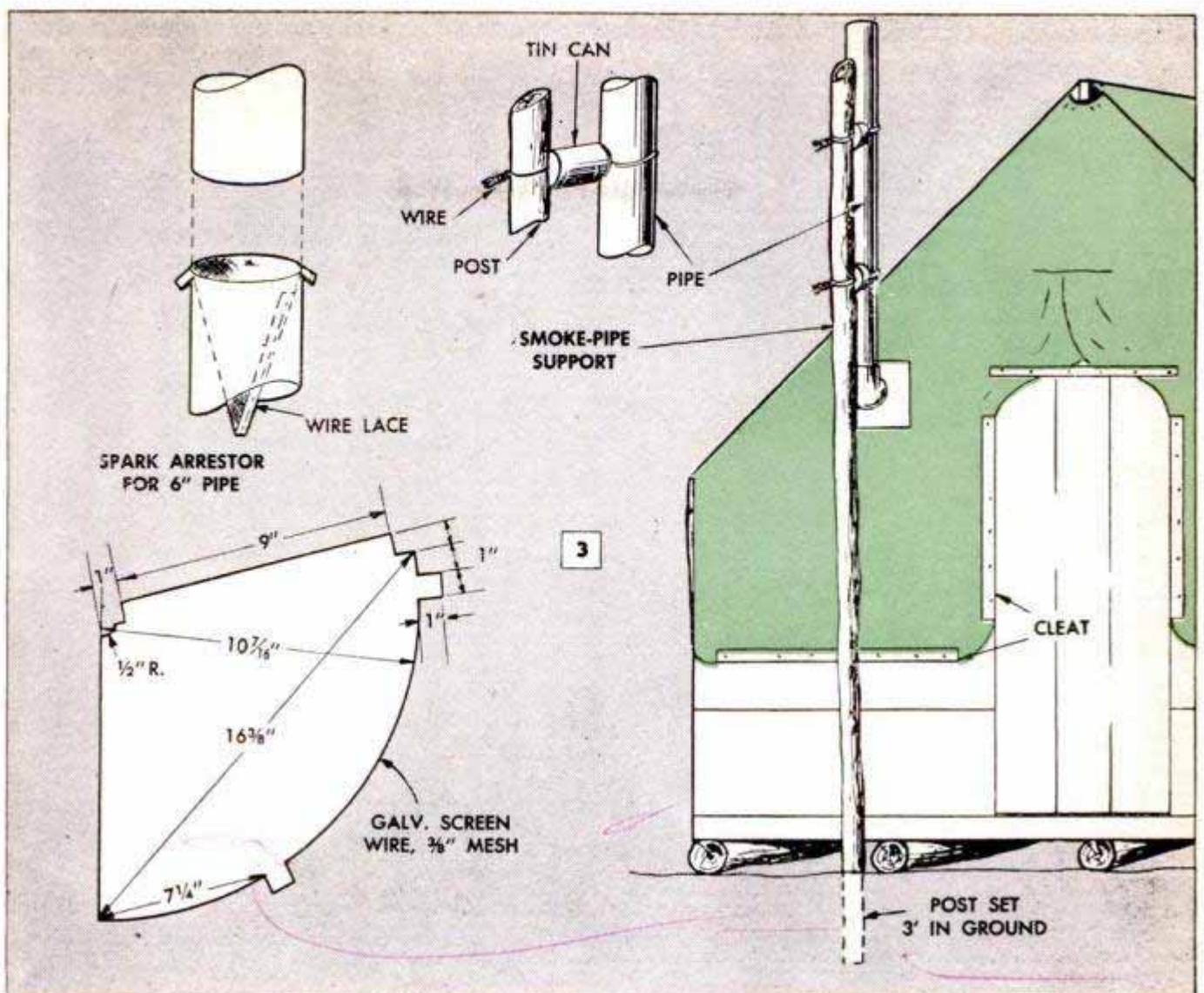
DETAIL A



DETAIL B



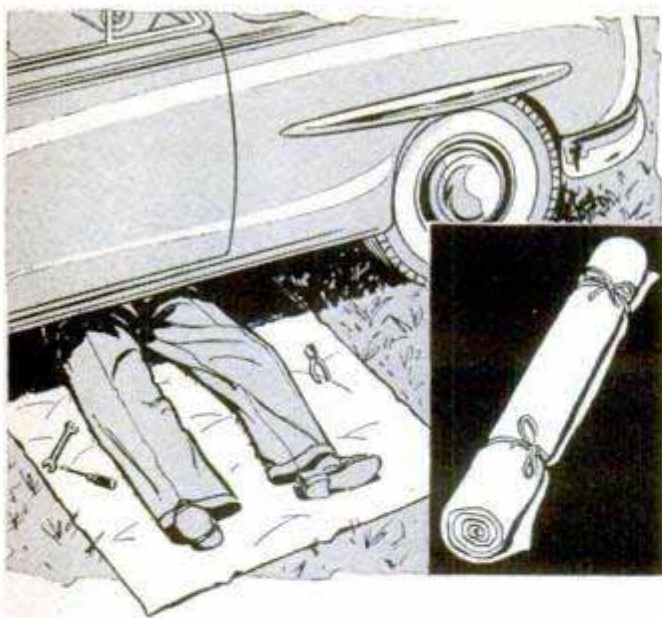
DETAIL C



plumb and brace them as in detail C, Fig. 2. If no level is available, use a weighted cord as shown. After plumbing the corner posts, nail the side plates in position first, and then install the middle studs. Now, tie the side frames by nailing the back plate and stud in place. The doorframe is 30 in. wide and 78 in. high, inside measurements. Install the uprights, which serve as jambs, and tie the top ends with a header as shown in Fig. 2. Then nail false studs to the inner faces of the uprights to support the ends of the divided front plate. Toenail the ridge-pole supports in place and brace them temporarily. Set the ridge pole in position, toenail it to the supports and then nail the diagonal braces in place. Cut the rafters to fit at the lower ends as in detail B, Fig. 2, and at the upper ends as in detail A. Nail them in place at the upper and lower ends. Now, note the position of the notched braces in detail A. These braces are designed to strengthen the whole roof structure and should be carefully fitted. One end of each brace is notched, or slotted, to fit tightly over the upper end of the ridge-pole support and butt against the rafters. In this position it serves as a three-way nailing block, as it is nailed to the bottom edge of the ridge pole, and also to the up-

per end of the support from both sides. Finally, nails are driven through the rafters near the lower edges and into the butting ends of the brace. If a tent larger than 10 x 12-ft. floor area is used, install four additional rafters, two on each side. Draw the tent over the framework and fasten the side walls with cleats.

If desired, you can hang a conventional door to swing inward, or make one by cleating boards together to build up to the required width. If the room is to be heated, a smoke pipe is installed and supported by a post as in Fig. 3. The pipe is attached to the post by means of metal spacers made from tin cans in the manner detailed. For your own safety, as well as to prevent forest fires, the pipe must be fitted with a spark arrestor. This is made from galv. screen in the cone shape detailed in Fig. 3, and is installed in the inverted position in the pipe at the first joint below the upper end. Place the stove or heater in a shallow box filled with dry sand. Install a turn damper in the pipe between the stove and the first elbow of the smoke pipe. To protect the tent wall from the hot smoke pipe, install an asbestos flange, or thimble, in an opening cut in the canvas about 8 to 10 in. below the lower edge of the rafter.



Roll of Canvas Saves Clothes When Repairing Car

A piece of ordinary canvas, rolled up and carried in the luggage compartment of your car, will come in handy should it become necessary to crawl under the car in order to make some unexpected repair. Besides protecting your clothes, the canvas provides a measure of comfort to a generally uncomfortable job.

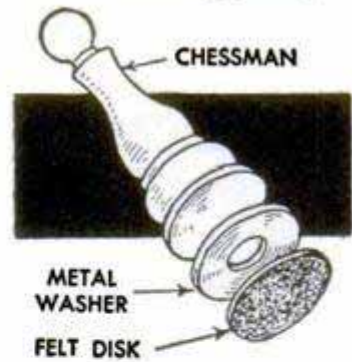
Artist's "Marking Gauge" Holds Brush to Speed Drawing Straight Lines

Used in the same way as a carpenter's marking gauge, this handy tool makes it possible to draw fine lines with an artist's brush quickly and easily. To use the tool, the guide pin is simply held against a straightedge, as shown, and the brush held to draw the line parallel to the straightedge. The guide pin is made from an 8d finishing nail, the head being cut off and the point filed round. It is fitted in a hole drilled in a plastic or light, metal block and held by a setscrew. A second hole, drilled adjacent to the guide pin, is countersunk to accommodate brushes of various sizes. In use, the brushes are pressed into the hole and the guide pin is set to the necessary length.

L. W. Mitchell, St. Clair Shores, Mich.

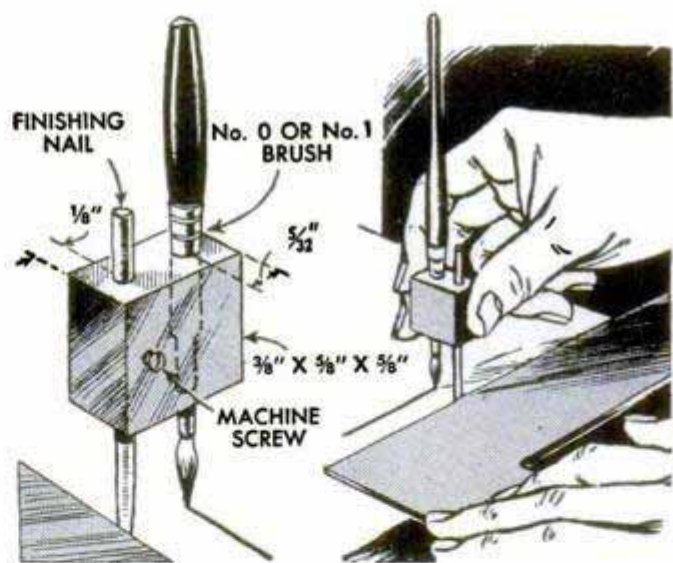
Make Your Chessmen Nontipping

To keep chessmen from tipping and rolling on the board, cement a metal washer to the bottom of each piece. Then cement a felt disk to the washer to keep it from scratching the board.

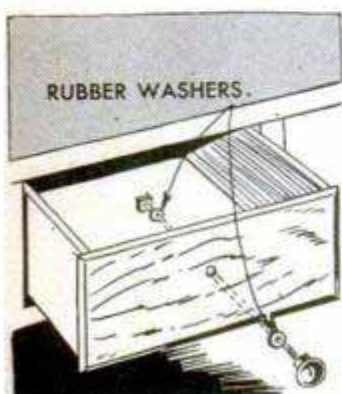


Masking Tape Rubbed With Wax Prevents Ragged Paint Edges

One disadvantage in the use of masking tape to paint straight edges is bridging—the formation of a bridge of paint between the work and the edge of the tape. This usually necessitates removing the tape before the paint is dry in order to avoid pulling chips of paint from the edge of the work. However, bridging can be prevented by rubbing the edge of the tape with a piece of wax or a candle before using. As the paint will not stick to the waxed edge, the tape can be removed at any time and will leave a clean edge.



Drawer Knobs Kept From Loosening by Rubber Washers



When you have a drawer knob of the type that is attached either with a bolt or a screw and cannot keep it tight, use a couple of rubber washers as illustrated. Remove the knob and place one washer on the outside.

Then push the knob in position and place a second washer on the inside. Tighten the screw or nut, whichever is used, and you will have no further trouble.

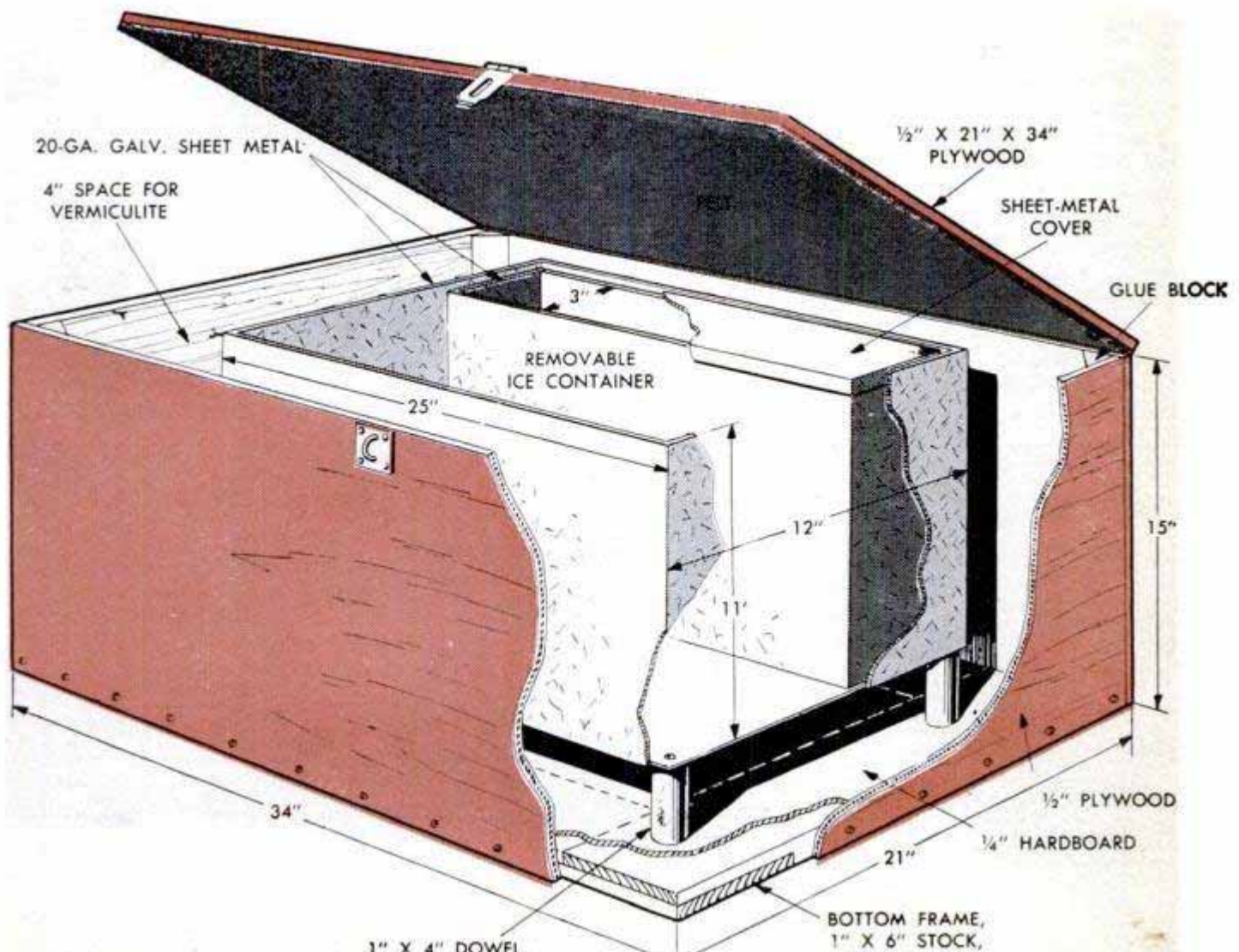
Victor Lamoy, Upper Jay, N. Y.

☐ If you are inexperienced at staining, always test the stain at hand on a piece of scrap wood of the same kind that you plan to finish. Also, remember that the same stains made by different manufacturers are not always the same color.



Homemade Picnic Cooler

Reliable cold storage for foods and beverages solves a major picnic problem. This food-storage unit is simply a box within a box, the outer one being made of plywood and the inner one of galvanized sheet metal. The 4-in. space between the walls and bottoms of the boxes is packed with Vermiculite, a granular-type insulating material. Sides, ends and top of outer box are of $\frac{1}{2}$ -in. plywood. Bottom is an open frame, half-lapped at corners and covered with hardboard. Cut ends of metal box with rivet tabs and, after riveting, solder the joints. Make metal ice container in the same manner and provide a tight-fitting metal cover



KEEP COOL

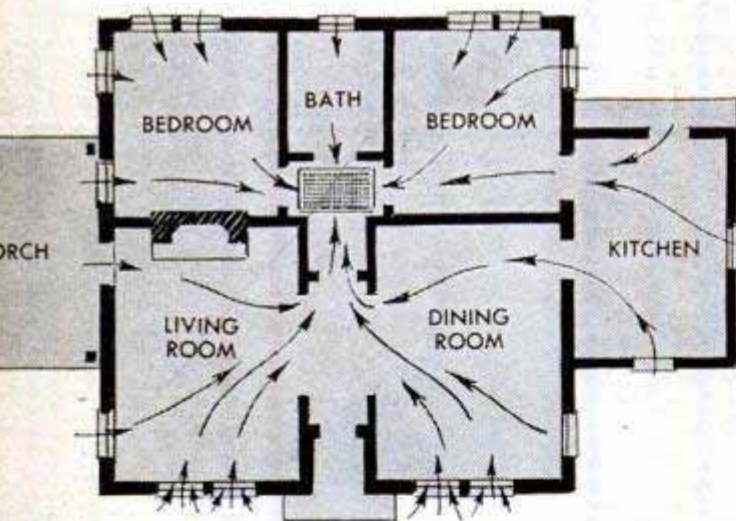
By Stanley Schuler

QUICK relief from hot-weather discomfort can be had by reducing excessive temperatures in your home with an attic fan. The operating principle of this unit is simple: At the end of a hot summer day the outside temperature drops 10 to 20 degs. at nightfall, but the walls and roof of the house prevent escape of warm air accumulated during the day. Air in the closed attic that has been heated to a high temperature continues to radiate heat to the rooms below until well into the early morning hours. An attic fan removes this stifling, heated air from the attic and from the rooms below and replaces it with fresh, cool air from outside. The high rate of air exchange carries away accumulated heat from the walls, furniture, draperies and linens, thereby reducing the temperature in the entire home. How the attic fan cools the home so rapidly and efficiently is shown graphically on the typical floor plan at the left, the directional arrows indicating movement of air through open windows to a centrally located ceiling grille, or louver. The air is drawn through the grille and exhausted through the attic louvers. As long as the fan is in operation there will be a slow movement of air in all the rooms, and cool air drawn into the house in this manner through windows and screen doors will gradually equalize inside and



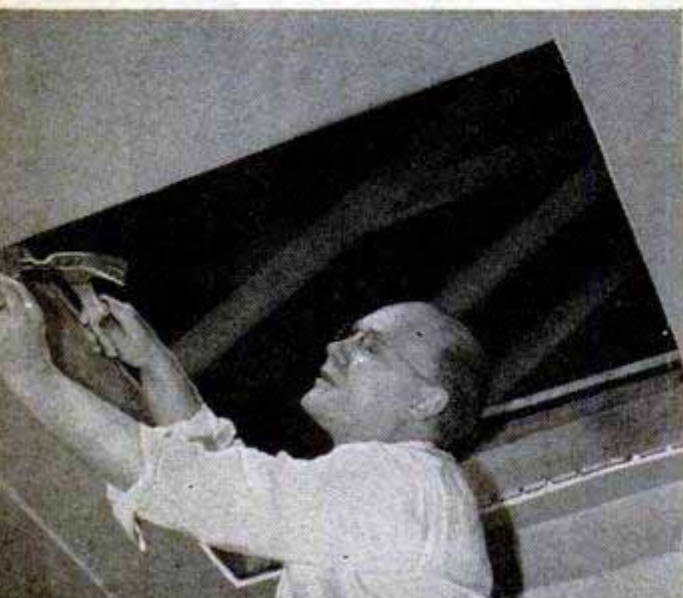
Photo courtesy Hunter Fan & Ventilating Co.

After installing the vertical-discharge fan in the ceiling opening, check belt tension and all electrical connections



Locate ceiling opening in a hallway or in one corner of the room nearest the center of the house. Finish the opening to the edges with new plaster before framing

When framing the ceiling opening, check carefully to make sure it will be of the size recommended by the manufacturer of the fan. Make required allowances



With an Attic Fan

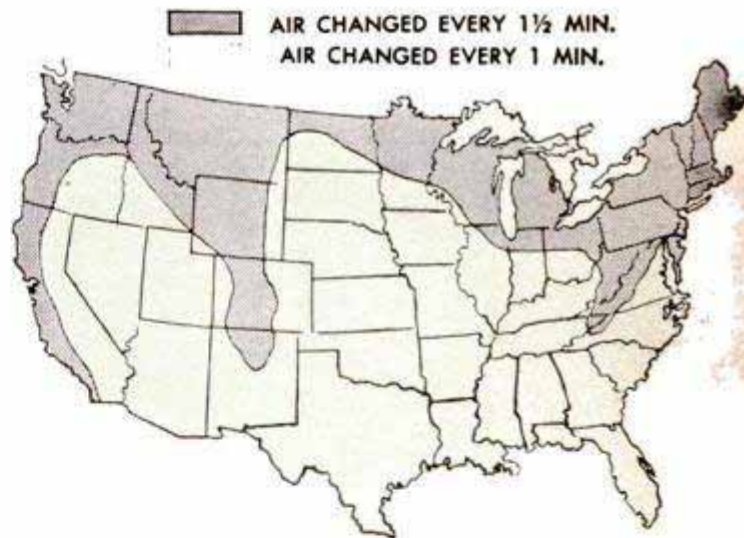
outside temperatures. However, effective use of the attic fan is not limited to the early hours of the night. It can be turned on at intervals during hot, sultry days to exhaust heated air from the attic and maintain a more comfortable temperature in the living areas of the house.

In general, manufacturers of attic fans supply two basic types as packaged units. One is designed to exhaust air vertically in a low attic, the other is designed to discharge air from a plenum chamber or directly through an attic louver. The vertical-discharge fan is installed in a framed opening cut in the ceiling of a hallway. Photos below and on the opposite page show the method of installing this unit. It will operate efficiently with a minimum of attic headroom. Often this is the only type of installation that can be made in ranch-type homes and in 1½-story structures where most of the attic space is utilized for rooms.

The size of the fan selected depends primarily on where you live. The map at the right shows those areas in the central, western and southern states where a 1-minute air change is generally recommended. In the northern states a 1½-minute change is usually considered sufficient. In computing the size of the fan required, determine the floor area of all the rooms in the house and multiply the total by the ceiling height. Then divide this result by the rate of air exchange required. For example, if the cubic volume of the house is 10,000 cu. ft., and you live in an area requiring a 1½-minute air change, divide the cubic volume by 1½ to determine the capacity of the fan.

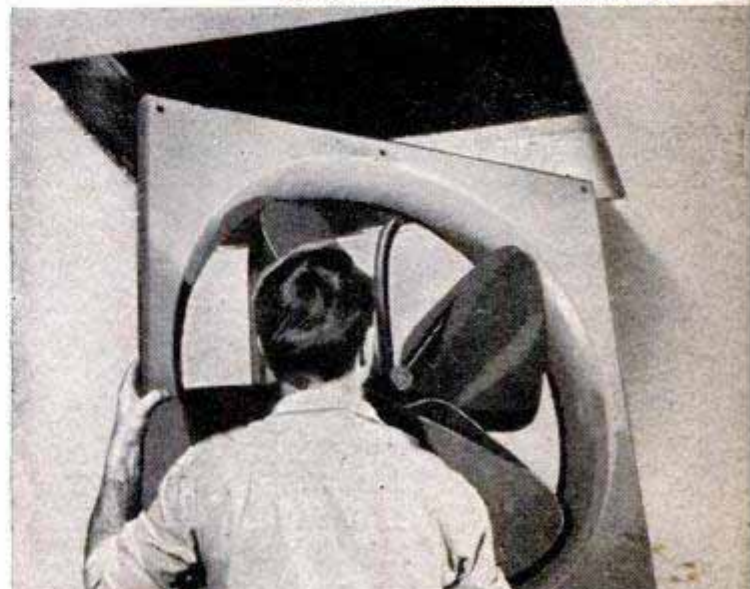
After the opening is framed, it is lined with a resilient, sound-deadening material so that slight vibrations are not transmitted to the framing members

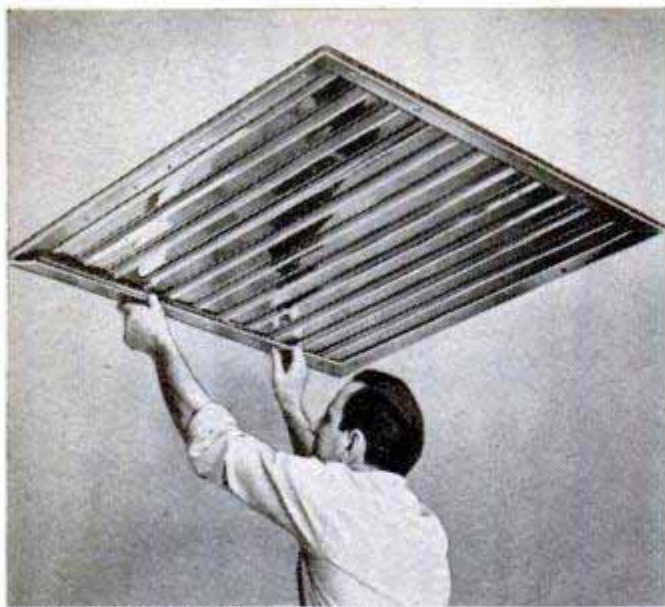
If a 1-minute air change is necessary then you would install a fan rated at 10,000 c.f.m. When computing the cubic volume of the house it usually is not necessary to include clothes closets, pantries, or other small dead-storage spaces. These values assume that the fan or the grille will be located centrally, such as in a short hallway or in a corner of the room nearest the center of the house. There are two other important computations to make before installing the fan. The first is the minimum gross area of the exhaust opening and the second is the grille and louver size. If you purchase the grille unit with the fan, the size has already been computed by the manufacturer and the unit is installed in an opening in the ceiling as in the photo at the left. If you make your own louver, or grille, as in the details on page 176, then it will be necessary to compute the net free areas of both as in the tables on page 177.



Above, map shows areas where 1 and 1½-minute air changes are required. Below, the fan unit is lifted into the attic through the rough ceiling opening

Photos courtesy American Blower Corp.

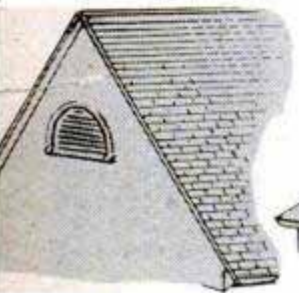




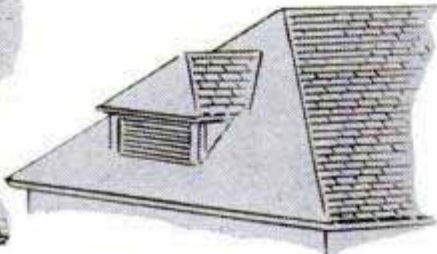
Photos courtesy American Blower Corp.

The last step is the installation of the metal louver, or grille, in the ceiling. In this type of installation, the metal shutters open and close automatically

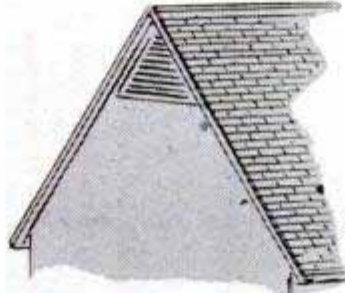
In computing louver and grille areas, use the lower table on page 177 which makes it easy to determine the required size. In the table, the values under the heading "gross grille area" are based on the assumption that the wooden grille provides a net free opening of approximately 80 percent, while the average metal grille has a net free opening of about 65 percent. Although you can build a suitable ceiling grille, as in the lower right-hand details A and B on this page, you'll save a lot of time and extra work by purchasing this unit ready-made to fit your fan. The metal shutters open and close automatically as the fan is started and stopped. This type of ceiling grille is recommended for use with all vertical-discharge installations. Although a 14-mesh screen is specified in the upper right-hand detail of an exhaust louver, instructions usually call for 1/2-in. mesh screening over exhaust openings.



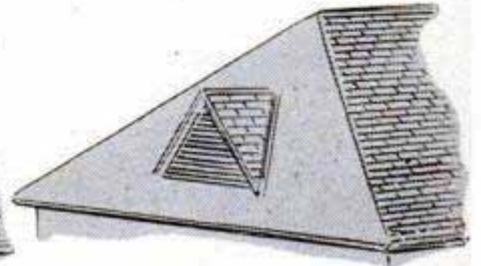
HALF-ROUND LOUVER



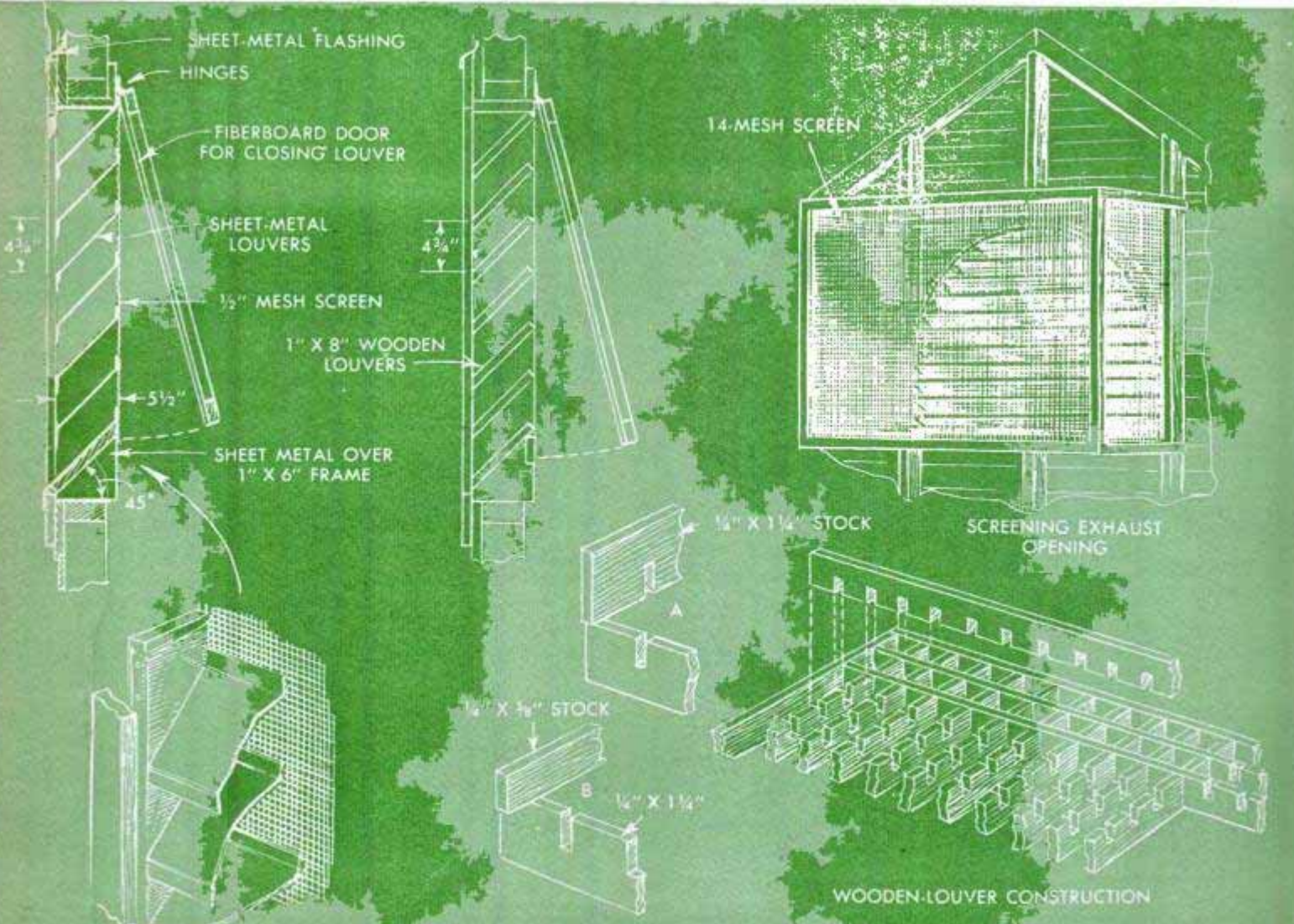
LOUVER IN HIP DORMER



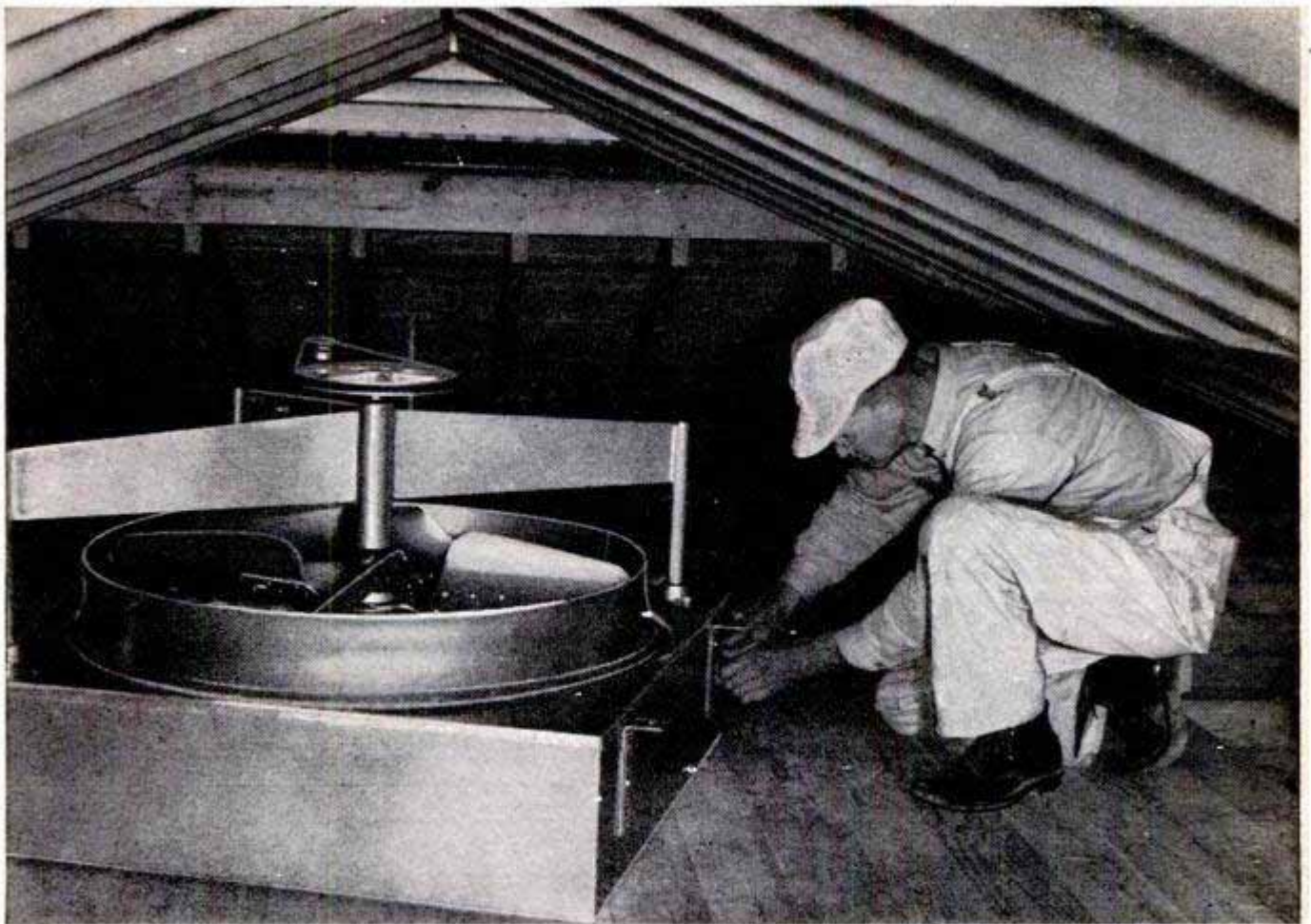
GABLE-END LOUVER



GABLE-ROOF DORMER



WOODEN-LOUVER CONSTRUCTION



Photos courtesy Hunter Fan & Ventilating Co.

The vertical-discharge fan is designed for installation in low attics. It will operate in only 30 in. of headroom

MINIMUM GROSS AREAS OF EXHAUST OPENINGS

AREAS	1-MINUTE AIR CHANGE	1½-MINUTE AIR CHANGE
Wood louvers backed with ½-inch wire mesh	Not less than 1/40 of gross floor area	Not less than 1/60 of gross floor area
Metal louvers backed with ½-inch wire mesh	Not less than 1/50 of gross floor area	Not less than 1/90 of gross floor area
Plain openings, such as those in soffits, backed with ½-inch wire mesh	Not less than 1/65 of gross floor area	Not less than 1/100 of gross floor area

GRILLE AND LOUVER SIZES

Fan capacity CFM	Net grille, or louver, area Sq. Ft.	Gross grille area Sq. Ft.		Gross louver area Sq. Ft.	
		Wood grille	Metal grille	Wood louver	Metal louver
4000	5.3	6.7	8.1	10.6	7.6
5000	6.7	8.3	10.3	13.4	9.5
6000	8.0	10.0	12.3	16.0	10.4
7000	9.3	11.7	14.3	18.6	13.3
8000	10.7	13.3	16.5	21.4	15.2
9000	12.0	15.0	18.5	24.0	17.1
10000	13.3	16.7	20.0	26.6	19.0
11000	14.7	18.3	22.6	29.4	20.9
12000	16.0	20.0	24.6	32.0	22.8
13000	17.3	21.7	26.6	34.6	24.7
14000	18.7	23.3	28.8	37.4	26.7
15000	20.0	25.0	30.8	40.0	28.6
16000	21.3	26.7	32.8	42.6	30.5
17000	22.7	28.3	34.9	45.4	32.3
18000	24.0	30.0	36.9	48.0	34.3

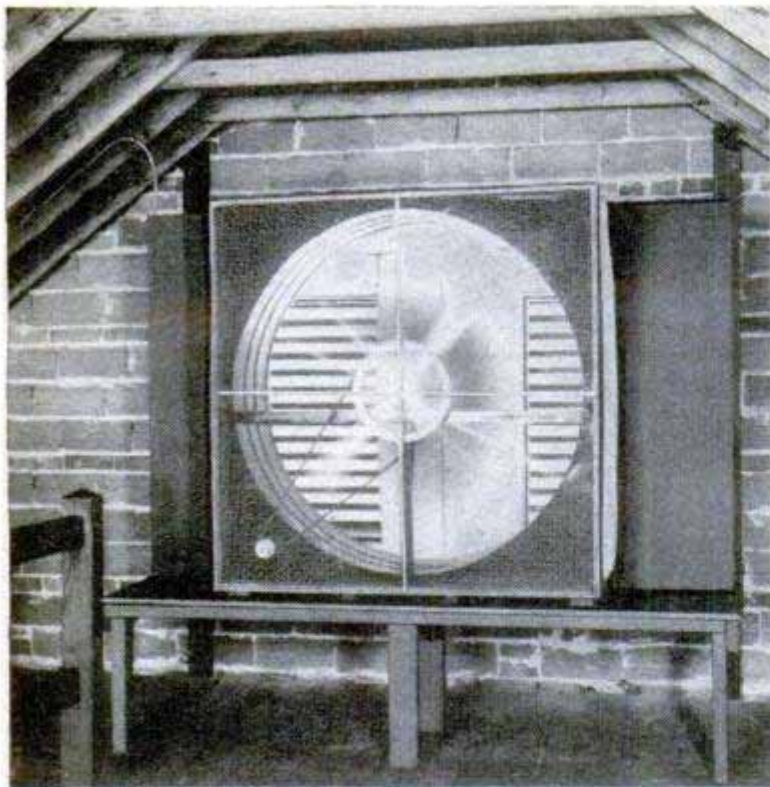
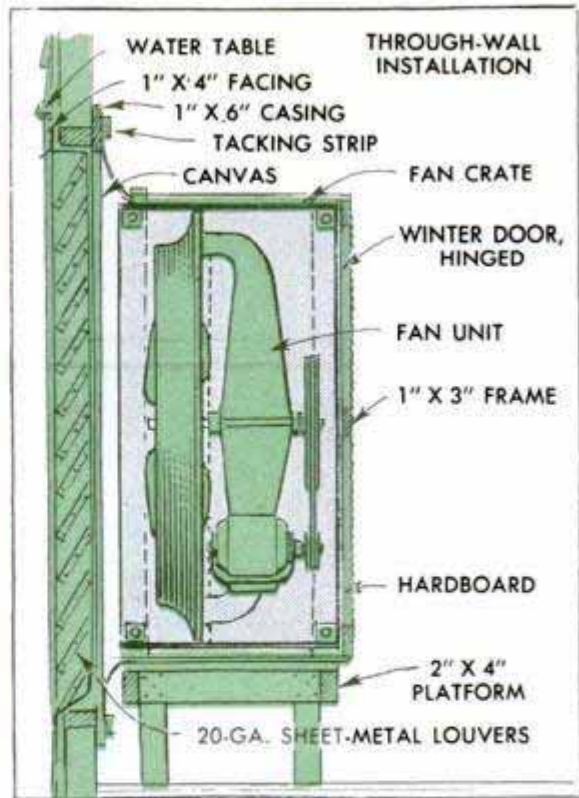


Photo courtesy Emerson Elect. Mfg. Co.



When installing the metal grille with shutters, it is essential to follow the manufacturer's directions in all details. Be sure that the opening is cut to the correct size and is framed according to the instructions for installation of both the grille and fan. Often it is necessary to shim the metal frame of the grille at several points to prevent twisting, which might cause the shutters to bind and prevent them from opening fully. Although every attic will offer

Photo courtesy Hunter Fan & Ventilating Co.

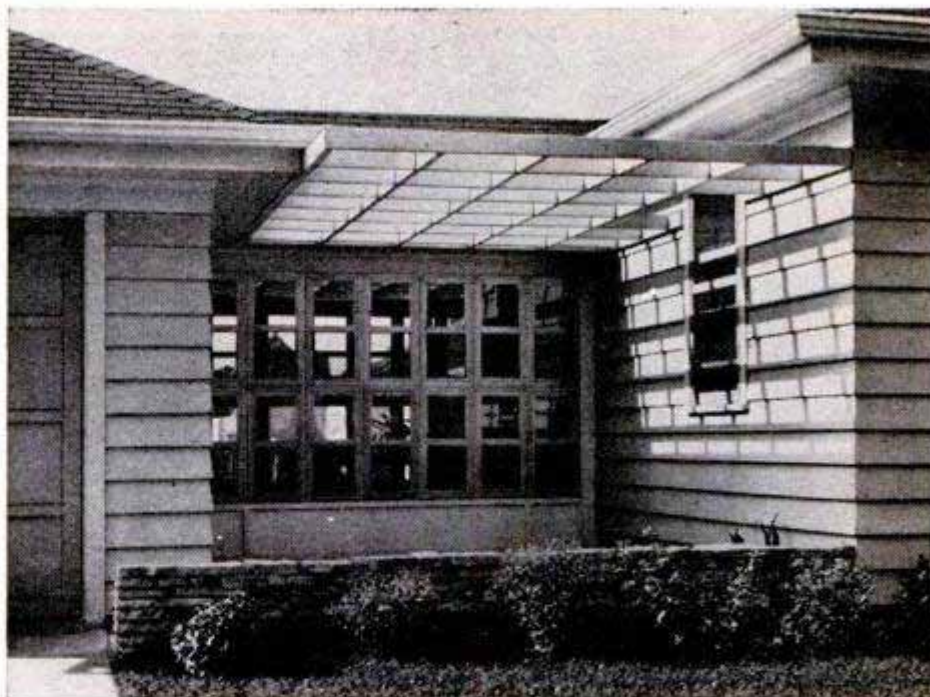


an individual installation problem, it is essential that the vertical-discharge fan be placed on its resilient mountings in such a way that no part of the frame touches the framing in the opening. For quiet operation the unit must "float" on the mountings. When installed in unheated attics in cold climates, the automatic ceiling grille does not always provide sufficient protection against infiltration of cold air and some arrangement must be made for closing the opening. Some owners cut insulation batts to fit over the ceiling shutter. These batts are removed in the spring and kept in the attic for easy replacement.

The gable, or through-wall, installation of the type pictured and detailed above is a popular unit. Usually the louver is homemade, the louver shutters being made of metal or wood, and the fan is installed to discharge horizontally as in the detail. In this installation the fan and its shipping crate are supported on a low platform and connected to the louver opening by means of a canvas bellows. The fan mounting should be cushioned on a piece of softboard or rubber pads, and the opening to the fan should be screened with $\frac{1}{2}$ -in. wire mesh. Provision must also be made for closing the opening during the cold winter months. Where possible, locate the louver on the side or end of the building opposite the prevailing winds. The center details on page 176 suggest several different types of attic-louver installations. As a rule, attic fans are controlled by a manual switch conveniently located in a room or hall as in the photo at the left. If desired, an automatic time switch can be installed.

Overhead Lattice Added to Small Patio Gives That "Finished" Look

If you have a small patio between your house and garage, an overhead lattice will often give it that added improvement for which homeowners constantly strive. The photo shows such a lattice which, in this case, was built to finish off the space formed by the sides of a house, breezeway and garage. Lengths of 2 x 4s were used in assembling the lattice. The openings are 18 in. square. All joints were half-lapped with the exception of those in the outside frame. It is advisable to assemble the entire lattice on a flat surface, such as a driveway, after which it is lifted into position. Use a length of pipe or 2 x 4 to support the lattice while it is being nailed in place.

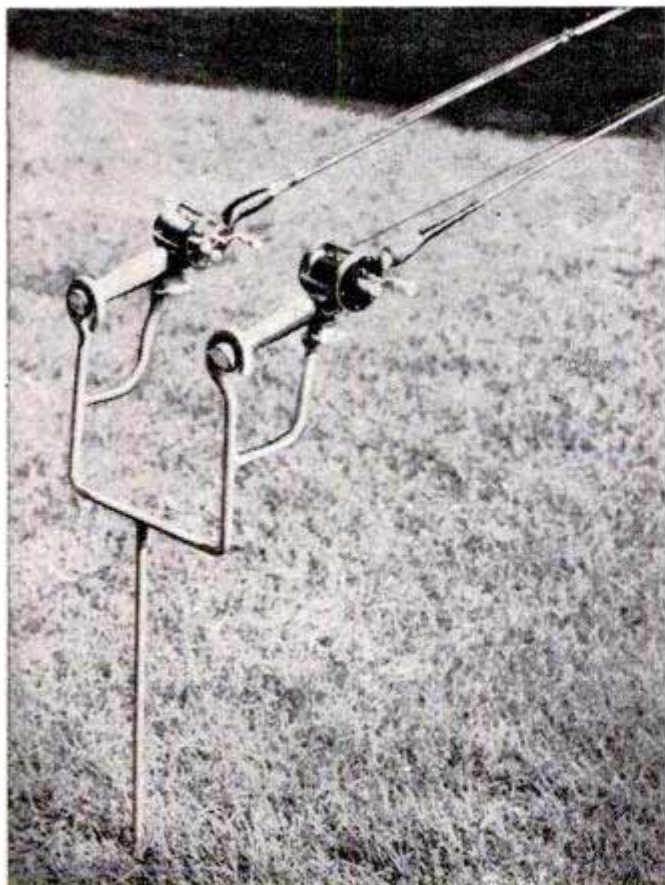


Blocks can be used under the post for slight adjustments in height.

Don Brooks, Lombard, Ill.

Dual-Pole Bracket Makes Life Easy for Bank Fishermen

Fishermen who like to use set poles when fishing from the banks of streams or farm ponds will appreciate this handy bracket, or holder, for two poles. In this case, bait-casting rods are pictured, but the bracket can be made for bamboo poles as well. The holder is a welded job, using $\frac{3}{8}$ -in. mild-



steel rods for the various parts. The lower end of the vertical member is sharpened to form a stake which is easily forced into the ground. A U-shaped member, having eyes formed at the ends, is welded to the stake to form a yoke. The eyes should be just large enough for easy insertion of the butt ends of the rod grips. Then supporting arms are welded to the arms of the yoke. U-shaped members of $\frac{1}{8}$ x $\frac{3}{4}$ -in. flat steel are welded to the top ends of the supporting arms to form seats for the rods. These seats, or clips, support the rod at a point opposite the reel seat and prevent it from twisting or sliding forward when a fish is hooked.

Grounding Tail Lamps on Cars

On older cars where tail lamps are bolted to the rear fenders, rust and dirt accumulated in the joint between the bracket and fender often prevent grounding of the lamp circuit. The joint can be cleaned and the ground renewed simply by driving a thin metal washer between the bracket and fender. Both sides of the washer should be indented with a punch to form slight projections on the metal which will cut through the corrosion.

E. T. Gunderson, Jr., Humboldt, Iowa.

Wads of cotton packed in the finger tips of rubber gloves will keep fingernails from tearing through the rubber.

NURSERY

Part II

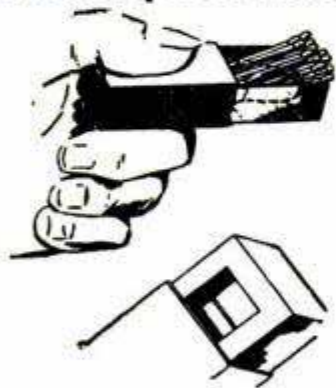
CONTINUING the series on nursery furniture styled by John Bergen, details are presented for building a playpen, desk-toy cabinet, chair, toy chest and night lamp. The playpen is completely enclosed with plastic screen wire and features a hinged top which folds flat against the back of the playpen. Both the front and back sections of the playpen are assembled by fastening the top and bottom rails of each section to a center upright and then joining the ends of the rails to 1 $\frac{3}{4}$ -in.-sq. corner posts, all the joints being doweled and glued. Note that a handrail is installed between the corner posts approximately 12 in. from the top. Each end section of the playpen consists of two screened panels pivoted to the corner posts and hinged together at the center to permit folding. Hinges are improvised from common L-braces, angle brackets and mending plates. The hinged panels are locked in the open position by flat-steel latches. These are notched near one end to engage roundheaded screws driven partially into the panel frames. The hinged panels are locked in the open position by flat-steel latches. These are notched near one end to engage roundheaded screws driven partially into the panel frames. The $\frac{1}{2}$ -in.-plywood bottom rests on cleats screwed along the lower rails of the front and back sections. The over-all height of the side panels is 37 $\frac{3}{4}$ in., the corner posts extending 2 in. below them.

The desk-toy cabinet is made entirely of

Sturdy Base for Bench Saw Made From Scrap Parts

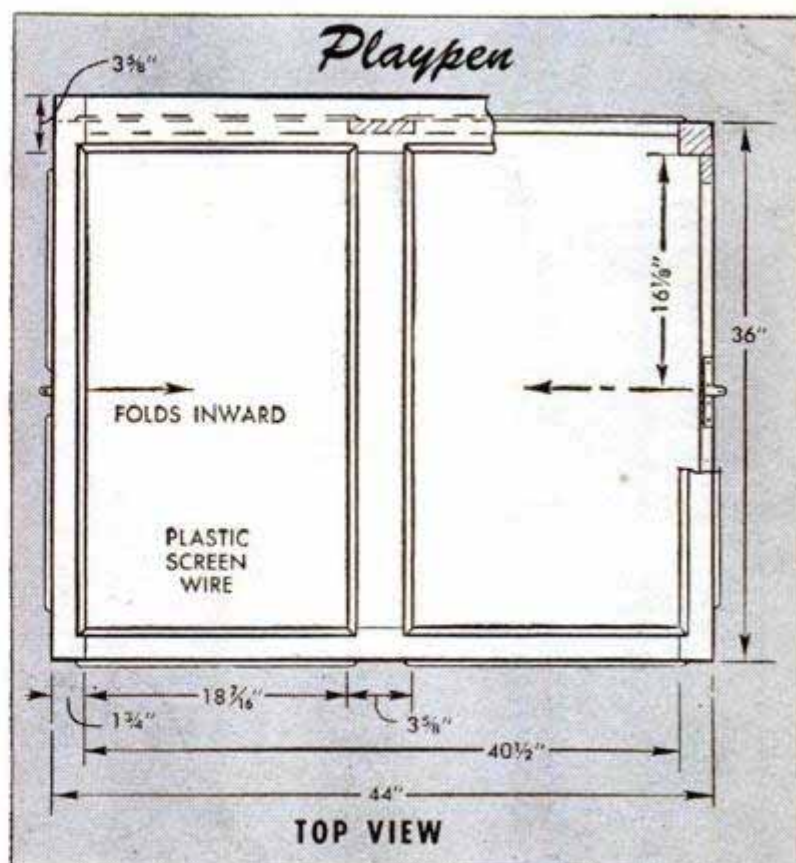
One craftsman made a sturdy base for his bench saw by utilizing the base from a discarded cream separator and a wheel taken from an old mowing machine. The cream-separator base was inverted and attached to the wheel with a single large bolt run through the hub of the wheel. Holes in the separator base that had formerly been used to anchor the machine were utilized for bolting the saw in place.

Fumbleproof Matchbox



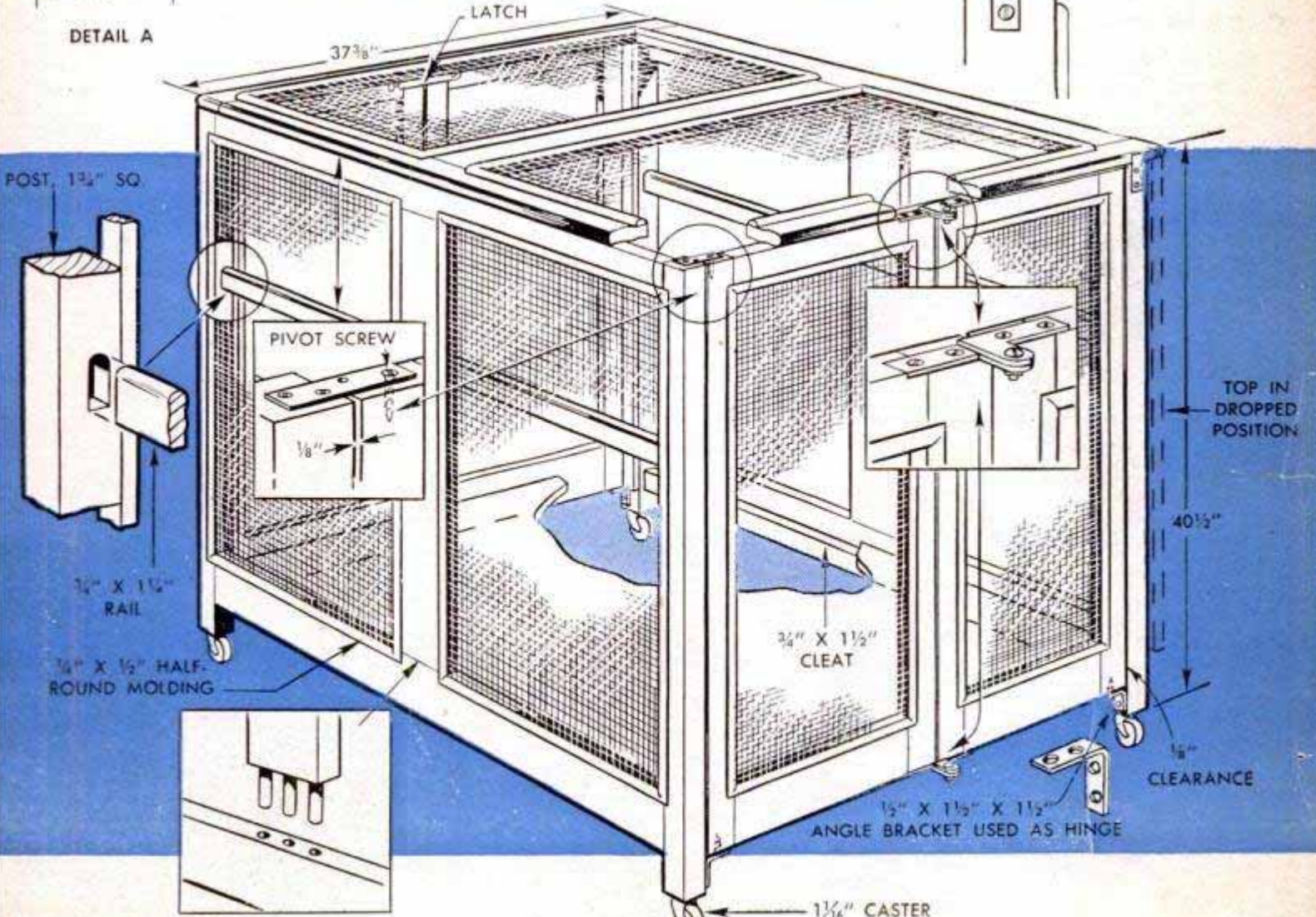
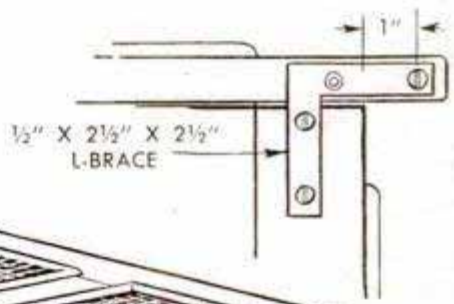
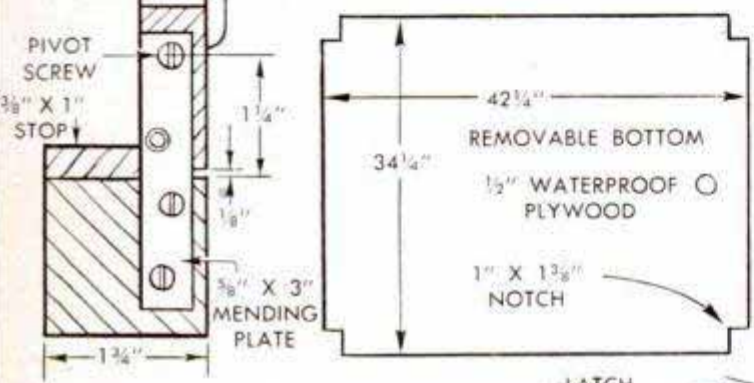
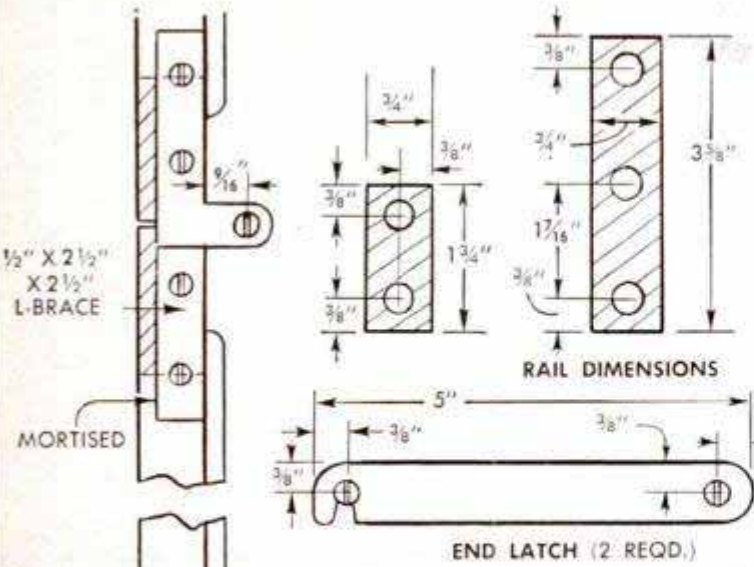
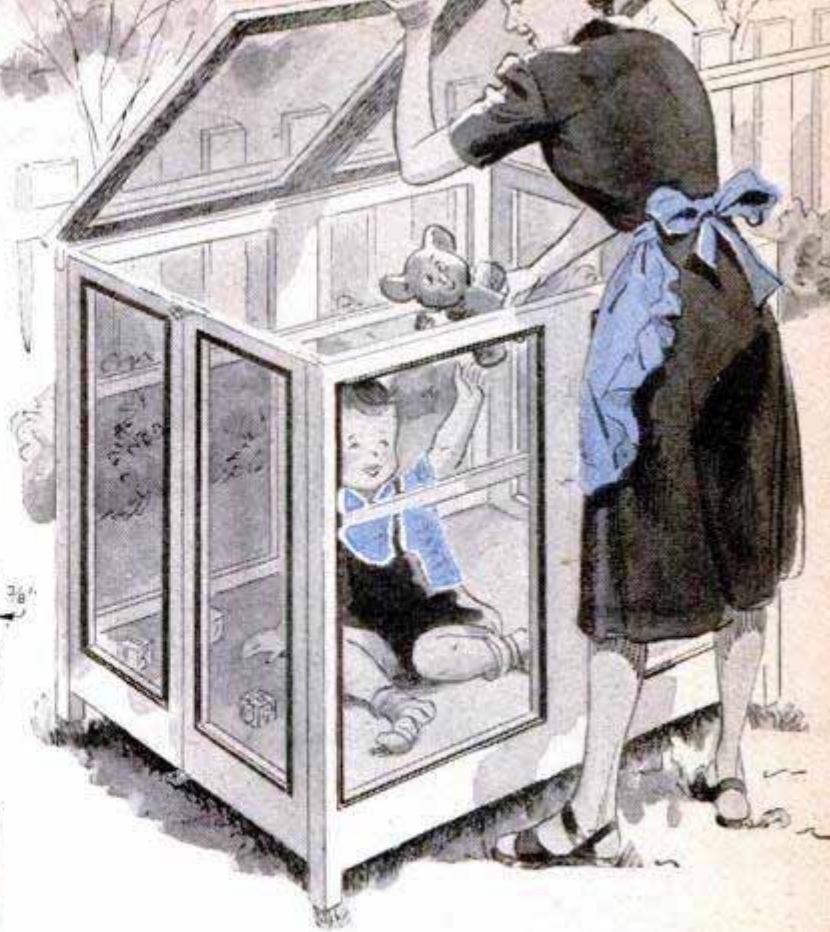
Cutting a hole in the drawer of a penny-size matchbox makes it possible to raise the matches out of the box with the finger tip so that one match can be removed without having to fumble for it. If cut ap-

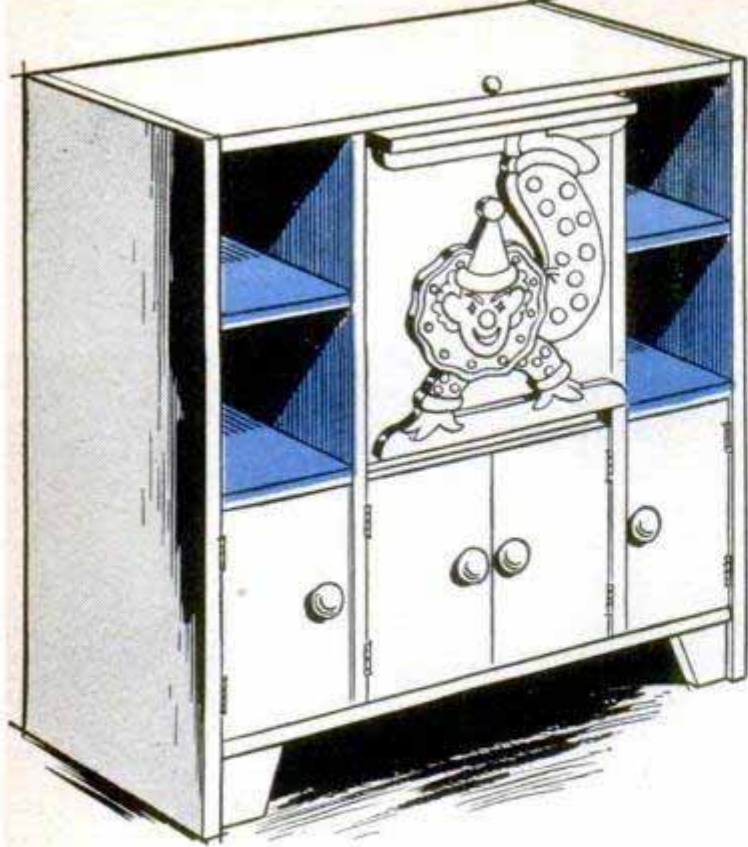
proximately $\frac{3}{4}$ in. square in the center of the drawer, the hole will not be large enough to permit the matches to fall through.—E. Binderwald, Riverton, N. J.



TOP VIEW

FURNITURE



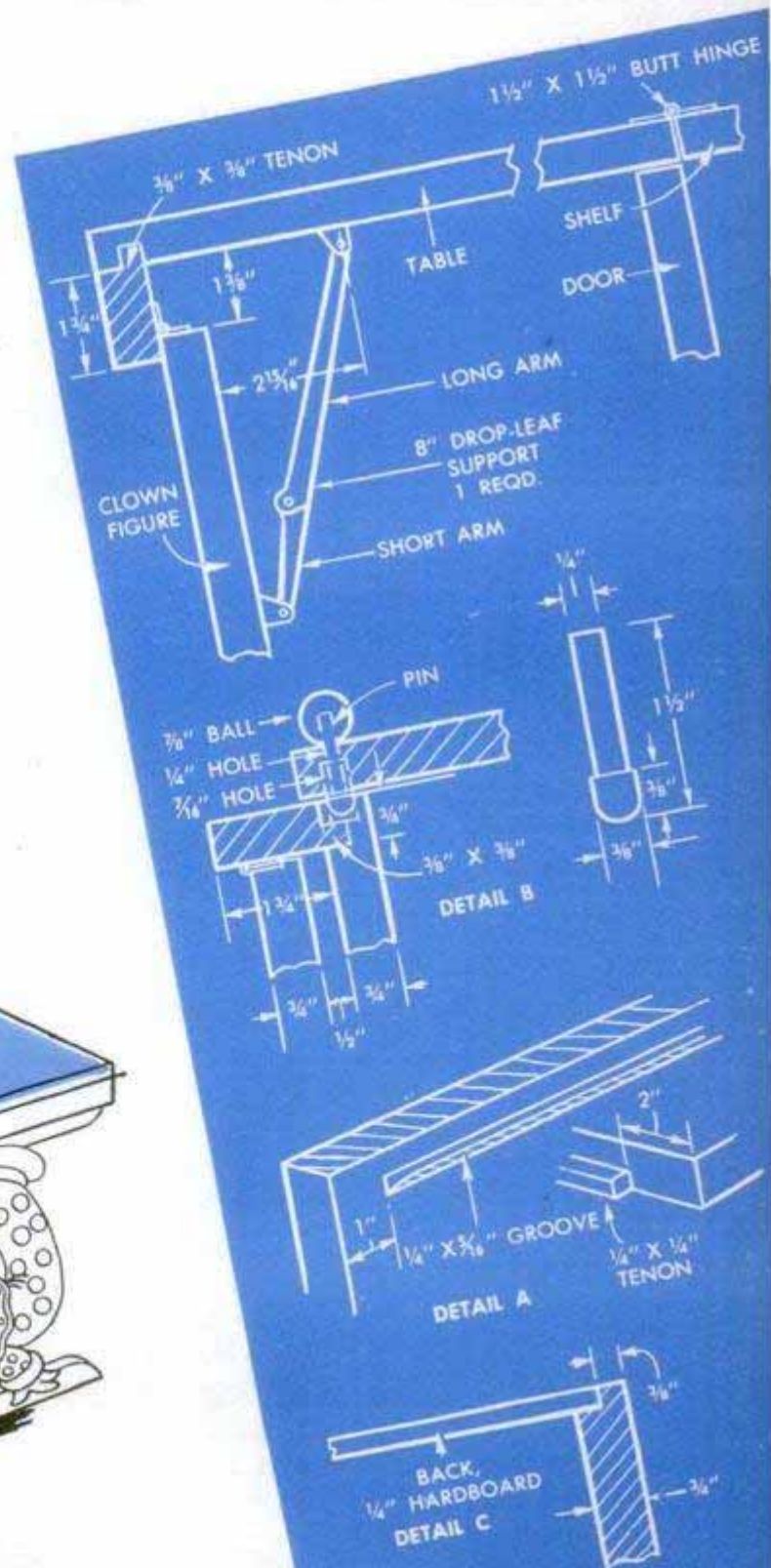
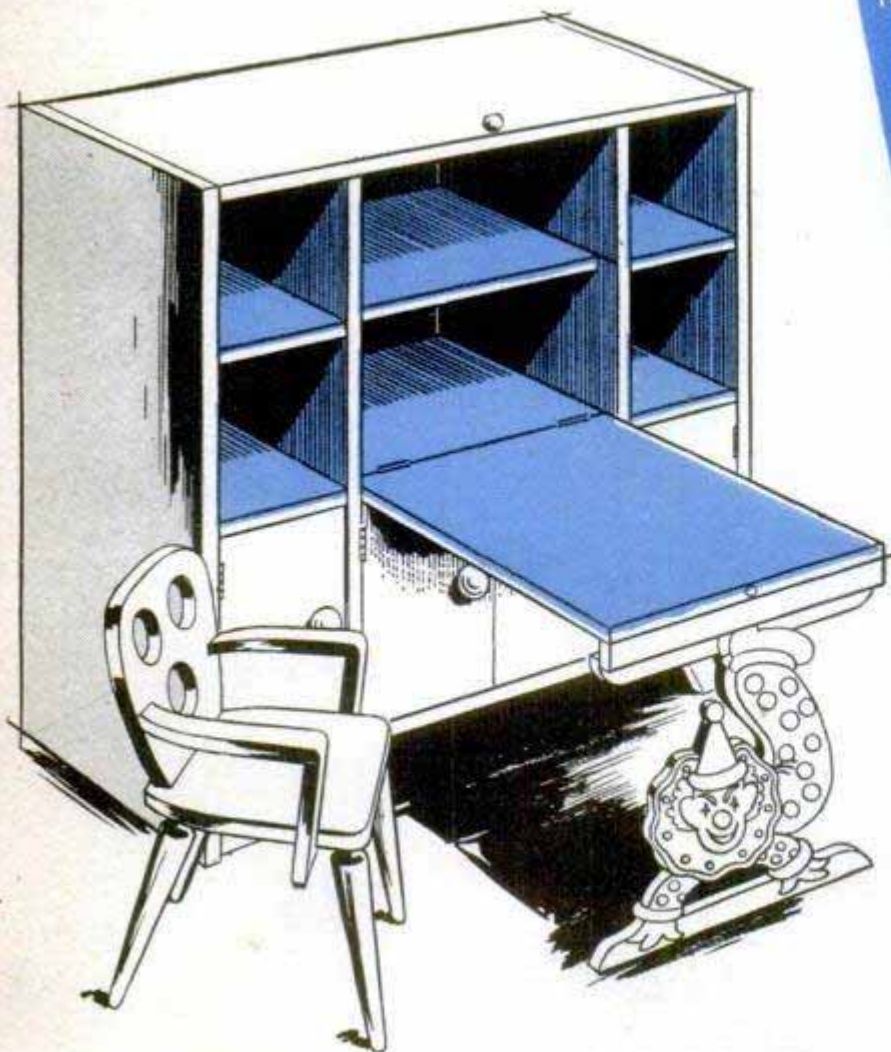


3/4-in. plywood except for the back panel which is of 1/4-in. hardboard. Construction is unusually simple, the edges of the shelves and top being tenoned to fit matching grooves in the sides and partitions. The drop leaf, detailed below, is hinged to the center half and supported in the open position by a large clown jigsawed from 3/4-in. plywood. The clown is hinged to a 3/4 x 1 3/4-in. cleat mounted along the front edge of the drop leaf. A standard drop-leaf support locks the clown cutout at right angles to the leaf, and when the leaf is in the up, or closed, position the cutout folds flat to form a decorative overlay on the front of the cabinet.

Splayed legs and a novel jigsawed back distinguish the sturdy desk chair. The seat

Desk-toy Cabinet

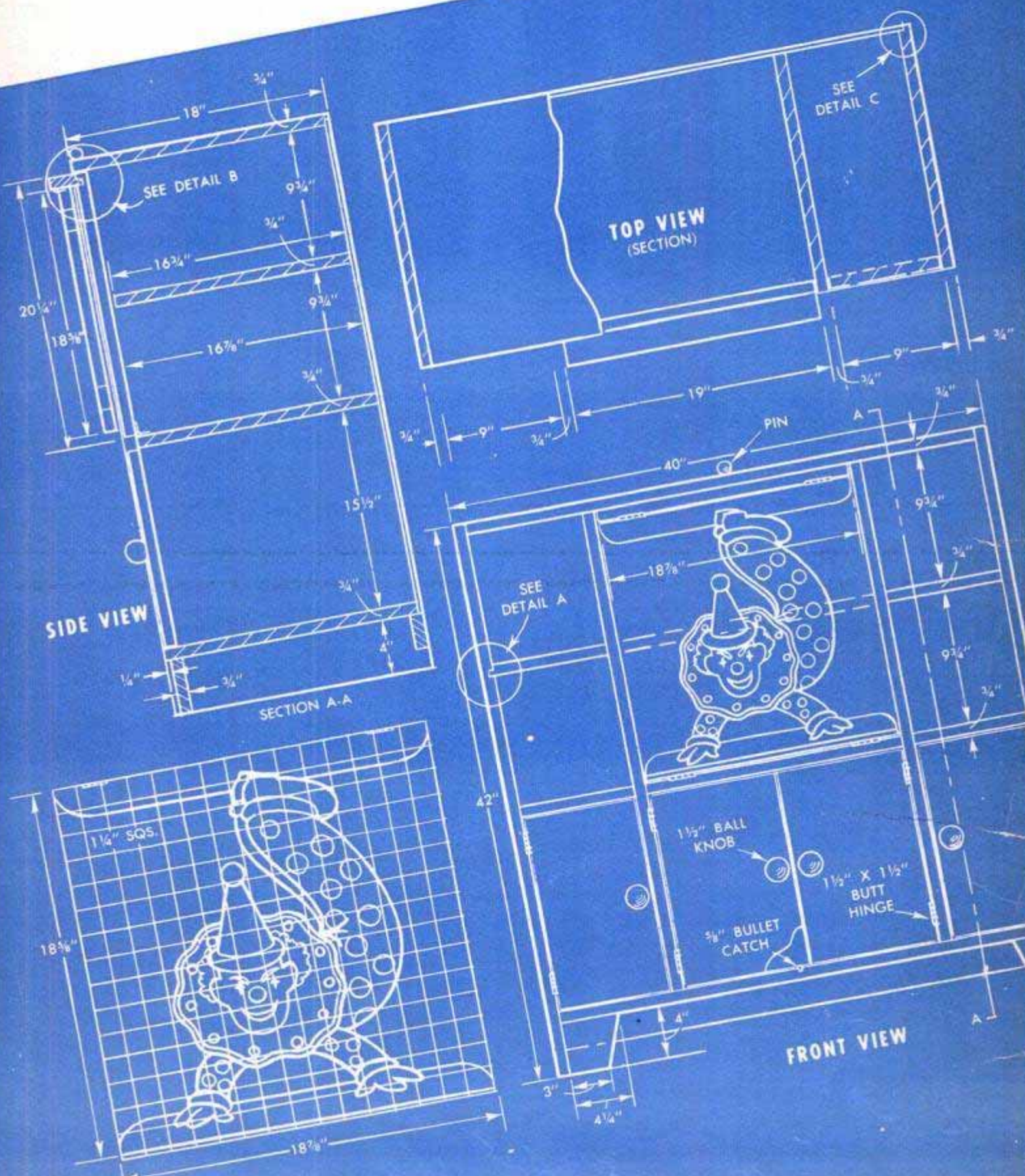
The drop-leaf table is held in closed position with metal or hardwood pin detailed at the right. The pin engages a hole drilled in the front edge of the leaf and is pulled upward by means of a ball-shaped wooden knob in order to disengage leaf

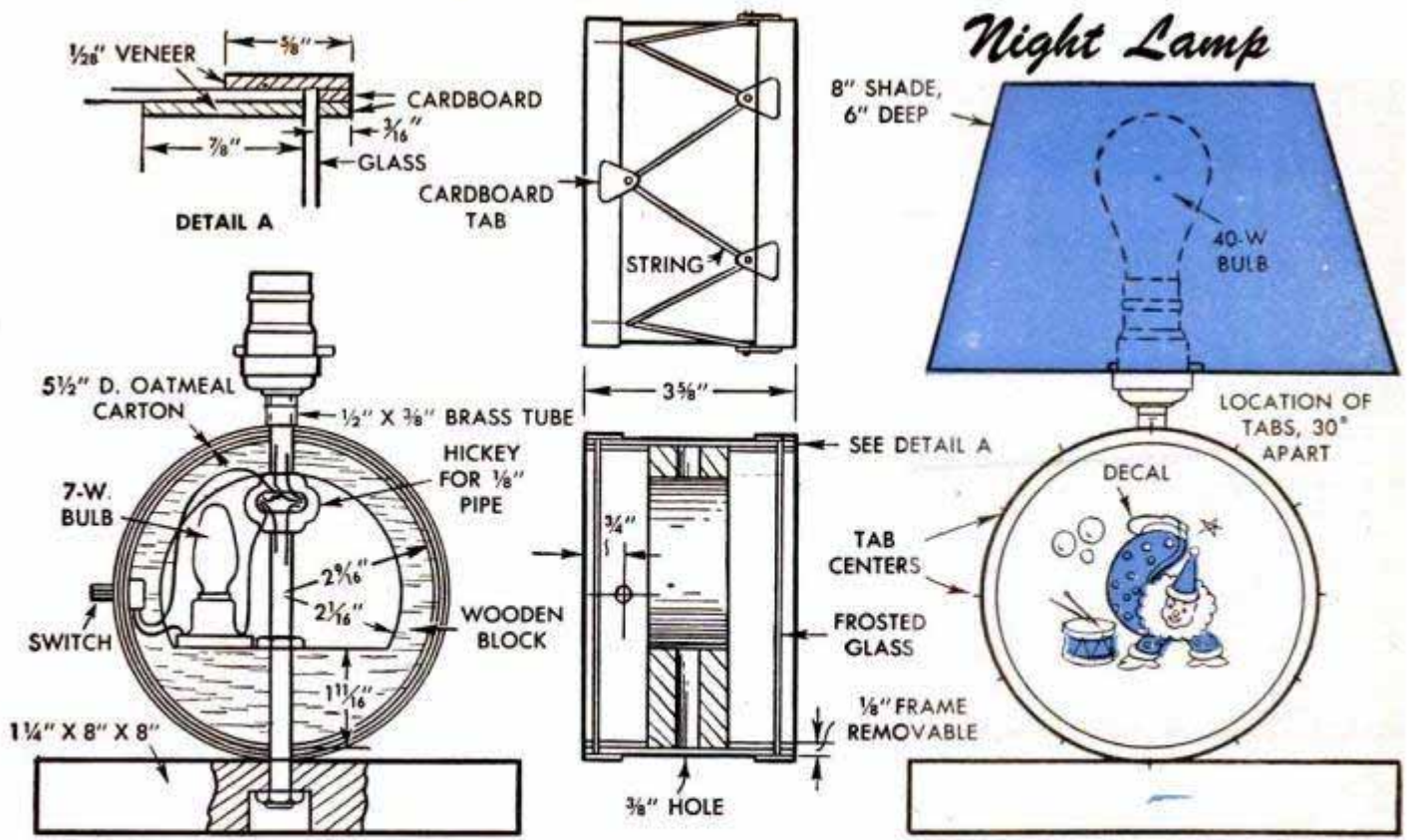


and back are of $\frac{3}{4}$ -in. plywood, the back being tenoned and glued in a blind groove plowed in the seat. Note that the ends of the tenon are relished, or cut back, to fit in the groove. Three holes are jigsawed in the back, as in the upper detail, and four holes are bored through the seat to receive the tenons turned on the splayed legs. The chair arms are doweled and glued to the supports which, in turn, are doweled to the ends of a crosspiece. The crosspiece

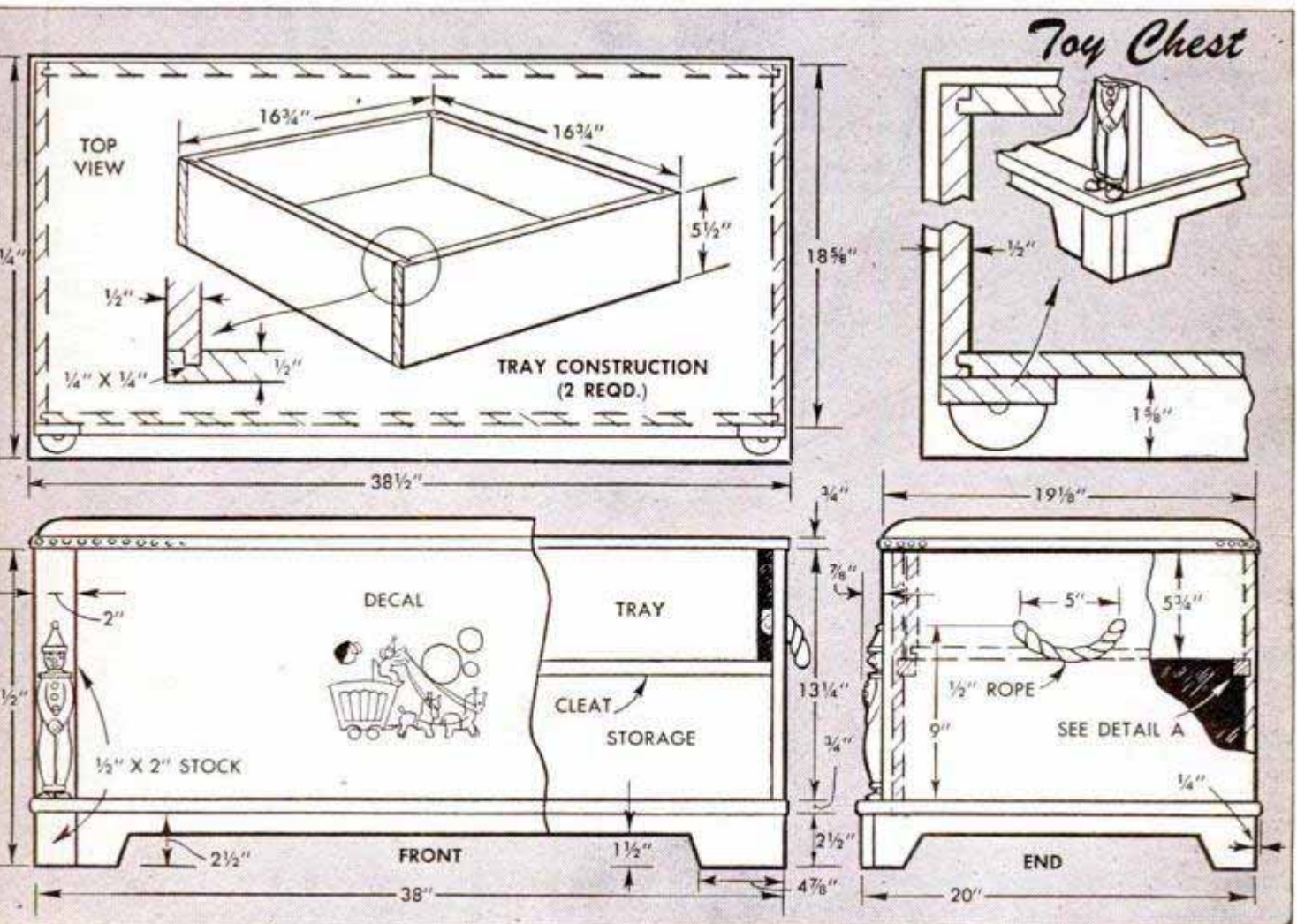
is screwed to the underside of the seat, the top edge of the crosspiece being beveled to fit the slant of the seat.

With its plastic-upholstered lid, the handy toy chest also serves as a window seat or bench. Two removable trays comprise the upper portion of the chest, and facilitate storing small items which otherwise would be "lost" in the bottom of the chest. Front,

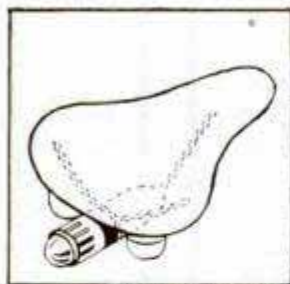




A drum-shaped base decorated with a phosphorescent decal retains the circus motif in this little night lamp. The drum shell is made from a cardboard cylinder, such as a section cut from an oatmeal carton, which is reinforced with a wooden block about 1 1/4 in. thick. Disks of frosted glass form the "heads" of the drum. These are held in place with spacer rings of 1/28-in. veneer on inside and laminated-cardboard frames on outside. The frames fit inside strips of veneer which form the rims of the drum. A threaded fixture pipe extends through the bottom of the drum to permit attaching an 8-in.-square wooden block. Lamp is wired as in the left-hand detail, the base block being drilled from the center hole to one side to provide an outlet for the lamp cord



Swinging Taillight on Bicycle Is Easily Seen by Motorists



To make the taillight on your bicycle attract attention of oncoming motorists, suspend it with small chains from the bicycle seat where it will swing back and forth in constant motion. The light in the detail is a two-cell unit that works in the same way as a flashlight, but any type light can be used. Three short lengths of small chain are attached to the sides and rear end of the light, and are bolted to the underside of the seat in the positions shown. The chains should be short enough to keep the light from striking any part of the seat.

R. Galuzzo, Chicago.

Holder for Slack in Electric Cord



A useful device, on which excess slack in an electric cord is wound and held, can be made from a $\frac{1}{8}$ x 1 x 6-in. length of pressed board or heavy cardboard. Drill a $\frac{5}{16}$ -in. hole, $\frac{1}{2}$ in. from each end and cut a slot from each hole to the end of the board. The surplus cord is wound on the holder and held by slipping the cord through the slots.

Removing Broken Setscrews

Removing a broken socket-head setscrew, or one on which the socket has been deformed, can be a real poser, especially if the screw is in a hard-to-get-at place. One way of doing the job is with a screwdriver. Drive the screwdriver lightly into the

socket and, placing a drop or two of penetrating oil on the head of the screw, turn the screwdriver bit with a small wrench. Another way is to select a socket-setscrew wrench of a larger size than the screw socket and grind a taper on the hex end. Then drive the tapered end lightly into the deformed screw socket until it fits tightly. Still another method that often works is to place a pin punch against the screw socket and upset it slightly by striking the punch with a hammer. This method usually will reform the socket sufficiently so that the screw can be turned out with the regular wrench. If the head of the screw is broken or chipped but still projects slightly above the tapped hole, it generally is possible to slot the broken end of the screw and remove it with a screwdriver.

LeRoy T. Rice, Syracuse, N. Y.

Comb Cases Store Small Tools

Pocket-comb cases make handy holders for small tools such as rulers, pencils or scribers. Tack the cases to the wall where the tools to be held will be kept convenient.

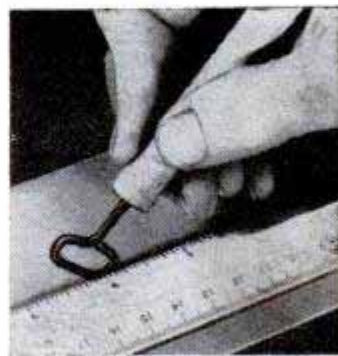


Hardening "Dusty" Concrete

If you have a concrete floor in your home that always seems "dusty," chances are that the condition can be corrected by hardening the surface of the floor with a zinc sulphate solution. Mix powdered zinc sulphate, 3 lbs., to water, 1 gal., and pour the mixture over the floor. Then scrub vigorously with a stiff brush but don't remove the solution. Instead, let it dry thoroughly, and then sweep the floor clean.

Can Key Scores Cardboard

Hobbyists who work with cardboard will find this tool useful for making press scores in cardboard so that it can be folded without breaking. The small key used to open most vacuum-packed, tin containers is force-fitted into a hole drilled in the end of a short length of $\frac{1}{2}$ -in. dowel. If a key is not readily available, a substitute can be made from a piece of stiff wire.

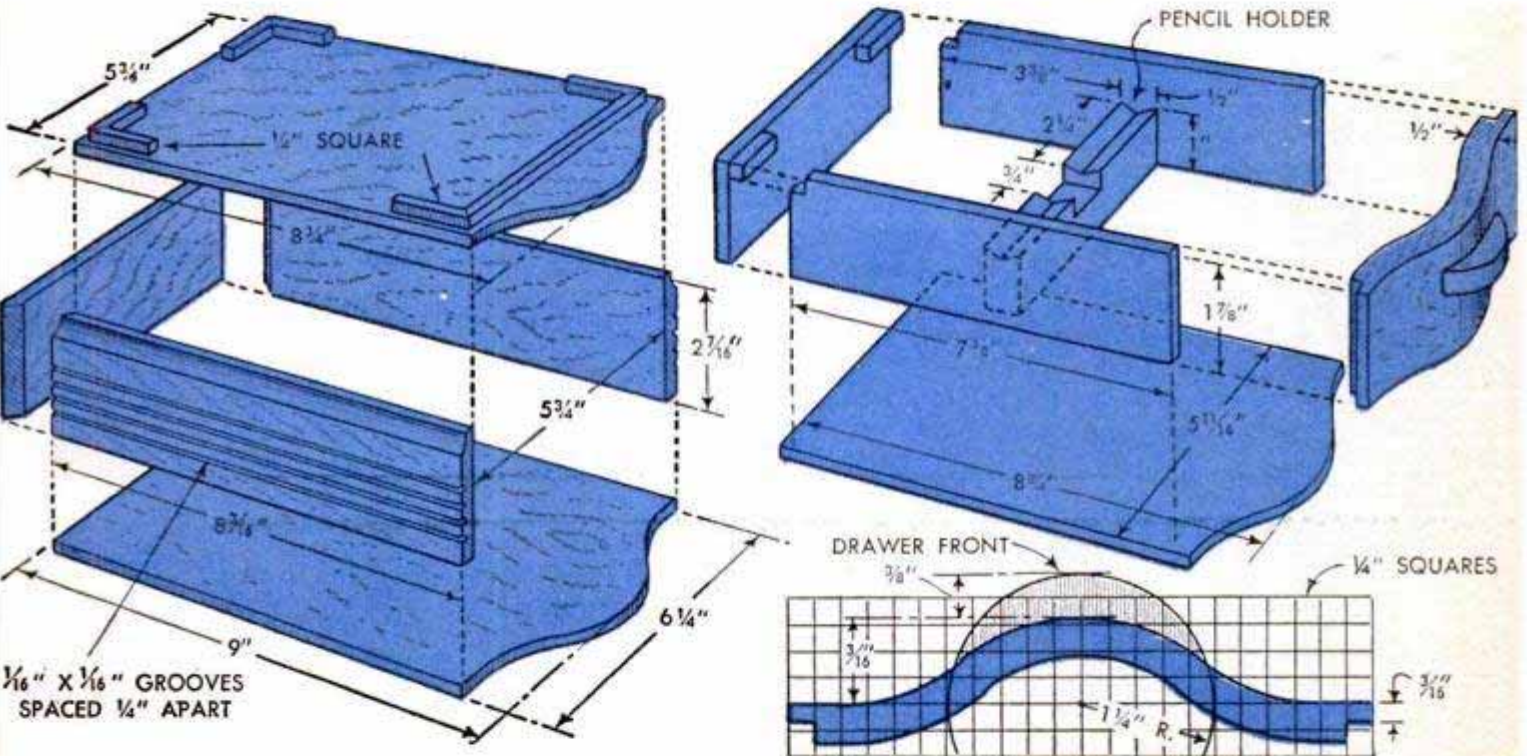


Telephone Stand

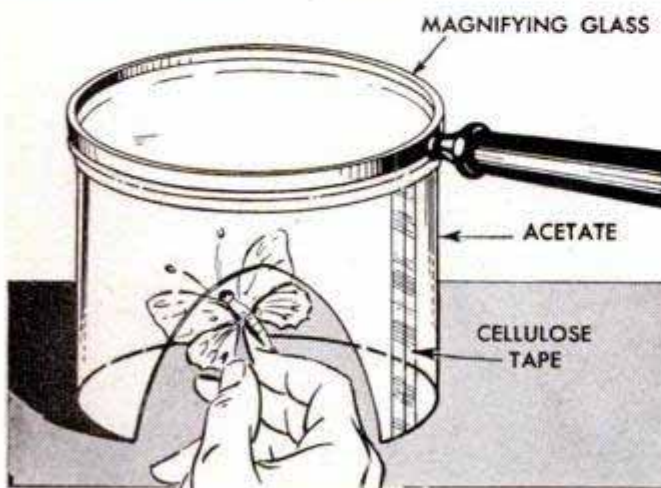
By James F. Casey



ATTRACTIVE design and day-to-day utility are features of this cabinet telephone stand. The partitioned drawer provides space for receipts as well as a phone-number file and, if desired, the top edge of the partition can be V-grooved and notched to serve as a pencil holder. Use $\frac{1}{4}$ -in. solid stock for exposed parts and $\frac{1}{4}$ -in. plywood for the drawer bottom, sides and back. The curved drawer front is bandsawed from $1\frac{1}{2}$ -in. stock, a cross-hatched detail below, giving the curve pattern for the drawer front and the forward ends of the top and bottom members of the cabinet. Strips of matching wood, $\frac{1}{4}$ in. square, are glued to the top to hold the telephone in place. Finish with varnish or enamel.



Clear-Plastic Cylinder Holds Magnifying Glass for Viewing



Butterfly collectors, or other hobbyists who collect small items that are usually viewed with a magnifying glass, will find this clear-plastic holder very convenient. It provides a steady support for the glass, thus leaving both hands free to handle the specimens, and the transparent sides allow unobstructed lighting of the object being viewed. To make the holder, bend a thin sheet of plastic to form a cylinder that just fits within the rim of the magnifying glass, joining the butting edges of the strip with cellulose tape. Then cut an opening in the holder, as shown, and set the glass on the top edge.—Ed Packer, Chicago.

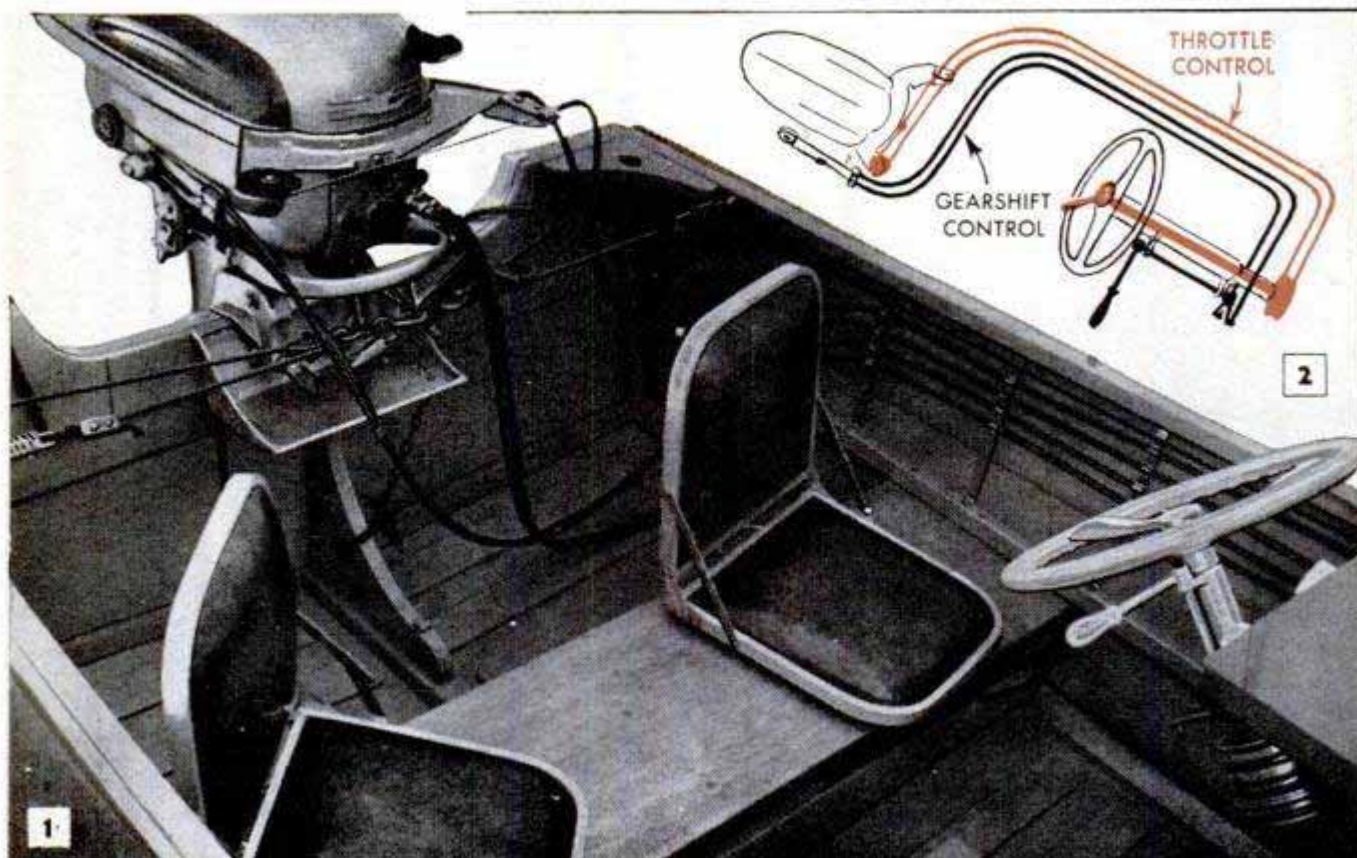


REMOTE CONTROL *for* GEARSHIFT OUTBOARD

By Clinton R. Hull

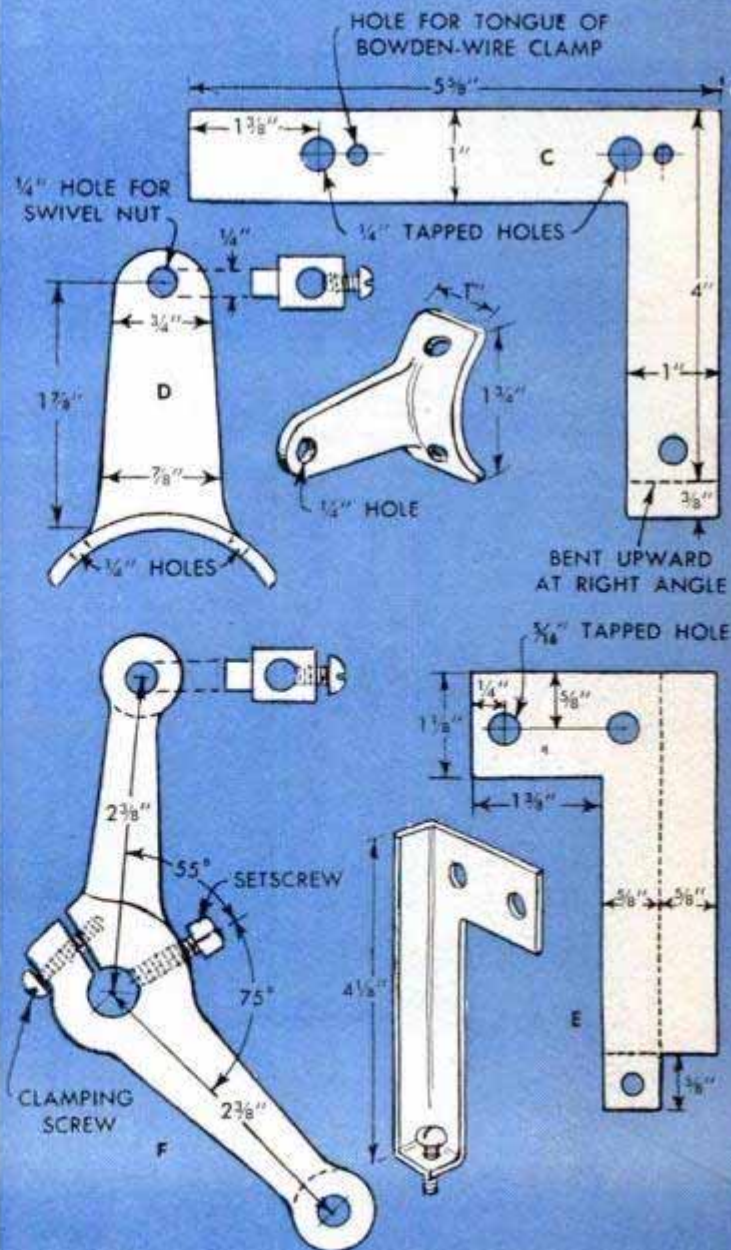
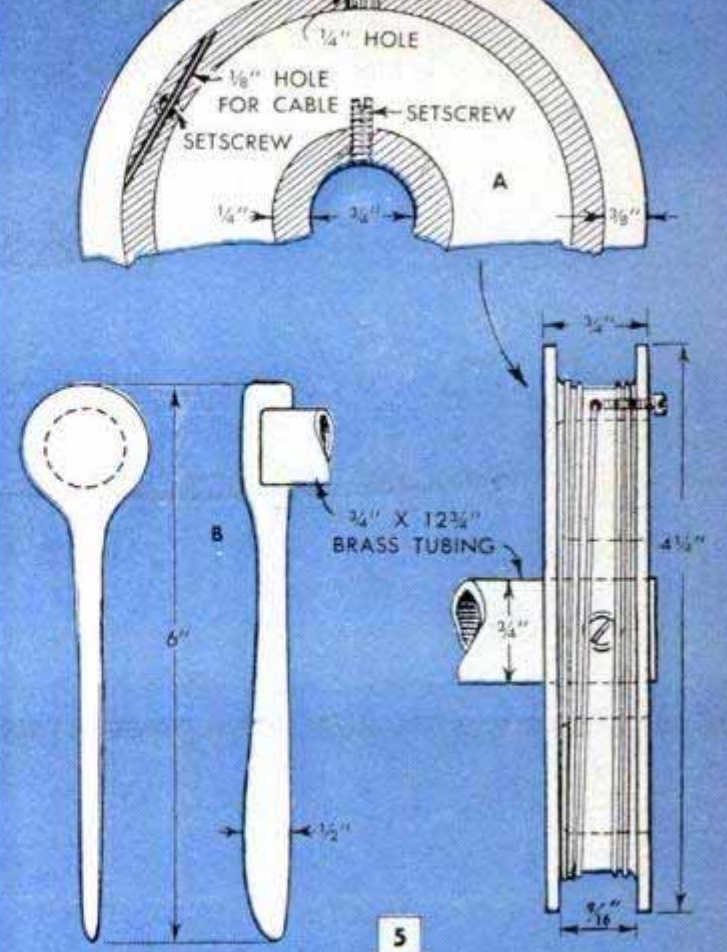
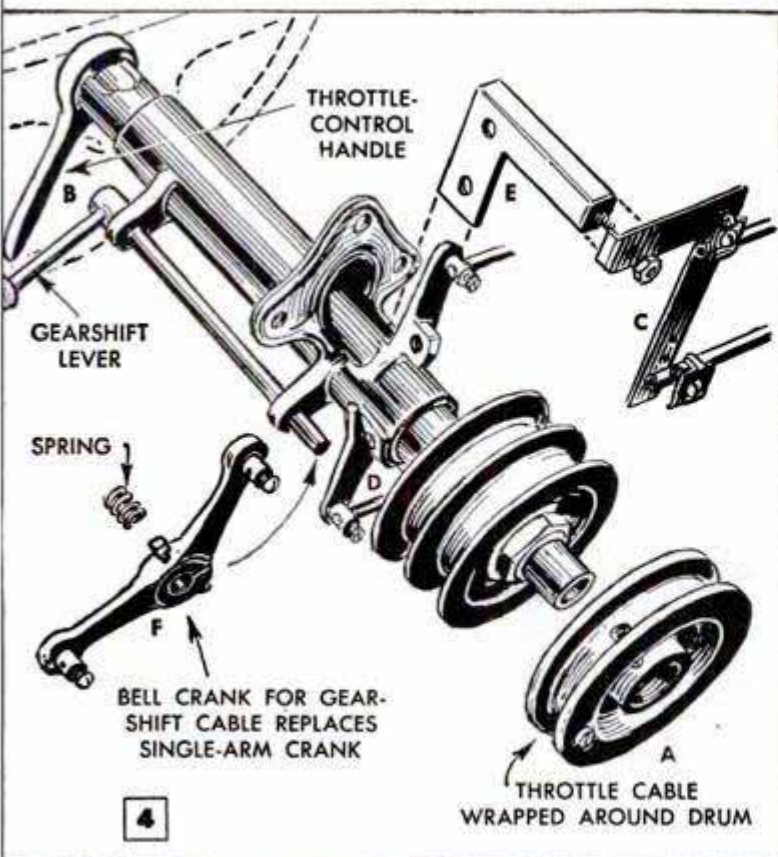
NOW YOU CAN fit your gearshift outboard motor with a remote control that gives you the safety, maneuverability, and smoothness of operation formerly enjoyed only by inboard boat owners. The principal features of the control units, designed by Joe Carver of Costa Mesa, Calif., are ease of construction, adaptability and positive action. Both the gearshift and throttle-control mechanisms operate without takeup or drag, a feature of importance in the control of high-speed craft. Both controls are mounted on the conventional outboard steering-wheel unit, such as the Kainer wheel. The designs of the control-support brackets that mount on the motor are quite easily changed to adapt them for use with various types of outboard motors and shift mechanisms.

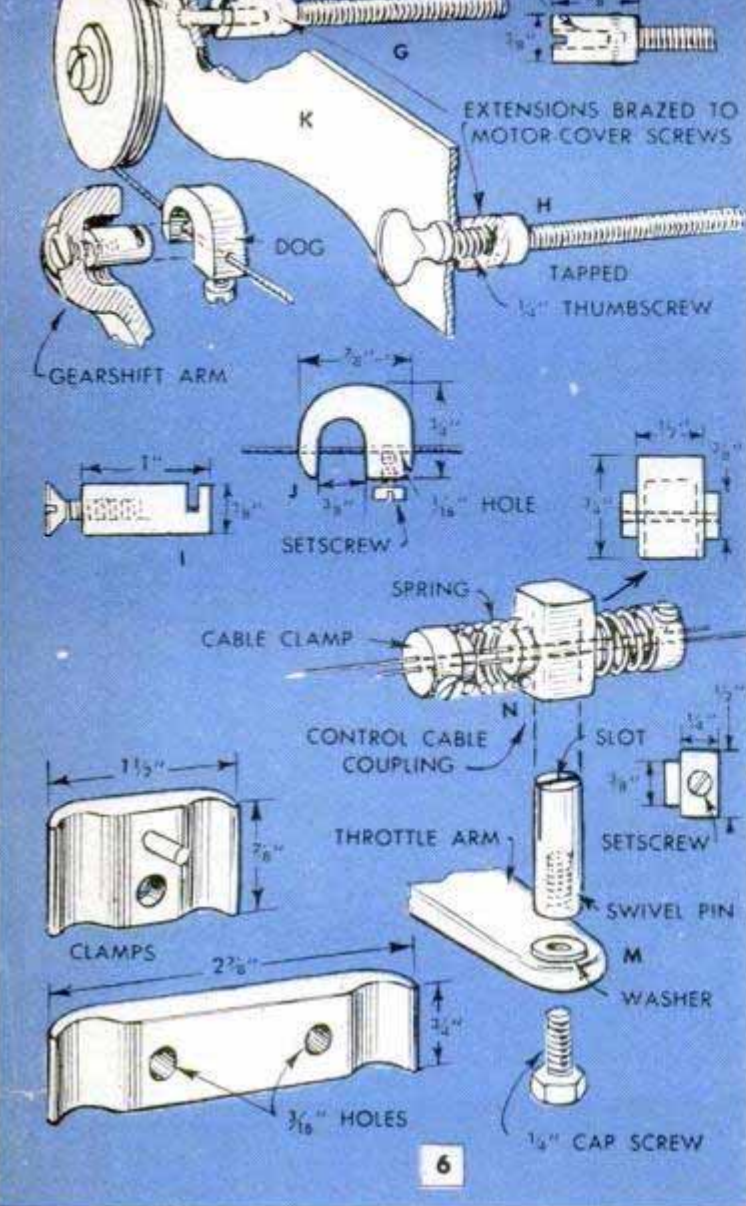
On most small boats of the runabout type, somewhat better balance will be obtained





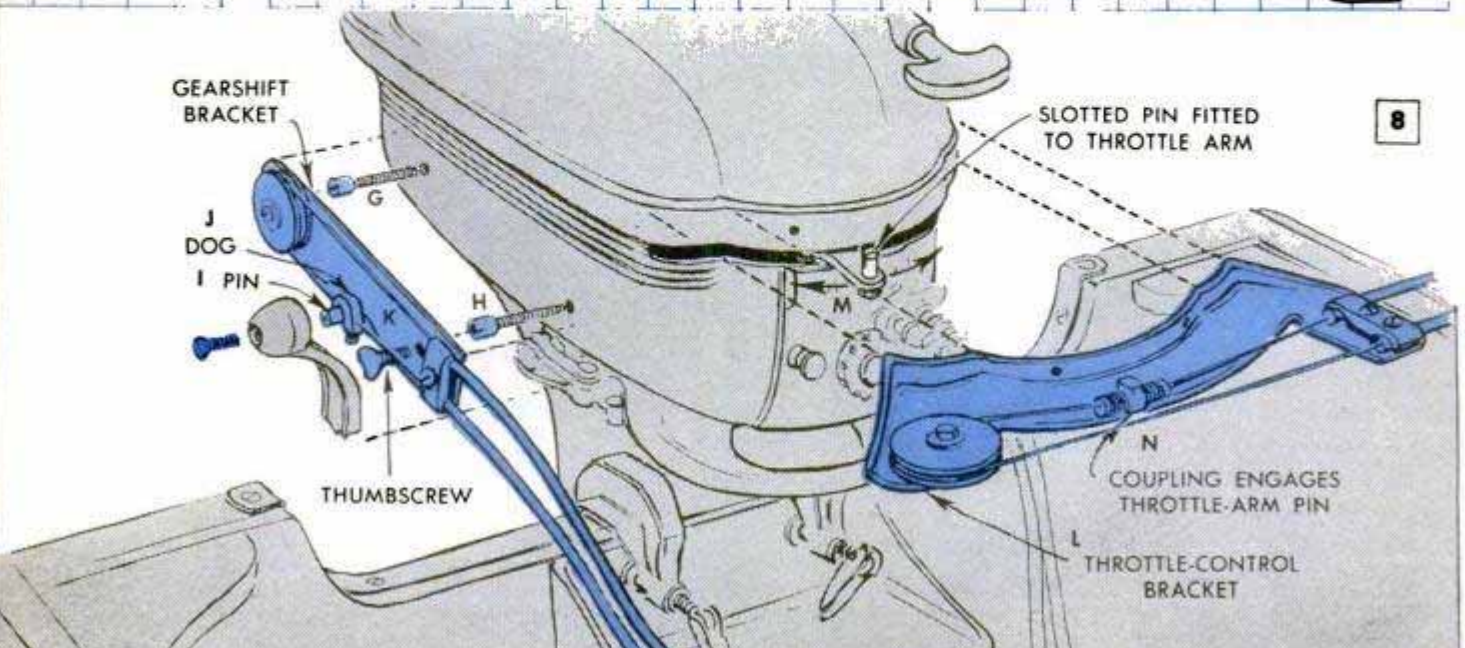
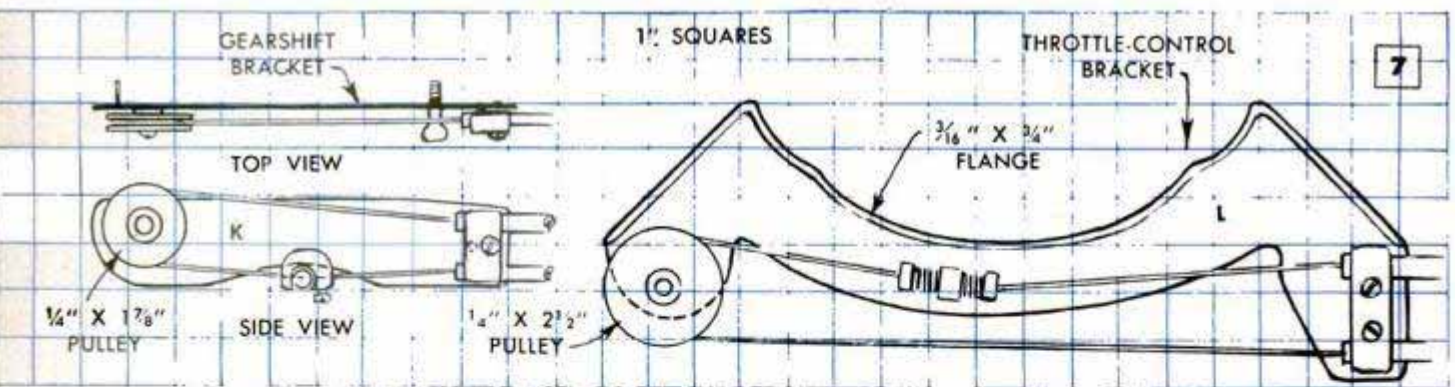
by mounting the steering wheel on a cowl aft of midships as in Fig. 1. In this case, the cowl and deck are open at the center to permit easy passage to the forward cockpit. The left-hand (port) section of the built-in cowl provides a support for the steering-wheel-and-control assembly and the space under the starboard section is utilized for storing an extra fuel tank. Figs. 1 and 2 show how the steering cables and the Bowden wires controlling the gearshift and throttle are placed along one side of the boat. The cables and wires are attached by means of special cable and casing clamps to metal straps which are screwed to the inwales and seat risers. The parts which are added to the standard steering-wheel unit are detailed in Fig. 5 and shown in place in Figs. 3 and 4. Parts A, B, D and F are aluminum castings. If you wish, you can make the wooden patterns and have the castings made at a local





foundry, or castings can be obtained from the designer at a nominal cost. The special parts C and E, which form the bracket supporting the Bowden-wire throttle control, are made from sheet metal. Note especially the location of the holes for the Bowden-wire clamps on part C, Fig. 5, and the position of the parts C and E in Figs. 3 and 4. The drum on which the throttle-control wires are wound is actuated by the throttle-control handle, B. Both parts are attached to a brass tube which passes through the steering column, Figs. 4 and 5, and forms the throttle-control shaft. When assembling the throttle control on the Kainer steering unit, the brass pin which passes through the original drum and steering column is removed to permit passage of the tubular throttle shaft. Two 10-32 machine screws replace the pin.

Figs. 6 and 7 detail the parts of the gearshift and throttle-control brackets, while Fig. 8 shows the parts in their relative positions on the motor. First, note the construction of the mounting screws, G and H, in Figs. 6 and 8. These are brass studs with 3/8-in. extensions brazed on. One extension is drilled lengthwise to take a 1/8-in. pin; the other is drilled and tapped for a thumbscrew. This arrangement makes possible the easy removal of the bracket, K, when the motor is removed from the boat. Although not shown, it will be necessary in some applications to provide the studs, or screws, with jam nuts. The pulley is mount-



ed on a shouldered brass spindle, not detailed, which is center-drilled and tapped for a machine screw. The shouldered end of the spindle is threaded to turn into a tapped hole in the bracket, K. Turning a nut onto the projecting threaded end holds the spindle firmly. After the pulley is placed on the spindle it is held in position by a machine screw and washer as shown. The same construction is used when assembling the pulley on the throttle-control bracket. Both pulleys are turned from aluminum to the diameters given in Fig. 7. The dog, J, parts of the cable coupling, N, and the swivel pin, M, should be made from brass or bronze, preferably the latter. Note that the swivel pin is slotted at the upper end to provide clearance for the ends of the Bowden control wires, or cables. The clamps are shouldered to provide spring seats. Note also that the wire from the right, Fig. 6, passes through the first clamp, through the swivel block and through the second clamp in which it is held with a setscrew. The second wire is inserted from the left, passes through the left-hand clamp, through the swivel block and the end is held in the right-hand clamp by means of the setscrew. This arrangement places the springs under compression, giving necessary flexibility to the control. There's one more important detail in the assembly of the coupling: The slotted pin, M, must swivel on the throttle arm and, to assure this, use a cap screw that will bottom in the tapped hole without drawing the parts tightly together. If necessary, file the end of the cap screw. The casing clamps for both controls are easily made by filing the parts from brass or aluminum to the size and shape required. Rubber-lined casing clamps are available from marine-hardware dealers. The throttle-control bracket, L, Figs. 7 and 8, is cast aluminum, and, as detailed in Fig. 7, is adaptable to only one type of outboard motor. Minor changes will have to be made in the wooden pattern if the bracket casting is to fit other types of motors. Of course, it also is practical to make the bracket from 1/4-in. aluminum and support it by means of L-brackets fastened to the motor housing with thumbscrews. After the units have been installed, some adjustment may be necessary to assure that they operate properly. It should be remembered that all fastenings and parts must be of corrosion-resistant metals such as brass, bronze or aluminum. Galvanized parts are the second-best choice. When checking the units after assembly, be sure that the parts operate freely throughout the entire range of movement. A tight pulley or a sharp bend in the control wires may cause binding at some point. This fault should be corrected before the units are placed in service.

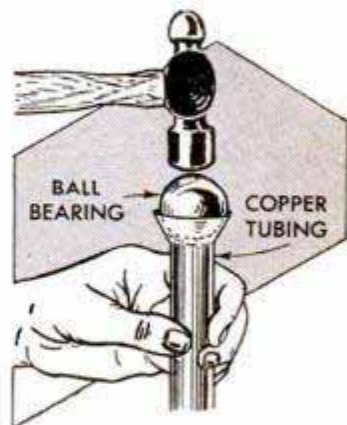


Quickly Constructed Trellis

Because of the simplicity of its design, this sturdy trellis can be built in only a few minutes. It is particularly suited to climbing roses planted near a house, garage or other building. The three upright members are lengths of 1 x 2-in. stock which are clamped together and drilled at 8-in. intervals to receive the 1/2-in.-dowel cross members. The lower ends of the uprights are set into the ground, while the upper ends are attached with angle brackets to the overhang of the roof.

Ball Bearing Flares Copper Tubing

Copper tubing can be flared by using a ball bearing slightly larger than the inside diameter of the tube. Simply lay the bearing on the end of the tube and tap it gently with a hammer until the desired degree of flare is obtained.



☞ When you take a bathing cap out of storage, rub it with a mixture consisting of a small amount of household ammonia and soapy water. This will make the rubber pliable so that there is less danger of it splitting when placed on your head.



Photos by Irwin Nord

It's easy to adapt your contact printer to serve as a retouching stand, copy easel and negative viewer

Extra Service from YOUR CONTACT PRINTER

By Alan R. Harris

BY MAKING a few simple changes in the electrical circuit and adding controlling switches, a rheostat and a low-wattage lamp, your contact printer can be used for retouching, copy easel for transparencies, tracing easel, light box for register of bas-reliefs, and as an accessory for solarizing negatives and prints. The changes also improve the efficiency of the printer, as fast projection papers and slow negative materials may be used in contact printing. Nearly all print-control operations in connection with enlarging are possible.

As you will see in the wiring diagram on the opposite page, a rheostat of 2000 to 3000-ohm capacity is placed in the printing-light circuit to control light intensity when using high-speed printing papers. As the regular printing light is not suited to printing at very low intensities, a 6 or 8-watt bulb is located in a socket directly under the center of the printing glass, and between the glass and the regular printing light. A separate switch makes it possible to select either of the lights, and an on-off switch is wired into the circuit as an auxiliary to the regular platen switch. The

on-off switch is used for making very short exposures on fast papers and it also is especially useful when two or more units are being registered on the printing glass. After register has been attained, the platen is lowered and locked in position before making the exposure with the on-off switch.

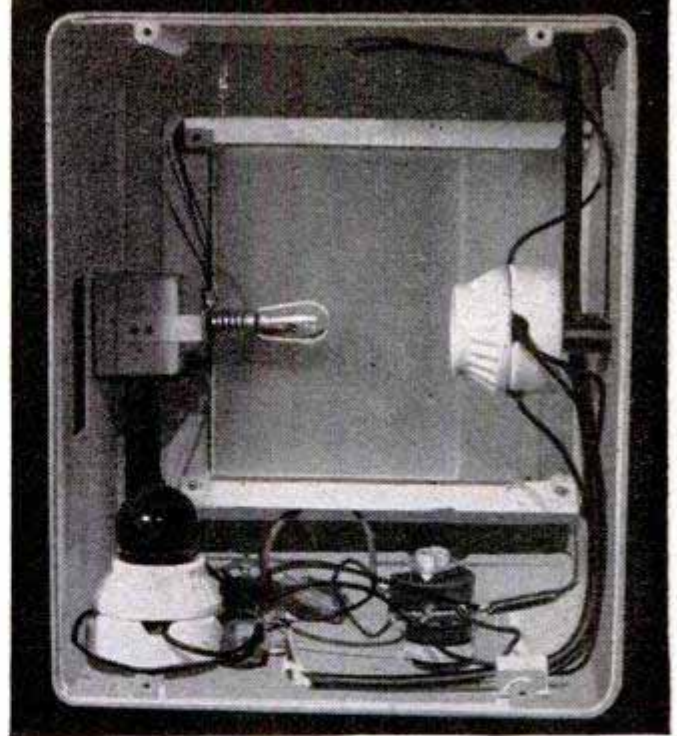
Additional switches, 6 or 8-watt lamp and rheostat are installed in the printer to increase versatility



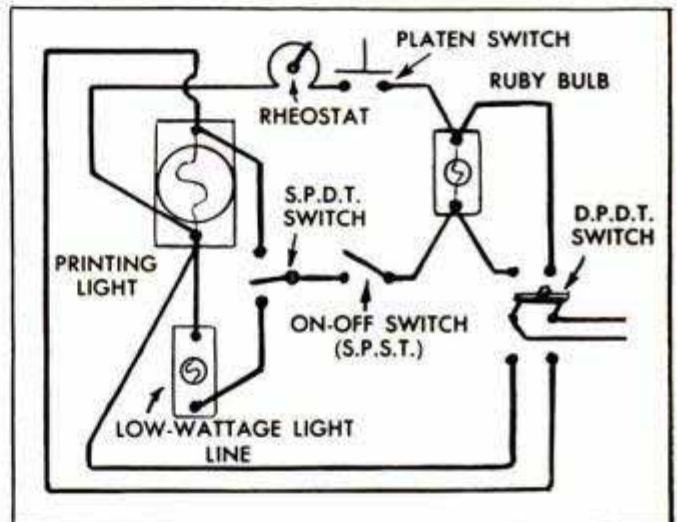
The lower photo on the opposite page pictures the extra electrical units which are added to the regular printing-box circuit, and the photo at the right shows these units in place in the printing box. Note also from the wiring diagram that one switch shunts current past all other controls directly to the regular printing light. Using this circuit, the light comes to full intensity and remains on until the switch is turned to the off position. With the printing light controlled by this switch, the platen can be lowered and locked, and the box used as a retouching easel, for dodging with a soft pencil, as a negative or transparency viewer and for vignetting, diffusing, or other methods of print control.

Before installing the new wiring and switches, remove all the old wiring. Locate the switches and rheostat on the front of the box as in the lower right-hand photo. Then bring in the wiring and make the necessary connections. When installing the wiring inside the box make sure that no wires pass underneath the printing glass in a position to cast a shadow either from direct or reflected light. Before plugging in the new circuit, check all connections carefully, as a short may seriously damage the rheostat. It's also important to check the box in the darkroom for light leaks. Plug the box into the darkroom circuit, close the platen and switch on the printing light. Examine the box thoroughly for leaks, especially around the newly installed switches and rheostat. On some metal printing boxes it may be necessary to install switches and wiring leads with rubber washers and grommets to prevent leaks. Also on some types of boxes it is possible to install an opal glass between the printing glass and the light source to provide even more uniform light distribution. The printing bulb should be of the frosted type, but the small bulb should be clear.

The printing light can be controlled with a separate on-off switch for retouching or negative viewing



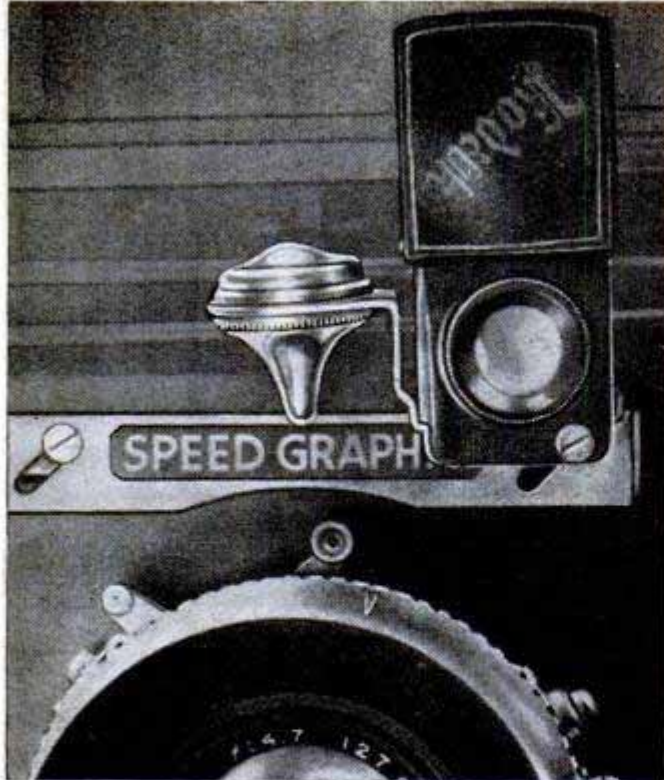
A 6 or 8-watt clear bulb is placed between the printing light and glass for printing at low intensities



This wiring diagram shows how the switches and rheostat control the electrical circuit to the three lights

Front of printing box is used as a panel for installing controls. After the installation, test box for light leaks





Screw-Eye Thermometer Holder

When not in use, a stirring-rod thermometer can be stored safely and conveniently in a screw eye, which has been turned into the edge of an overhead shelf. If desired, the inside surface of the opening in the



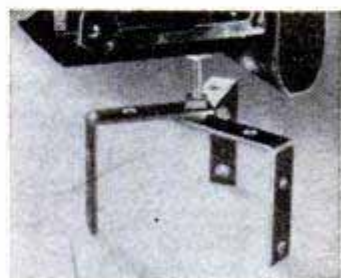
screw eye can be padded by applying several thicknesses of adhesive tape. This will prevent the possibility of the thermometer being broken when dropped into place in the holder.

Waist-Level Finder on Lensboard Aids Taking Low-Angle Shots

One photographer finds that it is more convenient to shoot from the hip and take low-angle shots if a waist-level view finder is mounted on the lensboard of his press-type camera. He simply fastened a waist-level finder to his Speed Graphic with one of the screws that holds the lensboard slide lock.—Julian A. Belin, Bronx, N. Y.

Tripod for Table-Top Photography Improvised From Angle Brackets

Just the thing for table-top shots, this little tripod is formed by bolting together three angle brackets. A single $\frac{1}{4}$ -20 stove bolt is passed through the outer hole in one arm of each bracket, and a nut, used to hold the brackets in place, is left loose enough to permit the tripod to be folded for carrying in the coat pocket. A second nut, turned on the bolt, locks the camera on the tripod.



David Findlay, Brooklyn, N. Y.

Fingerprint Causes Overexposure

If you occasionally find a negative with bright areas that are fuzzy, though the image is sharp, look for a large fingerprint or grease smudge on the lens. A lens soiled in this fashion will pass the sharp image but will cause the brighter areas to receive more exposure and will give an effect similar to that produced by halation.

Popular Mechanics Book Shop

POWER TOOLS AND HOW TO USE THEM

To get the most from your home-workshop power tools, it is necessary to know how to use them and the various types of operations that can be performed on them. In this book, Mr. Lammey, who is an assistant Crafts Editor of *Popular Mechanics Magazine*, not only tells what can be done with each tool, but illustrates the various operations. No matter whether you have only one tool or a complete shop, the book will pay for itself on just one of your projects. Send \$2.50 and it will be delivered to your door.

MOTORIST'S FIX-IT BOOK

By enabling you to make just one small repair or adjustment on your car, this book will

return its price of \$2.00 to you. Hundreds of such repairs are given so that you can keep your car operating at top efficiency and thus save money on gas and oil and increase your motoring pleasure.

RADIO-TV AND ELECTRONICS HANDBOOK

If you are like most owners of TV sets—dislike being without your set while it is being adjusted or repaired—this book will enable you not only to make some minor repairs and adjustments, but it also will help you to keep your set in top condition so that you get a good picture. It will also assist you in determining the causes of many major ailments that should be handled by your repairman. Price \$2.50.

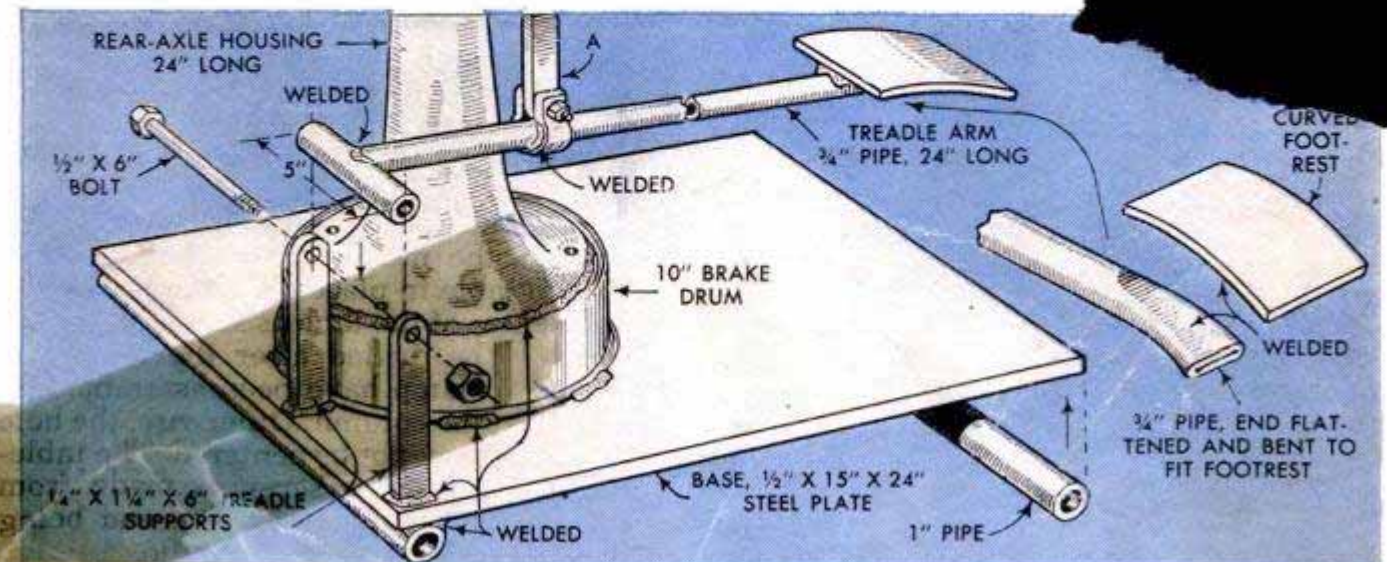
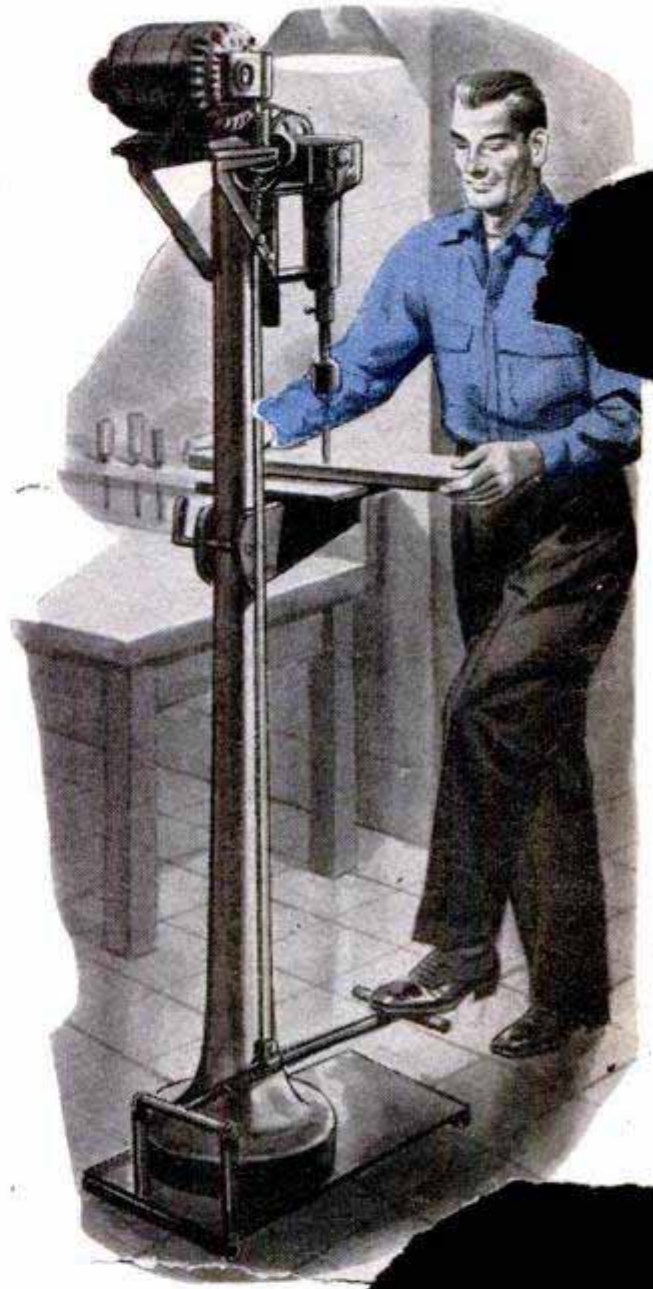
All books available from Popular Mechanics Book Dept., 206 East Ontario Street, Chicago 11

DRILL PRESS *made from auto parts*

By L. H. Houck *X-246*

UNUSUAL simplicity of design and construction are features of this inexpensive drill press that will appeal to craftsmen and shop mechanics who like to make their own power tools. The spindle is motor driven through bevel gears adapted from an auto-differential spider, and is actuated by foot feed only, no hand feed being provided. This feature eliminates most of the accurate machine work which otherwise would be necessary. The motor, motor bracket and drill head lower as a unit and the head is returned to the original position by a tension spring.

Details below show the construction of the base and the lower end of the column. The steel base plate should be large enough for mounting the treadle supports in the position shown. The construction of these parts will be clear from the details and notes, which give the important dimensions. Likewise, details on page 197 show the construction of the combined slide and motor support, the spindle assembly and the drill table. First, note the part A, below, and also part A on page 197. The part labeled A in both details is the long treadle link between the treadle arm and the drill head. The lower end of the link is attached to the treadle arm by a U-shaped clamp,



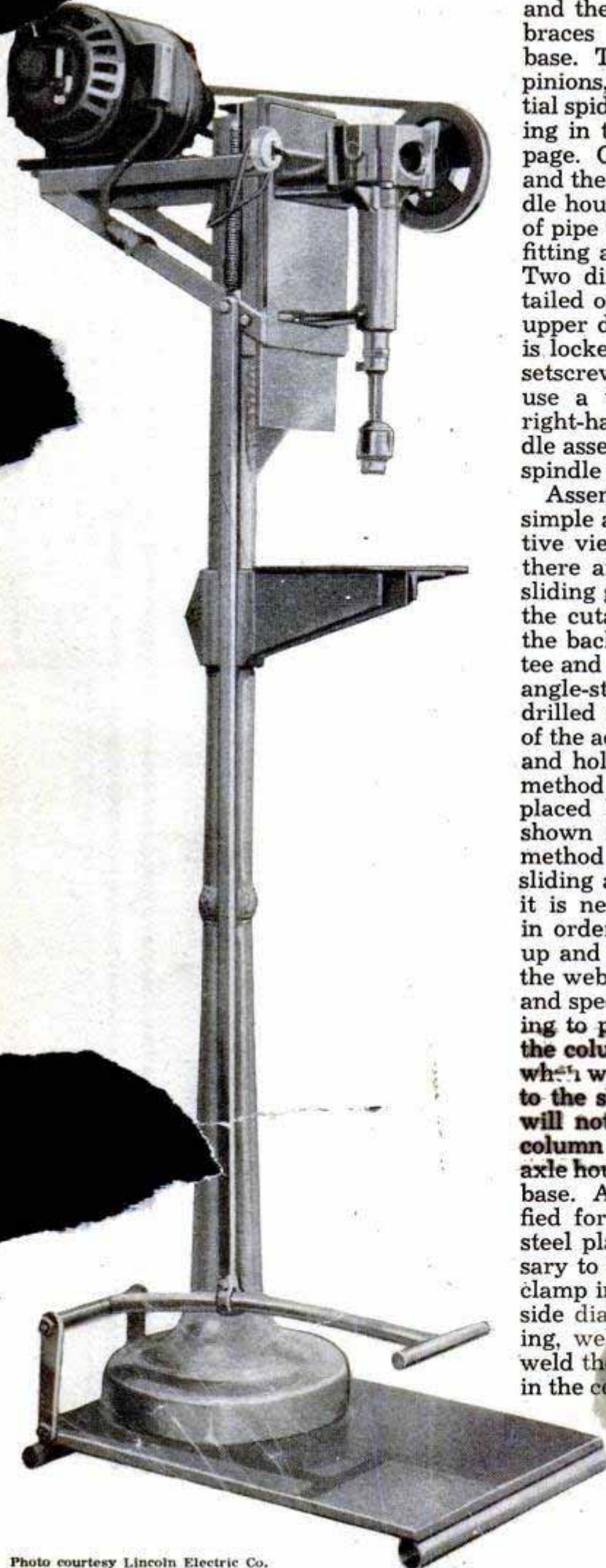
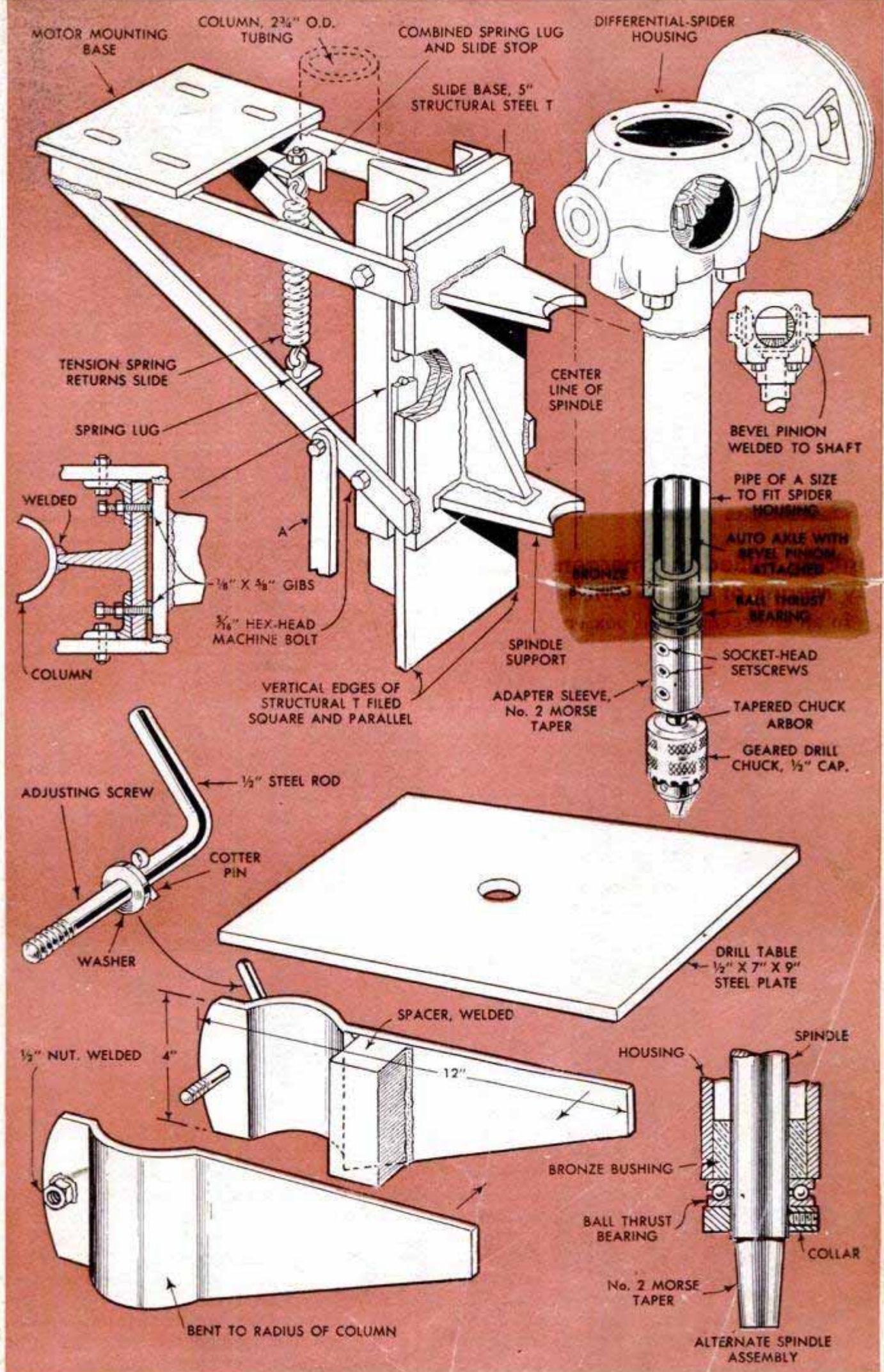


Photo courtesy Lincoln Electric Co.

and the upper end is bolted to one of the braces supporting the motor mounting base. The spindle is driven by two bevel pinions, which are taken from the differential spider, and mounted in the spider housing in the manner shown on the opposite page. One pinion is welded to the spindle and the other to the pulley shaft. The spindle housing is formed by welding a length of pipe to the spider housing as shown, and fitting a bronze bushing at the lower end. Two different spindle assemblies are detailed on the opposite page, the one in the upper detail using a tapered sleeve which is locked on the end of the spindle with a setscrew. On this spindle it is necessary to use a tapered chuck arbor. The lower right-hand detail shows an alternate spindle assembly in which the lower end of the spindle itself is tapered.

Assembly of the sliding drill head is quite simple and is clearly shown in the perspective view. However, it will be noted that there are two methods of assembling the sliding gibs. By the first method, shown in the cutaway perspective, the gibs ride on the back face of each leg of the structural tee and are placed between the tee and the angle-steel guides. Two blind holes are drilled in each gib and the threaded ends of the adjusting setscrews enter these holes and hold the gibs in place. In the second method of mounting the slide, the gibs are placed between the slide and the tee as shown in the sectional view. This latter method results in an exceptionally smooth sliding action but has one disadvantage as it is necessary to slot the leg of the tee in order to permit the setscrews to move up and down with the head. In any case, the web of the tee is welded to the column and special care must be taken while welding to position it parallel with the axis of the column. **The same care must be taken when welding the spindle-support brackets to the sliding head as, otherwise, the drill will not run true.** The lower end of the column is welded to the upper end of the axle housing which forms a part of the floor base. Although $\frac{1}{2}$ -in. steel plate is specified for the drill table, $\frac{3}{8}$ or even $\frac{1}{4}$ -in. steel plate may be used. It will be necessary to heat the two members of the table clamp in order to bend them to fit the outside diameter of the column. After bending, weld the members to a spacer, then weld the table in place. Although the hole in the center of the table is shown, it should be drilled after the table and clamp have been assembled on the column. Otherwise, the hole may not be centered. The table-adjusting screw is made from $\frac{1}{2}$ -in. steel rod, one end being bent to form a handle.

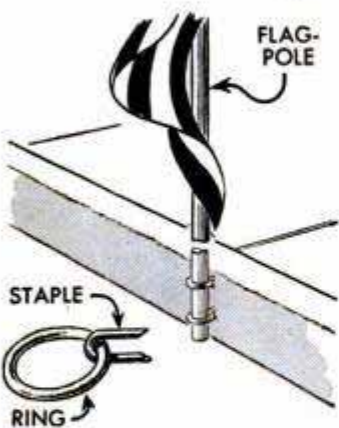




Battery Pulled in Emergency by Means of End Wrenches

In an emergency, two box end wrenches can be used to lift a battery out of a car. The wrenches should be just large enough to fit snugly over the terminals of the battery. In lifting, hold the wrenches at such an angle that they will wedge against the terminals in the same manner as a regular battery puller. Letting the handles touch, while in contact with the terminals, will, of course, short the circuit.

Sidewalk Flag Held Upright With Metal Rings



Instead of the usual dirt-catching socket in a sidewalk for supporting a flag, one store owner had large staples and rings placed in the edge of the sidewalk as indicated. Holes, drilled in the curb, were fitted with lead anchor shields to receive the staples.

The rings support the flag just as rigidly as a socket and, when not in use, fold down close to the walk out of the way.

Two squares of sandpaper tacked to the edge of a drawing board come in handy—one for sharpening pencils, and the other one for cleaning erasers.

Paper Stapler Mounted on Paddle Is Easy to Hang Up

To keep his stapler conveniently at hand, yet out of the way, one shipping clerk mounted it on a paddle-shaped base. He drilled a hole in the base so that it could be hung from a nail on the wall above his desk. The stapler is convenient to use when mounted on a paddle, and is not likely to be knocked off the packing bench or thrown carelessly into a drawer.



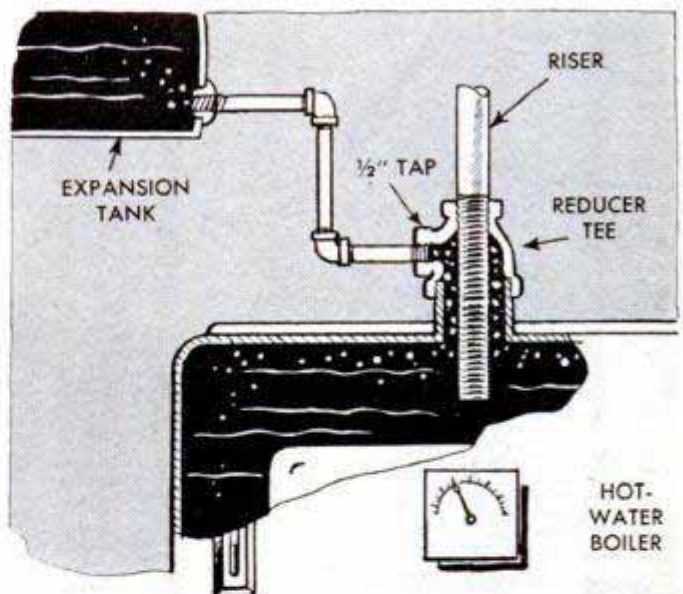
The stapler is convenient to use when mounted on a paddle, and is not likely to be knocked off the packing bench or thrown carelessly into a drawer.

Cork "Seats" Improve Thumbtacks

Thin drawing paper, especially tracing paper, which has a tendency to tear away from thumbtacks, can be held firmly in place by using tacks having thin, cork pads under the heads. Cut slightly oversized from small cork stoppers, the pads are simply pushed over the points of the tacks.

Richard Hanscom, Elmhurst, Ill.

Air Outlet for Hot-Water System

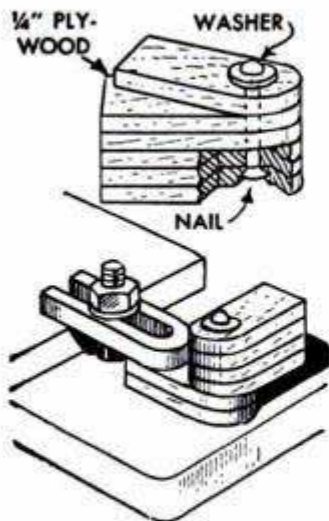


If you have had trouble eliminating air in water-heating systems, try this hook-up. Instead of connecting the water line to the boiler with the usual reducer, use a reducer tee having a side opening to take 1/2-in. pipe. By running a line from the side of the tee to the expansion tank, and turning the riser far enough to extend several inches into the boiler—but not far enough to contact the second section of the boiler—air bubbles by-pass the riser and enter the tank.

Gerald D. Wickham, Iowa Falls, Iowa.

U-Clamp Height Adjustments Made Using "Battery" of Shims

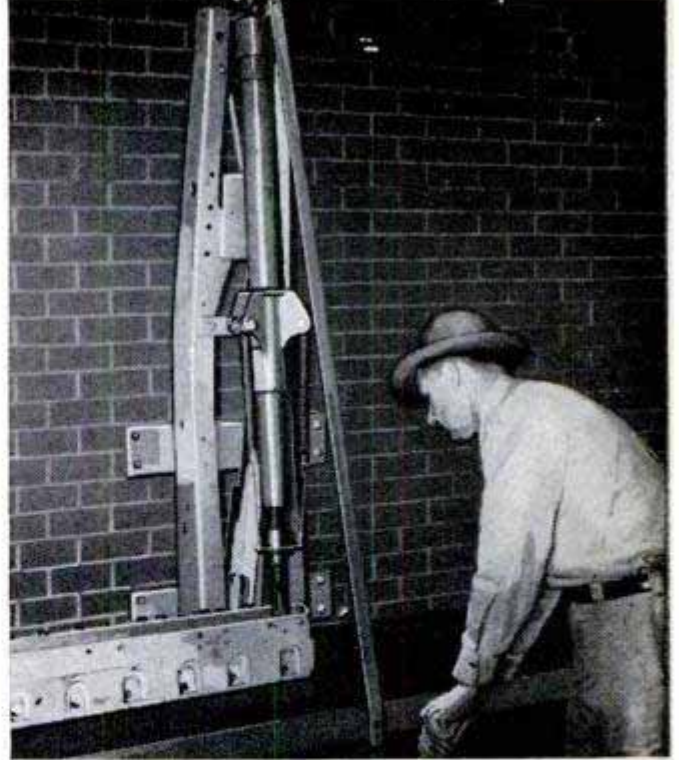
When clamping irregularly shaped work on the drill-press table or other machine, and the clamps used are the older-type



U-shaped clamps — sometimes called "horseshoe" clamps—it's handy to have adjustable shims which can be set to the correct height under the heel of the clamp. The shims can be built up as a unit by stacking several thicknesses of 1/4-in. plywood and sawing to size and contour on a bandsaw. Drill

a hole through the stack near the rounded end for a rivet. Countersink the head of the rivet in the lower shim so that it will clear the table surface and peen the rivet loosely so that the separate leaves of the shim, or pad, will swing sidewise easily. In use, place the work, locate the clamp and simply slide the pad under the heel. It will adjust automatically to the correct height, as excess leaves of the pad will swing sidewise when the battery is pushed against the heel of the clamp.

Clifford T. Bower, London, England.



Easily Installed Airplane Jack Makes Useful Hydraulic Press

An airplane jack, mounted on the wall as shown, makes an effective hydraulic press in this mechanic's shop. This particular jack is used primarily for installing new valve seats in overhead-valve cylinder heads. However, such a jack can be readily adapted for use on various other pressing jobs often called for in the shop.

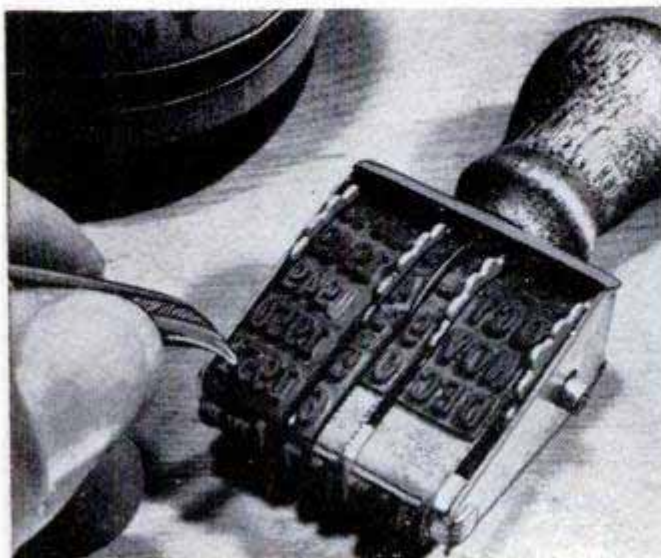
L. H. Houck, Jefferson City, Mo.

First Turn Off the Electric Current When Extinguishing a Burning Motor

Suppose an electric motor in your shop should suddenly burst into flames? Your first thought should be to turn off the current at the main switch. Turning the motor switch is not sufficient. Then use your fire extinguisher — you should have one for

such an emergency, filled with carbon tetrachloride or carbon dioxide. If you do not have one, smother the fire with a blanket, tarpaulin or other heavy cloth. Having neither extinguisher nor the cloth, cover the motor with dirt, sand or ashes.

Rubber Stamp Brought Up-to-Date by "Resetting" Type

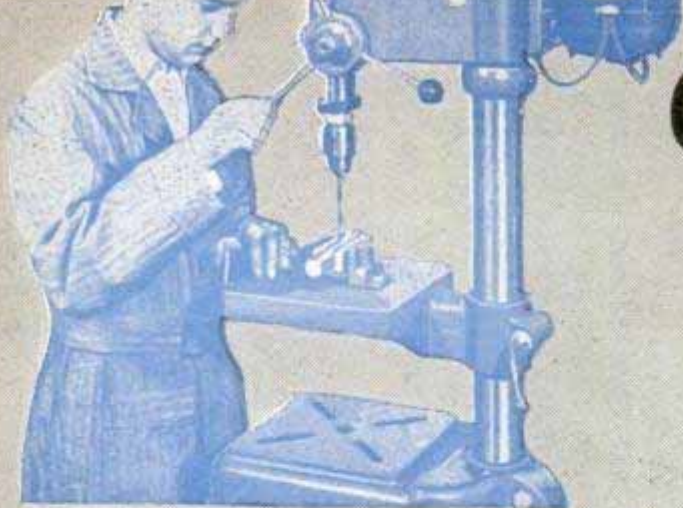


If your date stamp has become "dated," you can change 1950 to 1951, for example, by replacing the "0" in 1950 with a "1" cut from 1949. Cut off the number with a razor blade and "transplant" it by cementing in place, being careful to align it perfectly with the other numbers.

Louis Hockman, Sherman Oaks, Calif.

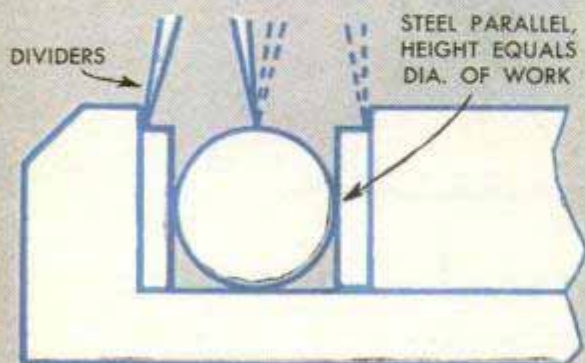
Steel Slag "Boiled" From Torch Tip

The opening in a brass acetylene-torch tip can be cleaned of slag metal, or even a chip of a steel drill or cleaner, by boiling the tip in an alum solution. Use a heat-resistant container and as much alum as a quart of boiling water will dissolve.

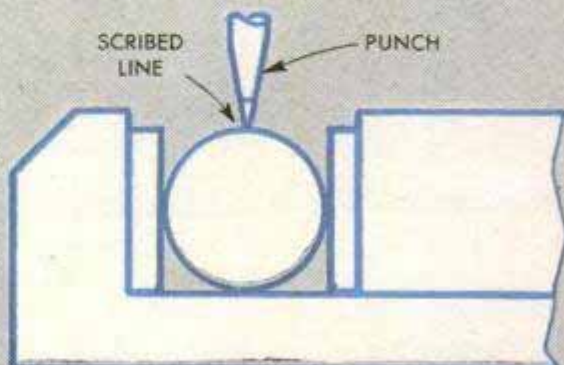


CROSS-DRILLING ROUND WORK

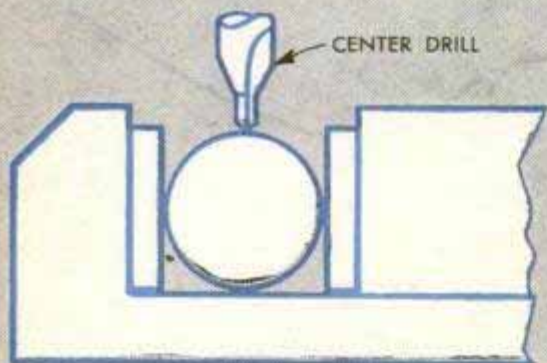
There's no trick to drilling transverse holes through round stock or the walls of tubing if you make use of these simple jigs and fixtures



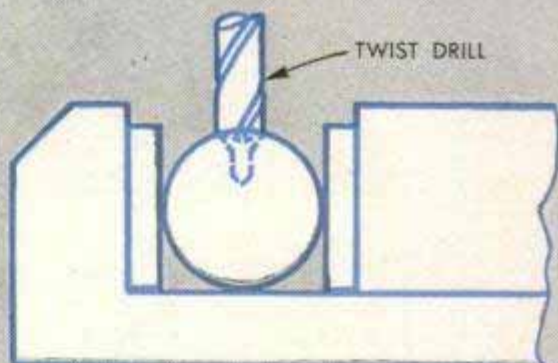
To locate center, clamp work in drill-press vise between steel parallels. Set the dividers for the estimated center and scribe two lines along work, using vise jaws as straightedges



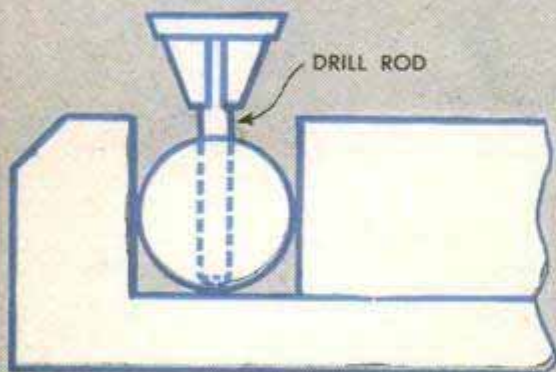
Then use a prick punch to mark the point to be drilled. Tap punch into the scribed line or, if two distinct lines were scribed by dividers, center the punch mark between them



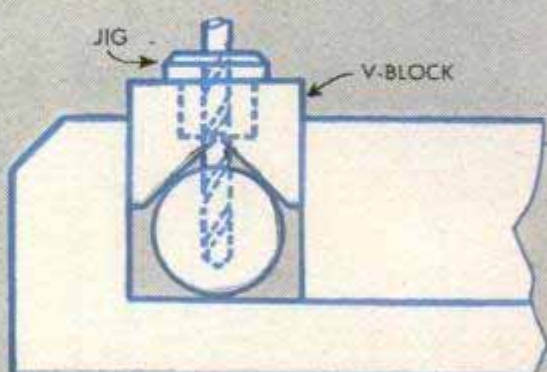
After enlarging the prick-punch mark with a center punch, start the hole with a center drill, which is carefully aligned with the indentation that was formed by the center punch



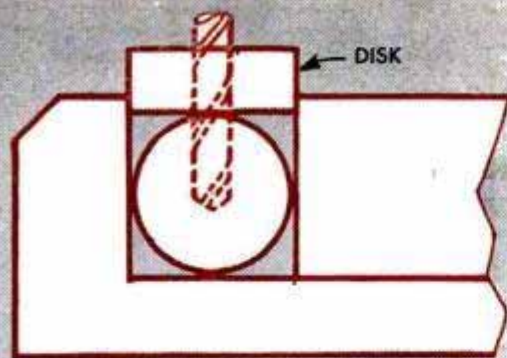
Hole of desired size now can be bored with a twist drill. Tapered hole formed by the center drill will accurately pilot the twist drill, eliminating the danger of drill runout



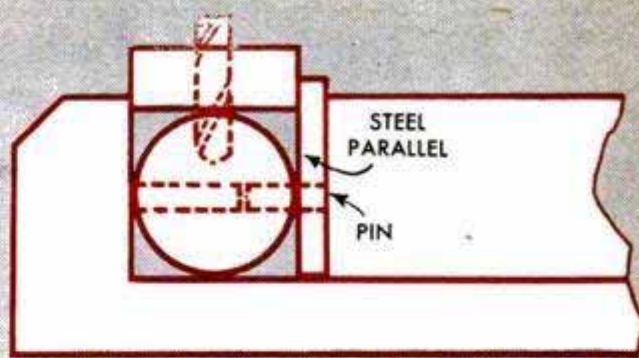
A length of drill rod chucked in the drill press can be used to align a hole in cross-drilled work to permit accurate reaming. Rod should be a fairly snug fit in the hole



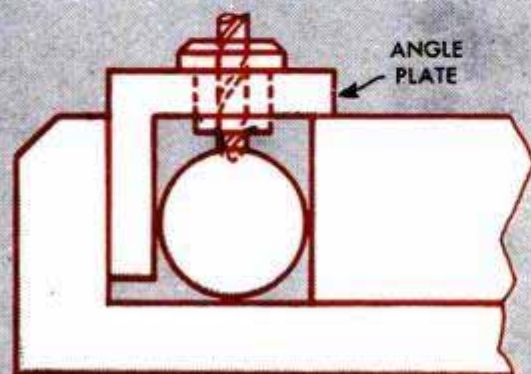
Another way to center round work for cross-drilling is to use a drill jig inserted in an ordinary V-block. The block is held firmly against work and clamped in drill-press vise



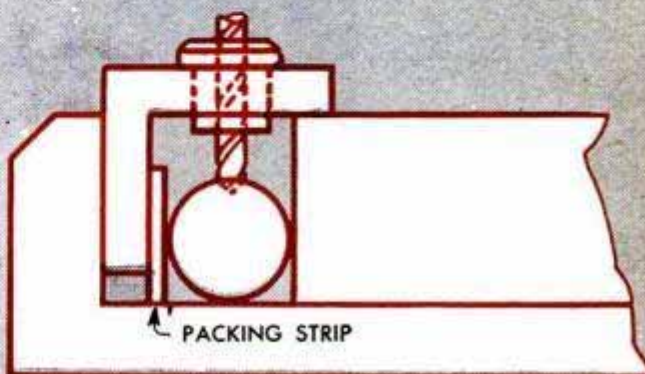
For precision drilling, turn a metal disk to exact diameter of the work, and drill center with a bit of same size to be used for cross-drilling. Clamp disk in drill-press vise over work to guide drill



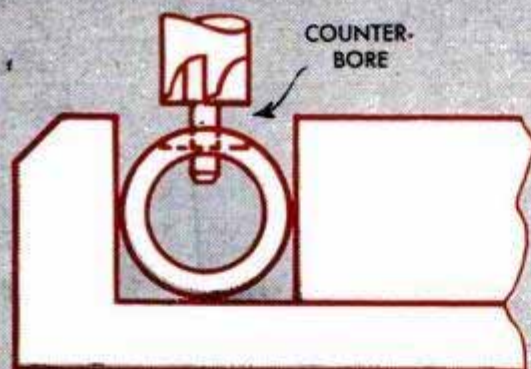
To bore at right angles to previously drilled hole, rivet pin in flat-steel parallel to align with original hole. Then clamp the work in vise with pin inserted in hole, drilling the second hole with jig as before



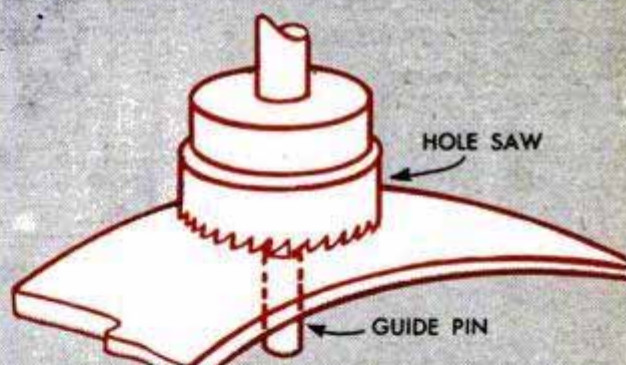
Cast-iron angle plate, accurately machined and fitted with drill jigs of various sizes, can be used to cross-drill work of specific diameter. A flat-steel packing adapts jig to take work of smaller diameter



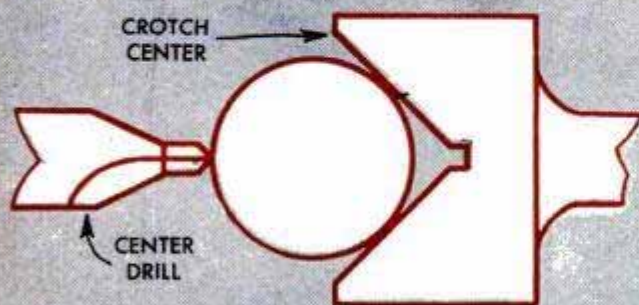
Flat-steel packing is inserted between work and face of angle plate. Thickness of packing must be exactly half the difference between the diameter of the work and the diameter for which the plate was designed



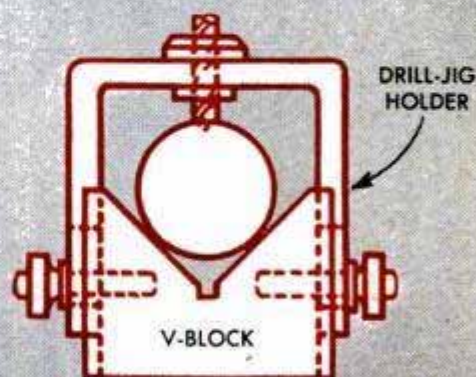
Large-diameter holes in round stock or tubing are drilled best with a counterbore of the type shown, hole for guide pin being drilled first. Use a good cutting oil, medium drill-press speed and light feed



A hole saw can be used for cutting large holes in large-diameter, thin-wall tubing. If saw has guide pin instead of bit, drill pilot hole for pin. Use medium speed and flood the work with cutting oil

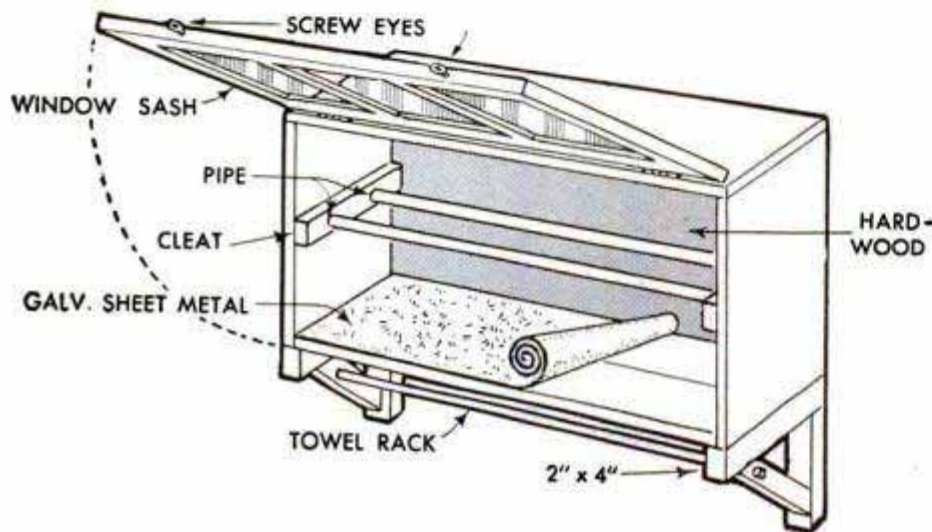
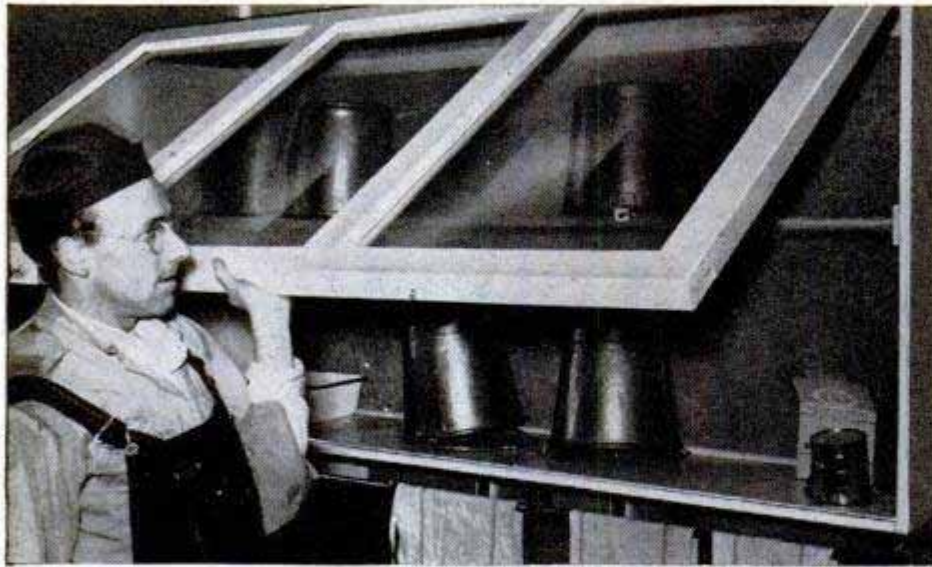


Crotch center of metal lathe automatically aligns work for cross-drilling. Start with center drill to avoid runout, operate at medium speed and feed slowly. Follow with a twist drill of the desired diameter



V-block with adjustable drill-jig holder quickly centers round work of various diameters. Holder is slotted for vertical adjustment and is locked in place with thumb nuts turned on threaded studs in V-block

Closed Cabinet for Milk Pails and Equipment Utilizes Large Storm Window as Door



A closed cabinet in the milk barn is a handy aid in keeping pails and other milking equipment free from dust and insects. The one shown was made from $\frac{3}{4}$ x 12-in. stock, for the sides, top and bottom, and a hardwood panel for the back. It was provided with a door by utilizing a large storm window. The latter was hinged from the top and is held open by overhead hooks that engage screw eyes turned into the bottom edge of the door. Wooden cleats, attached to the inner sides of the cabinet, support a "shelf" of two steel pipes on which recently washed milk pails are drained. The bottom shelf was covered with galvanized sheet metal to catch the drainage water and provide for easy cleaning. The cabinet is mounted on brackets assembled from 2 x 4s, as shown. A wooden dowel is attached between the brackets to serve as a rack for hand towels.

Oil Consumption of Compressors Lessened by Making Minor Alterations

Oil consumption of compressors can be reduced considerably by means of this kink. The lower oil ring is removed from the piston and six or eight $\frac{1}{8}$ -in. grooves are ground about .01 in. deep at equal intervals across the bottom surface of the ring. Then, a similar number of $\frac{1}{8}$ -in. holes

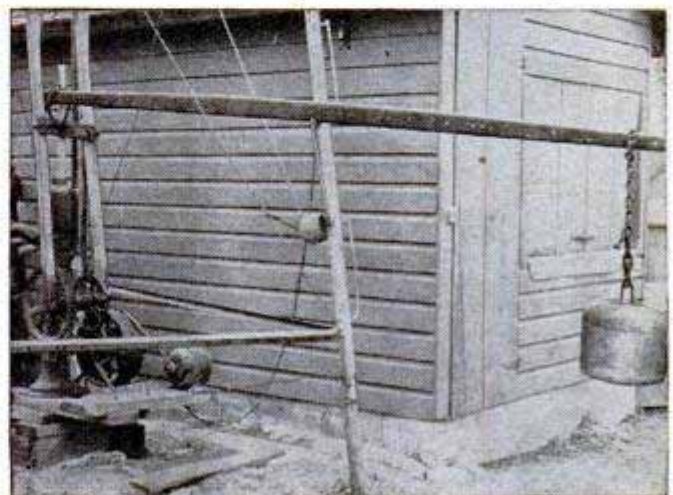
are drilled at an angle in the bottom of the ring groove and through the piston walls, the holes being spaced to register with the grooves in the ring. Thus, oil is permitted to pass into the skirt of the piston and drop back into the crankcase.

B. E. Wilder, Chicago Heights, Ill.

Counterbalanced Rocker Arm Aids Small Motor in Operating Pump Jack

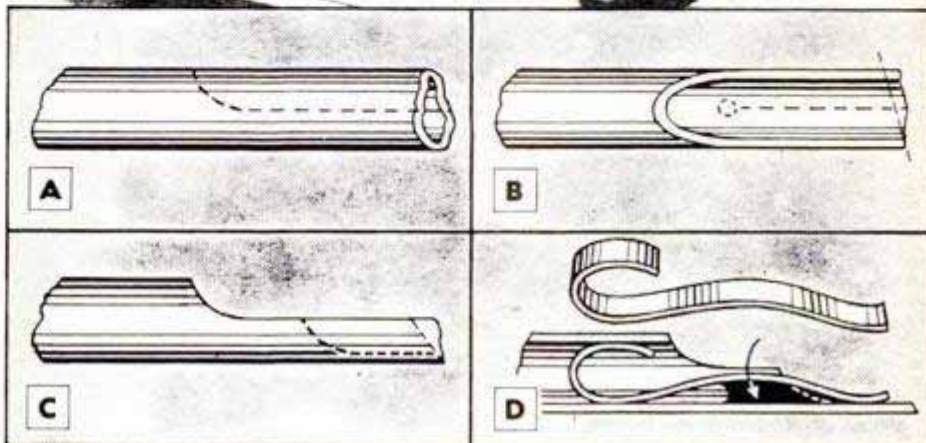
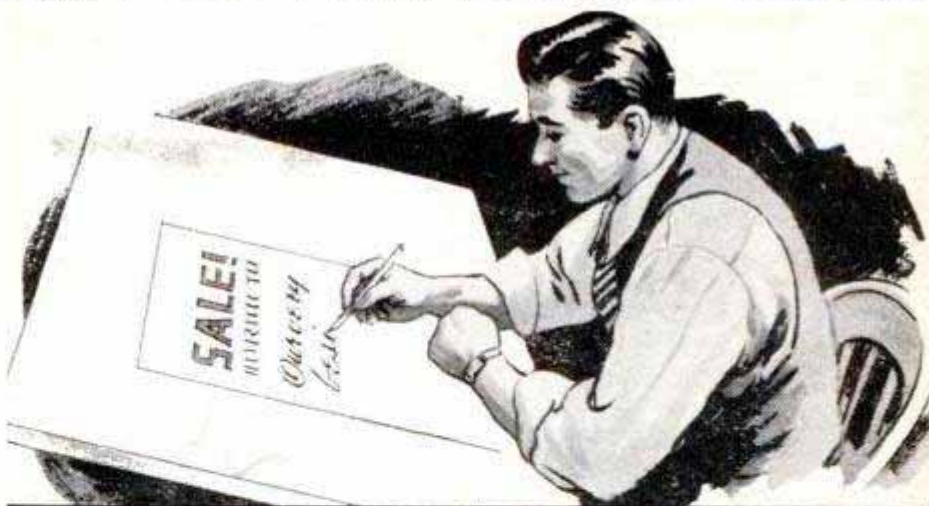
By counterbalancing the long, heavy pump shaft with a simple rocker arm and a counterweight, this deep-well pump is operated with a small motor. The rocker arm is pivoted near the center to an upright member, and is linked to the pump jack at one end and to the counterweight at the other end. Weight of the counterbalance should equal approximately in pounds the pull of the pump rod on the upstroke.

☞ To prevent nuts from becoming locked on bolts by rust, dip the threads of the bolt in shellac and turn the nut onto the bolt before the shellac has had time to dry.



Making Lettering Pens From Bamboo Shoots

Finding reed pens especially helpful in executing scroll or Old English-type lettering, many letter artists make their own from bamboo shoots. These are available at most florist shops and, for ordinary sized lettering, should be no larger than $\frac{3}{8}$ in. or smaller than $\frac{1}{4}$ in. in diameter. The shoots are cut to lengths that will be suited to the individual user. Follow the diagrams at the right, which show steps for making each pen. Start the first cut, diagram A, $\frac{7}{8}$ in. from the end of the reed and make it a little over half the diameter of the reed in depth. Make the diagonal cut across the end of the reed, B, to conform to the angle at which the user will hold the pen. If the user is left-handed, the diagonal will, of course, be cut in the direction opposite that shown. The tiny hole in the reed is made to check the length of the split made in the reed. Therefore, the hole is made first, with a small drill or the point of a knife, and the split is started at that point. The dotted line in diagram C is a side view of the cuts made on each side of the reed that will determine the width of the tip and, thus, the width of vertical lines made by the pen. The bevel shown on the end of the tip will govern the



thickness of lines made with side strokes of the pen. Both the width of the tip and the bevel can be varied with different pens as desired. Next, all sharp edges of the pen should be broken by sanding very lightly with fine sandpaper. Finally, diagram D, a short length of flat, spring steel, about $\frac{1}{16}$ in. wide—the mainspring out of a watch will be fine—is heated over an open flame, bent to the shape shown and inserted in the pen to provide an ink reservoir.

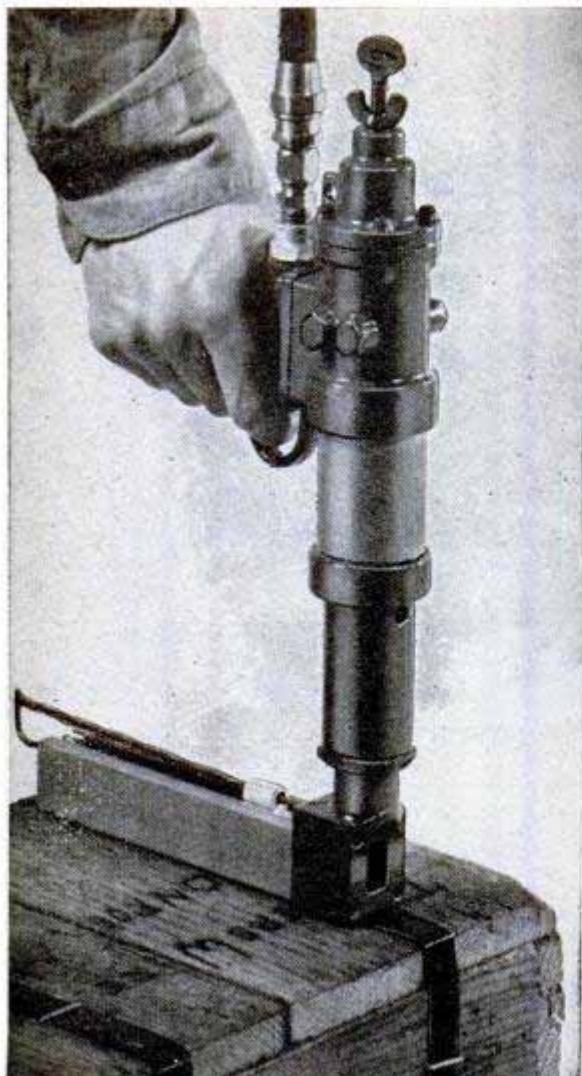
Truck Tires With Two-Part Rims Safely Inflated on Special Jig

The danger involved when inflating some truck tires—that is, the possibility that the outer ring on certain types of rims may be



blown off to injure someone when the tire is expanded—was completely eliminated by one Nebraska garage owner. A special jig was made on which the tire is mounted, and which holds the outer ring of the rim intact while the tire is being inflated. Utilizing scrap parts from the junk pile, a cone-shaped base, of a size to engage the inside diameter of the rim, as shown in the photograph, was welded together. A large bolt was welded to extend vertically from the center of the base. A length of channel steel was drilled at the center and, in use, is slipped over the bolt where it spans and is held against the outer surface of the rim by turning a nut onto the bolt. The latter is welded to a short length of steel rod. This makes it a simple matter either to tighten or to remove the nut.

SHOPPING



Powers Wire Products Co., 523 Detroit Ave., Monroe, Mich.

PNEUMATIC STAPLER eliminates fatigue and assures uniform stapling of steel box banding or wire strapping at a speed unequaled by handwork. Drives a 13/16-in. staple over flat-steel banding, but also is available for 3/8-in. banding or wire strapping. Attaches to airline



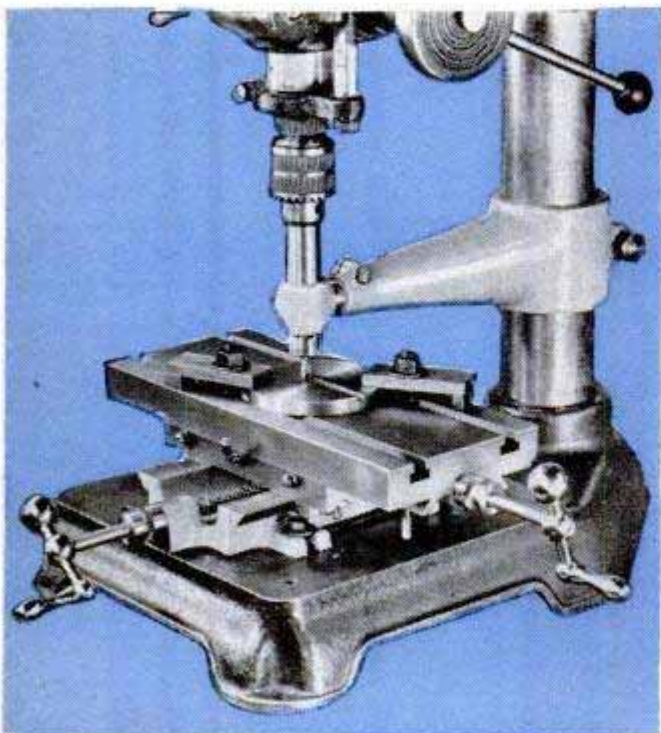
Sutton Tool Co., Sturgis, Mich.

QUICK-CHANGE COLLET is fitted with interchangeable pads which can be changed without removing the collet from the machine. Bearing surfaces of the pads are diamond-serrated to withstand both horizontal and rotating thrusts of the work and are held in place by a special mechanism which entirely eliminates looseness and scoring of the work



Hoffritz For Cutlery, 551 Fifth Ave., New York City 17

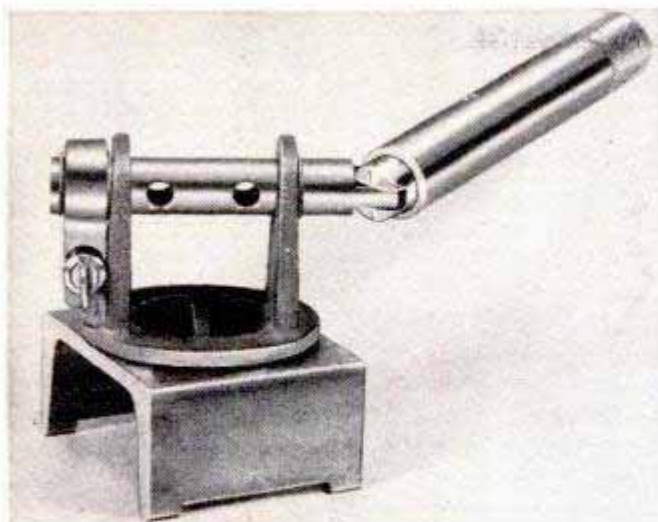
SIX-IN-ONE tool combines a hatchet, hammer, pliers, wire cutter, screwdriver and nail puller in one easily handled unit. The screwdriver bit is forged on one handle, the nail puller on the other. Both parts serve as a handle for the pliers, hammer and hatchet, a knurled section on each of the handles providing a firm grip



Waterborg Machine Co., 2830 Rapids Drive, Racine, Wis.

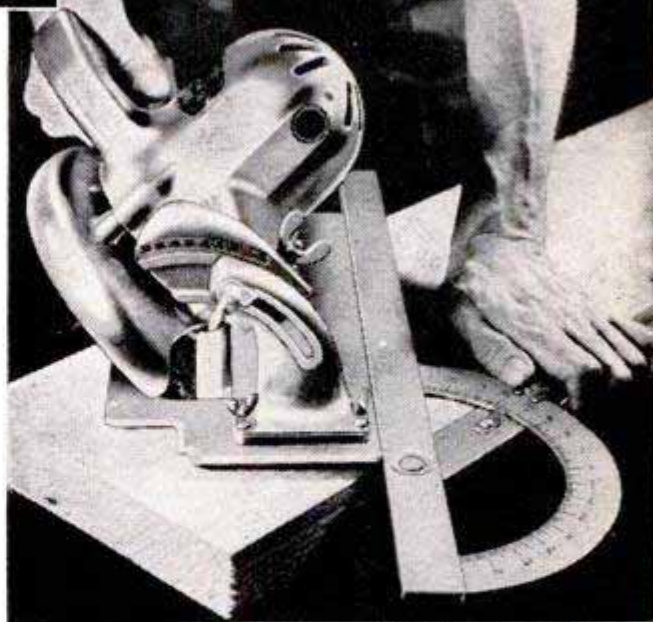
MILLING ATTACHMENT for small drill press fits any light bench-type machine. Unit consists of a compound slide which is bolted to the drill-press table, and a support arm which clamps to the drill-press column. Outer end of the arm carries the milling-cutter spindle in a bronze bushing, thus relieving stress on chuck

FOR TOOLS



Piper Form Tie Co., 3802 N. Attu, Portland, Ore.

WIRE-TYING UNIT speeds erection of concrete forms by enabling the operator to tie the ends of the supporting wires automatically. Wires are drawn to a uniform tension and the tie is made simply by turning the handle of the unit. After the tie has been completed, the tool is easily removed from the work



Black & Decker Mfg. Co., Towson 4, Md.

PROTRACTOR for use with portable electric saws enables operator to make all angle cuts with the accuracy of a tilting-arbor table saw. Unit consists of two straightedges and a calibrated segment. One straightedge slides along the edge of the work while the other, set at the desired angle, guides the saw

DRIP GUARD fits any paint roller and effectively solves the problem of dripping paint and spotted walls. Made of sheet metal with an enamel finish, the guard attaches to the handle of the roller by means of a clamp. Bottom of guard is curved to the contour of the roller so that it retains paint drops

Warner Ventilator Co., La Grange, Ind.

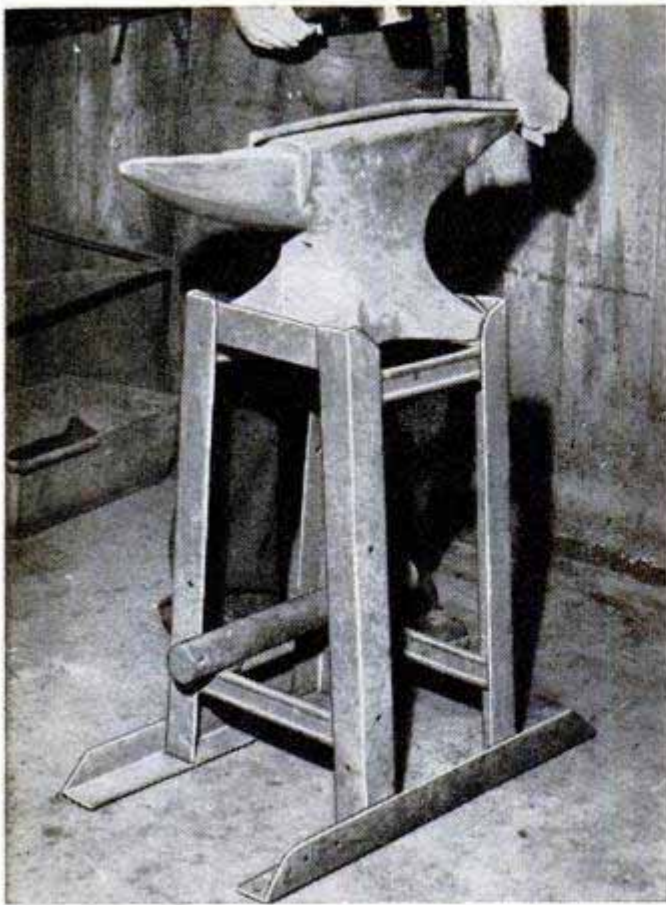


DUAL-PURPOSE HAND TRUCK is fitted with a hydraulic hoist for lifting and stacking heavy cartons and barrels from ground level. Lifting capacity is 500 lbs. and maximum lifting height is 54 in. The load platform measures 19 x 22 in. and the front edge of the platform is flush with the floor when fully lowered



Clark-Hopkins Equipment Corp., Philadelphia 23, Pa.

AUGUST 1951



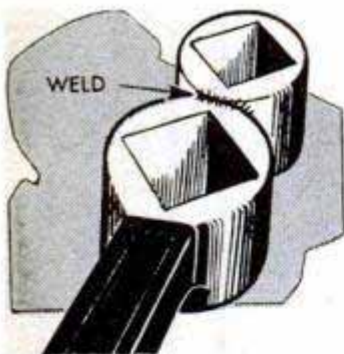
Light But Sturdy Stand Holds Anvil

Rather than use the usual section cut from a log, or other makeshift type of stand for his anvil, one farmer built a stand from heavy angle steel that is not only sturdy and exceptionally rigid, but fireproof as well. Each pair of legs is slanted, or splayed, in one direction as will be noted from the illustration. An angle-steel foot welded to each pair of legs prevents tipping sidewise. Short pieces of channel, with their ends welded into the corners of the angle legs near the upper and lower ends, form braces. The length of these braces must be determined by the size of the anvil base, which is supported on two rails made from steel angle and welded to the legs in an inverted position. The projecting sides of the legs form stops which prevent the anvil base from slipping sidewise.

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

Extra Socket on Tool-Post Wrench Saves Time Making Adjustments

When doing specialized lathe work that necessitates frequent changing of the tools and shifting of the toolholder, this combination wrench saves considerable time.



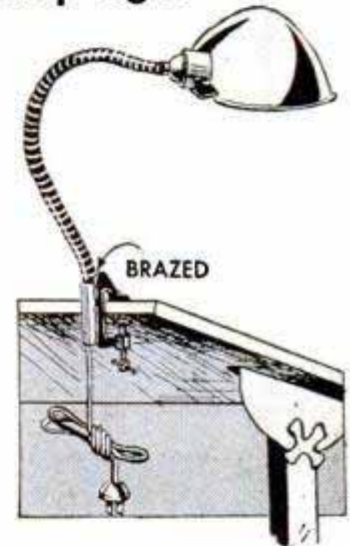
It's made by cutting off the square socket on the toolholder wrench and welding it to the side of the socket head on the tool-post wrench. In this way, the one wrench can be

used for shifting the tool post and adjusting the tool bit in the holder, thus eliminating the loss of time when using the separate wrenches ordinarily supplied.

M/Sgt. James R. Wood, Seattle, Wash.

Brazing C-Clamp to Desk Lamp Provides Utility Shop Light

Needing a special shop light that would be readily portable and could be clamped to power tools or a drafting board, one craftsman removed the flexible arm, or gooseneck, from the base of an ordinary desk lamp and brazed it to a small C-clamp.



Before brazing, the lamp cord must be removed to prevent damage to the insulation. To remove the cord, unscrew the bulb and shade and disassemble the socket. Attach the end of the cord to a length of fine wire and pull the cord back out of the flexible arm, leaving the wire in the arm. Then after the brazing is completed, the cord is drawn into place by means of the wire.

Warren Norcross, Philadelphia, Pa.

Ordinary Beam Scale Used for Counting Small Stock-Room Parts by Weight

Where an occasional request to count out quantities of small identical parts does not warrant investing in a regular counting scale, a beam-type balance scale can be used as a substitute. Noting the balance ratio of the particular scale, for example, 50 to 1 (1 lb. of weight on the counterpoise equals 50 lbs. on the platform), one of the parts to be counted is placed on the counterpoise instead of the regular weight. Then

the parts are placed on the platform. Thus, when the weight of the parts brings the scales to the balancing point, the number of parts should equal the balancing ratio of the scales, which would be 50 pieces in the example given.

Robert G. Murphy, Stillwater, Minn.

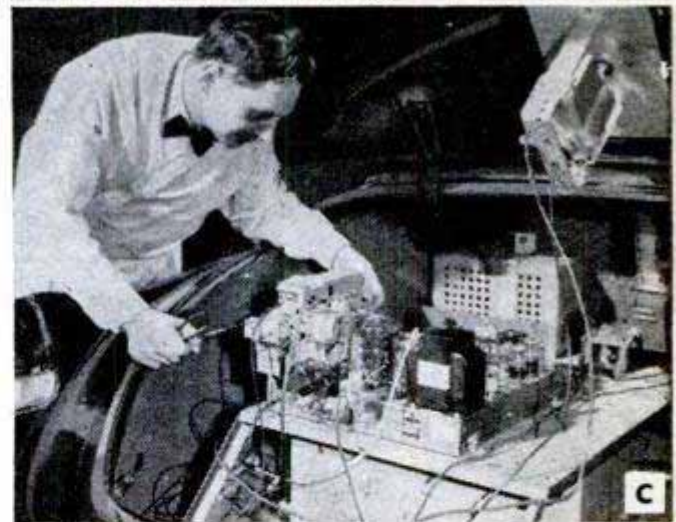
☐ Dirt packed in cap-screw holes is often the cause of gaskets repeatedly blowing.

TELEVISION TODAY

PERHAPS the first television receiver to be installed in a private car was demonstrated recently by William M. MacDonald, Jr., in Chicago. It is a custom-built permanent installation and features a Zenith television set with a 12½-in. screen. The viewing screen is built into the back of the front seat solely for the entertainment of the passengers as illustrated in photo A. In this position, it does not disturb, or distract, the driver any more than the usual radio receiver located on the instrument board. The entire chassis is shock-mounted in the trunk of the car on a specially built platform as shown in photo C. In this location, it is easy to service, and there is plenty of room for the battery-operated power units.

The antenna is mounted on the trunk cover of the car as shown in photo B, and it is operated with an electrically driven rotor for directional beaming to receive any desired TV station within range. A complete control panel for the TV receiver is mounted on the armrest of the rear seat to permit convenient remote control of the picture and sound. This car, in addition to its television receiver, is also equipped with two telephones.

A practical joke that turned into a useful idea occurred at the General Electric Supply Corporation during last year's World Series. Company workers watching the telecast of the series were mystified when they saw a player apparently head for third base after smacking a liner to the outfield. They saw runners score from what appeared to be first base. The TV-service manager for the company had purposely reversed the coil controlling the horizontal reception of the televised image so that everything came out in reverse. It furnished a lot of laughs for the company workers, but it means much more now to Bob McKenna of Rochester, N. Y., who sees his television through a mirror attached to the top of his iron lung at the Strong Memorial Hospital. As in the practical joke, the TV image is reversed, but the mirror shown in photo D reverses it again, affording McKenna a true image adjusted to his line of sight. He now watches television steadily from early afternoon until midnight. American Legion posts are sponsoring this and similar installations.



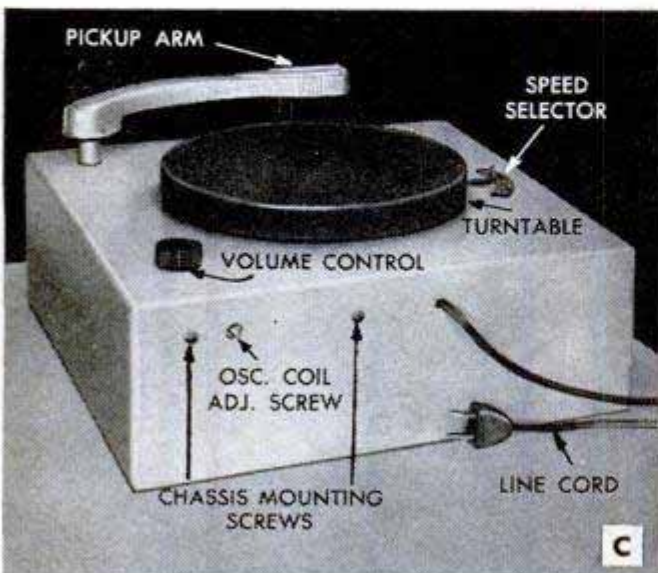
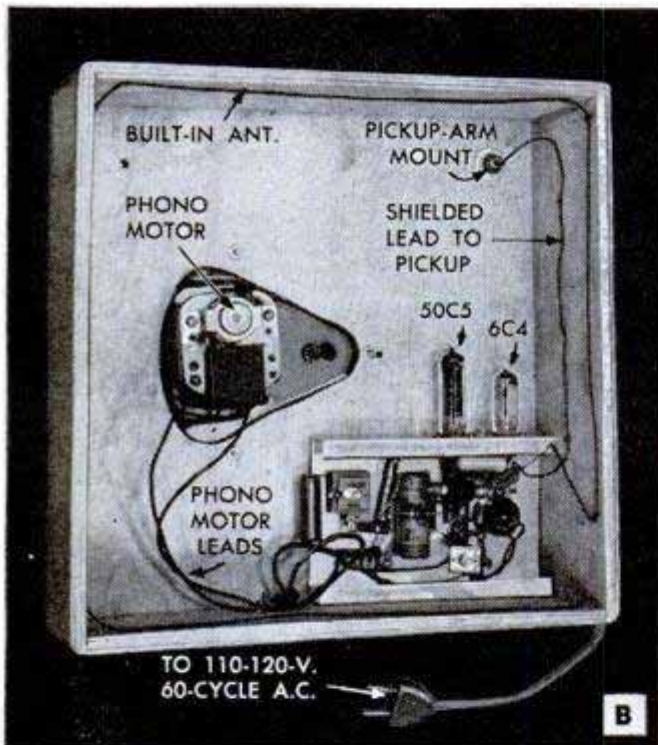
THREE-SPEED RECORD BROADCASTER



THIS HIGH-QUALITY "wireless" record player will mystify your friends as it is really an efficient "miniature broadcasting station." It employs a special oscillator circuit which provides nearly 100-percent modulation from the amplifier tube, a feature definitely not found in phono oscillators of the past. This means that you can now play phonograph records through your radio receiver with greatly improved quality of reproduction without the necessity of a direct connection to the radio set itself, as illustrated in photos A and D.

With the short built-in antenna indicated in photo B, broadcasts can be made up to 10 ft. with plenty of signal strength, and up to 20 ft. with acceptable signal strength. With the addition of about 20 ft. of external wire added to the built-in antenna, a range of from 20 to 30 ft. can be covered easily. The two-tube oscillator unit and three-speed record player operate from any 110-120-volt, 60-cycle a.c. line. Photos B, C, D and E show various views of the completed unit which is housed in the homemade case detailed in Fig. 2. The schematic circuit diagram appears in Fig. 1. The chassis base is standard miniature open-end aluminum type that is available from radio parts houses for about 50 cents. It is mounted in one corner of the plywood case by means of two 6-32 ornamental-head machine screws, 1 in. long, in the position shown in photo F. The size of the cutout for mounting the phono motor in the cabinet, Fig. 2, will depend upon the make of the three-speed phono motor used. Each manufacturer supplies a paper template for the mounting hole required for his particular product. The phono motor used was an Alliance model JPT8 three-speed type, which is listed in parts-house catalogues for about \$6.50.

The selenium rectifier for the oscillator unit can be either a Mallory 6S75 or a Federal No. 1003A, the latter being preferred for this particular circuit. A 6C4 amplifier tube is used to modulate one of the grids of a 50C5 oscillator tube. A standard Meissner oscillator coil, No. 14-1040, is employed. (Lugs 3 and 6 are wide-spaced for terminal identification. See Fig. 1.) The 6C4 tube amplifies the weak signals from the crystal pickup. The three-speed phonograph turntable plays any standard 78-r.p.m. record, as well as the new 33 $\frac{1}{3}$ -r.p.m. long-playing records and 45-r.p.m. miniature records. The pickup uses a universal stylus having a .002-in.-dia. point so that it may be used with any type record without changing needles. It is the Shure model 901U.



PLAYS THROUGH ANY SET IN THE HOME

The actual layout of parts on the oscillator chassis, photo F, is not critical. The volume control R1, which includes the on-off switch, has its shaft protruding through the top of the plywood case. A hole is also provided on the side of the case to permit the adjustment of the oscillator-coil tuning-slug screw. The tube-socket holes in the side of the chassis base are $\frac{5}{8}$ in. in diameter and may be made with either a tapered reamer or a $\frac{5}{8}$ -in. socket punch.

The power-line leads for the phono motor and line cord are connected to a terminal strip which has three insulated lugs. Looking at photo F, the line cord connects to the center and left-hand terminals. One of the phono-motor leads also connects to the left-hand terminal. The other one is on the right-hand terminal. The center and right-hand terminals are connected to the switch on volume control R1. Leads to R7 and R8 are also connected to the right-hand terminal. The two final connections on the left-hand terminal are the end of condenser C1 and a lead run over to common ground on the insulated two-lug terminal strip at the left of the volume control. The opposite end of C1 goes to chassis ground on the top of the selenium-rectifier chassis-mounting screw. The rectifier positive and negative lugs are out at the side.

Final adjustment is very simple and, once made, may be left that way indefinitely. The oscillator is tuned both by means of the small mica trimmer condenser C6, and the iron-core slug inside the oscillator coil. Turn on the unit with the switch on the volume control. This also starts the phono motor. Then allow three or four minutes

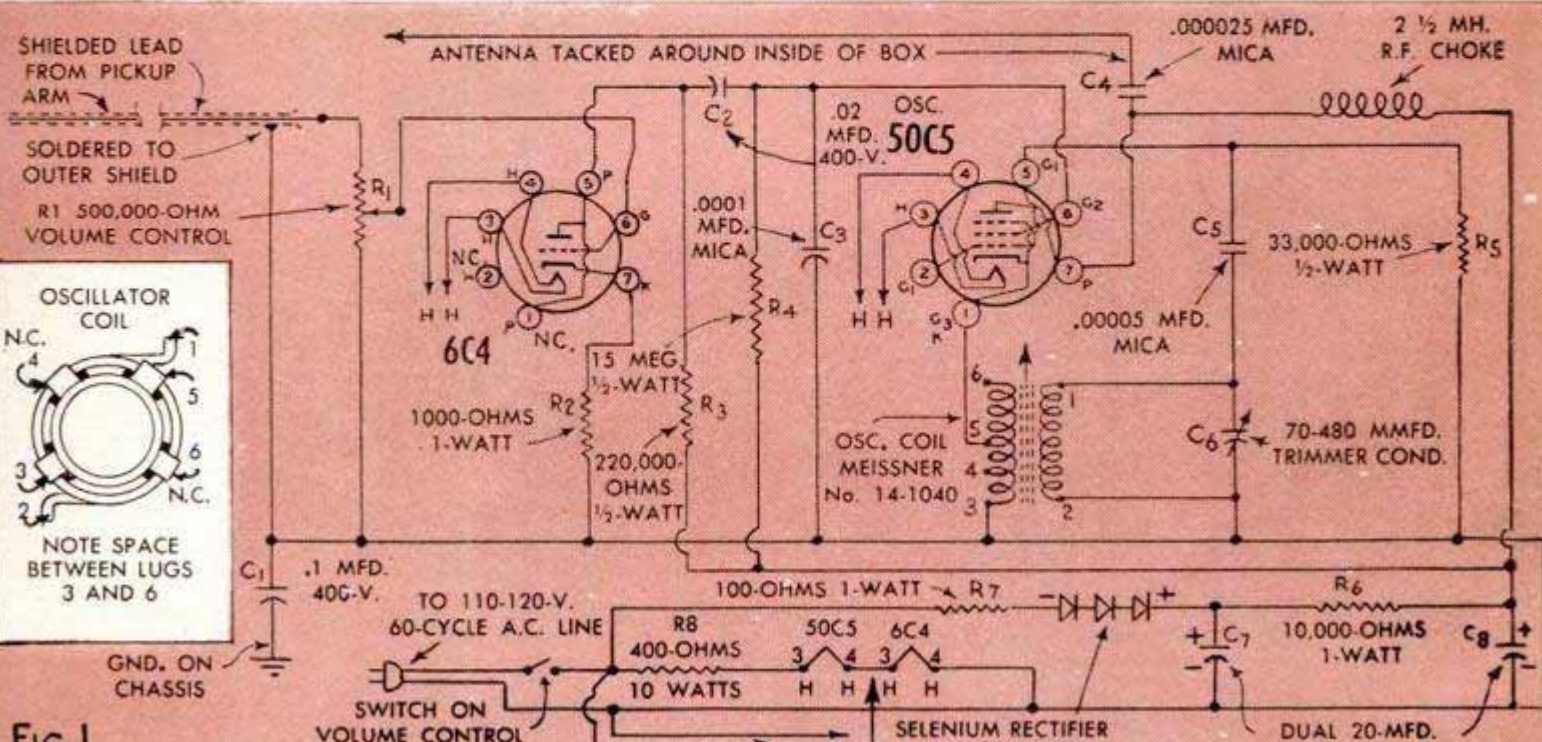


Fig. 1

for a warmup. Now tune in your home radio set to a spot on the dial where no broadcast stations are received. Go back to the record-broadcaster unit and adjust the trimmer condenser C6 with a small screwdriver to where you hear a quiet spot without crackling or hissing in your radio. You will identify the presence of your record-

broadcaster carrier signal when these noises stop. Now put a record on the turntable and set it to playing. Following this, for precise adjustment to the exact frequency on your radio set, adjust the oscillator-coil screw until maximum volume and clarity are obtained. The volume control R1 permits setting at the proper playing level for the various kinds of records. See that the speed selector is set at the proper speed for the type of record you are playing. The proper setting of the volume control is the highest setting which does not introduce distortion. It is always better to advance the volume control on the radio receiver rather than the volume control on the record broadcaster in order to prevent distortion. Too high a volume-control setting in the phono-oscillator unit will result in impaired reproduction quality. This unit is not designed for use with a microphone. It is intended for record-playing purposes only. Detailed student material list R-402 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary postage.

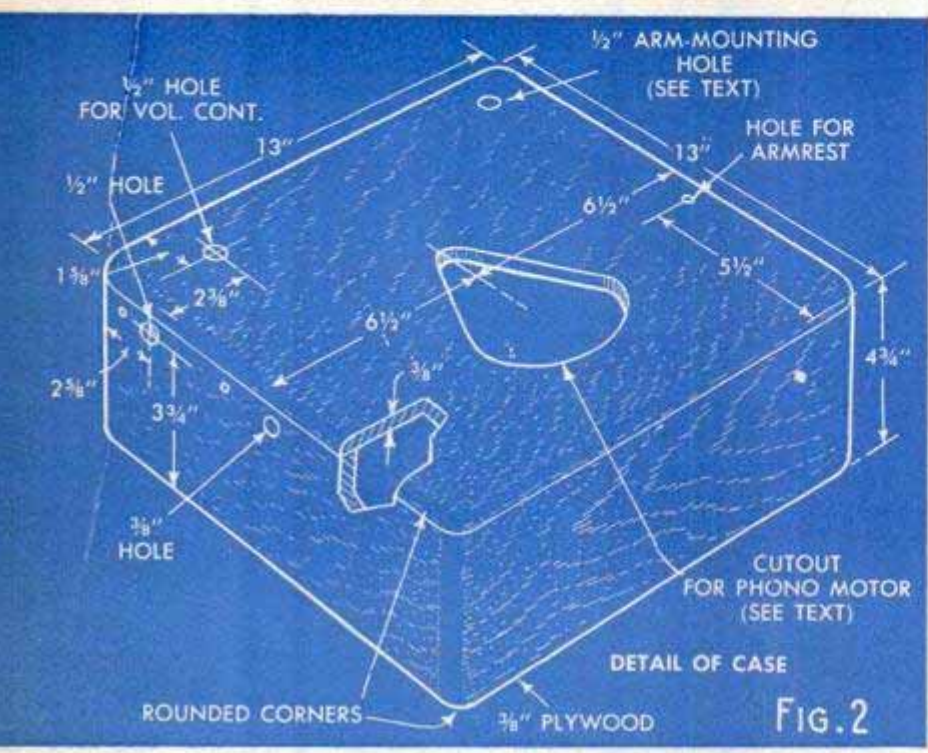
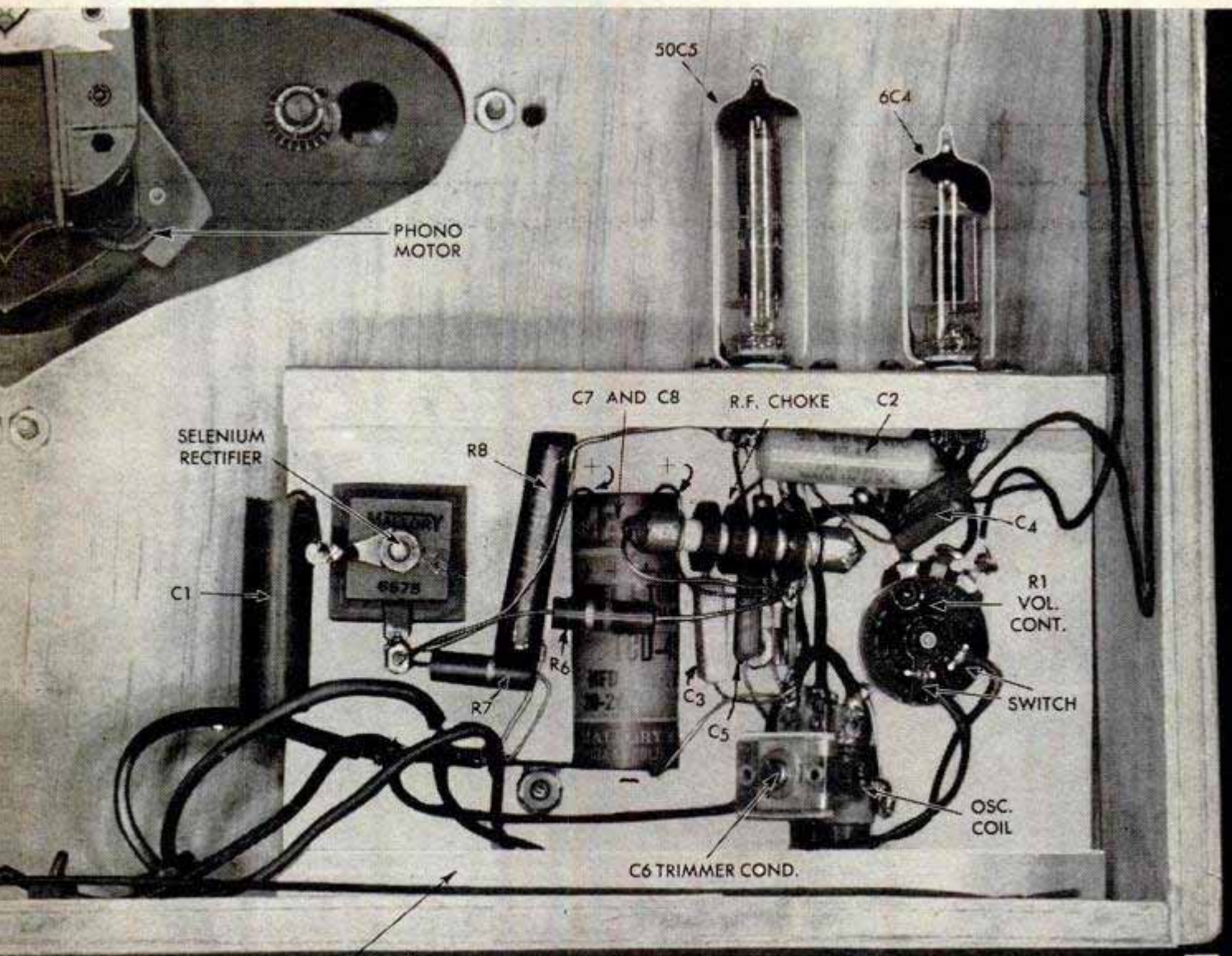


FIG. 2



CHASSIS BASE

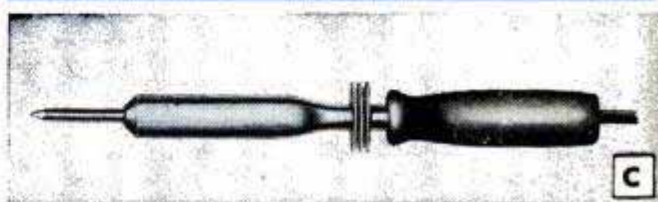
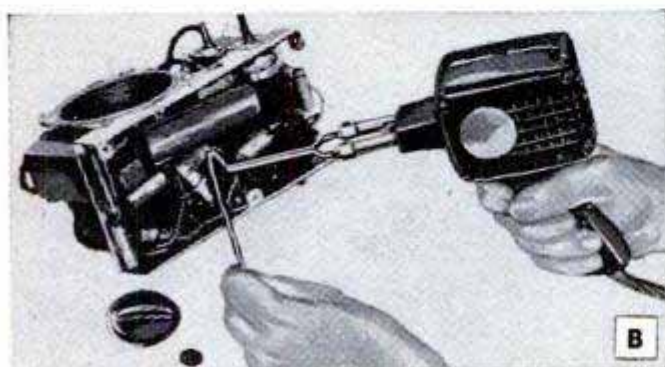
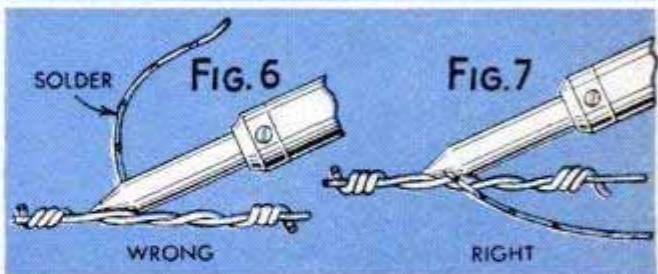
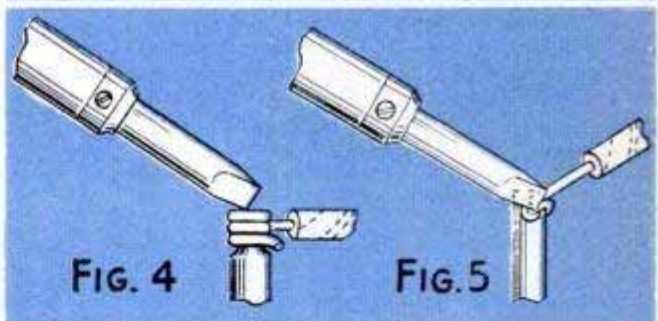
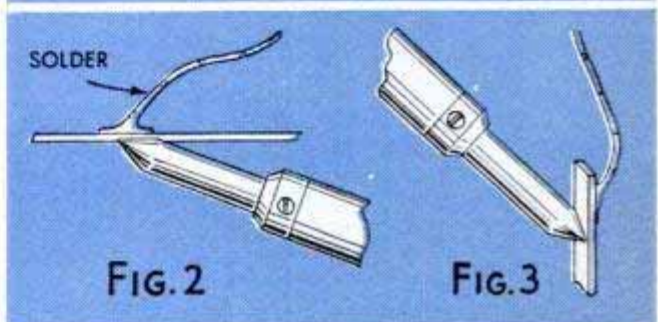
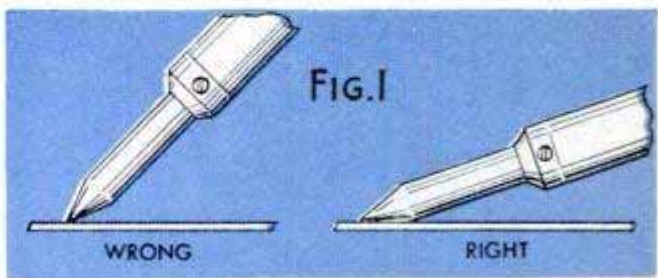
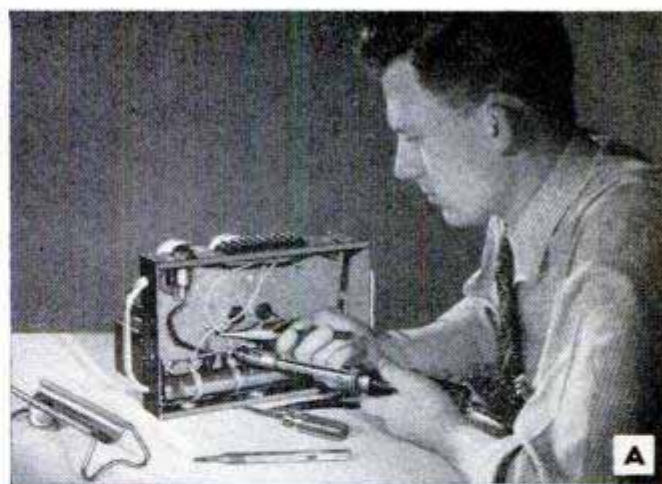
← OSC. COIL

SOLDERING HINTS FOR STUDENTS AND RADIO WORKERS

POORLY soldered connections account for a large percentage of troubles in student units. Servicemen and factory workers always strive to improve their soldering technique. Soldering is a basic technique in many arts, but it is especially important in radio and electronics. The novice may wonder why it is necessary to solder a connection that can be made easily by twisting two wires together. When such connections are exposed to air for some time, the wires will oxidize and form a high-resistance joint. Furthermore, a mechanical bond, no matter how well it is made, will work loose under vibration.

Photo A shows a radio worker testing a soldered connection by giving it a sharp pull with a pair of long-nose pliers. Soldering irons should be suitable for the type of work being done. Soldering guns of the type shown in photo B supply instant heat and are great timesavers. The tiny variety illustrated in photo C is ideal for delicate work. Never use acid flux, or acid-core solder for radio, TV or electronic circuits; always employ a good grade of rosin-core wire solder.

The eight soldering hints illustrated in the sketches appeared in one of the DuMont Laboratories' pamphlets intended for use by their workers and assembly inspectors to insure a high standard of assembly wiring and soldering. Fig. 1 shows the correct way to hold the soldering iron to transfer maximum heat to the surface to be soldered. Figs. 2 and 3 show the proper application of solder when soldering a wire to a horizontal terminal (Fig. 2) and a vertical terminal (Fig. 3). Applied in this manner, a smooth layer of solder will merge with the terminal. Fig. 4 shows improper edge placement of the soldering tip; the correct position for this type of vertical terminal is illustrated in Fig. 5. Always apply the solder directly to the heated surfaces as in Fig. 7, and not to the iron as in Fig. 6. When shaping flexible resistor leads for making soldered connections, do not make sharp bends, for the reason illustrated in Fig. 8.





New, inexpensive slide projector

Kodaslide Merit Projector, only \$24.50; carrying case, extra. The big news about this projector is the new, improved slide-feeding mechanism. You insert slides in top of projector—thus no jarring or moving of instrument. Large-sized lamphouse of unique, new design assures efficient cooling to keep slides flat. Built-in elevating mechanism for angles up to 10 degrees. Other features: (1) Lumenized Kodak Projection Ektanon Lens, 5-inch $f/3.5$; (2) ready access to optical system for cleaning; (3) powerful 150-watt lamp.

Color Show



Think of shooting and showing your own personal pictures in glorious full color with Kodachrome Film! It's one of the biggest thrills in photography. On these pages you see some of the latest equipment and accessories now offered for projecting and viewing the color

Fine, ultra-thrifty "miniature"

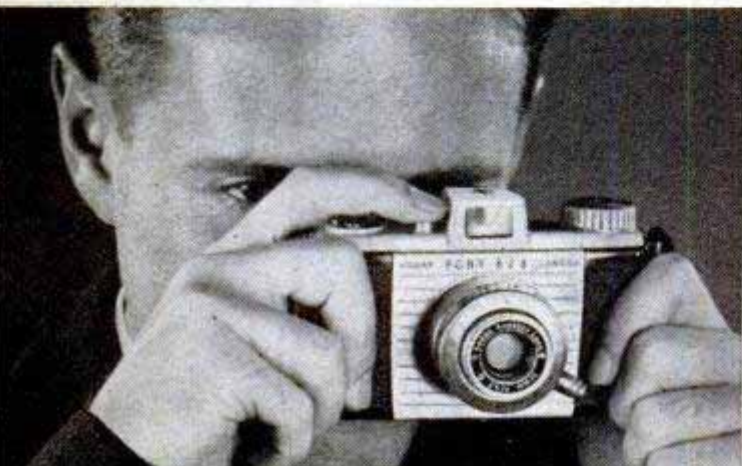
The value-packed Kodak Pony 828 Camera makes superb color slides on Kodachrome Film; sharp black-and-white negatives; also gorgeous Kodacolor snapshots. Kodak Anaston $f/4.5$ Lumenized Lens; Kodak Flash 200 Shutter with built-in "synch"; body shutter release. Takes 8-exposure rolls. Only \$32; similar "Pony" 135 for 35mm. films, \$36.75. Field cases for both models also available.

slides you get, and for displaying color prints and enlargements made from them.

Your dealer will be glad to answer any questions you may have regarding picture taking in color—and to help you choose the right Kodak equipment for getting the most out of color photography. Visit him soon.

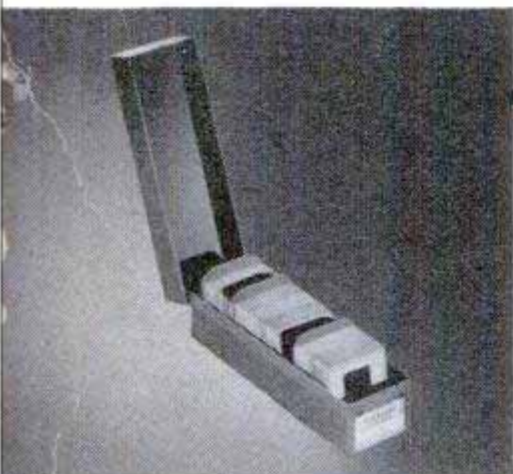
Projects images up to 7 feet wide

Kodaslide Projector, Model 2A, is compact and efficient—costs only \$49.50, with Kodak Projection Ektanon Lens, 5-inch $f/3.5$; with 7½-inch $f/4$ lens, \$59.50. Slide carrier accepts two transparencies. All optics are Lumenized. 150-watt lamp. You can tilt projector up to 10 degrees. Made of die-cast metal with gray finish. You'll find this model ideal for large home gatherings.

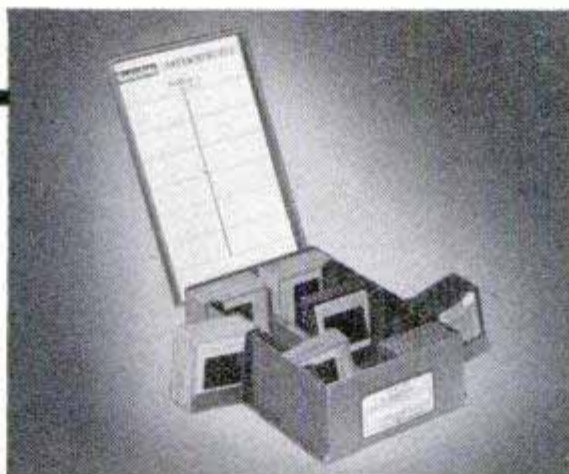


**Budget-priced
table viewer**

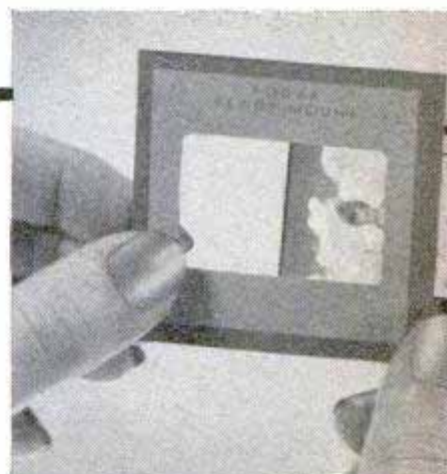
Kodaslide Table Viewer, 4X, combines projector and screen in one compact unit. Here's the *practical, effortless* way to show color slides, enlarged more than four times, to a small group of friends. With the "4X" there's no longer any need to rearrange furniture, no dimming of lights. Just plug it in and you're ready for a color show. Because of the handy on-and-off switch on the eight-foot cord, you can leave the viewer plugged into a wall socket when not in use. Attractively styled to blend with room furnishings. Price, \$49.50. Accessory carrying case, extra.



Protect precious slides—Inexpensive metal Kodaslide File Box holds 150 cardboard or 53 glass slides—keeps them organized. \$1.50.



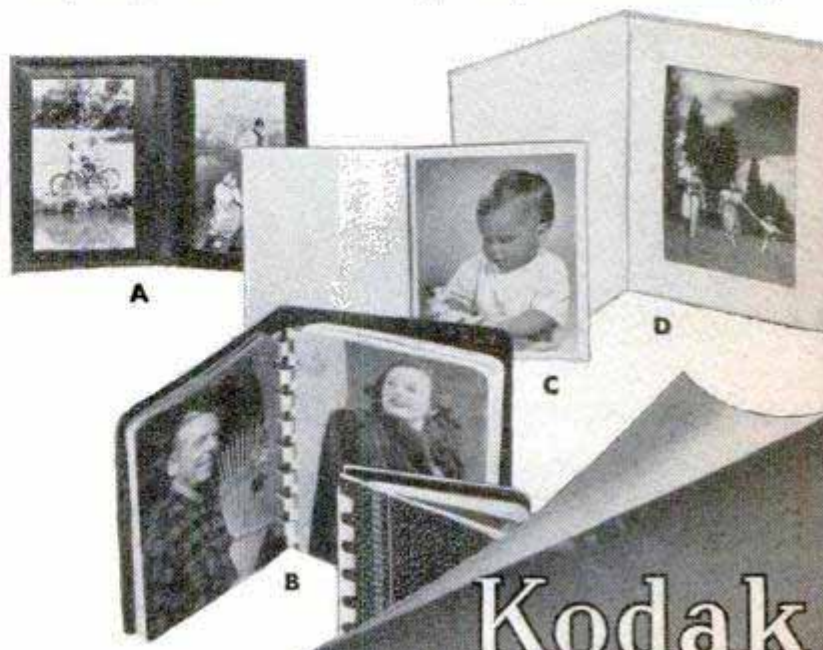
De Luxe file—Kodaslide Compartment File has 12 swing-out compartments, for 240 cardboard or 96 glass slides. Contains handy index inside cover for listing slides by subject. \$3.75.



Ready-Mounts—Mount Kodachrome transparencies at home with Kodak Ready-Mounts (cardboard). Box of 50, \$1.75 (35mm. or Bantam).

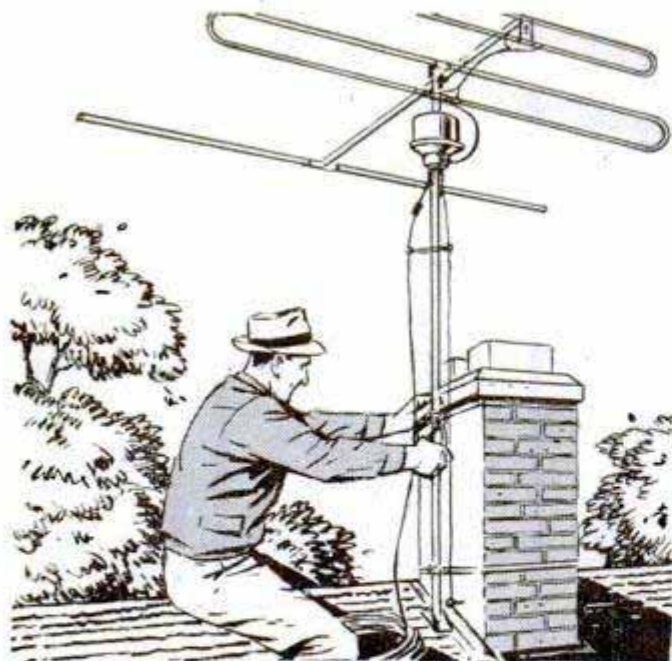
Share your color prints—For Kodachrome Prints: A, Kodachrome Print Wallets. For Kodachrome or Kodacolor Prints and Enlargements: B, Kodak Color Print Albums; C, Kodak Color Print Mounts. For Kodachrome or Kodacolor Prints: D, Kodak Color Print Folders. Protect your Kodak color prints and enlargements, and make it easy to share your enjoyment of them with family and friends. Prices start at 10¢.

Prices subject to change without notice and include Federal Tax where applicable. Consult your dealer.



Kodak

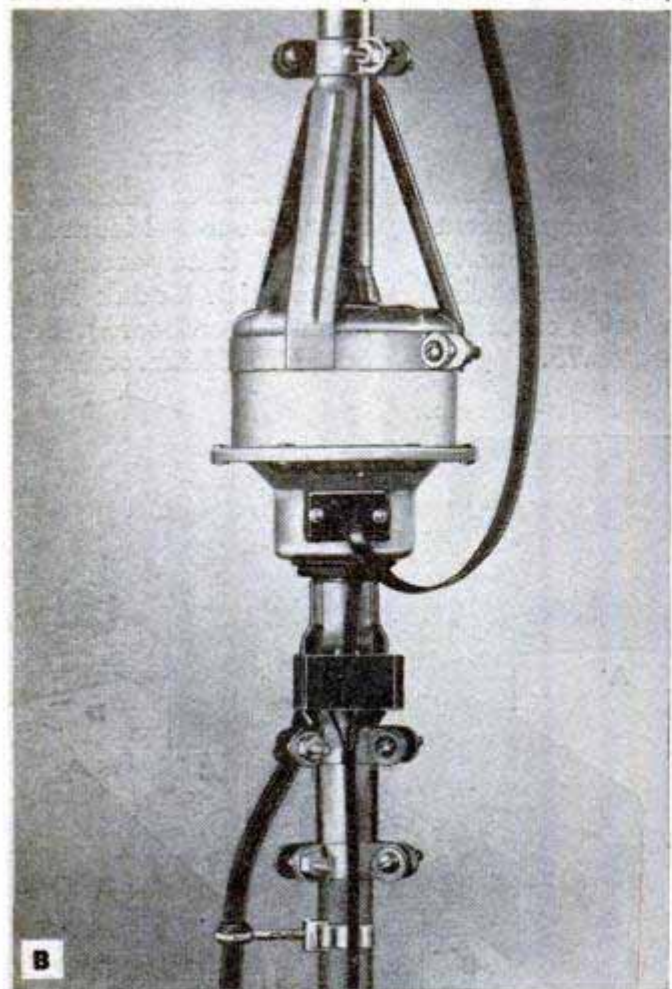
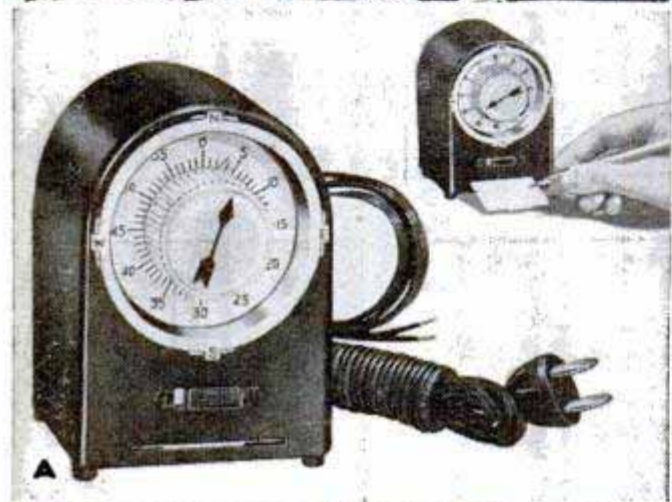
ANTENNA ROTATOR SOLVES TV-RECEPTION PROBLEMS



TRANSMITTED at ultra-high frequencies, TV sight and sound signals are reflected like light from the surfaces of buildings in crowded localities, and these reflected signals result in ghost images. This condition usually demands a highly directional receiving antenna that will give sharp discrimination to reject unwanted signals. These ghosts are often received on several stations, making it necessary in some locations to employ more than one TV antenna, or a rotating device like the one illustrated that will turn the directional antenna to favor the desired station.

In areas where there are several TV-transmitting stations located in widely separated directions from the set-owner's home, a means for rotating the antenna is obviously desirable. Early antenna-rotating devices in many cases were of the hand-operated, homemade variety. These have now been replaced with highly efficient motor-driven rotator units operated by remote control from direction-indicating control boxes located near the receivers.

The motor-driven antenna rotator and control-box units are easy to install. One of the new assemblies is illustrated in photos A, B and C. It is designed to rotate in one direction only, and it is claimed to have greater power and higher torque than is usually available in reversible motors. The attractive remote-control unit is shown in photo A. A handy card for logging stations slips into a slot in the front of the control unit as will be noted in the inset photo. A close-up of the rotator-unit assembly appears in photo B. The three-wire rotator-control cable connects to the terminal board on the underside of the automatic-control unit as illustrated in photo C. To operate the device, you merely switch the power on and then set the pointer to the desired antenna direction. When the pre-determined direction is reached, rotation stops automatically.





SELF-HELP IDEAS FOR SET OWNERS

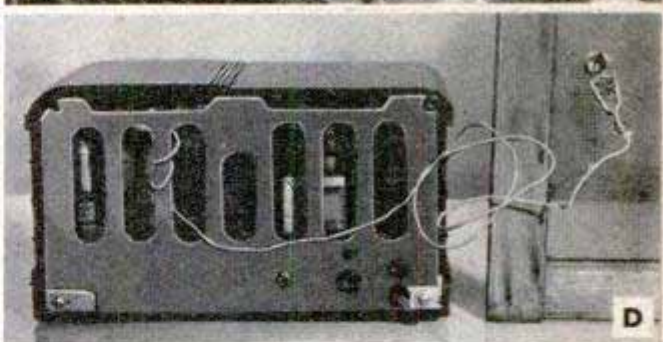
A—Many set owners using large extension speakers can take a tip from this serviceman, who houses his test speaker in a storage cabinet under his workbench. The same idea can be applied to closet doors, kitchen cabinets and recreation-room walls.

B—If you are in a fringe area or need a TV-FM booster for better reception, here is one that is fully automatic. You can hang it on the back of the TV set where it is out of sight, and forget about it, as it is automatically tuned by normal operation of the set.

C—You can check your a.c. record-player speeds with a 15-cent stroboscope card and a small neon lamp.

D—A window screen will serve as a temporary antenna for radios that normally use an external wire.

E and F—How a sideboard can be used to house a bass-reflex (10-in. speaker) enclosure 11½ in. deep, 20 in. wide, 26 in. high. The rectangular hole in E is 3½ x 7½ in. Inside lining is carpet padding.



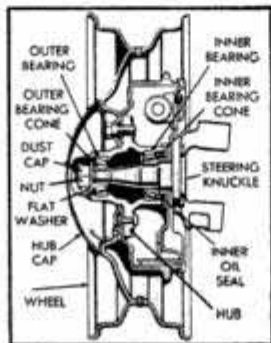


Care and Feeding of Engines

BY S. P. CORP

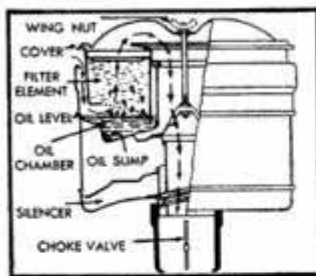
COOL BEARINGS IN SUMMER HEAT

Lubrication of front wheel bearings every 10,000 miles is sometimes neglected with sad consequences. It's not a hard chore to remove a front wheel, clean, grease and replace—but remember these points. Have a new inner oil seal and new cotter pin for replacement. Clean the bearings with gasoline and allow to dry but **DON'T** spin a dry bearing. Inspect bearings and cups for chipping, flat spots or for overheating—indicated by a dark blue ball or roller. Work about a tablespoon of wheel bearing lubricant into each bearing with your fingers.



Tighten nut till you feel a binding on wheel rotation, then turn one revolution to seat bearing and back off wheel nut until bearings are slightly loose. Retighten nut until looseness is just removed. Install your new cotter pin.

CLEANING AIR CLEANERS



Oil bath air cleaners need service every 5000 miles, others every 2000 miles. If used on dusty roads, clean them twice as often. Oil should be replaced with SAE50 for hot weather and a lighter oil for winter. A dry cleaner unit should be plunged up and down in clean gasoline or kerosene,

taking care not to wet the felt at the top of the cover.

IF YOUR CAR DRINKS TOO MUCH

An engine that uses too much oil needs new Sealed Power piston rings. The Sealed Power MD-50 Steel Oil Ring does the world's best job of oil control, even in badly tapered and out-of-round bores. Your dealer has Sealed Power Rings or can get them for you. They save gas, save oil, restore original power to your engine and lengthen its life. A postal to "Sealed Power, Dept. G-8, Muskegon, Mich." will bring you free a helpful book, "7 Ways to Save Oil."



On the Trail of the Gulf Stream

(Continued from page 128)

which, in turn, support the multitudes of Antarctic birds like guanayes, pelicans and penguins. They are able to survive only because the Humboldt Current is chilly enough to sustain them. The birds, in turn, help support the Chileans and Peruvians with their production of guano—a world-famous source of nitrate for fertilizer.

But every few years, a warm, tropical current from somewhere sneaks in and heats up the Humboldt, kills the fish and raises Cain with the birds. Last time it happened, the coasts were littered for hundreds of miles with millions of guanayes that had died of starvation.

To find out what causes these shifts in the currents, what the effects may be, and perhaps how they may be forecast, is one of the big reasons scientists at Woods Hole and other oceanographic institutions are forever out scouring the seas.

Currents in the ocean have different temperature and salt content from the water around them. It is by measuring these that scientists can tack their ships in and out of a current, follow its edge and track it down.

Until recently, the surest way to follow a current was to compute its temperature and salinity every 20 to 60 miles, then figure how it would have to be running to set up such a pattern—a tedious job. The ship would heave to. A man would lean perilously over the dipping side and lower a series of Nansen bottles on a long cable into the water. The bottles, fitted with thermometers, would test the temperature and salinity at different levels.

Now, loran provides accurate positions at any interval. And a rapid temperature-measuring device—the bathythermograph—which looks like a bazooka shell, is simply lowered every 30 minutes. On a glass slide coated with skunk oil (because it won't wash off in the water) the bathythermograph makes a running record of temperatures as deep as 900 feet while the ship is under way.

Over the side of the pitching ships, scientists also lower their direct-current meter—a propeller with a long fin on it which acts like a weather vane and keeps the propeller facing into the current. The current turns the propeller, and from the number of revolutions, scientists can compute the speed of flowing water.

Already, out of recent surveys, oceanographers have learned that the Gulf Stream is not a broad, steady "river in the ocean." At its swiftest part, between Hatteras and the Grand Banks, it is 10 to 15 miles wide,

(Continued to page 222)

Yogi Berra SAYS

"I add water
only 3 times
a year"

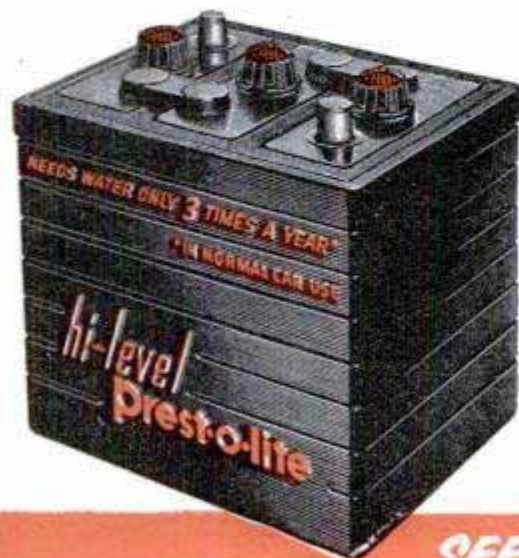
PREST-O-LITE HI-LEVEL BATTERY...



Yogi Berra, most colorful catcher in baseball and star clutch-hitter for the New York Yankees, finds Prest-O-Lite Hi-Level has over 3 times the liquid reserve of ordinary batteries—goes 3 times as long without adding water.

needs water only 3 times a year

IN NORMAL CAR USE



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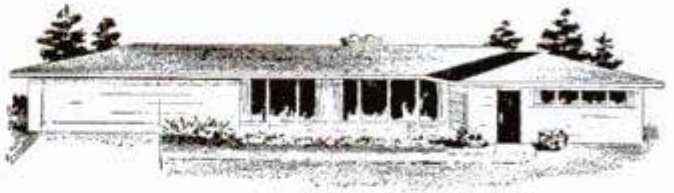
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Dept. 290, 55 West 44th St., New York 18, N.Y.

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Clinic for Homemakers



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Hanging Gutters

Q—In planning to replace the gutters on my house I've encountered the question of whether to hang them level or slant them toward the downspouts. The gutters are 30 ft. long, without any offsets, and are of the half-round type. Which should I do, slant them, or hang them level?—T.B., Kans.

A—Although it's a common practice to pitch gutters to the downspouts, especially half-round gutters, it also is recommended that gutters be installed level on certain types of architecture. This recommendation applies particularly to box-type gutters and also to wooden gutters of various types. Half-round gutters are more apt to sag slightly at one, or several, points along the length, and for this reason alone it generally is recommended that they be installed with a pitch toward the downspout ranging from $\frac{1}{4}$ to $\frac{1}{2}$ in. for each 10-ft. length. For short runs up to 20 ft. total length, pitch the run $\frac{1}{2}$ in. Longer runs up to 30 ft. on a single downspout should be pitched not more than a total of 1 in. for the full run, as otherwise the gutter will tend to overflow at the lower end during heavy rainstorms. On a long run such as you have, it's a good idea to place hangers every 30 in. throughout the length, instead of the 36-in. spacing usually recommended. Use 5-in. gutter, as the 4-in. width is entirely too small for a 30-ft. continuous run.

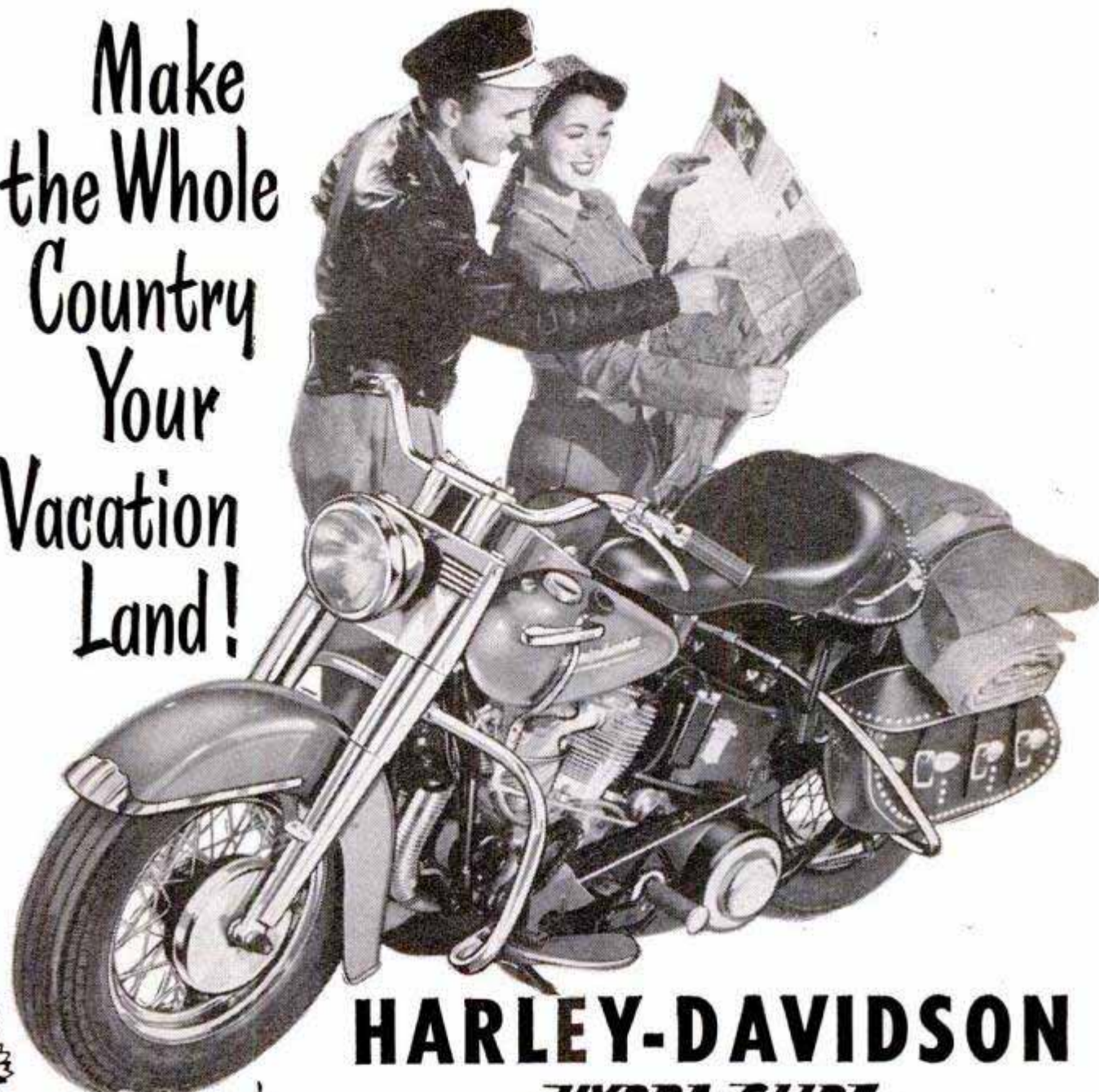
Waterproofing a Porch Deck

Q—What should I use to waterproof a porch deck that is covered with matched flooring and roll roofing? Apparently the roll roofing will not withstand being walked on, as the deck leaks already in several places. Is there any way of sealing the joints in the floor boards to make the deck waterproof?—S.R., Kans.

A—It is not clear from your letter whether you are referring to new or old construction. Assuming that you are describing a fault in new construction, we would not consider it practical to attempt to waterproof the deck by filling the joints between the floor boards. Rather we would suggest that you apply a covering of canvas of a grade made especially for this purpose. Remove the roll roofing and sweep the flooring clean. Plane off raised edges of the individual boards and renail any that are warped. Fill open cracks between the boards with calking compound. If the flooring is old and in rather bad condition generally, it will be necessary to cover it with $\frac{3}{8}$ -in. outdoor plywood. A newer

(Continued to page 220)

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the Whole
Country
Your
Vacation
Land!



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SEE America the scenic, low-cost way — on a Harley-Davidson Hydra-Glide! You'll enjoy a new kind of vacation — an economical and fun-packed tour, with picturesque back-country roads and towns, breath-taking mountain trails, hidden lakes and out-of-way resort regions offering thrilling new adventures and good times. You'll ride swiftly and comfortably, too . . . float along like a breeze! Even on longest trips you'll hardly know you're traveling. Plan now for a thrilling vacation. See your dealer today.



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How to make files last longer

STEEL is the national security program's most essential material. Its conservation is everybody's concern—and duty. In files, steel can be either saved or wasted . . . saved, firstly, by buying *good* files (they consume no more steel than poorly made, short-lived ones); secondly, by proper use and care of files. Here are a few rules:



DON'T

throw files around carelessly—say, on top of one another. Scuffs, blunts, chips teeth.



DO

keep files clean—tap frequently on wood to loosen chips; also brush with file "card."



DO

use The right file for the job. Different metals ruin wrong files.



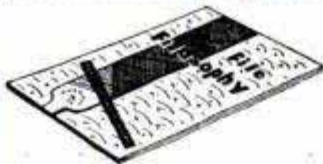
DON'T

let files rust or fill up with dirt. Corrodes and dulls teeth.



DON'T

put heavy pressure on forward file stroke; nor "drag" file back under needless pressure.



DO

send for "File Philosophy"—best book on kinds, use and care of files you ever saw. FREE.

Using files properly is up to you. Making good files is up to us. There are none more carefully shaped, accurately cut, properly hardened—none longer-lasting than Nicholson and Black Diamond brands. The hardware dealer who sells them is reliable in helping you select the files you need.

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(In Canada, Port Hope, Ont.)



NICHOLSON FILES

FOR EVERY PURPOSE

(Continued from page 218)

floor in reasonably good condition will do, if treated as described. Apply a coat of lead-and-oil paint and allow to dry. Then coat the surface with white-lead paste, or heavy white-lead paint, applying the paste or paint in a strip only as wide as the canvas, and at the low side of the porch deck. Press or roll the canvas strip in place. Then coat another area of equal width and length and lay the second strip of canvas, allowing for a 4-in. lap. Continue this same procedure until the deck is covered. Then tack the edges and laps with copper tacks spaced about 1 in. apart. After drying, paint the canvas with two coats of deck paint.

'Sweating' Stovepipe

Q—I have an oil-burning space heater in my combination garage-workshop. The vent pipe passes through the ceiling and runs horizontally to a chimney at the end of the building. Length of the horizontal run is about 12 ft. In cold weather, water drips from the pipe joints along the horizontal run, causing the pipe to rust out in one season. Where does the water come from and what can I do to remedy the trouble?—E.F., Mass.



A—One of the products of the combustion of concentrated fuels is water vapor. Heat from the horizontal run of vent pipe is quickly dissipated in the cold attic of the building. This lowers the temperature of the pipe to the dew point and causes the vapor in the waste gases to condense on the cold metal. Sometimes it is possible to correct the trouble by adjusting the gravity damper, or draft control, to permit more heat to escape to the vent pipe. While this lowers the efficiency of the heater and raises fuel consumption, it often proves effective in preventing the objectionable condensation in the pipe. A better way, where space permits, is to slant the horizontal run of pipe 15 deg., or more, from the elbow to the chimney. This inclining of the vent pipe generally increases the velocity of the gases sufficiently to minimize condensation to the point where it is no longer troublesome.

Mildew in Closet

Q—Clothing mildews in our clothes closets every summer. The closets have single-panel swinging doors and it is not possible to leave them open because of the wall space they take up in small rooms. What causes the mildew, and what can we do to remedy the condition?—A.P., Ore.



A—Lack of ventilation and high humidity cause this trouble and the problem of ventilating a closet is not simple. Leaving the door open might alleviate the condition to some extent but still would not cure the basic cause, which is the presence of high humidity in the air throughout the house. One thing that sometimes proves to be a help is the installation of a shutter door. These are now available to fit doorframes of various standard sizes. The shutter door would permit the circulation of air, even when kept closed and might prove a remedy for your trouble. Air the garments frequently in bright sunlight and, when placing them on hangers, space them individually so that air can circulate around each one. Regular use of an electric dehumidifier will reduce humidity to the point where it no longer is a cause of the trouble you describe. Of course, this unit is rather expensive.

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some 6000 feet deep, flowing at a rate of four to six miles an hour. Between Hatteras and the Grand Banks, it starts spreading and weaving like a big snake, looping into large meanders which break off and form eddies—some of them hundreds of miles across. It's by getting on the wrong edge of one of those eddies that a ship captain, thinking he's following the stream, can actually be bucking a stiff current.

A brand-new current-measuring device, developed at Woods Hole, may be the answer for tomorrow's navigators who want to know how they're faring. Called a geomagnetic electrokinetograph, it uses the earth's magnetic field as a navigational reference—instead of fixed points on land. Thus, instantaneous and accurate position fixes can be made and, with a minimum of figuring, a navigator can tell whether his ship is being shoved along or pushed back by an ocean current.

On most voyages, Woods Hole scientists make frequent weather observations. Little by little they are gathering data to show what happens to air coming in contact with the varied surfaces of sea.

To find out if salt particles ever get into the air to become fog, cloud and raindrop nuclei, the institution's Alfred Woodcock devised a gadget that looks like a mammoth comb. The instrument is carried aloft by planes, circling from almost sea level to heights of 9000 feet. Any salt particles in the air adhere to the comb spikes for examination later.

So far Woodcock has found large salt particles in cloud formations high above the seas. How did they get there? "Picked off the whitecaps by wind," says Woodcock, "and carried aloft. Bacteria from the ocean, and other organisms get up there the same way."

The meteorologists believe that they may be on the trail of a real weather breeding phenomenon.

These men lose no chance to find out more about their discovery. If salt nuclei gather raindrops, then you should be able to find them in rainstorms. They decided to test a hurricane and see. Recently, Woodcock got word of a hurricane moving in on Florida. He flew down immediately. Though his plane was headed for Miami, Woodcock was forced to get out at Jacksonville, where the plane was grounded. He took a train—which was forced to call it quits at Daytona. The meteorologist grabbed a cab, paid the driver \$37 and told him to "just drive south." They made it to Cape Canaveral. There the cab was creeping across a causeway at Cocoa when the wind hit it as it came around a jetty. "It

(Continued to page 224)



SINCLAIR RESEARCH LABORATORIES—nine buildings containing the most modern testing equipment known—have contributed many of today's most important developments in petroleum products, production and

refining. Under the Sinclair Plan, the available capacity of these great laboratories is being turned over to work on the promising ideas of independent inventors who have no such facilities within their reach.

An Offer of Research Facilities To Inventive Americans Who Need Them

The Sinclair Plan is opening up the Company's great laboratories to every American who has an idea for a better petroleum product

INVENTIVE Americans are often at a loss today. Not because of any lack of ideas, but because of a need for large and expensive facilities to find out if and how their ideas work.

This was no obstacle in our earlier days. The Wright Brothers designed their first airplane with the help of a foot-square homemade "wind box"—and the plane flew.

In contrast, the man with a new idea in airplane design today often needs a supersonic wind tunnel costing millions.

In short, science and invention have become so complex that a man with an idea for a better product often needs the assistance of an army of specialists and millions worth of equipment to prove his idea has value.

Within the petroleum field, the Sinclair Plan now offers to provide that assistance.

Under this Plan, Sinclair is opening up its great research laboratories at Harvey, Illinois, to independent inventors who have sufficiently good ideas for better petroleum products or for new applications of petroleum products.

If you have an idea of this kind, you are invited to submit it to the Sinclair Research Laboratories, with the provision that each idea must first be protected, in your own interest, by a patent application, or a patent.

The inventor's idea remains his own property

If the directors of the laboratories select your idea for development, they will make, in most cases, a very simple arrangement with you: In return for the laboratories'

investment of time, facilities, money and personnel, Sinclair will receive the privilege of using the idea for its own companies, free from royalties. This in no way hinders the inventor from selling his idea to any of the hundreds of other oil companies for whatever he can get. Under the Plan, Sinclair has *no control* over the inventor's sale of his idea to others, and has *no participation* in any of the inventor's profits through such dealings. Moreover, it is a competitive characteristic of the oil business that the new products adopted by one company are almost invariably adopted by the whole industry. This means that the very fact of his agreement with Sinclair should open up to the inventor commercial opportunities which might otherwise be hard to find.

How to proceed: Instructions on how to submit ideas under the Sinclair Plan are contained in an Inventor's Booklet available on request. Write to: W. M. Flowers, Executive Vice-President, Sinclair Research Laboratories, Inc., 630 Fifth Avenue, New York 20, N. Y. for your copy.

IMPORTANT: *Please do not send in any ideas until you have sent for and received the instructions.*

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blew the cab clear across the road," recalls Woodcock, "and the driver would not go another inch."

Dragging his equipment with him, the meteorologist scrambled to a near-by lighthouse, where he sat at a porthole taking hurricane rain samples for several days. They contained enough salt particles to make him a happy man.

With a more complete knowledge of how the cauldrons and refrigerators of the seven seas brew up weather, and how the mighty currents carry their weather-breeding stews to different parts of the world, some meteorologists are hopeful that eventually they may be able to predict changes in climate and weather long before they occur. Columbus Iselin, senior oceanographer of the Woods Hole Oceanographic Institution, points out, "Ocean circulation is much like air circulation, but slower. A week in the ocean is apparently equal to a day in the air so far as circulation is concerned."

And out of it all may come the answer to why the whole world is getting warmer—as it seems to be doing. Are the warm, shifting currents of the Gulf Stream the reason why Greenland Eskimos are eating, as a main diet, codfish, never found in those northern waters before 1900; and why great cracks are splitting Greenland's ice dome, and melting it away to reveal Norse cemeteries 900 years old? Ice is also receding from Antarctica's giant refrigerator in several places; some small glaciers in Lapland have disappeared and one has lost 30 feet in height since 1902; snow-capped mountains in East Africa are growing green bonnets; and one Alaskan glacier has receded a full 18 miles in 35 years.

Is the answer in the ocean? Oceanographers won't even talk about it. They're too busy trying to explain the ocean's behavior. If they get the key to that puzzle, they'll move on to open the next door.

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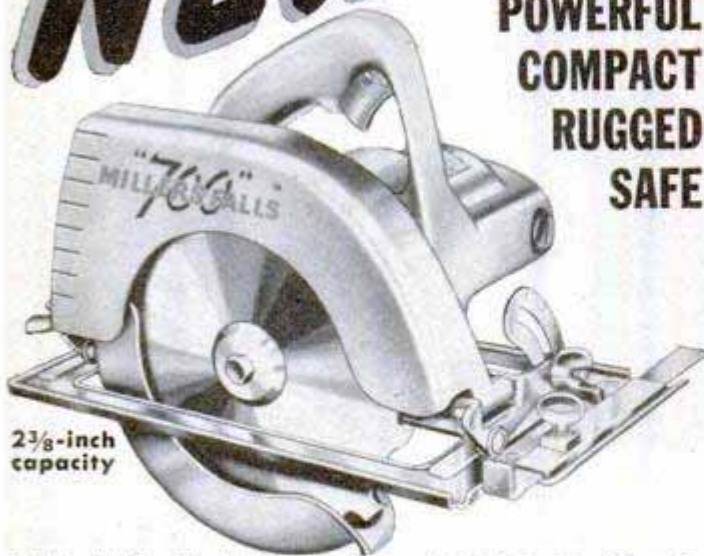


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The Mark of Superiority

Mastermind for Hollywood's Wars

(Continued from page 68)

the studio's tank, Witte directed the operation of giant wind-making machines, huge drums that created waves, and pots that produced clouds of billowing smoke. As he hand-signalized the various effects, he was almost like Arturo Toscanini conducting a symphony orchestra.

When the script called for a deadly stream of machine-gun bullets to cut through the water, Witte's experts laid submerged pipe. Blasts of magnetically controlled compressed air simulated the bullets. (This is how the Shirley Temple scene was shot.) When an actor was bloodied, a broken capsule spread a gruesome red dye.

Witte's skill at creating movie magic brought him to the attention of the Marine Corps during World War II. At Camp Pendleton, the big Marine Corps training base near San Diego, he helped to create realistic battle effects for troop training and set up a camouflage school.

Witte is also manager of one of the largest private arsenals in the country, located in the old Tom Mix stables on the Twentieth Century-Fox lot. Consisting of some 4000 guns, ranging from duelling pistols to six-foot-high machine guns, its worth has been estimated at \$135,000.

Some of these guns were once actually used to guard the West Coast. It was during those bleak and tense days of December 1941 when nobody knew where the Jap fleet was. The commandant at Fort MacArthur, Los Angeles' main military base, learned of Witte's guns and got in touch with him.

"We need any machine guns you've got—in a hurry!" he ordered. A studio crew hustled 15 Vickers, Thompson, Lewis and Browning guns to Fort MacArthur. For several months, until the Army sent additional equipment, they guarded the Los Angeles airport.

Witte feels that Hollywood has come a long way in the making of war pictures—both from the viewpoint of safety for the actors, and authenticity.

"When we made 'What Price Glory,' we just put a lot of dynamite in the ground and touched her off. Explosion and smoke were enough, and if it looked something like a battlefield scene we were lucky."

"But it's harder to convince today's audiences. A lot of young men saw the real thing since 1941 and you can't fool them. Television and newsreels are also sharpening up the public's eye for the genuine article. That's why we went to such great lengths in 'The Frogmen' to make it technically flawless."

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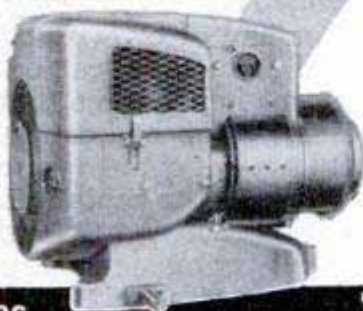
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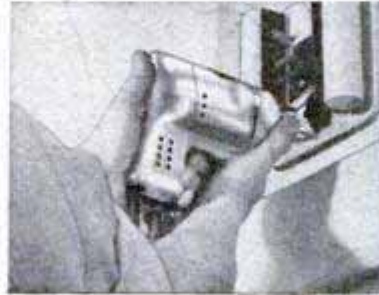
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BEARINGS



The Patients Are Pets

(Continued from page 117)

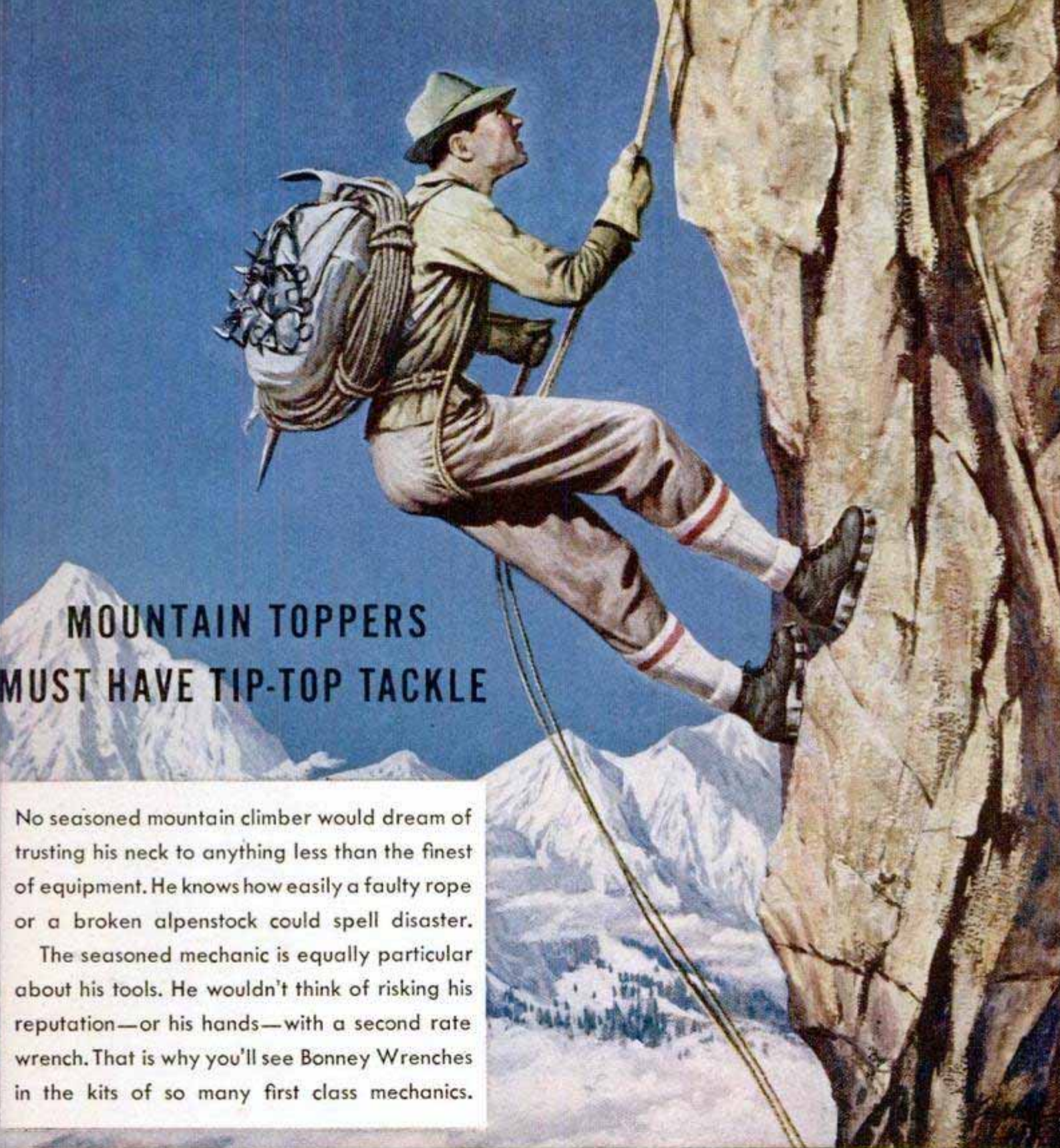
few years ago someone came up with the suggestion the League auction off a race horse at the annual ball in the Plaza Hotel. A race horse promptly was procured. Getting it through the revolving door at the Plaza was an engineering problem, but the auction brought in \$15,729.10 and a tremendous splash of publicity. Even the new owner was happy—the horse became a fairly consistent winner at tracks in the East.

The handling of pets is a science at Speyer. The attendants, who know every trick of the trade, offer a few suggestions on handling household pets. First of all, they say, a dog owner who gives his dog a bath can do more harm than good—if he doesn't watch his step. To prepare the pup, say the Speyer experts, put boric-acid ointment, yellow mercuric oxide or castor oil around his eyes so soap won't irritate them.

Plain soap flakes are best for the bath, they say. Be sure you wash between the toes where dirt collects and cuts frequently become infected. Don't wash the dog's face, as he'll take care of that himself. And most important of all, use enough rinse water. If even a speck of soap remains, a skin irritation may result.

Over a period of years Speyer experts have administered tons of pills to animals. Here's the way they suggest giving a dog a pill so he won't spit it back out. First, apply gentle pressure far back on the upper jaw, forcing the lips against the teeth. Hold the pill between the forefinger and middle finger of the right hand, so it will be ready to slip into the mouth. When the dog opens his jaws, insert the pill and push it as far back to the root of the tongue as possible. Once there, the dog's esophagus should automatically swallow the pill and the animal won't choke. But if the dog doesn't seem to be swallowing the pill, Doctor Kinney says, massage his throat for a few seconds in a downward direction. This will eliminate any tendency to regurgitate the pill.

Even the New York police occasionally call on Speyer for help. Not long ago startled passers-by saw a big, black paddy wagon squeal to a stop at the hospital door. A squad of brawny cops proceeded to unload 16 boxes of cat, each miaowing in a different key. Seems that the Police Athletic Association had conducted a very successful pet-cat contest for children, but when it was over the captain found 16 cats roaming the station house, left behind by their small-fry masters. He made a desperate call to Speyer, where the felines were housed until diligent research turned up every one of the owners.



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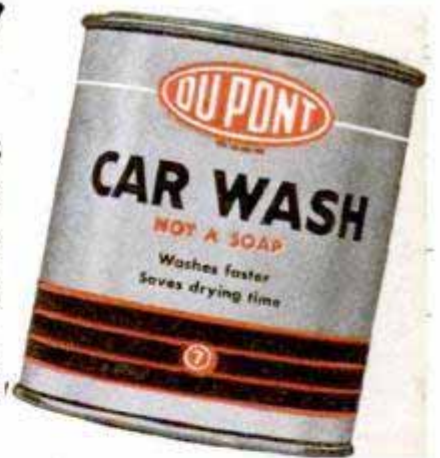
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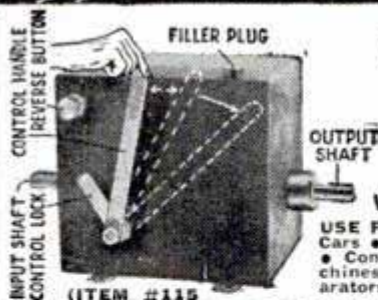
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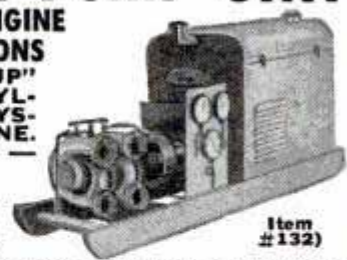
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ITEM #31C—Double action hydraulic cylinder, 3 1/2" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1 1/8" piston rod. Clevis mounting at base and shaft. 19 1/2" overall length closed. Will lift 9625 lbs. using 1000 PSI from Logan Heavy Duty Hydraulic Pump. Uses 3/8" tubing fittings. Value \$102.00. Shipping wt. 11 lbs.

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ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke. Will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel, 1 1/8" stainless steel shaft. Gov't. acq. cost \$176.00. Shpg. wt. 26 lbs. F.O.B. Chicago. **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for. **32.50**

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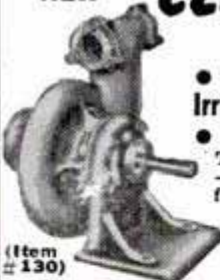
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This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2 1/2" standard pipe thread, twin outlets with 1 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs.



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10'	65'	200	5.2	3500
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Gov't. acq. cost \$145.00. F.O.B. Chicago. Now Only **39.50**

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PISTON TYPE

Ideal for use with hydraulic cylinders and valves

described in this page ad, Vickers constant displacement piston type pump delivers .507 cubic inches per revolution, 8 gallons per minute at 3750 RPM, 1000 PSI. Has 1/2" diam. shaft, 3/4" 18 thread inlet and outlet ports. Rotation—clockwise. Postpaid **19.90**

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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. Ship. wt. 8 lbs. A \$60.00 value. **12.95** postpaid

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7x50 mm PRISM BINOCULAR

Imported from U.S. Zone abroad. Finest Ground and Color Corrected Lenses. Inter-pupillary adjustment. Eye focus. Light weight: This model features greatest light transmission; very wide field, Night Glass, Naval Model. With handsome case and 2 straps.

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Same fine manufacture as above 7x50mm's but 43% more powerful. In fine case with neck and shoulder straps.

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This is a REAL BUY. These are genuine GERMAN, Coated, Center-Focus Binoculars made in Germany. They have great optical precision and are but 10½ oz. in weight, Magnesium. In hand made leather case with straps. Similar glasses on the market at very high prices.

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This is the same nation-wide famous tiny precision model sold so widely at much higher prices. Eye-width adjustment—individual eye focus adjustment. 370 foot field at 1,000 yards (leather case & neck cord).

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Both lower side adjustment and upper tube extension to increase power. Exceptionally critical instrument. \$4.95

20x40x60 POCKET MICROSCOPE

This model has high light clarity, very powerful, lower knurled adjustment knob. Unusual buy in this Power and quality \$3.95



200 POWER MICROSCOPE

Newly imported from France. Highly ground and polished precision lenses. With 2 directional French Mirror. In box including 5 prepared slides complete. \$12.95

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This is the finest instrument we handle. It is in every way comparable to domestic makes selling for \$495.00. Complete with tools, oil for immersion, 3 objectives: 10x, 40x & 100x oil immersion. Eye pieces are 5x, 8x, 15x Huygenian. X & Y mechanical stage. Abbe 1.2 condenser. In hardwood chest with lock and Key, etc. \$250.00



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Mid-West Branch Office, 30 W. Washington St., Chicago 2, Illinois

A Clock for Eternity

(Continued from page 133)

—or stellar time—has an interesting explanation. It is brought about by the fact that, while the earth rotates 365 times about its own axis in relation to the sun during a mean year, it will, during the same period, rotate 366 times in relation to a fixed star. It follows that a sidereal day is 3 minutes 56.666 seconds shorter than a solar day. The hands showing sidereal time and mean time are driven by the same mechanism. They are connected by a transmission which consists of three pairs of wheels with different cogs, the sizes of which are calculated so exactly that during 300 years there will be a deviation of only 0.4 second in sidereal time.

Two special hands on the sun-and-moon mechanism have peculiar, bowed extensions which show the eclipses. Another dial shows the courses of the planets. The dial consists of eight movable rings, each of which represents a planet and rotates with a speed corresponding to that of the planet. The planet nearest the sun, Mercury, goes around its orbit in 88 days, whereas Neptune, which is farthest from the sun, takes no less than 165 years to go once around its orbit.

Jens Olsen completed a model of the clock and a new set of construction plans in 1943. The plans consisted of 46 sheets with 14 diagrams and 214 detail drawings, all done in six copies which, for the sake of safety, were kept in different places throughout the country. The clock cost \$150,000 to build, a sum that was realized through contributions, small and large, from an immensely interested public which, through the press, also took an active part in the discussion of the clock's site of erection and its artistic embellishments.

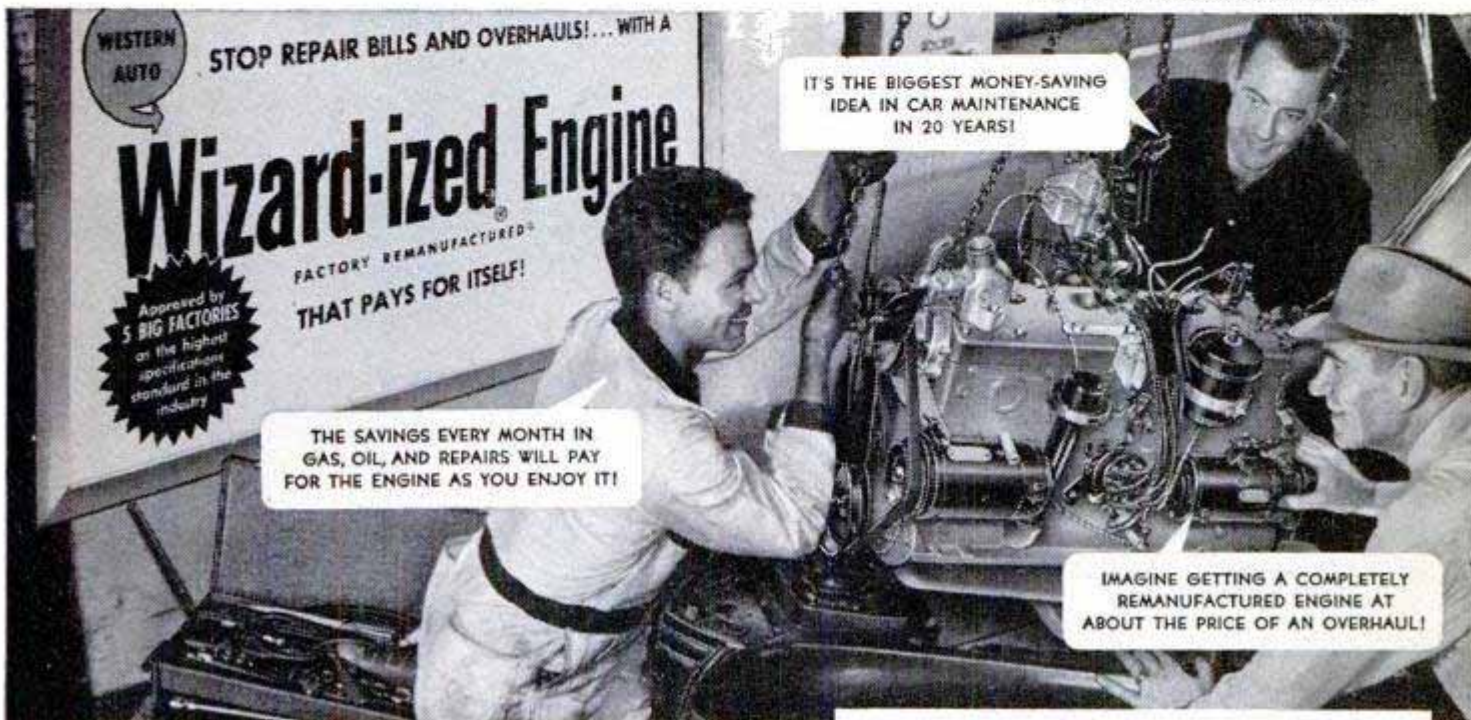
It is the clock of all Denmark, of all the solar system.

Rhenium Rivals Tungsten

Because it has a longer life than wolfram (tungsten), a little-known metal called rhenium may become increasingly important in high-temperature alloys and in electronics. Its only known production now is at the University of Tennessee. Originally the metal is in a flue dust obtained in the processing of molybdenum sulphide, a by-product of Arizona copper sulphide. Rhenium's melting point is 3100 degrees Centigrade, about the same as wolfram, and it has a higher electron emission than that metal. A dark gray to black powder, samples of the now-limited supply have been sold to research labs at \$900 a pound.

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(TERMS VARY BY AREA AND MAKE OF CAR)



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THAT PAYS FOR ITSELF!

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5 BIG FACTORIES
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IT'S THE BIGGEST MONEY-SAVING
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Thousands have discovered this easy new way to end costly repair bills—simply by replacing their old engines with low-cost Western Auto Wizard-ized Engines . . .

No other engine—no overhaul job—can give you more power-packed miles at so little cost! And, you get . . .

The same engine guarantee that comes with a new car—plus a free 500-mile service inspection of our installation. Every Wizard-ized Engine gets a . . .

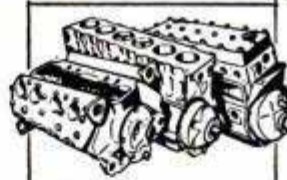
Complete factory inspection and then a final test run. Our installations made by trained mechanics in fully equipped garages. And, this new car power is yours for . . .

Half the cost of a new engine. You're paying for it in gas, oil, repairs . . . why not enjoy it now? For . . .

Less than 1/2¢ per mile, you get years of new miles without paying the high cost of a new car. Don't wait . . .

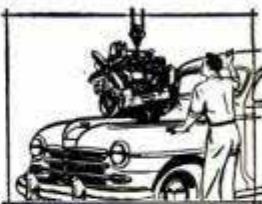
See your Western Auto man tomorrow . . . find out about his guaranteed trade-in allowance for your old engine! ➔

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OIL WASTE is your warning that in your engine rocking their pistons are wearing out cylinder walls.

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...every car owner should know about the 10 ways worn piston rings cause premature old age in engines. Learn why oil pumping is the danger signal WRITE POSTCARD TO RAMSEY CORPORATION, Dept. 3764, St. Louis 8, Mo.

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Piston Rings actually
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Ramco's
"NO-GAP"
Spiro-Seal steel section on the 10-Up oil ring develops a special compensating action that minimizes friction on the power stroke. Then, as the piston rises in cylinder, Spiro-Seal lessens its contact thus insuring adequate wall lubrication for exceptionally long life. This is one of many Ramco originations which make possible the control of oil in worn engines through STABILIZATION rather than pressure. See your repair shop displaying the RE-POWERING Sign... or write for free booklet. Send postcard to Ramsey Corporation, Dept. 3764, St. Louis 8, Missouri.

5572

The Owners Report On the '51 Cadillac

(Continued from page 106)

with high compression and regular gas—they don't go well together.)

A Nashville, Tenn., dentist was uncertain about the engine, saying: "Right now I can't get used to the odd noise it makes; I guess it is supposed to sound like that." A Bristol, Tenn., building-materials salesman said he likes the engine fine, "but with a few more miles the valves probably will start sticking like the '49 and '50 models." (This skeptical owner, we think, is going to have a pleasant surprise.)

1951 CADILLAC SPECIFICATIONS

ENGINE

Type.....	V-8, OHV
Bore and stroke.....	3-13/16 in. x 3 5/8 in.
Piston displacement.....	331 cu. in.
Horsepower.....	160
Compression ratio.....	7.5:1
Transmission.....	Hydra-Matic, 4-speed automatic 61-11/16 in.

GENERAL

	Series 61	Series 62	Series 60
Weight (4-door sedan).....	3827 lbs.*	3983 lbs.	4155 lbs.
Wheelbase.....	122 in.	126 in.	130 in.
Tread, front.....	59 in.	59 in.	59 in.
Tread, rear.....	63 in.	63 in.	63 in.
Height.....	61-11/16 in.	62-11/16 in.	62-11/16 in.
Over-all width.....	80 1/8 in.	80 1/8 in.	80 1/8 in.
Over-all length.....	211 1/2 in.	215 1/2 in.	224 1/2 in.

Interior Dimensions (4-door sedan)

Front-seat width.....	63 7/8 in.	63 1/2 in.	63 1/2 in.
Rear-seat width.....	64 5/8 in.	64 1/2 in.	64 1/2 in.
Leg room, front.....	43 1/2 in.	44 3/8 in.	43 5/8 in.
Leg room, rear.....	40-13/16 in.	41-15/16 in.	41-15/16 in.
Headroom, front.....	35-13/16 in.	35 1/2 in.	35 1/2 in.
Headroom, rear.....	35 1/8 in.	36 in.	36 in.
Tire size.....	8.00x15	8.00x15	8.00x15
Recommended tire pressure	24 lbs.	24 lbs.	24 lbs.
Road clearance.....	8.34 in.	8.34 in.	8.34 in.
Turning radius (outside bumper sweep).....	22 ft.	22.5 ft.	23 ft.
Steering wheel, lock to lock	4 1/2 turns	4 1/2 turns	4 1/2 turns
Steering ratio.....	21.3:1	21.3:1	21.3:1

CAPACITIES

Oil.....5 qts. Water.....18 qts. Gasoline.....20 gal.

*On Series 61, add 90 lbs. to weight figures for cars equipped with Hydra-Matic transmission.

A Milwaukee, Wis., executive remarked that he had "a sloppy engine for the first 5000 miles, but after that it is perfect." He also commented that the lack of air conditioning makes the windows steam up. (This didn't happen in my test car.)

A few owners complained of rattles and overhead-valve noise, but these constituted a small minority.

Perhaps the most frequent comment in the entire survey was on the 1951 Cadillac's "ease of driving." Most owners seem to think it is the easiest car they have ever driven on the highway. Ninety-eight percent prefer the V-8 engine as their choice of design, and 89 percent think overhead valves are best.

(Continued to page 234)



THE MOST

Versatile TOOL

ON YOUR BENCH!

CHANNELLOCK PLIERS

Made only by CHAMPION DEARMENT

In almost any job you can think of—Pliers are necessary—and Channellock pliers are the best you can buy. Whether you are working on your car, electrical repairs, plumbing work or just tightening nuts and bolts Channellock pliers do it better.

And remember, Only Champion DeArment makes Channellock—More than 3/4 of a Century of experience in producing highest quality tools. Send for Catalog D15—today.

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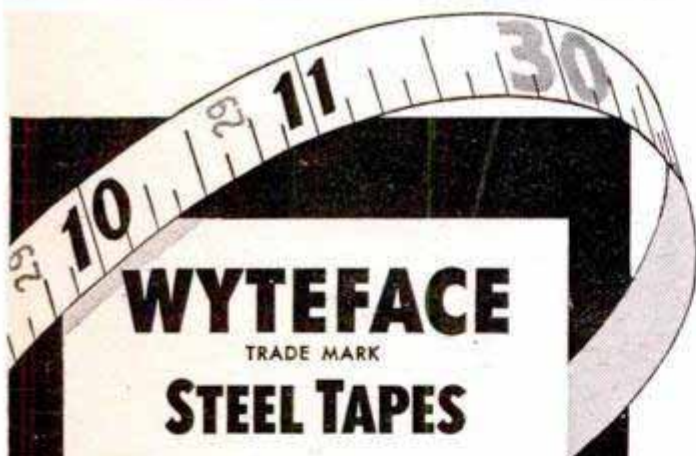
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No squinting, no guessing when you use WYTEFACE Steel Tapes. Jet black markings (foot numbers in red) on a white background. Easier to read in any light. Faster, more accurate measurements. Rust-resisting, hard to kink, simple to clean.

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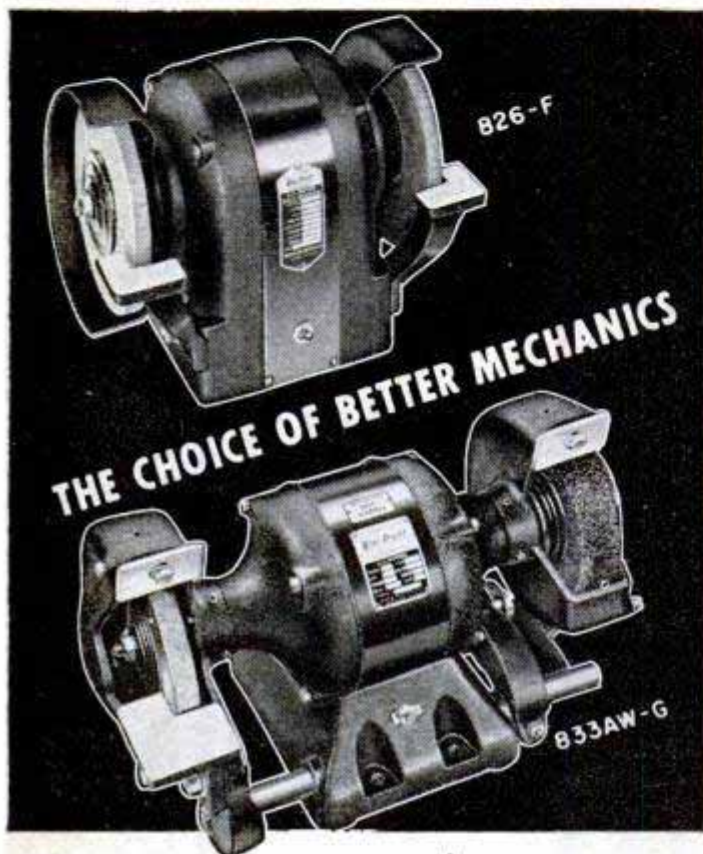
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IT'S BLUE-POINT for the finest grinder performance you've ever enjoyed! Blue-Point Bench Grinders are amply powered and exceptionally smooth—ruggedly built—designed in every detail for handy, time-saving operation! Complete range of models, $\frac{1}{4}$ to 1 H.P. Never sold in stores—buy direct from factory (or from Snap-on factory branch in larger cities). Complete details in free Snap-on catalog—write for it today!

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- Motor completely enclosed, protected.
- Oversize ball bearings throughout.
- Induction run motor develops less heat in windings.
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And now for my own test of the '51: I drove the new Cadillac approximately 2900 miles from the factory in Detroit to Indianapolis, then over Route 36 through St. Joseph, Mo., to Denver, and on to Albuquerque, N. Mex., then on Route 66 to Los Angeles, and then some additional mileage in Southern California.

The test included 75 miles of back-road testing in New Mexico over dirt roads, some covered with dust and gravel.

When I left the Cadillac factory I was given the standard instructions. One thing that intrigued me . . . I was told by the young chap who delivered the talk that no break-in period is necessary for the Cadillac engine. "Drive it as fast as you want to as soon as you want to," he said. This was music to my ears, for I have long felt that slow driving when new is unnecessary.

Cadillac's roadability and ease of riding compares favorably with any car manufactured in the world, and is far superior to most other makes. The 160-horsepower, overhead-valve engine packs a lot of dynamite and the acceleration is terrific.

My maximum speedometer reading (on long, open stretches) was 107 miles an hour. Like all speedometers on modern cars, I found a variation of about five percent on the high side. The instrument panel is easy to read and the speedometer figures go up to 110 miles per hour. On a long, straight stretch a good Cadillac driver can keep the needle somewhere between 100 and 110 if he so chooses.

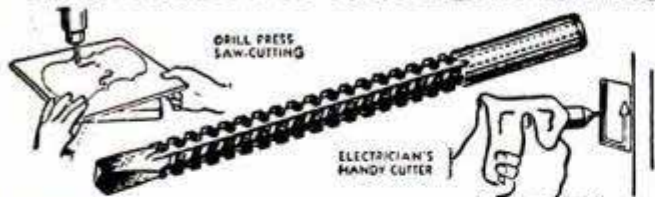
Cadillac's Hydra-Matic transmission (four forward speeds) is smooth and shifts with little effort. One feature I do not like about Hydra-Matic is the lack of a parking-lever position in the shift arrangement. There also is some creeping when standing with the lever in Drive or Low position. The high gear ratio (3.37:1 in fourth) enables the Cadillac driver to cruise at extremely high speeds with no apparent strain on the engine and with little effort on the part of the driver. Eighty-five and 90 miles an hour can be reached with almost no effort or strain.

For the length and weight of the car, it handles very well on corners. The springing is very soft—in fact, a little too soft to suit me when cornering at high speed. The ease of steering is apparent; however, it takes a lot of turning of the wheel to set the wheels exactly where you want them. I would prefer a quicker-acting steering wheel. It must be remembered, however, that to secure easy steering with our large, fat, present-day supercushion tires we must have a lot of wheel movement.

The driving position in the Coupe de

(Continued to page 236)

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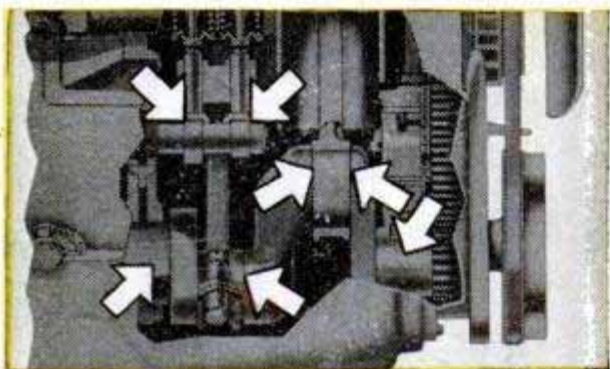
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Ville I tested is fairly comfortable, although there could be more space between the steering wheel and the left door—and a large man needs more room for arm movement than is provided. Likewise, there is not too much leg room for a tall driver.

I found Cadillac's brakes to be very good, with little evidence of fading even when used at high speeds or on mountain roads.

The brake-pedal pressure is light and the operation is especially smooth. I would prefer a wider brake pedal, inasmuch as the clutch pedal is eliminated.

The hand brake operates easily and the operating lever is well located at the left side. A feature I like is when the hand brake is applied, there is an indicator on the instrument board that reads "Brake" when the ignition is turned on.

The ventilating system is one of the finest that I ever have used, and entry of cool or hot air is controlled by two separate levers. There is, of course, a blower to help circulation of either hot or cold air.

The foot-controlled de luxe radio which I had on my test car (offered as optional equipment) is unique in that touching a foot button brings in the desired station.

The choke is automatic. During my 2900-mile test, there was no evidence of overheating at any time, and no water was added during the test period.

The oil level remained unchanged and no oil was added after the first oil change at 700 miles.

Another feature that was a part of all speedometers a few years ago and which has apparently been forgotten by most of today's manufacturers still is remembered by Cadillac. I refer to the trip-mileage indicator which, of course, can be instantly reset to measure the exact mileage of any set distance.

The push-button doors are quite heavy and it takes considerable pressure or slamming to close them. I think easier door closing would be an improvement.

The body is, of course, the well-built Fisher which has been used on all General Motors cars for years. The body is solid, and with the exception of one small squeak in the door for about 500 miles, there were no rattles or squeaks of any kind. Incidentally, I ran into a hard rainstorm for about 400 miles and no water leaked in at the windows or windshield. I have found in the testing of a large number of postwar cars that a surprising percentage of many makes of cars do leak water at some point, and many bodies are not dustproof.

Vision is far above average, with the one-piece curved windshield and narrow corner posts. Vision directly in front of the hood

(Continued to page 238)

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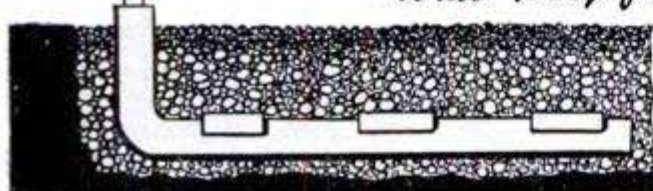
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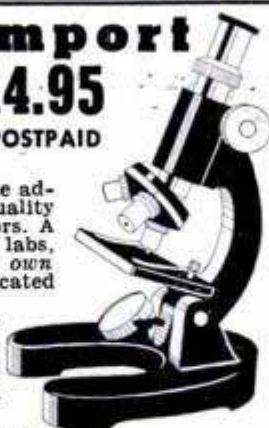
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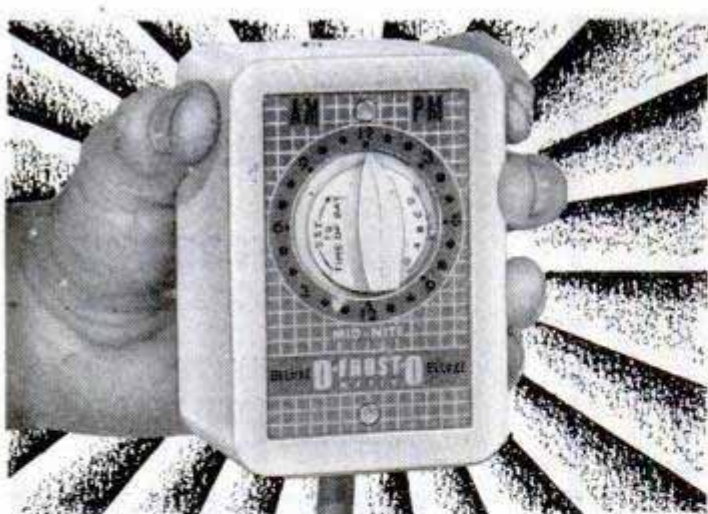
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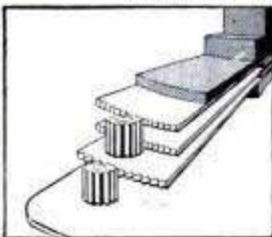
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would be improved some if the hood sloped a little more in front.

The trunk space varies on different models, but is ample. The rear-deck lid is counterbalanced and ease of opening is a nice feature, although it takes a little too much pressure or slamming to close it easily.

The ignition switch is easily controlled by the right hand, and by turning the switch to the extreme right, the starter is placed in operation.

The car I tested had the automatically controlled door windows. A master switch operated by the driver controls all four windows and there are individual switches for both right and left doors and rear windows, which the passenger can operate. Owners I interviewed reported very little trouble with the automatic-window unit.

For its size and horsepower (160), the Cadillac high-compression engine undoubtedly is one of the world's best and, for the size and weight of the car, the gasoline mileage is remarkable. While the car is heavy, actually the engine weighs only about 60 pounds more than many V-8 engines used in lighter cars.

Owners reported excellent economy with an average of 17.9 in country driving and 14 in the city.

In the 1951 Mobilgas Economy Run a Cadillac 62 averaged 21.539 miles per gallon when driven at an average speed of 40.329 miles per hour from Los Angeles to the Grand Canyon, Ariz., and return.

In Cadillac's high-compression engine (7.5:1) I found that premium gasoline is best to use. (An amazingly high percentage of the owners who replied to our poll reported the use of premium gasoline.)

From the days of the lowly chain-driven, single-cylinder "chugger" to the luxurious 1951 V-8, Cadillac never has built a really poor car. Nor since early days have they been a poor-man's car. However, in 1906 Cadillac, with its single-cylinder model at \$750, was hardly competition for Henry Ford's massive 6-cylinder Model K at \$2650.

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Even as early as 1909 Cadillac craftsmanship was evident when four Cadillac cars were sent to England, then dismantled and all parts mixed up, then selected at random for reassembly. This was to demonstrate precision, interchangeability of parts, and uniformity of Cadillac workmanship—and for this demonstration Cadillac brought to the United States for the first time England's famed Dewar Trophy.

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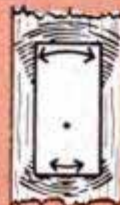
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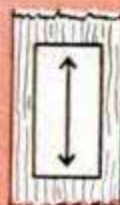
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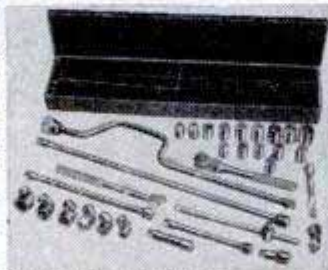
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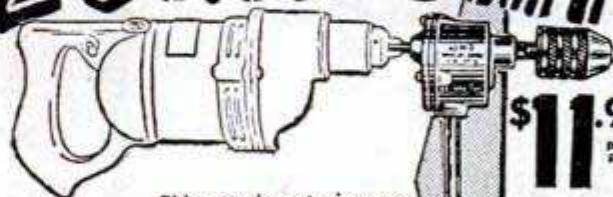
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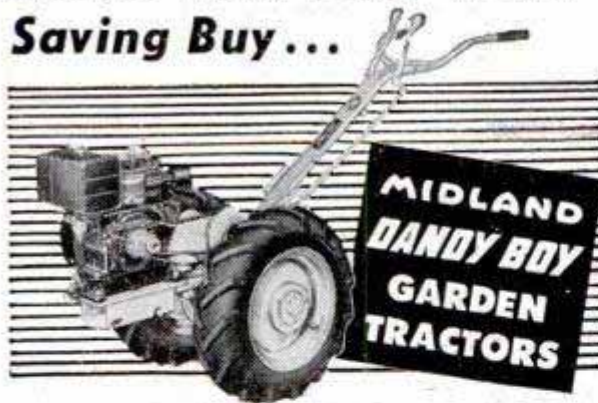
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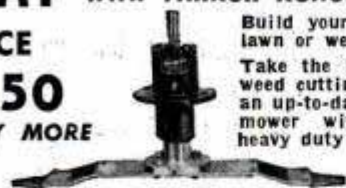


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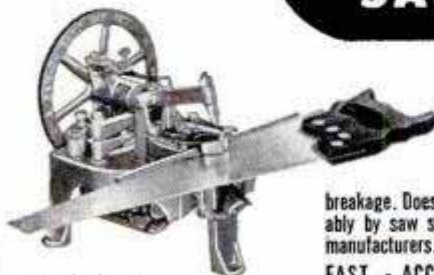


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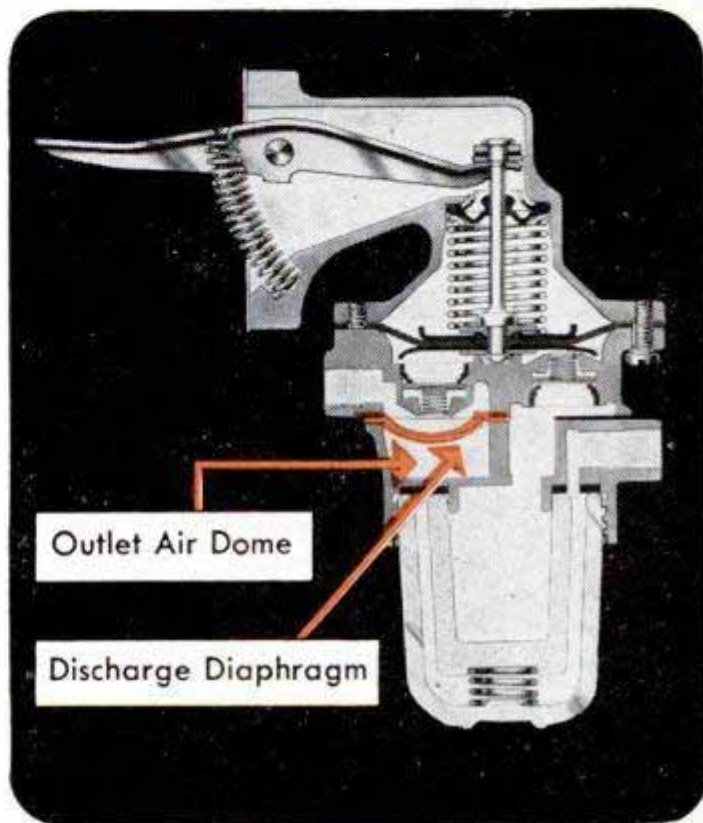
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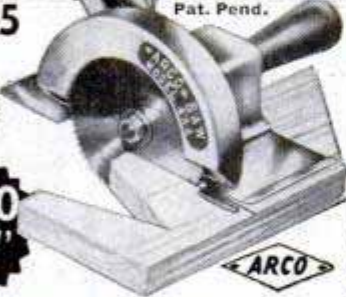
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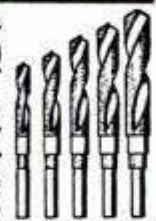
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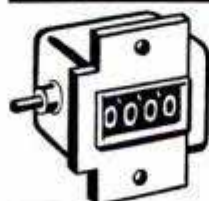
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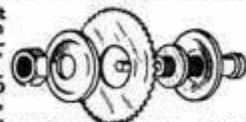
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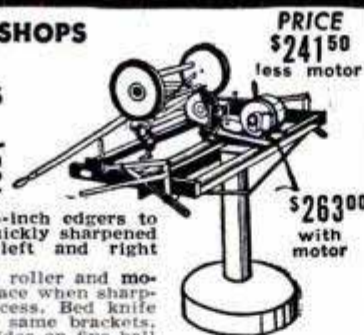
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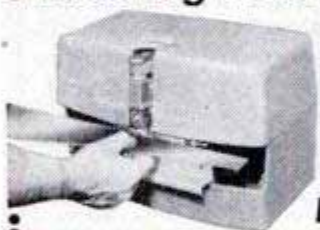
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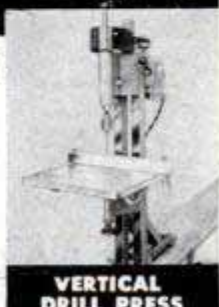
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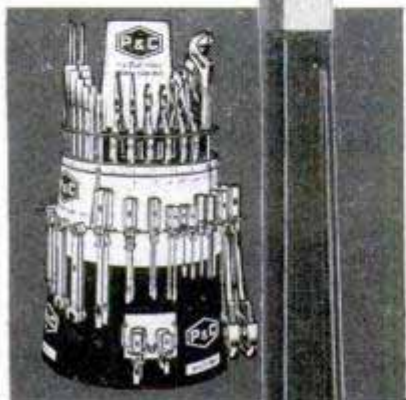
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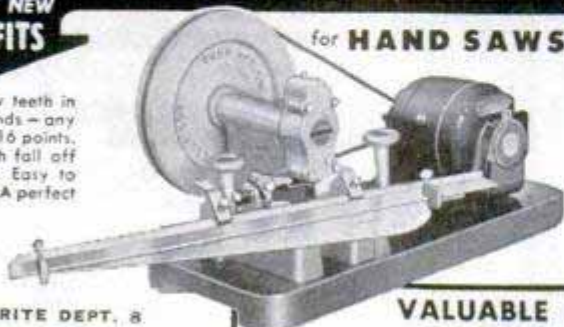
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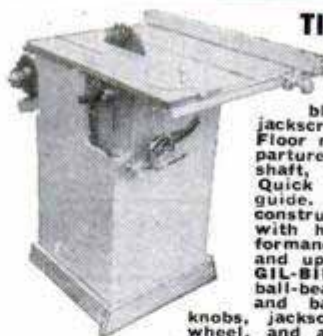
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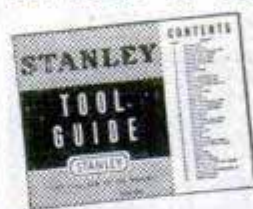
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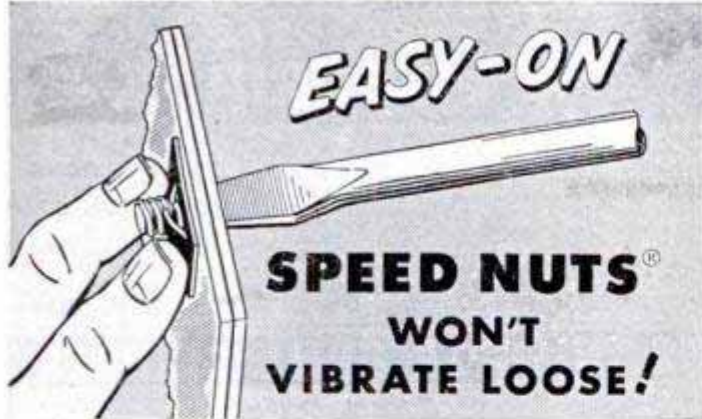
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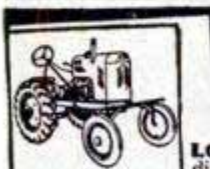
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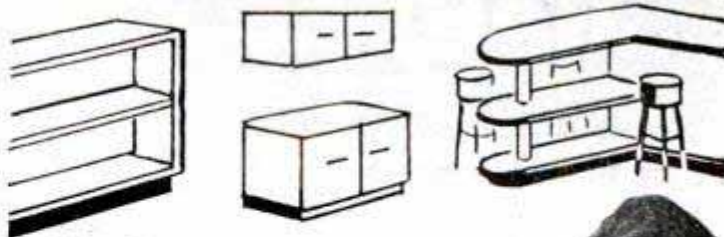
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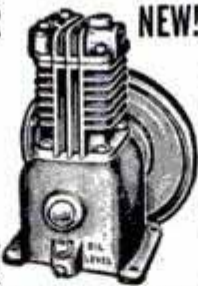


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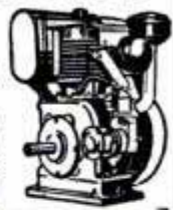
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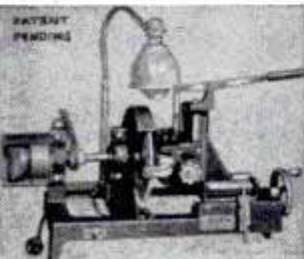
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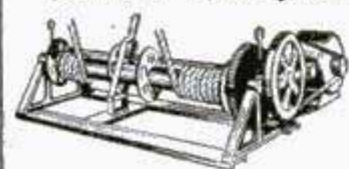
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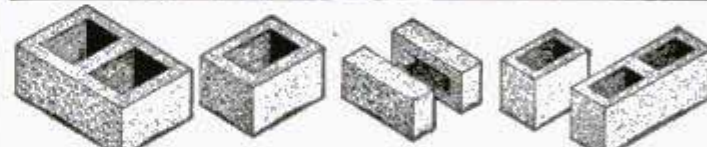
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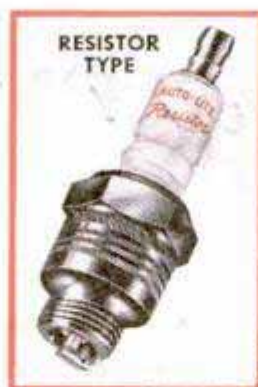
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