

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



JUNE
25 CENTS
30c IN CANADA



TO THE AMERICAN PEOPLE:

Your sons, husbands and brothers who are standing today upon the battlefronts are fighting for more than victory in war. They are fighting for a new world of freedom and peace.

We, upon whom has been placed the responsibility of leading the American forces, appeal to you with all possible earnestness to invest in War Bonds to the fullest extent of your capacity.

Give us not only the needed implements of war, but the assurance and backing of a united people so necessary to hasten the victory and speed the return of your fighting men.

William B. Leahy
Dwight D. Eisenhower
Franklin D. Roosevelt
Arthur H. Sulzberger





FOR QUALITY

Choose the name you can trust in Rubber

● War has destroyed most peacetime yardsticks of tire value . . . and here's why:

All tires are now made from GRS (Government Rubber Styrene)—the soft plastic adopted for tire manufacture after Pearl Harbor. Therefore all manufacturers started at the same time, from scratch, to create the new techniques necessary to process GRS into serviceable tires.

Naturally, then, it is the skill of the maker—and skill alone—that determines the *quality* of today's tires.

Skill has always been the outstanding

ingredient of Seiberling Tires. That skill has grown inevitably out of Seiberling's honest determination to build and market fine tires—not to a *price*, but to *perform*.

That is why so many tire research achievements come out of Seiberling laboratories.

That is why Seiberling men—chemists, engineers, tire builders and dealers—are known as Experts in Rubber.

And that is why you can have complete confidence in today's Seiberling Synthetic Tire. It bears "*The Name You Can Trust in Rubber.*"

SEIBERLING

Experts in Rubber

THE BATTLE OF RUBBER IS FAR FROM WON!

This war is consuming tires at a rate so fast no one could possibly have foreseen it. One fighting unit alone requires 5000 in 24 hours. Help win the Battle of Rubber by making your tires last. And help win the Fight for Freedom—

**BUY BIGGER BONDS
IN THE
7th WAR LOAN!**



RETAILED ONLY BY FREE,
INDEPENDENT BUSINESS MEN
DISPLAYING THIS SIGN OF QUALITY

**SEIBERLING
TIRES**



Life hangs by such threads



WANTED: Something to keep flyers from freezing. So engineers developed electrically heated goggles, shoes, suits . . . Something dependable to guide pilots in fog and dark. So engineers devised electrically driven gyroscopic instruments . . . Something automatic to control airplane engine temperatures. And now comes an electrical control for this purpose.

G. E.'s research and engineering staff has solved hundreds of such problems. The pictures here show how a few have been met. *General Electric Company, Schenectady, N. Y.*



Flyers' lives often depend on their instruments. G-E workers use only tweezers to handle these precision parts of electrically driven gyroscopic instruments, dry them with air jets, oil them with hypodermic needles. They've got to be accurate.

Eye lids can freeze shut when you're 7 miles up! Electrically heated goggles, developed by G-E engineers, have fine wires embedded in plastic lenses. With G. E.'s electric blanket as a start, G-E engineers designed electrically heated flying suits, heated gloves and shoes now being made in three G-E plants. Toughest problem was to devise heated gloves with thin wires strong enough to stand constant flexing.



Making night landings safer. Engineers adapted the G-E "Sealed Beam" auto headlamps into war use—G-E airplane landing lamps 20 times brighter than those on your car. Sealed against dust, dirt and salt water damage, they cut down the peril of high-speed landing.

Hear the G-E radio programs: *The G-E All-girl Orchestra* Sunday 10 p. m. EWT, NBC—*The World Today news*, Monday through Friday 6:45 p. m. EWT, CBS—*The G-E House Party*, Monday through Friday 4:00 p. m. EWT, CBS.

FOR VICTORY—BUY AND HOLD WAR BONDS

GENERAL ELECTRIC

This One



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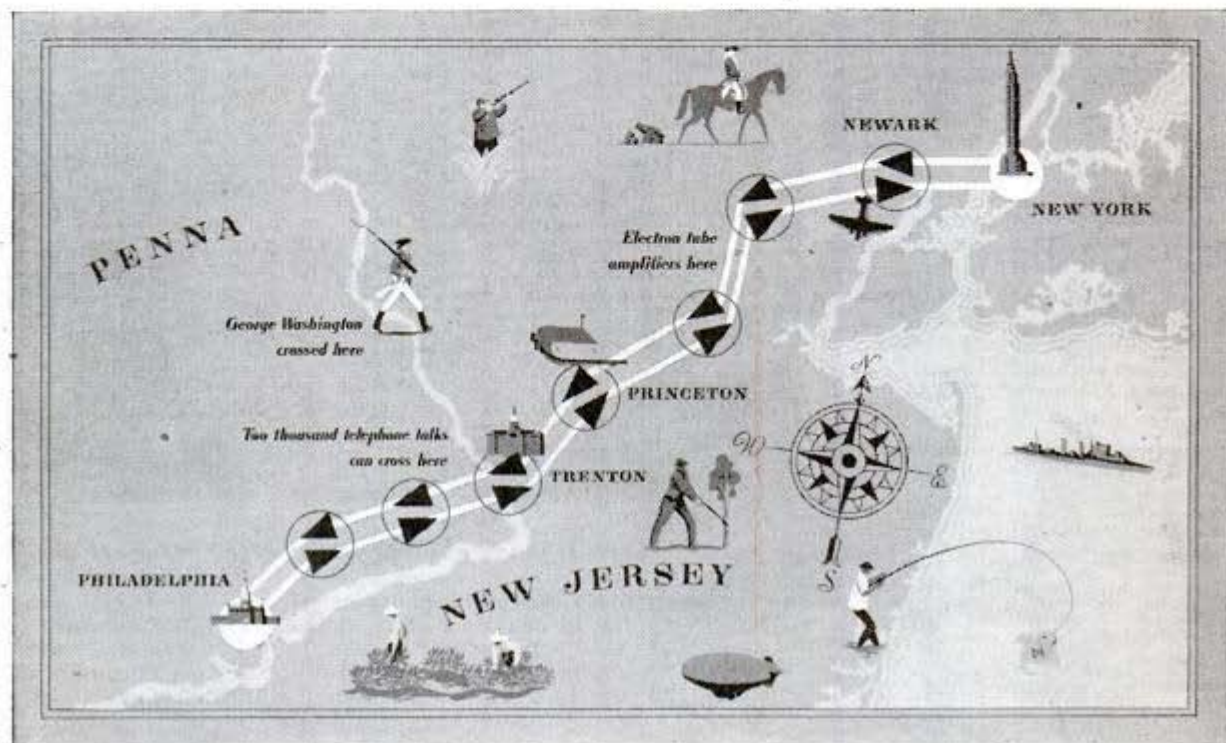
JUNE, 1945

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Материал, защищенный авторским правом

90-MILE LABORATORY

for Telephone and Television



BETWEEN telephone offices in New York and Philadelphia once stretched a strange sort of laboratory. Most of the way it was underground; engineers made their measurements sometimes in manholes. It was a lead-sheathed cable containing two "coaxials"—each of them a wire supported in the center of a flexible copper tube the size of a lead pencil.

Theory had convinced Bell Laboratory engineers that a coaxial could carry many more telephone talks than a full-sized voice frequency telephone cable; that it could carry adequately a television program. Experimental lengths were tested; terminal apparatus was designed and tried out. Finally, a full-sized trial was made with a

system designed for 480 conversations. It was successful; in one demonstration people talked over a 3800-mile circuit looped back and forth. Now the cable is carrying some of the wartime flood of telephone calls between the two cities.

This cable made television history also: through it in 1940 were brought spot news pictures of a political convention in Philadelphia to be broadcast from New York. Bell System contributions to television, which began with transmission from Washington to New York in 1927, have been laid aside for war work. When peace returns, a notable expansion of coaxial circuits is planned for both telephone and television in our Bell System work.

BELL TELEPHONE LABORATORIES *Exploring and inventing, devising and perfecting for our Armed Forces at war and for continued improvements and economies in telephone service.*



Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

Next Month

EVER since the first sailor shoved off in a hollowed out tree trunk, man has been battling one of nature's most potent forces—storms at sea. When 100-knot typhoon winds and mountainous waves strike a vessel, veteran seamen know that any craft from destroyer size down is in deadly peril. Three U. S. destroyers and several smaller ships were lost with 600 men when a typhoon struck a task force off the Philippines. How high-riding carriers, destroyers, subs and other vessels fight the sea is told in a July story.

IF YOU are an explorer at heart—and who isn't?—make a memo of a wild region called Baja California for a trip after the war. It has rich gold deposits, marble mountains, lush tropical growth and deserts, and abounds with legends of Spanish pirates and buried treasure. A July article takes you to this "Land of Mystery," Lower California, one of the least known parts of the world.

STICKING a house together with glue sounds farfetched until we are told that in 1944 wood and glue released five million tons of metal for military purposes. In a housing project in Oregon, nine million square feet of wallboard were attached with glue. An article in the next issue makes some startling predictions on future uses of glue.

GYROSCOPIC gunsights and central gunnery control systems are only two of many innovations that upped the accuracy of our aerial gunfire 100 percent. "Our Wallop on Wings" tells the full story.

GASOLINE is flowing into China through the world's longest pipe line. "Oil for the Tanks in China" follows U. S. engineers on an epic task through the jungle.

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Managing Editor.....Roderick M. Grant
Assistant Managing Editor.....Wayne Whittaker
Shop Notes and Crafts Editor.....E. R. Haan
Radio and Electronics Editor.....Frank L. Britton
Art Director.....Frank Beatty
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It's Homemaking Time Again

THIS little home-building, feathered fellow with his jaunty Defoe yachting cap and his pretty mate symbolize what thousands of American families would be doing about now if this were a normal, peaceful spring.

● ● Perhaps next spring will be—and *you* will be building a new home. In the meantime, you can keep adding to your nest-egg of War Bonds which will help finance it. And we at Defoe can plan ahead for the surprising and thrilling things we will be able to build into it for you.

● ● Of course, Defoe's engineering experience and production facilities are now

being used only to build more warships and badly needed cargo ships for the Navy. However, the postwar plans of our Housing Division are progressing. New methods of manufacture are being worked out and a host of building materials put through a series of exhaustive tests to make certain that the new Defoe homes will set the pace for living comfort, efficient functional design, beauty and individuality of exterior treatment.

● ● Follow the story of Defoe's little home-making birds in subsequent advertisements and let them lead you to eye-opening developments in a new concept of housing for Americans.

HOUSING DIVISION—DEFOE SHIPBUILDING CO.,

BAY CITY, MICHIGAN

☆☆☆☆ Five White Star Renewal Citations now decorate the Navy "E" Award won by Defoe workers.

BACK THE ATTACK
—BUY WAR BONDS

Defoe

SHIPS FOR VICTORY
SERVANTS FOR PEACE



FROM THE SKYWAYS ...

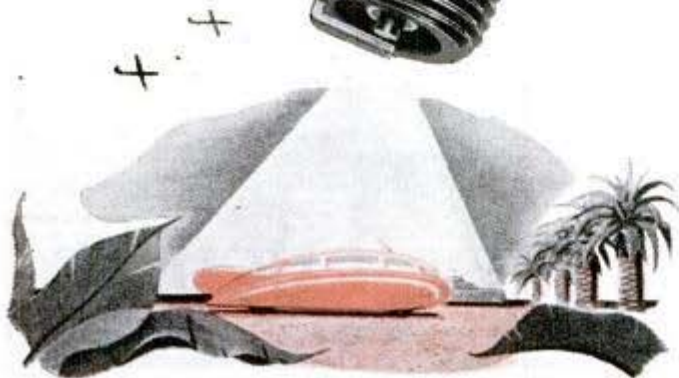
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 "Bigger Bonds for
 the Mighty Seventh"



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in Two Worlds?

*Does Your Mind
Go on Night Missions?*

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Accept this FREE Book

Demand to *know* the psychological and *mystical principles* behind these statements. Do not confuse *mere dreams* with the faculty to extend your consciousness *beyond* the reaches of *space* and the borders of *time*. Your life is only as limited as you let fear and superstition make it. Rise to the mastery of your *natural faculties*. Let the Rosicrucians, a world-wide fraternity of thinking men and women (not a religion), tell you about these rational laws of self. Write today for a *free* copy of the "Mastery of Life." It will explain how you may receive this unique knowledge.

Address: Scribe Z.R.H.

The ROSICRUCIANS
SAN JOSE (AMORC) CALIFORNIA

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

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

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

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

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Manufacturer's name and address appear in parentheses directly after items believed by us to be commercially available

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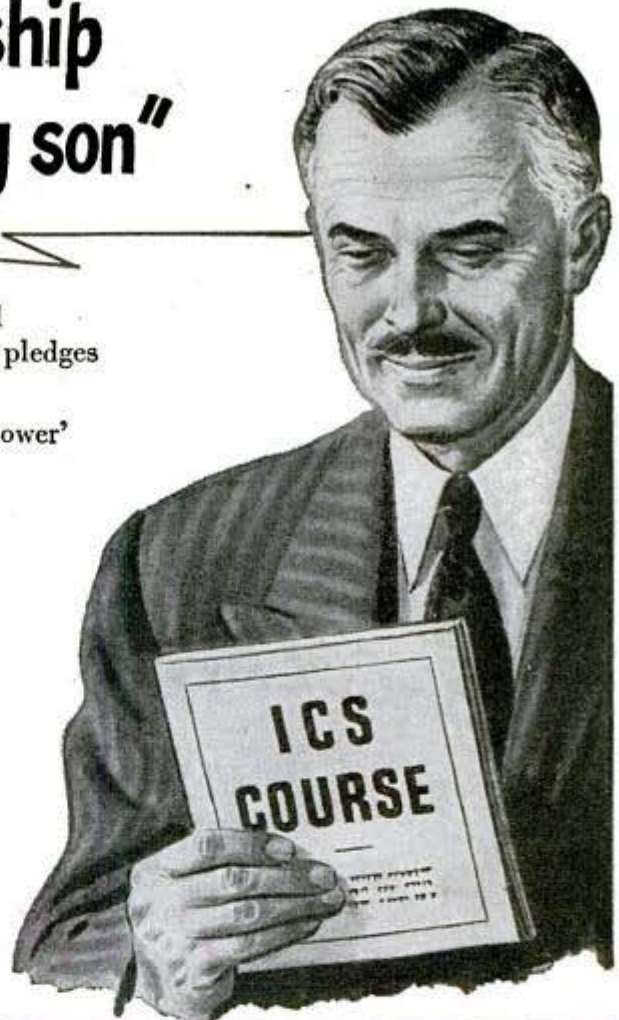
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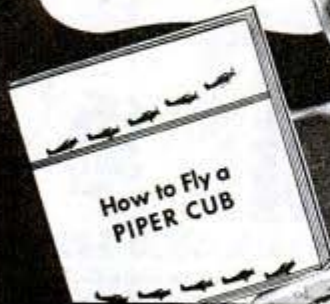
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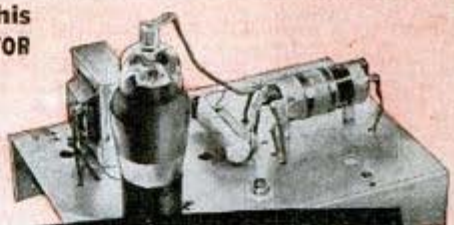
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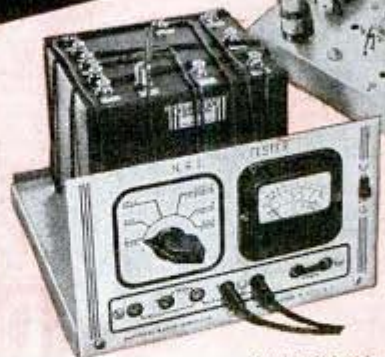
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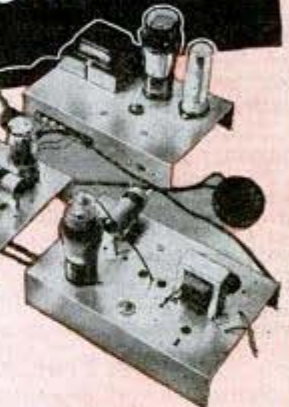
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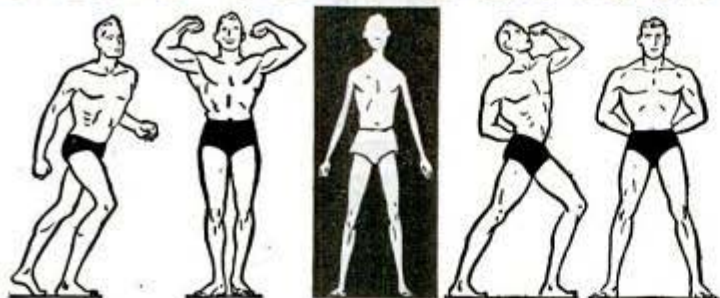
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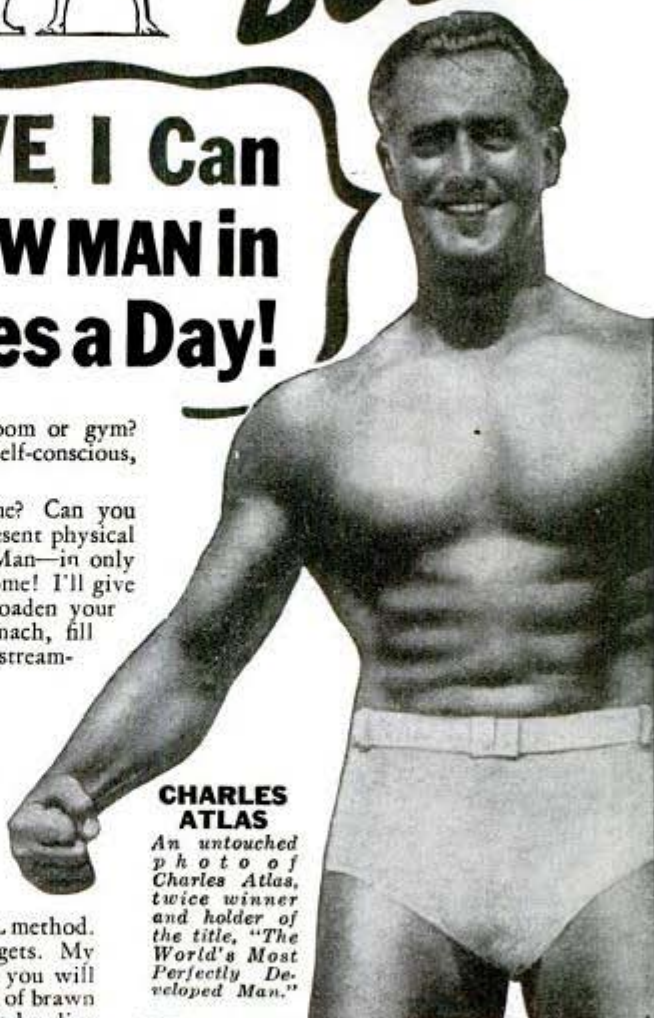
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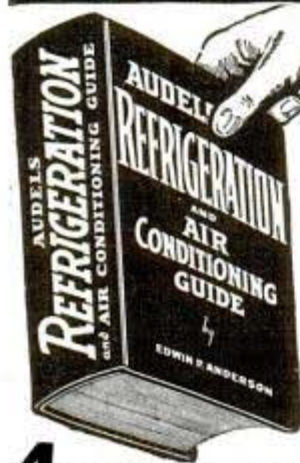
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By S. T. CHRISTENSEN
the "Fix-it Man"

"WELL, I guess I'm the fellow to see, for I've repaired thousands of refrigerators (home and commercial both), vacuum cleaners, radios, washing machines, irons, fans, lamps, mangles, motors, etc. In fact, many of my customers call me their "electrical appliance doctor." And, "doctoring," I might add, has paid me a good substantial income for quite a few years. Funny, in a way, how I got started. Always liked to tinker and by experimenting around I found that most electrical appliances had many things in common. That, regardless of what the appliance was used for, or who the manufacturer was, the basic principles were much the same. From fixing my own appliances to fixing friends' and then for strangers at a fee, seems now to have been but a small step.

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At first, I let the owner decide the charge and, frankly, I was amazed at what I earned per hour. But then, when one figures what initial costs are involved in buying most electrical appliances, one can readily see that spending extra dollars for repairs is well worth while. Before long I was making more in my spare time repairing than from my regular job. The result . . . I went into business for myself. When war came, business boomed, for new appliances were not available.

For a while, repair parts (needed on some

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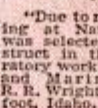
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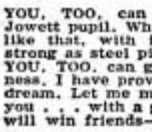
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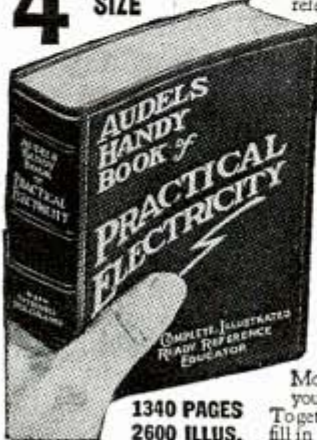
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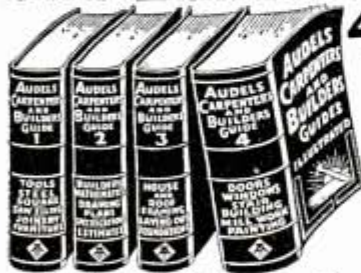
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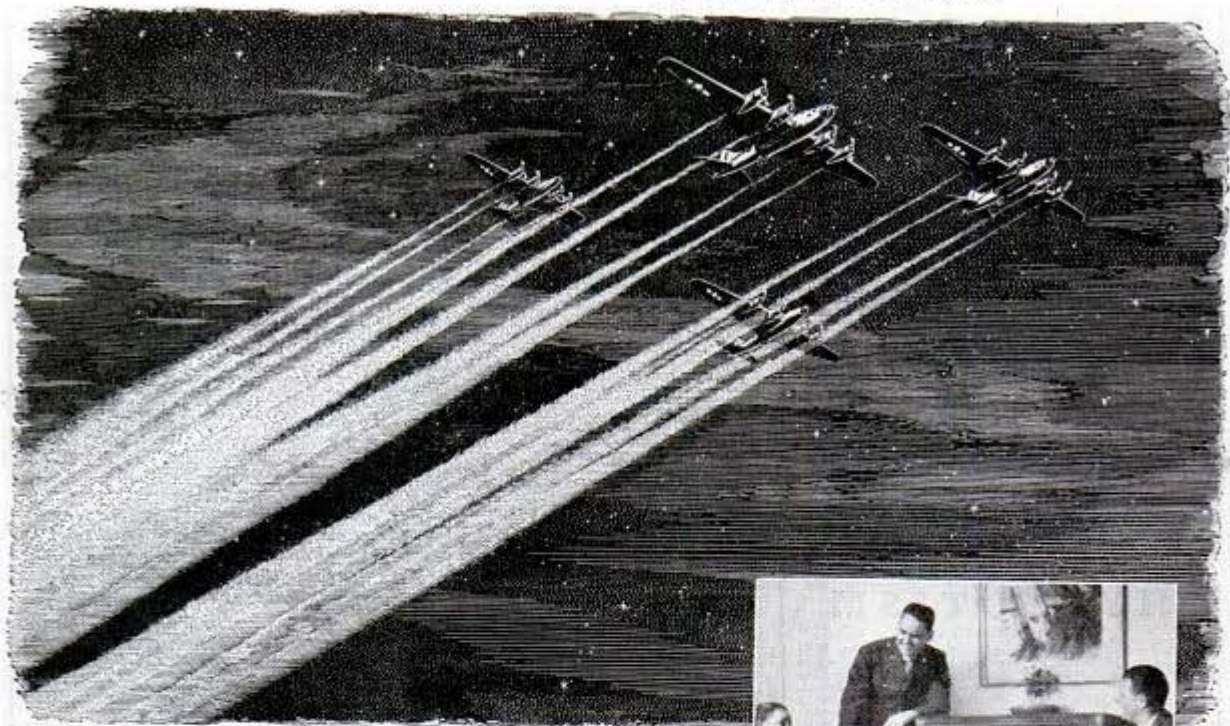
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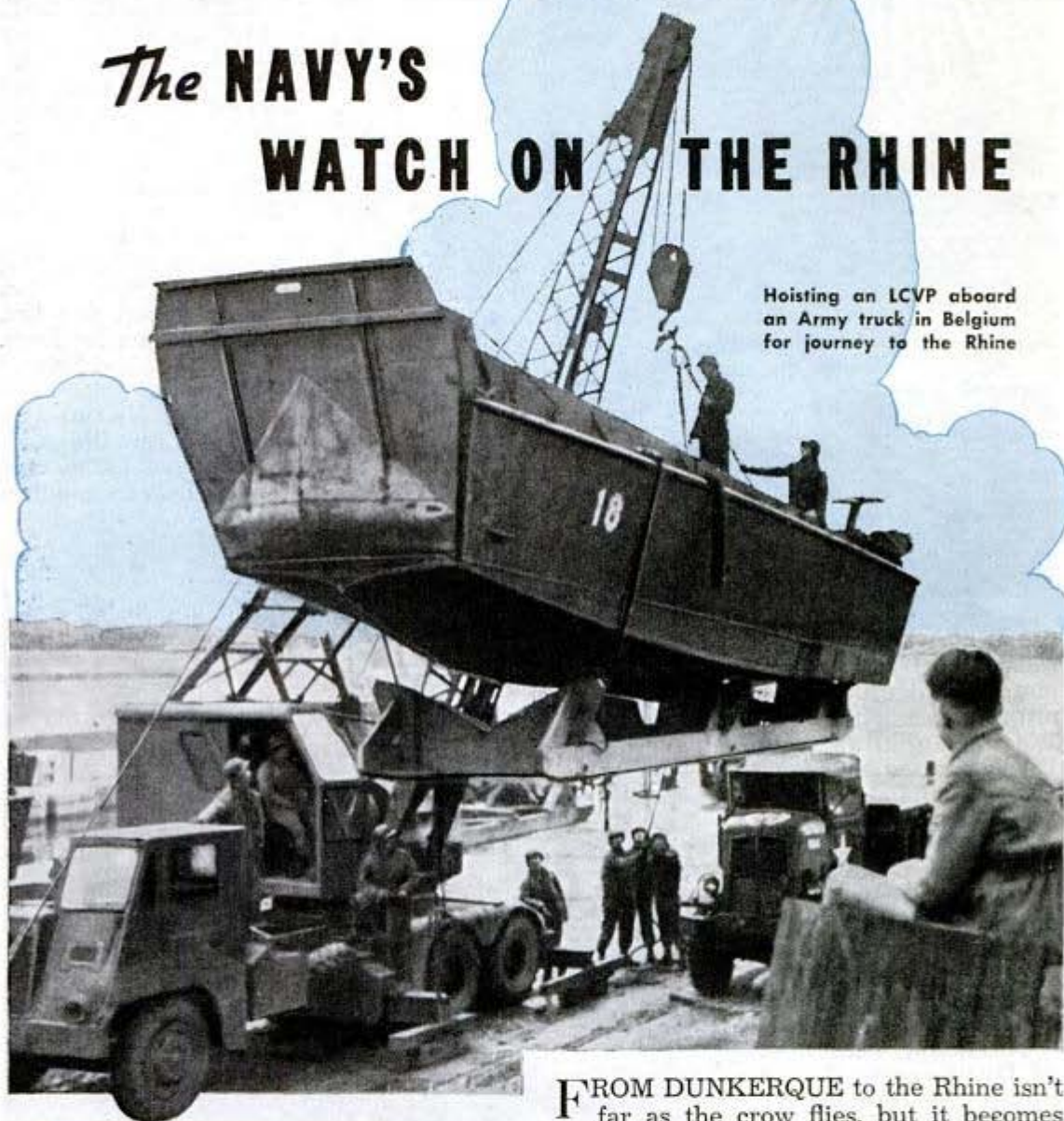
Vol. 83

JUNE, 1945

No. 6

The NAVY'S WATCH ON THE RHINE

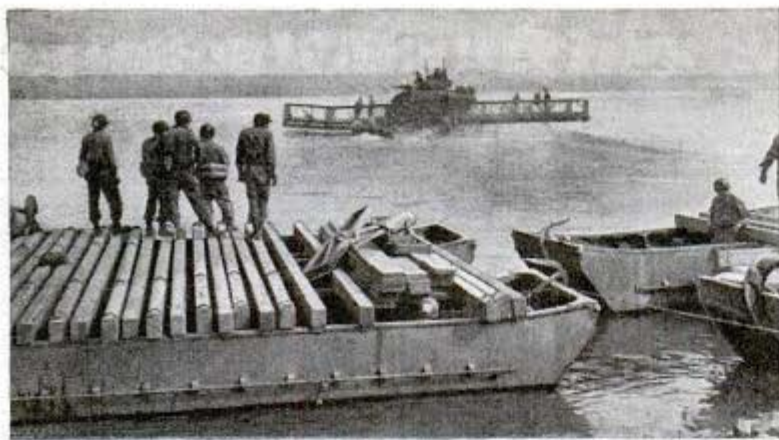
Hoisting an LCVP aboard
an Army truck in Belgium
for journey to the Rhine



Our Alphabet Navy was conceived at Dunkerque. Hitler learned his ABCs when our LCM and LCVP fleet opened the Rhine River ferry

FROM DUNKERQUE to the Rhine isn't far as the crow flies, but it becomes quite a voyage by way of North Africa, Italy, Normandy and the Pacific—the route traveled by the Amphibious Forces of the United States Navy.

More than 200 miles from the nearest ocean, sailors of the Amphibious Forces joined tars of the British Royal Navy in ferrying Allied invasion troops across the Rhine, prized natural defense line of the Reich. LCMs (Landing Craft Mechanized) and LCVPs (Landing Craft, Vehicle, Personnel) handled the bulk of the load.



U. S. Engineers watch a Bailey raft—bridge on pontoons—ferry tank across Rhine. Below left, Ducks mass in woods near Rhine



sail liners and troopships into French harbors and unload an invasion army.

Our answer was the Alphabet Navy, the LSTs (Landing Ship, Tank), LCIs (Landing Craft, Infantry) and all the other weird vessels which helped upset Hitler's applecart and are busily doing the same for Hirohito.

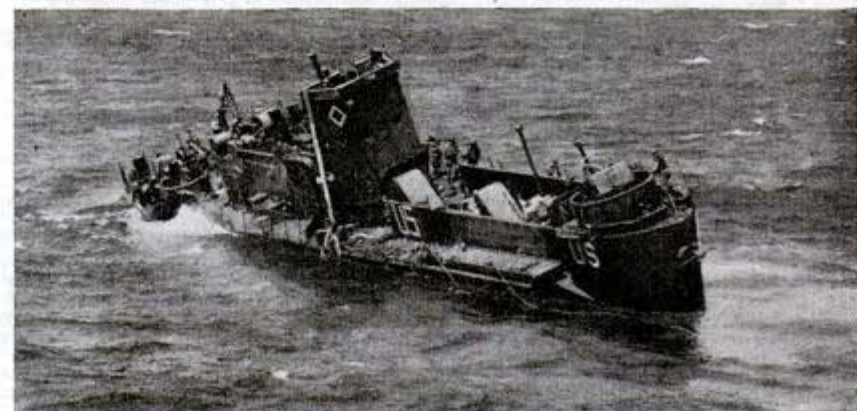
First tests of the invasion craft came in the Commando raids of 1941 and 1942. Dieppe was the dress rehearsal for the North African landings. North Africa and lessons learned in the Pacific led the way to Normandy and, finally, the Rhine.

The 26-ton LCMs and nine-ton LCVs used on

Smaller assault boats powered by outboard motors and countless amphibious Alligators, Water Buffalos and Ducks poured men and supplies onto the east bank of the Rhine.

No chance operation, this unique task was accomplished after months of rehearsal. And the tragic lesson of Dunkerque must be credited for the landing craft which made it possible.

The heroic evacuation of Dunkerque drove home the immediate need for special invasion craft, which both Americans and British had been considering for some time. Designs for landing vessels were rushed as Hitler's seizure of Western Europe torpedoed England's plan to



Assault boats like these, above right, crossed Rhine. Bottom, a Coast Guard LCI, mortally hit

Sherman tank rides LCM during Rhine rehearsal. Below, repair barge hits the beach in Pacific

the Rhine were the largest types which could be transported overland. Loaded on the Army's heaviest tank conveyor, the all-steel, 50-foot LCM made a neat package 77 feet long, 14 feet wide and 20 feet high. Many LCMs were carried over more than 300 miles of battle-scarred countryside. They began to arrive at Antwerp in December, traveling the Albert Canal to training grounds. There they crossed and recrossed the Maas River in mock landings.

With a speed of 13½ knots and a crew of five, the LCM can carry a General Sherman tank, cargo such as 7,500 gallons of



gasoline, or 60 men. The 36-foot LCVP can make 12 knots. Manned by a crew of four, it can carry 50 soldiers over smooth water, or loads such as one bulldozer, a 57-mm. antitank gun and a 105-mm. cannon, two 75-mm. howitzers or 1,000 gallons of gasoline. Bows of both the LCM and LCVP lower for unloading and loading.

First to cross the Rhine were the smaller craft, such as the plywood storm boats carrying eight riflemen and a crew of two. Powered by 50-horsepower outboard motors, these roar along at 20 to 23 miles an hour, often tobogganing high and dry as they hit a beach at full speed.

Next came the Alligators and Water Buffalos,

Coast Guardsman eyes invasion jeep aboard LST. LCI at left is rigged out as invasion fireboat



LVT(A) sweeps toward a beach in the Pacific. Tracks enable landing vehicle to creep over dangerous reefs

amphibious tanks, and the Ducks, amphibious trucks. Amphibious jeeps also swept over the Rhine, which at that time averaged 500 yards in width with a six to eight-knot current.

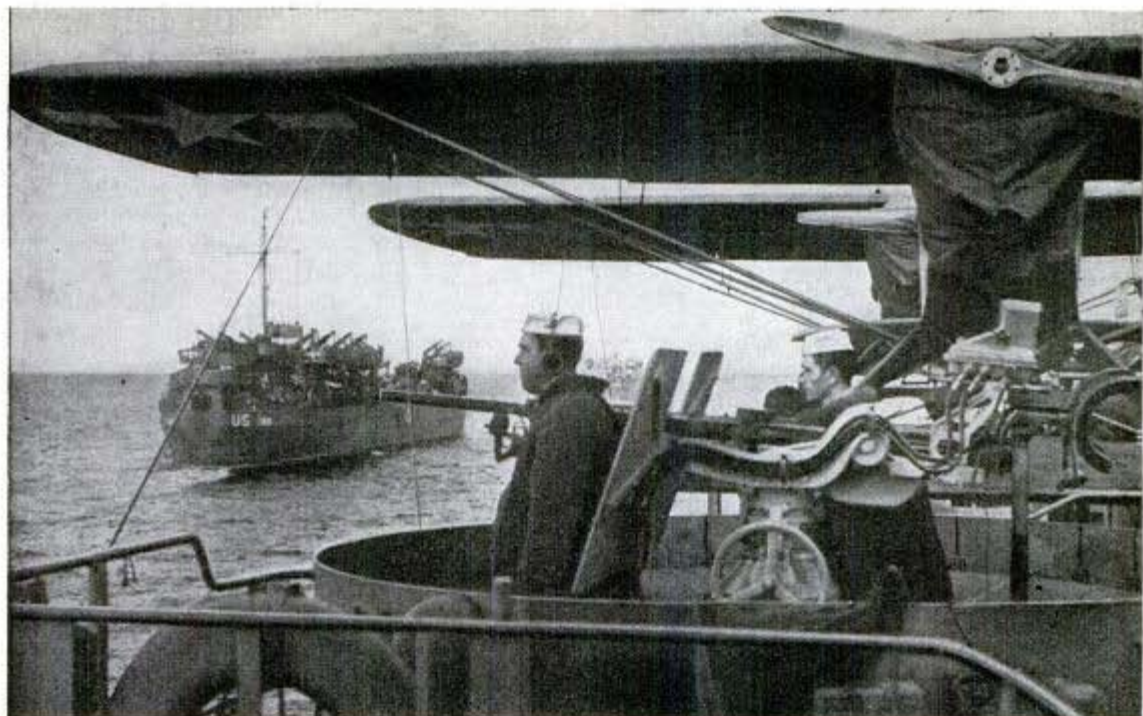
Finally, from the LCMs and LCVPs flowed an unending cargo of men, tanks, guns, jeeps, ammunition and other supplies.

As a monument to American ingenuity and inventiveness, the story of the Alphabet Navy can't be beaten. Sailors have to be rugged just to man their landing craft—the rollingest, pitchingest vehicles that ever hit an ocean! Living quarters are cramped and uncomfortable, too.

The Navy is accumulating \$5,000,000,000

Bulldozer runs up on ramp to help unload LCM landing on Pacific beach. LCMs had major role on the Rhine





These LSTs, converted into junior aircraft carriers, launch small planes to act as spotters for naval guns

worth of landing craft and soon there'll be upward of 80,000 such vessels.

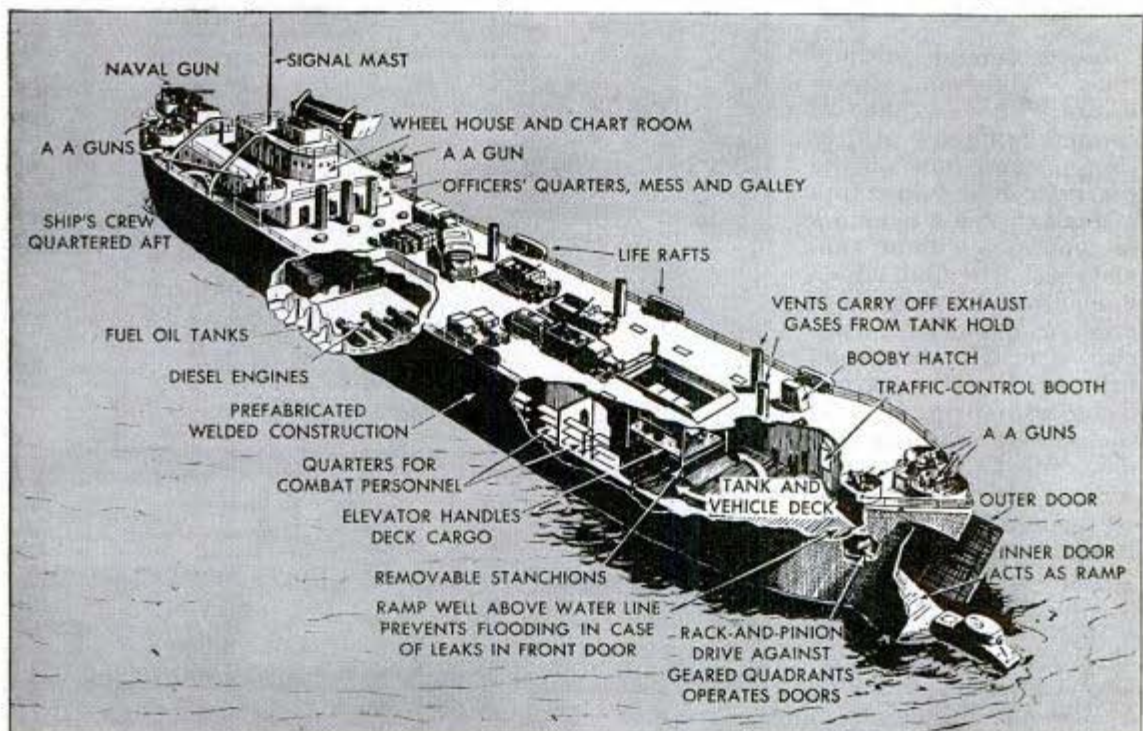
Production has been almost incredible since American shipyards, many inland, began turning out the craft on a large scale in 1942. Small boats came first. Larger ships such as the LST (Landing Ship, Tank) and LCI (Landing Craft, Infantry)

started out as brainstorm, with no time for experimental models or exhaustive tests.

Landing craft specifications would drive a conservative marine architect insane. Extremely long range and high speed were essential, yet power plants had to be small to save space. A minimum target must be

(Continued to page 156)

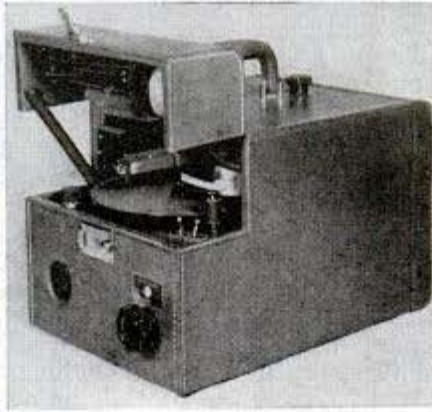
Here is the inside story of the LST, King of Amphibs. Some have borne whole trains from England to France





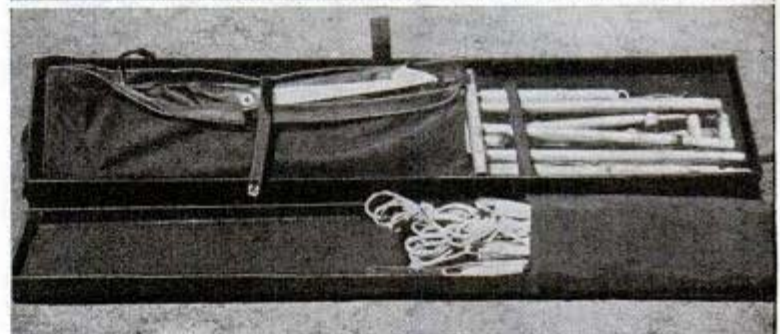
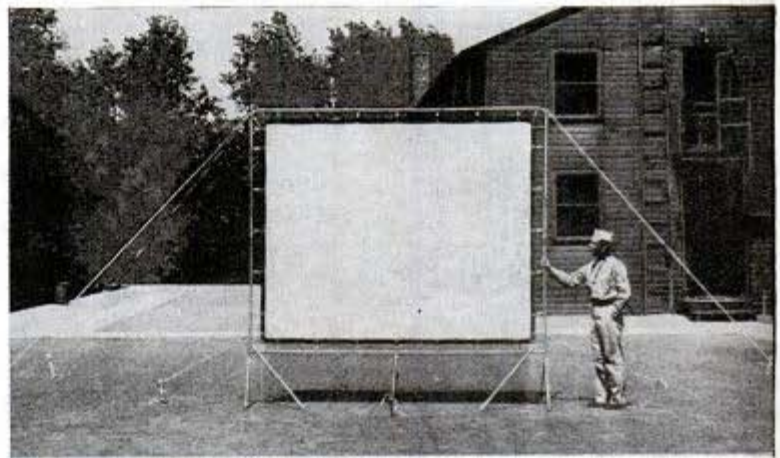
"Sound Letter" On Plastic Disk Will Not Break

"Sound letters" can be recorded on wafer-thin plastic disks and sent through the mail at regular postage rates. The records cannot be damaged by bending or dropping and under normal conditions they can be stored indefinitely without becoming warped or distorted. One hundred "sound letters" can be filed in one inch of drawer space. Fifteen minutes of dictation are possible on each side of a 7-inch disk and each disk can be played back 100 times. The recorder, which is made in both desk and portable models, takes voice dictation electronically through a sensitive microphone and plays the record in distinct tones with "live voice" clarity at the flick of a switch.



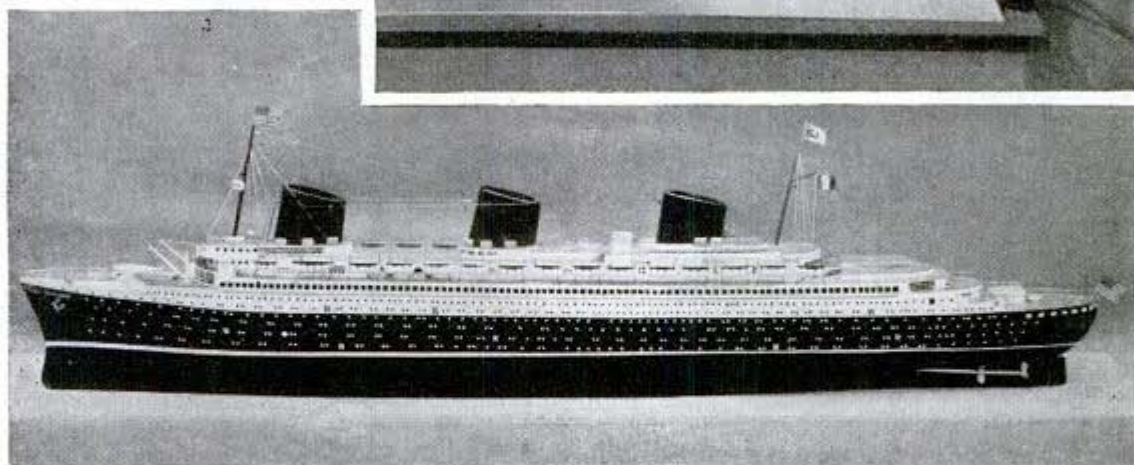
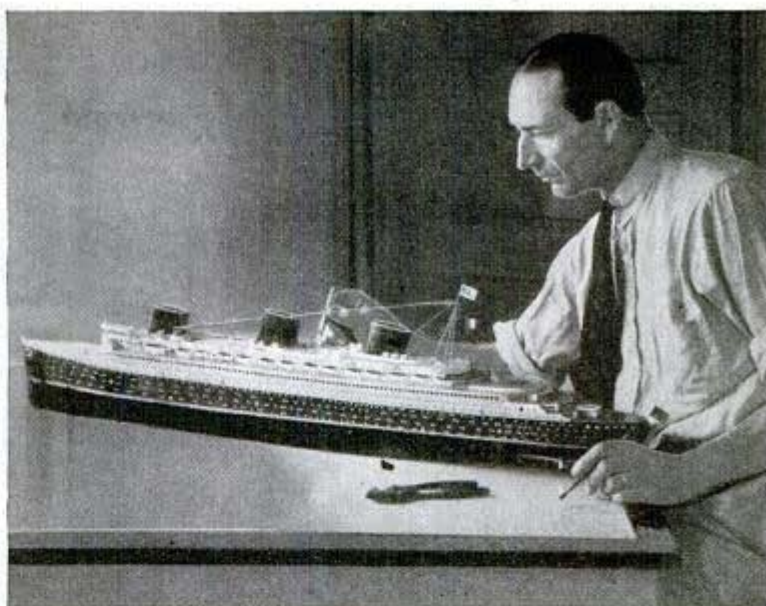
Outdoor Screen Folds Into Case

Large enough for any kind of show and sturdy enough to withstand rough handling, a projection screen now on the market can be folded into a small carrying case in a few minutes without special tools. The unit, which is said to be ideal for large outdoor gatherings, consists of a light, rustproof, fully collapsible steel frame with springs to hold the screen smooth and flat. The fabric of the screen, which is supported on legs that can raise it five feet above the ground, is washable and is said to have unusual brightness. The unit is available in two sizes. Guy ropes are provided for use out of doors.



Watchmaker Models Normandie From Magazine Pictures

Although he never had been on an ocean liner and knew nothing about ships, a Maine jeweler was inspired to build a model of the SS Normandie when he saw a picture of the salvaged French liner in Popular Mechanics. "I have saved all the pictures from your magazine of the SS Normandie," writes C. J. Hammond of Kezar Falls. Working entirely without blueprints, Hammond took nearly two years to build his realistic four-



foot model, making everything by hand. He shaped stairs from a piece of square wire, cutting slots for the steps with a jeweler's saw and using a small watch main spring for the steps themselves. The model includes the outside swimming pool, life rafts, life boats in three sizes, ventilators,

horns, lights and even antenna insulators. The davits are of metal and there are 1,600 windows, 1,200 portholes and 900 soldered joints on the rail. Propellers are of brass and the hull of pine. All material used can be found in the junk box in almost any home, Hammond declares.

Automatic Money Changer Ejects Nickels But There's No Jackpot

You don't take chances when you drop coins into the slot machine money changer. When a dime or quarter is dropped into the box, this robot cashier ejects its equivalent in nickels from a slot in the bottom. The unit, which issues nickels only, can be adapted to make change for 50-cent pieces, as well as quarters and dimes. It may be used on street cars and buses or hung on the wall near telephone booths.

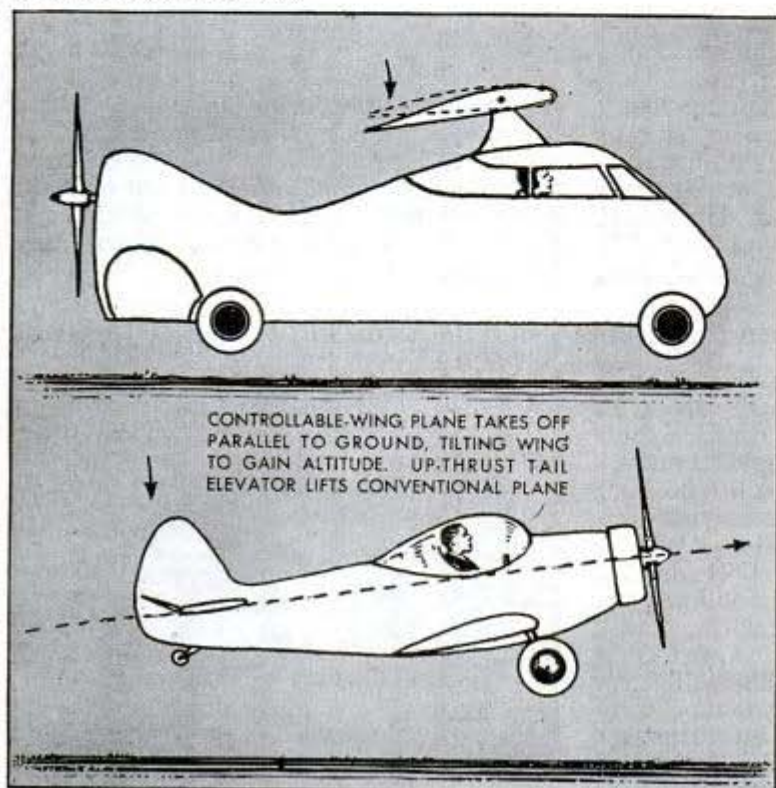
ⓈCivilian aircraft in peacetime will consume more than one billion gallons of gasoline annually, according to a forecast by the Aeronautical Section of the Society of Automotive Engineers.



STEERABLE-WING PLANE



In flight (above) and on the ground the Spratt plane steers like an auto
Drawing by Consolidated-Vultee



SINCE the Wright Brothers skimmed over the Kitty Hawk dunes, men have guided their flying machines with ailerons, elevators and rudders. A break from these traditional controls is introduced by George Spratt, whose unconventional plane is steered through its three-dimensional sphere by a control wheel that tilts, pivots and banks its wing.

Mr. Spratt is an engineer in the Stout research division of Consolidated-Vultee Aircraft Corporation. His unique craft may be the father of the roadable plane of tomorrow. Like the automobile, it has four wheels. Like the helicopter, its fuselage is suspended beneath its wing—which turns, but does not rotate.

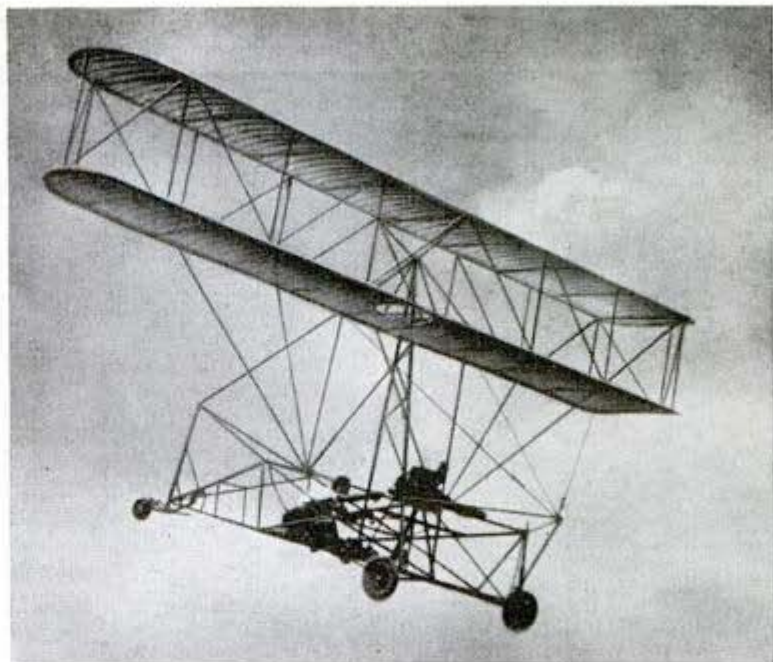
Maneuvering is simple. Pull back on the control

wheel to lower the trailing edge of the 26½-foot wing and the plane climbs; a turn of the wheel to the right or left drops or lifts a wing tip and pivots the wing, turning the ship. The air-cooled engine is at the rear. A shaft extending through the stabilizer assembly juts the propeller from the abbreviated tail.

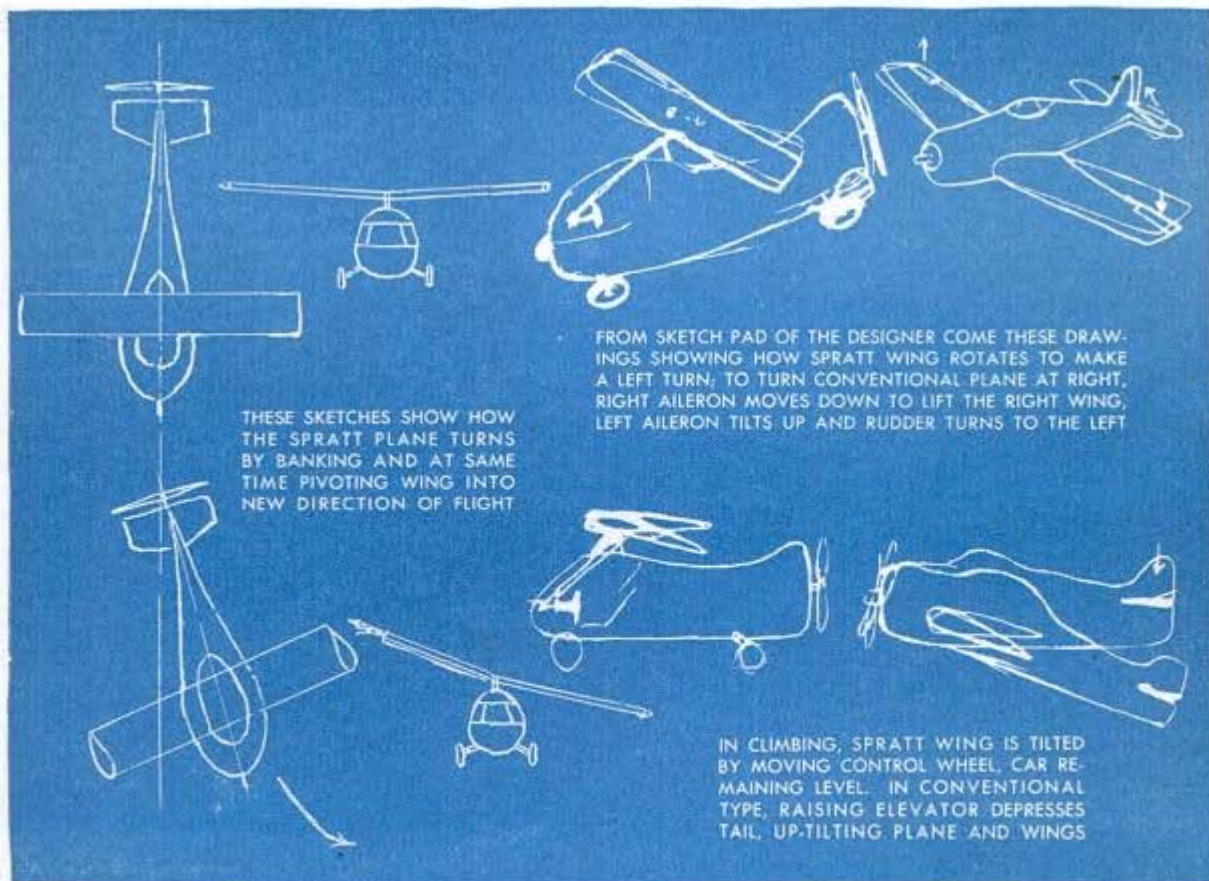
The revolutionary method of control is expected to make small planes safer and easier to handle. Since the pilot must move the wing by manual strength, there are no present plans to adapt it to larger planes. The front wheels steer with the wing and eventually the plane may be adapted for highway travel.

But Consolidated-Vultee does not contemplate building the plane commercially until it has had exhaustive tests. It has been flight-tested at 6,000 feet.

Spratt designed the plane to prove that his father, Dr. George A. Spratt, was right when he told the Wright brothers that aircraft could be steered with a controllable wing. Spratt cannot fly a conventional airplane, but has flown 100 hours in his own craft.



This is an early model of the steerable wing plane flown in 1934 by its developer, George Spratt. His father, an aircraft pioneer, had advocated the movable wing principle in 1902

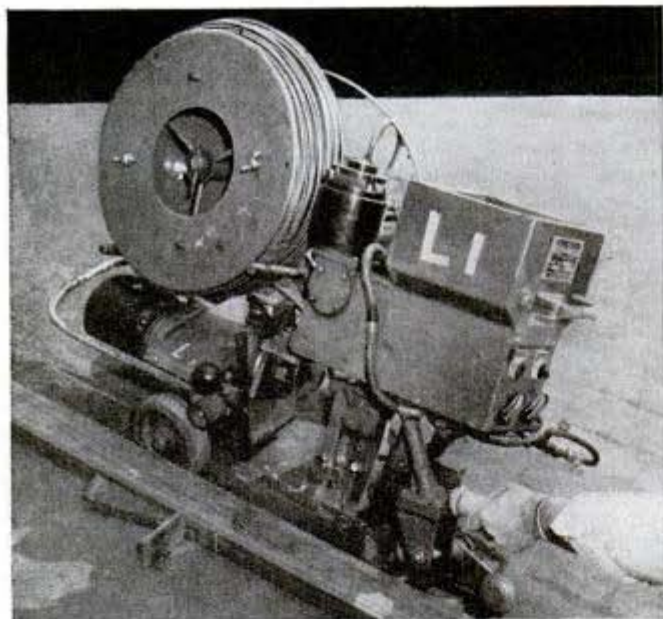


THESE SKETCHES SHOW HOW THE SPRATT PLANE TURNS BY BANKING AND AT SAME TIME PIVOTING WING INTO NEW DIRECTION OF FLIGHT

FROM SKETCH PAD OF THE DESIGNER COME THESE DRAWINGS SHOWING HOW SPRATT WING ROTATES TO MAKE A LEFT TURN, TO TURN CONVENTIONAL PLANE AT RIGHT, RIGHT AILERON MOVES DOWN TO LIFT THE RIGHT WING, LEFT AILERON TILTS UP AND RUDDER TURNS TO THE LEFT

IN CLIMBING, SPRATT WING IS TILTED BY MOVING CONTROL WHEEL CAR REMAINING LEVEL. IN CONVENTIONAL TYPE, RAISING ELEVATOR DEPRESSES TAIL, UP-TILTING PLANE AND WINGS

Greater Field for Welding Seen in Automatic Arc Process

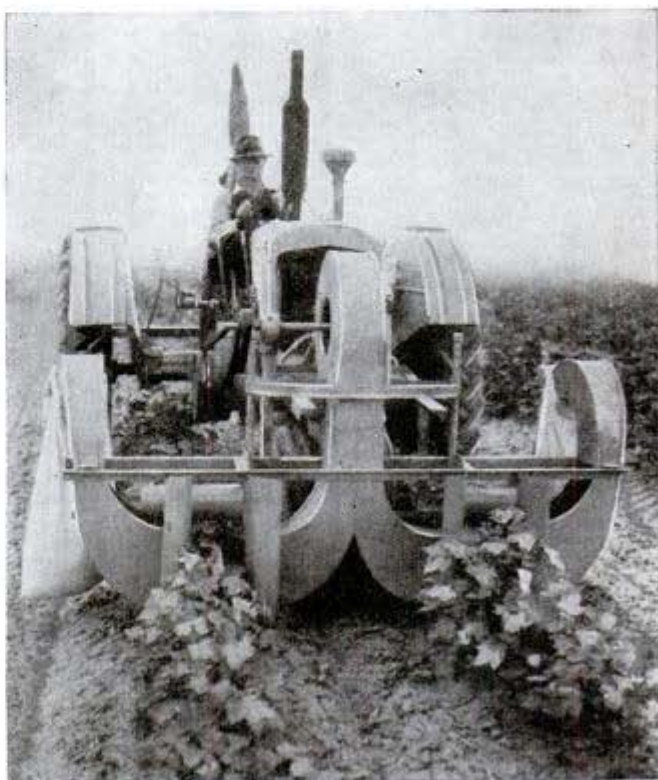


Greater speed, simplicity and economy are claimed for a new type of automatic arc welder operated on direct current. A bare metallic electrode is fed through a

granular flux deposited on the joint to be welded, the flux blanketing arc and molten metal. Unfused flux may be reclaimed for further use. A simpler and more positive welding control is afforded by direct current, according to the manufacturer, plus ability to weld nonferrous metals and better control of electrode melting rate through use of either straight or reverse polarity. The process is declared to be less sensitive to scale and moisture than conventional automatic welding methods, thus eliminating or reducing plate cleaning before welding. The welding head normally is used with an automatic welding set of 300 to 1,200-ampere capacity. The standard head may be changed from butt to fillet welding in a few minutes. The manufacturer reports that in welding a butt joint with $\frac{3}{8}$ -inch plates, the total cost per foot of weld with the new process is 6.7 cents, compared with 11.94 cents for manual welding.

Bug Catcher on Tractor Eliminates the Need of Spraying

Insect control becomes a simple matter with a bug catcher attached to a tractor. The unit, which obviates the need for spraying, consists of a fan driven from the belt pulley of the tractor which blows a blast of air across the rows of plants and sweeps insects into an attached bag. This attachment is available in a two or four-row model and may be used in conjunction with a cultivator. The bug catcher has been successful in removing boll weevils, flea hoppers, leaf worms and potato bugs. The collected insects may be used to feed poultry.

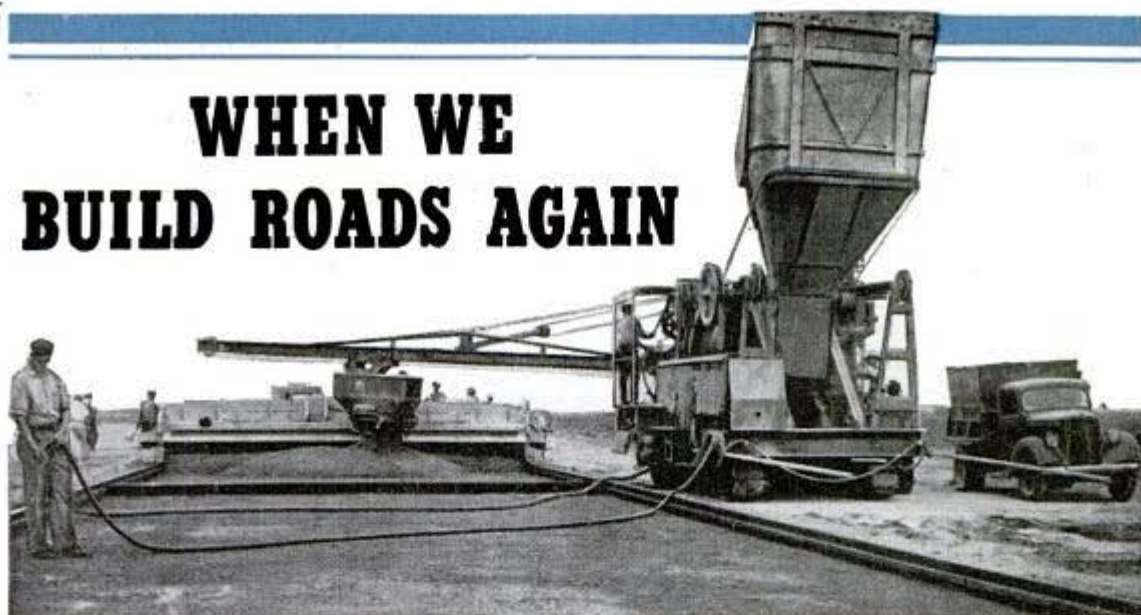


Compound Protects Oils In Aircraft From Cold

Warplanes using a new chemical compound in their lubricants can climb from desert heat to stratosphere cold without threatening the efficiency of their hydraulic mechanisms. The material, a water-white acrylic polymer, when mixed with aviation oil, prevents dangerous thickening at extremely low temperatures and excessive thinning in tropical heat. If the hydraulic oils freeze,

the plane might be torn apart by the kick of its own guns, and controls and power transmission mechanism fail to operate.

WHEN WE BUILD ROADS AGAIN



Courtesy Ransome Machinery Co.

This "ambidextrous" machine mixes concrete with one "hand" and spreads it over roadbed with the other

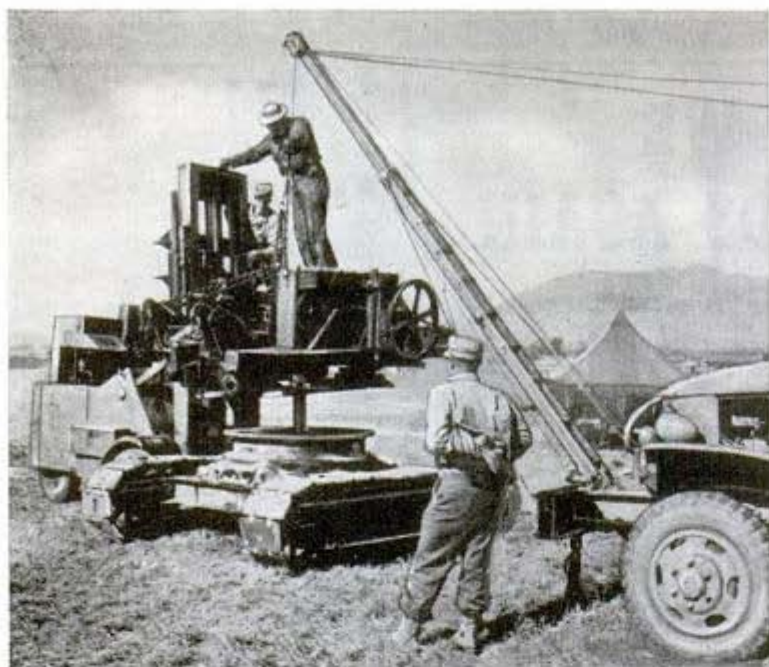
HIGHWAY transportation is so much a part of our daily life and is so taken for granted that only a few who are directly concerned with it begin to comprehend its dimensions. Our highways have changed our ways of life in many respects. The highway and the motor car have made it possible for the city-dweller and the

farmer to share many advantages. Yet our highways were never adequate.

American roads were inadequate as far back as 1930, when car registration was but two-thirds that of 1941. During the last decade, while registration increased, we cut down on road building, and so far we haven't equalled the 1930 expenditure of

Alcan highway served as "research laboratory" for road builders; here they are drilling holes for blasting
Signal Corps photo





Army engineers assemble machines flown from India to rebuild Burma Road

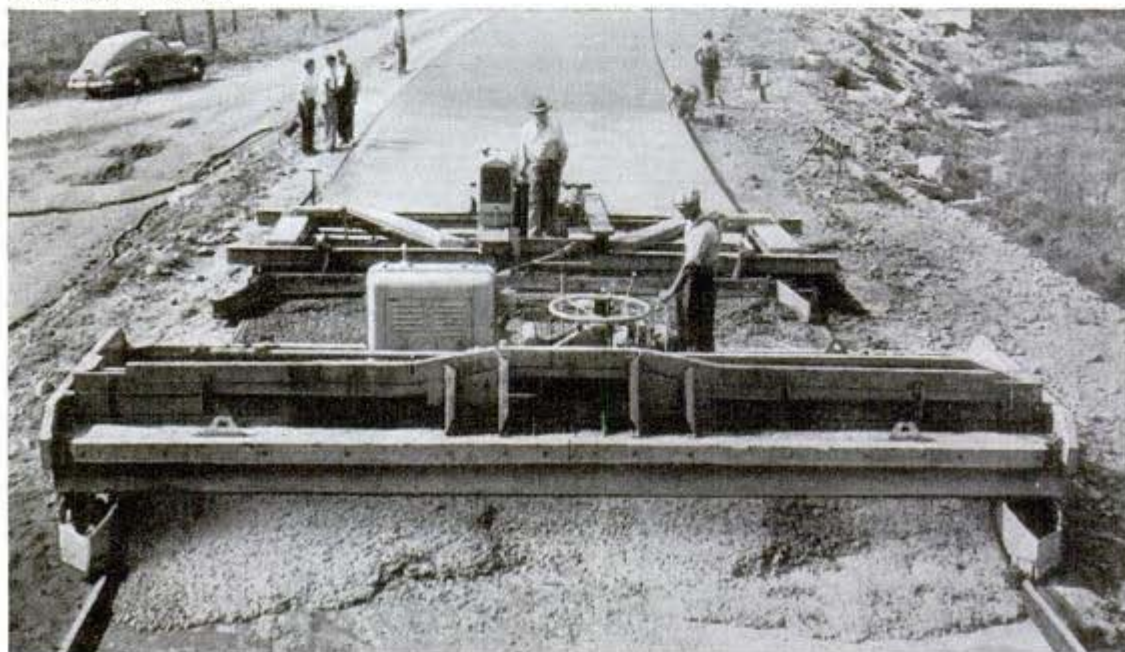
\$1,500,000,000 for road construction and maintenance.

Due to lack of manpower and materials, highway building and maintenance necessarily are postponed during the war. Two years after the war, we are bluntly warned, there will be more cars on the road than the 34,400,000 registered in the peak year 1941. But the end of the war will find us with worn-out roads, totally inadequate to handle the motoring public. The hope of quickly building new roads lies in war-

ing of vital roads, new machines and techniques were evolved. Road construction machines became faster, easier to operate and capable of handling greater loads.

Roadbuilding today is a scientific process. Although the road to be built may be of cement concrete, asphaltic concrete or bituminous macadam, the basic construction steps are similar. Let us see what happens when a county or state authorizes the construction of a new cement concrete road. Of course the location of the pro-

Paving spreader in foreground levels batches of concrete; it is followed by a surface finishing machine
Courtesy Blaw-Knox Co.





Chinese peasants use primitive tools helping repair Burma Road

posed road has been surveyed, many times, perhaps, and plans and maps are available.

Having decided where he will begin and in how many stages he will do the work, the contractor establishes a field office for his engineering crew and builds shanties for his laborers and tools at several places along the proposed route.

He next sends out his engineering party with surveying instruments. Working from the blueprints, they locate the road on the ground and mark it with wood stakes along the centerline of the route at regular intervals. These wood markers bear figures showing the elevation above sea level, or the elevation of a fixed



Courtesy
R. G. Le Tourneau, Inc.
Scraper and "tiltscraper" built for air shipment will do work of 50 men. Below, Yanks build road through jungles of Leyte





Cable-operated self-loading scraper used by Army is towed by tractor

point in the vicinity, from which the construction crew can determine how deep to dig.

The first step in the actual construction is the clearing of the land—called “clearing and grubbing” in the contractor’s specifications. The bulldozer is the contractor’s ace performer. In addition to pulling up stumps and hauling away cut timber, the bulldozer pushes boulders and other obstacles out of the way. Parts of the Alaska Highway and the Ledo Road were built al-

Traffic flows smoothly through “maze” forming Long Island road intersection



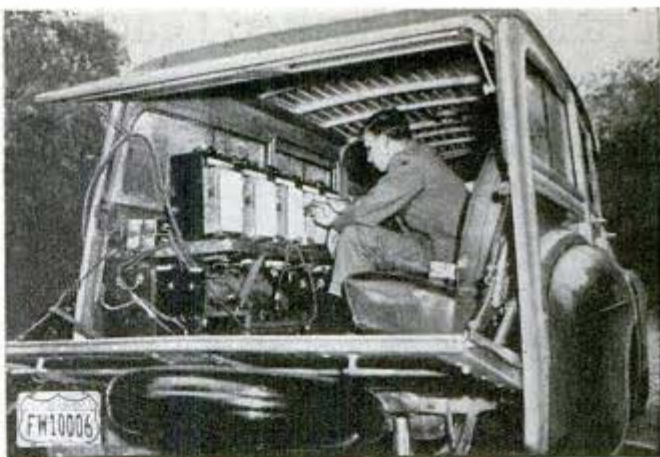
most completely with bulldozers only.

The next step consists of excavating and grading, or leveling. High spots along the right of way are cut down and the excess, called “fill,” is used to build up low spots. If this excess fill is not enough, extra fill called “borrow” is brought from “borrow pits” located close to the road. If there is a large amount of fill and the excavation is deep, a power shovel and trucks are

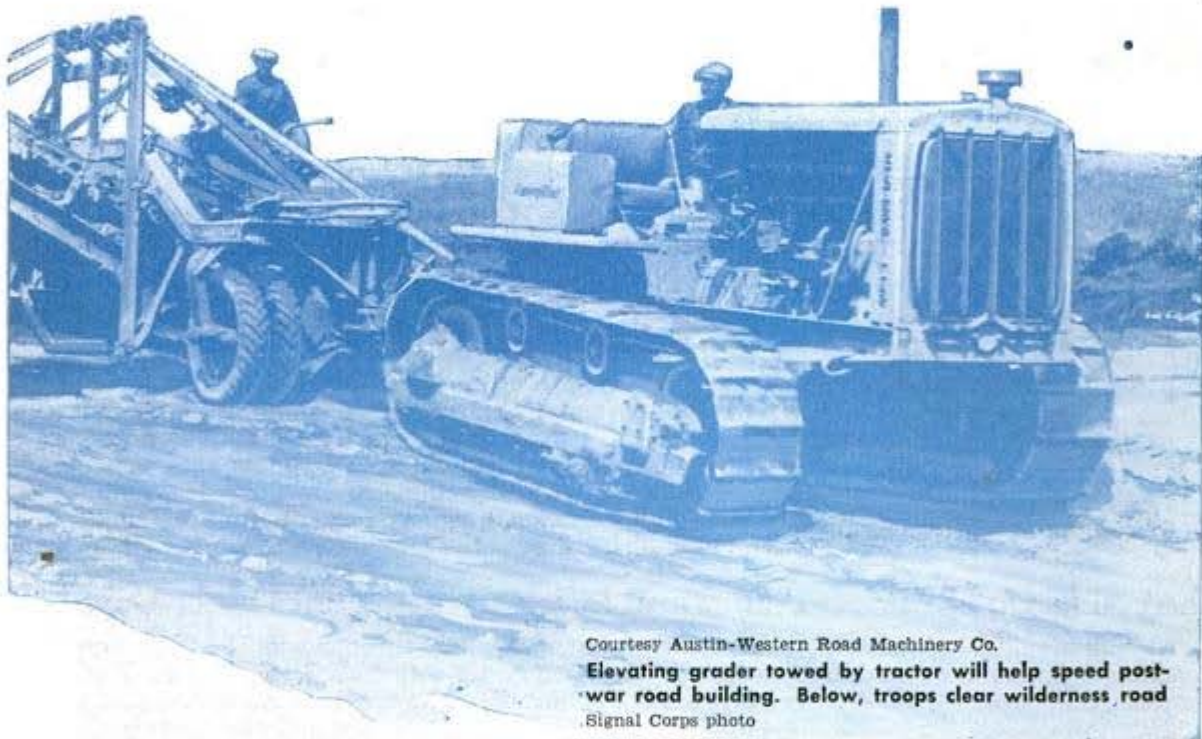


used. The shovel digs up the earth and loads it into trucks, which dump the excess excavated material in the low spots where it is leveled with a bulldozer.

If the distance between fill and excavation is short, say up to a thousand feet, a self-loading scraper is used. This new scraper has a tub-like body, with a hinged bottom to which is attached a cutting blade or lip. Towed by a tractor, the scraper removes earth to any predetermined depth. When full, the operator closes the bottom through hydraulic or cable operated controls and the full scraper is towed to the disposal area. Here it is dumped in one spot, or spread



Electrical instruments on truck automatically record speed of vehicles; charts also show time to gauge distance between cars



Courtesy Austin-Western Road Machinery Co.

Elevating grader towed by tractor will help speed post-war road building. Below, troops clear wilderness road. Signal Corps photo

evenly, also at a predetermined rate, the opening of the bottom and speed of the tractor regulating the depth of the fill being deposited.

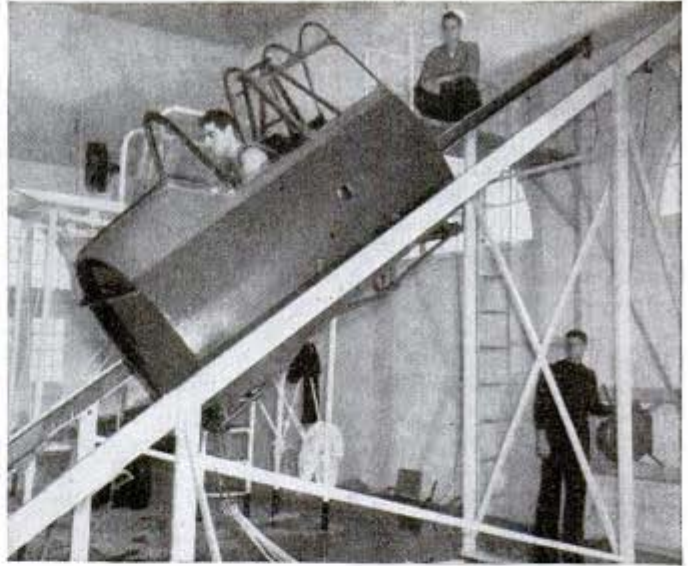
One of these scrapers, the Tournapull, uses a rubber-tired mobile unit to pull it. It works much like a track-type tractor, except that transmission speeds have been increased for faster travel and pneumatic tires are used instead of tracks. One model has a top speed of 14 miles an hour, which is about two and one-half to three times faster than a track-type tractor. The machine loads quickly, accelerates to top speed in almost no time

(Continued to page 160)

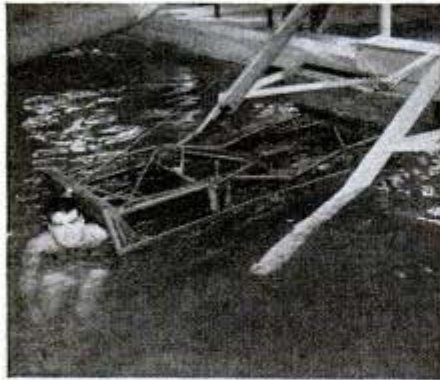


Crashes in Dunker Teach Flyers to Escape at Sea

Down goes a student flyer at right in "Dilbert Dunker," which reaches 20 knots, turns over at water line



Flyer emerges from Dunker, below. He knows how to escape in safety



Flight students at the Pensacola Naval Air Training Base ride the "Dilbert Dunker" to learn all the tricks necessary to escape from a plane after it crashes at sea. The Dunker is the complete cockpit of a Navy trainer plane, mounted on twin rails 25 feet long and set at a 45-degree angle at an end of the station swimming pool. Motor driven pulleys hoist the Dunker to the top of the incline. Wearing safety belt and shoulder harness, the student straps himself into the cockpit and the Dunker is cut loose. It hits the water at a speed of 20 knots. At the point of impact, a tripping mechanism flings the cockpit over on its back to simulate a common occurrence in sea crashes. If the student fails to extricate himself in 30 seconds, lifeguards rescue him. All flight students must pass the Dunker test.

AAF Vets Build Midget Pianos and Learn to Play Tunes in 21 Days

Thanks to midget pianos and a short-cut teaching system, no one laughs when a convalescent flyer sits down to play the

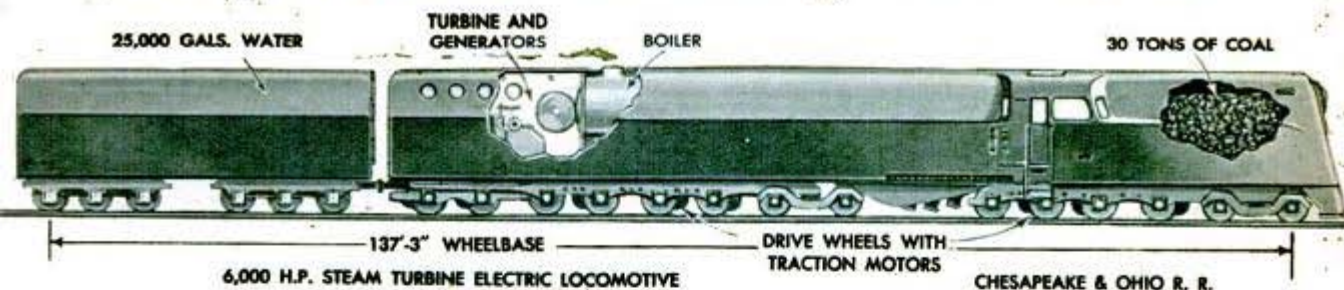
piano after only three weeks of instruction at the Army Air Force hospital in Fort Thomas, Ky. The tiny musical instruments,

called Xylettes, were built by the patients themselves. Both the Xylette, which can be carried under one arm, and the capsule lessons were developed by Harold B. Rhodes of the AAF Personnel Distribution Command while himself a patient.



☐ New battleships in the Iowa class boast an announcing system which includes eight transmitting stations, 294 loudspeakers and 31,000 feet of cable, according to Bell Laboratories.

Turbine Locomotives Challenge Diesel Power



Combining best features of steam, turbine and electric drive, the locomotive above is one of three to be built for Chesapeake and Ohio Railway by Baldwin, using Westinghouse turbine-electric equipment.

Coal is carried ahead of boiler, too, in "Triplex," steam turbine locomotive developed by Pennsylvania Railroad. One direct drive turbine will be geared to driving wheels of each of two swiveling trucks



Viewed by railroad men as a direct challenge to the increasing popularity of Diesel-electric locomotives are two radically new steam turbine locomotives designed for operation on the Chesapeake and Ohio and the Pennsylvania lines. Both are similar in placing the coal supply at the head of the engine, with the cab and boiler section following, cab at the front and boiler at the rear. Water tenders are coupled at the rear of both units. There the resem-

blance ceases. The Pennsylvania "Triplex" is powered by two direct drive steam turbines, geared to two swiveling trucks beneath the coal compartment and boiler and producing 9,000 horsepower. The C. & O.'s steam turbine delivers 6,000 horsepower to generators at the rear of the boiler. From the generators come 4,000 kilowatts to operate electric motors on each of eight driving wheels. Both models eliminate the piston rods of the conventional locomotive.

3-Part Mattress Joined by Zipper Can Be Turned Easily

Turning a three-piece mattress held together by zippers requires very little exertion by the housewife. Instead of turning over an entire bulky mattress frequently to distribute the wear, the housewife merely unzips and reshuffles the sections of the three-in-one mattress into different combinations. When unzipped, each of the sections can be aired like a pillow. If the parts are interchanged regularly, the mattress should last longer than an ordinary mattress because no one part will wear out faster than the others. The mat-

tress is tuftless, buttonless and has no rolled edges. A quilted pad zipped to the mattress keeps it from shifting.



THE TRAIN THAT FOLLOWS THE FLEET



U. S. Navy photo
Backing up these mighty U. S. warships is train of supply vessels enabling them to range thousands of miles

By Frederick Lansing Oliver

Captain, USN (Ret.)

IN THE PACIFIC the task forces of the U. S. Navy have roamed over thousands of miles from one objective to another. They have confounded the Japanese by throwing into the discard the previously accepted theory that fleet operations were limited to a radius of about 2,000 miles from an established base.

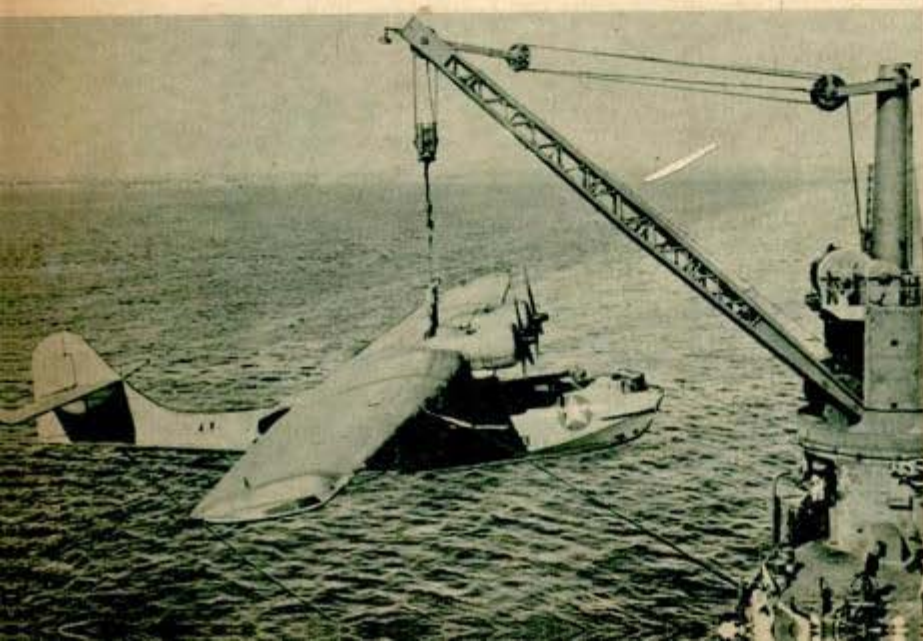
This success is due to our floating base equipment and advanced bases, which permit the Fleet to be efficiently serviced.

In the days of sail there was little need for overseas bases as naval vessels were almost self-sustaining. They carried vast quantities of ammunition, supplies and food. The copper sheathed bottoms of wooden ships offered little attraction for sea growths which foul steel hulls. Consequently dry docking was seldom necessary, and almost any item of repair was considered to be within the capacity of a ship's force.

With the transition from sail to steam there came a radical change in cruising requirements, and Great Britain astutely established naval bases in all parts of the world. The United States made no attempt to obtain similar facilities aside from isolated instances of securing permission from other governments to locate store ships in selected ports.

Over a long period of years the U. S. Navy managed as best it could without benefit of overseas bases. Fuel and other needs were obtained by contract. Upon the outbreak of the Spanish-

Giant PBV is hoisted aboard seaplane tender like a toy



POPULAR MECHANICS



American War, the restrictions of international law put our ships on their own resources. This resulted in the acquisition of varied floating base equipment such as colliers, store ships, refrigerator ships and our first hospital and repair ships. The lack of overseas bases made us realize that we labored under a handicap that would have to be mastered if we were to become a first-class naval power.

After intensive study, the theory of the "fleet train" was evolved. The train is a navy term for an organization of auxiliary ships which affords

U. S. Coast Guard photo
Temporary causeway is built for unloading supplies from landing craft

LST carries bridge of steel pontoons to effect landing along rocky shore





Courtesy International Harvester Co.
A favorite with Seabees who build advanced bases is this mobile shop

all the services needed by the Fleet, and was the germ from which the present floating bases developed.

This development experienced many growing pains. Congress was loath to appropriate money for experimental purposes, and trade organizations, fearing a reduction in navy yard repair work, vigorously opposed money being spent for repair ships.

The initial venture in this field, after having successfully served its purpose with the Fleet off Santiago in 1898, was discarded. There was no naval repair ship until the USS Panther was equipped to accompany the battleships sent around the world by President Theodore Roosevelt in 1908.

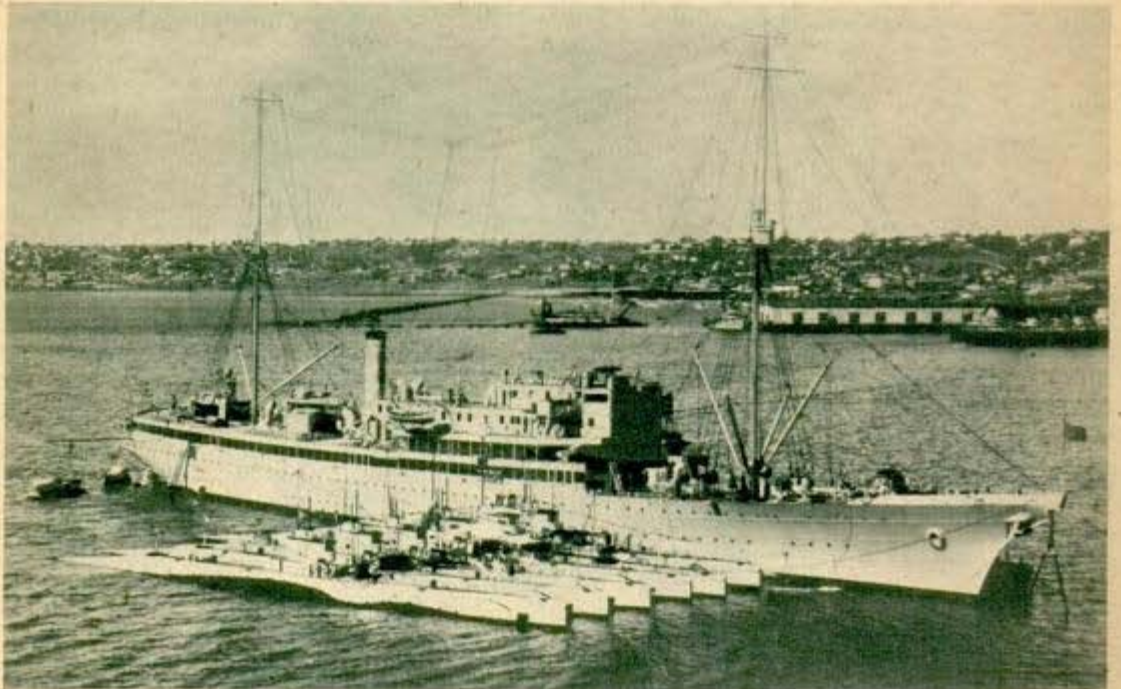
Subsequently, the Navy Department avoided criticism by converting two fine new colliers into repair ships, one of which, the Vestal, has long been the Fleet's "Old Reliable," able to repair anything from a watch to a main engine.

Another subterfuge was the tender. This innocent sounding cognomen did not arouse the distrust associated with repair ship, despite the fact that in addition to supplying destroyers, submarines and seaplanes with am-

munition, torpedoes, spare parts, food, clothing, emergency fuel and incidental materials, tenders are fully equipped to effect repairs. Slowly but surely the train grew into an assembly of ships which could accompany the Fleet, or any portion thereof, and supply its needs.

On January 1, 1941, the auxiliary vessels in our Navy numbered 85. Today there are approximately 800, with a projected 1,600 in the next few months. These ships, which will comprise about 20 percent of the total tonnage of the Navy, tend toward specialized duties. Various repair ships now are equipped to care for particular types of work, such as battle damage, heavy repairs to ships' hulls, internal combustion engines,

Pigboats huddle alongside sub mother ship for "feeding" of fuel oil, torpedoes and other vital supplies



landing craft, airplanes, and salvage work.

General duty repair ships can, in addition to all varieties of machine shop work, turn out castings and forgings, handle welding, underwater cutting and electrical, optical and instrument repairs of all types. Another special auxiliary is the distilling ship which furnishes vast quantities of fresh water to island garrisons and other ships.

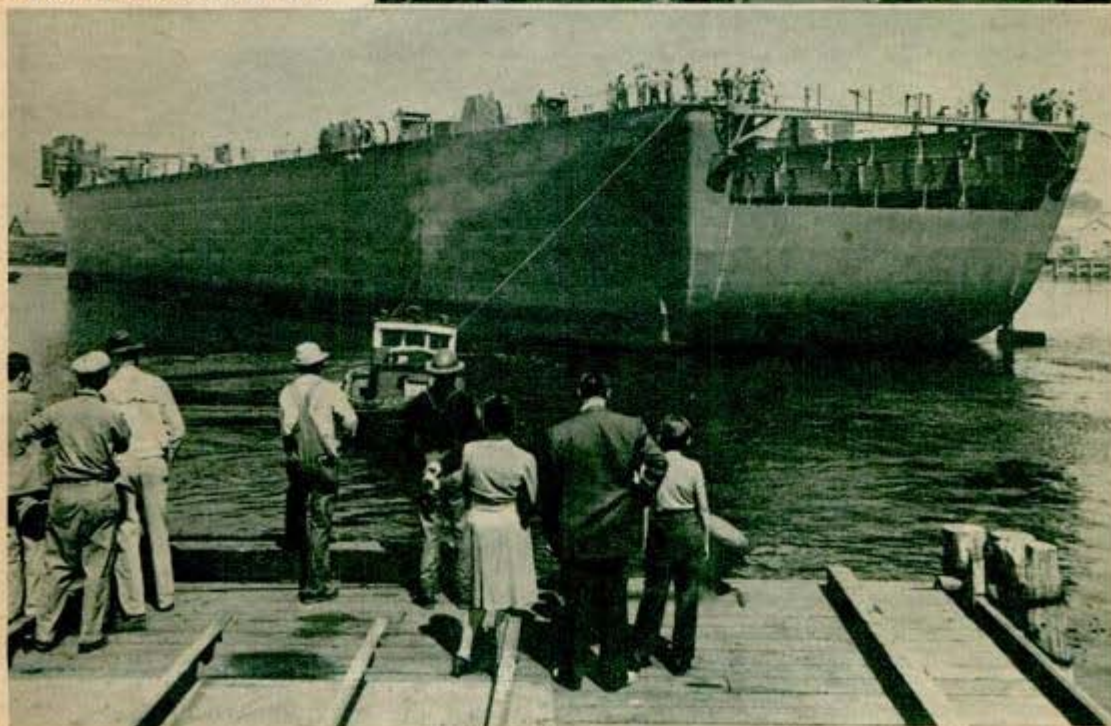
The lack of overseas bases has had a marked effect on the design of our men-of-war. Great attention has been given to making them as self-sustaining as possible. In no other navy has the same stress been placed on providing the greatest obtainable cruising radii and installing well equipped machine shop facilities.

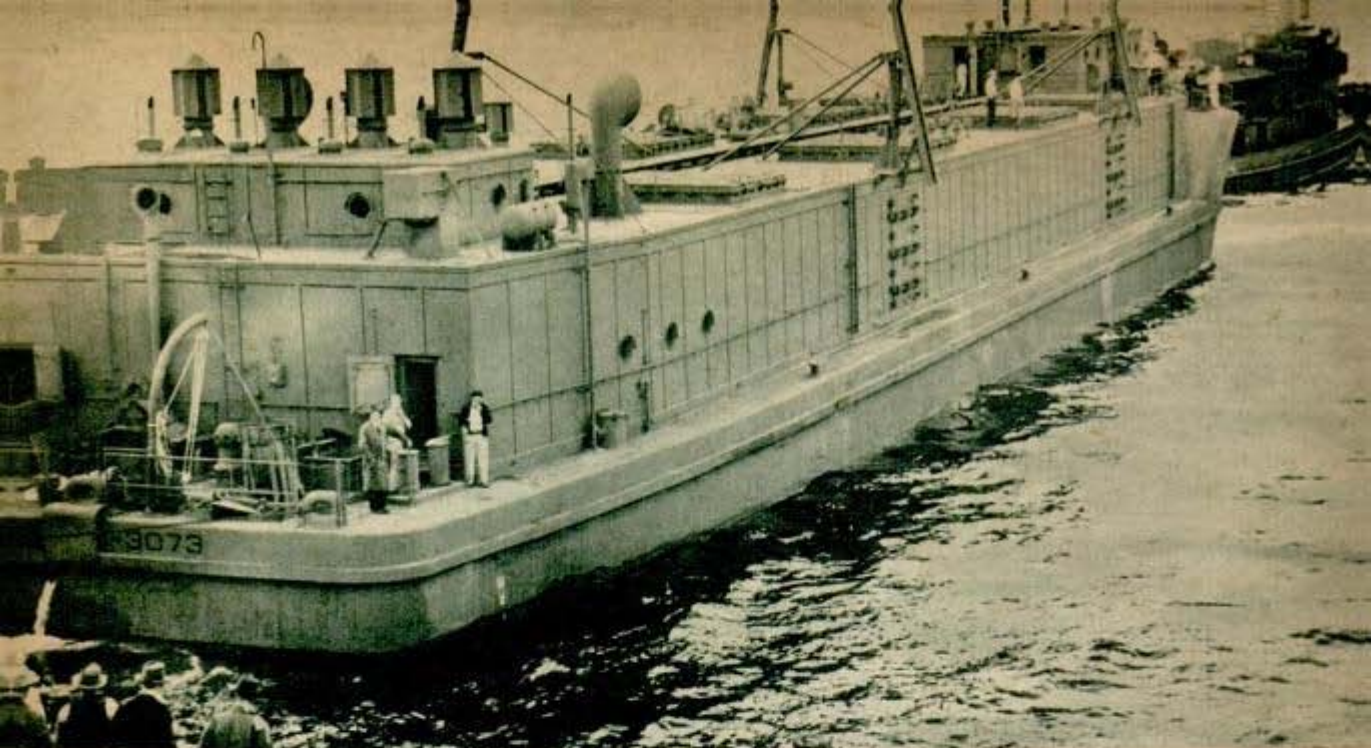
Hand in hand with the thought given to providing an adequate train was the development of plans

End gate in stern of floating dry dock drops to admit vessel



Courtesy International Harvester Co.
Pontoons are unloaded from a Navy truck at an advanced base depot in the Pacific. Below, well equipped machine shop on a modern cruiser





This new refrigerator barge holds 64 carloads of meat and has plant that makes five tons of ice daily

for wartime advanced bases. Certain types of repairs require measurements which can be made only on stationary foundations. Repair ships are limited in the amount of work that can be handled, and dry docking necessarily is done in sheltered water.

Before the outbreak of the present war, experimental floating dry docks capable of handling a destroyer had been built. These docks were designed to be towed overseas, and larger types were built in sections. By combining the requisite number of sec-

tions, a dry dock of any desired size can be assembled quickly.

In tropical waters ships' bottoms foul rapidly. The skin friction due to sea growths has a deleterious effect on a ship's fuel consumption and speed, resulting in a severe military disadvantage. A dirty bottom can reduce the speed of a cruiser or destroyer five or six knots, and along with the reduction in speed comes excessive vibration which interferes with the use of delicate fire control instruments.

Tons of equipment that back up an invading force are stacked for miles along beach—supplies win wars





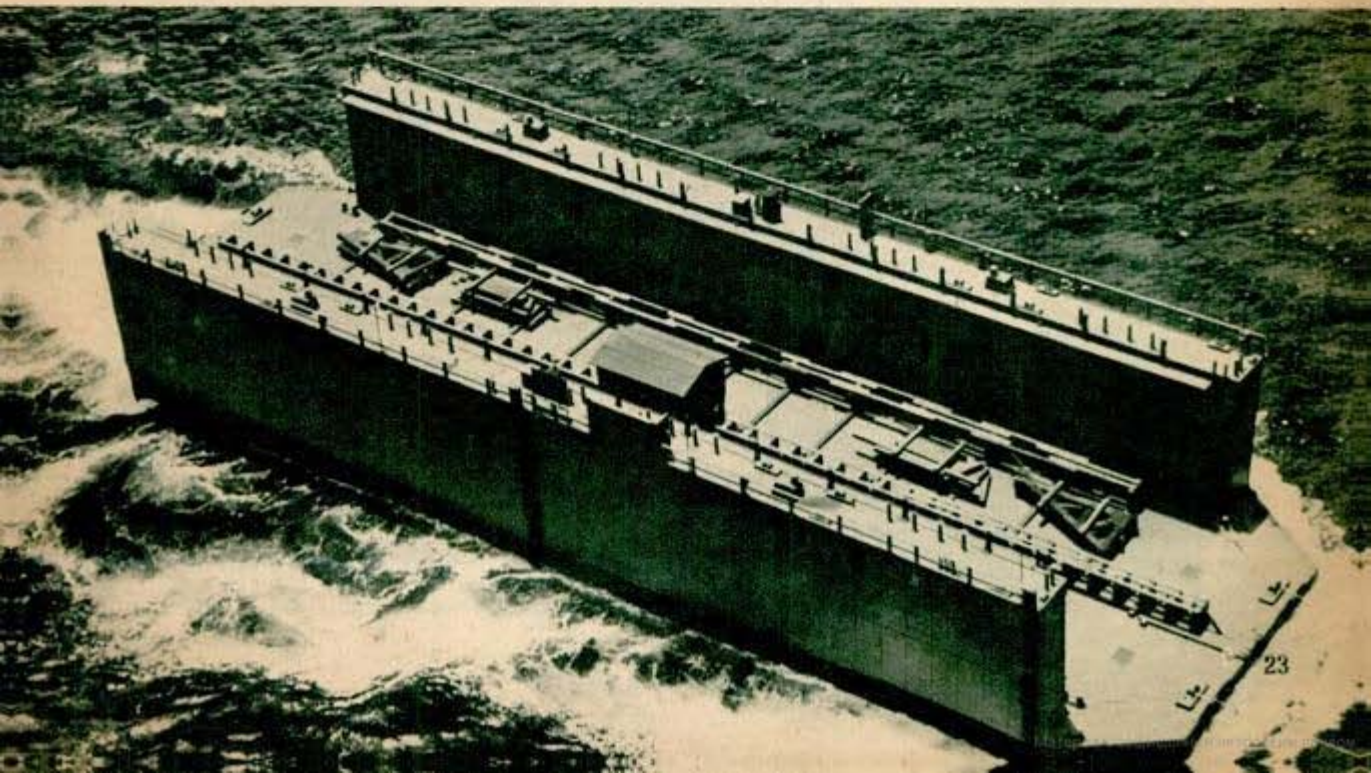
While helmsmen keep the two vessels at equal speeds, a British cruiser refuels from tanker far at sea

Advanced bases in the Pacific area have been in use for several years. These bases have been pushed forward as the battle areas advanced westward. They were quickly established by our Seabee battalions, and the larger ones are practically navy yards. In addition to dry dock and repair facilities, they have housing and hospital accommodations, storehouses, cold storage, ammunition dumps, fuel tanks and recreation centers. Wharves, cranes and transportation systems are provided, together with the necessary utilities to knit

the base into an efficient unit. Adequate defense measures, including airfields, anti-aircraft batteries and antisubmarine nets, are provided where necessary.

However, advanced bases are not sufficient for the needs of the Fleet in a fast moving war. The task force which supported the assault on Kwajalein went on to blast Truk and shell Guam. Between leaving Pearl Harbor and returning to that base, it sailed approximately 8,000 miles. On this voyage, fuel, ammunition and supplies were drawn from an attendant train

Here you are looking down from Navy patrol plane at a 1,000-ton floating dry dock as it is being towed





Marine Corps photo
Loading 2,000-pounders on carts at bomb dump on Pacific island base

vessel having a surplus, and with both vessels going ahead at a brisk pace.

When a tanker pulls alongside a thirsty vessel, a light line is shot across and then a rope to which is tied a hose. Telephone lines are connected to the hose stations and the bridges of the two vessels. As the oil flows through the hose or hoses, as the case may be, the ships must be kept at equal speeds and at an even distance. The hoses, suspended on curved wooden saddles tied to booms, are tended by hand on the big ships and by winch on the tankers. They must be payed in and out carefully to compensate for the varying distance between the two vessels.

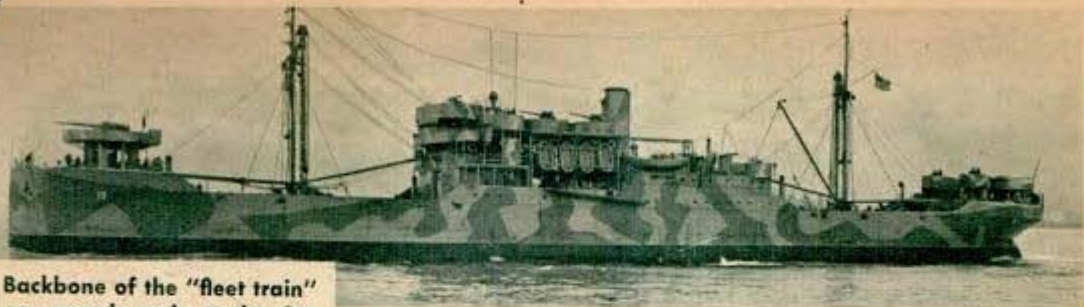
in accordance with prearranged plans. Strategically located repair ships cared for emergency needs.

The fueling of our ships is done either at sea or in harbors that have been taken. Fueling at sea is an art that has long been practiced by the U. S. Navy in anticipation of today's needs. Fuel oil can be transferred not only from tankers, but from any

Ammunition and torpedo requirements in the fast shooting warfare of today are far in excess of any previous experience, and although ammunition dumps have been established at advanced bases, an expedition operating in distant waters cannot waste precious time in going to a base for ammunition. Nor can it, with a depleted stock, afford to chance meeting enemy

Loaded for combat, trucks roll over steel mat on sandy beach toward lowered ramp of Navy's sturdy LST





Backbone of the "fleet train" are vessels such as the *Capella*, cargo ship above, and the *Storm King*, a transport



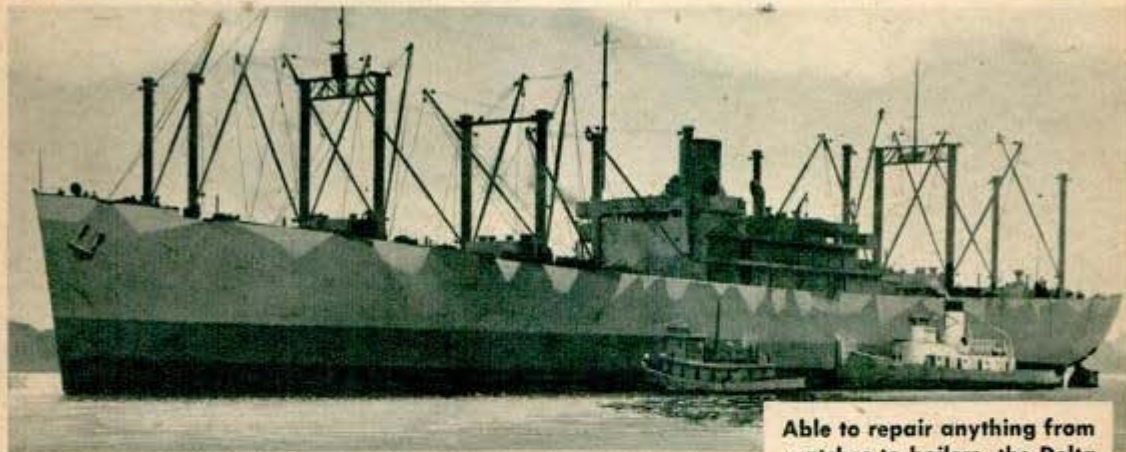
forces. Ammunition ships, which get refills at advanced bases, afford prompt service.

Japan probably placed great emphasis on our inability to carry out a Pacific naval campaign or military operations on land if the Japanese seized and held all base sites from which a fleet could be serviced. This belief premised Japan's acquisition of the mandate for the Pacific islands which had been under the German flag prior to World War I, and actuated the prompt seizure in 1942 of many bases in the Southwest Pacific. This conquest was in process of be-

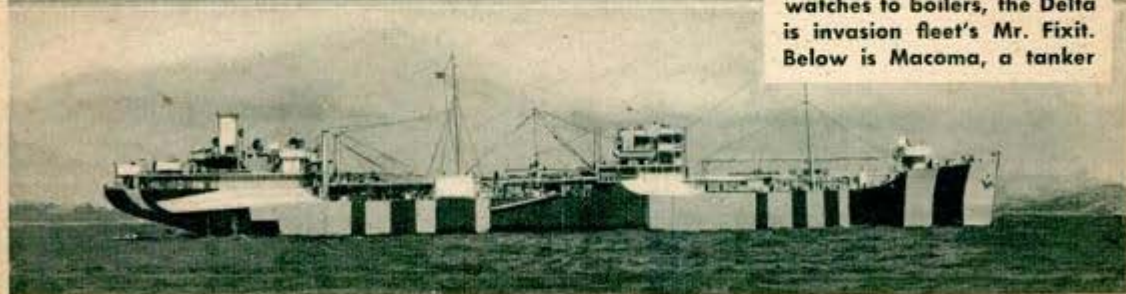
ing further advanced when called to a halt at Guadalcanal in September, 1942. The extensive defenses found at Tarawa and other captured islands show the importance with which they were regarded by the Japanese.

But take them we did, and as the war moves inexorably toward the shores of Japan, our floating and advanced bases are enabling our Fleet a wage a victorious campaign.

(The opinions contained in the above article are those of the writer and are not to be construed as reflecting the views of the Navy Department or of the naval service at large.)



Able to repair anything from watches to boilers, the *Delta* is invasion fleet's Mr. Fixit. Below is *Macoma*, a tanker



Deicer Wing Boots Tested on a Mountain Top



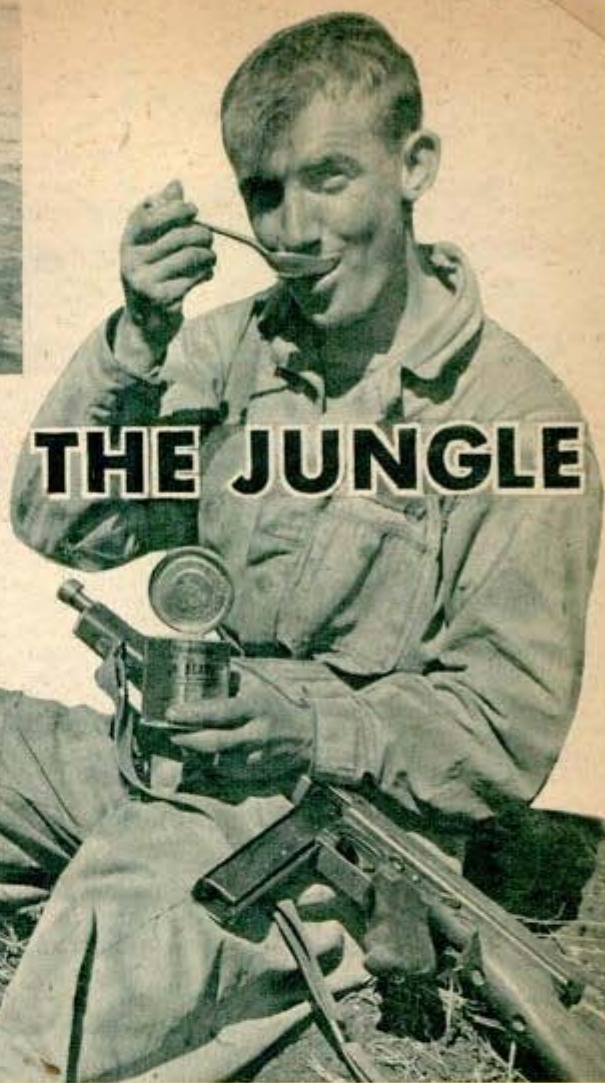
Mounted like a weather vane so it will face the wind, an airplane wing wearing experimental deicer boots is perched on a tower 18 feet above the summit of 6,288-foot Mount Washington in New Hampshire. The test rig, built by the B. F. Goodrich Company, is located atop the peak because the almost continuous icing conditions there, combined with high winds that sometimes reach 231 miles per hour, afford conditions comparable to those encountered in flying. Weather Bureau records show that last January there were 20 days on which wind velocity exceeded 100 miles per hour, and

25 days on which ice formation occurred. In addition, the U.S. Weather Bureau experts of the Mount Washington Observatory are always on hand to give information on temperature, wind velocity, ice density and type, icing rate, etc. The boots contain tubes that are alternately inflated and deflated to break off the ice.



Hot Dip Gives Tools New Skin Of Protective Plastic

Tools dipped for five seconds into an electrically heated tank containing hot liquid plastic are given a protective coating which guarantees longer wear and freedom from rust. The temperature of the plastic fluid is thermostatically controlled. The tank can be operated on 110 volts a.c. or d.c. or 220 volts a.c.



AT HOME IN THE JUNGLE



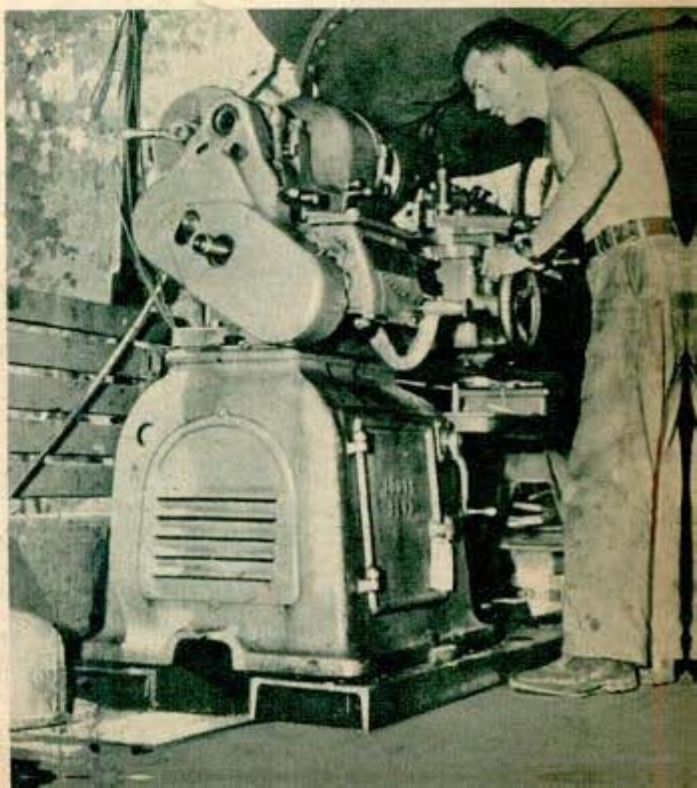
By Staff Sgt. John L. Kent

WHEN GI Joe, fighting in the hot New Guinea jungle, wrote home how much he would give for a plate of ice cream, he never thought he would taste this American dessert until he got back to the States. But GI Joe is going to have ice cream soon, no matter where he is. American ingenuity and mechanical ability have reduced the bulky ice cream making machine into a lightweight portable unit which produces 40 gallons in eight hours.

This portable unit is only one of a score of newly designed pieces of mechanical equipment that are making jungle warfare more bearable for our troops.

Americans are a nation of gadgeteers. Portability, light weight, and the simplification of ways of doing things have been the quest of inventors and research men since before Elias Howe made his wife's work easier by inventing a sewing machine. For use in jungle war, Army ordnancemen and inventors have designed

Booster pump (top left) pumps salt water into purification unit. Above, GI gets hot meal in jungle. Below, operating lathe in Army's mobile machine shop





Three-ounce wax fuel tablet serves as "stove" to heat jungle fare

new lightweight weapons such as mortars, pack howitzers and rocket guns. To cross the many streams they have built vehicles that can travel over land or water. American inventive genius has furnished the soldier with portable machine shops to repair his guns and vehicles, and power tools to make the job easier. But the inventions closest to the GI's heart are those which are adding to his comfort and well-being in the jungle.

Life in the jungle is a dreary one at best, full of inconveniences, scares and tension. There are moments, though, when there's a chance to take a bath and clean one's clothing and just relax. To help the jungle fighter keep clean, the Army has a new

mules, native porters and soldiers' backs. Roads as we know them are nonexistent and jungle trails seldom permit the movement of heavy equipment. In addition to lack of roads, the climate cuts down the soldier's physical capacity, and he must look to portable power tools to augment his strength.

The jungle soldier must also bring with him all equipment to cook his food and purify his water. Unlike the soldier in Europe, he cannot occasionally sleep in an abandoned house—there are no houses in the jungle. He must bring his own portable huts and set them up, or use his tools and build his shelter.

Because of the warm climate the Army has been using tents for housing soldiers and for storage of materiel, but the life of tentage in the moist jungle is very short. On semipermanent installations the Army now builds with wood, which is plentiful. To help speed construction, the Army has adopted the power chain saw, a portable two-man tool for felling trees, bucking logs and similar operations. It is a sawing mechanism composed of a guide rail in which a continuous cutting chain operates. This cutting chain is nothing more than large saw teeth linked



shower unit which can be used by 24 men simultaneously. It weighs only 3,900 pounds and folds into a space only 60 inches in height. Moreover, it also can be used as a fumigation unit. To help clean his clothes, the Army has portable laundry units, some mounted on light trucks as permanent mobile laundries, some like the latest laundry unit, breaking down into small components easily carried in the jungle. This latter unit weighs 2,465 pounds and will clean and dry 40 pounds of laundry per hour and serve 600 men. Jungle war is hard on clothes, so the Army has textile and clothing repair shops. One of these portable shops, originally designed for airborne warfare, is mounted on a trailer and weighs 3,900 pounds, which is in sharp contrast to an earlier model which weighed 22,000 pounds. The latter was limited to use where roads were available.

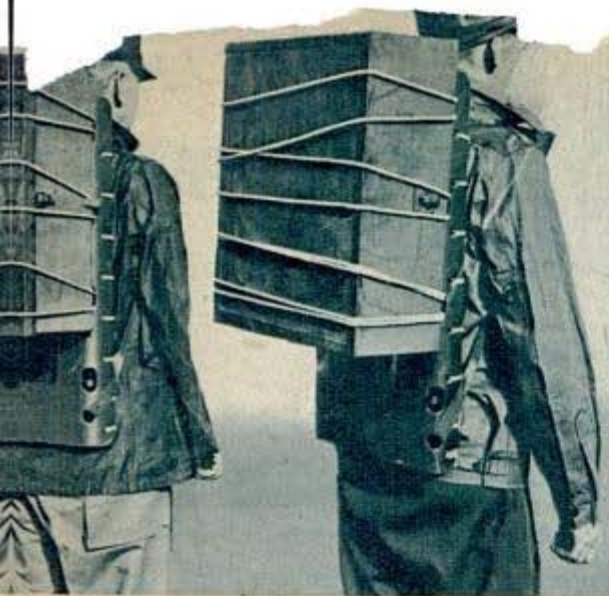
Our equipment in the jungle must be portable, for transportation most of the time consists of

mules, native porters and soldiers' backs. Roads as we know them are nonexistent and jungle trails seldom permit the movement of heavy equipment. In addition to lack of roads, the climate cuts down the soldier's physical capacity, and he must look to portable power tools to augment his strength.

The jungle soldier must also bring with him all equipment to cook his food and purify his water. Unlike the soldier in Europe, he cannot occasionally sleep in an abandoned house—there are no houses in the jungle. He must bring his own portable huts and set them up, or use his tools and build his shelter.

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Portable Diesel engine furnishes the power for laundry operations in New Guinea



Strapped to jungle packboards, two-man cooking outfit (top left) is ready for "transport." Right, Elsie, "GI cow," makes fresh milk from powder. Below (left) mobile laundry truck and (right) two-man chain saw



together. One end of the guide rail is bolted to the transmission housing of a gasoline engine which drives the chain sprocket. Power comes from an air-cooled, two-cylinder motor, rated at six horsepower.

Food and water are the biggest problems in jungle war. Seldom is jungle stream water safe for human use, and the soldier must be equipped to purify this water and make it fit to drink.

Although we have an efficient portable water purification unit which is easily carried on trucks or jeeps, a specially built portable set has been developed and is being issued to jungle troops. Known as the

diatomite water purification set, the equipment can be carried on backs of mules or it even can be attached to packboards and carried by the troops.

The unit consists of a pressure filter, a diatomite slurry feeding apparatus, two gasoline engine driven pumping sets, a chlorination set and four fabric tanks. The unit is designed to be moved to the water point by three pack animals or in nine individual man packs, and in some cases can supplant the filter of the standard portable water purification unit.

When packing facilities are limited and the required output is less than the capac-



This portable apparatus can produce 15 gallons of pure drinking water per minute from a jungle stream

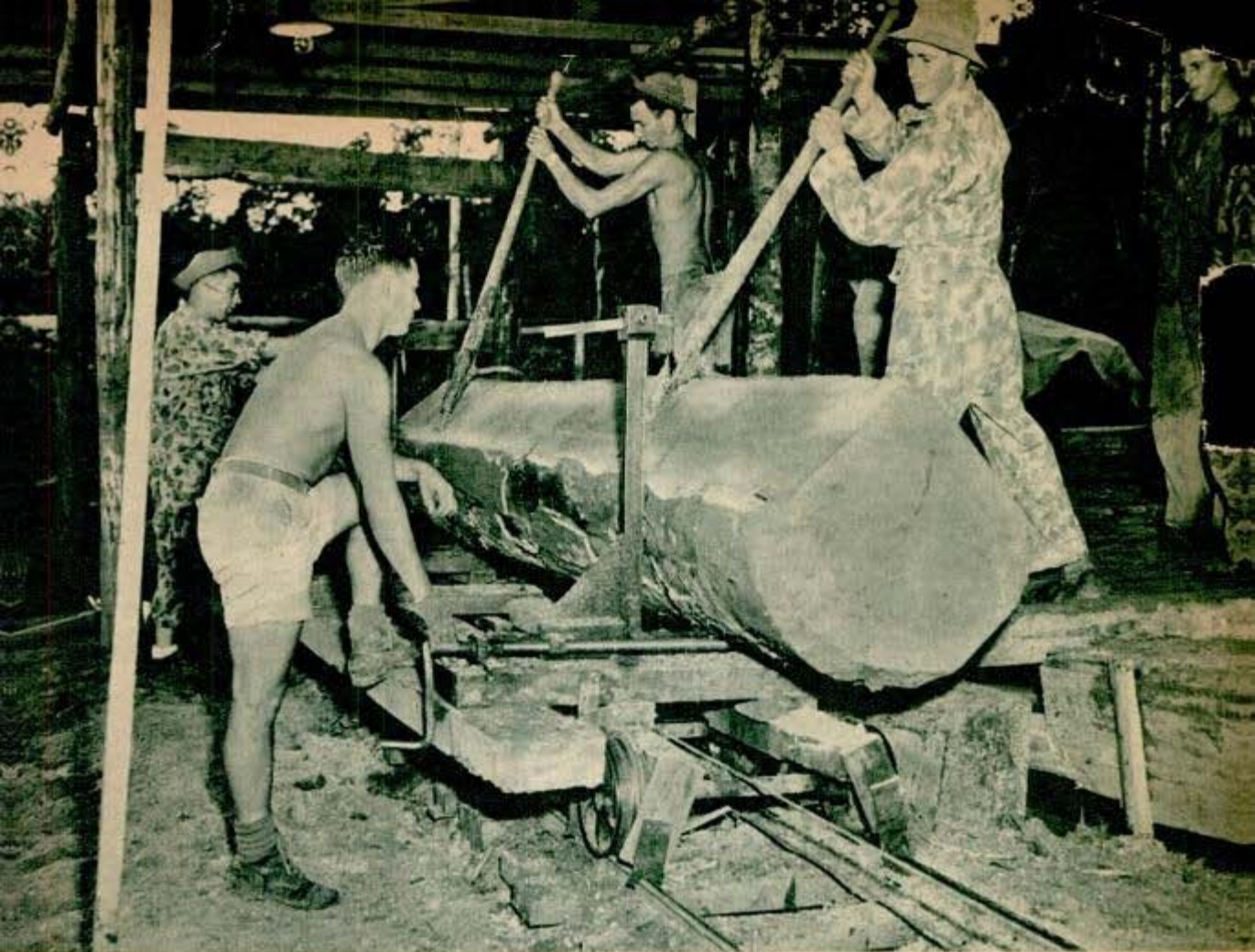
ity of 15 gallons per minute, only essential components of the set need be carried. Thus, if only one pack animal or three men are available, an output of five gallons per minute may be obtained with packs No. 1, 2 and 3, which contain the bare essentials. Pack No. 1 holds the filter and feeder section, No. 2 holds a gas engine driven pump, and No. 3 contains the hose and diatomaceous silica used as a filtering agent. Packs Nos. 5, 6, 7 and 8, holding one 500-gallon canvas tank each, may be omitted,

since the containers can be filled directly from the filter outlet.

Next to water, the soldier must have food. In the jungle, greater dependence is placed on the Army's combat C and K rations because of the problem of moving heavy field kitchens. Only in rear areas can kitchens be set up. C rations are usually canned hash or stew, or other meats and vegetables, and are especially suited for jungle use where food spoils quickly. These rations are palatable and nourishing,

Tank of water purification unit on island in the Pacific can supply 10,000 soldiers with one gallon apiece





Turning over log for squaring in jungle saw mill; the wood is used for construction of new bridges. Below, repairing automobile parts in mobile machine shop of an ordnance division. Note humor in sign

but taste much better when hot. Also one of the components of Army rations is coffee powder, which, although soluble in cold water, leaves much to be desired, for there is nothing more appreciated by the soldier than a cup of hot coffee.

To furnish this cup of hot coffee and cook or warm canned food, two new types of portable stoves were developed. The first is a gasoline stove intended for use by two or three men of a reconnaissance party. The other, called a portable field stove, is a larger stove for use by small detachments and will provide hot meals for 20 to 30 men.

The gasoline stove, burning either ethyl or regular gasoline, is the

(Continued to page 152)



Suction Harvester Gathers Nuts and Puts them in Sacks



Manpower shortages for nut-picking in Oregon are solved by a pneumatic harvester with four suction funnels resembling vacuum cleaners. The machine gathers nuts, leaves and hulls and delivers them to a separator and sacking device behind it, where the leaves and most of the hulls are blown out by the same fan that produces the suction. An auxiliary engine operates the fan.

"Trashcraft" Yields Art With Toothpicks or Fish Scales

Pupils in a Chicago public school create things of beauty from rubbish. Using discarded egg shells, fish scales, bits of thread, buttons, pumpkin seeds, toothpicks, etc., children turn out landscapes, clusters of flowers and multi-colored birds. The only tools necessary are paste, scissors, razor blade and colored scraps of crepe paper which, soaked in water, yield the dyes for coloring. The course in "trashcraft" is supervised by Mrs. O. R. Foster, its originator.



Floating Bag for Wounded Flyers Is Equipped With Electric Heater



An electrically heated floating casualty bag for protection of wounded flying crewmen has been developed by the 8th Air Force. The bag maintains normal body temperature at high altitudes or when afloat, and permits injured personnel to be freed of tight clothing and to be properly bandaged without danger of frostbite. Strap handles on each side facilitate lifting the patient and carrying him from the plane without use of a litter. The bag will float a 190-pound man in the water if the plane has to be "ditched" during a mission.

☐ Saving, time, money, labor and lives, an airplane laid 16 miles of telephone wire, for use by National Park Service rangers, over the rough, wooded slopes of the Great Smoky Mountains between Tennessee and North Carolina in only 6½ minutes, according to the Air Technical Service Command.

WINGS FOR THE FAMILY?

By T. P. Wright

Civil Aeronautics Administrator

THE Civil Aeronautics Administration predicts that if certain programs are initiated and aggressively continued, there will be 400,000 private aircraft operating in this country within 10 years after the war. This is an ambitious statement, and we of the CAA are marshaling all our ingenuity to make this forecast come true.

We have told airplane manufacturers that aviation cannot reach this goal on the wings of prewar private airplanes, which unquestionably are good planes and must continue to be the backbone of the expansion during its initial stages; that minor improvements and added gadgets will not fill the need for the utility value which the private plane must have before it achieves even a fraction of the mass market of the automobile.

Recently, in the belief that a heroic effort to achieve this mass market is well worth while, I challenged the industry to produce a \$2,500, four-place, all-metal plane with a cruising speed of 150 miles per hour and possessing a maximum of safety features. I suggested that the plane should have a castored, or controllable, landing gear and an effective muffler and propeller arrangement to eliminate the nuisance factor of noisy power plants.

The price and specifications would place the plane within the buying power of many thousands; the castored, or controlled, landing gear would make one-way airports safe, practical and inexpen-

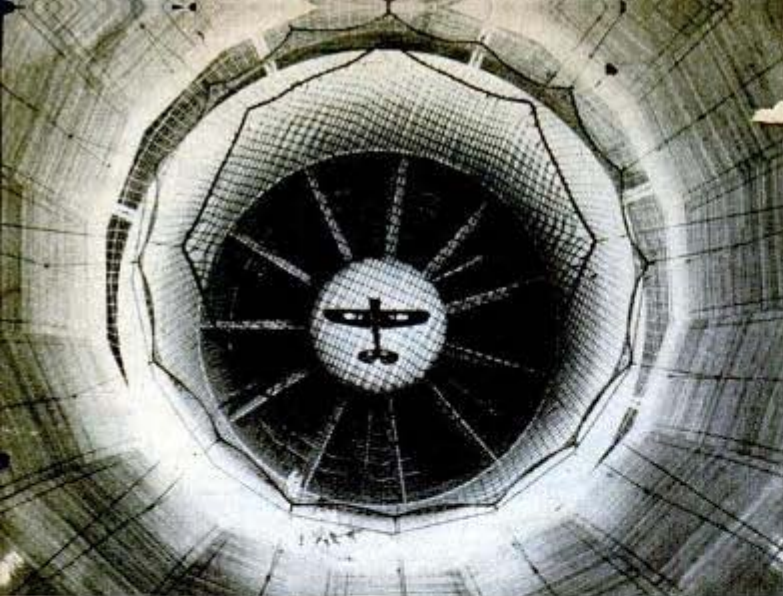


Safety, excellent visibility and comfort are combined in these Aeronca models. New low wing Arrow is in the foreground



Thousands of war pilots are prospective postwar plane buyers; here a Ryan instructor explains maneuvers with model. Below, Hiller-copter makes a vertical takeoff from a lawn





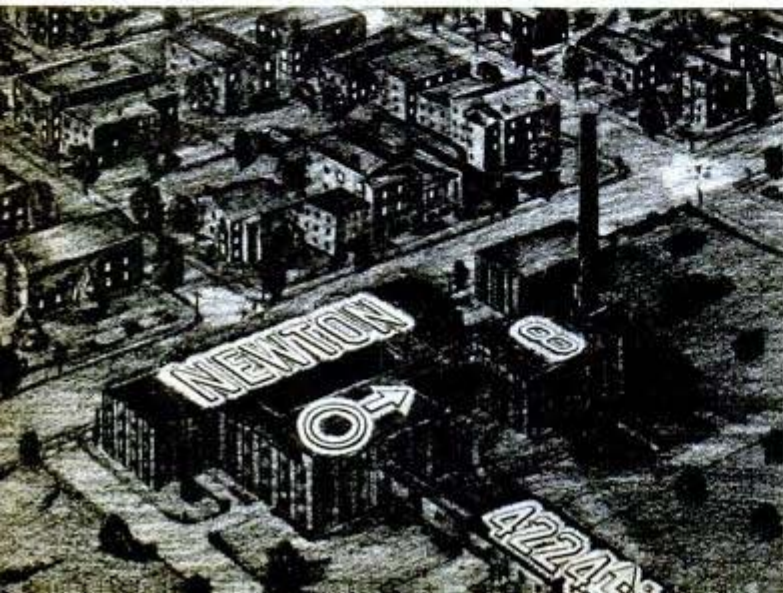
Air Technical Service Command photo

Nylon net catches free-flying model planes in 80-foot vertical wind tunnel at Wright Field. It is used for spin tests



Courtesy Republic Aviation Corp.

This four-passenger amphibian designed for postwar use has a cruising speed of 105 m.p.h.; cabin resembles auto interior. Below, neon air markers are of standard type advocated by CAA



sive; the quieted engine would make air traffic acceptable in residential areas.

However, it generally is believed by farsighted men in aviation that the kind of plane which will be available immediately after the war will attract only a flash market composed of those who will soon become dissatisfied, as have the majority of owners in the past; and that aviation cannot become a sound, peacetime industry until the family airplane develops a usefulness which it does not yet possess.

One third of the purchasers of private planes between 1931-1939 sold their planes within a year, one half within two years, and the average period of ownership for 80 percent of the owners was two and one half years. Reasons for this discouraging procedure were given as "expense greater than anticipated," "too much time to and from airports" and "not as useful as expected," in that order.

The postwar "Model T" of the air must serve a practical purpose. It cannot be a playboy's toy, hangered at some distant field, used only for a few hours' flight a month. It must provide "front door" transportation; it must be parkable in the garage, or in an inexpensive hangar of the same approximate size; it must take off and land within a short space, and its angle of descent and climb must be very acute, possibly almost vertical, so that it will not be necessary to destroy trees around the home or buy many acres for a field so that it can fly.

The postwar plane for the family must have a wide range of speed; it must be capable of enough speed to be the fastest means of private cross-country travel, regardless of winds encountered, and it must be possible to slow down much below present stalling speeds for convenience, utility and pleasure. It must be comfortable and roomy inside.

It must be quiet—for two reasons. First, the neighbors will not tolerate it with its present roaring noise; second, there is no pleasure in flying if the pilot and his passengers have to communicate with each other by screaming, hand signs and pointing.

Ten years ago, the CAA encour-

aged the development, among other planes, of a roadable autogyro, which leading aeronautical engineers said could have been mass produced at relatively low cost. It was flown successfully and driven through the streets of several of our larger cities.

This autogyro was far from perfect, but it might have been developed to a point of real utility as a private plane. The Model T plane must have characteristics which we now know exist in the helicopter and the roadable gyro. It must take you from your home all the way to your ultimate destination, and not be only a supplement to your automobile.

The plane of the future must be so easy and safe to fly that any person physically capable of driving a car will be able to fly it with little, if any, more instruction than is necessary in driving a car. Physical requirements continuously are being studied and revised. The spinproof plane is already flying, but we still must conquer the greatest cause of fatal accidents—those which result from stalling, or slow turns close to the ground.

Under the prewar complaint of "expense greater than anticipated," we must list original cost, maintenance, insurance, extra travel to and from the airports and



Air Technical Service Command photo

Officer inspects gas jet of AAF beacon lamp that burns for year without refueling. Sun's rays turn beacon on and off



Courtesy Aeronca Aircraft Corp.

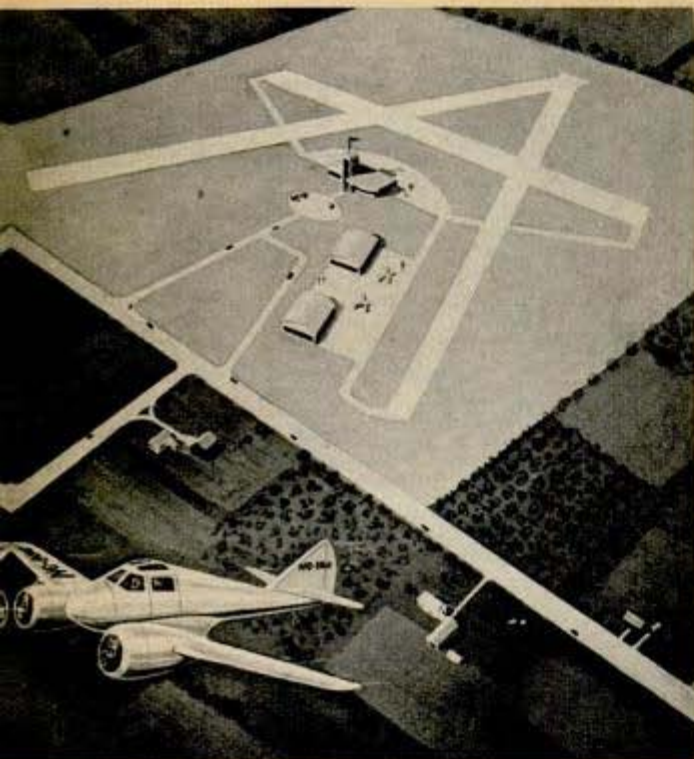
This postwar Aeronca two-passenger plane is said to be spinproof. Left, ultra-high-frequency radio range station. Below, prewar CAA-sponsored roadable gyro on a busy street





Courtesy Piper Aircraft Corporation

Postwar Cub Skycycle is a single place low wing plane with cruising range of about 400 miles; note bubble canopy on this experimental model. Below, airport designed by CAA to serve area with 25,000 population



other miscellaneous expenses. These mount up. Insurance on a \$2,500 plane will be close to 20 percent per year. This must be reduced and the reduction justified on the basis of a low accident record.

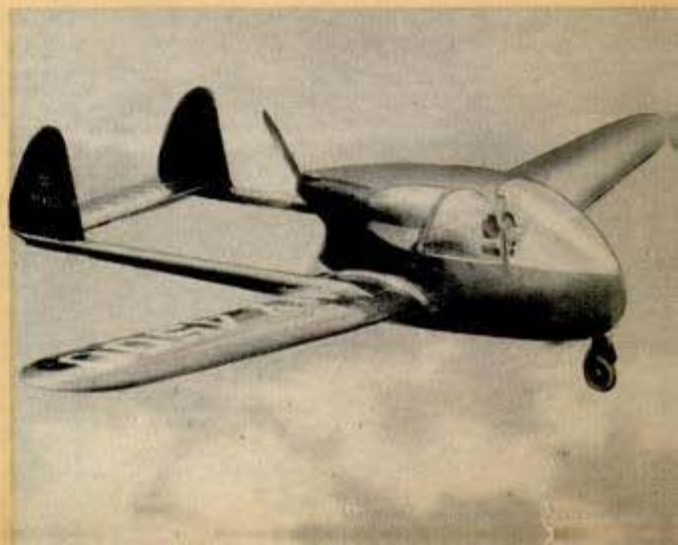
Maintenance costs have caused many owners to sell their planes in disgust; simple ground loops, which can happen to the best of pilots, have resulted in minor damages but major raids on the pocketbook for repair. The expense and delay of getting to and from the airports is familiar to all who fly or have ever flown.

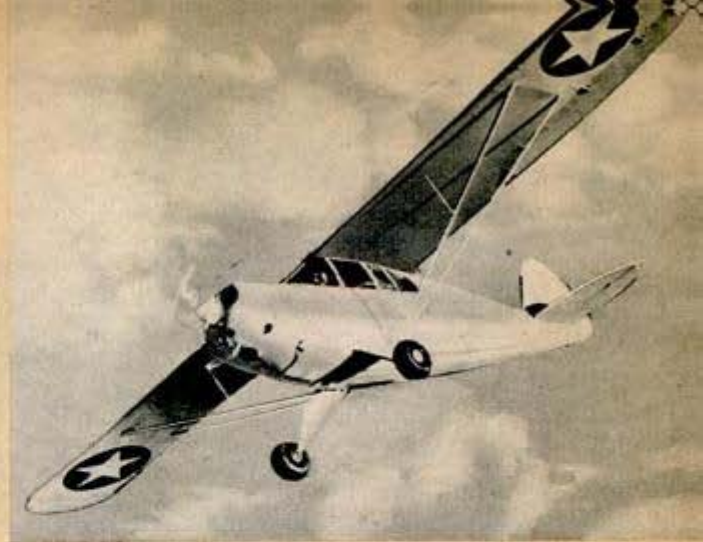
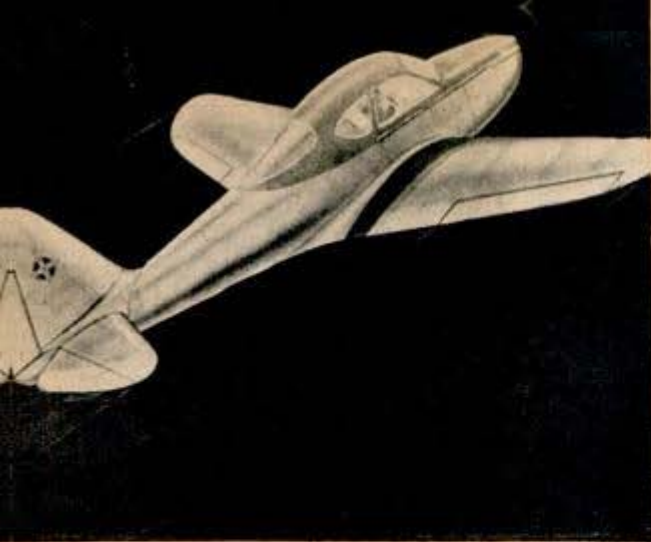
We hope that the CAA National Airport Plan now being studied by Congress will give us the answer to the airport problem. Airports and airplanes are Siamese twins because neither will be able to survive without the other.

We do not believe there will be any aeronautical development which will eliminate the need for relatively large airports for the airliners of the future, but there is a possibility that the small family plane, after its transition to the "front door" aircraft, will need much less area than the smallest airport of today.

As light airplanes become more efficient;

V-tailed Beechcraft (below left) features simplified controls; below, new two-place Piper Cub Skycoupe





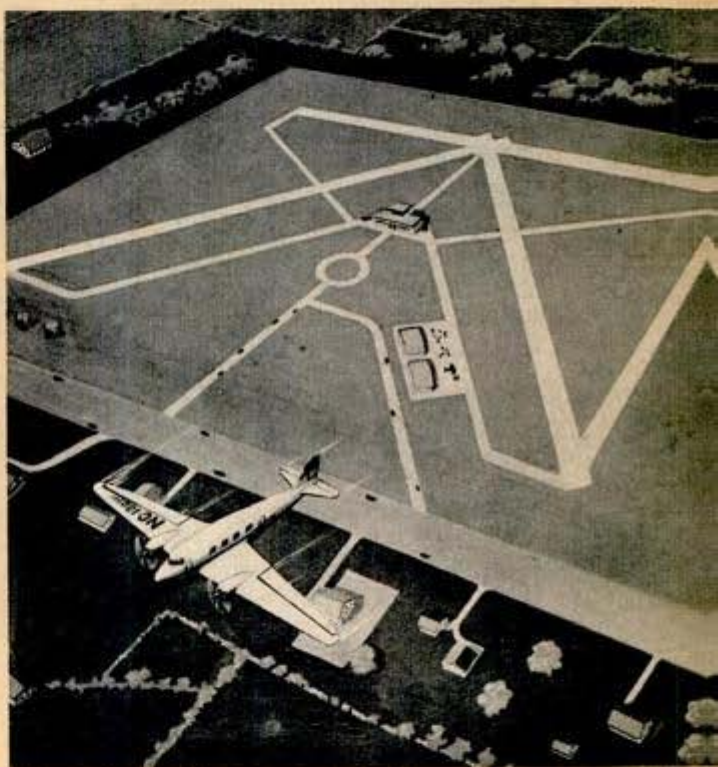
Another postwar Piper Cub model is the Skysedan, four-passenger plane for family use. It has top speed of 140 m.p.h. and 500-mile range. Right, wartime Cub is used for spotting and other front line jobs

the area needed for landing will become less and less; addition of a castored, or swivel-type, landing gear, or a more serious study of cross-wind landing devices, could reduce landing surfaces to a 300-foot path 1,800 feet long—if its long direction is roughly parallel to the prevailing wind.

Therefore, the CAA's Airport Plan is flexible, especially in the Class 1 and 2 sizes, which are designed primarily for the private owner and form the large majority of the proposed new fields. We hope to co-ordinate the growth of airports with the development of aircraft so that, in the near future, the ultimate plane will fit the airport as the train fits the track. For the present we must plan airports to meet the requirements of aircraft now in production or known to be designed.

Regulations are under constant study to make licensing, owning, flying and servicing airplanes less onerous to the people. Suggestions by pilots, fixed base operators, and other air-minded people are given our full attention. Medical examinations, traffic rules, weather minimums, license renewals and restrictions or repairs

(Continued to page 154)



Airport for feeder-line system (above) designed by CAA to accommodate transports; below, sleek Rocket 185





Mechanical Exerciser Keeps Bass Viol Fit In Masters' Absence

Although its masters are away in the Navy, a bass viol gets daily workouts with a mechanical exerciser built by a Cleveland man. After his two musician sons went into the service, the instrument lay idle until he constructed the exerciser in his home workshop. Built of belts and pulleys and powered by a small electric motor, the device pushes the bow across the strings just above the bridge. The bow holder runs in an arc-like channel so all four strings are played alternately. A wooden frame holds the instrument steady. The inventor, who is a jig builder at an aircraft plant, believes that regular use will tend to improve the bass viol, and he keeps the exerciser going at least 20 minutes a day.

Old Iron Horses Form a Team To Supply Power

After 44 years of service, a pair of overage locomotives are sitting out the rest of their lives, cab to cab, in useful roles at a U. S. naval air station. As a standby source of steam power, they still puff hard but don't go anywhere. The iron horses were first used by the Navy to augment inadequate steam power at the Alameda, Calif., station, where each engine's 500-horsepower gave almost half again as much capacity as the station's plant. Originally



coal burners, they were refitted to burn oil, and a steam pipe was connected to the former whistle outlet.



Jeep Dresses in Teardrop Of Salvaged Plastics

Soldiers stationed at the 644th Ordnance Depot utilized plastics salvaged from the scrap pile to dress up their jeep with a teardrop enclosure. Working in their spare time, they developed a super-streamlined model of the Army's workhorse. Outfitted with windshield wipers, defrosters and spotlight, the car is completely encased in its plastic "show window."

POPULAR MECHANICS

Rotating Wire Roll Dry-Cleans Floors

Wood floors are cleaned and polished without the use of soap, water or chemicals by a rotary scrubber that employs a factory-wound, drum-type steel wool roll. The machine, which looks much like an oversized vacuum cleaner, is powered by a 2½ to 5-horsepower electric motor that drives the cleaning drum at a speed of 850 to 1,725 r.p.m. and also operates an 11-inch fan to provide a vacuum. The centrifugal action of the high-speed drum throws the heavier debris into a hopper, while the lighter particles are sucked into a heavy-fabric bag by the fan. Operated by one man, the machine dry-cleans and burnishes the floors in one sweep and is said to be so efficient that cleaning need be done only one-sixth as often as with ordinary hand scrubbing. Elimination of water and chemicals prevents softening of the wood, aids sanitation and allows floors to be used immediately after cleaning. A fiber brush or sanding drum may be substituted for other operations, and a heavy steel-wire brush is available for cleaning factory floors.



British Air Sleeper Has Sidewise Seats

Seats which face sidewise instead of forward are a feature of the cabin of the Lancastrian, a new British civilian airliner. The seats are ranged arm to arm along one side of the fuselage and can accommodate nine passengers. Sleeping space is arranged by opening out berths above the seats, as in a Pullman car, and converting each of the four double seats into an additional berth. The plane is an adaptation of the RAF Lancaster bomber.



V-Paper and You

Paper, the universal war material, is used to wrap, pack or tag 700,000 or more items needed by our armed forces. Demands for paper won't end with V-E Day; if anything, they'll increase as shipments to the Pacific rise. Turn in waste paper to scrap the Axis.

RAILROADING UNDER THE "BLITZ"

By Arthur L. Stead

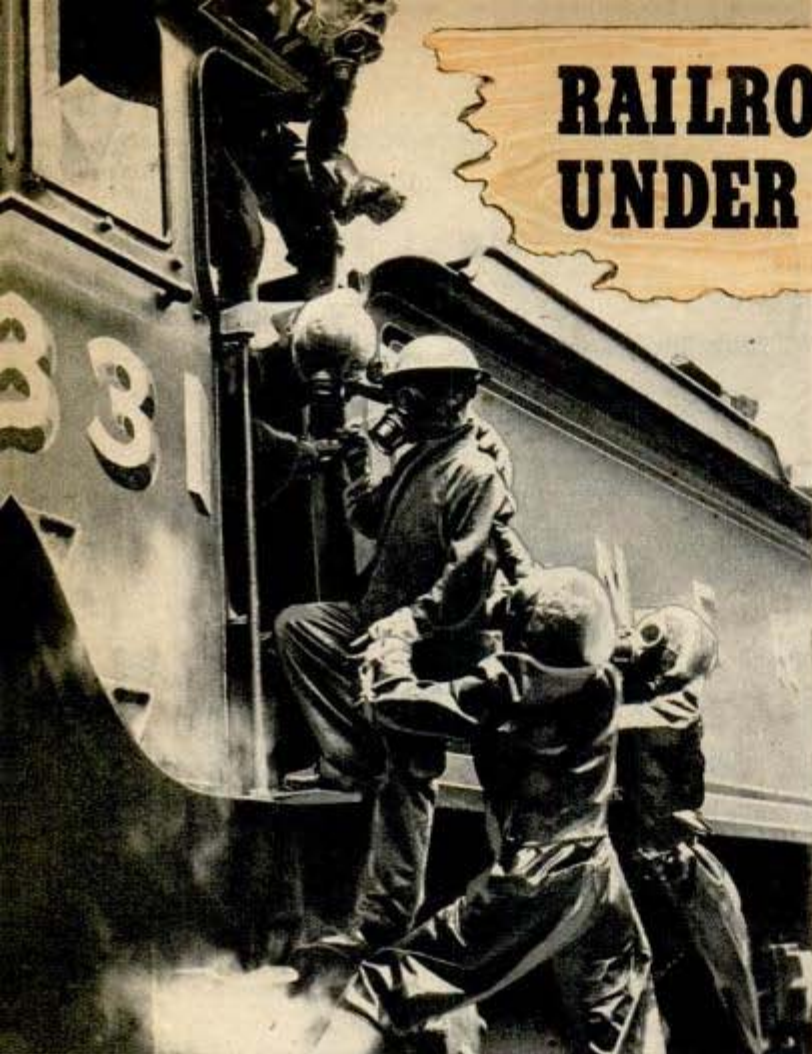
IN A CENTURY of railroading, few records equal the performances turned in by British roads against almost insurmountable odds during the five and a half years of total war.

Unlike the German railways—most of which were deliberately constructed for war purposes, with strategic, costly roads built through areas having little traffic possibilities—British roads were planned for peacetime needs. But after the nationwide railroad network was expanded and perfected in the early days of the struggle, the English railways presented as fine a fighting machine as could be found the world over.

Almost from the start the constant threat of an air "blitz" sharply altered the looks of rail operations. After the heavy attacks of 1940 and 1941, most British railroad depots were without roof glass and some of it is just now being replaced. Platform edges had to be whitened to aid passengers using the station in blackouts, which also made antiglare screens for locomotive cabs and metal hoods for signal and other small lights necessary.

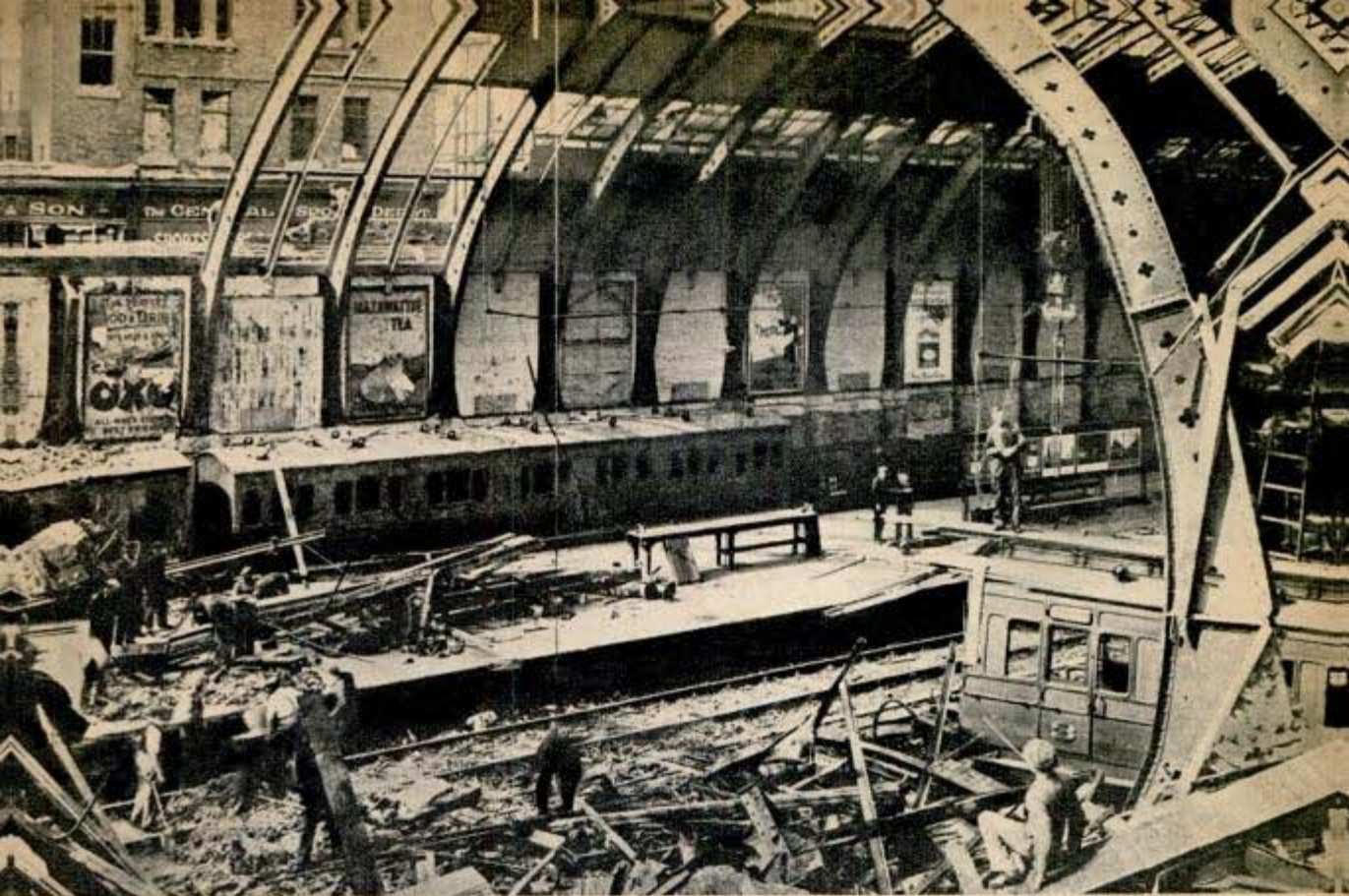
But trains continued to run during air raids and flying bomb attacks as long as there were tracks to run on, since a moving train is a much less vulnerable target than a stationary one. Speaking broadly, the railroads got off much more lightly than was expected, despite the fact that they faced 10,000 pilot propelled air attacks and thousands of flying bombs. With the exception of Coventry, probably the most bombed section of the lines was a 2½-mile stretch near London. It was assaulted from the air 92 times in nine months. Somehow or other traffic kept moving, though not without difficulty and improvisation.

POPULAR MECHANICS



Undaunted by the daily threat of bombing and strafing attack from the sky, British train crew wearing gas masks and tin helmets climbs aboard locomotive. Below, British railways built mobile canteens to feed employees during wartime schedules





A dozen bombs were dropped one evening on a depot in the eastern suburbs of London. Platform walls were damaged, the track lifted and rails bent, while there were bomb craters in various places. Broken bits of roofing lay all around. A train ran into the debris, blocking two of the four sets of tracks through the depot. Less than twenty hours later the debris had been removed, the derailed train withdrawn, the platform walls and tracks repaired, and both tracks opened for traffic in time for the evening rush hour.

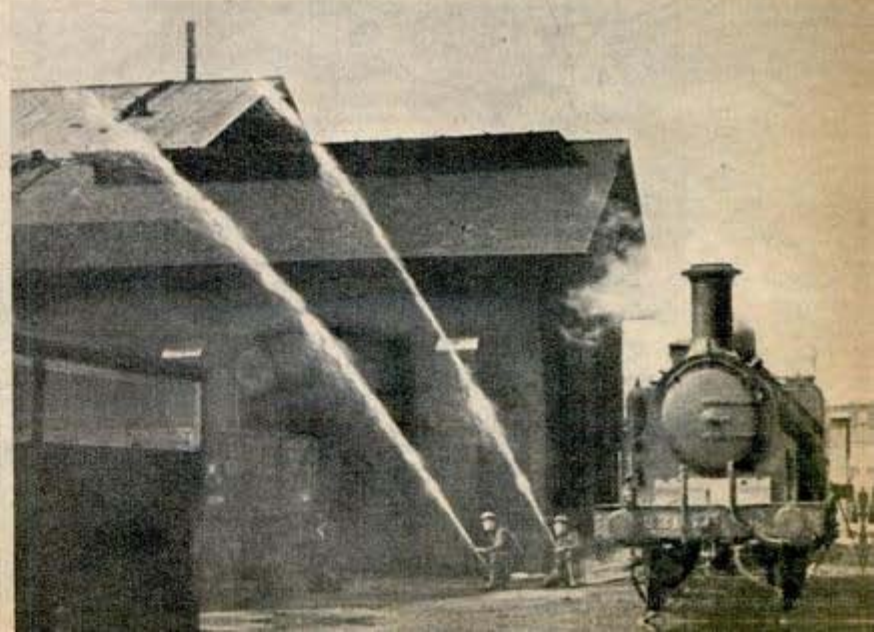
Another example of quick repair work occurred one morning in the London underground railway, when a four-track bridge was damaged by a Nazi bomb, putting a section of the electrified track out of service. Highway coaches were rushed to the scene and were ready when the first trains arrived at the gap. Meanwhile by 10 a.m. a plan to restore the railway service had been devised and begun. It was decided tem-



English railway depot (above) as it looked after a devastating attack by German planes

A "light tunnel" (left) which shields bright floodlights from the outside in blackouts was constructed for locomotive inspection

As soon as incendiaries began to fall, the English fire-fighting trains with hoses were rushed to the scene





British car controller (above) keeps traffic moving. Right, a control office constructed of sturdy ferroconcrete

porarily to give up two tracks and to divert all traffic to the remaining two roads. To do this the repair gangs had to shift high tension cables and entrench them, to build a new crossover 200 feet long, and to reverse automatic signalling over two miles of track. Although work had to be stopped at night because of the blackout, train service was restored by 6 o'clock the next morning. Early in the repair operations an enemy plane swooped low over the workers but they carried on under the protection of comrades armed with Bren guns.

Under the pressure of greatly inflated traffic, including the enormous movements of men and materials from the United States, the British railroads had to work out a new system of controls. On each of the four big roads—the London, Midland &

Scottish; London & North Eastern; Great Western, and the Southern—the system was divided into areas, each under a control office, which was responsible for all movements within its area. Some of the control offices were located below the ground in specially protected concrete forts.

The interior of a control office was an interesting arrangement. Passing an armed guard outside the door and moving through a special gasproof chamber, you entered the main room. The object which first caught the eye was an



enormous geographical train board stretching round the walls. This board carried a large scale relief map of the area under control, with every track clearly marked, and gave a multitude of details concerning yards and depots, signal towers and locomotive sheds.

Special tokens on the map were moved by the controllers to coincide with the actual passage of trains and locomotives on the tracks outside. At any moment of the day or night the controllers had before them a precise picture of the complete traffic situation. Every signal tower, depot and locomotive shed reported every movement to the control when it was made. By juggling schedules, the controllers kept the trains in movement without snarls, regardless of obstacles.

Each office had a staff of experts from all departments, including

(Continued to page 150)

The only locomotives Hitler stopped were the ones he completely demolished with bombs



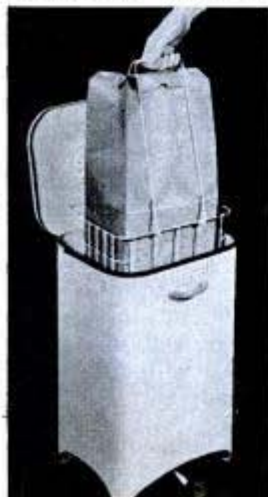
POPULAR MECHANICS

Skyscraping Tree Trimmer Reaches Top Branches



Trimming the top branches of tall trees ceases to be a problem with a mechanical trimmer used in California groves. A 65-foot boom and a gasoline engine are mounted on a carriage which runs on a wooden track made in four sections, so it can be moved ahead. Movement of the carriage is controlled by a foot-operated bicycle gearing arrangement. The gasoline engine powers a series of belts which turn a circular saw at the end of the boom.

Garbage Can Is Air Conditioned



An air conditioned refuse container has been developed which can be kept in the house for several days without the need for emptying. The can has no bottom. Perforations around the top allow continuous air circulation to keep the paper bag in the can dry. A deodorizer

throws off a neutral heavier-than-air gas which counteracts the odors of the garbage. The bag is held open and in place by means of grippers on a ventilated tray.

Colored Steps on Glass Gauge Tell Thickness of Thin Film

Extremely thin film can be measured to the last millionth of an inch by comparing its color with a series of colors on a gauge. The gauge is a strip of special glass, containing lead, on which films have been built up like steps. The steps appear as stripes of vivid color and each color represents a different thickness, yellow meaning the film is six millionths of an inch thick, red for seven millionths, blue for eight millionths, etc. The thickness of a film is found by matching its color with the colors of the steps. Colors are similar to those seen in soap bubbles and in films of oil on water.

Yank Carries Pup in Harness To Keep His Paddies Dry

Fashioning a novel harness for their canine mascot, Yanks on the Western Front carried him along wherever they went, safe from miring in the muddy ground. Even when laden with gear, a soldier was able to move the dog easily with the harness.



BLACKOUT IN THE SKY



Rainbows in the night—brilliant auroras occur when sunspots prevail. Below, this is how eclipse of sun on July 9 will look from vicinity of Chicago at 7:03 a.m.

By Robert S. Richardson

ON JULY 9, 1945, the sun and moon will stage a show so awe inspiring that for a few brief seconds men will be compelled to turn from earthly things to stare in wonder at the heavens.

Beginning at sunrise the tip of the moon's shadow moving at the rate of 3,000 miles an hour will trace a path 50 miles wide from Butte, Mont., to the Aral Sea in Russia, a distance of 7,300 miles. People within this narrow shadow path will have an opportunity to witness nature's most glorious spectacle—a total eclipse of the sun.

The eclipse will force our attention upon the only two celestial bodies capable of influencing our lives upon the earth. If all the planets and stars in the universe were suddenly wiped out of existence, leaving only the earth, sun and moon, no one but a close observer of the sky would know the difference.

Once a month the moon comes within 221,500 miles of the earth, closer than any heavenly body except an occasional meteorite. If we could fly to the moon in an airliner, the journey would require about one month.



POPULAR MECHANICS

With a good telescope we can bring the moon within an apparent optical distance of about 240 miles. But we can never see the moon as well as if we were hovering only 240 miles above its surface. Even when the 200-inch reflector on Mt. Palomar is in operation we cannot hope to bring the moon closer than is already possible with much smaller telescopes. The main obstacle in obtaining a clear view of the moon's surface is our own atmosphere. Even on the calmest nights the air is disturbed by currents which distort the image formed by the telescope. The more we magnify the moon the more we magnify the disturbing effect of the air currents. The result is that very seldom can we magnify the moon more than 1,000 times to advantage.

When the moon is viewed through a large telescope its most remarkable features are the craters that stud its surface. More than 30,000 have been counted, ranging from gigantic walled plains 150 miles wide down to tiny cones barely 1,000 feet across. The



Sun is observed with small telescope by projecting image on white card. Below, 24-hour development of sunspot group. Disk shows comparative size of earth
Photos by Anthony Wausnock, Mt. Wilson, Calif.

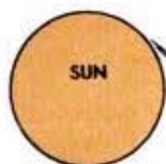
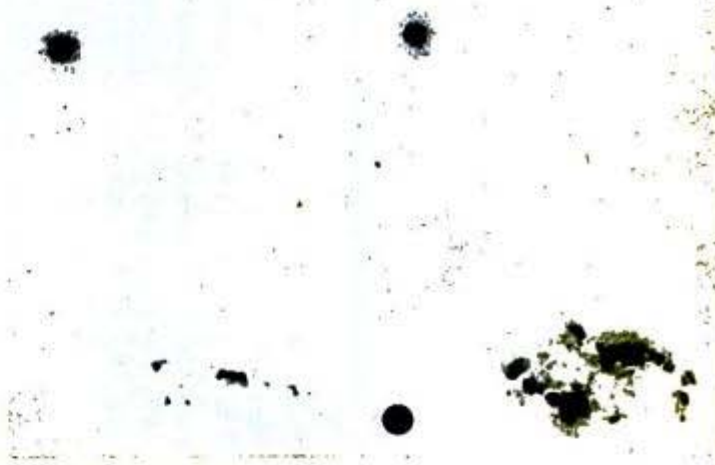


Diagram shows wide area from which eclipse can be viewed. Below, 17-inch disk captures image of sun projected from mirrors atop a high tower

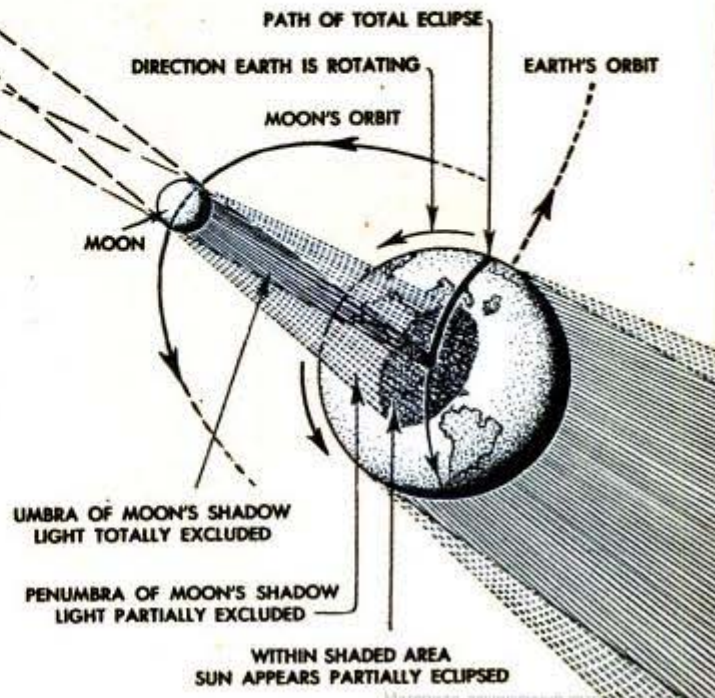
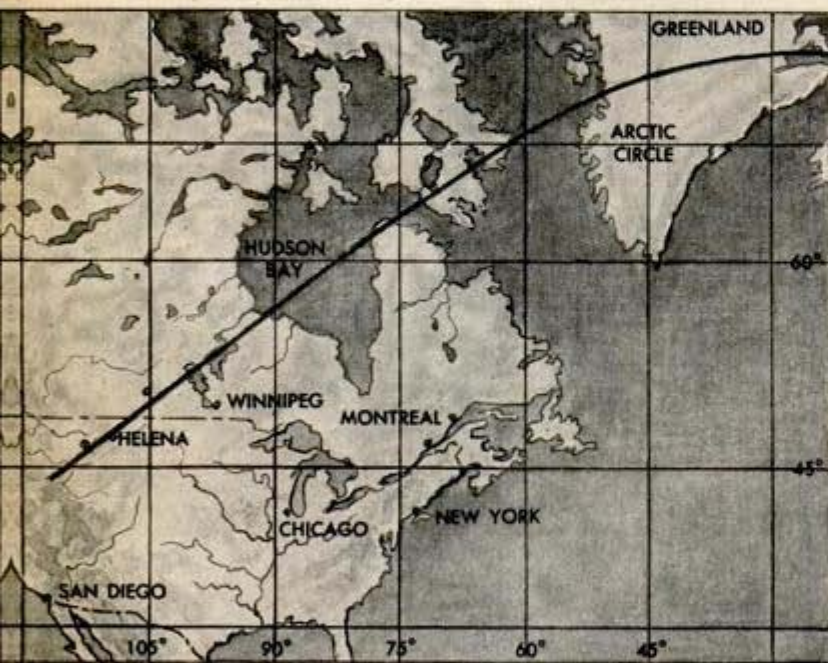


Illustration: ANTONIO GONZALEZ



Smoked glasses and dense celluloid negatives protect eyes of eclipse gazers. Below, line shows path of total eclipse



ringed walls of the largest craters rise 20,000 feet nearly straight up from the lunar surface. There is usually a peak in the center almost as high as the crater wall itself. If you look closely sometimes you can discern a minute hole or craterlet in the summit of the crater peak.

It has long been the custom among lunar mapmakers to name the craters and other formations after famous astronomers and philosophers, to such an extent that the moon has come to be known as the "Graveyard of Astronomy."

The moon invariably presents a sharp clear surface; there is never the slightest

evidence of haze or clouds, as we should expect if it had an atmosphere. Also, when the moon passes in front of a star it disappears so abruptly that the effect is startling. If the moon had an appreciable atmosphere the star would change color and the disappearance would be gradual.

The latest attempt to detect a lunar atmosphere is that made by Professor V. G. Fessenkoff of the USSR. He examines through polaroid a faintly luminous area on the side of the moon that is still in darkness. The piece of polaroid attached to the eye end of the telescope is rotated to see if the illumination varies at different positions. Professor Fessenkoff reports that the amount of gas above a square foot of the moon's surface must be less than one-millionth that above a square foot on the earth.

Another question still unsettled is the origin of the lunar craters. Are they extinct volcanoes? Or were they formed by meteoric impact? However, we do know something definite about the nature of the lunar surface soil.

During a lunar eclipse as the moon enters the earth's shadow and is cut off from the sun's light and heat, its surface begins to cool. The quantity of heat we receive from the moon is naturally ex-

Sun tower telescopes on Mt. Wilson have mirrors in domes which reflect the light down shafts to disks at bottom of towers



tremely small but it can be detected with an instrument called the thermocouple. When used with the 100-inch reflector of the Mt. Wilson Observatory, the thermocouple is theoretically capable of detecting the heat from a candle 100 miles away.

From thermocouple observations made during a lunar eclipse, it has been found that as the earth's shadow passes over the surface of the moon, the temperature drops from 275 degrees F. down to -179 degrees F. Then as the shadow passes off the temperature rises rapidly. During the space of two hours a man on the moon would experience a range in temperature of 454 degrees F.

The fact that the moon cools off and heats up so quickly shows that the surface soil must be covered by a thin layer of light material that is a good heat insulator and a poor heat conductor. Therefore, it cannot be composed of massive rocks such as granite and limestone, but rather light minerals like pumice and volcanic ash.

The principal way the moon affects the earth is by the tides it raises. The moon is responsible for 55 percent of the force that raises the tides and the sun the other 45 percent. The friction due to the ebb and flow of the tides acts as a brake on the rotation of the earth, which is continually increasing the length of the day and month. From ancient eclipse records it has been shown that the length of the day is increasing at the rate of 1/1000 of a second per century.

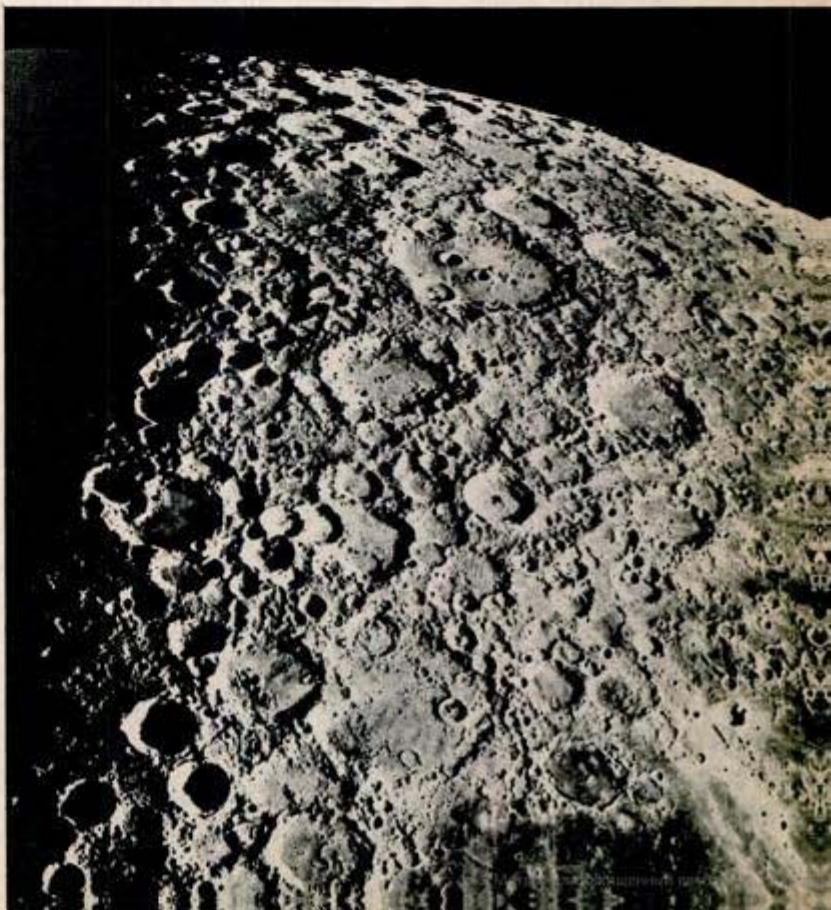
The rotation of the earth is our fundamental source of time measurement, yet in the course of thousands of years even the earth cannot be regarded as a strictly accurate clock.

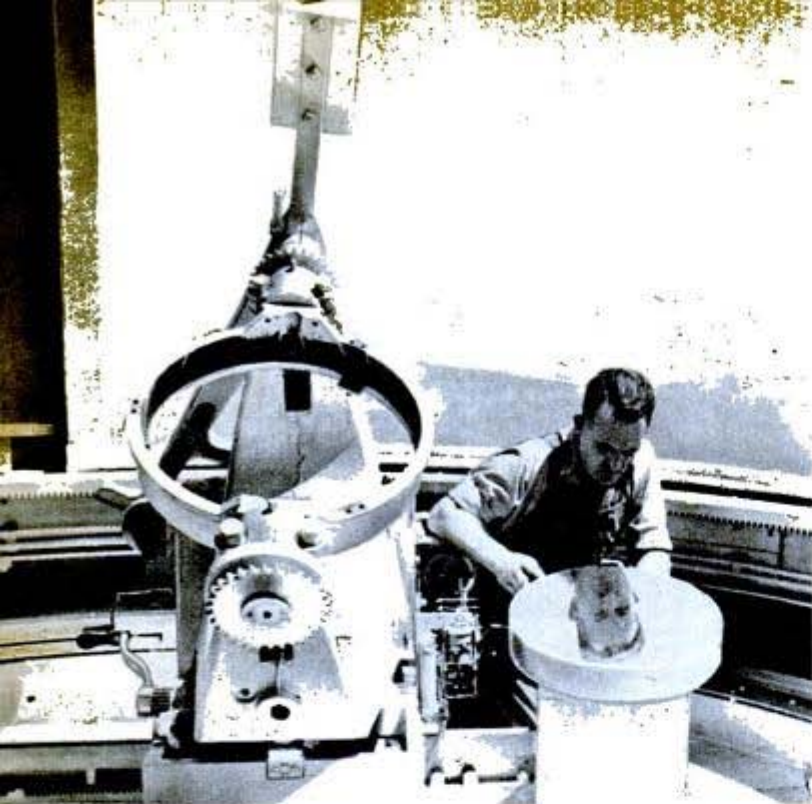
The moon is of importance only because it is so near. Our satellite is not an especially interesting body in itself. About the only occasion on which astronomers turn their telescopes upon the moon is when there are visitors to entertain at the observatory.

On the other hand, the sun is not only comparatively close as celestial distances go, but is an exceedingly interesting object in its own right. For this reason, astronomers constantly devote a tre-

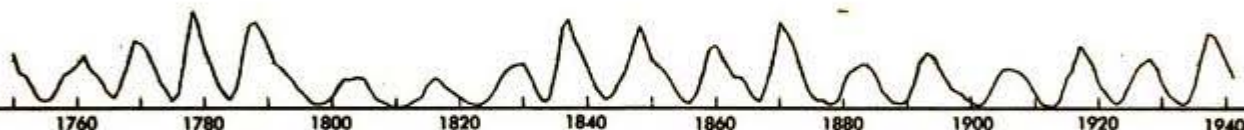


Centering beam on mirror at top of sun tower insures proper reflection down shaft. Below, "closeup" of moon shows craters





Engineer inspects mirror removed from cell inside dome of 150-foot tower. Below, 200-year record of sunspot cycles



mendous amount of attention to the sun.

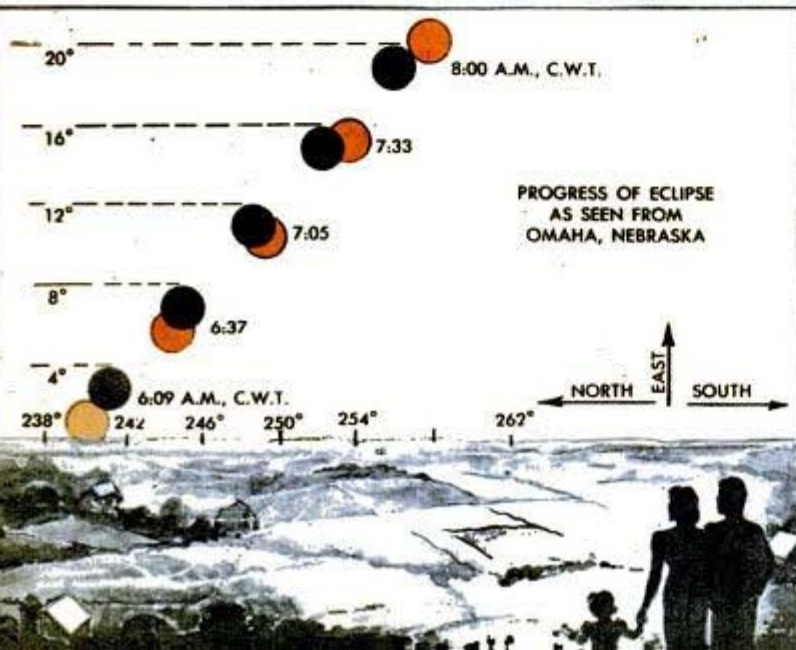
The most interesting features easily observable on the sun are the dark areas or spots. They are most conveniently studied by pointing a telescope at the sun so that its image is projected on a white card. Never look at the sun directly through a telescope, spyglass or binoculars, for you could be blinded.

ateur working with a two-inch spyglass!

Since 1843 sunspots have been counted fairly regularly, so that by combining modern observations with the fragmentary material of early days, tolerably good records of sunspot activity are available from 1750 to the present time.

Men have devoted their lives to the study of sunspots because of their possible effect on the earth. Almost every conceivable variable has been considered—rainfall, business conditions, the quality of wine, the fecundity of rabbits, the severity of influenza, electrical disturbances and many others. Although the champions of these relationships are enthusiastic in their claims, few have been firmly established.

One is that when a spot-group large enough to be visible to the unaided eye is near the center of the disk, we can expect sudden and violent changes in the strength of the earth's magnetic field, or a magnetic storm. These storms are



People in Omaha, Neb., will get this view of eclipse if skies are clear on July 9

generally accompanied by brilliant auroras visible as far south as Los Angeles and New Orleans, and by earth currents which seriously interfere with telegraph and telephone communication.

On Sunday, March 24, 1940, a magnetic storm occurred which for several hours completely disrupted all long distance communication, war reports and Easter greetings alike. Had it occurred on a business day the financial loss might have been serious with garbled stock reports adding to the general confusion. A similar disturbance, although not as severe, hampered the wire services December 16, 1944.

It happens that the United States entered the war as the sunspot cycle was approaching minimum, so that during the last two years transmission by radio, telegraph and telephone has been free from solar disturbances. But during the next few years as sunspots increase rapidly in number we can no longer expect to enjoy such immunity. Glowing announcements are being made for the future of electronics due to developments in radar, television and frequency modulation. Without wishing to be an alarmist, those sponsoring these projects would do well to give a thought to the sun, still beaming peacefully upon them from a distance of 93 million miles.

After searching for ways in which sunspots may affect the earth, the next most fascinating study is trying to predict their rise and fall in the future. At first glance this might seem very simple. Do not the spots vary in a cycle of 11 years? The trouble is the length of the cycle is 11.1 years on the average. The interval varies irregularly from one cycle to the next, sometimes being as short as 9 years or as long as 13 years. We can predict with assurance that spots will be plentiful about 1950. But to venture a prediction beyond that would only be guessing.

The most marvelous sight during a total solar eclipse is the halo that flashes out around the sun at the instant the moon cuts off the last dazzling ray of light. This is the mysterious corona of the sun, consisting of pearly white streamers of gas extending outward for more than a million miles in some cases, and intertwined "like masses of luminous hair in disorder." Although the corona has been intensively studied at every favorable eclipse since 1842, its nature is still largely unknown. This is perhaps not so surprising when we reflect that the longest an eclipse can last is 7 minutes 40 seconds, and that the total length of time the corona has been observed since this date is about one hour.

A big advance was made in 1930 when a young French astronomer, Bernard Lyot,

(Continued to page 148)

Miniature Earthquake Recorder Reveals Machine's Vibration



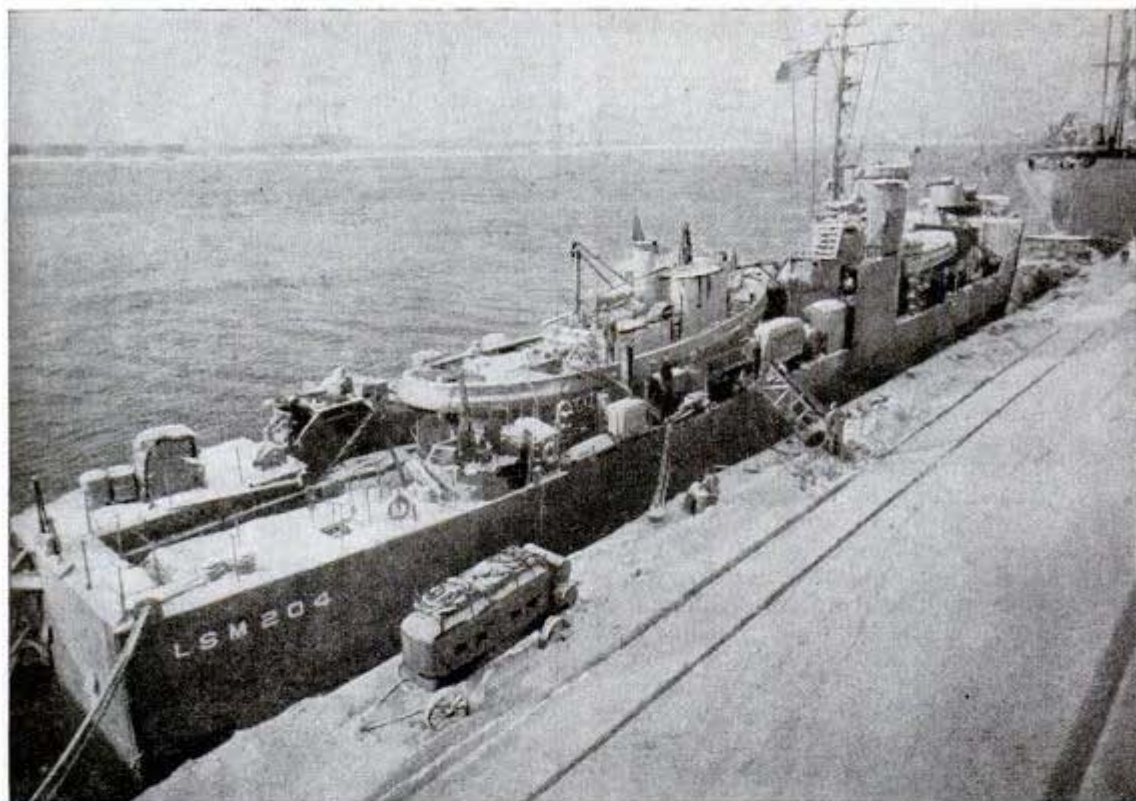
Vibrations of machinery in factories are recorded quickly and simply with a nine-pound instrument using the principle of the seismograph in recording earthquakes. About the size of a box camera, the portable instrument records vibrations of 600 to 15,000 cycles a minute on a transparent tape read with a low-power microscope. Entirely mechanical, the device requires no outside source of power. It consists of a frame containing a weight suspended by a weak spring. A pointer attached to the weight indicates motion between it and the frame, a stylus recording the motion on the tape. The recorder can be placed directly on machinery being tested.

Sponge Mop Is Mounted on Stick

Bottles and narrow-neck glasses can be cleaned efficiently by using a small sponge mop mounted on a stick. The mop can be squeezed into a compact mass to go through small openings. Then it expands against the sides and into corners, dislodging all food particles.



Tugboat Gets a Ride on Deck of Landing Ship



Full size tugboats are carried as deck cargo on the Navy's new LSM (Landing Ship, Medium). The LSMs are 200-foot oceangoing vessels with a 34-foot beam.

Broad, snub bows open to lower a ramp, down which men, equipment and material roll onto enemy beaches. Driven by a direct-drive Diesel engine, the "Pacific Puddle Jumper" is capable of high speeds and a wide range.



All-Purpose Field Pack Adopted by Army

More equipment may be carried with greater ease in the all-purpose field pack now being procured for American soldiers. Fifty soldiers marched 10 miles a day for seven days carrying different combinations of packs and equipment over varied terrain so the Quartermaster General could select the best one. The new outfit combines two detachable duck bags chemically treated to repel water and resist mildew. Binding straps hold the horseshoe roll and intrenching tool. The pack rides high on the hips, leaving the arms free for swimming, and can be easily packed in the dark.

Soldier at left wears present haversack, one at right new field pack which offers more comfort and accessibility to contents

ZERO IN THE KITCHEN



Sanitary Refrigerator Co. photo

By Paul F. Healy

REMEMBER when you used to get a thrill out of freezing your own ice cream? Well, the old-fashioned ice cream freezer has put on long pants. Its grown-up version is the quick-freeze industry, which promises to revolutionize your eating habits and your economy after the war.

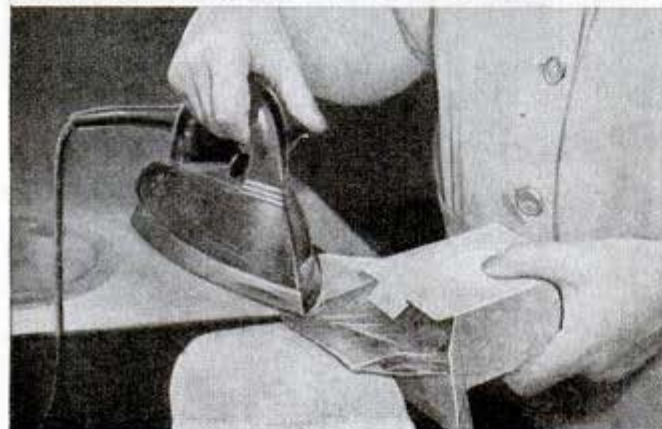
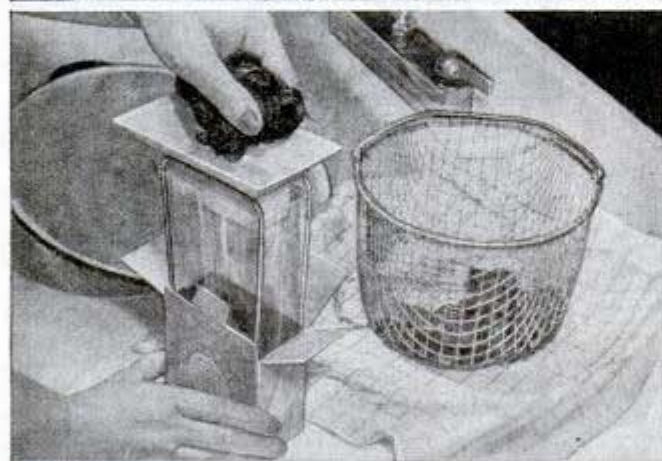
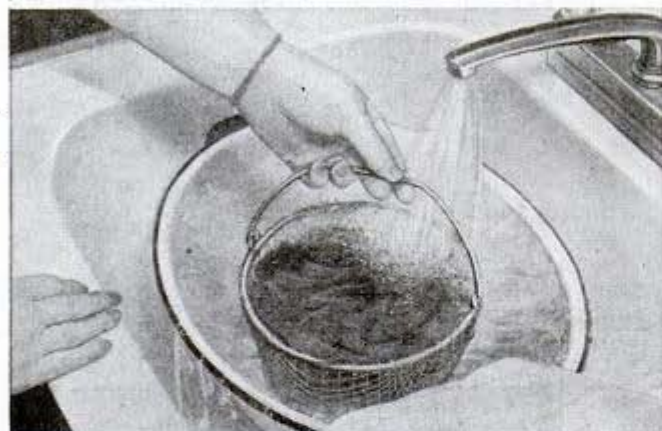
Quick—that is, below zero—freezing is the answer to man's age-old quest for means of preserving food. Drying, salting, pickling, smoking and canning proved fairly satisfactory but they failed to preserve the exact taste and texture of the fresh article.

Francis Bacon, the English scholar, may have been on the right track. He died in 1626 of bronchitis contracted while stuffing a chicken with snow to see if he could keep it from spoiling. More recently, moderate cold storage in rail cars, rooms and cabinets effected temporary preservation, but not until 15 years ago was freezing at very low temperatures discovered to be the most perfect way of preserving meat, fish, fruit, vegetables, and even bakery goods for long periods.

Gourmets who have explored the possibilities of family-size "cold barrels," community freezing plants and commercial frosted foods have given the new menu

A private grocery store at home! This family freezer preserves 575 lbs. of meat as well as fish, fruit and vegetables. Chops (below) are put in moistureproof paper for fast freezing





miracles wide publicity. Home freezer manufacturers predict that once priorities are lifted their products will do for the average household what a lamp did for Aladdin.

With his own frozen food cache, dad won't have to gorge himself on trout after a fishing trip to keep it from being wasted, and Junior won't complain that back-yard garden berries served in December lack the tang they had in May.

As for mother, rapid freezing may liberate her from some of the drudgery of cooking and shopping. She won't have to wheedle the butcher into saving her a nice roast for Sunday, nor will she worry about unexpected guests catching her when her cupboard is bare. Food cooked previously could be dug out of the freezer, heated and served very quickly in the fullness of its flavor.

The retail frosted foods business today makes it possible to buy farm-fresh raspberries in November, field-fresh corn in March, oysters in July. Hundreds of millions of pounds of frozen foods are sold annually in the United States. After the war it probably will be possible to purchase complete frozen meals over the counter.

The small grocery store will be able to buy a freezer for as little as \$200. More than 30 manufacturers will be offering boxes ranging from four to 40 cubic feet in capacity. Some will be rebuilt ice cream freezers. Others will be newly designed from the ground up and will include two compartments—a home refrigerator and a quick-freeze cell—probably with sterilizers to kill bacteria.

Quick-freezing at home requires preparation and packaging of the food; for this reason, family-size units have been most popular with rural residents. Apartment dwellers and those who prefer not to bother with food processing at home will "bank" their cache in a rented frozen locker plant, where the processing is taken care of. Most of the individual lockers hold about 200 pounds of food at five to

Top to bottom: Before freezing, greens are washed in cold water; after scalding, they are chilled under faucet; drained, they are put in moistureproof package, which is heat-sealed with electric iron

10 degrees below zero. The rental runs between \$10 and \$25 a year, and "deposits" may be drawn on at will. Already there are about 6,000 of these plants serving approximately 1,500,000 customers. There will be many more after V-Day.

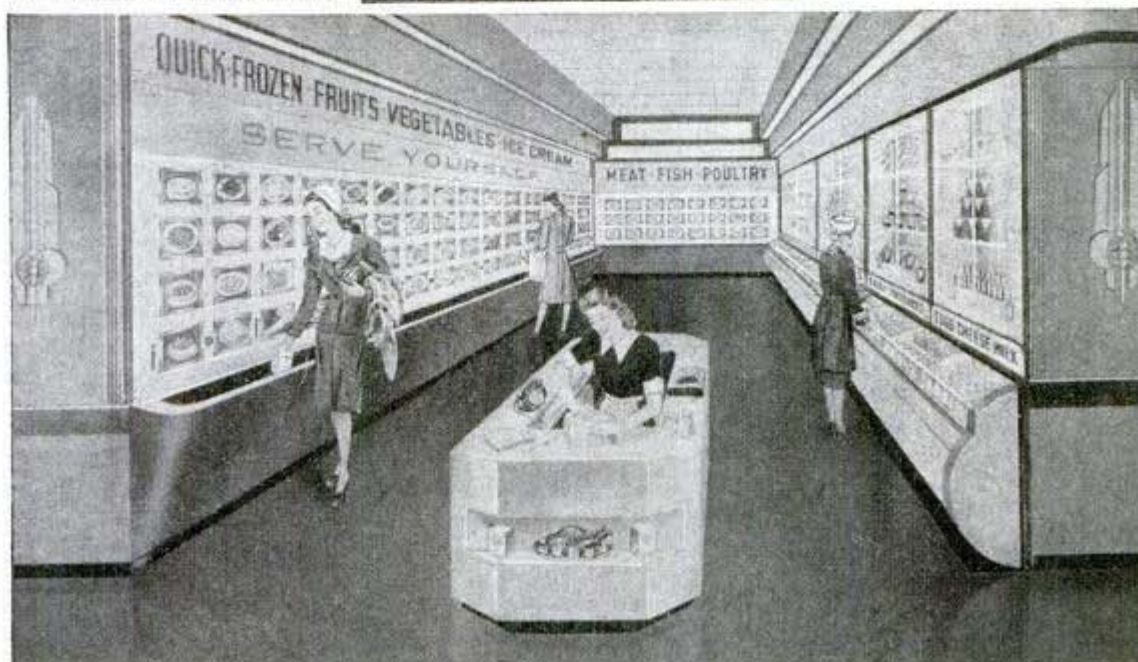
Why doesn't rapidly frozen food deteriorate, when defrosted, like slow-frozen food? The "secret" is that the faster a food is frozen, the smaller are the ice crystals which form, thereby doing less damage to the delicate food cells. When freezing is slow—say at 25 to 31 degrees F.—the ice crystals are so large they rupture the tissues, changing the nature of the product. Quick-freezing also checks the enzyme and chemical actions that cause discoloration and off flavors.

Clarence Birdseye, an inventor, discovered the quick-freeze principle while hunting and fishing in Labrador in the 1920s. He noticed that

Photos: top, International Harvester Co.; center, Despfreeze Corp.; below, Refrigeration Corp. of America



Above, walk-in cooler serves both as milk chiller and as refrigerator for other farm produce. At left is a double size quick-freezer designed for stores, farms, institutions, large families, and other quantity users. It has 48 feet of primary freezing surface. Below, sketch of proposed self-service frozen foods center which may be installed in large cities after the war. Housewife will make her selection from facsimile labels and food will pop out on insertion of coin





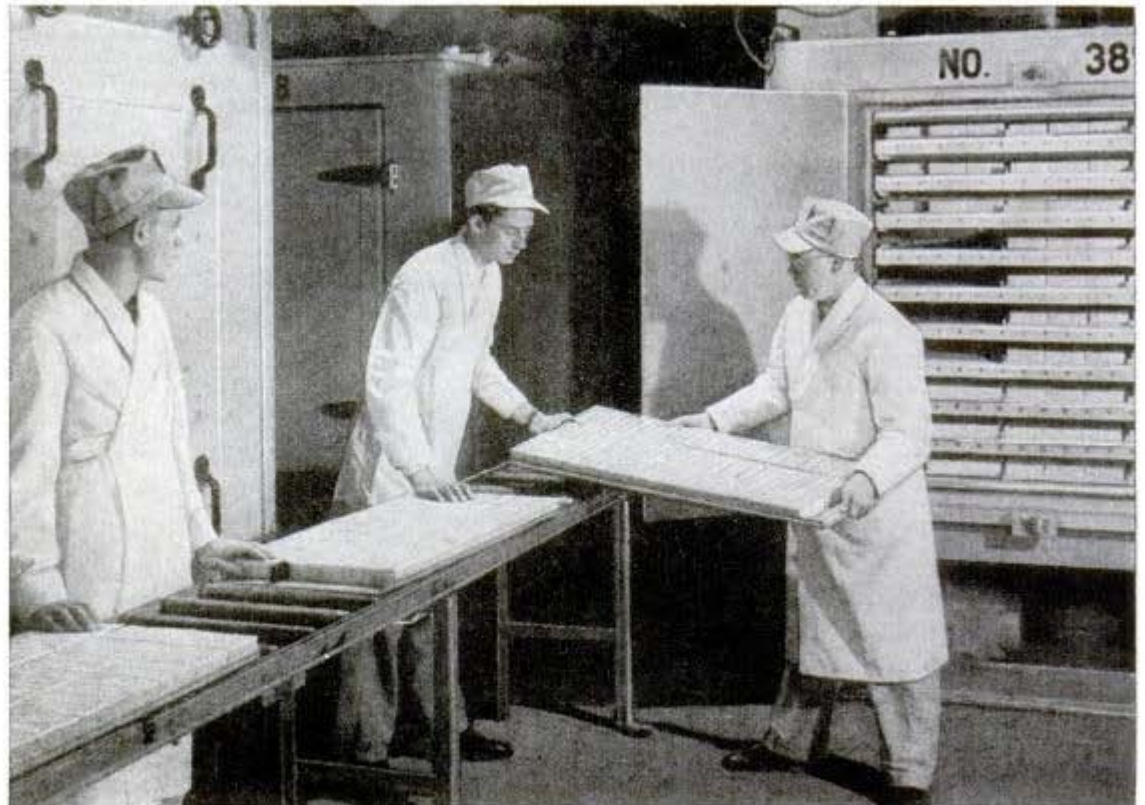
When customer pulls open door containing food wanted, automatic ejector tips package into her hand. Below, peas wrapped in finished packages are placed on quick-freezing machine's metal plates four hours after they were harvested
 Courtesy Birdseye Frosted Foods

fish and caribou meat frozen rapidly in the arctic air remained fresh and tender when cooked months later. Birdseye soon found that packaged food frozen between frigid metal surfaces retained its original goodness for an amazingly long time. In 1930 General Foods acquired his process and a new industry was born.

The modern multiple-plate freezer cabinet contains several layers of hollow aluminum shelves. Cartons of food are placed in single layers on the plates, which are brought together by hydraulic pressure so that they come in direct contact with the packages. Freezing at 25 degrees below zero F. is accomplished by direct expansion of liquid ammonia circulating inside the plates.

Blast-freezing in a large wind tunnel is a popular method of preserving mass quantities of food for wholesalers. The air is circulated over the food by giant fans at 30 to 50 degrees below zero and at velocities between 250 and 2,000 feet per minute.

When you do your own quick-freezing, you must use a high quality food. Only vegetables freshly picked from the garden at their peak of ripeness should be fast-frozen. After being cleaned in cold water, fruit or vegetables must be blanched, or scalded, chilled in cold water, and sealed in a moisture-proof container. Once packed, it is placed quickly in the low-temper-



ature compartment at five to 20 degrees below zero, then stored at zero.

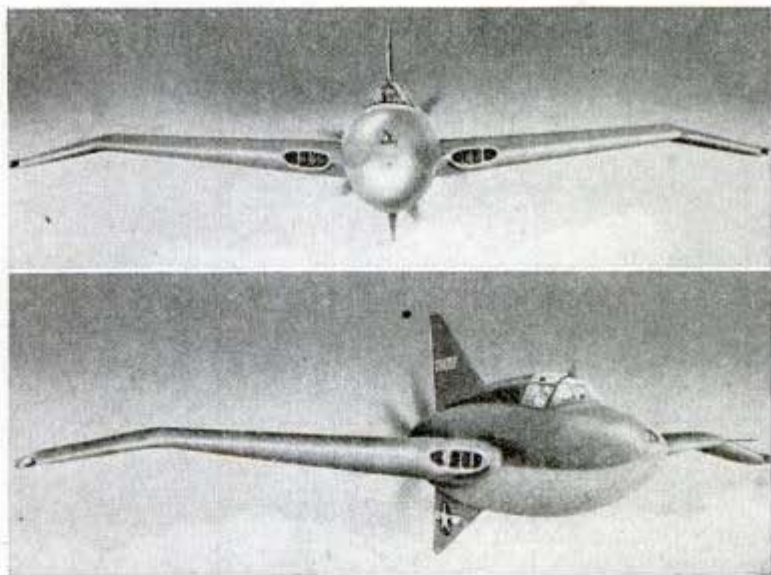
Vegetables which yield particularly desirable frozen products are peas, lima beans, sweet corn, broccoli, asparagus, rhubarb, turnip greens, Brussels sprouts, beets, beet greens, green shelled beans and cauliflower. Lettuce, tomatoes, potatoes, cucumbers, radishes, and turnips are unsuitable for freezing. Surprisingly, bread, pies and cakes become flakier and fluffier under fast-freezing. Other things which have appeared recently in frozen form are cantaloupe, hors d'oeuvres, citrus juices, and dough.

Now let's have a look at the frozen locker plant. At a typical public locker plant there is, first, a "chill room," where freshly killed meat is hung under ultraviolet light for cooling and aging at 38 degrees above zero. Next is the "cutting room," a butcher shop where meat is cut to order. Renters pay around four cents a pound for aging, cutting, wrapping, fast-freezing and other processing.

Each piece of meat is frozen at around 20 degrees below zero, then stored in drawers.

Many novel forms of distribution are promised for quick-frozen produce. The Twentieth Century Marketing System of Denver, Colo., plans to make a panel of 42 compartments, each labeled with the facsimile of a different frozen food package. When the customer opens the door of the compartment, an automatic ejector will dump the food in her hand. Another plan is to freeze whole eggs in segmented bars, so that eggs can be cracked off for cooking just as you break off a square of chocolate.

Tailless Plane Is Steered by Its Wings



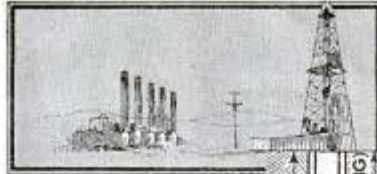
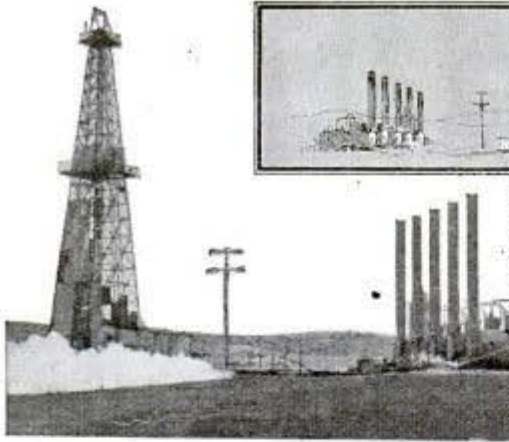
Shark of the skies is the XP-56, Northrop Aircraft's extremely advanced pusher type airplane without a tail. Successful in test flights, the plane looks much like a shark with elongated fins. Pilot and blower-cooled engine are carried in a streamlined nacelle. Elevators and lateral controls are on the trailing edges of the wings, while fixed vertical fins above and below the fuselage give directional stability. The maker says the XP-56 is the first pusher type airplane with contrarotating propellers giving high thrust without torque, and also is first of its type with a completely submerged air-cooled engine installation.

Tanks Launch Rockets in Reich Attack

Equipped with overhead tubes for launching rockets, U. S. General Sherman tanks added to the firepower of the forces invading Germany. After all the rockets have been fired, the overhead racks are jettisoned and the tanks drive ahead, using their 75-mm. guns as the major weapon. Camouflaging adds to the effectiveness of the surprise rocket artillery.



Deepest Well Explores 3 Miles of Inner Earth

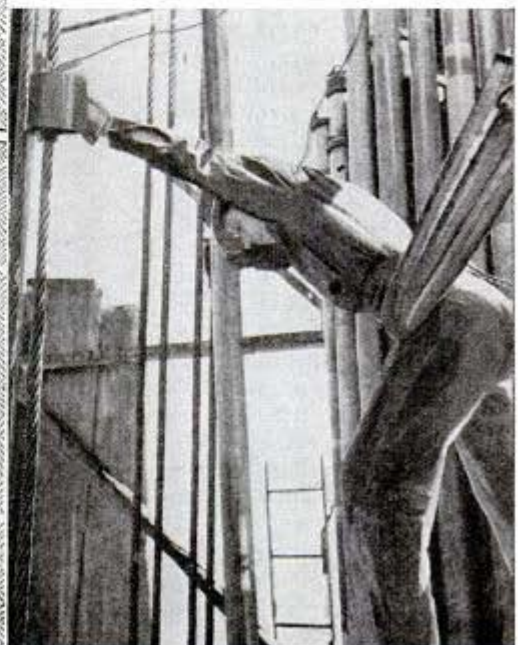


Ever try drilling a nine-foot hole with a hollow human hair? Sounds fantastic, but it's a fair comparison with the task encountered in boring the world's deepest well 16,246 feet into the earth with drill pipe only 3½ inches in diameter. The new well, drilled by the Standard Oil Company of California between Bakersfield and Taft, Calif., at the edge of the Kern River Valley, is 967 feet deeper than the previous record holder, Phillips Petroleum Company's Ada Price No. 1 well in Pecos County, West Texas. Ada Price No. 1 held the record only six months. Unglamorously christened KCL 20-13, the new well took 17 months of drilling. Temperatures and pressures were so great toward the bottom that only four out of 24 hours went into actual drilling, preparations taking the rest of the time. The temperature at the bottom was reported unofficially as 403 degrees Fahrenheit, which is a new high for recorded temperatures of the earth's crust in any save volcanic areas. A standard 136-foot drilling derrick supported more than 250,000 pounds of equipment in the operations. Five 100-horsepower boilers supplied steam at 250 pounds' pressure to the steam engines which drove the draw works and rotary assembly. This steam rig, incidentally, reclaimed the title for deepest drilling from Diesel power, which was used in drilling the former record holder in Texas. The first 11,000 feet of the California well contains a seven-inch casing, with an additional 11¾-inch casing placed in the first 1,188 feet. The last 5,246 feet of the well is an open hole, without casing. Only circulation of drilling mud in



This standard 136-foot derrick, above left, drilled world's deepest well. Above, drill and reamer assembly. Below, derrickman holds stand of pipe as it is pulled from the hole

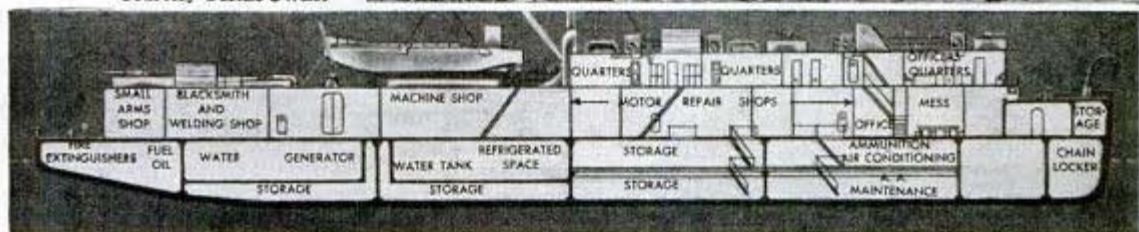
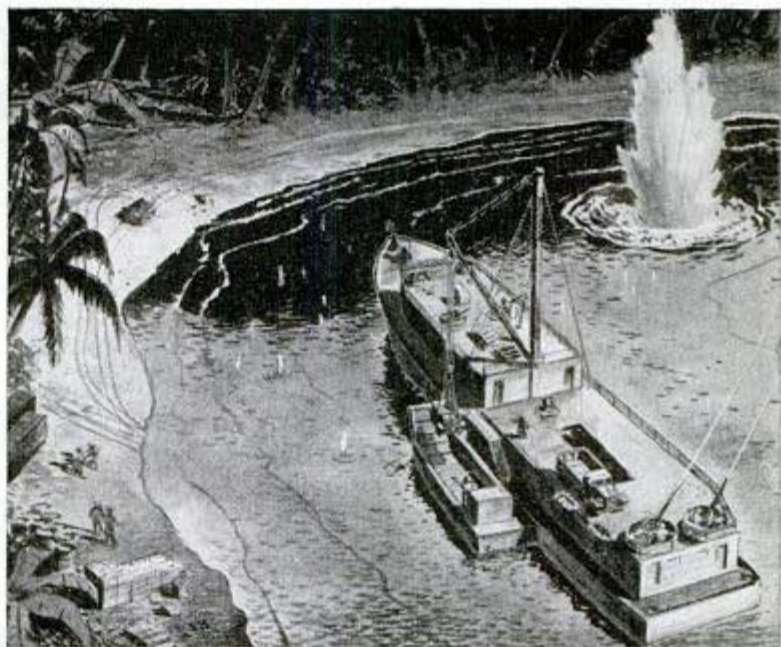
this uncased section kept out gas, water and particles from the formations pierced by the drill. The mud fluids carried drill chips, cuttings and other substances to the surface, where they were removed by a vibrating screen which also degassed the mud. Then the mud was recirculated. Although the well appears unproductive at the bottom, the geologic knowledge obtained was regarded as well worth the expense. Tests for oil at higher levels are continuing.



Floating Base Shops Follow Pacific Invaders

Moving right along with our island invasion forces in the Pacific, floating base shops are now keeping our battle equipment in repair right under Jap noses. Two seagoing versions of Ordnance's heaviest maintenance outfit now are in action and two more \$1,000,000 shops are about ready to go. Those in use were improvised from concrete-hulled Navy barges to fill an urgent need and have less elaborate quarters and equipment than the custom-built barges near completion. These 265-foot base shops have an

Courtesy FIREPOWER



11-foot draft, permitting operations close to or right on the beaches. A special lightweight concrete gives the hull even more resistance to near hits than steel. Steel reinforcing rods provide elasticity and minimize the effect of direct torpedo hits. Flooded compartments may be sealed off in the event of damage. The main deck houses many shops, including machine shop, welding and blacksmithing, small arms, tire repair, motor rebuilding and cleaning, carburetor and ignition, paint, tool crib and issue room. A precision radio and instrument shop is air-conditioned against the corrosive tropical climate. Two large dehydrated compartments permit storage or unpacking of stock without danger from rust. Stowed on the main deck are two jeeps, three cargo trucks, an engineer's tool and bench truck and a 5-kilowatt power trailer. Most repairs are made on board, but trucks will make repairs on call. A 30-ton crane swings a 50-foot lighter into the water, then places the trucks in it for trips ashore. Each barge is manned by 123 men. They have a sick bay, power laundry, electric oven bakery and galley. The barges are directed by the Army, whose maintenance work they perform.

Screw Driver Puts on "Brakes" To Prevent Thread-Stripping

Danger of stripping threads by overtightening screws, bolts and nuts is eliminated by a screw driver equipped with a torque-setting mechanism. A torque setting of one inch-pound to 25 inch-pounds may be made quickly on an easily read dial. When the setting is reached, the handle turns without applying further pressure to the screws.



THEY FLY RINGS AROUND THE WORLD



Side-line coach of the Air Transport Command, the B-17 specialist above stands at head of runway with a radio jeep, "talking down" B-17 pilot in trouble. B-24 pilot below operates radio set used to talk to control tower



By Thomas E. Stimson, Jr.

IT IS RADIO that makes possible the world-girdling operations of the Army Air Forces Air Transport Command, yet the same radio can get unwary ATC pilots and radio operators into all kinds of trouble.

ATC pilots have ferried more than 40,000 aircraft overseas. They fly more than 35 million pounds of cargo, passengers and mail per week to points outside the western hemisphere. Their flight operations total more than 65 trips around the world per day. Only by radio can such operations be scheduled and maintained.

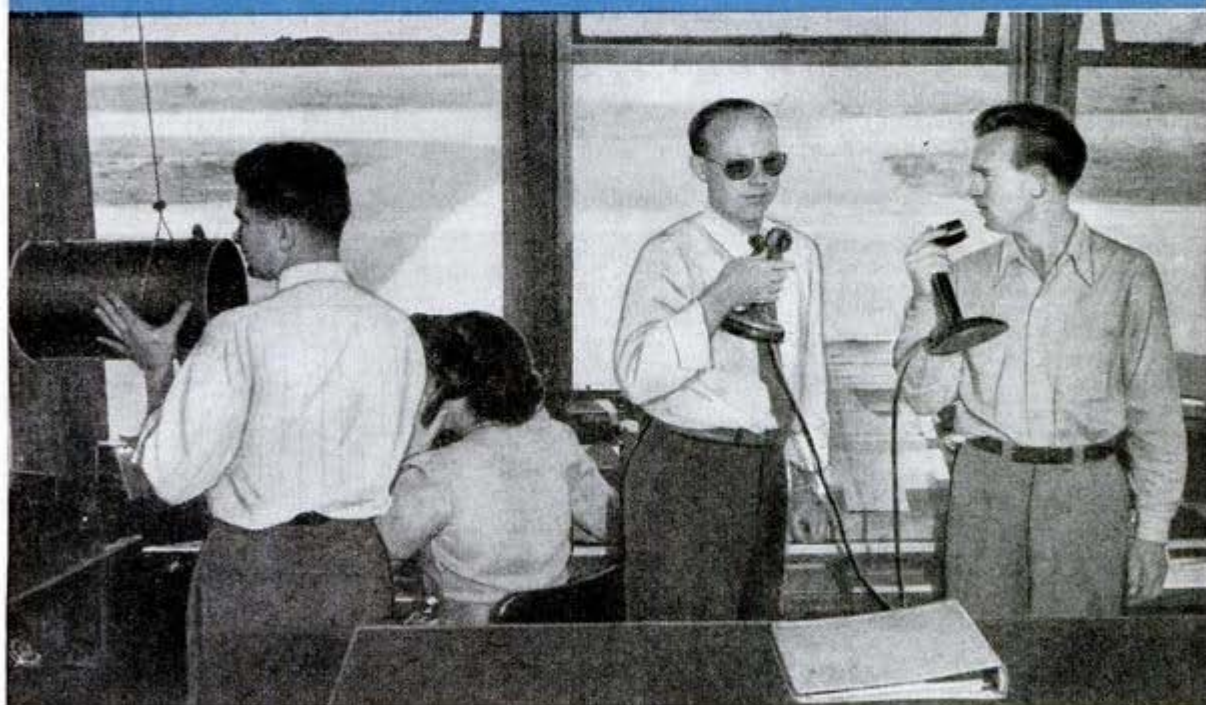
Enemy radio operators can tune in much of this radio traffic and they do their best to interfere with it.

Ferrying a new bomber west over the Pacific, the radio operator may broadcast a call several times before he gets an acknowledgment from the ground station. When the answer does come in, it may carry unfortunate news.

"Airport at your destination has been bombed out," the message



Catwhisker wire, above left, discharges static electricity as B-24 lands. Ferry crew member at right dons "Mae West" life preserver in a forced landing rehearsal. Below, CAA dispatchers in control tower



may say. "Change course and proceed to Landing Field X."

That sounds sensible, but several things may make a bomber crew suspicious. Wording of the message may not follow the exact current procedure. The pilot may know that he hasn't enough fuel to reach the alternate field named. The ground station may not repeat the message or even

reply when the plane asks for confirmation.

All this adds up to an attempted Jap trick, worked this way: The Japs heard the plane call its ground station but due to a temporary radio skip phenomenon, the ground station was blanked out. As soon as the Jap operator realized this, he answered the plane with his fake message. The Jap didn't dare repeat his message, of



Bomber interior is sprayed with a lethal mist to kill malarial mosquitoes

course, for fear the pilot might take a radio bearing and discover that the message wasn't coming from the correct direction.

Down in the South Atlantic when a German submarine lay on the surface to charge batteries, the radio operator might busy himself by transmitting the letters "MO" over and over again. He might even rig up an automatic key to keep broadcasting the signals. Like the Japs he would try to trap

Allied aircraft into changing course and running out of fuel at sea.

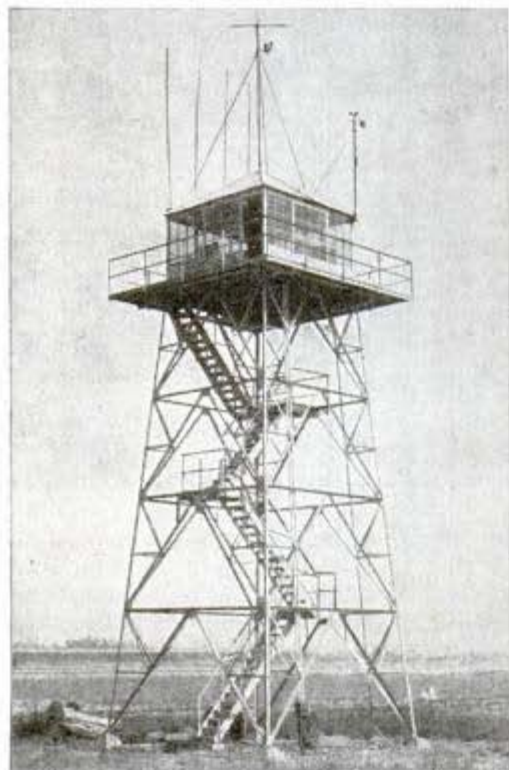
The German would know the radio station on Ascension Island is radiating the MO signal so that planes bound across the water can fix direction with their radio compasses. He tunes his fake signal to a frequency just adjacent to the genuine frequency, in the hope that some pilot will pick up the wrong radiation and fly a false course. This trick, too, is a flop. A pilot or navigator is always checking the plane's position by celestial observation as well as by radio fixes and an error in direction is detected

before any great distance has been flown.

Pilots of the Ferrying Division of the ATC have been delivering aircraft across the Atlantic at the rate of one plane every 13 minutes and across the Pacific at one plane every 90 minutes.

Military Air Transport, another ATC activity, operates transport planes on regular schedules practically all the way around the world. The "Fireball" run across the

Various types of antennas top ATC control tower. Dispatcher at mike hears incoming calls over speaker battery



South Atlantic extends all the way to India, the "Crescent" route crosses the middle Atlantic, and the "Snowball" run via Newfoundland and Iceland to Scotland has been extended to terminate in Paris.

In recent months transport planes have been making 1,200 transatlantic crossings every 30 days. They carry a variety of urgent cargo. Paper invasion currency, hundreds of pounds of penicillin, and a stock of new electrically heated flying clothes may be the priority items on one eastbound plane, while a westbound plane that it meets at sea may be carrying half a ton of mail, a ton of mica, and 100 ounces of platinum. Wounded men who require special treatment in the United States also are brought home by ATC.

In the Pacific one of the newest additions to the ATC network puts Leyte in the Philippines only two days away from California. With stops at four intermediate islands for fuel and changes of crew, big C-54 Skymasters have carried as many as 36 litter patients from the Philippines to west coast hospitals in as little as 39 hours.

All ATC planes on delivery flights or transport runs report their positions at regular intervals to their nearest radio ground stations and in turn receive time checks and weather reports. This makes up a vast amount of radio traffic. Enemy radio operators sometimes try to jam the frequencies so that such reports can't be made, as well as attempting to give misleading information or instructions. Always they are fishing for information, imitating the wording of standard messages



Canvas covers protect B-24's tail guns during overwater delivery flight. WAC below leads cars across runways between landings at Long Beach





Temporary fuel tanks fill B-24 bomb bay on long ferry flights

in the hope that some unwary operator will answer.

The expert operators of the Army Airways Communication System who man the ground radio stations have their hands full all the time. One ground station may have a dozen operators on duty at all hours of the day and night. Each handles scores of messages during his six-hour watch and at the same time guards frequencies that might be used by planes that encounter emergencies.

The ground operator's "opposite number" in the air, the radio operator of a big bomber or transport plane, likewise has a busy time. The radio equipment on the airplane may include a liaison continuous-wave transmitter capable of phone or tone transmission, the usual voice "command" transmitter, and the VHF (very high frequency) voice command set. These last two are used over

Ground stations keep in touch with aircraft on ferry routes

very short distances as from plane to plane or from plane to the control tower of a landing field.

Other equipment includes the radio compass, radio altimeter, marker beacon receiver, and, on some planes, a radio type of blind landing device.

Able to operate any of the radio equipment, the plane's operator spends most of his time handling messages on the liaison set. He always must be on the alert against being fooled into communicating with enemy operators, although on a long overwater flight he usually works many different types of stations. On a single trip he may handle traffic with domestic stations, AACS stations abroad, commercial, Navy and foreign stations. In addition to the radio, the operator handles the visual signals that may be used prior to a landing or for communication with a nearby aircraft.

Radio really works overtime at a busy ATC landing field. The men in charge of the control tower may be in communication with a dozen aircraft at practically the same time, radioing them instructions as they approach and fitting them into the landing pattern. Factory deliveries, overseas departures, test hops, training flights, and regular domestic air transport operations are all dovetailed together with a minimum of delay.

An outstanding example of such heavy traffic is at the Long Beach, Calif., base of



the 6th Ferrying Group of the ATC. Here as many as 1,300 separate landings and departures may be made on the field's five runways during a single day, the yearly total amounting to a quarter of a million.

The control tower at Long Beach is handled by the Civil Aeronautics Authority, with two expert dispatchers on duty at all hours. The loud speakers mounted on a special panel are constantly babbling with the voices of pilots that may come in over any of eight frequencies, and the two dispatchers reply and give instructions via microphones attached to high and low-frequency transmitters.

Although ordinary operations around the field are a thrill in themselves, the dispatchers occasionally have an emergency to handle. A plane may have to land in spite of practically no visibility; in that event, one of the dispatchers stands out on the catwalk at the top of the tower, talking the plane down by means of instructions over the air. This has happened even on a clear day, as when a pursuit pilot was blinded by engine oil that sprayed up over his windshield. He was flying totally blind but he carefully followed each bit of instruction that the watching dispatcher radioed to him. "You are over the field right now," the pilot heard in his earphones. "Make a 45-degree turn to the left. Now fly straight ahead. Keep going. Okay, bring it around in a 180-degree turn. You can start to drop. Get your wheels down. Keep on coming down. Flaps, lower your flaps. Drop her in. You are all lined up with the runway. Okay, okay, keep her straight." The pilot landed successfully, unable to see a thing, and then the voice of the dispatcher yelled in his earphones, "Brakes. Brakes. Hit your left brake hard." The pilot followed instructions and changed course just in time to miss a line of fighters parked alongside the runway.

Sometimes, too, a pilot on a test hop with a new aircraft gets into mechanical difficulties aloft. Possibly only one wheel drops into landing position when he is ready to land, his flaps won't work or one or more engines fail. The pilot and the CAA men take no chances. First the dispatcher cautions the pilot to remain in the air, then he sends a message to the operations department, asking for the help of a specialist in that type of plane. Finally he phones for the crash wagon and fire truck to stand by, spotting them at that point on the runway where the plane can be expected to stop.

Then the specialist takes over at the radio. The pilot describes his difficulty and the specialist replies with suggestions that have worked on other occasions. Usually, between them, they manage to correct the trouble and the pilot lands safely.

Christmas-Tree-Shaped Casting Yields 96 Shell Noses



Centrifugal casting is speeding up munitions production by making 96 shell noses grow where only one grew before. Using the new casting method, the J. B. Beard Corporation of Shreveport, La., is turning out tremendous quantities of shell noses for the Army. After a "Christmas-tree" casting—so called because of its appearance—is removed from the mold, the excess metal is removed and later remelted and recast for other shell noses.

Computer Figures Payroll Tax With Touch of a Hand

Payroll tax deductions for any given salary are quickly shown by a handy office device which can be operated by turning a knob with the left hand, leaving the other hand free to write down the figures. The computer shows the tax for only one dependency status at a time,

helping to avoid errors that are apt to occur when using charts showing deductions for all dependency statuses at once. Measuring 7½ by 3½ by 3½ inches, the device will slip easily into a drawer.



Eyewitness War-Front Stories Recorded on Film



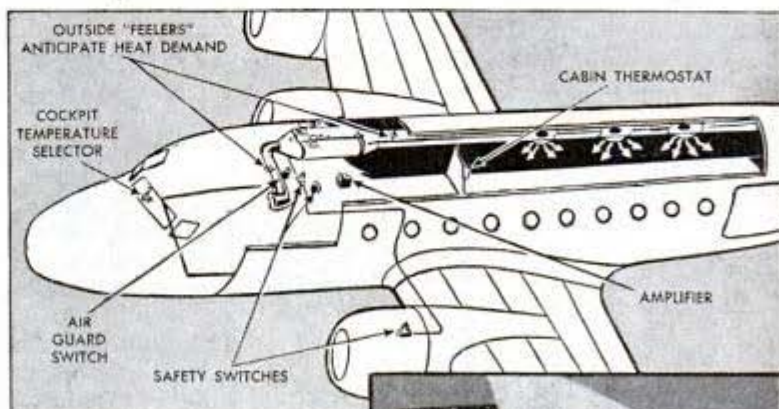
Radio reporters cover the battle fronts with a portable recording set that takes down the eyewitness account on a sound film for broadcast later from a short-wave station. Not only does this permit the news man to remain at the front covering the action, but his "canned" story can be readily censored at headquarters without de-

laying him. The recorder, which weighs 50 pounds and is about twice the size of a portable typewriter, operates on the same principle as a transcription machine except that its recording needle traces sound grooves on a 50-foot film belt instead of a disc. One belt at normal speed records about an hour and 50 minutes of sound, and is played back without special processing by running a pickup needle along the parallel grooves. The system was inaugurated on D-Day in Normandy when four major networks pooled recordings lent by the Navy. Correspondents interviewed fighting men on the deck of a flagship at the scene of the invasion, and the sound track

included the roar of diving planes, flak bursts and the cheers of an antiaircraft crew as a Nazi plane was downed. Before releasing the film for broadcast, censors listened to it and deleted objectionable portions by turning off the copying machine to drop out words or phrases as the original film was re-recorded.

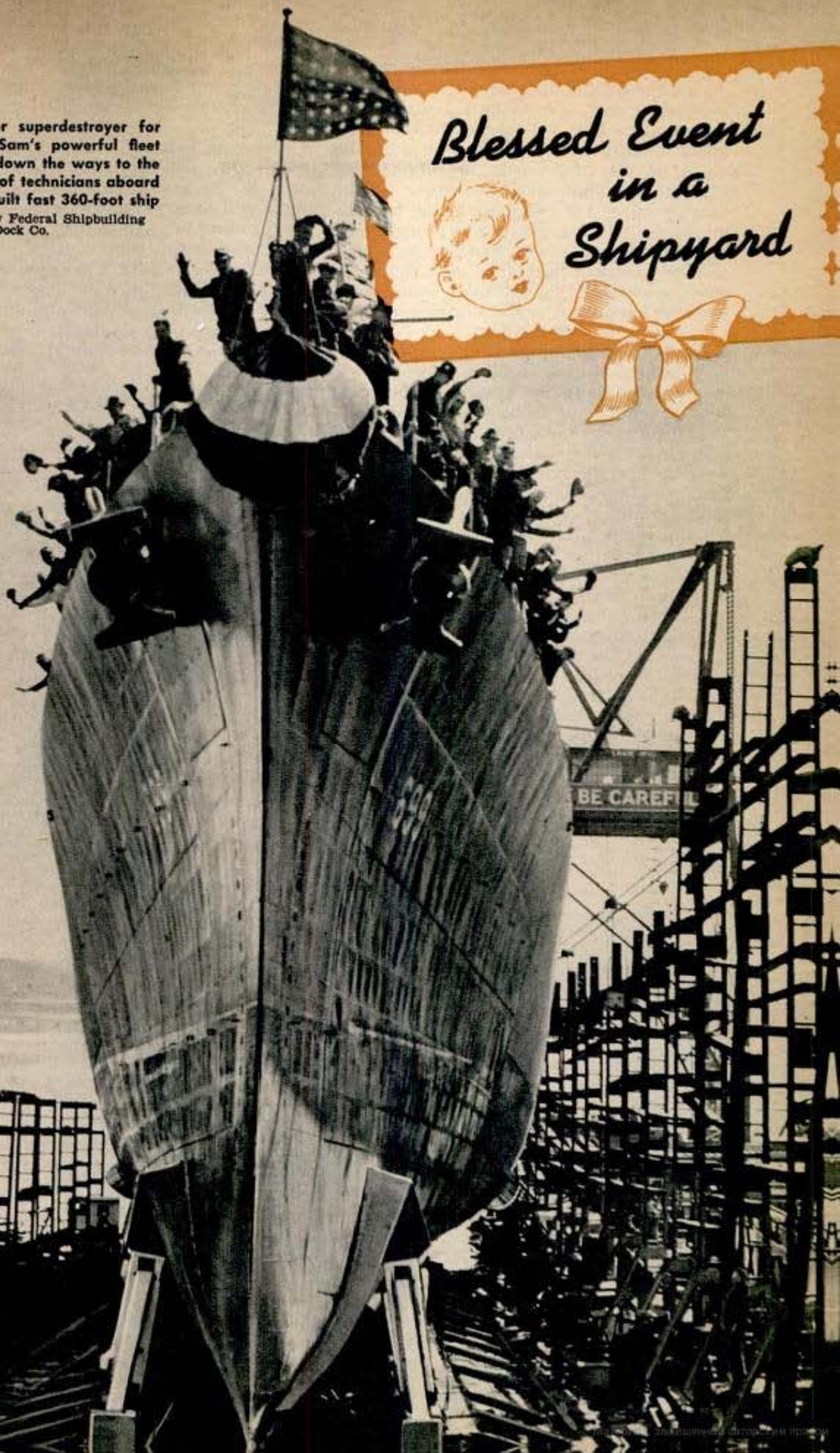
Plane's Electronic Heat Control Reacts to Outer Weather

Tiny coils of wire and electron tubes which will register the outdoor weather and adjust the temperature in an airplane cabin accordingly will be a feature of post-war air travel. The system has been developed by the Minneapolis-Honeywell Regulator Company. Completely automatic, the controls keep the cabin heat at a steady level. The unit weighs less than eight pounds and is connected to the master control switch in the cockpit, being turned on when the pilot starts the engines. Acting as the brains of the system, electron tubes learn from the exterior coils that the air outside is colder or warmer and then send electrical messages to a motor which opens or closes a mixing damper, proportioning the amounts of outside air with heated air from the plane's heaters.



Another superdestroyer for Uncle Sam's powerful fleet slides down the ways to the cheers of technicians aboard who built fast 360-foot ship
Courtesy Federal Shipbuilding & Dry Dock Co.

Blessed Event in a Shipyard



IF YOU are merely a spectator you miss a lot of the hidden drama in the launching of a big ship. Your view is limited. You are permitted to see only a great bulk of steel, thousands of tons of it, inert on the ways, slightly slanted in the direction of the water. You hear the music of the band, you see the members of the launching party, you listen to oratory, you see a beribboned bottle of champagne swung against the steel hull. The vast structure starts toward the water; there are cheers, a crescendo of music, a volley of applause.

You have missed a lot.

A modern launching must be as precisely coordinated and as thoroughly briefed as a mission of B-29s. It took many thousand manhours of labor and the work of 30 skilled trades to fashion the ship for this moment. Hidden behind the scaffolding, the flags and the bunting, about a hundred men who know their business attended to the intricate procedure of the launching.

Launchings have become commonplace since we entered the war. Last year over 41,000 merchant and combat vessels were built in American shipyards, left dry land and became wedded to water and joined in the mounting fight against the Axis. Inland citizens, folks who live along our great rivers, the people along our Great Lakes, the Americans on the Atlantic, Gulf and Pacific coasts have witnessed countless launchings, many of them for the first time in their lives. Only a few of them, how-

Newly launched ship is secured to fitting dock to be readied for service. Below, diver goes down to look for obstructions on day before ship is launched

ever, know what goes on behind the scenes.

Few seem to know, for example, that a diver plays an important part in a launching. The diver is a sort of a sub-sea scout. On the day before the launching, the diver goes down and strolls around on the bottom of the water through which the big ship will pass when she leaves the ways. Any debris or obstructions washed in by the tides or currents must be removed. After the launching, the same diver again submerges and makes a thorough examination of the hull of the ship to see if it has been damaged by its first trip.

Unseen, too, is the crew of men in dunga-



rees whose job it is to grease the ways down which the ship will slide. First comes an application of stearine, a special liquid wax, which is poured from big buckets, smeared evenly on the ways by men with large broom brushes. To launch an average ship, 14 barrels of the wax are needed, nearly two and a half tons. This gives a base to the twin ways, four feet wide and nearly 600 feet long.

Next come the workers who spread the launching grease on the standing ways down which the ship will slide. Two and a half tons of this grease are spread smoothly by hand over the stearine base.

The day before the launching, a small crew of specially trained workers "tightens up the cradle." While the ship is under construction, its keel rests on blocks of wood. These blocks shoulder a high proportion of the tremendous weight of the ship. But, as work progresses and the weight of the ship grows, various other types of cribbing and shoring help to share the weight. In preparation for the launching, a great "cradle" is built around the ship. This cradle has runners, becomes a sort of a supersled. This structure will carry the hull along the greased ways to the water. A special problem becomes urgent just before the launching: the shifting of the load of thousands of tons of weight from the temporary foundations to the cradle. Workers butt home wedges, made of foot-square timbers, which tighten up the cradle, shifting the weight of the ship to the cradle.

Three hours before the launching another group of men removes the heavy bilge blocks or cribbing, making it possible for the bulk of the ship's weight to rest on the ways.

One of the most ticklish phases of the launching is the business of cutting the dog shores. This happens just a few minutes before the ship races toward the water. These ropes are attached to a steel clevis through which strands of heavy, strong steel cable hold the ship in partial leash. There are two of these dog shores, one port and one starboard. The axman stands tense and ready while his foreman stands by, his hand

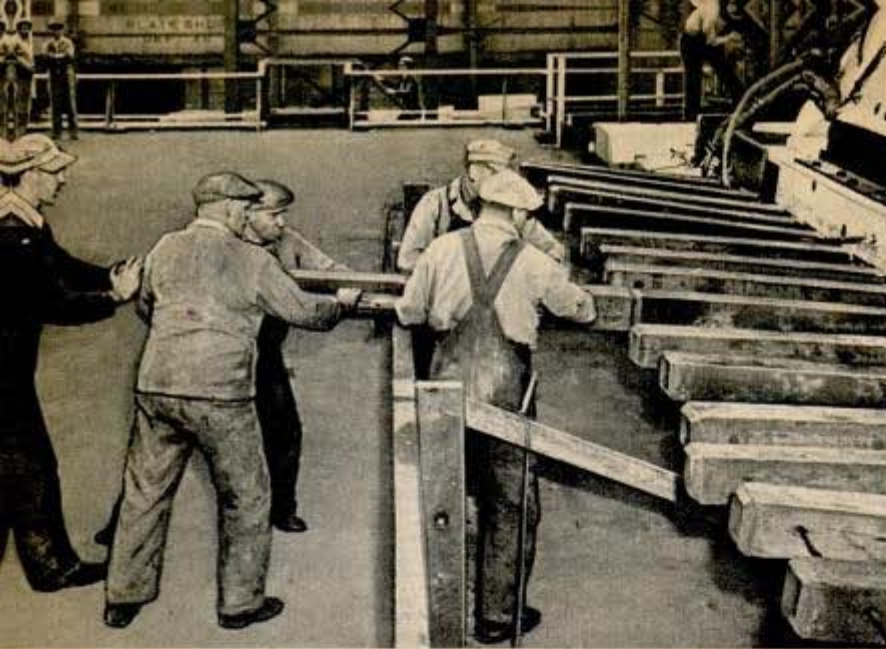


Waiting for the signal to start final act of launching. When light flashes, throttle is opened and several million pounds of ship start down the ways in the cradle built around the craft



Flagman signals that tide has reached peak and big ship can start first trip. Below, workmen spreading launching grease over special liquid wax on ways; it takes 5,000 pounds for job





Workmen tighten up cradle which will carry the ship down the ways

on a light signal switch. When the signal is given, the axman and his counterpart swing their axes at the same moment and the keen blades slice cleanly through the hempen bridles.

The foreman presses home the switch, flashes a signal that his job has been done to the under-hull commander-in-chief, who then proceeds to direct other essential moves by his launching team.

Ensnues now the final act of the drama staged by the unseen men and forces, all nicely synchronized. Beneath the hull the master of the under-hull teamwork watches lights on a panel which keep him informed of what is happening. The lights tell him that the dog shores have been severed, that the ship's bridge and the sponsor's bottle of champagne are ready.

He does not open the throttle in his hand until he receives a last-second report from two men in a rowboat, whose presence has been unnoticed by the crowd. The very minute of the launching has been set long ago; that moment is when the tide is at its peak. One man in the rowboat measures the depth of the water with a 20-foot pole. When the top of the tide is reached, he waves a signal and the boat quickly scurries out of the path of the big ship that will shortly rush down the ways.

The man at the throttle now

Last minute launching operation—when signal comes ax-wielder will cut rope

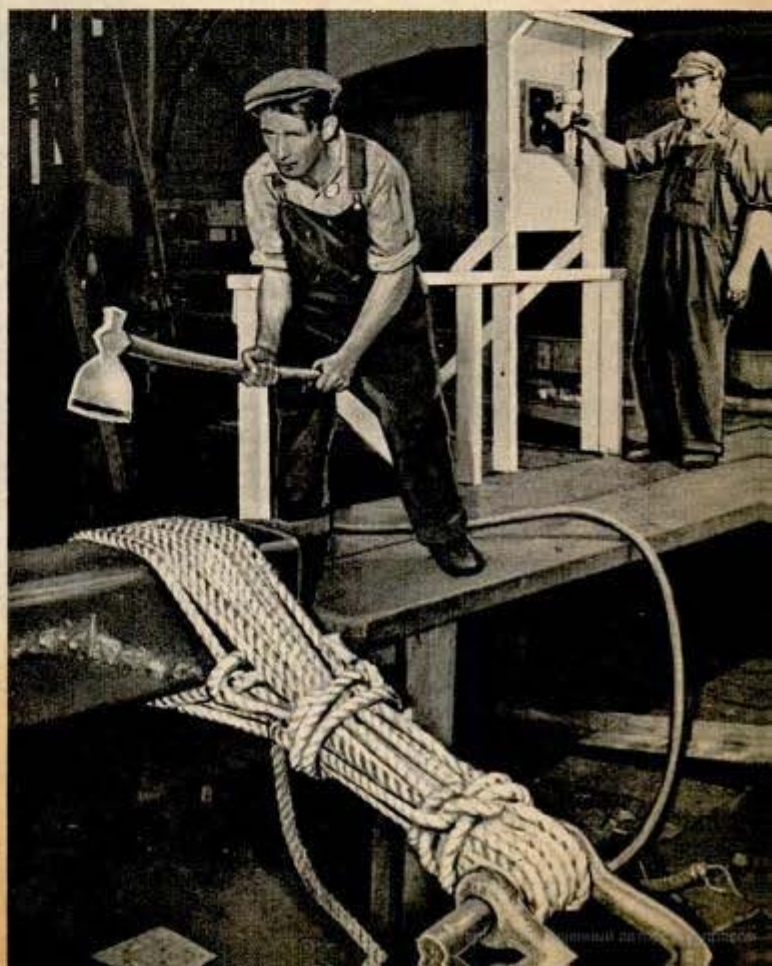
swings it open and a hydraulic gear is unlocked which gives the millions of pounds of steel a vigorous push—and away the bulk goes, followed by the hydraulic gear ready to give the ship a nudge if she hesitates at any point in her progress.

On the platform, the sponsor swings the champagne bottle and speaks the formal words that christen the ship.

Unseen, entirely unsuspected by the charming feminine sponsor, a grinning worker stands on top of the covered platform firmly grasping a gaily colored cord. Attached to the other end of the cord is the

beribboned bottle which the sponsor is supposed to smash against the hull. Feminine aim is usually good, but once in a while the bottle fails to break. Then the man on the platform swings the cord and smashes the bottle neatly. Seamen, you see, are given to superstition. They believe it's bad luck if a ship reaches water without having wine spilled on it. Shipyards take no chances—even on superstition.

(Continued to page 148)



"DITCHING" THE B-29

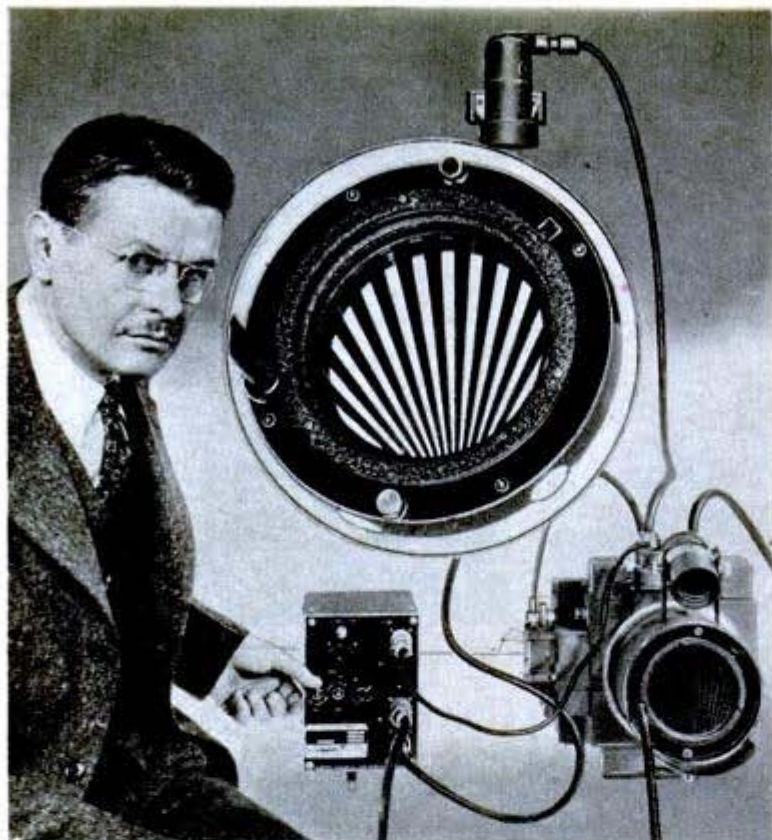


AAF Tactical Center photos
Braced for impact, crewmen hold hands behind head and co-pilot braces feet on rudder pedals. Below, tail gunner scrambles out window

From the "caboose man" (tail gunner) to bombardier, B-29 crew members are taught the art of ditching—making an emergency landing on water. At moment of ditching, two bright yellow rubber rafts burst from compartments atop fuselage and bounce onto the right and left wings. Above, trainees at AAF Tactical Center, Orlando, Fla., practice floating raft from rear edge of wing. Right, radar observer climbs to one of six emergency exits. Below, 11-man crew "escapes" from fuselage



Aerial Camera Shutter Operated by Bomb Flash



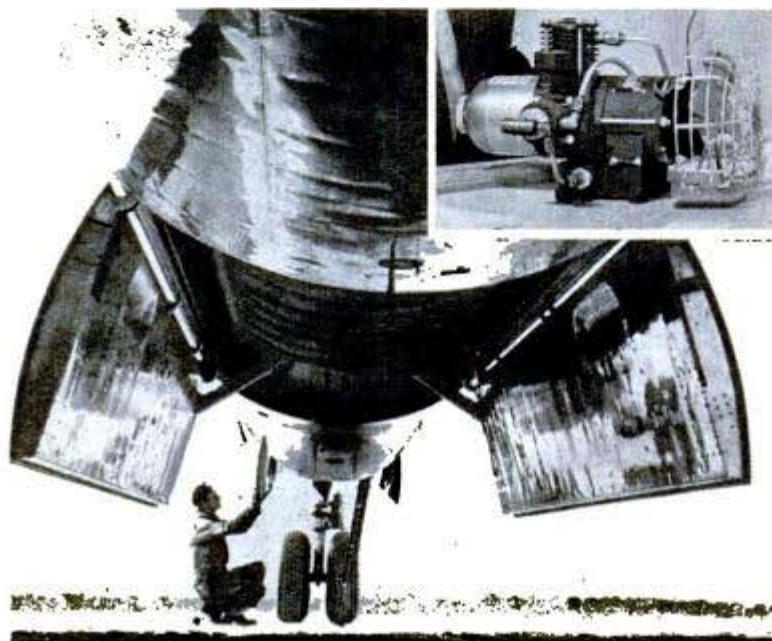
Instantaneous, high-altitude night photography by the Army Air Forces owes its success to an entirely automatic photoelec-

tric grid shutter which is electronically controlled. The control discriminates between light from the bomb flash and extraneous light, in contrast to the old type of shutter which reacted to searchlights, flak and ground fires, as well as the illuminating bomb, often exhausting the film supply before the desired pictures were taken. A light impulse from the flash bomb dropped by the aircraft is picked up by the camera's selective photocell; by means of an amplifier the impulse initiates a current that instantly opens the shutter for the correct exposure and then closes it. The film automatically advances for the next exposure. The streaky films formerly obtained with time exposures, due to light on the ground, are eliminated by the short exposure time. Alignment of radially slotted leaves or grids, both stationary and movable, admits light to the film.

Air Jet Snaps Open Bomb Door of Superfort in a Second

From the moment the bomb bay doors begin opening, bomber crews know they are a steady target for the enemy. It is a

signal to enemy fighters and flak gunners that the plane is about to start a bombing run and must fly level for several seconds.



But in the B-29 Superfortress the problem is minimized by a handful of stored energy in a 10-pound air compressor unit, which snaps the doors open in $\frac{1}{10}$ of a second, instead of the 15 seconds formerly required, and closes them after the run in three seconds. The quick closing reduces air drag and permits the B-29 a quick getaway. The lightest motor-driven compressor ever built, the unit produces 1,500 pounds of pressure. Each B-29 now has seven air compressors, which provide power for chargers, turrets and bomb bays.

POPULAR MECHANICS



Aluminum "Attack Span" Erected in 90 Minutes

Built entirely of aluminum, a 50-ton "attack bridge" which is lighter, wider and capable of faster construction than any other floating span has been developed by the Army Engineers corps. The bridge, called the M-4, comprises only three main parts and is so simple that a 301-foot section takes only an hour and a half to knock together, including time needed to unload the parts from trucks. The main parts are half-pontons that are locked stern to stern with connector pins to form a complete ponton which alone will safely support 26 tons; hollow deck balks which re-

place both balk stringers and chess flooring in older type wooden deck bridges; and removable gunwales which, attached to each ponton, provide a foundation for the deck balk. The decking is so buoyant that if every ponton were sunk the deck could still support a loaded truck. Tactically, the M-4 is intended for use in the attack—the four or five days between the assault boat crossings and the installation of a Bailey or timber trestle bridge. One M-4 "set," consisting of 436 feet of floating bridge and 180 feet of fixed span, is carried in 69 trucks and trailers.

Way to Harness Internal Power Is Claimed by Inventor

Emphasizing that it is not a perpetual motion device, John Paul Sparks, Navy radioman, claims to have invented an auto-generator which produces its own power from Model T Ford magnets. Sparks asserted the machine eliminates the counter-electromotive force encountered in conventional generators, and in four months produced 29 times as much energy as he put into the magnets. He said his model might have run several years without further aid, although the magnets eventually would have had to be recharged.

Mortar Fires From the Shoulder

A mortar on which a patent has just been granted can be fired from the shoulder with little recoil. The barrel, sliding within an outer tube, is pressed back against a coil spring before loading. Pulling the trigger releases the spring to give the barrel forward motion which must be overcome before recoil can take place.



ENEMY
OBSERVERS

ROCKET-FIRING
FIGHTER
WRECKS TOWER

MACHINE
GUNS
SWEEP
STREET

TANK
DESTROYER
DEMOLISHING
WALLS

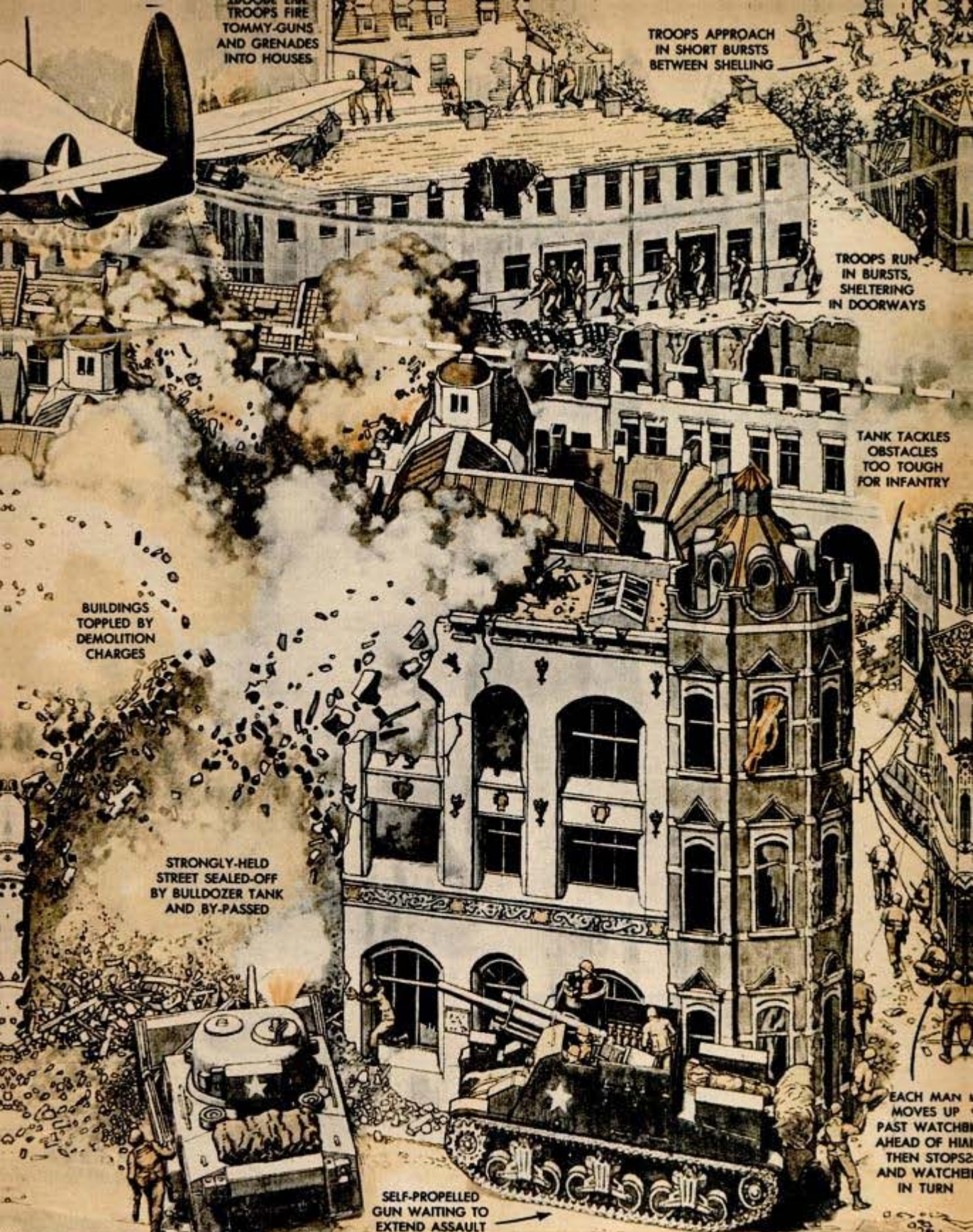
BULLDOZER
BLOCKS OUTLET
TO AWAIT
EXTENSION
OF ASSAULT

SIGNALS TRUCK
COMMUNICATES
WITH
HEADQUARTERS

YANKEE TEAMWORK CLEARS A GERMAN TOWN

The scene depicted here by a noted artist shows what happened in Leipzig, Magdeburg and a score of other German cities where fanatical Nazis fought a "last ditch" action. Dotted lines indicate sectors marked

POPULAR MECHANICS



ABOVE THE
TROOPS FIRE
TOMMY-GUNS
AND GRENADES
INTO HOUSES

TROOPS APPROACH
IN SHORT BURSTS
BETWEEN SHELLING

TROOPS RUN
IN BURSTS,
SHELTERING
IN DOORWAYS

TANK TACKLES
OBSTACLES
TOO TOUGH
FOR INFANTRY

BUILDINGS
TOPPLED BY
DEMOLITION
CHARGES

STRONGLY-HELD
STREET SEALED-OFF
BY BULLDOZER TANK
AND BY-PASSED

SELF-PROPELLED
GUN WAITING TO
EXTEND ASSAULT

EACH MAN
MOVES UP
PAST WATCH
AHEAD OF HIM
THEN STOPS
AND WATCHES
IN TURN

Copyright by the artist, S. W. Clatworthy
off for capture by various units. Action starts in top right-hand corner with infantry approaching in spurts under fire of enemy lurking in doors, windows and tower at left. The infantry is supported by tanks, mobile guns, flamethrowers, bulldozers and fighter aircraft which knock out tower with rockets. Foreground shows final phase with bulldozer clearing rubble while machine gunners stand guard. Tankdozer is sealing off pocket held by mortars, antitank guns and built-in tanks. Upper floors were wrecked by bombardment

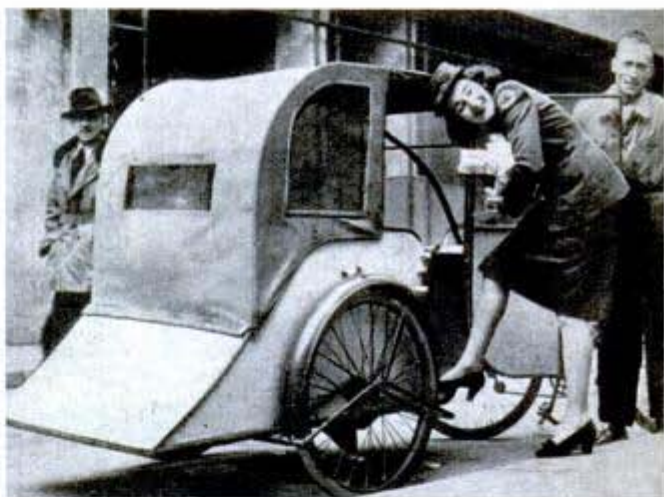
Collapsible Plastic Bag Distills Water for Survivors at Sea



Water, water everywhere, and all you want to drink, is the modern version of the old lament, thanks to a new pocket-size solar still developed for armed forces in the Pacific. Able to supply fresh water indefinitely to flyers forced down in tropical waters, the flexible still can produce more than a pint in eight hours under average conditions and, under ideal conditions, almost a quart. In operation, the metal container is used to pour about two quarts of sea water into the still, a vinyl plastic bag in the center of which is attached a plastic screen supporting cellulose sponges. The bag is then inflated and attached to the side of a raft or boat by towlines. The cellulose sponges soak up the sea water. Heat of the sun on the inflated bag causes the sea water to vaporize on the bag, where it condenses and runs into a trap on the bottom. Drinking water is drained out from the same nozzle into which the sea water was poured. The bag is easily inflated by blowing or even breathing into it.

Bicycle Taxis Help Solve Fuel Shortage For Parisians

The bicycle, always popular on the European continent as a means of transportation, became more important than ever in Paris during the Nazi occupation, when gasoline for civilians was practically nonexistent. Necessity evolved the bicycle taxi, which was an enclosed, cabriolet-style two-passenger trailer mounted on bicycle wheels and drawn by another bicycle. After the liberation of Paris the taxi-bike became popular with Red Cross clubmobile girls.



Broken Jaw Put Back in Place With Novel Chin Restorer

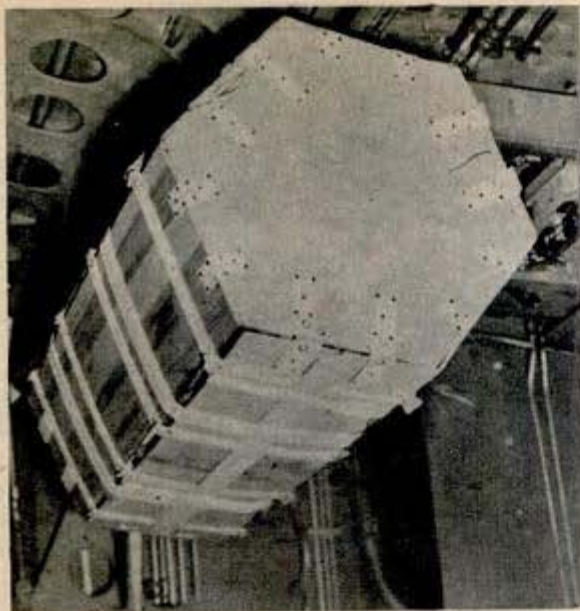
Fractured jaws can be restored to normal with an ingenious clamp device developed for a patient at the Naval Hospital at Ferndale, Wash. His jaw was fractured badly when his ship was bombed off the Philippines. A turn of the thumb screws on the clamp every few hours is gradually bringing the telescoped bones back into place. The contrivance is expected to find wide use in other similar injuries.



So important is the Army mule that 17 ships have been converted into mule carriers accommodating 320 to 699 mules each, with sick bays for 16 to 32 animals.

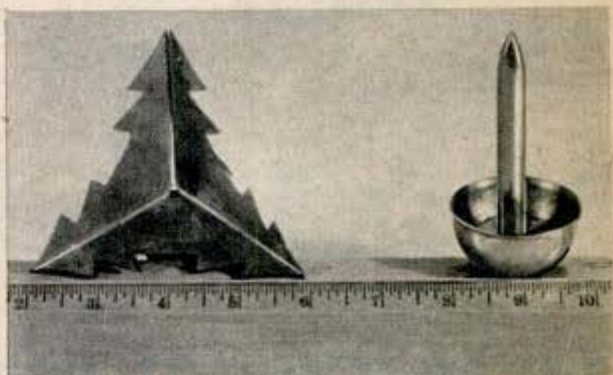
POPULAR MECHANICS

Planes Scatter Pronged Barbs for Enemy Tires



Left, collapsible box loaded with three types of tire-ripping barbs pictured above and below

Sharp, tire-bursting missiles which would make a careful motorist shudder are scattered over enemy air strips and roads by the Air Forces to wreck planes, trucks and other vehicles. The gigantic "tacks" are designed and fashioned at the AAF tactical center, Orlando, Fla. One is a "Christmas tree barb" made from two pieces of sheet steel with serrated edges that give a fishhook effect. The single-barb type is a hollow, pointed tube mounted on a curved base containing a lead deposit. When knocked over, it bobs right up again. Both types are 3½ inches long. The four-inch, four-pronged type, especially designed to gash leak-proof rubber tubes, always rests on three prongs, leaving the fourth prong pointing up at 90 de-



grees. The missiles are laced together in crates that collapse and scatter the barbs over a wide area. When they hit a congested highway or landing field, they cause mass blowouts and traffic pile-ups.

Dual Wheels on Front of Truck Prevent Blowout Wrecks

Easier steering control and greater safety will be characteristic of postwar vehicles which use "steering duals"—double wheels on the front axles. Designed for use on trucks and buses, the dual steering front wheels enable the driver to avoid a serious accident when a tire blows out. Prior to this development it was impossible to employ dual front wheels because fixed duals would not steer. Longer life is claimed for the tires on dual front wheels in addition to the greater safety.

☐ The record for big feet for normal adults is 12.4 inches (a Negro man), while the smallest recorded foot length is 7.6 inches (an Indian woman), according to Dr. Howard V. Meredith of the University of Iowa.



This Press Wireless office was set up on Leyte almost as fast as the Army moved in



Flashing THE NEWS FROM THE FRONT



NEWSPAPER men covering the war are sending dispatches direct from the battle areas to America and elsewhere in the fastest time in history. Special 400-watt radio transmitter stations built and operated by Press Wireless near the front lines flash stories across the oceans and into newspaper and magazine offices at the rate of 250 words per minute and more. Speeds of 500 words have been attained. The elapsed time from filing at the transmitter to delivery at home in a form ready for the editor has been cut to a matter of minutes.

These battle-front stations are something new for the press. They reflect the tremendous strides that have been made in electronics since World War I, when radio was little more than a scientific plaything. Long distance messages frequently have been sent from transmitters of much lower power than 400 watts but not regularly under all sorts of conditions nor at such high speeds. The war-front sets are

An historic moment! New York operator makes contact with Press Wireless truck on Normandy beach

POPULAR MECHANICS

Equipped to send voice as well as radio telegraph. Special receiving equipment, special antenna arrangements and employment of the frequency shift principle are among the factors that have made this transoceanic radio press news service possible.

Press Wireless stations, which are authorized by the Federal Communications Commission, the Board of War Communications, and the joint chiefs of staff, follow closely on the heels of our invading armies. The first—installed on an Army truck to give it mobility for rapid moves on short notice—established regular service June 13, 1944, just seven days after D-Day, on the Normandy beachhead. By the end of the year a second mobile unit was set up in Holland.

The Leyte station, which is not on wheels but can be moved quickly, began operations November 14, 1944, making direct contact with the Press Wireless terminals near Los Angeles. Later Press Wireless units followed General MacArthur to Luzon and into Manila, transmitting news to Leyte, which relayed it to America. In the first 12 hours after our troops entered Manila, Press Wireless handled 25,000 words of copy.

On Normandy, after driving the truck loaded with Press Wireless equipment off the landing craft, through the narrow lane cleared of mines and onto the beachhead, the crew soon found a place to "set up." They were on the air within 90 minutes after their equipment had been assembled. A pasture was their first operating site. They were attracted to it by two horses grazing, indicating absence of mines.

Then on June 12 an engineer at the receiving terminal on Long Island heard a signal calling "Press Wireless New York!" The call was coming in on a frequency being used at that moment by the company's Los Angeles station. California was notified immediately, the transmitter there shifted to another frequency and the 400-watt set on the Normandy beachhead came in. Regular news dispatch service was begun the next morning and the first story was on the editor's desk in New York 21 minutes after filing.



Near Paris, crew camouflages mobile transmitter before starting to work. Below, correspondent about to broadcast to U. S. from Nazi library in France turned into Press Wireless studio





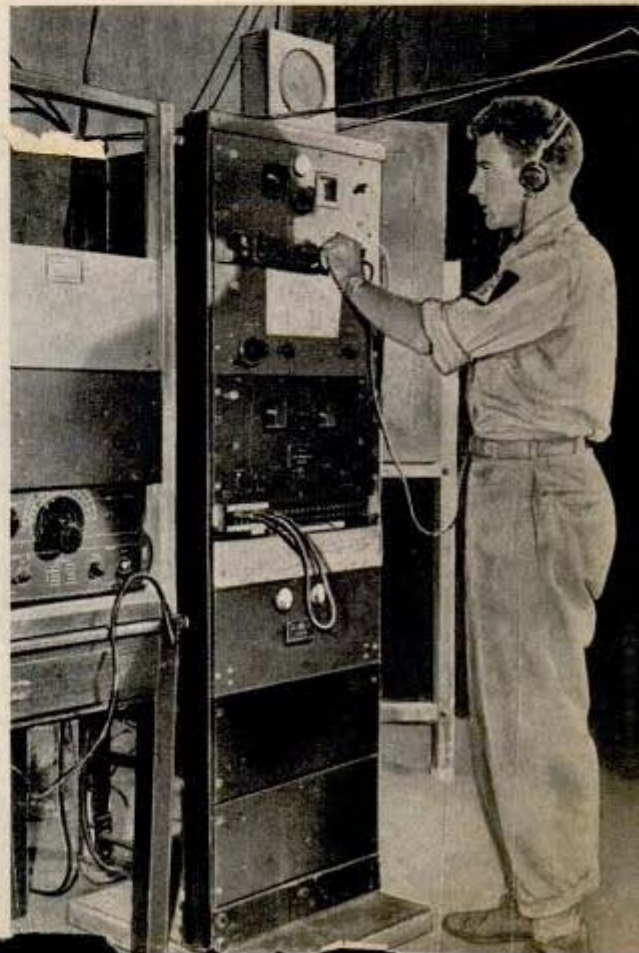
Operator tunes in overseas dispatches in Press Wireless' New York office. Right, technician adjusts a code sender which can transmit 100,000 words of copy daily from Leyte to U. S. Below, inspecting bombproof station in the Philippines

Word of the beachhead unit spread quickly. Correspondents lined up to file their stories. A censor's tent was pitched nearby to help speed service. For a time, London and other writers would send their copy via Station PX, the Press Wireless unit, to New York and have it relayed back to their home offices. This was quicker than trying to get around the news jam that occurred during the early days of the invasion.

The station moved ahead with the First The crew became expert at setting up and taking down antenna rigs on short notice, throwing camouflage nets over the truck and handling special technical problems. Cooperation of the Signal Corps and of the correspondents assigned to the area proved invaluable. So far as was possible, regular schedules were set up to simplify handling dispatches which came flooding in at the rate of as much as 80,000 words and sometimes more in a single day.

Not long after the station was in operation, successful voice transmission was accomplished. American networks picked up the programs originating at the 400-watt transmitter and rebroadcast them. The station was first into Paris for direct radio news service from the liberated city and first into Belgium with radiotelegraph and voice facilities.

The unit on Leyte, manned by a crew of nine, is housed in a sandbag-protected



and camouflaged structure. It sent the first commercial radio news message from the Philippines to the United States since the Japanese invasion of 1941. The Leyte transmitter keeps direct contact with the company's receivers near Los Angeles, whence dispatches are distributed as required. To speed news reception into New York City and other points, special technical arrangements have been made whereby messages are regularly delivered into New York newspaper offices within 12 minutes of filing time on Leyte.

Rain, mud, heat and other factors have given the Philippine crews their share of trials. Paper tape used for traffic transmission became soggy and couldn't be used, since it wouldn't punch out. An emergency oven, large enough to hold 25 rolls of tape at a time, was quickly made out of a box, a spare heater and a thermostat. It worked, as did other homespun contrivances the crew devised.

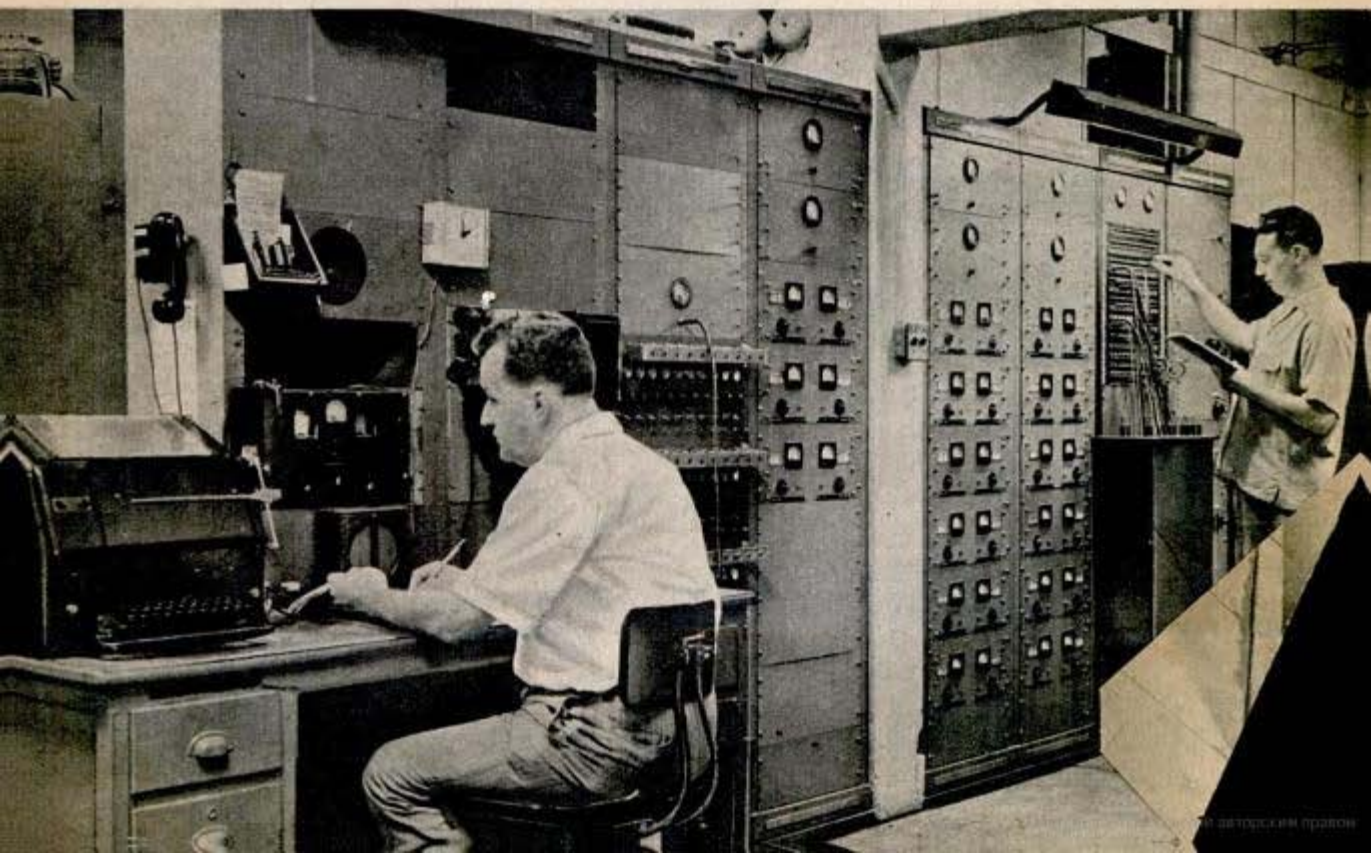
A quotation from a letter received from one of the Leyte crew gives a graphic impression of the setup:

"We fondly refer to the transmitter as 'Venice' and the operating center as 'Hollywood and Vine'. (This is in honor of the California home station.) The latter is in a dimly lighted corner of a concrete building. The walls are rough and water-stained. The tin roof serves as a ceiling. The floor is of cement and threaded with cracks. The atmosphere is damp and the high humidity results in troubles not often encountered at home.

(Continued to page 156)



Technician operates transmitter which relays news flashes at 400 words a minute. Below, this control board on Long Island "talks back" to units overseas



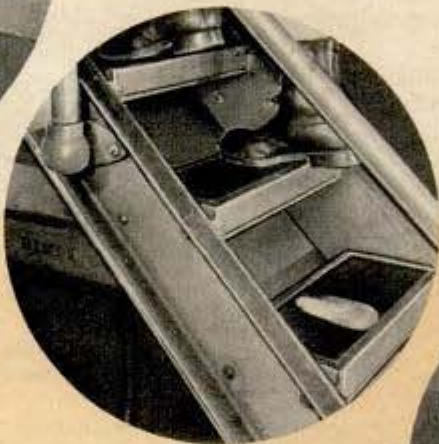
NO DUST MAY ENTER HERE



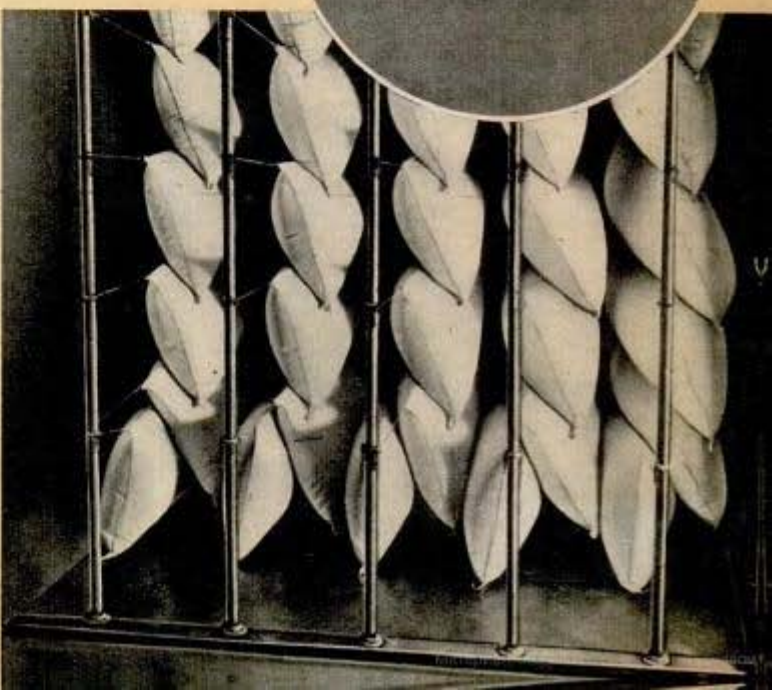
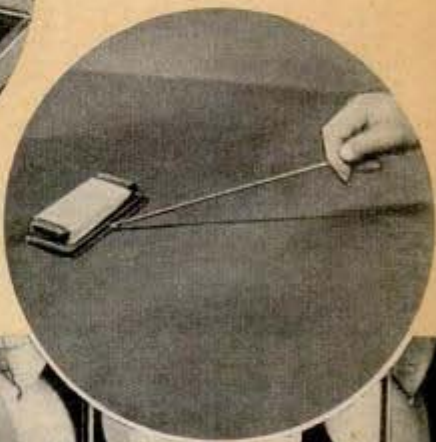
Courtesy Eastman Kodak Company
The "D-Men" in a huge film manufacturing plant hunt down dust as G-Men hunt criminals. Vacuum hose (above) picks up particles of plaster as hole is made in wall. Below, dragging "dust detective" along floor. It is made of a two-pound weight with wrapping of cleansing tissue. Workmen wear special white uniforms which get "wind baths"



Above, hall floors and all main traffic routes in film plant are washed twice daily with electric suction scrubbing machine. Right, "gelatine" mats pick up dust



Giant vacuum cleaner (below) removes dust from streets adjacent to buildings. Right, these "pillows" are actually filter bags through which air passes and is cleaned at film plant



X-901 Co., P.O. Box 13044
Berkeley, Calif.

←When the face of your favorite movie star is flashed on the screen, it is many times larger than it appears on the film in the projector. The same is true of the tiniest flaw on that film. This also applies to enlarged Army and Navy aerial photographs, often made at the risk of a man's life, and what is a minor annoyance to a moviegoer may be of major concern to a reconnaissance officer. These flaws can be caused by "Film Enemy No. 1"—dust. The devices pictured on the opposite page are used by the Eastman Kodak Company in Rochester, N. Y., to protect sensitive photographic emulsions from this enemy.

In the "blacked out" interiors of the hundred buildings where film is made in Kodak Park, a dim figure can be seen at intervals dragging a white object up and down the aisles. This object is a two-pound weight wrapped in white cleansing tissue. The amount of dirt on the tissue—and it usually takes a microscope to find any—determines the frequency of cleaning.

The air that enters the buildings passes through a miniature Niagara Falls, or mist chamber, and is driven through cloth bags. Its humidity and temperature are regulated within a fraction of a degree. Walls and ceilings are coated with a paint that repels dust, and the floors are treated with special dustproof materials. Dust-collecting gelatinous mats are placed inside the entrances.

Vacuum systems are used throughout the buildings, and the floors washed with suction scrubbing machines. If a hole is cut in a wall, a vacuum hose carries away all foreign particles. Even the streets of Kodak Park are washed frequently and cleaned with a giant vacuum cleaner.

Because the photographic emulsions react chemically to the smallest particle of foreign matter, great care is taken with the employees' uniforms. White uniforms, including shirts, caps, underwear, socks, trousers and shoes, are made from special materials and cost about \$80 per man. Before an employee enters a workroom his shoes are "shined" with an electric brush. Each worker also gets a "wind bath" to remove lint or dust. After a couple of wearings, the apparently spotless uniforms are laundered with special soap solutions.

Employees are instructed to avoid hair tonics, ointments, hand lotions, or any product used in the home that might have a chemical effect on the emulsions. The bulletin boards go so far as to tell victory gardeners what insecticides to use! White machines, white walls and ceilings, and even white stair rails give the rooms a hospital-clean appearance.

It costs money to fight a war—even one against dust. The Battle of Kodak Park costs a million and a half dollars a year.

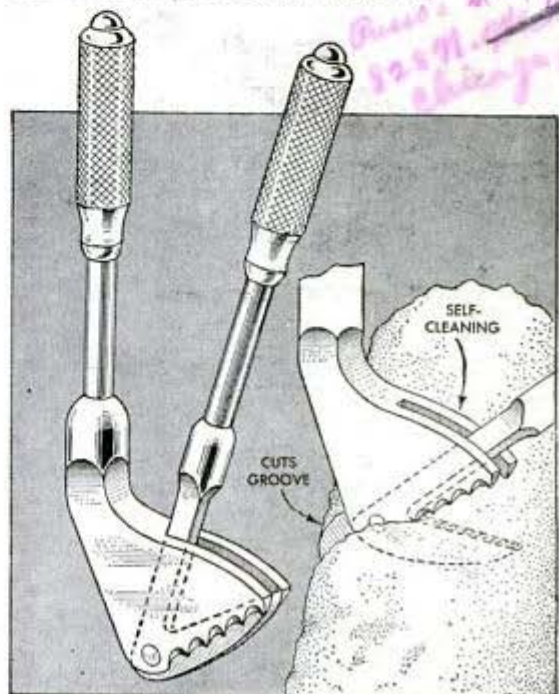
Drill Converts to Saw or Shears With Simple Attachments



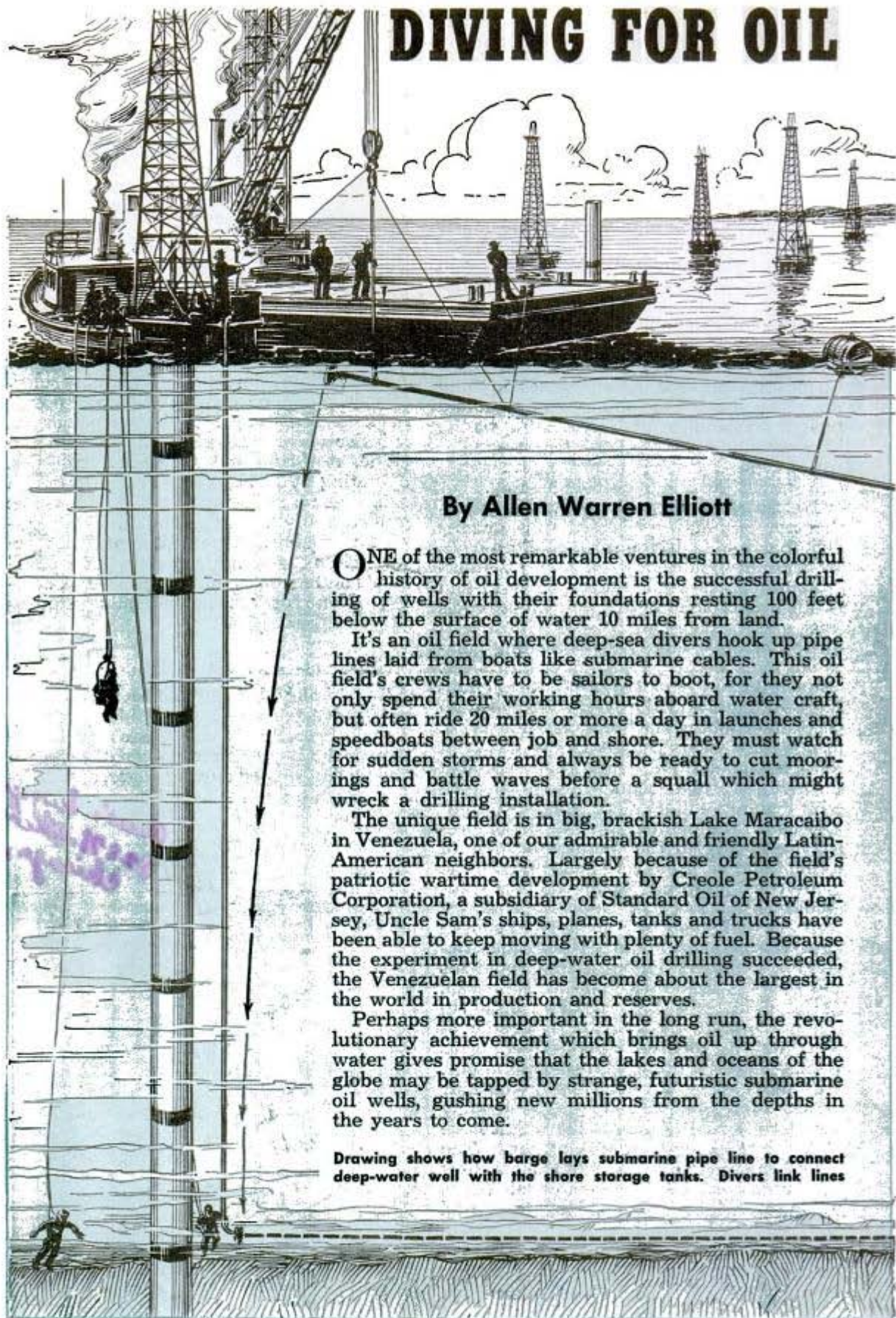
By means of simple attachments, an electric drill can be converted into a power hack saw, a filing machine, a power tin snips or a rivet gun. As a saw or filing machine, it uses standard blades and files, operating at 1,750 to 2,500 r.p.m. The tin snips cut up to 20-gauge metal and can be guided easily in any direction. A pein attachment converts the drill into a rivet gun for peining aluminum, copper and small rivets and for bumping, chipping and etching. None of the attachments requires gears or springs.

Scissors-Saw Cuts Plaster Cast

To simplify cutting plaster casts from patients, a scissors-saw just invented cuts a perfect groove and then cleans itself. The two upper blades have powerful leverage and wedge-shaped cutting edges, and operate with a semicircular action.



DIVING FOR OIL



By Allen Warren Elliott

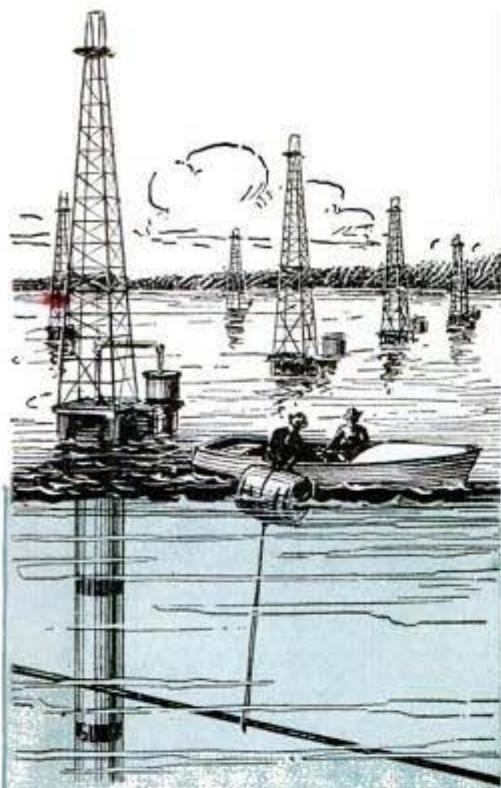
ONE of the most remarkable ventures in the colorful history of oil development is the successful drilling of wells with their foundations resting 100 feet below the surface of water 10 miles from land.

It's an oil field where deep-sea divers hook up pipe lines laid from boats like submarine cables. This oil field's crews have to be sailors to boot, for they not only spend their working hours aboard water craft, but often ride 20 miles or more a day in launches and speedboats between job and shore. They must watch for sudden storms and always be ready to cut moorings and battle waves before a squall which might wreck a drilling installation.

The unique field is in big, brackish Lake Maracaibo in Venezuela, one of our admirable and friendly Latin-American neighbors. Largely because of the field's patriotic wartime development by Creole Petroleum Corporation, a subsidiary of Standard Oil of New Jersey, Uncle Sam's ships, planes, tanks and trucks have been able to keep moving with plenty of fuel. Because the experiment in deep-water oil drilling succeeded, the Venezuelan field has become about the largest in the world in production and reserves.

Perhaps more important in the long run, the revolutionary achievement which brings oil up through water gives promise that the lakes and oceans of the globe may be tapped by strange, futuristic submarine oil wells, gushing new millions from the depths in the years to come.

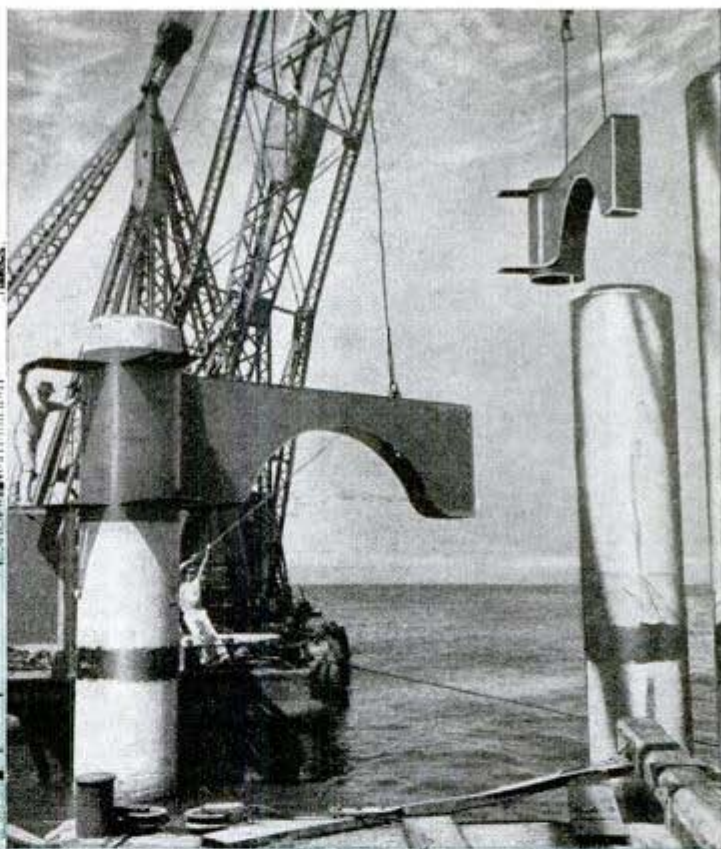
Drawing shows how barge lays submarine pipe line to connect deep-water well with the shore storage tanks. Divers link lines



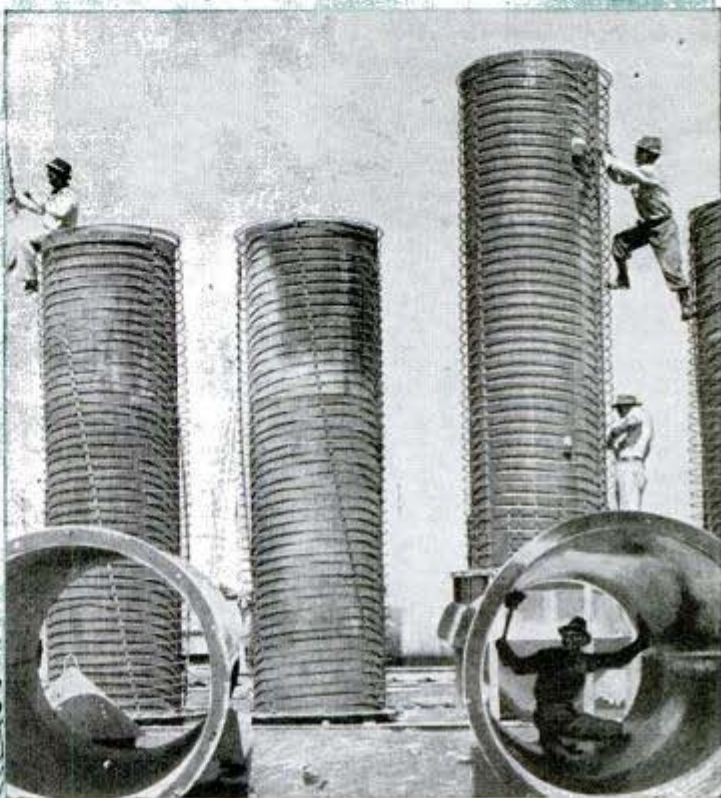
Venezuela long has been an important source of oil. Rich fields were found in its jungles, but its largest field was discovered by a British-Dutch company's successful drillings along the shore of Lake Maracaibo, where oil well derricks now extend in a 50-mile ribbon. Hopeful that the oil pool might extend out under the lake, one American company, Gulf Oil, leased the rights to drill along a narrow margin in the shallow strip just off shore, building short piers and putting down wells at their tips.

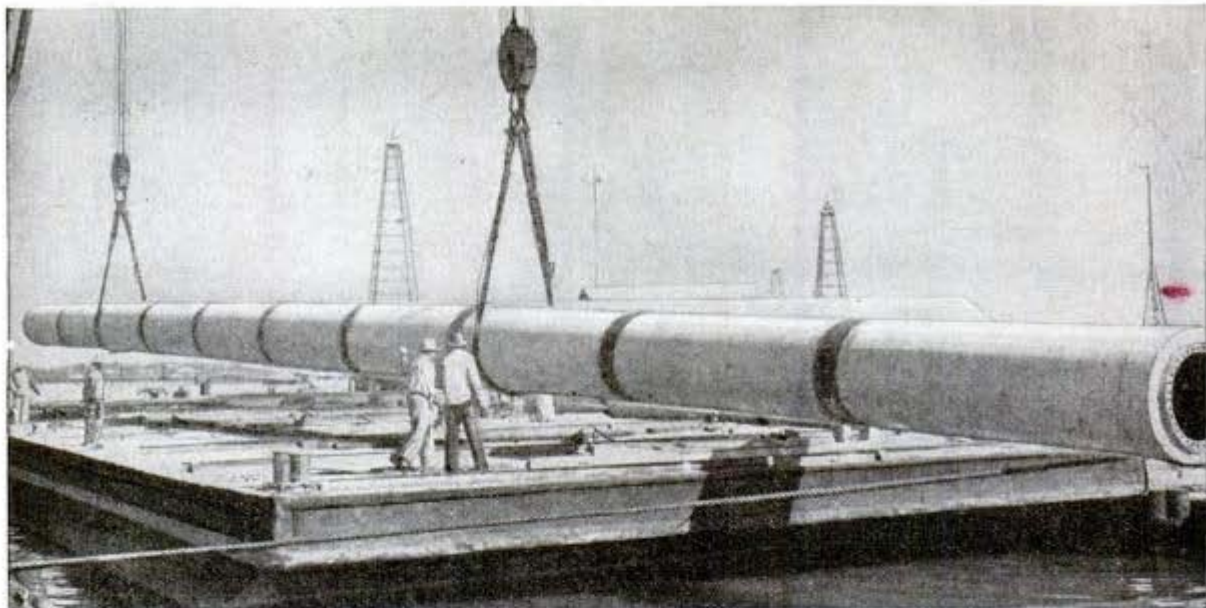
But the Jersey Standard subsidiary took the plunge into deep water by leasing rights to drill as far as 10 miles out in the lake, a venture without precedence in the annals of oil. Its courage was rewarded, for the oil was there.

The capital and technical skill for the venture were



Workmen above are attaching steel braces to caisson piles which will hold platform of rig. Below, steel cores of piles ready for concrete coating to prevent corrosion





Above, 150-foot caisson pile being loaded on barge. Left, testing core samples in La Salina laboratory

ally consisted of two plumb, or vertical, and one batter or brace pile set at a slight angle in each corner, a total of 12 piles per well. A concrete cap, cast in each corner, tied the three piles together and to the structural steel derrick base, forming a rigid structure. A 15-foot cantilever overhang on one side of the 24-foot square base and a 10-foot one on another carried all loads to the corner piles. The base supported the engine, draw works, rotary, landing platform, 122-foot derrick and auxiliary drilling machinery.

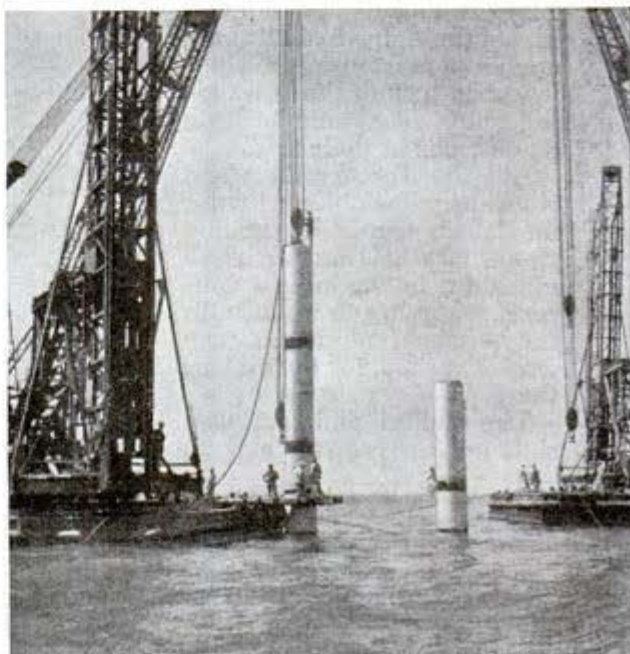
During drilling operations the draw works, drilling engine, and engine house

waiting in New York City. The labor was available—hardy, experienced Venezuelans. But how were they to get the flowing black gold up from the deeper areas?

Close to shore the problem had been fairly simple, with rigs erected on concrete pedestal foundations or timber mats. For water depth up to 60 feet, precast monolithic piles were placed by a pile-driver barge. They could be built in any size to suit a variety of structures and foundation conditions. Except for special types such as sheet piles, precast piles from 12 inches to 24 inches square and up to 133 feet long were used. Occasionally, extensions gave a total length of 145 feet.

Close-to-shore derrick foundations usu-

Caisson piles are filled with water to aid sinking





Camouflage paint is sprayed on tanker at storage depot for lake wells

welded steel arch girders to form a rigid frame. The caisson is fabricated on land and at least partly assembled in the yard by joining several 15-foot lengths. The assembled portion is then moved by barge to the drilling site, up-ended by derrick barges and set in place.

The caisson piles are not driven, as are the solid piles, but are forced to the desired depth in the lake bottom by 200 tons of concrete blocks, placed on top of the pile after it has been lifted into position, filled with water, and allowed to sink of its own weight as far as it will go.

Other sections are added, one by one, as the top of the assembled portion approaches the surface of the lake. The longest cylinders used so far are about 185 feet long and weigh about 100 tons. The caisson foundation is similar to the older pile type only in its use of a derrick base supported at the four corners. Fundamentally, the two designs differ

Pulling out drill pipe during operations on Lake Maracaibo



radically because the pile type depends upon brace piles for lateral strength while the caisson type is a true rigid frame without braces.

Equipment for drilling with either foundation is mounted on drilling barges anchored at the site. The barges are 110 by 48 by eight feet and are fitted with three or four 125-horsepower oil field boilers, two 18-inch or 20-inch mud pumps, fuel compartment holding 225 barrels of fuel oil, mud circulating system and pit, pipe rack, and anchor hoists. Mud, water, and steam lines are connected to the rig from the barge by flexible connections. Auxiliaries include a connecting barge, mud barge, fuel barge, and production test barges as well as dumb barges for transporting equipment.

Creole engineers recently introduced the twin well foundation on caisson piling for deep-water drilling where two separate nearby spots are productive. The new foundation consists of the regular 24-foot base, four-caisson layout, plus a 21-foot extension base and two more caissons to give a rectangular platform on six caissons. The first of the twin wells is drilled as usual; then the derrick

and drilling equipment are skidded along the rectangular base to a new position and the second well is drilled.

Under consideration are a multiple well foundation and directional drilling. This would drill several wells from one foundation, eliminating deep-water foundations for separate wells.

Once these deep-water wells on stilts are producing, the oil is pumped to temporary storage tanks ashore through submarine pipe lines.

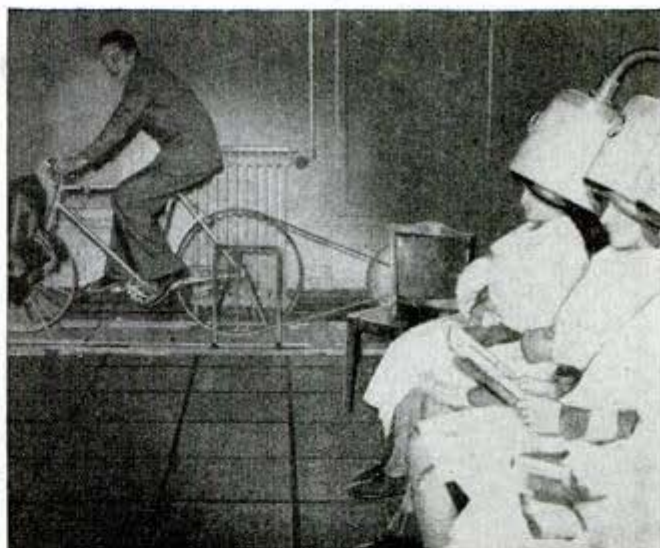
Laying of these lines is another novel feature. Specially designed pipe-laying barges are used, with pipes ready in convenient racks. As fast as the barge moves, pipe sections are welded together and payed out behind, moving into the water over a roller. The lake bottom has become criss-crossed with a spider web of pipe as development has progressed. It's no easy job when repairs are necessary to pick up and work on the defective line, which may be lying under one or more other lines on bottom. But it is done, without fuss and bother.

So the engineers have solved all the problems except one. There is evidence that the annoying teredos have developed a taste for the enamel pipe line coating. Eating the enamel off, the teredos leave the metal exposed to corrosive acid in the water, necessitating continual repairs to the pipe. Just now the oil laboratory scientists are seeking a protective coating to relieve the engineers' headache and give the teredos a stomach ache instead.

Synthetic Tires Survive 500 Miles at 100 M.P.H.

Synthetic tires can take it. In a speedway test four tires made of stock synthetic rubber were driven 500 miles at an average speed of 100 m.p.h. without a blowout. The driver, Wilbur Shaw, hit 90 m.p.h. on the turns and more than 135 m.p.h. on the straightaways. Purpose of the test, equivalent to 50,000 miles of ordinary driving, was to find out whether war-developed synthetic rubber tires now limited to 35 m.p.h. speeds would stand up under the faster speeds after the war.

Bicycle Rider 'Pumps Up' Electric Power For Beauty Shop Driers



Lacking electricity, the owners of a French beauty salon solved their problem of providing electricity for hair driers by installing a dynamo and connecting it with a bicycle. The dynamo generates enough current to operate six driers at once.

Flamethrower May Get Postwar Job Fighting Forest Fires



Conversion of the Army's deadly flamethrowers into a peacetime tool for fighting fires is planned in the Pacific Northwest. Forest officials propose to use the back-pack flamethrower for starting back fires to check runaway forest fires. The device includes a pressure tank and nozzle and a wick through which is forced a combination of kerosene and light machine oil. When ignited, the mixture under pressure ejects a 20-foot sheet of flame that starts slash fires in a matter of seconds as against the slow and uncertain "hand-set" methods. With three such flamethrowers, forest workers were able to slash-burn over 500 acres in a period of days instead of weeks.

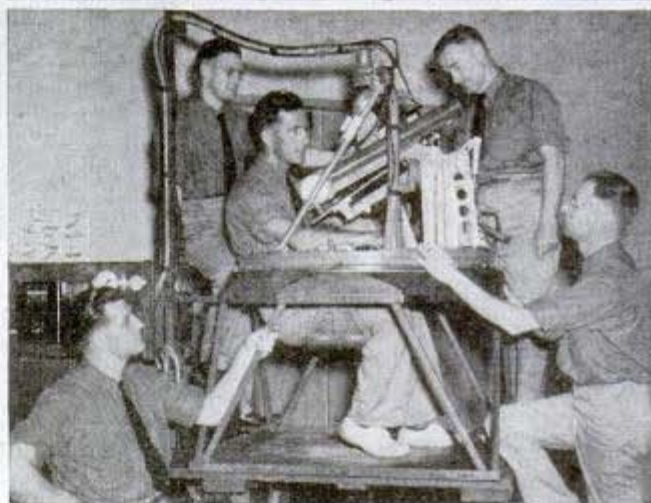
Preflight "High School" Trains Canada Cadets

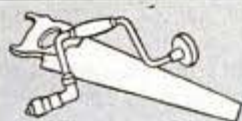


Thousands of Canadian boys, too young for war, receive preflight training in the Air Cadet League of Canada. Aircraft recognition, armament, meteorology, mathematics, radio, navigation, and kindred subjects lay a groundwork equivalent to the first 12 weeks in the RCAF. Cadets attend night classes weekly in winter and spend two weeks at RCAF training station in summer



At top, cadets explore the workings of a radio telephone. Vickers gas-operated gun turret, above, is explained to students by instructor, while nervous cadet, above right, grips .303-caliber machine gun for his first burst of firing. Steel guide at end of barrel prevents too much movement of gun. Cadet instructors, right, who also must study, examine a stripped-down gun turret





The Craftsman



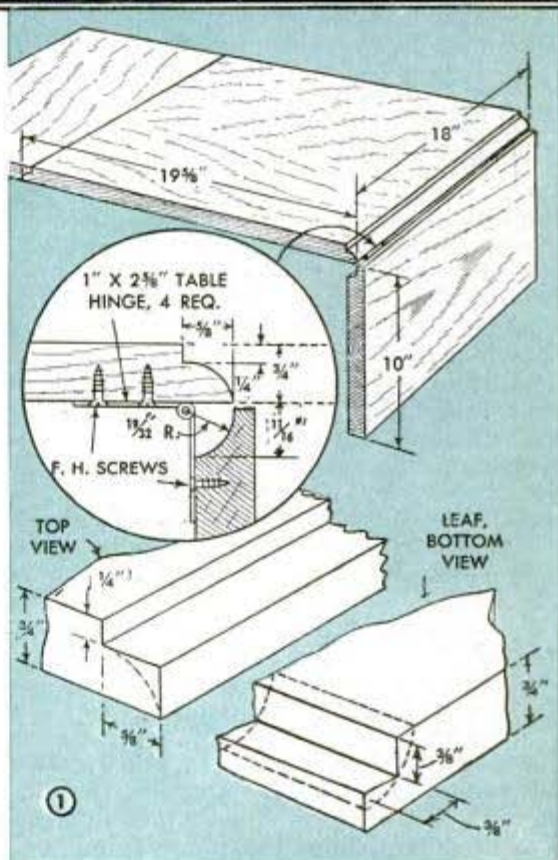
Drop-Leaf PHONE STAND

By Norbert Engels

TWO small drawers in this attractive telephone stand provide ample space for storing directories, memo pads and similar items, which often are stacked on the stand or on the floor nearby. The stand has space for a lamp and a bowl of flowers as well as the telephone, and, used with one or both of the end wings or leaves raised, it will serve as an emergency occasional table in any room in the house.

The stand looks most attractive when done in walnut, mahogany or maple. If desired, its construction can be brought entirely within the scope of hand tools by substituting tapered, square legs for the turned ones. All other work, except the knobs, which may be purchased, can be done with hand tools alone, including the shaped edges of the top piece and leaves as indicated in Fig. 1.

In shaping these edges, preliminary saw cuts remove much of the waste stock and provide a straight rabbeted edge for the joint at the same time, as indicated by the two lower details, which show views of the leaf and table top. The material remaining on the edge of the top is rounded off with a sharp chisel or plane, and excess stock on

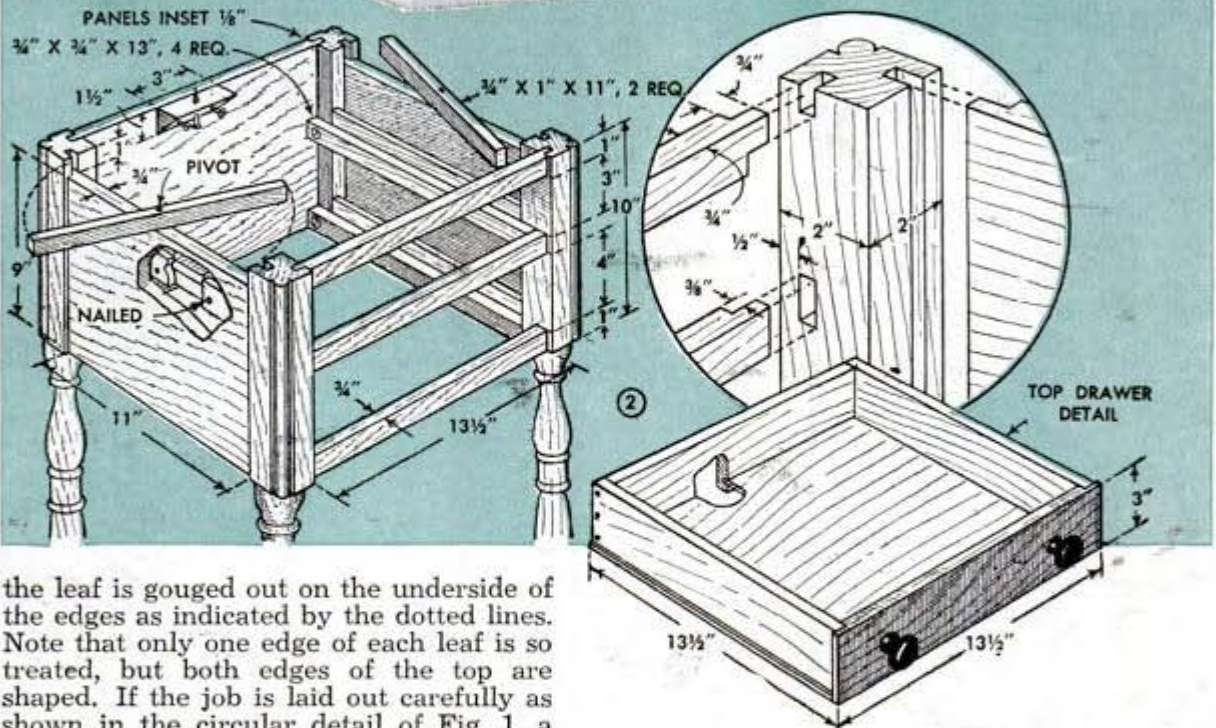


47824 Furniture for your kitchen



until it works freely. Careful attention to this detail will result in perfect positioning of the leaves, whether in the raised position, or hanging as in Fig. 1.

Full length mortises and tenons join the back and both side panels to the legs, Fig. 2, the mortises running $\frac{1}{8}$ in. from the outside surface of the legs. The mortises can be cut by grooving with a rabbet plane, or on a circular saw. The three parting strips that space the drawers are similarly mortised and tenoned. In all these joints the shoulder of the tenon faces toward the outside of the piece. Cut the mortises and tenons carefully



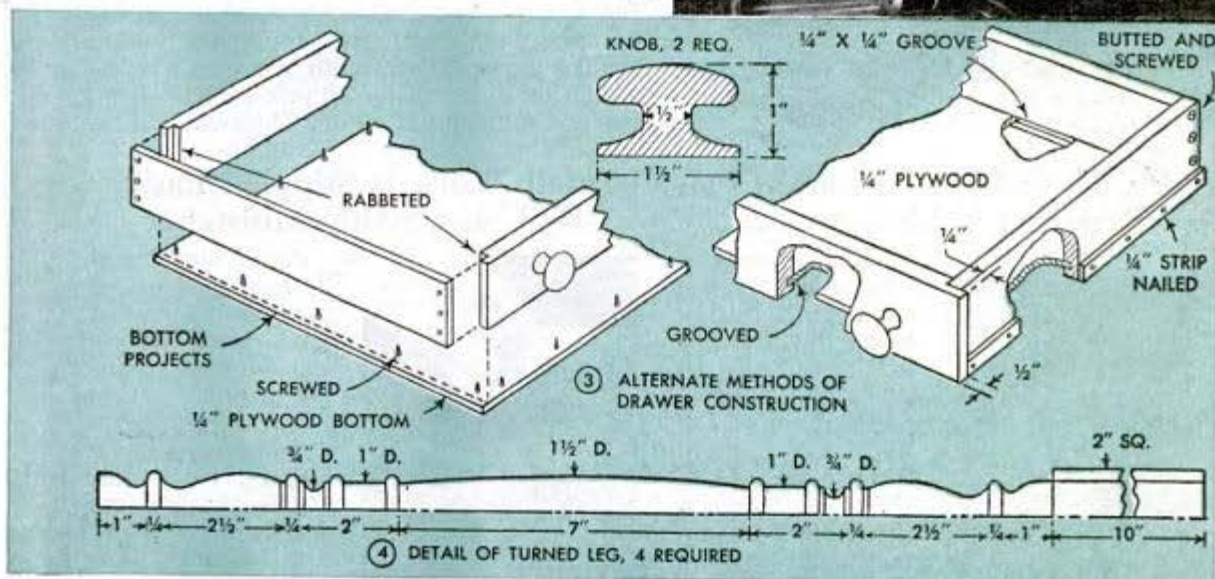
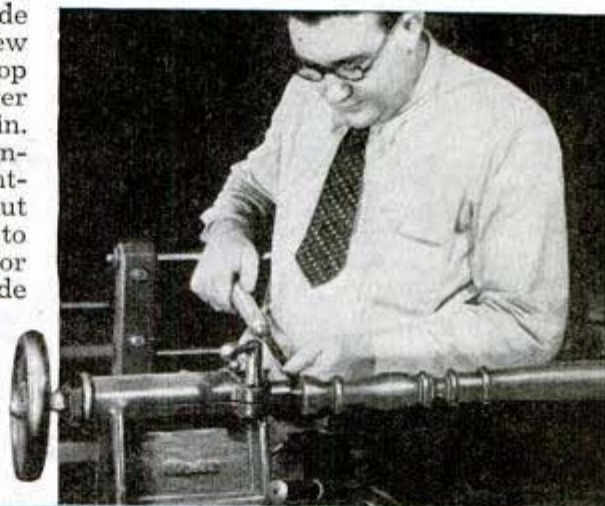
the leaf is gouged out on the underside of the edges as indicated by the dotted lines. Note that only one edge of each leaf is so treated, but both edges of the top are shaped. If the job is laid out carefully as shown in the circular detail of Fig. 1, a neat, free-working joint will result. However, if you have access to a power shaper, much tedious work can be avoided by cutting the joint on it, using a set of cutters designed especially for this kind of construction. The same type of shaper cutters designed for use on a bench saw also are procurable and do the work well. Remember that it is important for the operator to work with the grain of the wood when making these cuts.

Probably the most exacting feature of this project lies in hanging the leaves. This is done with the top piece turned upside down and the leaves in place. Set the four table hinges in position about 4 in. in from both front and back edges, pressing the parts together so that the joint works tightly, and then sand the contacting edges

to get snug fits, and then glue them into place. It is best to run the mortises in the legs before shaping them. When this has been done turn the legs to the size and shape indicated in Fig. 4, and assemble as in Fig. 2. The outside edge of the square portion of each leg may be beaded if desired, but it should be at least slightly rounded. On top of each side panel a 1-in. strip is pivoted to serve as a supporting arm when the leaves are raised to a horizontal position. They bear against the underside of both the leaf and table top and afford a very secure surface.

The drawer runners should be assembled before they are screwed in place. A side strip is nailed to the back of each runner, and acts as a guide for the drawer, thus preventing excessive side movement of the

drawer itself. The position of this guide strip is shown in place in the cutaway view of Fig. 2. Overall dimensions for the top drawer are given in Fig. 2. The lower drawer is similar, except that it is 1 in. deeper. Fig. 3 shows two methods of constructing the drawers. The one in the right-hand detail is of stronger construction, but the one in the left-hand detail is easier to make as there are no grooves required for the bottom, which projects beyond the side to work against the guide strips on the drawer runners. The right detail shows how the bottom is set into grooves in the sides and ends to provide more rigidity. Spacer strips nailed to the sides work against the runner guide strips.



Seine Will Catch Crayfish in Weedy Ponds and Streams

GUNNY SACK HOOKED OVER HEADLESS NAILS

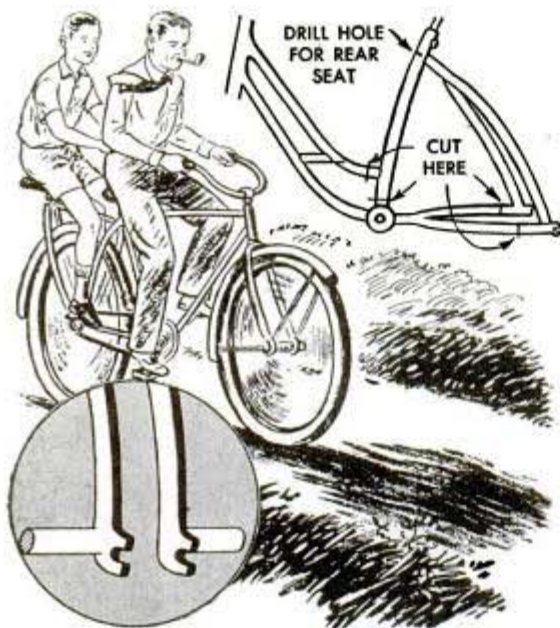


The difficulty of seining crayfish from a pond or stream that contains vegetation, where they usually are plentiful, is eliminated with this seine, which consists of a wooden scoop having a burlap sack at the rear end. If the seine has a tendency to float or not rest heavily enough on the bottom of the pond to flatten the growth as it is pulled along, weight it with a stone or heavy piece of metal. Drilling a number of small holes in the bottom of the scoop also will help it to sink to the bottom.

Kenneth Roden, Chicago.

Securing Tent Pegs in Damp Earth

To keep tent stakes from pulling out of the ground during damp weather, simply drive them in at the same angle as that of the tent ropes to which they are attached. The experience of many campers has been that this is more effective in moist earth than placing the pegs in the usual way.



"Rumble Seat" for Your Bicycle Is Strong and Comfortable

You will find this extra bicycle seat quite an improvement over the usual type because it has a spring cushion and a comfortable footrest. The seat is made by cutting down the rear half of an old frame of a girl's bicycle, as indicated in the upper detail. Only the seat post and rear fork are used. Notice that the horizontal rear fork is cut off about 4 in. from the axle to leave projecting pieces, which then are bent at right angles to form the footrests. Install the assembly so that the seat post is in a horizontal position with the fork straddling the rear wheel and resting on the axle, where it is held by the axle nuts. The front end of the post is clamped to the bicycle under the seat, after which a hole is drilled vertically through the post for installation of a regular bicycle seat.

Malcolm Hannah, Clearwater, Fla.

Worn Threads on Fountain Pen Repaired With Cement



If the threads on a fountain pen become so badly worn that the cap will not stay in place, you can repair them with household cement. Simply coat the threads with a thin film of the cement, let it dry and then screw on the cap. You will

find that the cement has built up the threads sufficiently to hold the cap securely.—Andrew M. Lavish, Washington, D. C.

Small Work Is Stippled Easily By Using Stamp Moistener



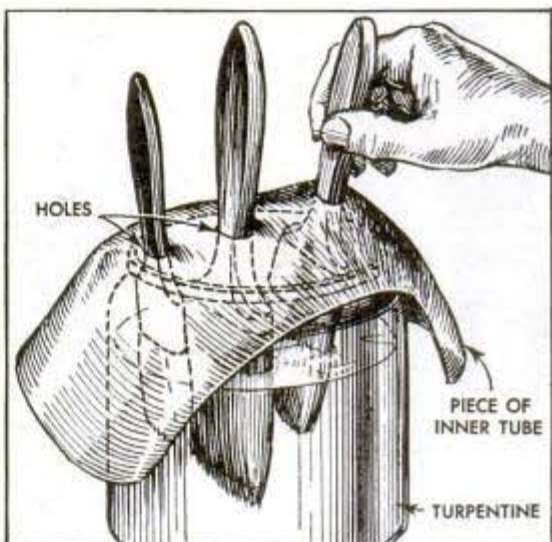
Applicators used for moistening stamps and gummed labels can be used to apply stippled effects on small work such as show cards, Christmas cards, etc. In cases where the color mixture is of a thin consistency, the mixture can be

poured right into the barrel of the applicator to work out through the sponge or brush end.—Herman Klein, Pittsburgh, Pa.

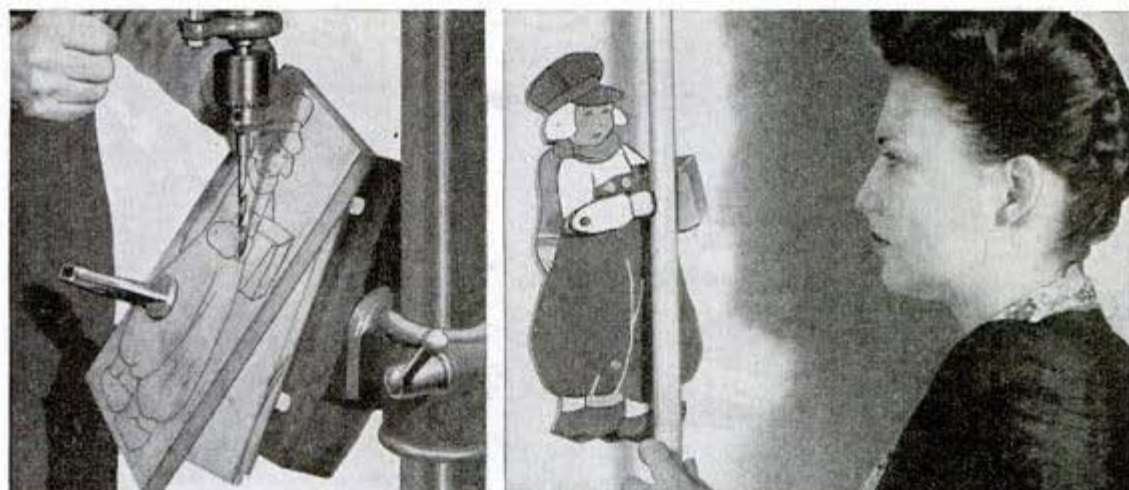
Preserving Wet Paintbrushes

When you want to keep paintbrushes in turpentine or other solvent overnight or for a few days to keep them from drying out, here is a good way to do it. Cut a piece of old inner tube to a size that will cover the top of a large can and come down well over the sides as indicated. Then put turpentine in the can and punch a 1/4-in. hole in the rubber for each brush handle. Push the handles through the rubber and insert the brushes in the can. The rubber will hold the bristles above the can bottom, thus preventing them from becoming bent, and at the same time close the top of the can tightly enough to help prevent evaporation of the solvent. It is possible to protect brushes for several weeks in this way.

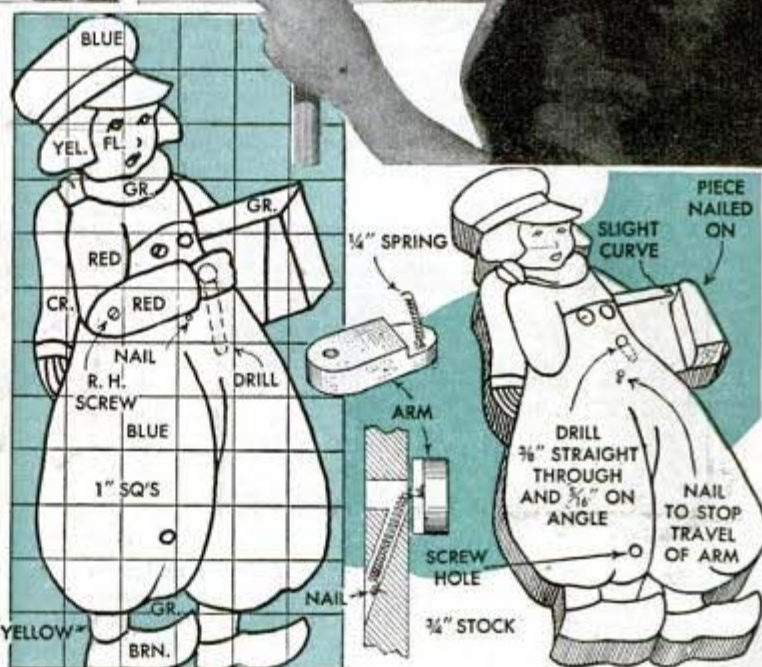
P. L. Brownell, Omaha, Nebr.



Dutch Boy Cutout Is Keeper of Kitchen Broom

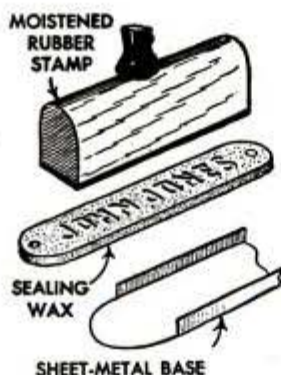


A firm grip with instant release are features of this unusual broom holder, which is both practical and attractive. As shown in the illustrations, the broom handle is held by being wedged between the figure's movable arm and a small backstop block. Positive tension on the arm is supplied by a light coil spring that works in a hole bored at an angle through the cutout. Boring this hole is simplified by first drilling straight through the work to provide a land for starting the drill on a slant, as shown in the left-hand photo. The color scheme is given in the center detail.



Name Plates From Sealing Wax

Attractive name plates to identify mail boxes, house-bell push buttons, etc., can be made easily from sealing wax. First, a base is made from tin or sheet metal as indicated, after which pieces of the wax are placed in the base and both the base and wax heated to melt the wax. Then a rubber stamp carrying the desired lettering is moistened with cold water and applied lightly



to the wax surface and held for a second or two. Metal or rubber type also can be used to form the lettering in the wax. To make the lettering distinct, paint it a color to contrast with that of the wax and wipe off the surplus, leaving it only in the depressed portions of the lettering.

Frank Shore, New York City.

Plant Cuttings Grow Sturdy Roots When Started in Coal Ashes

Plant cuttings will be almost entirely free from disease and fungus growth and will produce larger and more vigorous root systems, according to some plant scientists, if they are placed in anthracite coal ashes while they are striking root. After they have started to grow, they are transplanted in the usual manner.

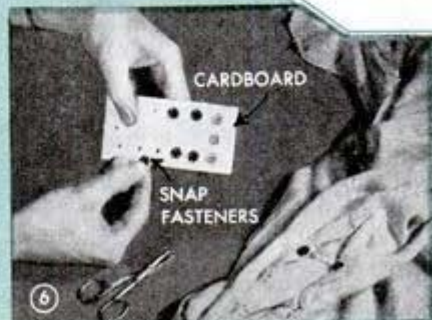
Solving HOME



1: When making articles of oilcloth you can prevent it from splitting or cracking at the seams if you sew on a piece of paper as shown. The paper then is torn off to leave a perfect seam. 2: An empty salt carton that has a pouring spout provides an excellent flour dispenser. Placed near the stove, it will save many steps, and a flip of the spout closes it



3: After transferring an embroidery design to the material, color the transfer sheet with crayons to show the various colors. This saves time, and you won't have to refer to the chart for the colors. 4: If you are leaving your home for several days, mulch your potted plants with cardboard disks and they will stay moist

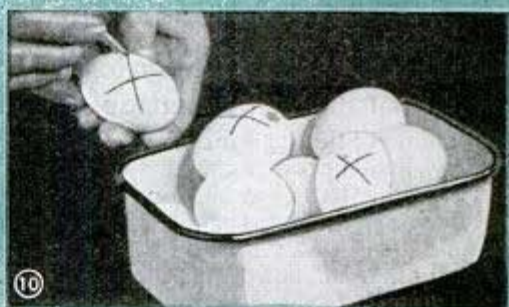
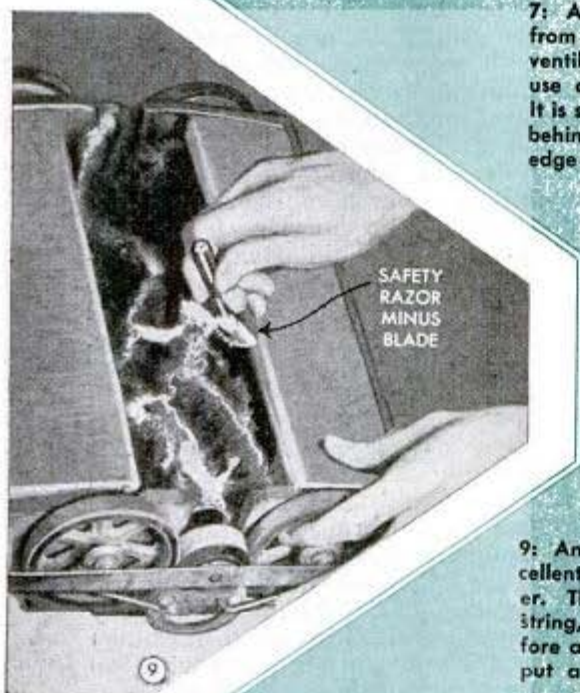


5: Fleece-lined work gloves turned inside out provide handy polishing mitts for cleaning silverware. 6: If you save dress snap fasteners, punch a thin card and attach the fasteners to it

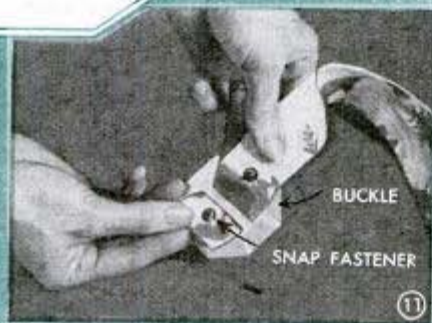
PROBLEMS



7: A crutch tip will prevent a broom handle from marring walls and furniture. 8: You can ventilate an attic without rain entering if you use a window ventilator like the one shown. It is shaped from light sheet metal and is nailed behind the stop strips at the sides and to the edge of the sill at the bottom to exclude rain



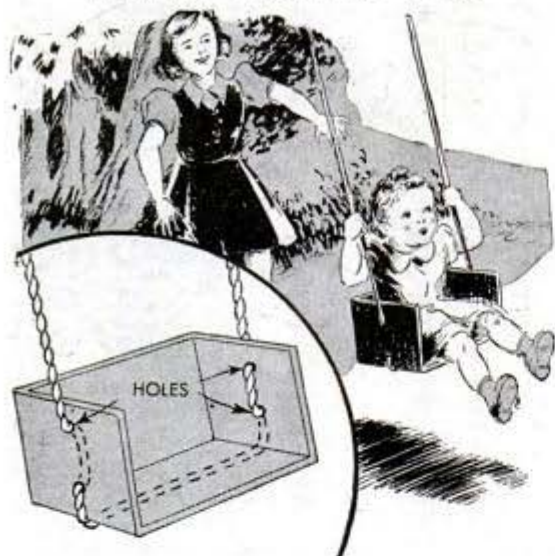
9: An old safety razor minus the blade is excellent for cleaning the brush of a carpet sweeper. The teeth of the razor easily catch lint, string, etc., and pull it from the brush. 10: Before adding new eggs to your refrigerator pan, put a pencil mark on the shells of any left over so that they will be used first



11: A buckle of a dress belt attached with a snap fastener is easily removed for washing. 12: To avoid stretching a washed sweater, rinse it in a colander and squeeze out the excess water



Young Children Can Swing Safely In This "Non-Tip" Seat

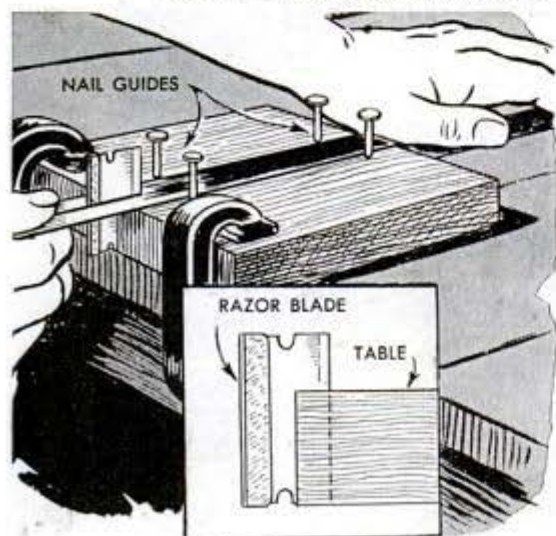


Children too young for ordinary swings will be safe if the swing is equipped with a seat that will not tip. Box construction and threading of the rope through two holes in each side make this seat particularly safe.

Leather Thongs Made Quickly With Emergency Cutter

Cutting leather thongs for shoelaces, belt lacings, etc., can be done accurately with an emergency cutter like the one shown. It consists of a safety-razor blade driven into the end grain of a wooden block as indicated and clamped to a table. Four nails in front of the blade serve as guides for the leather strip. In use, the leather is slit at one end the width desired for the thongs. Then the nail guides are located accordingly, and the leather is pulled across the cutting edge of the blade.

Chester Upton, Evansville, Ind.



Bronze Powders in Many Colors Give Work a Metallic Finish

Bronze powders in all the colors of the rainbow as well as in gold, silver, brass and copper can be purchased in various size containers, even in small 10-cent glass tubes, thus putting bronze finishing within the reach of any craftsman. These powders are real metals that undergo a pulverizing process and emerge as tiny polished flakes. When a good quality powder is applied properly, it furnishes a coat of actual metal on the work, giving the piece the appearance of solid metal. Much of the copper and brass hardware, statuary, ash trays, etc., made today are simply steel stampings or iron castings with an attractive, durable bronze finish added.

Bronze powders will keep indefinitely in a dry state, but deteriorate rapidly when mixed with any vehicle. Hence, the first rule in application is to mix only as much as you need for the job at hand. The mixing liquid can be any clear varnish or lacquer. So-called bronzing liquids and bronzing lacquers are simply products formulated to have the desirable features of toughness, clearness and powder suspension needed for best results. Do not use too much powder—about 1 tablespoonful to the pint of liquid will give full coverage.

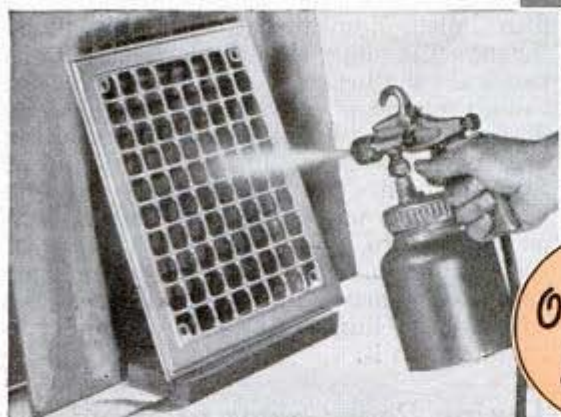
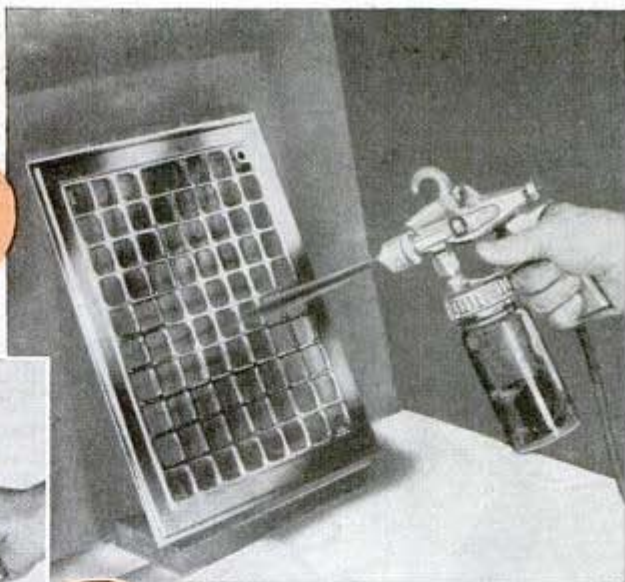
The work must be smooth. Bronze powder does not cover defects, and if a smooth metallic finish is desired, the surface itself must be perfectly smooth to start with. It always is good practice to apply a priming coat of clear liquid only, using the same material as for the bronze powder. If the work is rough or porous, such as wood or rough castings, it should be given a coat or two of primer-surfacer (the standard gray or white product used in metal finishing) and sanded down between coats with 5/0 paper to a perfectly smooth surface.

While a plain coat of bronze powder makes an attractive finish for many projects, most bronze finishes are shaded. This can be done by spotting or shading an enamel coat (usually black or green) over the bronze coat, or by applying a glaze or smut coat of thin pigment and then wiping off the excess with a cloth to give the appearance of high lights. Both methods have many variations and require a little practice in order to get artistic results.

Ordinary bronze powders cannot be buffed, but a high polish can be put on the work by applying a coat or two of clear lacquer over the bronze coat to serve as a protective covering. This then can be buffed or polished to any degree of gloss desired without damaging the bronze finish underneath.

How to Use

BRONZE POWDERS



Oxide finishes

Oxide finishes imitate the oxidation or rusting of metals. Various color combinations to effect this appearance can be used, the most common of these being a ground coat of brass or copper powder spotted or shaded with thin black lacquer. The two photos at the top of the page show the technique as applied by means of a spray gun to a hot-air register. The metal, of course, first must be clean and smooth. A first coat, of the vehicle liquid only, makes a good primer. This is followed by the bronze coat. The shading lacquer should be very thin, with the gun adjusted for good feathering of the edges. A black color can be made by adding one tablespoonful of black lacquer to a pint of bronzing liquid. A finish coat of clear lacquer, either flat or gloss type as desired, is added to complete the operation.

How powder is mixed →

Bronze powder can be mixed with almost any kind of clear varnish or lacquer, the best vehicle for spray application being a water-white lacquer. One tablespoonful of bronze powder to one pint of lacquer is sufficient for full coverage. The solution does not keep; therefore only as much as needed immediately should be made up



Smut finishes

Smut finishes imitate corrosion. The base coat is colored bronze powder. The smut is made by mixing pigment color in japan with turpentine to a thin paste. This is brushed on, then wiped off before it dries, exposing high lights. The finish is protected by clear lacquer. A smut coat of umber over gold bronze powder gives an antique gold finish; a chrome-green smut is excellent for antique effects, with bronze or brass powder for an undercoat

Positive Control of Your Kite Line With This Simple Brake



You won't have the kite string jerked out of your hand or have your fingers cut or burned by the string if you use this brake to control it. The brake, which permits the string to be payed out as desired by the pressure of your thumb, is made from a piece of leather, the end of an old trouser belt being ideal for the purpose. Just cut slots from opposite edges of the belt into the first two holes from the end, and then cut a third slot from the belt edge into the fifth hole. Now thread the kite string through the slotted holes as indicated. In use, hold the brake in your hand with the thumb on top of the leather between the first and second holes and the index finger on the underside of the leather in front of the first hole. The other fingers grip the brake on the underside between the second and third slotted holes. Pressure of the thumb tends to fold the brake and thus apply resistance to movement of the string without the fingers actually coming into contact with it.

Holder for Snelled Fishing Flies

If you have trouble with your snelled fishing flies becoming entangled, use a simple holder like the one shown, which is merely a piece of garden hose of suitable length. Just slip the hooks over one end of the hose and then notch the other end to take the knotted end of the gut as shown.

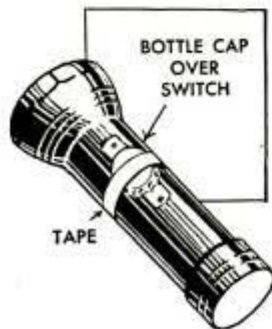


You can make up different lengths of holders to suit the various lengths of the hooks you usually use.—Corp. D. Roberts, Arcadia, Calif.

Shield Over Flashlight Switch Protects It in Tool Box

When a flashlight is carried in a tool box, tightly-packed bag or other container where there is a possibility that the switch may be turned on by contact with another

article, use a shield as indicated. The shield is simply a bottle cap which is inverted over the switch, where it is held in place with a piece of adhesive tape or a wide rubber band.—Pvt. Tom Colwell, San Francisco, Calif.



Taping Paper Signs to Windows



Small signs of paper or cardboard can be taped to a window so that the tape does not show. To do this, use an ordinary index card or other cardboard and punch holes near the corners. Then apply adhesive tape over the

holes at the back of the card and you can stick the card neatly to the window by simply pressing on the tape over the holes so that it comes in contact with the glass.

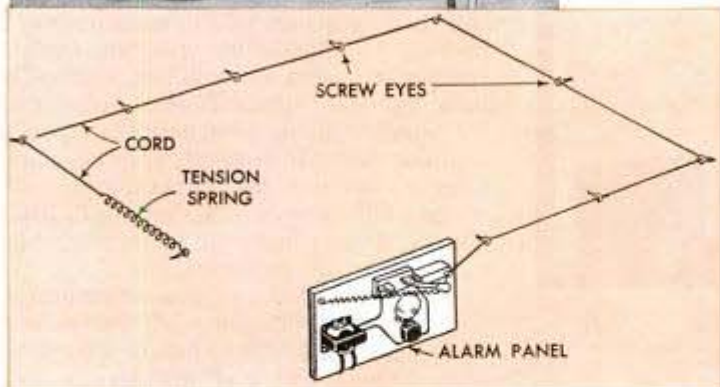
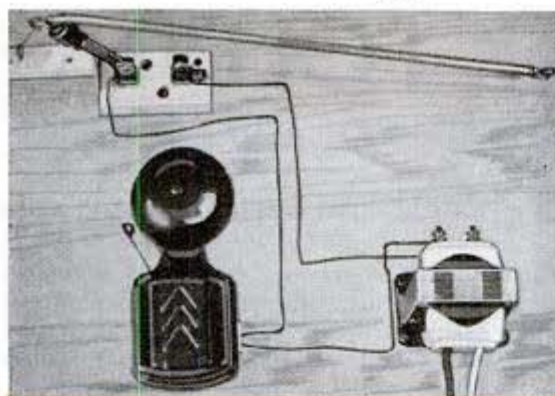
Joseph Jay Gold, Brooklyn, N. Y.

Tips Made on Rawhide Shoelaces With a Lighted Match

Hard tips can be put on rawhide shoelaces, belt lacing, etc., simply by holding the ends of the lacing in the flame of a lighted match. Slowly rotate the end of the lace while doing this, and take care not to char the leather. Apply the heat just long enough to harden the tip sufficiently.—H. Smith, Pottstown, Pa.



Fire Alarm Rings When Retaining Cord Burns



Costing less than a dollar, this fire alarm is simple, easy to make and install, and effective, particularly for garages, barns and other outbuildings where a fire may not be detected instantly. The alarm consists of a doorbell wired through a trans-

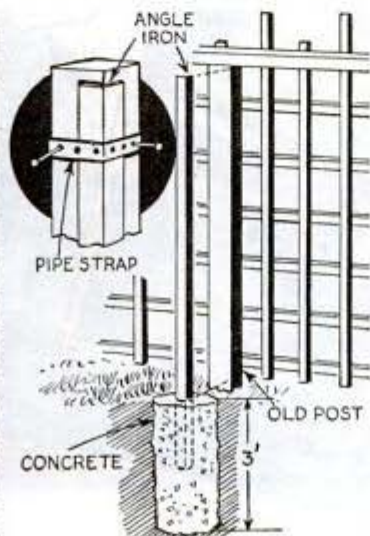
former to a single-throw knife switch. This is held open by a screen-door spring attached to a length of cord, which is strung through screw eyes driven into the wall around a room and tied to the switch blade. Another spring of slightly less pull exerts tension to close the switch and cause the bell to ring when the cord is severed by fire.—R. E. Bertrand, Dearborn, Mich.

Rotted Fence Posts Strapped to Angle Iron Set in Cement

When a high wooden fence surrounding the property of one home owner was threatened with destruction because the wooden supporting posts had rotted off un-

derground, it was repaired easily with a few lengths of angle iron, as shown in the illustration. These cost only a fraction of the price of new wooden posts, and saved the owner the work of rebuilding the fence. First, holes were dug about 3 ft. deep under each rotted post, then cement was poured into the holes and suitable lengths of angle iron were embedded in it. When the cement had set, the old posts were realigned in their original position and attached securely to the angle iron with pipe straps. Of course, the angle iron can be drilled for screws if desired.

John A. Haig, Alhambra, Calif.



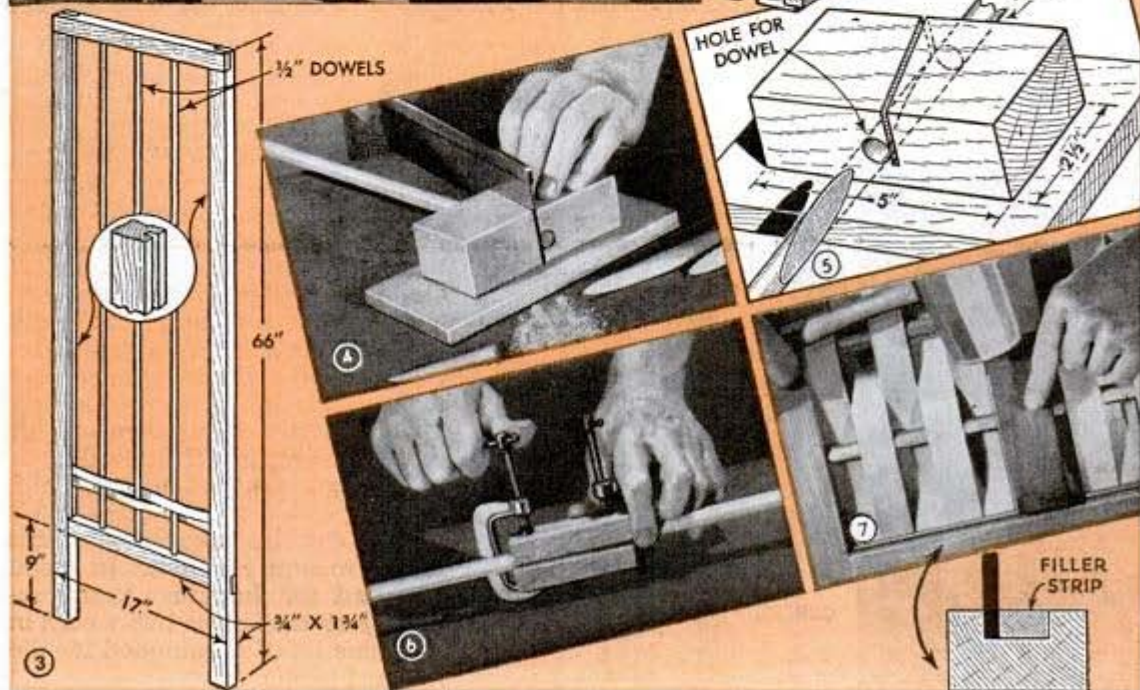
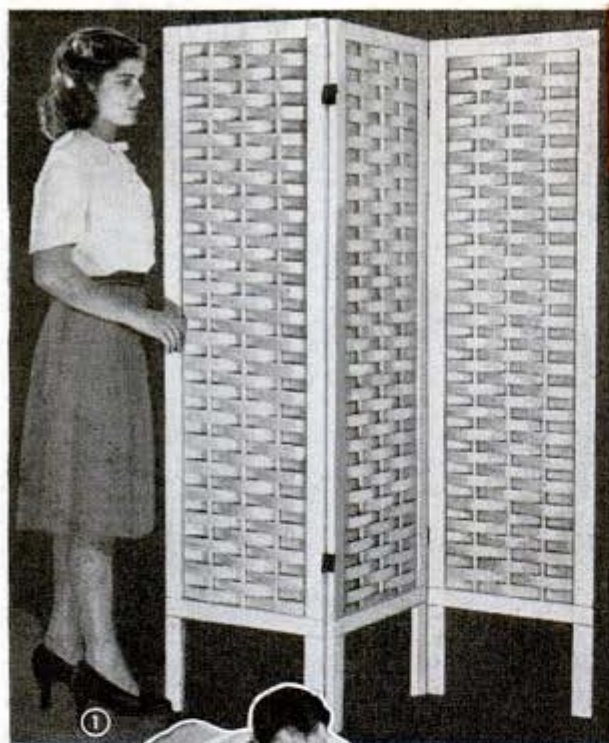
❗ You can be assured of "just right" moisture content in wood intended for furniture construction by storing it for two weeks in the same location intended for the finished project.

Here's FOLDING

By
Chas. and Bertram Brownold

FLOOR screens are not only useful and attractive, but they are interesting projects to make. The dimensions and number of sections of a screen can be varied to suit. Each of the three sections of the screen shown in Fig. 1 is made by weaving basket splints between dowels set vertically in a wooden frame. Basket splint can be purchased, or you can rip it on a circular saw. If desired, very unusual effects also can be worked out with strips of thin plywood, linoleum, fiber board, sheet plastic or other durable, flexible material.

Fig. 3 shows the construction and dimensions of the screen sections. The facing edges of the vertical members are grooved as indicated. If dowels of the required length are not obtainable, shorter pieces can be spliced together. A glued,



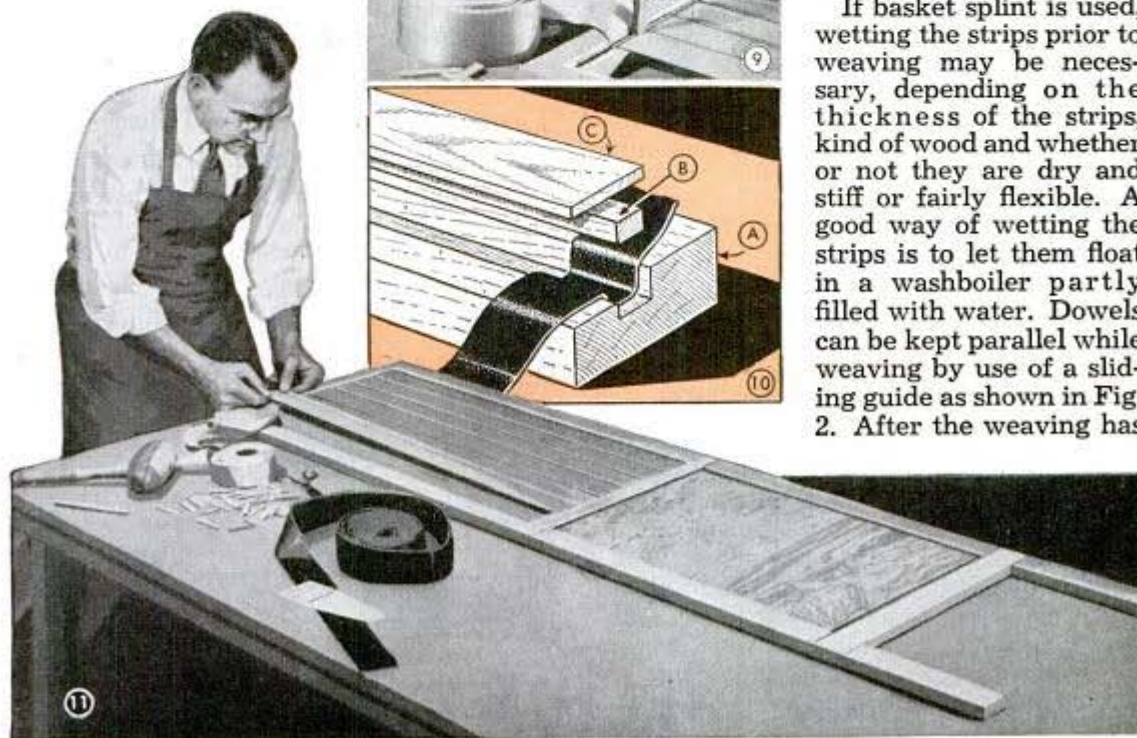
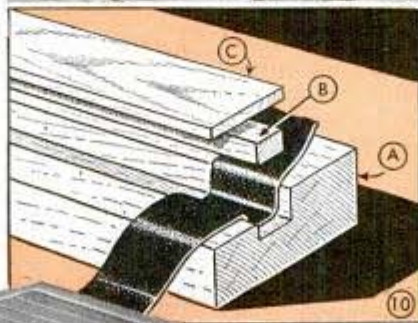
Novelty in SCREENS

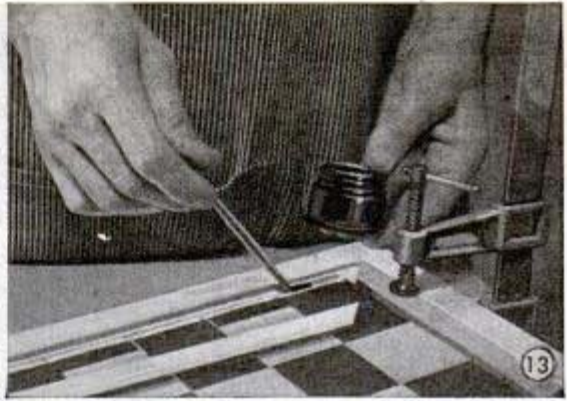
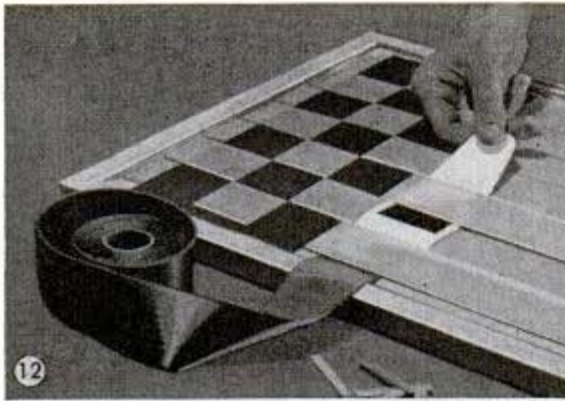
diagonal splice is strong and easy to make, particularly if a miter box like the one shown in Fig. 4 is used. It is a block of scrap wood with a hole drilled through it and a saw cut made as shown in Fig. 5. The block is nailed to a suitable base. When gluing up the diagonally-cut ends of dowels, hold them in alignment by means of two grooved blocks as in Fig. 6. Place waxed paper in the grooves so that glue extruded by pressure of the clamps does not cause the blocks and dowels to stick together. After the glue has dried and the sticks have been cut to the correct length, they are secured in the frames, their ends being forced into sockets drilled in the horizontal members.

The next step is weaving in the flexible strips. You can save time by fitting the first strip accurately and then using it as a template to cut a supply of similar strips. To fit correctly, the ends of a strip must butt against the bottom of the grooves, and it must be in contact with all three dowels. If it is

too long, it will stand away from one or more of them.

If basket splint is used, wetting the strips prior to weaving may be necessary, depending on the thickness of the strips, kind of wood and whether or not they are dry and stiff or fairly flexible. A good way of wetting the strips is to let them float in a washboiler partly filled with water. Dowels can be kept parallel while weaving by use of a sliding guide as shown in Fig. 2. After the weaving has





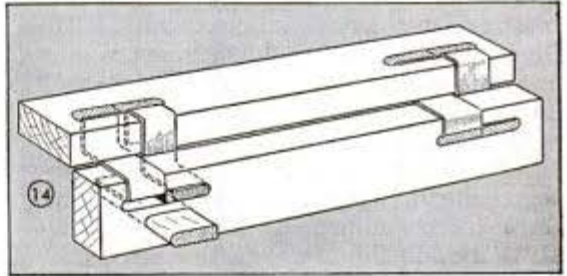
been finished, anchor the ends of the splints in the grooves of the frames by forcing filler strips into the grooves as shown in Fig. 7. Apply glue to the strips before driving them into place.

The three sections of the screen are fastened together with four double-acting hinges especially designed for use on screens of this type. If such hinges are unavailable, you can make two-way hinges of webbing or leather as shown in Fig. 14. Two pieces of webbing form one hinge. Each piece is attached to one side of one frame, and to the opposite side of the adjacent frame. The webbing is inserted into openings made in the frames and is held in place by tight-fitting wedges glued into the openings. The finish given the completed screen is governed by furnishings where it will be used, and by the material from which it is made. The screen described was made of basswood splints in pine frames, finished with two coats of clear shellac.

Fig. 8 shows a two-section screen, each section being a frame consisting of two vertical members with three horizontal members jointed into them. Stock dressed to $\frac{3}{4}$ by $1\frac{3}{4}$ in. is used. A panel of $\frac{1}{4}$ -in. plywood glued into grooves forms the lower part of each section, the panel being decorated with a rectangle of $\frac{1}{2}$ -in., half-round molding nailed and glued in place.

The upper part of each section is made of two colors of ribbon woven into a checkerboard pattern. Before gluing up a frame, dado the portions of the vertical and horizontal members to which the ribbon will be secured so that they have a shape like piece A in Fig. 10. The surfaces of the members between the grooves and the inner edges (the left-hand portion in the detail) are cut down $\frac{1}{8}$ to $\frac{3}{16}$ in. lower than the surfaces toward the outer edges. Make a hardwood strip, B, and cut it into pieces of the same length as the width of the ribbon. Then, cut a thin piece, C, wide enough to cover both the strip and the low-surface side of the member.

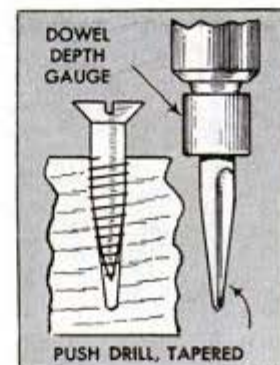
Lay one end of the ribbon in the groove



and anchor it in place by driving in one of the hardwood pieces as in Fig. 9. Pull the ribbon tautly across the frame, Fig. 11, secure it in place in the same way on the other side, and then cut it off with a razor blade. Put all the long, vertical strips of ribbon in place before weaving in the short horizontal ones. To weave in the horizontal strips, you can improvise a "needle" from stiff cardboard and use it as in Fig. 12. After the weaving is complete, miter the corners of the flat strips and glue them in place, Fig. 13. This screen is hinged in the same way as the one first described.

Tapered Drill Makes Pilot Holes For Driving Small Screws

Having a number of slender brass screws to drive for placing small hinges on boxes, I ground a fluted push-drill bit to a long taper to match the



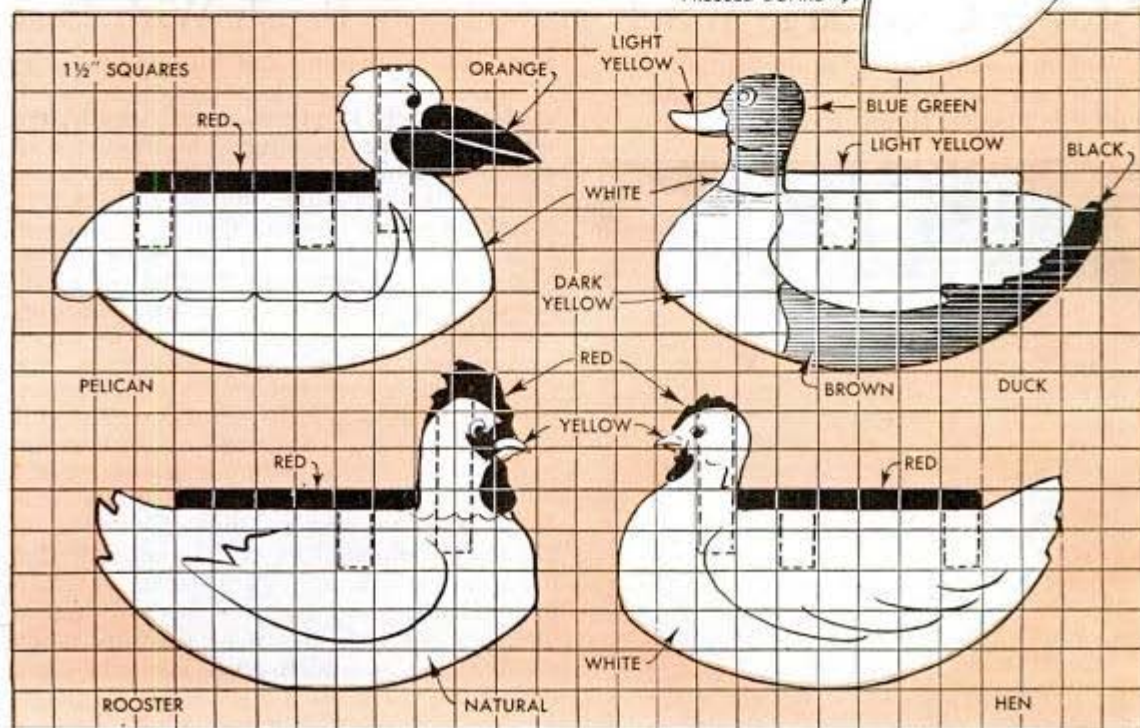
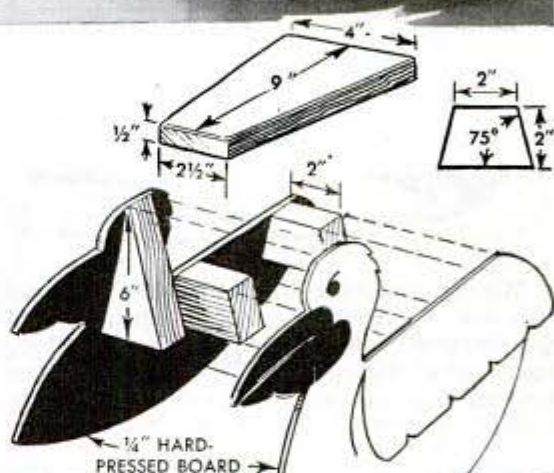
taper of the screws, and used it to drill pilot holes, after providing a depth gauge on the drill bit as shown. As the holes were the same shape as the screws, the latter went in easily and held tightly.—C. E. Barker, Regina, Sask., Can.

Hot glue can be deodorized easily by adding a few drops of oil of wintergreen or other scent while stirring.

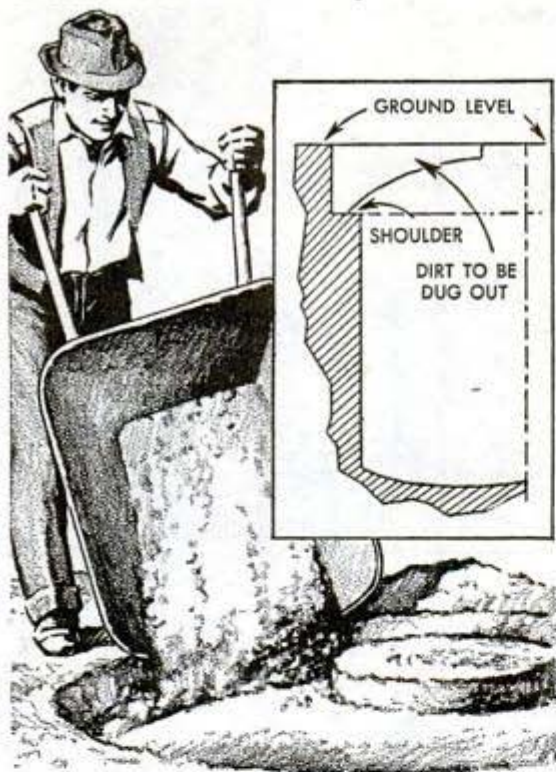
ROCKING BIRDS

Amuse Little Tots

THESE bird cutouts not only rock to amuse the kiddies, but are strong enough for them to sit on. The sides are screwed to wedge-shape filler blocks that spread them so that the rocker will not tip over with its little rider. First copy the outlines of the sides to $\frac{1}{4}$ -in. plywood, hard-pressed board or any other suitable material and jigsaw them to shape. Then, from a length of 2 by 4-in. stock, cut the blocks as shown in the detail, and screw them in place, fitting the sides to them so that the top edge of the heads meet and the tails spread out. Over the blocks screw a tapered saddle, and you are ready to add the finishing touches. Sand the birds thoroughly to remove any rough spots or splinters that may injure the rider, then paint the work as indicated in the cross-hatched drawing. For clearest coloring, first apply a flat-white undercoat. When painting toys such as these, which require several different colors, it is best to use tube oil paints and a can of white enamel. Then any desired color may be mixed in small quantities without waste. If the birds are to be used outdoors, coat them with spar varnish.



Concrete Cistern Curb Poured Without the Use of a Form



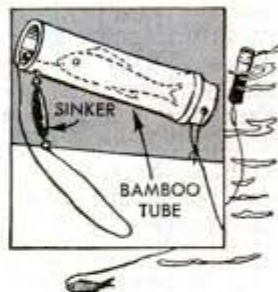
When a cistern is to be dug you can save the work and material of making a form for the concrete curb if you pour it before excavating the cistern. To do this, remove enough dirt to form a pattern of the curb, leaving soil in the center to form an open-

ing or manhole. Make the curb several inches larger than the cistern so that it will be supported on firm ground while making the excavation. After the curb has been poured and the concrete has set, you can dig the cistern, taking the excavated material out through the manhole.

Sam Gardner, Staunton, Va.

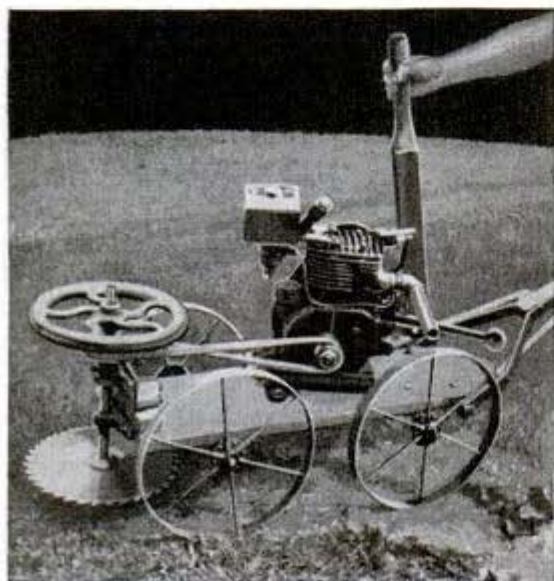
Live Bait Cast in Bamboo Tube Is Not Torn From Hook

The problem of casting live bait without having it torn from the hook was solved by a Wisconsin sportsman who placed it inside a bamboo tube as shown. The tube is made by cutting out a section of bamboo near a joint so that the tube is open only at one end. The casting line is tied to this end. To the other end is tied a short line carrying the hook and sinker. The minnow is hooked through the gills and dropped tail first into the tube, which then is filled with water and cast like a ball with the hand, not the rod. The tube protects the minnow, which swims out when the tube hits the water. The sinker keeps the hook under water and the tube acts as a float.



Mower Cuts Large Weeds and Heavy Brush With Ease

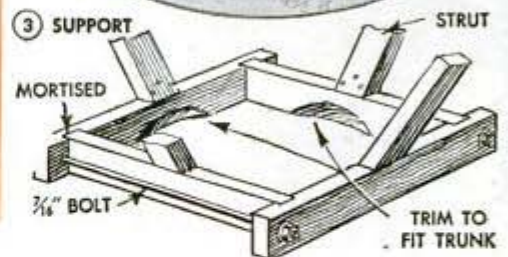
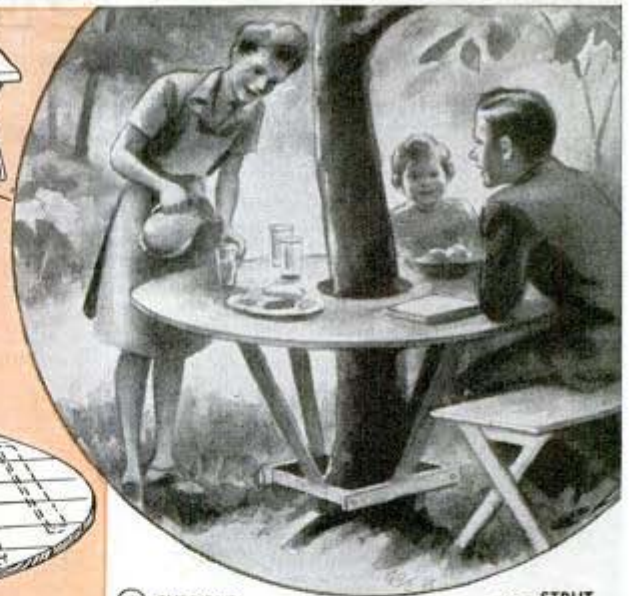
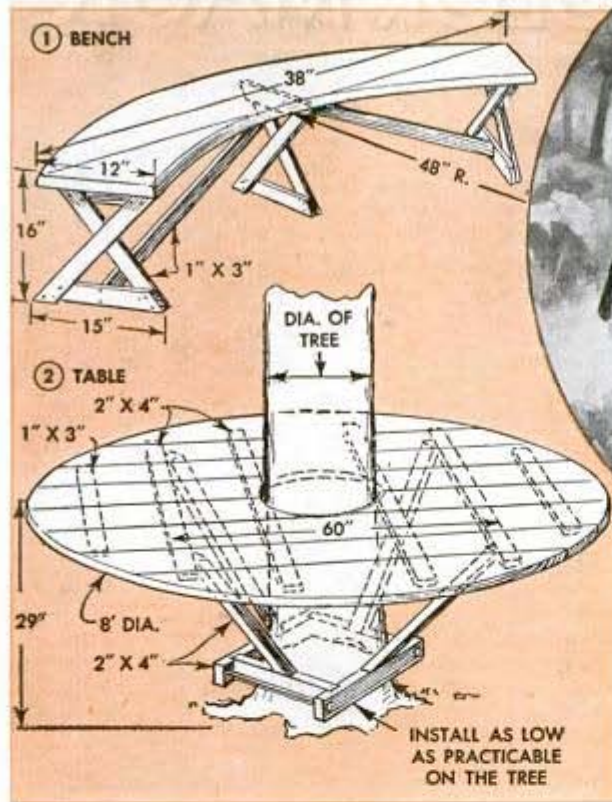
This unusual mower makes quick work of cutting large weeds and heavy brush, and it is just the thing for trimming around



the bases of ornamental bushes, close up around trees and along fence rows. If pushed slowly it will even cut small trees up to 1½ in. in diameter. The mower consists of a 14-in. circular-saw blade mounted on a vertical mandrel, which rotates in a couple of pillow blocks. These are screwed to a crosspiece, which is bolted to a wide oak board that serves as the body of a cart mounted on four wheels. A 4-in. V-pulley and a large flywheel are put on the upper end of the mandrel, which is driven by a ⅝-hp. engine as indicated. A pulling handle is attached rigidly to one end of the cart and a lever is fastened to the starting pedal on the engine so that it can be started by merely giving the lever a quick pull. Mounting the saw so that it clears the ground by about 2 in. will be suitable for most work. If uneven ground surfaces make it necessary to have the saw higher at times, merely raise it by pushing down on the handle, which will raise the front end of the truck off the ground.

Ethan Viall, Knox, Ind.

Picnic-Lunch Table Clamps Around Tree Trunk

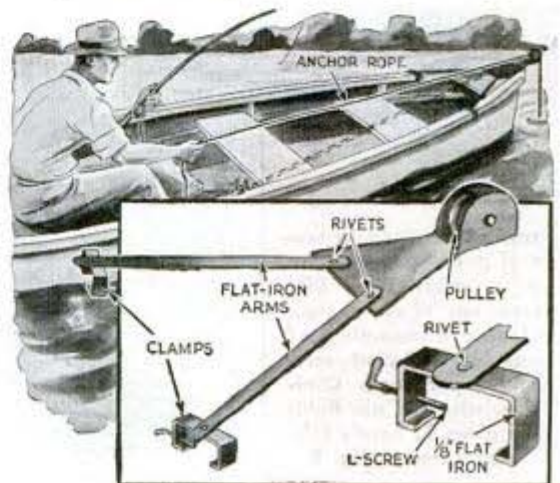


In building a picnic table under a shade tree, it isn't necessary to injure the tree by using lag screws or nails to hold the table in place. Just prop the table top on four struts nailed to a frame, which fits around the tree trunk. The frame is made by mortising four lengths of 2 by 4-in. stock, trimming the inner edges to conform to the shape of the tree trunk near the ground, and then clamping the pieces together tightly with two long bolts as in Fig. 3.

The table top consists of rough, weathered boards screwed to 2 by 4-in. cleats, Fig. 2, the two center cleats being drawn snugly against the tree when the boards are attached. It is best to use a level to prevent a tilt that may cause articles to roll off. A bench to match is made as in Fig. 1. This also is made of weathered stock, surfaced to remove splinters, and is cut on a curve to conform to the table top.

Anchor Hoist Is Attached to Any Boat by Flat-Iron Arms

If you have an anchor hoist made for a particular boat, and wish to make it fit a boat of different prow width, just rivet two arms to the hoist as shown. The arms can be made of $\frac{3}{16}$ -in. flat iron, about 1 by 12 in. They are attached to the gunwales by clamps. These are tapped for L-screws, then bent to shape and riveted to the end of the arms.—R. F. Gomoll, Chicago.



PASSING UP AN OPPORTUNITY?

Have you ever said "That's a good idea for Popular Mechanics" but you failed to send it in? Next time, don't pass up an opportunity—write a short description, include a clear photo or drawing, and mail it to the Homecraft Editor. If your idea is accepted, a check will be sent promptly.

COLOR MAGIC

What black light is

Shortwave or ultraviolet radiations are popularly called black light. Most powerful white lights produce invisible black light when white rays are screened out with a filter

What it does

Black light is associated with the effect known as fluorescence. Fluorescence is the property possessed by over 3,000 materials of glowing or changing color when exposed to black light rays

Bradley Smith photo

NON-FLUORESCENT SURFACE
FLUORESCENT PAINT (INV. BLUE)
FLUORESCENT PAINT (VISIBLE BLUE)

①

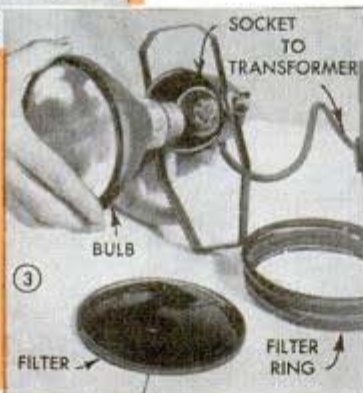
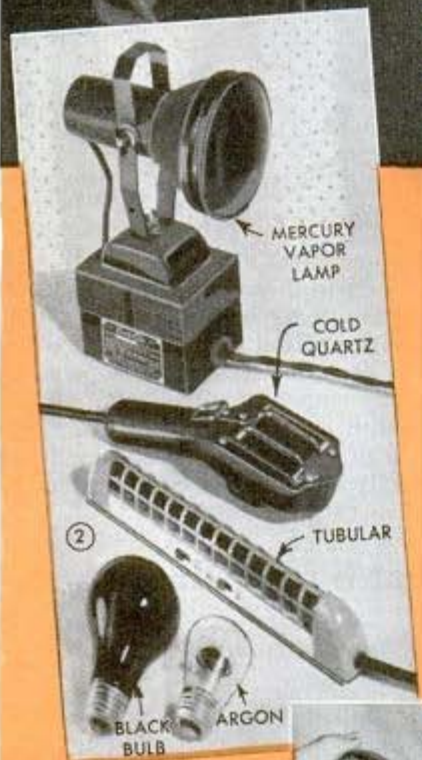
By Judith Richardson

WHETHER it's for fun or profit, you're sure to get a thrill out of black light, the latest brain-child of lighting science; a magic invisible ray that transforms "ugly ducklings" into colorful beauties.

Black light consists of a wide band of radiations immediately below the visible spectrum. If you filter out the white light from sunlight or any other strong white light, the remaining black-light rays then will be able to demonstrate their magic. What it is and what it does is indicated in Fig. 1. This magic is called fluorescence, and, simply put, means that various materials change color or glow when exposed to black-light rays. Over 3,000 materials are fluorescent, and the strongest of these materials are incorporated in paints, silks, cosmetics, plastics, coated paper, smoke powders and other products.

Popular light sources to activate these materials are shown in Fig. 2. Lamps for this purpose are available in several styles from 50 cents up. Fig. 3 shows the disassembly of the 100-watt mercury-vapor lamp, which is most popular of the various black lights. Fig. 8 gives data which will enable you to pick a light for your purpose.

How do you use this black light? Well, if you want it just as a hobby or for decoration, look at the little whatnot cabinet shown in Fig. 4. Nice enough under white light, but

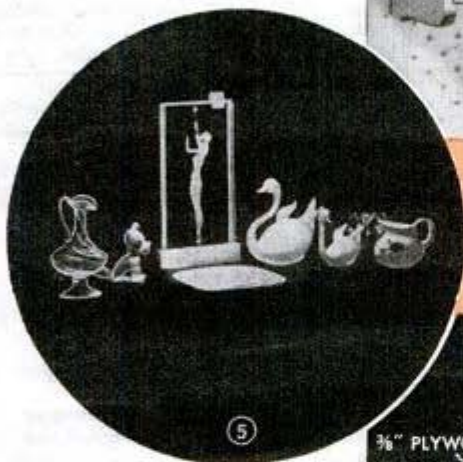


Black lights

can be obtained in several popular styles in a price range from fifty cents up. Photo at right shows disassembly of popular 100-watt mercury-vapor flood. Characteristics of all lights are given in handy tabular form in Fig. 8

with BLACK LIGHT

under black light the display on the lower shelf is truly a magic fairyland of color. Fig. 5 is the poor reproduction in black-and-white, but it will give you an idea of how the black light makes fluorescent objects glow. Best results are obtained in a darkened room, but this doesn't mean you have to turn off all the lights. Fig. 6 shows the arrangement of the lamps and how the shelves are constructed.

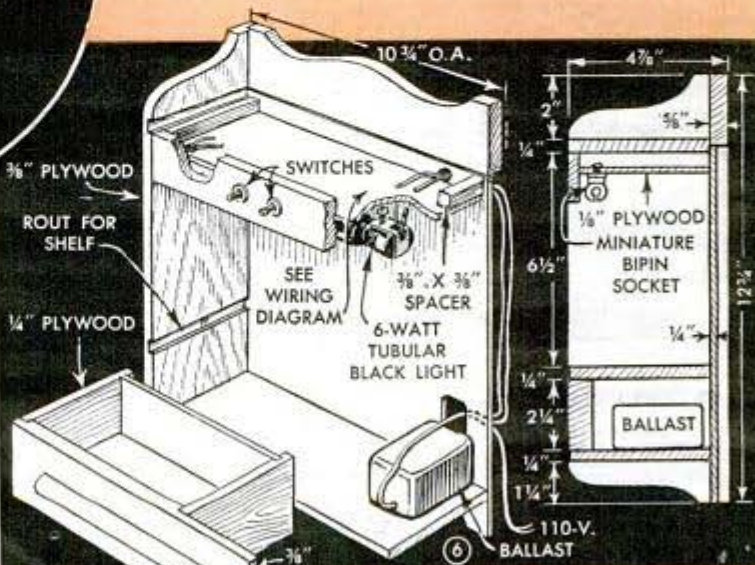


As a hobby

collecting and displaying fluorescent objects or minerals is lots of fun. Photo at the left shows how figures on the shelf look when placed under black light

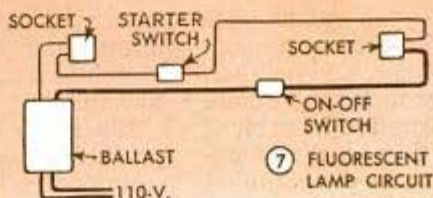
The wiring diagram is given in Fig. 7.

Again, suppose your club or church puts on some kind of performance, such as the ice ballet shown in Fig. 9. Under black light, your performers can be made to appear like the one in Fig. 10. The costumes are simply a matter of sewing fluorescent silk designs to the regular wardrobe, and painting the shoes with invisible fluorescent lacquer. If you go to a theater having special fluorescent carpeting, you won't have the least trouble in finding your way down the aisle, Figs. 11 and 12, and you will enjoy the glowing beauty of



Shelf construction

permits wiring and ballast of fluorescent-type tubular black light to be self-contained. Light is wired as shown, and lamp is illuminated by first turning switch on. Then 3-second contact is made with starter switch



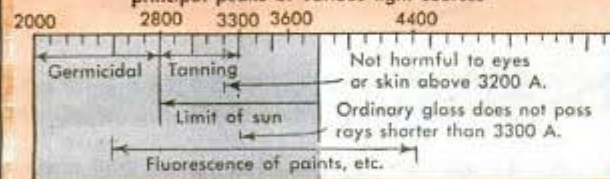
⑧ CHARACTERISTICS OF BLACK-LIGHT LAMPS

Lamp	Watts and volts	Lamp size	Lamp base	Light peak (angstroms) (1)	Exciting range (2)	Approx. cost (3)	Life hours	Remarks
Argon	2½ watts 110 volts	3⅛" O. A.	Standard screw	3900	4"	\$0.50	3000	Cheap light. Good only at close range.
Black bulb	250 watts 110 volts	4¾" O. A.	Standard screw	3650	30"	2.00	50 (8)	Exc. light, hot. Don't burn continuously.
Tubular (Red-purple) 4-watt 6-watt 8-watt 15-watt 30-watt	110 volts with ballast	6" T-5 9" T-5 12" T-5 18" T-8 36" T-8 (5)	Regular fluorescent Min. bipin Med. bipin	3600 Lowest range about 3300	10" 14" 18" 30" 40"	2.50 3.00 4.00 5.00 9.00	200 200 200 500 500	Ideal light source for hand lamps and special fixtures for shelf and cove lighting. Takes regular type sockets and ballasts. No filter needed.
Tubular (Special phosphor) 6-watt 15-watt 30-watt 40-watt	110 volts with ballast	9" T-5 18" T-8 36" T-8 48" T-12 (5)	Regular fluorescent Min. bipin Med. bipin	3600 with filter	14" 30" 40" 40"	1.00 1.00 1.00 1.50	500 1000 1000 1000	Regular fluorescent type with special phosphor. Good, visible light; works best with filter of ordinary blue glass.
Mercury (9) 100-w. clear 100-w. red-purple 100-w. flood 100-w. spot 250-w. clear 400-w. clear	110 volts with transformer	5⅝" O. A. 5½" O. A. 5½" O. A. 8" O. A. 11" O. A.	Screw base Adm. Adm. (6) Adm. Mogul Mogul	3600 All need filter except 100-watt red-purple	20 to 40 ft.	9.50 10.50 12.00 12.00 11.00 15.00	25.00 30.00 30.00 50.00	Best lights for range and coverage. Need transformer. All but red-purple require special heat-resisting filter. 100-watt flood most popular.
Cold quartz	10 watts 110 v. (4)	Grid— 1¼" sq. (7)	As fitted in unit	2550	10"	20.00 (7)	40.00	3000 Used mainly for fluorescing materials.

Angstroms (1 angstrom equals approx. 4 billionths of an inch)



Portion of electromagnetic spectrum showing principal peaks of various light sources



Portion of spectrum showing range and effect of various radiations

1. Light peak indicates point at which most of black-light rays occur for specific lamp. Does not exclude other wave lengths, which usually are present.
2. Approximate range at full intensity.
3. First column, bulb only; second, complete unit.
4. Also available for 6-volt battery.
5. T-5 means tubular ⅝-in. diameter.
6. Admedium base is screw type a little larger than regular.
7. Quartz tubing can be bent to any shape or size. Figures given here apply to medium size of portable hand lamp.
8. Gets very hot and must not be burned over four minutes at a time.
9. Requires 3 minutes to come to full intensity; if stopped, will restart automatically after cooling 3 minutes.

fluorescent murals, such as shown in Fig. 14. Fig. 13 shows an example of sponge-stipple technique for application of invisible fluorescent lacquer over a picture.

Not yet developed to any great extent, black light is certain to be used extensively for advertising displays and signs. Figs. 15 and 16 show an example of a small counter sign, using both white and black light. Construction of the sign is given in Fig. 17. The black light burns continuously, while the white light flashes off and on at two-second intervals. Even in ordinary room light the fluorescence is strong and distinct. This sign looks unusually well when done in plastics, but also is attractive in cabinet woods or veneer. Either thin plastic or veneer will be necessary to form the rounded lamp housings, which are open at the inner

corners so that light is directed onto the picture or lettering. Figs. 18 and 19 show another type of sign of simple construction. It consists of a plywood base supporting a back in a grooved strip, and a scrolled front, which hides the lamp. Many locations are "naturals" for black light. Posters in the foyer of a theater or any sign or decoration in the dimly illuminated interior of a night club are typical. The absence of glare and visible white light has made fluorescent instrument panels a "must" on fighter aircraft, and it is expected that automobile and radio manufacturers will follow suit.

It's more than a matter of just being pretty to look at. Sorters of acetate and cellulose yarns do the job quickly and accurately because the yarns glow differently

under black light although identical under white light. In culling seed beans, a bright streak of blue means that that particular bean goes in the discard since blue indicates that the non-fluorescent skin is broken, making the bean liable to disease. Hundreds of laundries have adopted black light in connection with invisible marking ink. Instead of using pass-out checks, many dance halls now stamp an invisible mark on the back of the hand, which glows



Conti-Glo photo

9

Costumes

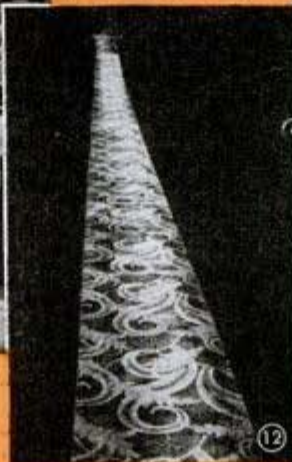
of fluorescent silk with applique design on skirts add novel touch to this ice ballet



11

Carpeting

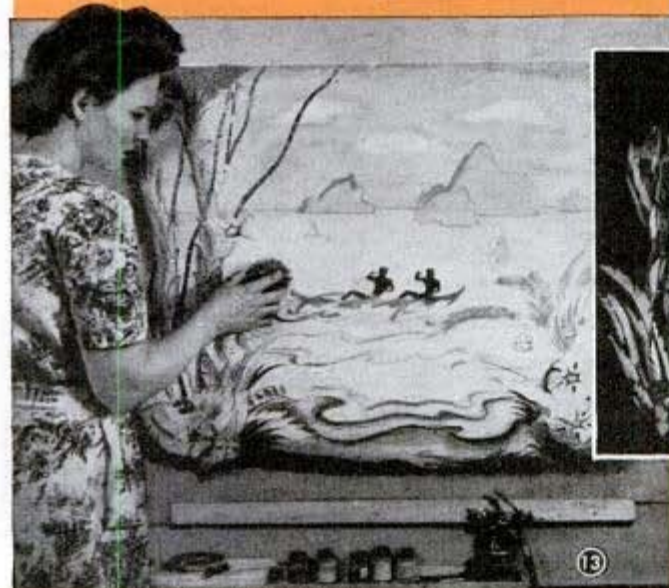
in fluorescent design eliminates groping around in theater aisles



12

brilliant green under black light. Prospectors on the trail of the valuable tungsten mineral, scheelite, know they have struck pay dirt when the rock gives back a ghostly blue under black-light rays. Criminologists have a new weapon in black light, most spectacular being use of invisible anthracene powder, which, sprinkled on the floor or around locks, is picked up on shoes or hands of a suspect and then dramatically revealed.

The list of black-light uses is almost endless, but to get back to something anyone can enjoy, consider fluorescent minerals. It's a real thrill to collect these specimens and exhibit them to your



15

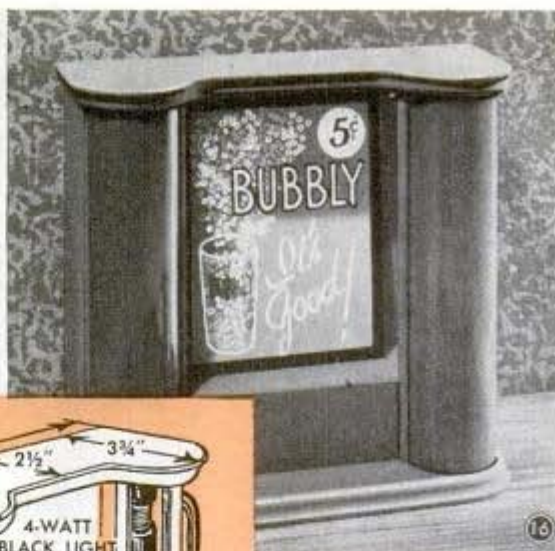
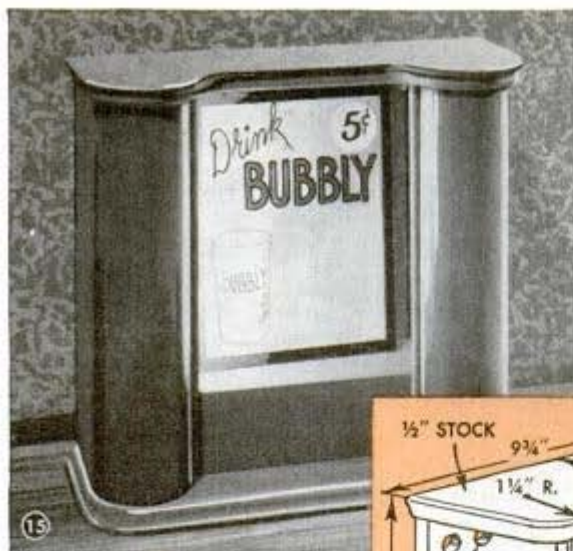


14

Pictures

and murals are gems of color. Example here shows sponge-stipple technique for application of invisible lacquer over picture

Photo courtesy of Black Light Products



Signs

under black light are novel in advertising. Example above shows effect of flasher system

friends. Fig. 20 gives a standard list which you can buy from any dealer. Good mineral specimens are brilliant in coloring and include all the variegations of the rainbow. Light equipment should include both short and long rays. Most of the stones show brightest under short rays, such as produced by the cold-quartz lamp, but a good collection can be made of stones fluorescing at 3,600 angstroms. Fig. 21 pictures ideal light equipment—a cold-quartz lamp and black-light tubular. Less expensive, the black

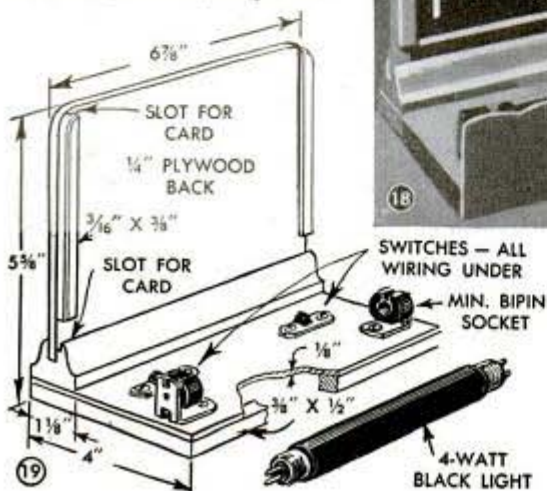
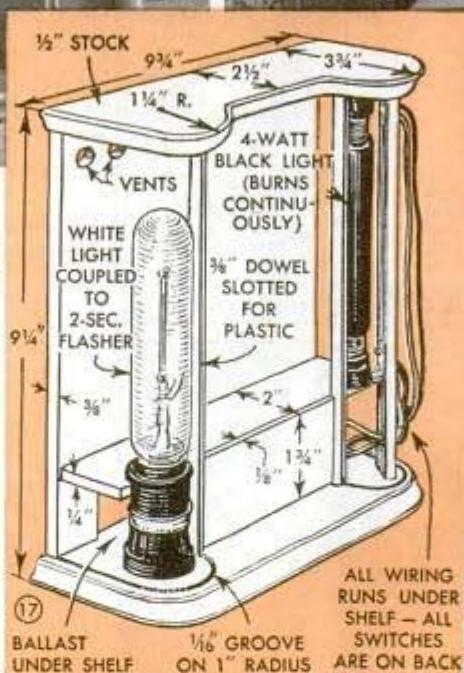


Photo courtesy Black Light Products

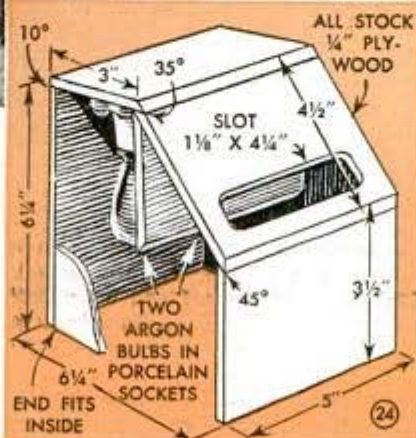
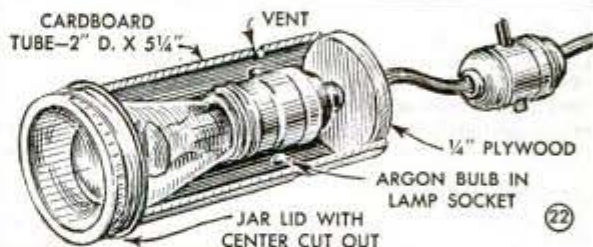
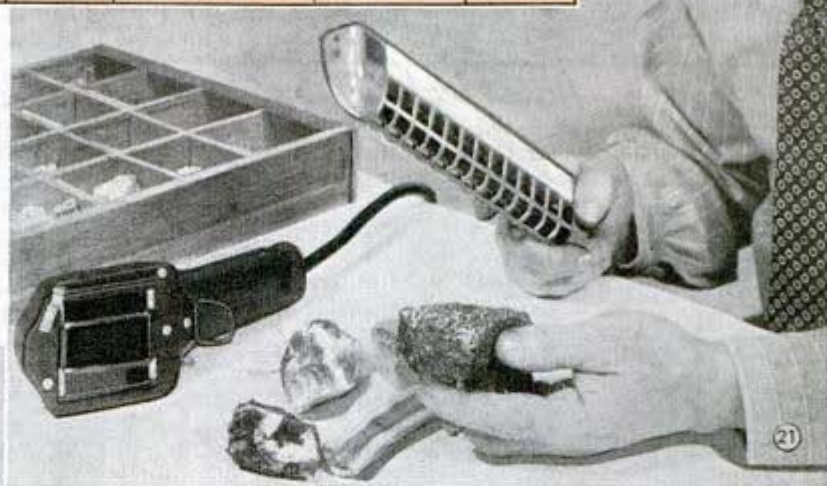
bulb is an excellent light source at the 3,600-angstrom level. Even the little argon will do the trick with many minerals, and a neat-looking job can be made by housing the bulb in a cardboard tube, as shown in Fig. 22. The jar lid over the end of the tube permits using purple Cellophane as a filter, but this is not essential. A bottomless peek-box unit, Fig. 23, which permits examining minerals and other fluorescent objects in daylight can be made from scraps of plywood and two argon bulbs, as shown in Fig. 24.

No one style of light is suitable for every purpose. None of the lights is truly "black," since all pass a certain amount of visible red-purple rays. This feature is subject to some control by means of the filter. A complete blackout filter cuts off all visible light but also reduces the amount of black light. The standard red-purple filter passes a small amount of visible red-purple, these rays being invisible in the presence of even a small amount of outside white light. Special heat-resisting filters

20 PRINCIPAL FLUORESCENT MINERALS					
Mineral	Color at 2550 A.	Color at 3600 A.	Mineral	Color at 2550 A.	Color at 3600 A.
Agate (Sweetwater)	Green	Negative	Opal	Green	Green
Aragonite	Green	Green	Powellite	Yel. White	Negative
Autunite	Yel.-Green	Yel.-Green	Selenite	Green	Green
Calcite	Red or Blue	Negative	Scheelite	Blue-White	Negative
Curtisite	Yel.-Green	Yel.-Green	Sphalerite	Orange	Orange
Dakeite	Yel.-Green	Yel.-Green	Torbernite	Yel.-Green	Yel.-Green
Fluorite	Blue	Blue	Wernerite	Negative	Yellow
Hackmanite	Orange	Orange	Willemite	Green	Green
Hydrozincite	Blue	Negative	Willemite and Calcite	Green and Red	Green

Minerals

which fluoresce under black light make an interesting hobby. Light equipment should include both short and long rays. Good mineral specimens are brilliant in coloring and include all the variegations of the rainbow



are required for high-intensity mercury-vapor and other hot lamps. Cold lights such as the tubulars and argon can make effective use of purple Cellophane, lacquer films or inexpensive blue glass. All light sources given are harmless to eyes or skin except the cold-quartz lamp. The extremely short rays from this light will cause reddening of the skin similar to sunburn, hence the light must be kept away from the body when in use. The cold-quartz lamp is used mainly for showing minerals. All other lights are keyed to the 3,600-angstrom level since it is on or near this band that most paints, dyes and other products fluoresce the strongest.

The technique of using fluorescent paints

is easy to master and lots of fun. You have a full range of colors, both transparent and opaque. Also, there are colorless lacquers that fluoresce white, blue and green, plus several whites which glow in different colors. Paints can be obtained in either lacquer base or water color, the lacquer product being the best for most uses. The best ground is a non-reflecting white illustration board

or any kind of surface painted with white or a light tint water-mix paint. Dark bases should be avoided since they weaken fluorescence. If you use a black card or cloth as a ground, first do the design with white water-mix paint, then apply fluorescent lacquer over it. Fig. 18 is an example of this technique, done in blue and yellow on a black card.

The normal method of painting is to



Paint technique

Both cards above are blank under white light, the clear fluorescent lacquer being invisible. Under black light, the untreated areas turn black while fluorescent background of Fig. 25 and letters of Fig. 26 glow blue



Combining use of invisible lacquer with a color change, black-light view of this card shows a green outline around the black portions. At the same time, dark-pink colored portions will change to a brilliant glowing yellow



This sample shows picture change technique. White-light view is done with non-fluorescent paint, with second picture superimposed and done with fluorescent lacquer. Use non-fluorescent colors carefully for uniform fadeout

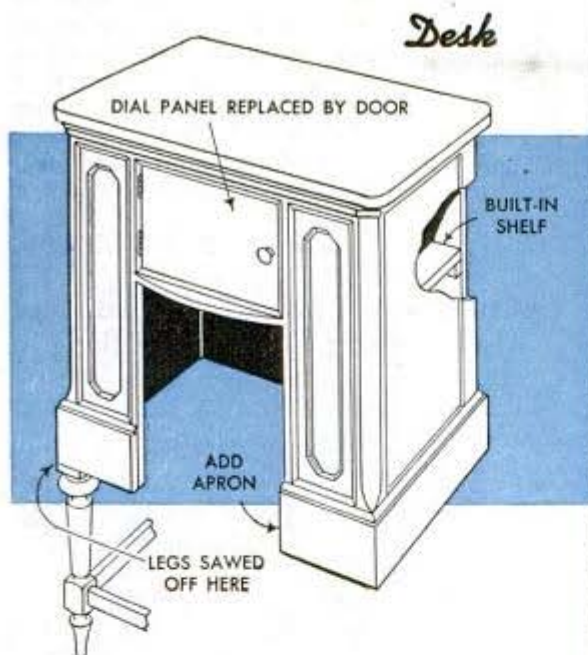
use colored fluorescent lacquers, and the design does not change materially when viewed under either black or white light, except that it takes on a glowing quality under black light. A similar technique is used in going over non-fluorescent pictures with fluorescent lacquer. In this case transparent colors are used, as these do not conceal fine detail or shading in the original picture. Another treatment for non-fluorescent pictures or objects is to use the invisible colors. These are water-white as applied but glow brilliant blue, green and

up the whole panel and thus expose the original picture. A coat of clear flat lacquer over the whole panel serves as a means of concealing the glossy highlights of the invisible picture.

☛ To kill crab grass, spread a tarpaulin over the infested area for three days. The best time is in the middle of May or the first of June. In August, the tarpaulin must remain for eight days. After removing the dead crab grass, seed the area lightly with 2 lbs. of seed per 1,000 sq. ft.

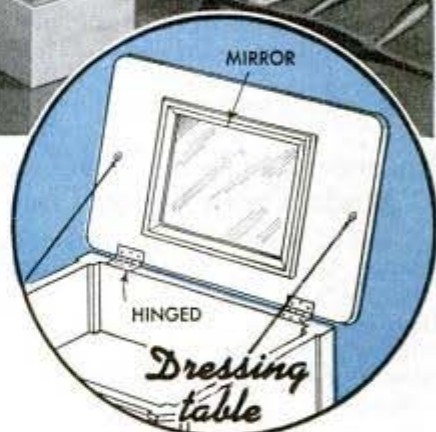
white under black light. These colors can be used for invisible pictures or signs. Figs. 25 and 26 are examples. Both of these are plain white cards under white light. Fig. 25 has the background painted invisible green; hence under black light, the background glows green and the non-fluorescent letters stand out black. In Fig. 26 the lettering is green and the background untreated. Figs. 27 and 28 show the color-change technique where the design is one color under white light and changes color under black light. Figs. 29 and 30 show the double-picture style. This ordinarily is the most difficult to handle. An essential is that the sign or picture must be viewed in almost total darkness. The second basic rule is that the non-fluorescent paint used for the white-light effect must fade out completely under black light. The right colors to use can be determined by holding colored test strips of non-reflecting cardboard or paint under the black light, picking out a set of colors that have the same darkness under black light. In this sample, the ground is yellow and the lettering green; both fade out black under black light. Third basic rule is that the superimposed design must be almost entirely in line since any large use of the invisible lacquer will light

Radio Cabinet Transformed Into Desk or Vanity



With very little work you can convert an old radio cabinet into a child's desk or a serviceable dressing table. After sawing off the legs, remove the dial panel and replace it with a door. You can use the speaker opening as a kneehole, and the top, when cut into suitable lengths, can be used as an apron around the base. Build in a shelf under the door to form a compartment, which can be divided as you wish. For a new top, use a piece of matching hardwood. Screw it in place and cover the screw holes with plugs, or hinge it and add a mirror for a dressing table, as shown in the circular detail.

Norbert Engels, South Bend, Ind.



Treadle Control on Mangle Makes It Easier to Operate



Women who dislike to use the knee shift or control provided on many mangles for operating the shoe, will find that this treadle shift solves the problem. Its use involves no change in the original mechanism and does not require removal of the knee-shift lever. The treadle is a piece of $\frac{3}{4}$ -in. oak 12 in. long and $1\frac{3}{4}$ in. wide. It is hinged to the mangle leg by means of an iron strap held firmly in place by a machine screw tapped into the leg. From the treadle, a length of stranded wire extends upward over a 2-in. pulley to the knee-shift lever where it is fastened by a small clamp. The shoe clutch is shifted instantly by a slight foot pressure on the treadle.

☞ Cooking odors can be neutralized by boiling three teaspoonfuls of ground cloves in two cupfuls of water for 15 min.

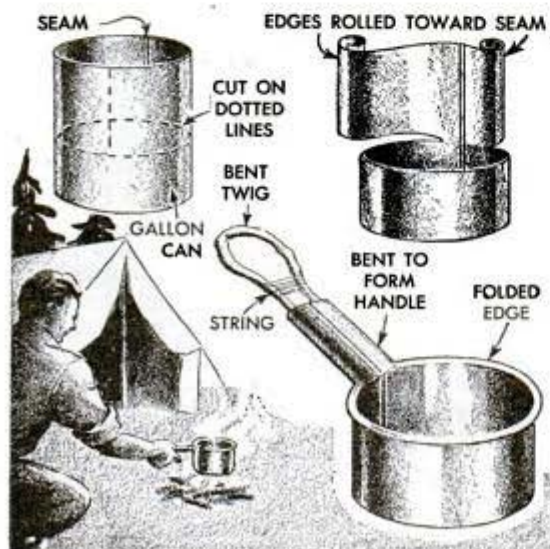
Auto Visor Mirror Clips on Tent For Easy Shaving



Your auto visor mirror will be especially useful around camp, for it may be attached by its clips anywhere to the edge or sides of the tent or over ropes at any desired height. Thus you can place it where the light is most suitable for shaving.

Emergency Utensils for Camp Use Made From Large Tin Cans

Lack of cooking utensils need be no hindrance to your culinary efforts in camp because you can improvise suitable ones from empty tin cans. For instance, a saucepan can be made from an empty can as shown. Slit the side opposite the seam to within 3 in. of the bottom. At this position, cut around the can to within 1 in. of the seam on both sides and roll the cut portion as indicated in the upper right-hand detail.

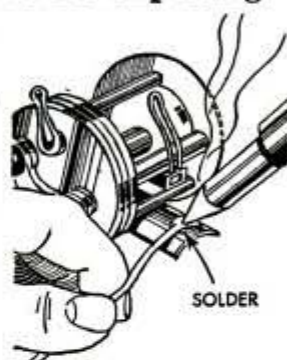


Insert a bent twig or piece of heavy wire for a handle and bind it with string or fine wire as in the lower detail. After forming the handle, fold over the sharp edges of the pan so there will be no danger of injuring your hands on them. A frying pan is made in the same way except that it is shallower, the slit down the side being made to within 1½ in. of the bottom. Other utensils are fashioned in a similar manner, making some of them without handles if desired.

Pfc. Arthur Drummond, New York City.

Small Drop of Solder on Fish Reel Makes Snug Fit for Slip Ring

If the slip ring of your fish rod is loose enough to slide away from the reel, you can secure it in place by applying a drop of solder to the tongue of the reel over which the ring slips. This will increase the size of the tongue and make the ring fit tightly. If the drop of solder is made slightly oversize it can be filed down to assure a good fit.



Tennis Racket Protected by Tape



All you need do to prevent scuffing the frame or fraying the strings of your tennis racket on the court surface when you

reach for a low ball is to stick a 4 or 5-in. strip of ½-in. adhesive tape along the racket top as shown. When this tears or wears out it easily can be replaced.

M. J. Stair, Chicago.

Blowing of Picnic Cloth Avoided By Stones in Corner Pockets

To prevent the wind from blowing your picnic tablecloth when spread on the ground, and disturbing the lunch set on it, sew a small pocket in each corner as shown. Stones or pebbles placed in the pockets will weight the corners and hold them down even when a strong wind is blowing.



Children's Picnic Table Has Adjustable Seats



Durable, good looking and light enough to be moved about easily, this picnic table for children can be used indoors or out. It is built of lengths of scrap hardwood flooring and is assembled with bolts through the legs and framing, the tongue-and-grooved

top being attached with screws. Holes drilled in the legs permit the seats to be adjusted for the height. The table can be stained or left natural, but spar varnish should be applied to protect it from moisture if it is to be used outdoors.

Kendrick M. Martin, Oakland, Cal.

Raised Baby-Crib Mattress Makes Stooping Unnecessary



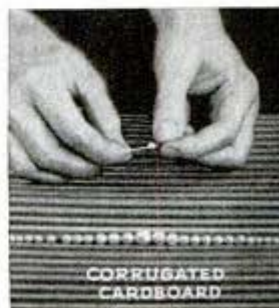
Mothers who dress infants in their cribs usually are required to stoop over the crib's edge to reach the child. To avoid this stooping and make dressing the baby an easier task, the spring and mattress can be elevated. To do this, bend four lengths of heavy wire to form hooks, illustrated in the circular detail, and attach them to the spring frame through the holes provided for screwing it to the bed rail. Then slip a piece of rubber tubing over the end of

each hook so it will not mar the finish on the bed and then suspend the spring and mattress from the top bed rail.

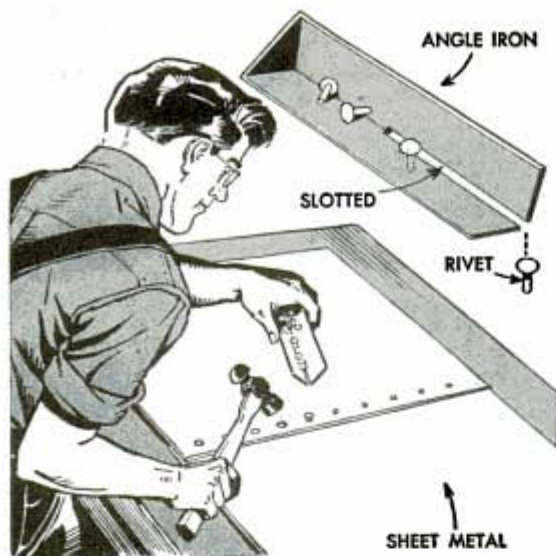
E. M. Peck, Oklahoma City, Okla.

Stringing of Beads Simplified By Use of Cardboard

You will find that beads can be strung much easier if they are arranged in the small grooves of a piece of corrugated cardboard. The beads can be picked up individually and the needle inserted. In some cases, it may be possible to hold the beads in place in the grooves with one hand and thread the needle through them with the other, thus making it unnecessary to pick them up one at a time. — William Swallow, Brooklyn, N. Y.



☐ You can keep pastry from adhering to a rolling pin by cutting the foot from an infant's stocking and using the leg part as a sleeve over the pin. It is advisable to dip the sleeve in flour before putting it on the rolling pin.

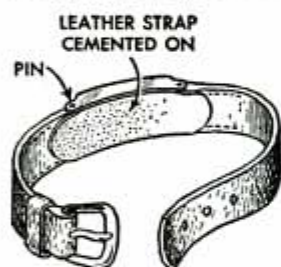


Slotted Holder Speeds Riveting When Done by Hand

On riveting jobs that must be done by hand, this holder will enable you to feed the rivets one at a time with one hand while driving them with the other. The holder is a length of angle iron, which is closed at one end and slotted at the other, the slot edges being filed smooth so that the rivets will slide along it. Drop a handful of rivets in the closed end, shake it a little occasionally and the rivets will drop into the slot in a line. If the work is in a horizontal position, you can deliver the rivets right into the holes from the holder. On work at an angle or in a vertical position, the holder enables you to slide the rivets out one at a time with one of your fingers for insertion in the holes.

Loss of Wrist Watch Avoided By Bridging Across Band

If one of the pins that attach the band to a wrist watch breaks or slips out, the watch likely will drop from the wrist and be damaged.



Or, when wearing heavy clothing, you may not be aware that the watch has slipped off your wrist, and it will become lost. To avoid this, place a piece of thin leather under the watch between the band ends and cement to the band as indicated. The leather should be cut to the approximate shape of the watch so that it will fit comfortably against the wrist.

Sgt. E. Parmeland, Wichita Falls, Tex.

Toothpicks Used to Reinforce Soap Carvings



Toothpicks make excellent reinforcements for the frailer parts of soap carvings such as legs, neck and tails of animal figures, as shown in the illustration. They can be used equally well in plaster - of - paris casts. In the former, the picks are inserted when the carving is almost finished, the holes being plugged with a dampened soap powder. In the plaster casts, they are put in just before the mix sets.—Frank M. Butrick, Jr., Alma, Mich.

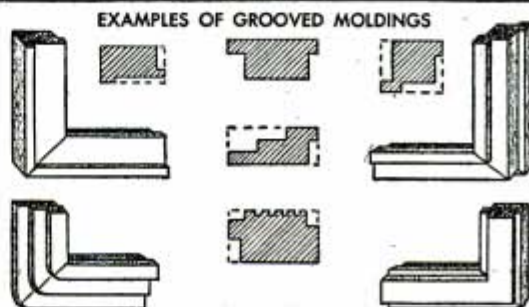
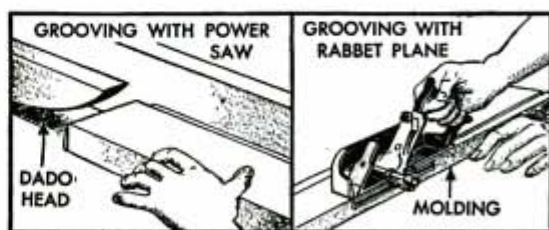
finished, the holes being plugged with a dampened soap powder. In the plaster casts, they are put in just before the mix sets.—Frank M. Butrick, Jr., Alma, Mich.

Decorative Moldings Made Easily With a Saw or Rabbet Plane

It's an easy job to make decorative moldings for picture frames and other uses by running straight cuts with a rabbet plane, or with a dado head on a circular saw. The various designs, several examples of which are shown, are formed by cutting a series of rabbets of different widths and depths. After assembly of the mitered frames, slight variations can be made by rounding the edges at the corners as shown in the lower left-hand detail. This can be done with a file and sandpaper.

Michael Ligocki, Gary, Ind.

Ⓜ A small amount of powdered rosin added to beeswax will give it the right amount of tackiness for archers' bowstrings.



Restoring OLD PRINTS

By Raymond F. Yates

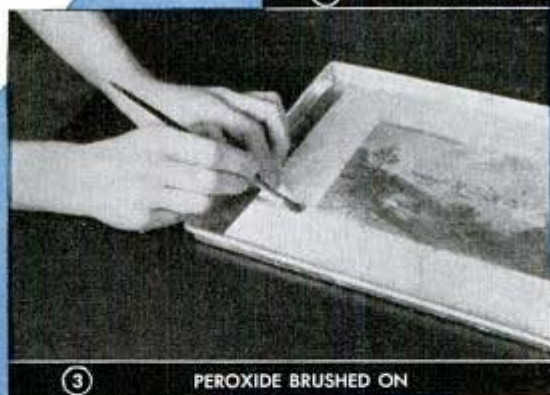
OLD engravings and prints that have been stained by mold, water or age may be restored to beauty by simple methods of bleaching. Almost any kind of discoloration can be removed in this way, but colored prints cannot be so treated because of the powerful action of some bleaching compounds.

If only very mild discoloration is to be removed, it may be done by placing the print face upward in a shallow pan of water as in Fig. 2, and allowing it to stand in direct sunlight for several hours. The face of the print should be completely covered by at least $\frac{1}{4}$ in. of clean water. Under these conditions the sun will bleach out the stains, the water acting as a shield to prevent other chemical reactions.

Severe stains call for more drastic treatment. One of the best bleaches for this purpose is ordinary drug-store hydrogen peroxide. This may be bought in solutions of



BLEACHING UNDER WATER



PEROXIDE BRUSHED ON

HYDROCHLORIC ACID, 1 OZ.



WATER, 30 OZ.

BLEACHING POWDER, $\frac{1}{2}$ OZ.

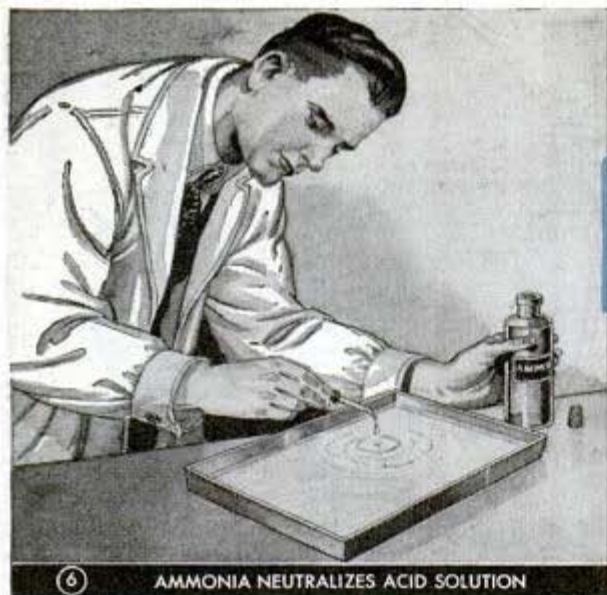


WATER, 100 FL. OZ.

TWO EASILY-MADE BLEACHES



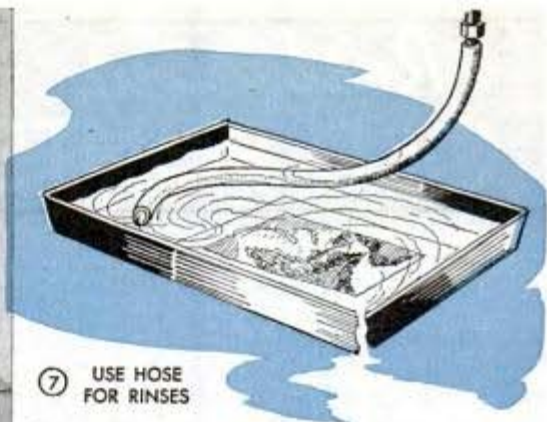
HEAT SPEEDS ACTION



10, 20, or 40-volume concentrations, the numbers indicating the volumes of pure oxygen released when the solution decomposes in contact with other matter. The 20-volume preparation is best for bleaching. Where excessive staining is not present, a mixture of hydrogen peroxide and grain alcohol, equal parts, can be brushed over the surface of the print, Fig. 3. A small camel's-hair brush is used, and after treatment the print is washed in running water for at least 15 min. Stubborn stains may be treated with undiluted hydrogen peroxide, the prints being left immersed for several hours at a time. The peroxide, however, should not be used at a temperature of more than 80 deg. F. Also, the peroxide should not be acid. To determine the condition of the solution, it is advisable to make a test with litmus paper, Fig. 1. If the solution is found to be acid, a few drops of very weak household ammonia will alkalinize it. This is added with an eye dropper, Fig. 6. Peroxide solutions may be applied locally on prints with a small brush to remove spots. The spot to be so treated first must be soaked with clear water. After the peroxide has been brushed on, a piece of clean white blotting paper is placed over the spot and a warm iron pressed on it, as in Fig. 4, to speed the action of the peroxide.

In every case the prints must be washed thoroughly to prevent other chemical stains from appearing. This is done by the use of a length of hose attached to a faucet, Fig. 7. The hose should be placed in the tray so that water is directed against the side of the tray and not on the print, which may tear under the impact.

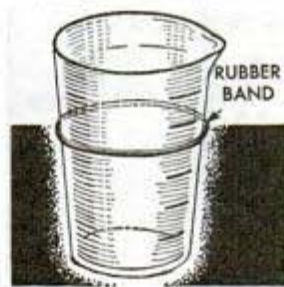
If stains do not yield to these methods, they often may be removed by exposure to a dilute solution of hydrochloric acid. This



is made by mixing chemically-pure acid with clean water in a proportion of acid, 1 part, and water, 30 parts, as shown in detail A, Fig. 5. A 20-min. exposure to this solution, followed by a second treatment, usually will clear up stubborn cases. After being immersed in the hydrochloric-acid solution, the print is transferred without washing to a solution of sodium hypochlorite or bleaching powder. This is made in the proportion of $\frac{1}{2}$ oz. of powder to 100 fluid oz. of water, B, Fig. 5. However, a metal pan cannot be used for these chemicals because of the action of the acid. Therefore, a shallow wooden dish protected by an application of hot paraffin may be used instead. If the print does not respond to the first cycle completely, the process may be repeated after brief rinsing.

To remove grease spots, ordinary benzene may be applied locally with a small brush and worked over the spot. Where stains are caused by vegetable oils, acetone is used as a solvent. Ink spots require a 10-percent solution (by weight) of oxalic acid. Rinsing in alcohol followed by a thorough wash in water is recommended after use of benzene and acetone, but plain water will remove all traces of oxalic acid. Prints always should be dried between clean white blotting paper after rinsing.

Rubber Band on Glass Graduate Aids in Measuring Chemicals



One photographer who makes up his own developing and other photographic processing solutions in quantity finds that a rubber band placed around the measuring graduate helps prevent errors. The band is set at the desired marking and is easier to see than the marks molded into the glass surface.

"False Back" Reduces Width of Studio Couch

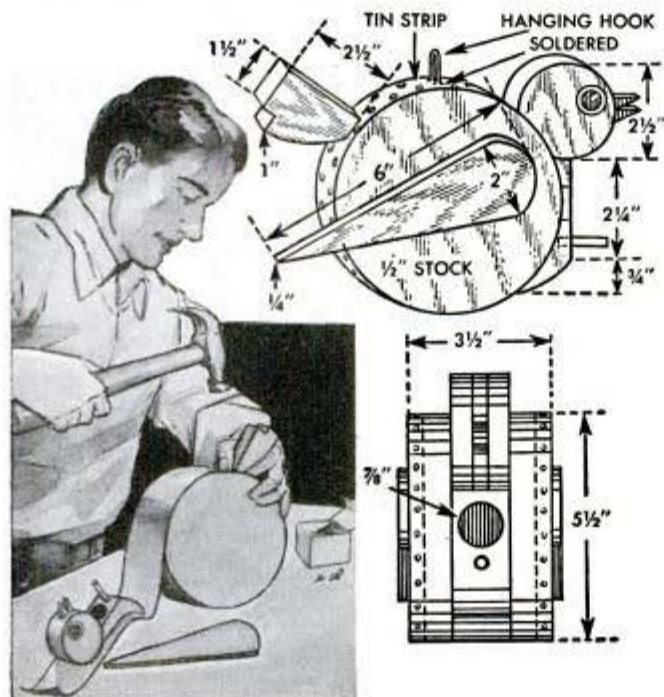
If your studio couch is too wide to sit on comfortably because you have to lean far back to rest against the pillows, build a false back behind the pillows and thus reduce the width. This can be made of plywood or other suitable material that is available. The top of the back will serve as a mantel, and the ends can be fitted with shelves for books. Small cleats nailed to the sides of the back will support the shelves. If plywood is used, a light framework will be necessary. Width of your couch will determine the width of the back, which is built to straddle the top and come down over the ends of the couch as indicated. It should be high enough to extend 4 to 6 in. above the pillows. Finish on the back depends on your choice and the material used. In most cases, paint will be the most suitable and the easiest to apply. However, if the back is made of solid or veneered wood, it will be most attractive



if it is stained and waxed or varnished to bring out the grain. In either case, the surface should be sanded glass-smooth before applying the finish.

N. Campbell, Boston, Mass.

"Early Bird" Wren House Is Attractive and Easy to Make

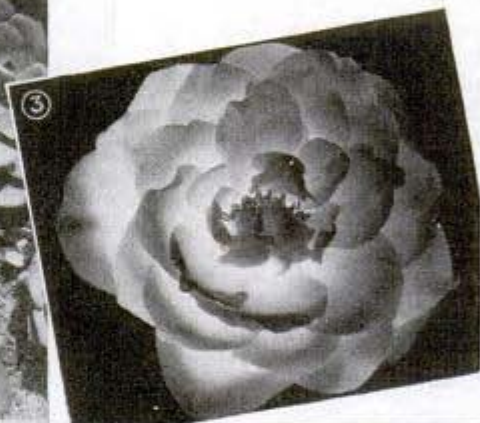
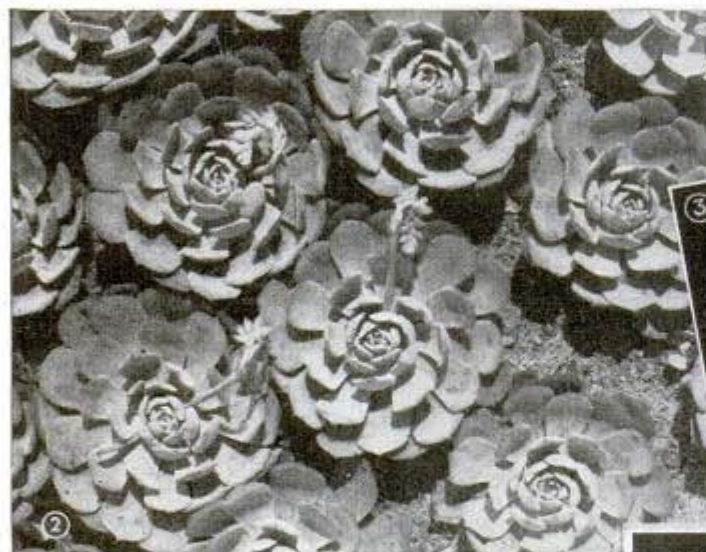
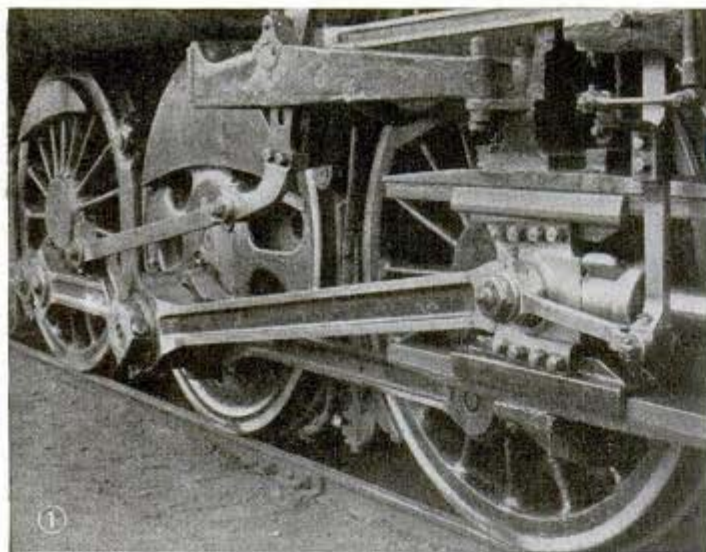


Saucy little wrens will appreciate this unusual house, which is made of two wood disks spaced and held together by a strip of tin. Before nailing the tin in place, attach the head and solder on a hook for hanging the house. A $\frac{7}{8}$ -in. entrance hole also is made through the tin just under the head, and a dowel stick is inserted for a perch. Tapered strips are nailed to the sides to simulate wings. Attaching a piece shaped as indicated to form a tail completes the assembly. Hang the house in the shade to avoid excessive heat inside.

Harold M. Johnson, Gary, Ind.

When a faulty inner-tube patch has to be removed, just hold it against the hot exhaust manifold of your car until it becomes reasonably warm. You then will be able to peel off the patch without damaging the tube.

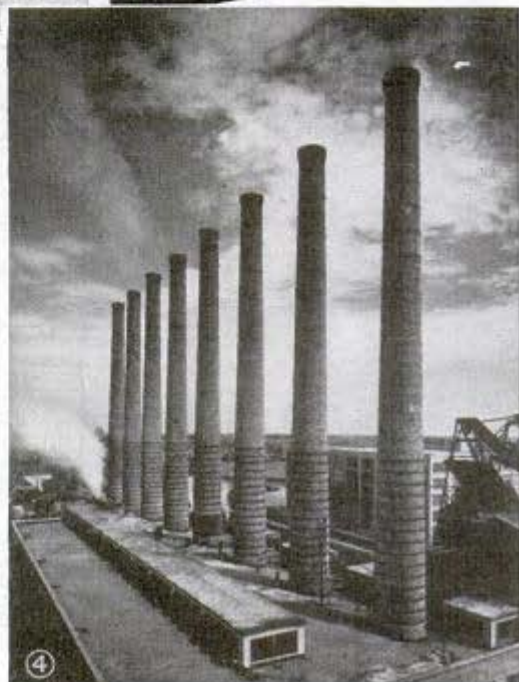
Pattern



By Fred G. Korth

EXPERIMENTING in pattern pictures is highly interesting and goes a long way in developing your ability to get better composition in photos. Also, since light and shadow are used to enhance or emphasize design, you get excellent practice in observing and producing good lighting effects. You can find patterns everywhere, indoors and out. You can produce them artificially on a table top or discover them in your garden, on the street, in the congested business district of a city, or while you are out on a vacation. However, patterns are easier to find than to reproduce on a film. To see exactly what you will get on the film, it is best to do the work with a camera having a ground glass. Then you can observe what is to be included and you can make adjustments to obtain best results in lighting and in general arrangement of the picture.

As examples of what you can find in a gar-



den, look at Figs. 2 and 3. In any planned garden, some of the plants and flowers are in neat, orderly rows, but even in clusters that are seemingly scattered, you will find that flowers in a group of the same species are similar in shape and general appearance. Individual plants, too, have their own characteristic design of leaves and flowers. An hour's inspection will turn up many interesting possibilities for pictures. Some of the effects observed may be found only at a certain

Pictures

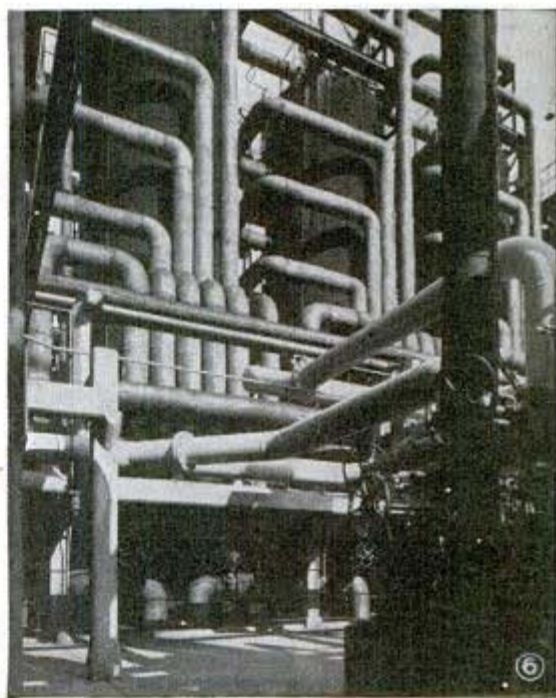
time of the day, especially where shadows help make a pattern.

Set your camera on a tripod equipped with a tilting head so that you can point the camera straight down if necessary, which was done in taking Fig. 2. Note that in this picture the shadows help to separate the plants from the soil, thereby creating the illusion of three dimensions. Also, the shadows give the contrast required to bring out some of the leaves. Individual flowers, such as the rose shown in Fig. 3, provide good material for pattern pictures. In this case the petals, no matter how the light was thrown on them, did not show up distinctly with the desired contrast and separation. So, after some experimenting, the flower was placed over a hole cut in a piece of black cardboard, and a bright light was placed underneath.

Photos shown in Figs. 1 and 4 are based on the idea of repetition. In Fig. 1, the drive wheels of a locomotive are repeated, although each one is different from the others in size and appearance, giving the element of variety. The series of smokestacks in Fig. 4 is an identical repetition. The lines formed by the tops and bottoms of the chimneys provide diagonal relief from the repeated perpendiculars. The idea of repetition was followed also in Figs. 5 and 6—the arches and roof-supporting pillars of



JUNE, 1945



Courtesy Commercial Solvents Corp.

Fig. 5 and the three sets of pipes in the upper part of Fig. 6. However, these shots are more than simple repetition. Fig. 5 contains not only repeat patterns but also includes elements of balance; note how the building at the right partly frames and thus emphasizes the arches, and that its heavy shadow is in contrast to the light-grey tone values of the arches. If you cover the right side of this picture with a piece of paper, it will be less pleasing. In



pebbled for texture effect. For subject matter you can select blocks of wood, match boxes or matches, drinking straws, test tubes, pills, crackers or almost anything available. In Fig. 7 pipe nipples were used, all of the same length but of various diameters. The nipples are arranged from top to bottom to get a diagonal effect which is offset by a few standing on end. Although this photo shows only one arrangement, many others equally pleasing can be created. The rows of pills and capsules in Fig. 9 were brought out in high contrast with light and shadow. It's a simple matter to arrange a number of such small objects by merely lining them up against a ruler or block of wood. Then the lights are adjusted carefully for shadows, and the camera is set to obtain diagonals, although diagonal effects can be obtained also when you make enlargements.

In Fig. 10 booklets of identical size are displayed in curved rows. In this case the exaggerated shadows could not be produced merely by placing the thin booklets over each other; therefore it was necessary to prop them up on small blocks of wood. Fig. 8 is an attention-arresting display of clarinets. The faint light spot on the background is just enough to help outline the instruments and relieve the severity of the strong diagonal lines, none of which strikes a corner of the picture. They are broken up by the black background and also by the keys. Where outlines are hidden, the eye tends to complete them. A pattern picture is good not only because of what it reveals, but also because of what it leaves to the imagination.

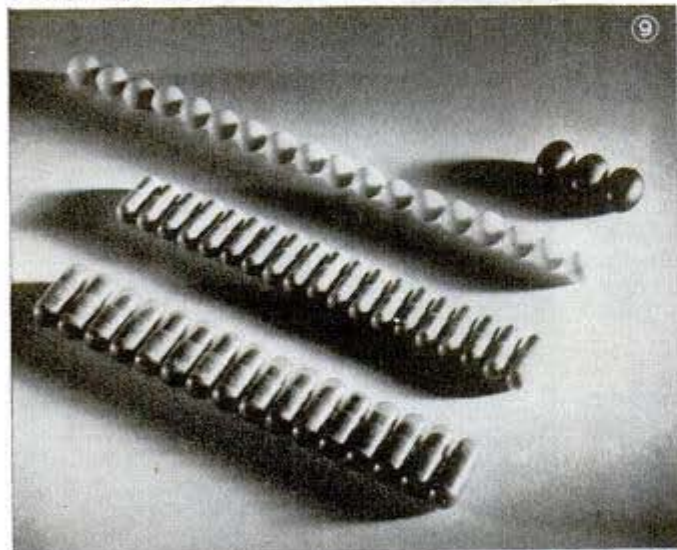
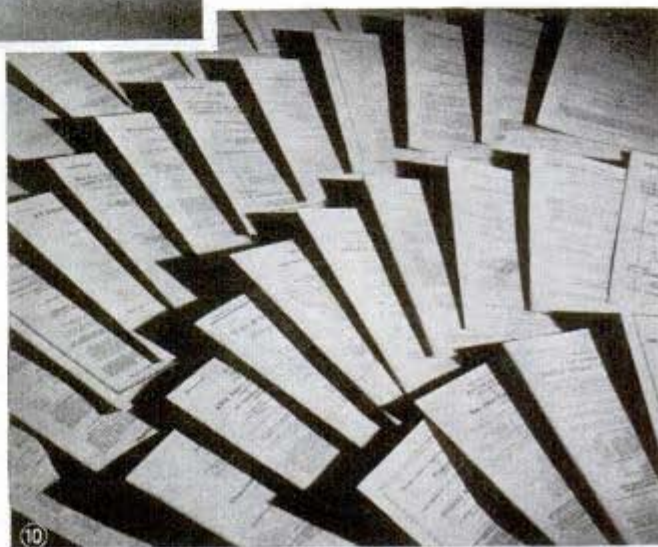


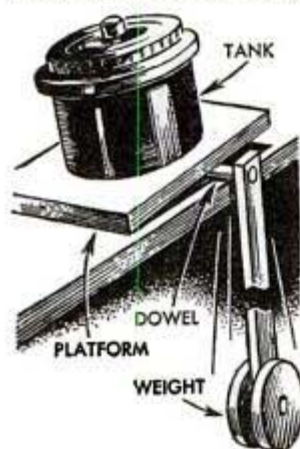
Fig. 6 the three repeat patterns running diagonally across the top are relieved by two opposite diagonal lines and also by the vertical pipe. This, mostly in shadow, covers part of one pattern and emphasizes it because the eye tends to fill in hidden lines. Deep shadows at the lower part of the photo and behind the light-grey pipes provide the needed contrast.

Pattern pictures can be made right at home with many small objects arranged on a table top, covered with a piece of suitable grey, black or white paper or cardboard, which can be smooth or can be



Pendulum Agitates Film Tank

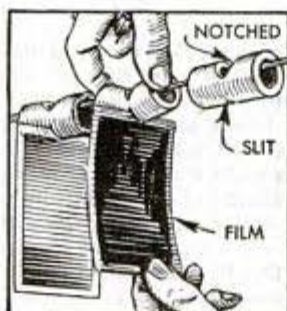
Agitating a film tank during development may be done automatically by a weighted pendulum attached to a dowel, which is screwed to the center of a wooden



platform as shown. If a small dowel is used, the pendulum should be proportionally short, otherwise the swing will be interrupted before it completes its normal arc. It will be necessary to give the pendulum added momentum only a few times during development.

Wet Negatives Held for Drying By Notched Pieces of Hose

To hold small films on a line for drying, one photographer uses short pieces of bath hose. These are notched on one side and then slit on the opposite side as indicated. When strung on the line, the hose pieces are pinched on the sides containing the notches. This opens the slits for insertion of the film edges, which are gripped firmly when the pressure is released.



Tongs Made From Clothespins

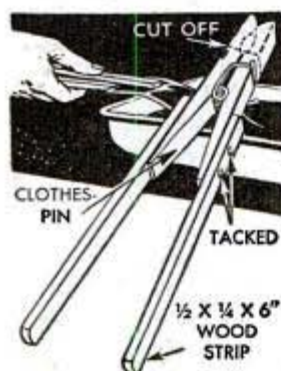
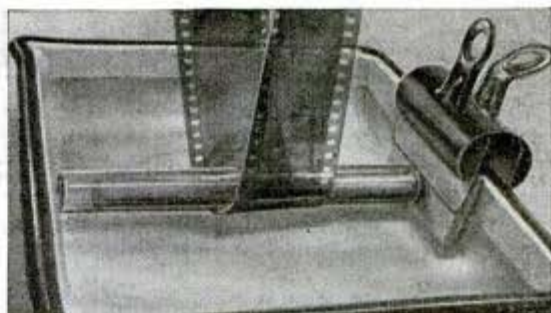


Photo-print tongs can be made in a few minutes by tacking strips of light wood to spring-type clothespins as shown. The end of each pin, indicated by dotted line, then is cut off, as this part is not needed. — R. Ey- rich, Milwaukee.

When photo prints are required in a hurry, you can print them from a wet negative if both sides of the film are covered with clear Cellophane.

Less Photo Developer Used By Processing Roll in Tray

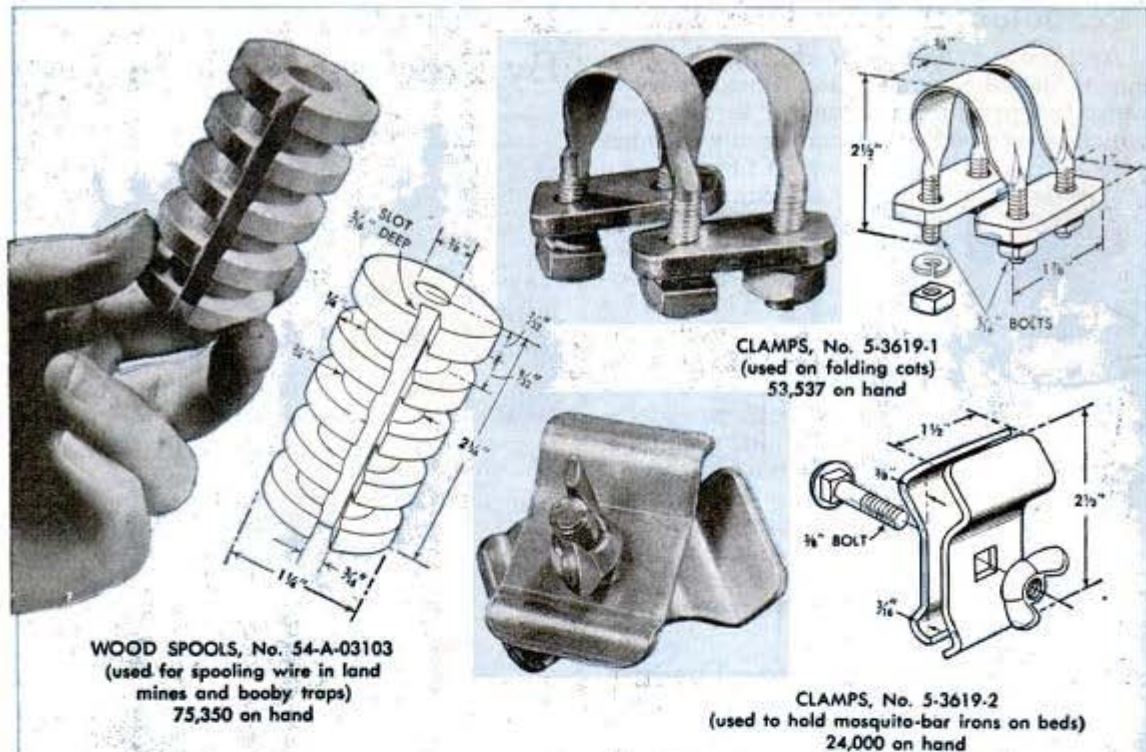


Roll film can be developed in a tray with less developer than is used in a tank. All you need is a roller over which the film can be moved up and down in the solution, emulsion side out. A common glass tube or a test tube is slipped over a length of dowel, which is bradded to a small piece of wood clamped to the tray by a spring paper clip. — Robert Scott, Saltsburg, Pa.

Powder Puff Serves as Applicator Of Movie-Film Cleaner

Home movie film can be cleaned quickly with a powder puff used as an applicator for the cleaning fluid. Place a few drops of fluid in the center of the puff, fold it and draw it over the film. The dry outer portion of the puff will wipe off any excess cleaner. — Roland Swedlund, Buffalo, N. Y.





WOOD SPOOLS, No. 54-A-03103
(used for spooling wire in land
mines and booby traps)
75,350 on hand

CLAMPS, No. 5-3619-1
(used on folding cots)
53,537 on hand

CLAMPS, No. 5-3619-2
(used to hold mosquito-bar irons on beds)
24,000 on hand

What Do You Suggest?

These are some of the surplus war commodities now available. Can you think of a practical use for any or all of them—not an individual or isolated use, but a use that will dispose of large quantities? An item might have widespread sales direct to the public, if advertised for a specific purpose to meet some general need, for instance as a clamp or holder in the home or workshop. Or, an item might serve as a part of some machine, lighting fixture, sign, artist's easel, cart or other manufactured product. Perhaps a slight change would be required to make it suitable, or only part of the item used. Whatever your answer is, write the number and description of the item, state to what it can be applied, as for example, toy, refrigerator, fence, marine engine, etc., and explain the exact purpose you have in mind. Also mention or show any changes to make on the item. Address your suggestion to OFFICE OF SURPLUS PROPERTY, PROCUREMENT DIVISION, U. S. TREASURY DEPT., WASHINGTON, D. C. (Potential buyers of quantities of such commodities can obtain, by request on their firm letterhead, lists of items available. Or, they can visit their Regional Treasury Office, where samples can be inspected, merchandising possibilities discussed and bids placed)

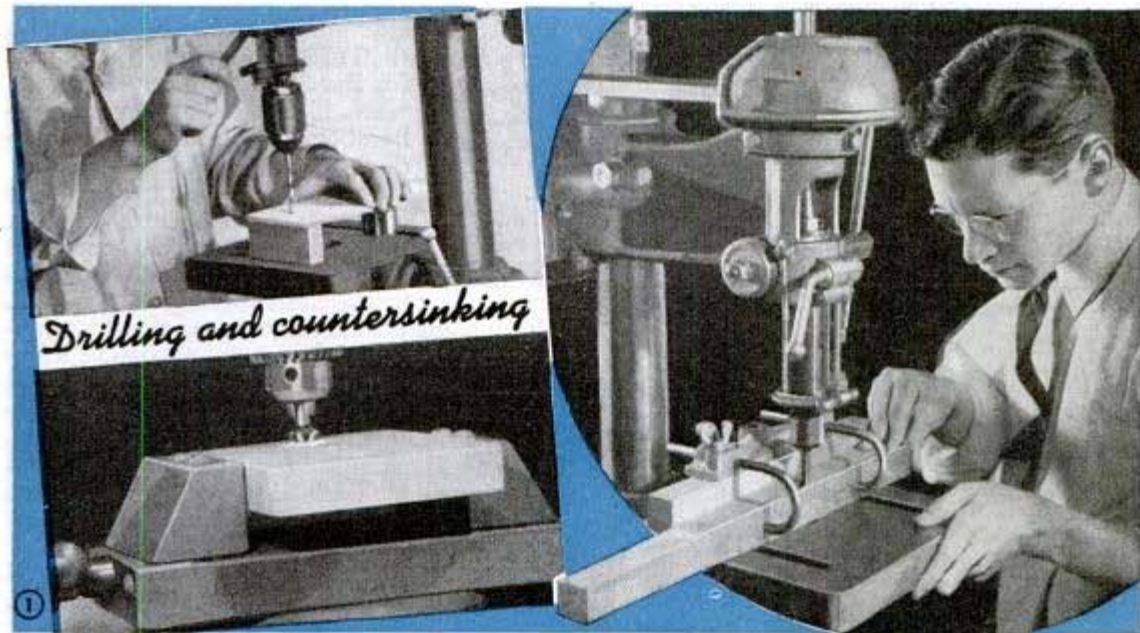
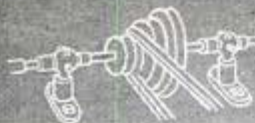
Simple Homemade Paint Keeps Incinerators Attractive

We have been using an old oil drum for an incinerator and have experienced some difficulty in finding a paint that would keep it looking attractive. Commercial paints available always darkened after a few fires had been built in the incinerator. While experimenting to find a paint that would not darken under heat, I used some powdered aluminum and sodium silicate (water glass) mixed to the consistency of paint and the results have been highly satisfactory. This mixture resembles flat white paint more than it does aluminum paint. It is applied to the metal with an ordinary paintbrush after removing loose rust and dirt particles. The surface to be painted need not be dry as the paint itself contains

water. After drying for a few hours, the surface should be heated, in this case by merely building a fire in the incinerator. If heating is not convenient, the surface should be wiped with a mineral-acid solution such as muriatic or sulphuric acid. The resulting film withstands even the heat of a direct gas flame, and does not seem to be affected by water. Undoubtedly similar mixtures of other powdered metals would produce results equal to these.

Frank A. Knight, Bangor, Me.

☐ When mixing a small quantity of powdered glue, use the paper cap from a milk bottle. It is waterproof and can be discarded after use.



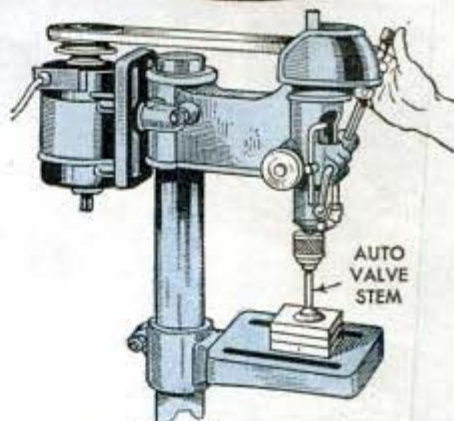
Making the Most of Your DRILL PRESS

What you can do with this universal tool as a substitute for other machines around the home workshop

By W. T. Warde

YOUR drill press is one of the most widely adaptable power tools in your workshop. It can be used not only for the obvious purposes of drilling and countersinking, but, with the use of easily-made jigs and fixtures, or with a few simple attachments, it will take the place of many other tools. Thus this versatile machine extends the capacity of a limited workshop and eliminates to a great extent the need for an immediate outlay of money for other equipment.

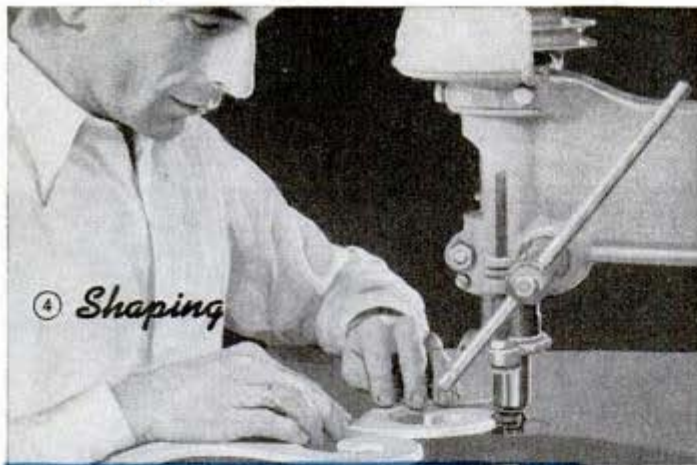
One of the simplest uses for a drill press, other than those of drilling and countersinking, Fig. 1, is as a gluing clamp, Fig. 2. An old auto valve or a length of shafting is gripped in the chuck and pressed down on the work, and the spindle is locked to hold it in position. For mixing paint, a suitable length of heavy wire is bent as shown in Fig. 3 to form a stirring tool, or a length of dowel studded with projecting nails can be used instead of the wire. Of course, care must be used not to form large bends in the wire or to use long nails in the dowel unless the speed is greatly reduced, otherwise the can may revolve or the paint may splash.



② Used as a clamp



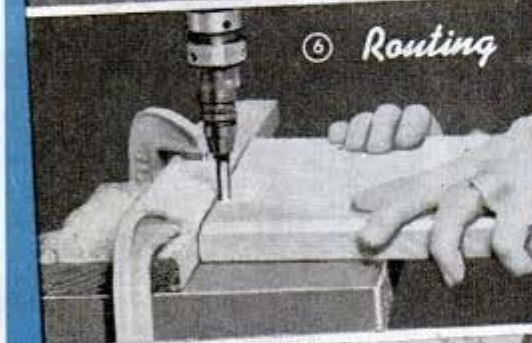
③ For mixing paint



④ *Shaping*



⑤ *Planing*



⑥ *Routing*



⑦ *Carving*



⑧ *Sanding*

To be used for shaping, Fig. 4, a drill press must be capable of 5,000 r.p.m. or more. Cutters can be bought for this work, or you can make a special mandrel to fit shaper cutters and chuck this in the press. If only outside shaping is to be done, the drill press can be used as is, but for inside shaping or elaborate work it is best to invert the head on the column so that this does not obstruct the work.

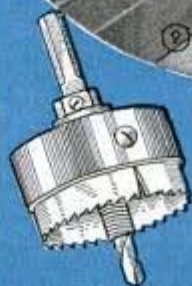
By the use of an inexpensive attachment, which operates at a speed of 3,000 to 5,000 r.p.m., a drill press can be converted to an efficient small planer, Fig. 5.

Such an attachment is especially effective when used for pieces too small to be handled on a jointer. Adapting the drill press to routing, Fig. 6, is simple, requiring no expensive equipment. Router bits, a special adapter for holding them, and an auxiliary table to provide ample room for attachment of fences, are all you need. Best work is obtained at speeds of 6,000 r.p.m. or more. Routers can be used also for cutting tenons. Carving, Fig. 7, is much like routing except that different cutters are used. The work should progress by several shallow cuts rather than by a few deep cuts in order to give smoother results. High speeds are required. Sanding with a drill press as in Fig. 8 not only saves time and effort, but gives excellent results, especially on curved work.

A special set of hollow chisels will equip the drill press for mortising, Fig. 9. Low spindle speeds are necessary, 400 to 500 r.p.m. being fast enough for most work. Mortising can be done also with a router, in cuts of about $\frac{1}{8}$ in. A hole saw, Fig. 10, is a valuable drill-press accessory, and is obtainable in sizes from $\frac{3}{4}$ to 3 in. Various types of saws are made for cutting wood, plastic, plaster board and metal. Work always should be clamped to the table during the cutting operation, and slow speeds must be used. However, speed required varies with the diameter of the hole and the kind of material being cut. Disks can be cut, too, by this method, much as dowels are cut. These are made with a plug cutter, Fig. 11, obtainable in sizes from $\frac{3}{8}$ to 1 in. Slow speeds are advisable here, also.

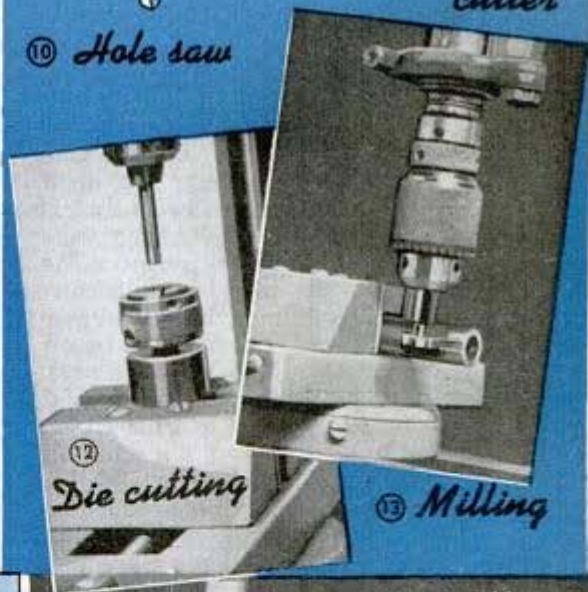
Die cutting and tapping also can be done with a drill press, as shown in Fig. 12. The press should be rotated by hand in cutting the threads, but the taps and dies can be backed off under power. Plenty of lubricant should be used. If much of this type of work is done, auto-

matic collapsing taps and dies, while somewhat expensive, are faster and more convenient. Light milling is another job you can do, provided that speeds are reduced as low as 150 r.p.m. Work should be held in a milling vise, Fig. 13, and cutters should be chucked with a mild steel bushing between the cutter shaft and the chuck jaws. If they are held directly in the hard jaws, slippage is likely to occur. Correct speeds to use depend on the material to be milled and the diameter of the cutters. A horizontal grinding attachment enables you to sharpen plane blades, chisels and other edged tools on the drill press, thus eliminating the hazards and inaccuracies of bench grinding tools held in your hands. Slow speeds are recommended for this work. In surface grinding metals, the work should be held securely in a drill-press vise or clamped to the table, Fig. 14. Grinding wheels can be bought in a variety of sizes and grits. As in carving and routing, grinding should be done in a series of shallow cuts. Correct speeds can be obtained from the manufacturer of the grinding wheels. Rust, paint and carbon removing and scratch brushing metal to a satin finish are some of the jobs that can be done with the drill press used as a buffer, Fig. 15. No abrasive compound ordinarily is needed when using wire brushes, of which there are various types in many grades of stiffness, each suited to a particular type of work. Like router bits, brushes should be held in a special adapter, but the press should be run at slow speed. By using buffing compounds a high polish can be given to metal or plastic. With a polishing tool improvised from a wood dowel to which a disk of leather is glued, a fine job of spot polishing can be done on metal. Valve-grinding compound or powdered emery in oil is used, and the drill press is run at slow speed.



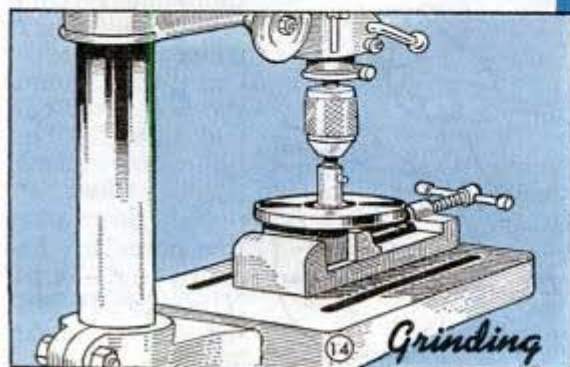
⑩ Hole saw

⑪ Plug cutter



⑫ Die cutting

⑬ Milling



⑭ Grinding



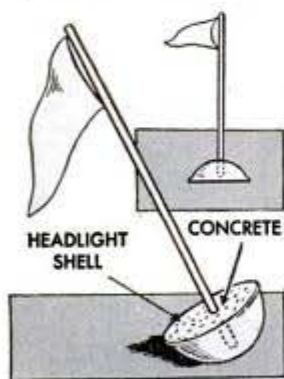
⑮ Buffing

Folded Edges Stiffen Show Cards To Prevent Curling on Display



Large show cards leaned against objects in a show window can be prevented from curling under their own weight by simply folding the vertical edges and stapling the folded portion. Score the cards with a glass cutter about 1 in. from the edges so that they can be folded without breaking.

Rounded Base on Warning Flag Allows It to Rock in Wind

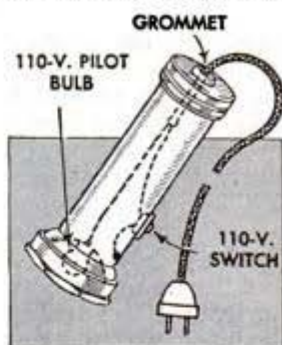


To display a warning flag on a highway so that it would attract as much attention as possible, one construction worker used a rounded headlight shell. This was filled with concrete, leaving a hole in the center for insertion of the flag staff. Mounted in this way, a slight breeze will cause the flag to rock back and forth to attract immediate attention. When it is desired to anchor the flag in a stationary position, the base is inverted as indicated in the small detail.

110-Volt Lamp for Inspectors Made From Flashlight

Inspectors and others who use flashlights in their work can save money spent for flashlight dry cells by converting the lights for use on 110-volt current. To do this, remove the cells and replace the flashlight

bulb with a 110-volt pilot bulb. Also, replace the regular flashlight switch with a 110-volt slide switch which you can obtain from a radio shop, and wire the bulb and switch as indicated, running the wire into the flashlight case through a hole drilled in the bottom of the case. Use a fiber or rubber grommet in the hole so that the wire will not wear through and cause a short circuit.



Long Wire Cable Easy to Carry In Old Auto Tire

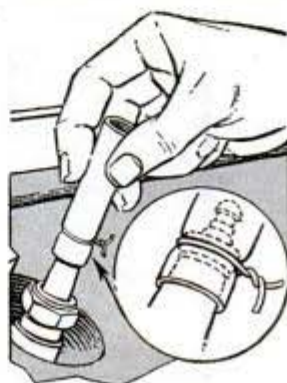
One plumber found that an old auto tire provides an excellent carrying case for lengths of heavy, flexible cable used in cleaning sewers. The natural springiness of the cable holds it inside the tire.

The capacity of the tire depends on its diameter and the size and weight of the cable, but normally two 25-ft. lengths of double cable about 1 in. in diameter make a convenient load for one tire.—Walter E. Burton, Akron, Ohio.



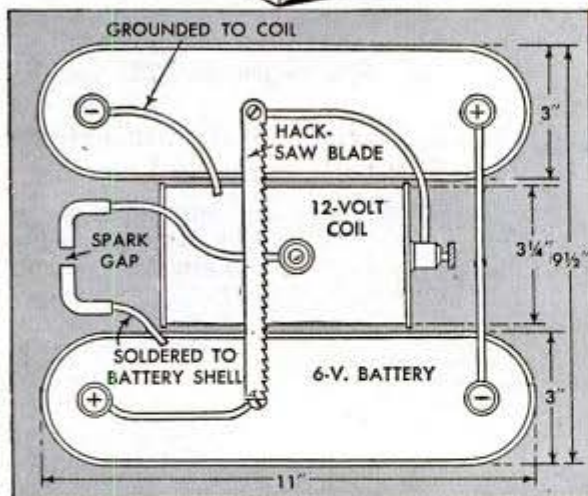
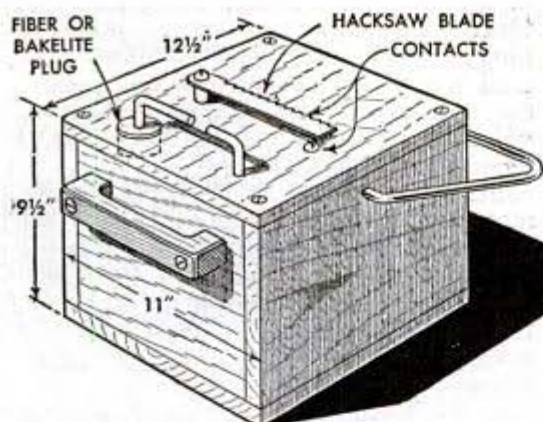
Spark Plugs Quickly Removed With Rubber Hose 'Wrench'

After loosening spark plugs on many motors, I found that a wrench made from a short length of air hose is ideal for unscrewing them. Also, it can be used for screwing the plugs into place, after which they are



tightened with a regular wrench. A piece of wire twisted around the hose near one end squeezes the hose to make a tight fit when it is pushed down over the porcelain insulator.—Cpl. Nicholas B. Miller, Geiger Field, Wash.

All-Weather Electric Lighter for Welding Torch



Designed by Marine Corporal Calvin A. Rastall, this electric lighter will function in all weather, is more positive than a friction lighter and safer than matches or cigarette lighters which sometimes are used for this purpose. The lighter can be made in 2 or 3 hours' time, and with normal shop

usage should last a year before the batteries have to be replaced. The scrap pile of an average shop should yield most of the necessary materials. Besides two 6-volt batteries, you will need one 12-volt vibrator coil, two 5-in. pieces of small brass rod, one 6-in. length of hacksaw blade, and five feet of 1 by 10-in. lumber for the container or carrier. Batteries and coil are wired as shown, the saw blade makes a switch, and the rod forms the spark gap. Pressure of the torch on the blade closes the circuit, causing the spark to ignite the torch.

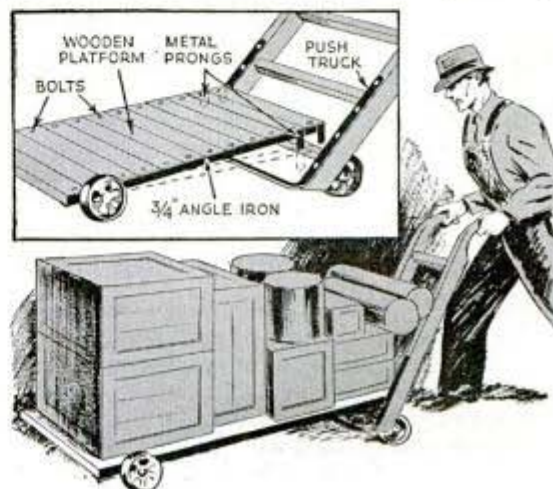
Capt. E. H. Klein, San Francisco, Calif.

Large Wheeled Platform Increases Push Truck Capacity

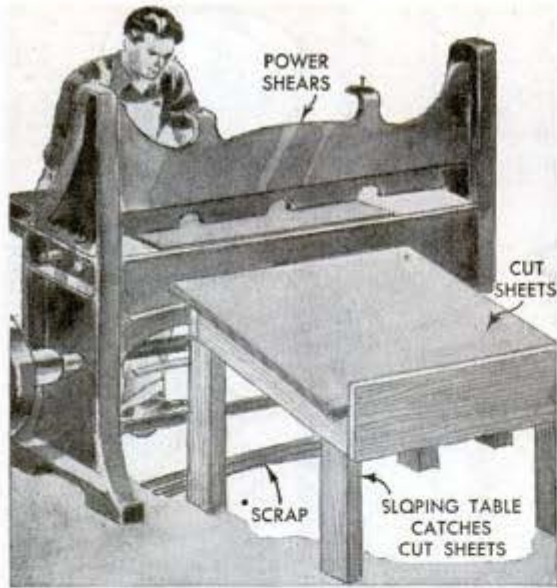
A simple platform like the one shown will increase the capacity of a push truck so that large loads can be moved about in a warehouse or factory. The platform has angle-iron side members to which 2-in. boards are bolted, and is fitted with two small wheels at the front end. Metal prongs on each side at the rear end slip over a cross member of the truck to connect the platform to it. Prongs are spaced to allow play between them and the cross member to permit steering.

Opie Read, Jr., Chicago.

☐ If the face of a rubber stamp becomes hard or glazed, roughen it slightly with fine sandpaper and it will print almost as well as a new one.

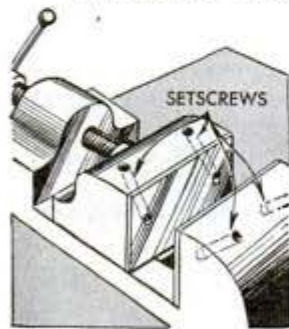


Sloping Table for Power Shears Separates Scrap From Sheets



To separate trim or scrap pieces from sheet metal cut on a power shears, one mechanic uses a sloping table as shown. This is placed at the desired distance from the shears to allow the scrap pieces to fall to the floor. The sloping top also causes the trimmed sheets to slide into a stack.

Setscrews in Vise Help to Hold Irregular-Shaped Castings



Rather than resort to complicated jigs for holding irregular-shaped castings and forgings in the vises on various machines, one workman uses setscrews in jaws of the vises. Holes are drilled and tapped into the jaws at an angle

so that when the screws are driven in, they exert a downward pressure on the work. With the combined pressures of the vise jaws and the screws, almost any casting can be held firmly in the desired position.

William Slamer, Milwaukee, Wis.

Flexible Coupling in Pump Drive Repaired With Rawhide Thongs

During several years of service, an eight-pin coupling in one of our centrifugal pumps wore out several two-ply leather disks and three sets of pins. Other materials were substituted for the leather disks, but because the pump sometimes had to

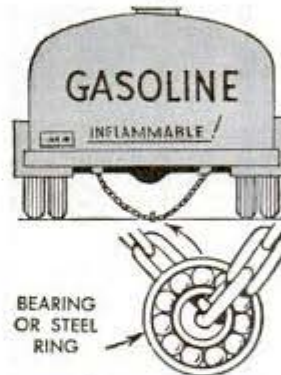
start forward when a head of water was causing it to rotate in reverse, service life of the disks was short. Also, there were times when the pins became loose, and worn disks caused excessive vibration. In an emergency, due to lack of suitable material for disks, we removed the pins and laced the coupling with rawhide as indicated. The pump now operates smoothly without vibration and, after several months of use, neither rawhide nor coupling shows any perceptible wear.

George Holman, Marissa, Ill.

RAWHIDE THONGS



'Wheeled' Drag Chain for Trucks Hauling Inflammable Liquids



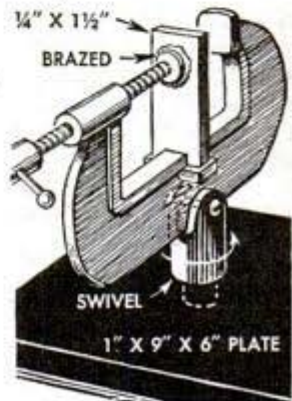
Instead of merely dragging a chain to ground static electricity from a gasoline truck, suspend the chain from both sides of the truck so that the center of the chain just clears the ground when the truck is in motion. Then slip a ball bearing

over the chain. Because of its weight, the bearing will make good contact with the ground, and it will last many times longer than the usual drag chain.

R. H. Cochran, Phillips, Tex.

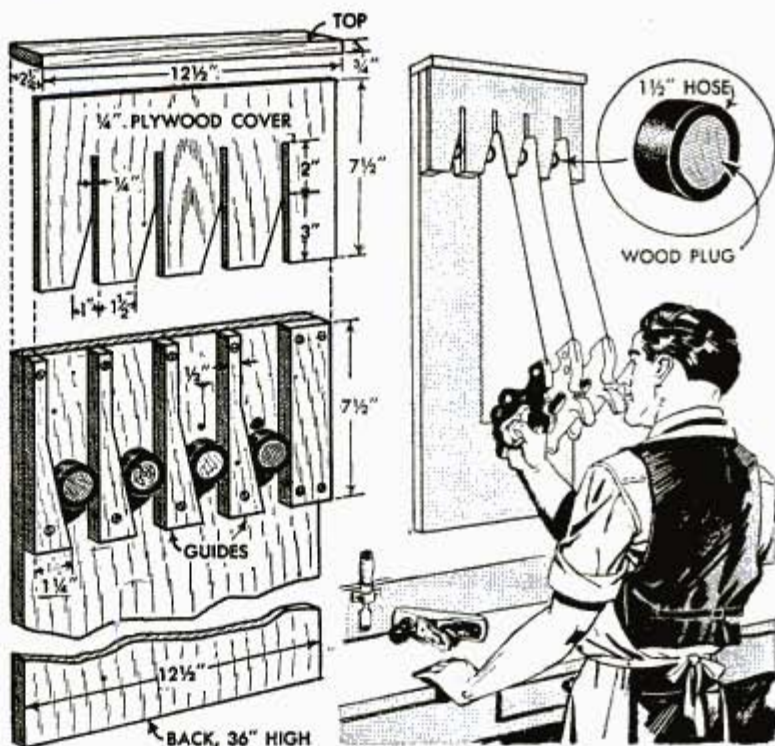
Welder's Vise Easy to Make

The universal action of this vise allows work held in it to be adjusted quickly to almost any convenient position for welding, as the vise can be tilted or turned in a complete circle. Made from a strong C-clamp fitted with a sliding jaw, the vise is attached to a metal plate for stability, and can be moved to any convenient location for working. — T. T. Lecom, Waukegan, Ill.



'Rubber-Tired' Rollers Hold Saws in This Rack

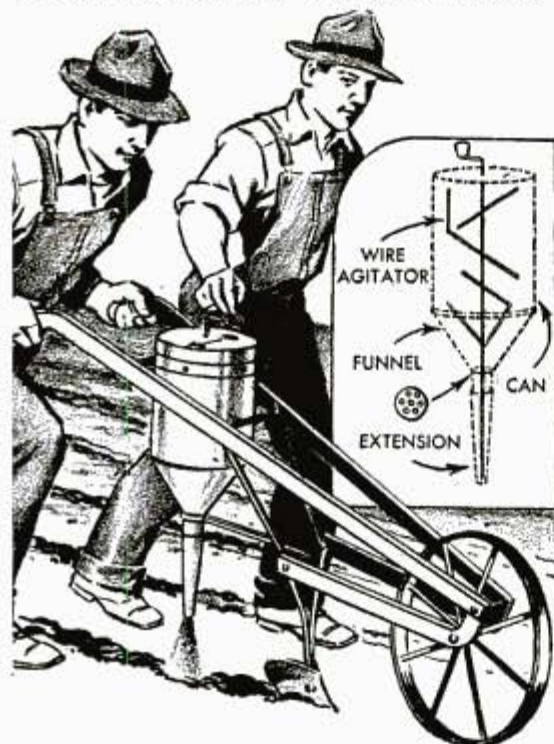
After trying several different types of hand-saw racks, we found the one illustrated to be the most convenient. When hung within easy reach over the workbench, it is nearly as easy to replace the saw in the rack after each cut as it would be to lay it on the bench. While holding the saw by the handle in a natural position, you simply push the end up into the slot where a rubber-covered roller grips it firmly. A saw is removed by a slight upward and outward motion. The rack can be made to accommodate as many saws as desired, and consists of a plywood back to which are screwed guides shaped as shown. You'll need one guide for each saw. Rollers housed between the guides are held in place by a plywood cover slotted at the lower edge as indicated. The rollers are slices cut from large hose and fitted with wood plugs or cores. When a saw is inserted, the rollers rise slightly to



let it pass, but when the saw is released, its weight causes the roller to press it tightly against the back of the adjoining guide and thus hold it securely in place.

William Vanish, Pond, Wis.

Garden Plow Attachment Spreads Chinch-Bug Powder



The difficult and time-consuming job of spreading insecticide powder in small furrows to kill chinch bugs was simplified by one farmer who fitted his garden plow with a spreading attachment like the one shown. Although two men are required to operate it—one to push the plow and one to rotate the agitator—time is saved because a furrow is made and the powder spread efficiently in one operation. The attachment consists of a funnel soldered to the open end of a large can and mounted between the handles of the plow so that the funnel neck extends close to the ground and directly above the furrow. An extension on the neck permits the desired height adjustment. An agitator is made of lengths of wire soldered to a small rod bent to form a crank at the upper end. The lower end of the agitator extends into a perforated disk at the upper end of the funnel neck. A hinged cover is provided for the top of the spreader.—Harold Tanner, Lerna, Ill.

☛ You can avoid straining your feet during long hours at a bench or lathe if you use a floor pad of 1/2-in. insulating board.

Pointers on CLAMPING

By Sam Brown

CLAMPS commonly used in making glued joints include handscrews, C-clamps and bar clamps. The actual mechanics of working and applying these clamps is often obvious, yet there are certain tricks in operation that save time and help to produce better work.

Swinging a handscrew: Oldest of all clamps, the handscrew often is misused. Learn, first, to swing it—grasp the end of the spindle with the right hand, Fig. 1, and then rotate the right hand toward

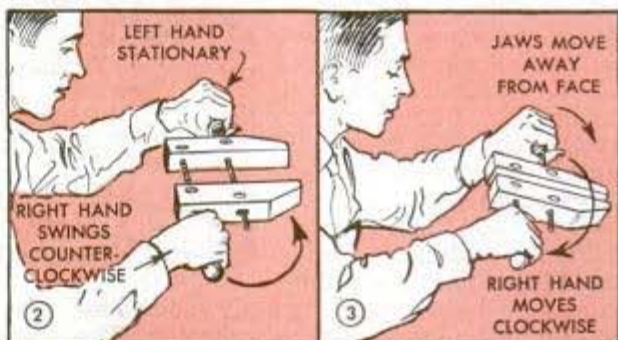


RIGHT HAND ALWAYS GRASPS OUTER SPINDLE

①

Swinging a handscrew

is rapid and easy to do. End spindle should always be grasped in right hand



LEFT HAND STATIONARY

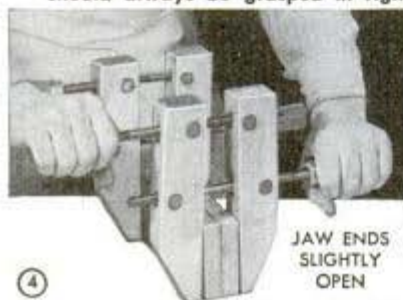
RIGHT HAND SWINGS COUNTER-CLOCKWISE

②

JAWS MOVE AWAY FROM FACE

RIGHT HAND MOVES CLOCKWISE

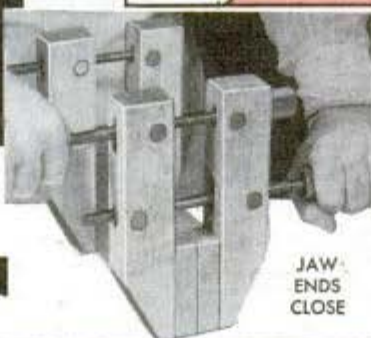
③



JAW ENDS SLIGHTLY OPEN

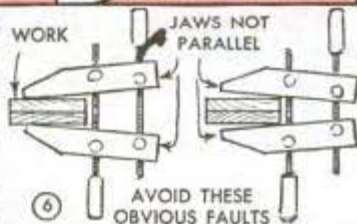
④

MIDDLE SPINDLE ADJUSTS TO WORK SIZE



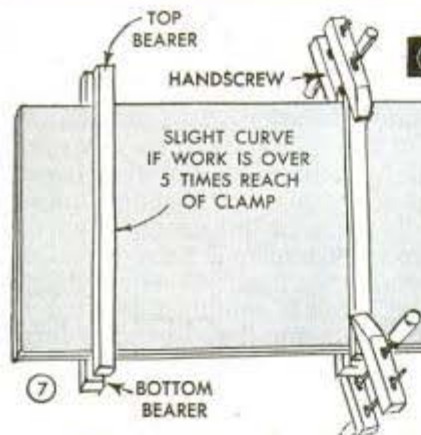
JAW ENDS CLOSE

⑤ END SPINDLE APPLIES PRESSURE



⑥

AVOID THESE OBVIOUS FAULTS



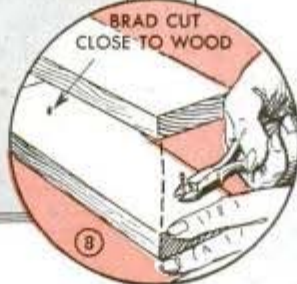
TOP BEARER

HANDSCREW

SLIGHT CURVE IF WORK IS OVER 5 TIMES REACH OF CLAMP

BOTTOM BEARER

⑦

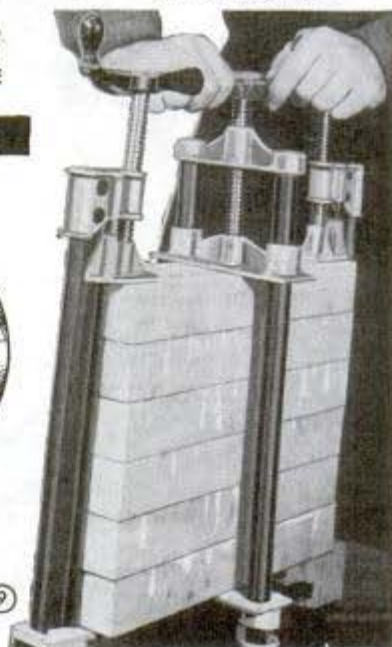


BRAD CUT CLOSE TO WOOD

⑧

Clamping boards face to face

requires heavy clamp pressure and equal distribution of clamps. Long bar clamps are used for laminations, as at the right



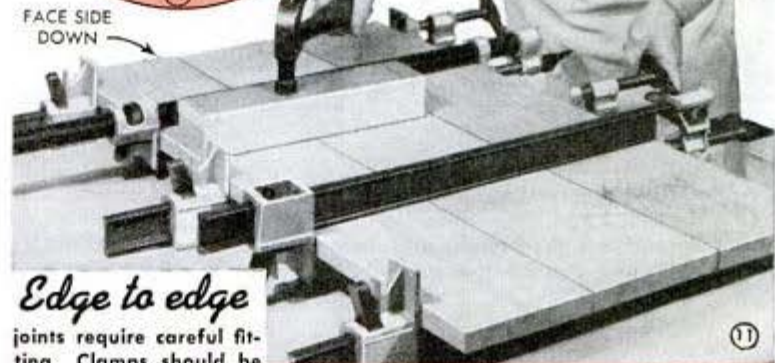
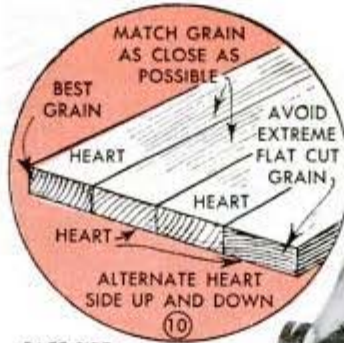
⑨

GLUED JOINTS

or away from your face, Figs. 2 and 3, to open or close the jaws as required. Always grasp the end spindle in your right hand. If you have trouble remembering the direction of swing, simply think "open face," indicating a swing of the jaws toward your face to open them, as in Fig. 2. New clamp jaws are oiled. Get rid of any excess oil by clamping over a soft board or blotter before you proceed with actual work.

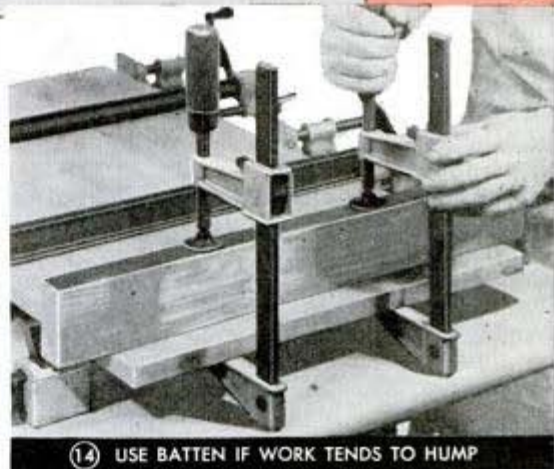
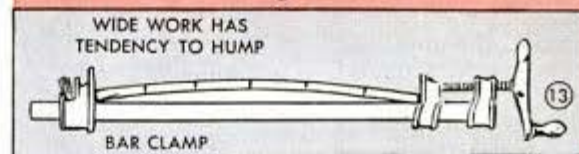
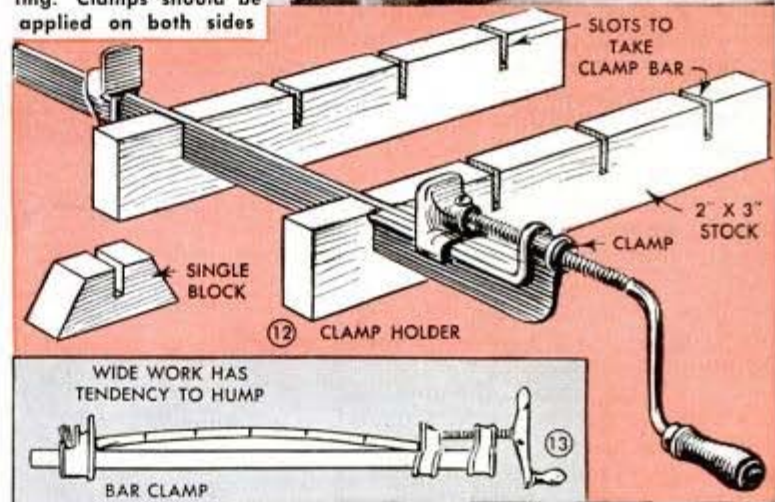
Face-to-face joints: The method of applying handscrews when gluing boards face to face is shown in Figs. 4 and 5. The same technique applies in any other use of handscrews. First, swing the handscrew to get the approximate jaw opening needed. Apply it to work, and turn both handles so that the jaws take the position shown in Fig. 4, with the tips slightly open. Use end handle to apply pressure, Fig. 5, bringing the jaws parallel. If the jaws do not come parallel, loosen middle spindle slightly, and then retighten it. Avoid the obvious faults shown in Fig. 6. The final position of the clamp jaws should be parallel for all average work. If the work is too wide to be clamped with handscrews alone, use bearers at top and bottom, Fig. 7. A few small brads driven into the wood and cut off close as in Fig. 8 will prevent creeping when clamp pressure is applied. Of course, clamps other than handscrews can be used for face-to-face joints. The use of single and double bar clamps for this work is shown in Fig. 9.

Edge-to-edge joints: Alternate the boards, one with the heart up and one with it down as in Fig. 10 when assembling work of this kind, in order to minimize warping. Match the grain as closely as possible. Place bar clamps on a level surface and assemble the work face down over the

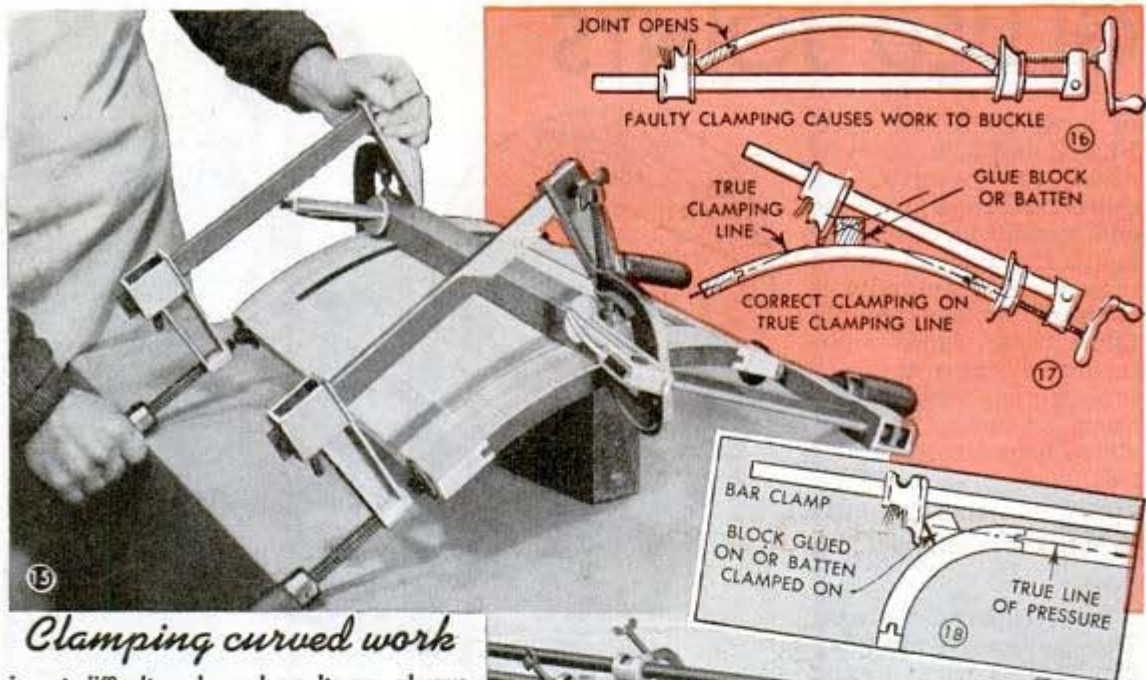


Edge to edge

joints require careful fitting. Clamps should be applied on both sides



14 USE BATTEN IF WORK TENDS TO HUMP



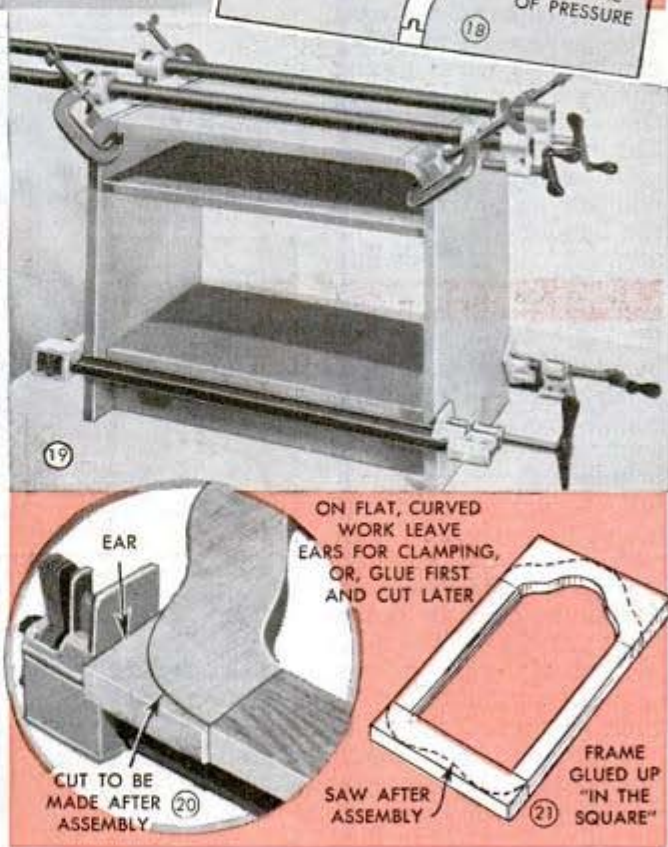
Clamping curved work

is not difficult and good results are always obtained if clamp parallels true pressure line

clamps. Some styles of clamps will stand alone; others will need holding blocks, as in Fig. 12, to maintain an upright position. Use paper at points where clamp bars cross glued joints to prevent sticking or staining. Tighten the clamps gradually, in rotation, leading off with the center clamp. The tendency of work is to hump, Fig. 13, and this should be eliminated by fitting clamps on both sides or by applying a batten as in Fig. 14. After medium pressure has been applied, go over the joints with a hammer and wood block as shown in Fig. 11, pounding all joints flat.

Clamping curved work: Curved work illustrates one basic rule of clamping: The pressure always must be directly across the joint. Note in Fig. 16 how violation of this rule would cause work to buckle. Correct clamping, Figs. 15 and 17, keeps the work in proper position. Figs. 18 and 19 show other examples. Blocks necessary to establish a clamping line can be glued or clamped on as desired. If glued on, they can be knocked off with a chisel when the glue joint has dried. The correct clamping line on flat work is established readily by leaving ears on the work as in Fig. 20, or by gluing up "in-the-square," Fig. 21.

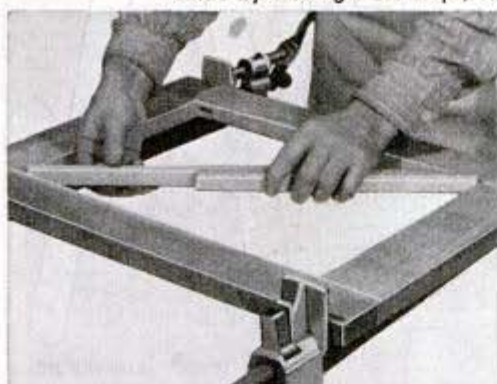
Framing: Framing is the classic of clamping operations in woodworking. It applies to tables, cabinets, frames—any kind of work assembled from legs or stiles



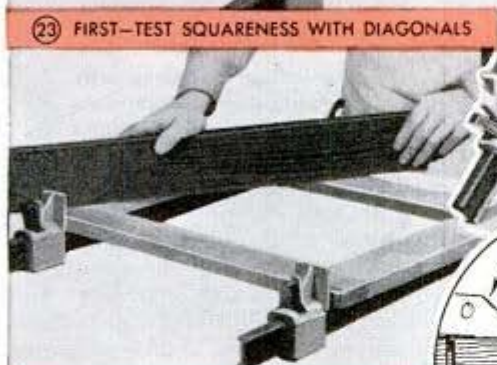
and rails. Check work of this kind carefully for wind (twist), squareness and flatness as shown in the photos, Figs. 22, 23, 24 and 26. Use a batten, Fig. 25, if the work is not level. Adjust clamps as in Fig. 27, if work is not square, or, apply a clamp diagonally, Fig. 28. Correct any twist by shifting the clamps in the direction of the arrows, Fig. 29. If the work leans or twists in any direction, the ends of the clamps are always shifted in the same direction as

Framing, four tests for trueness

All frames should be tested for trueness immediately after initial clamping. Corrections can usually be made by shifting the clamps, as shown in diagrams



23 FIRST—TEST SQUARENESS WITH DIAGONALS



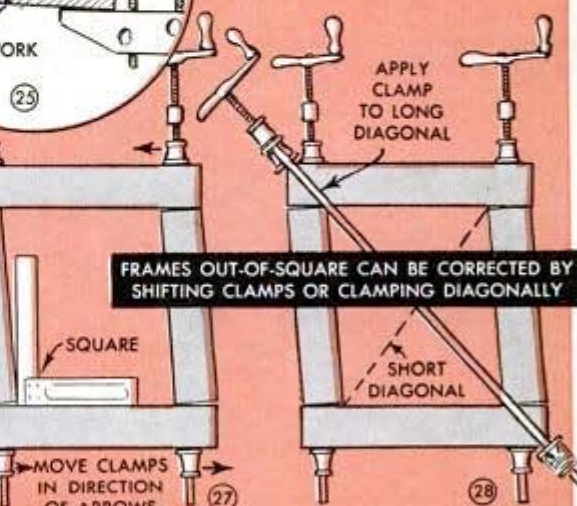
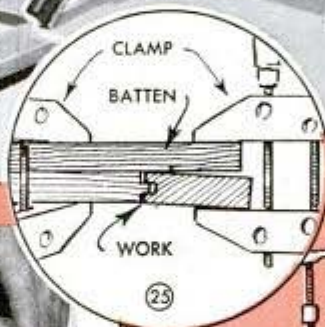
24 SECOND—CHECK SURFACE FLATNESS



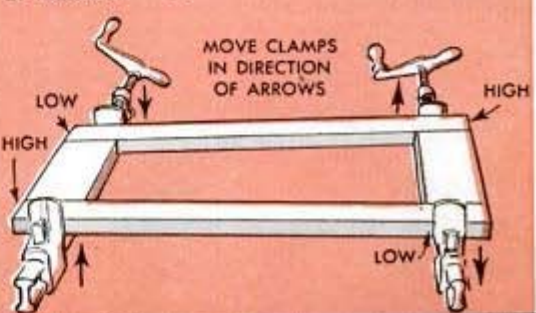
26 THIRD—TEST SQUARENESS AT EACH CORNER



22 FOURTH—SIGHT FOR WIND (TWIST)



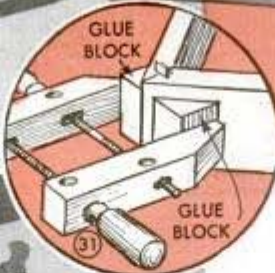
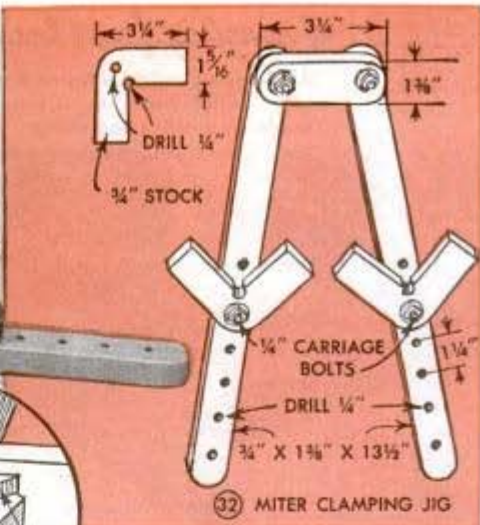
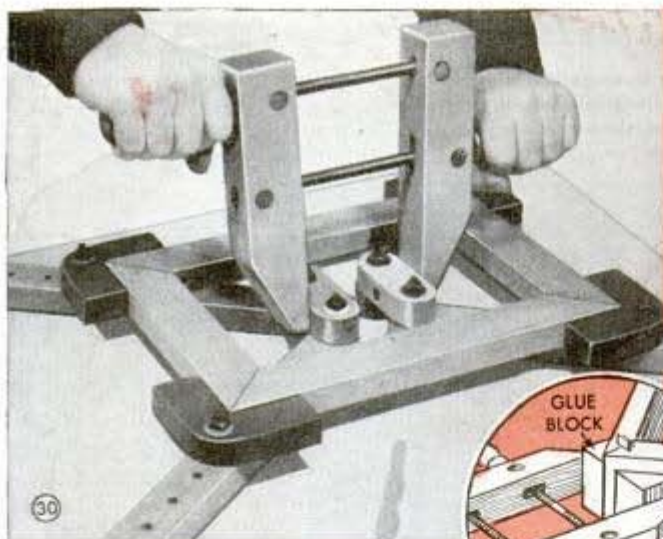
FRAMES OUT-OF-SQUARE CAN BE CORRECTED BY SHIFTING CLAMPS OR CLAMPING DIAGONALLY



29 CORRECTION FOR WIND

the frame leans to make the correction.

Miters: Hardest of all glue joints to clamp are mitered joints. Best results on light frames are obtained by using the clamping jig shown in Figs. 30 and 32. With clamps alone the best setup is probably one involving ears glued or clamped in place to establish the proper clamping line. Fig. 33 illustrates use of ears clamped on; Fig. 31 shows ears glued on. With minor variations, the same method applies to both flat and edge miters, Fig. 34. When the work permits drilling of blind holes in back,



Miter joints

are difficult to clamp with ordinary clamps. Best results are obtained with jig above



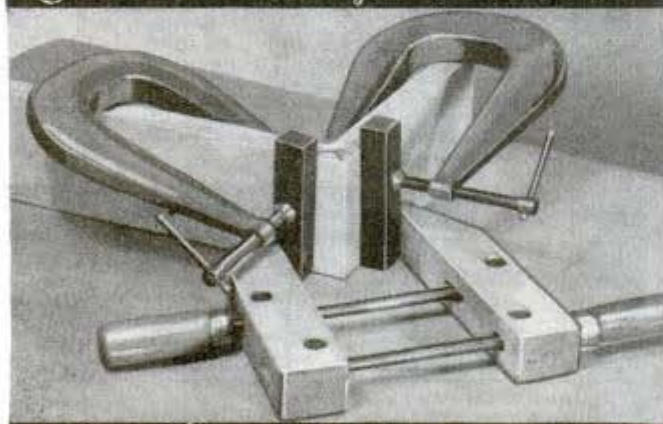
the special miter clamp, Figs. 35 and 36, can be used to advantage.

Columns: An efficient clamp for column work can be fashioned from sash cord and handscrews as shown in Fig. 38. The sash cord is threaded through blocks of wood, the free end being knotted to give the desired circumference. A variation of the method is shown in Fig. 37. This uses a single length of sash cord, fitted through holes drilled in handscrew jaws.

Cross clamp: One of many special types of clamps, the cross clamp is inexpensive and practical to use. It is used in connection with any deep-throat bar clamp, and its primary use is fastening edge strips on work where cross spanning with bar clamps would be impractical. It is excellent for veneering edges. The method of application is shown in Fig. 39. It is useful also for light framing, Fig. 40, eliminating the need of long bar clamps. As a supplement to a deep-throat clamp, it can be used on stiles up to 3 in. in width.

Glue: Almost any kind of glue can be used in making glue joints. The professional worker favors hot animal glue, largely because of short drying time and suitability for rubbed joints. The occasional worker does best with a cold, slow-setting glue, such as casein or cold resin. There is no particular advantage in roughing the edges of any glue joint; smooth wood sur-

33 CLAMPING FLAT MITER JOINT WITH USE OF CLAMPED EARS

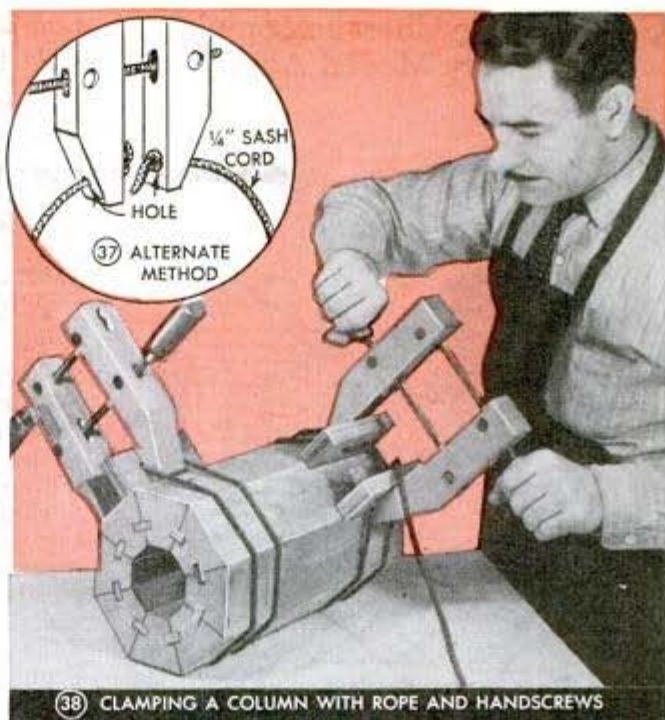


34 EARS APPLIED TO EDGE MITER

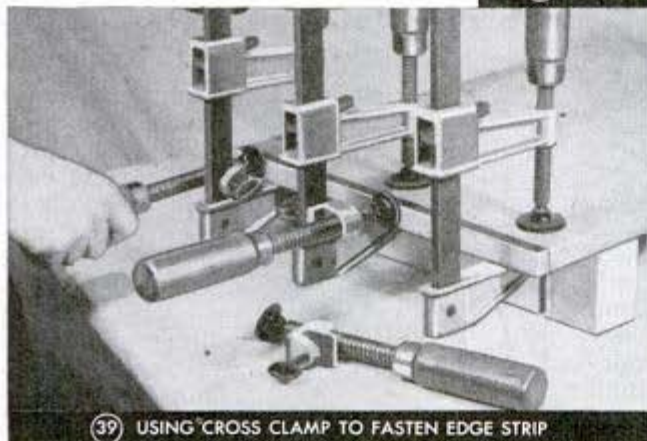


35 36 MITER CLAMP IS USEFUL WHEN WORK PERMITS HOLES

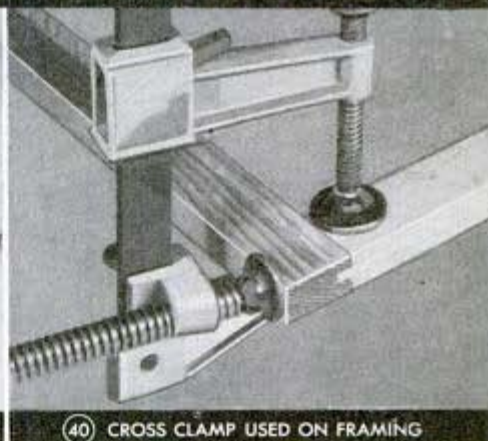
faces hold just as well as rough, provided that the edges to be glued are flat and even throughout. End grain joints should be sized with a priming glue coat to stop suction. Oily woods, such as teak, rosewood, pitch pine, etc., should be sponged with a weak caustic solution (or any household cleaner) to cut the oil film. Joints in hardwood should stand in the clamps two or three hours longer than softwood; minimum drying time will depend on glue used and temperature of room, but in all cases a full 12 hours' drying time insures sound joints. Extensive use should be made of dry setups to check fitting and accuracy of all joints so that when the work is finally assembled and glued, the job can proceed smoothly without the annoying delays which would be necessitated by taking apart the joints and refitting them.



38 CLAMPING A COLUMN WITH ROPE AND HANDSCREWS



39 USING CROSS CLAMP TO FASTEN EDGE STRIP



40 CROSS CLAMP USED ON FRAMING

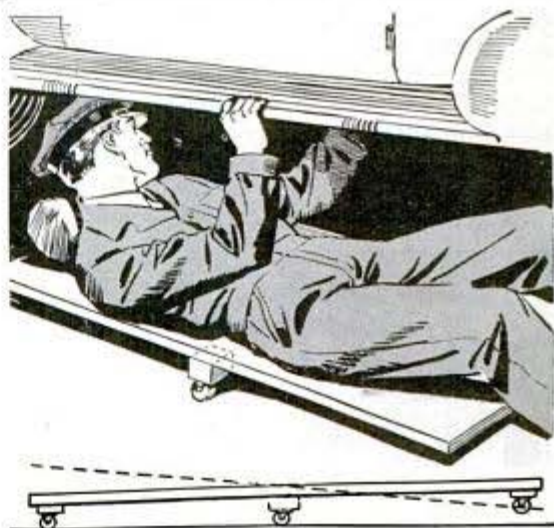
Creepers Raised at Center Simplifies Movement Under Car

Annoyed by the difficulty of manipulating his creeper into working position under a car, one mechanic removed the casters from the corners, put one at each end and the other two on a cleat across the center as indicated. This raised the center of the creeper so that by shifting his weight slightly, the mechanic could pivot the creeper with ease and thus quickly swing it into any desired position.

Rounded Collets Protect Fingers

If you have broken your fingernails by accidentally thrusting them against a rapidly rotating collet chuck, you can avoid this in the future by rounding the edges of the expansion slots. This can be done easily on a grinding wheel.

George H. Austin, Syracuse, N. Y.

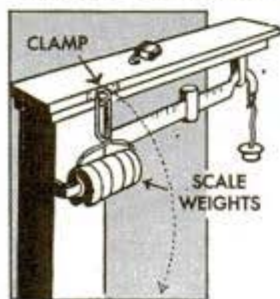


Combination Chest and Sawhorse Is Easily Moved About



Farmers and others who have widely spread jobs requiring the use of tools will find this wheelbarrow-type tool chest and sawhorse exceptionally handy. It is easy to move to the job and assures that an adequate supply of tools and a sawhorse will always be together when needed. The sawhorse is made in the usual way except that the top is about 12 in. wide and the front legs are fitted with an axle and small wheels. Handles nailed to the legs permit easy wheeling. A tool chest made especially for the purpose hooks to the underside of the sawhorse as indicated. When in use, the chest is unhooked to rest on the cross-pieces of the legs so that the tools are easy to reach.—W. E. High, West Lafayette, Ind.

Scale Weights Locked in Rack



Obliged to leave his platform scales in an open shed, a produce merchant often had his scale weights carried away when he was not around. To prevent this trouble without carrying the weights

into his office, he made a simple clamp from a small iron rod. This was slipped over the weight rack and was locked at the top by means of a staple and padlock. In this position, the weights could not be lifted from the rack, but were easily removed when the lock was taken off and the clamp swung down out of the way.

Bent Welding Rods Will Not Roll When Laid on Sloping Surface

To keep his welding rods from rolling around when he laid them aside temporarily while working on a sloping surface, one workman bent them. A slight bend is sufficient and does not interfere with their regular use.



Shoe-Polish Tin Stores Chalk Safely in Tool Box

To keep a disk of chalk handy with his tool box, yet prevent it from becoming broken or from smearing the contents of the box, one carpenter keeps it in an empty shoe-polish tin. This is attached to one end of the box with screws as indicated, and the chalk is removed by merely taking off the lid of the polish tin.



Telephone Headset Padded With Powder Puffs

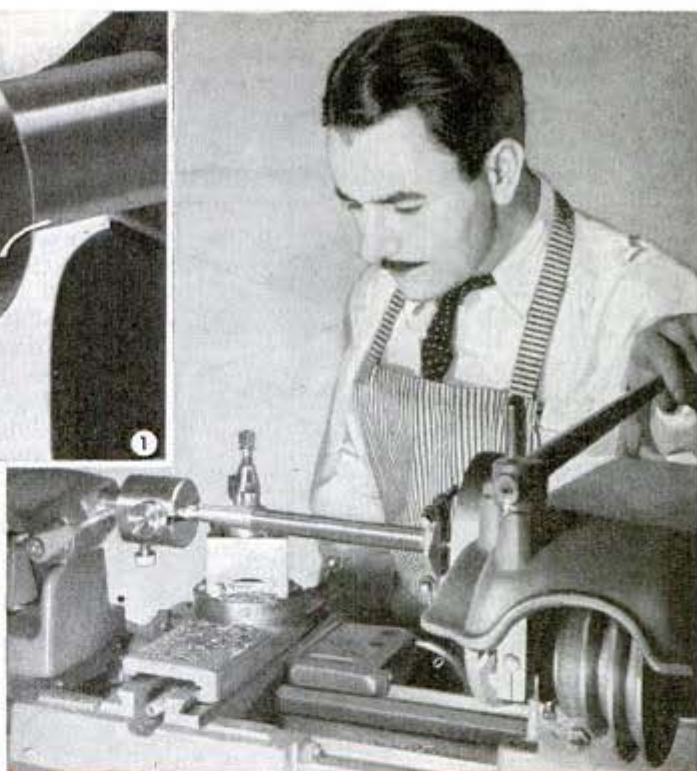
Telephone operators and others who wear earphones during most of their working time will find their headsets more comfortable to their ears if they are padded. Pads for this purpose can be improvised from powder puffs, which are perforated as shown in the detail, and are attached to the earphones with strips of adhesive or cellulose tape.



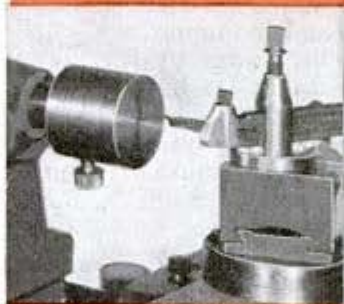


Offset TAILSTOCK Center

The annoyance of setting over the tailstock for taper turning is avoided by using an offset center, which fits over the tailstock ram, Fig. 1, without disturbing it, Fig. 2. Most of the work is in boring and slotting the body. First, fit the body to the tailstock ram and mark the centerline, Fig. 3. Run a small pilot hole across the work, Fig. 4, then enlarge it to $\frac{3}{8}$ in., finishing with a reamer. Hold the work on a stub spindle with a setscrew, as shown in Fig. 5, for counterboring, and mill a slot for the center, Fig. 6. Maximum offset is $\frac{3}{8}$ in. toward operator



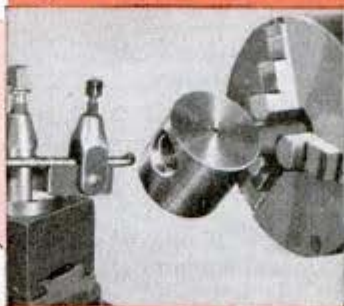
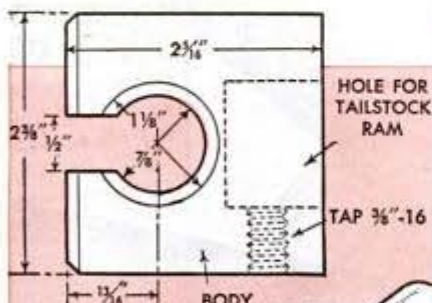
② HANDLES ALL TAPERING JOBS WITHOUT DISTURBING TAILSTOCK



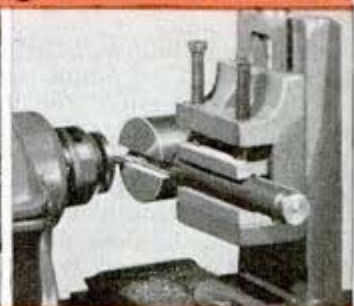
③ FIT BODY TO TAILSTOCK



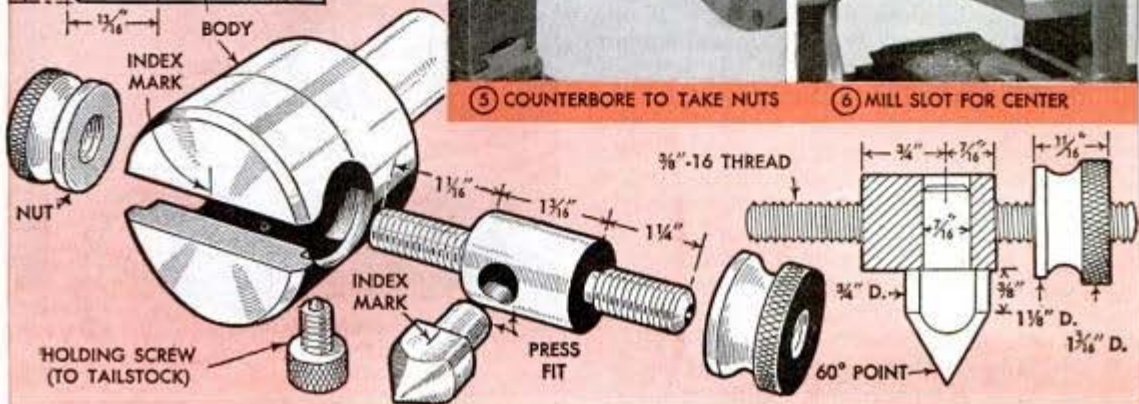
④ BORE PILOT HOLE THEN ENLARGE



⑤ COUNTERBORE TO TAKE NUTS



⑥ MILL SLOT FOR CENTER





Metal Curler Rolls Calendars To Insert in Mailing Tubes

Printers who have quantities of calendars or pictures to roll and insert in mailing tubes for their customers will find this device a time and labor saver. It consists of a piece of sheet metal which is rolled to an open cylinder shape and tacked onto a workbench at one end. The calendar is inserted in the position indicated and pushed so that it rolls up automatically to the desired diameter. The mailing tube then is slipped over the end of the roll, which is withdrawn to complete the operation. All sharp edges on the metal should be rounded to avoid injuring the hands.

Door Key Fastened to Block Unlikely to Be Misplaced

Whenever there is only one key to a door or cabinet and it must be used by several persons, attach it to a wooden block and it is less likely to be misplaced or inadvertently stuck in someone's pocket. The



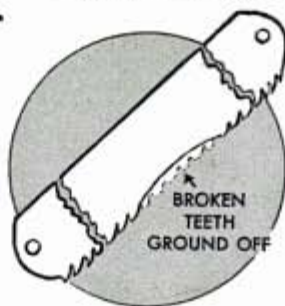
key can be attached to the block with a chain link and a screw eye, and the name of the room or cabinet can be stamped on the block. — Thomas Trail, Baltimore, Maryland.

Color Wheel Changes Wordings On Show-Window Sign

Lettering on a show-window sign will alternately appear and disappear when light is projected on it through this simple color wheel. To produce this effect, a four-spoke wheel is cut from plywood or hard-pressed board and grooved around the rim for a belt. Then pieces of red and green Cellophane are glued to it, with the colors alternating so that pieces of the same color are on opposite sides of the wheel. Next, the sign is lettered with red and green paint, alternating the color of the lines of letters. When the light shines through Cellophane of the same color as that of the lettering, this lettering will become invisible. But lettering painted in the other color will be plainly seen. The wheel is mounted on a support in front of a spotlight, and is rotated by a belt running over the pulley of a small motor. This should have a variable-speed control so that the wheel will rotate slowly enough to allow the lettering on the sign to be read easily.

Ken Murray, Baltimore, Md.

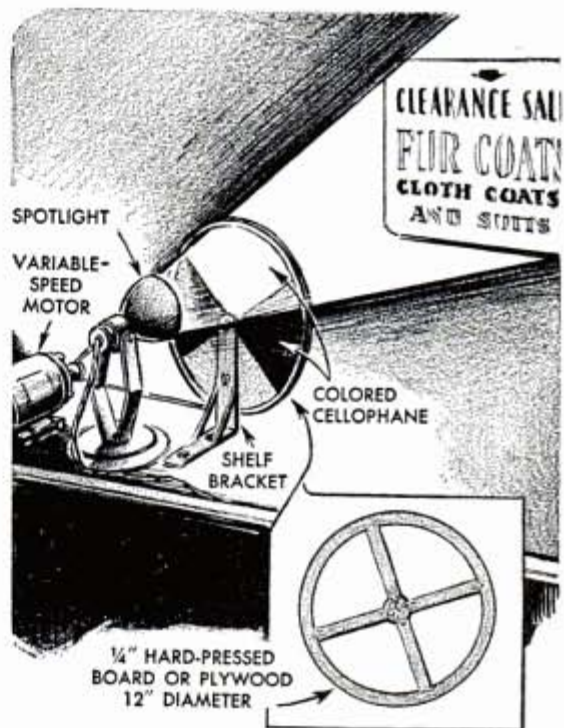
Broken Teeth in Hacksaw Blade Ground Off for Better Use



When two or more teeth in a hacksaw blade are broken off in a group, the blade can still be used with fair results if the broken teeth are ground as indicated. Taper off a couple of the good teeth on each

side of the break so that they will not be broken by coming abruptly into contact with the metal when the blade is in use.

Andrew Vena, New York City.

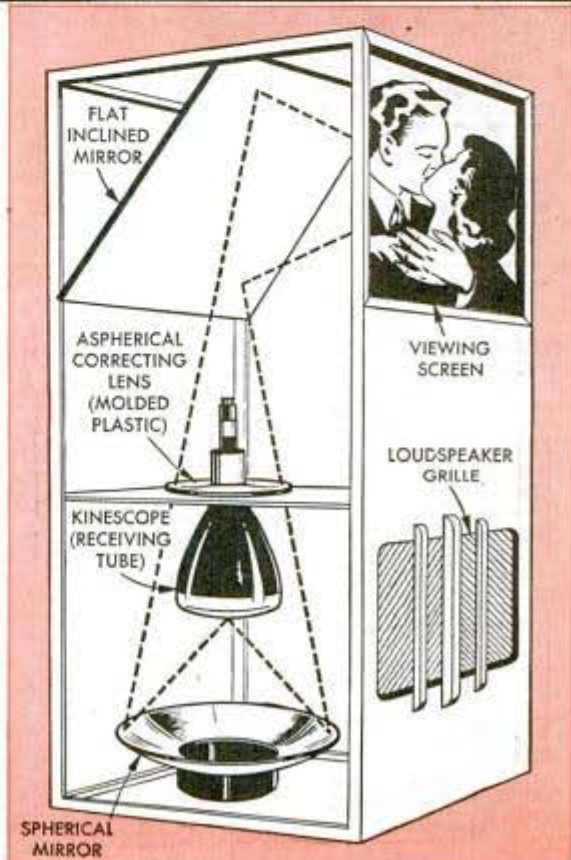




Large Screen Home Television

A "PREVIEW" of postwar television was given recently when a video program was received on an RCA laboratory demonstration model of a projection-type receiver. A 5-in. cathode-ray receiving tube produced an image filling a translucent screen 16 by 21½ in.

Operating on an improved projection principle and reflecting optical system recently announced by RCA engineers, the actual postwar television receiver sat for its portrait and gave a satisfactory demonstration, according to witnesses. The receiver projects the image on a built-in screen through a molded plastic lens projecting system, as illustrated in the accompanying pictorial diagram. The dotted lines indicate the path of light beams from a single picture element on the face of the cathode-ray receiving tube to a corresponding point on the screen. The spherical mirror and lens deliver to the viewing screen about six times as much light as could be obtained if a conventional f:2 movie projection lens were used. Console models of this type will cost about \$395 and will include FM and standard broadcast reception.



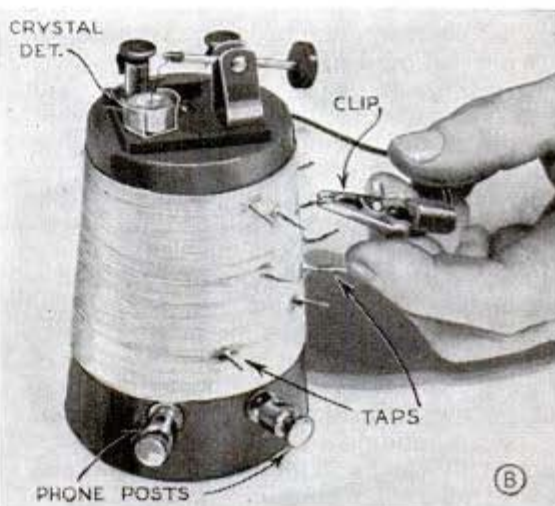
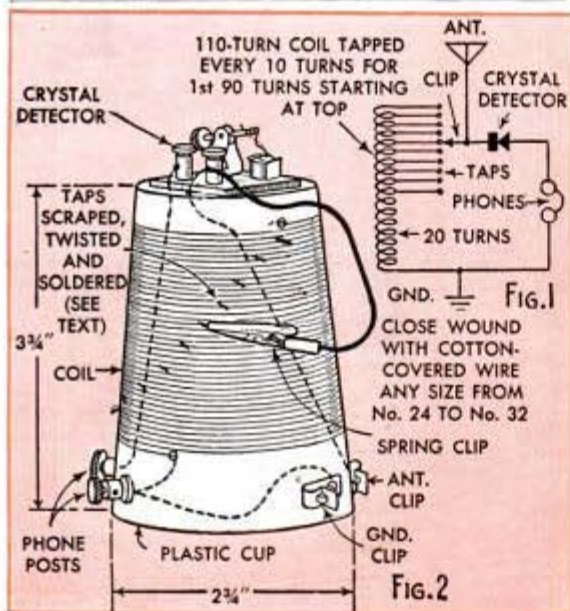
TWO LOW-COST CRYSTAL SETS



CRYSTAL sets never lose their appeal because they offer so much radio for so little money and because they give satisfactory reception on local stations. All you need is a good pair of 2,000-ohm headphones, a few scrap materials, and a crystal detector to build an efficient broadcast receiver of this description. Complete crystal detectors cost about 25 cents, or you can assemble your own holder and mount a small piece of galena mineral. A safety pin, or a piece of stiff wire, will serve as an adjustable contact point.

Crystal circuits are of infinite variety. Some are quite selective and will separate strong local broadcasting stations in crowded localities; others of simpler design are intended to receive only the strongest station in a given area. The usual range for any crystal receiver is about 40 miles for powerful broadcasting stations, although greater distances have been covered under favorable receiving conditions or with elaborate antenna and ground systems that are not practical from an economical standpoint. In every case maximum range is obtained with a long and high outdoor antenna and a ground on a cold water pipe, rather than with trick circuits. For distant stations the antenna should be 150 feet long or longer.

Schematic circuit diagram Fig. 1 shows a crystal set reduced to its simplest fundamentals. It consists of a coil, tapped for tuning, and a crystal detector. This set is intended for use only in a city which has but one broadcasting station powerful enough to give a good signal on crystal sets. The coil is wound on an ordinary plastic drinking cup of the "dime" store variety as detailed in the pictorial diagram



for EXPERIMENTERS

Fig. 2 and photos A and B; the total cost was approximately 50 cents. The coil tuning taps are made by scraping the insulation from the wire at the tap point, twisting it and applying solder so that it will stand out and provide a terminal for the "bulldog" spring clip. The standard adjustable crystal detector is mounted on top of the cup. Two Fahnestock spring clips and two binding posts complete the assembly.

A really selective crystal receiver is shown in photo C; the schematic circuit appears in Fig. 3 and simplified pictorial wiring diagrams are given in Figs. 4 and 4-A. It includes a wave-trap and employs two 2-gang variable condensers that were salvaged from old broadcast receivers. As only one section in each 2-gang condenser is used, single-section condensers of the same capacity may be substituted. The set is tuned with variable condenser C_1 at front; interfering stations are tuned out with the wave-trap condenser C_2 . Detailed student material list R-335 is available from Popular Mechanics radio department upon receipt of ordinary letter postage.

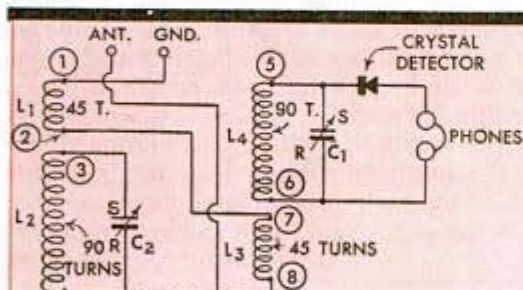
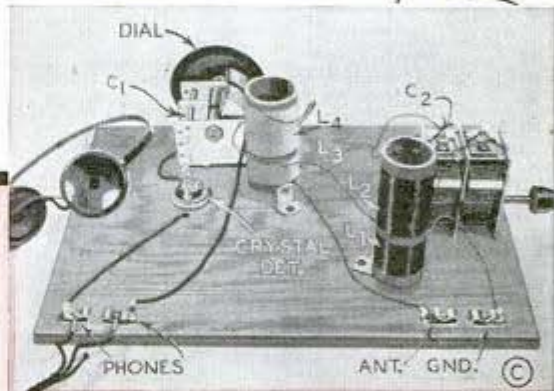


FIG. 3

NOTE
 C_1 AND C_2 —SINGLE SECTIONS OF TWO OLD 365 MMFD. 2-GANG VARIABLE CONDENSERS

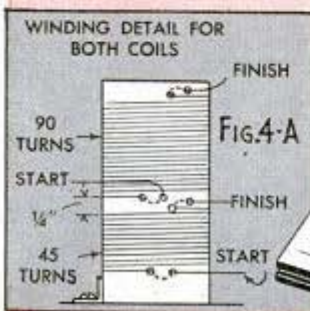


FIG. 4-A

NOTE—R=Rotor (common with frame)
S=Stator (stationary plates)
N. C.=No connection
All coils are close-wound in the same direction.
No. 26 enameled or cotton covered wire. Any size wire from No. 26 to 30 can be used.

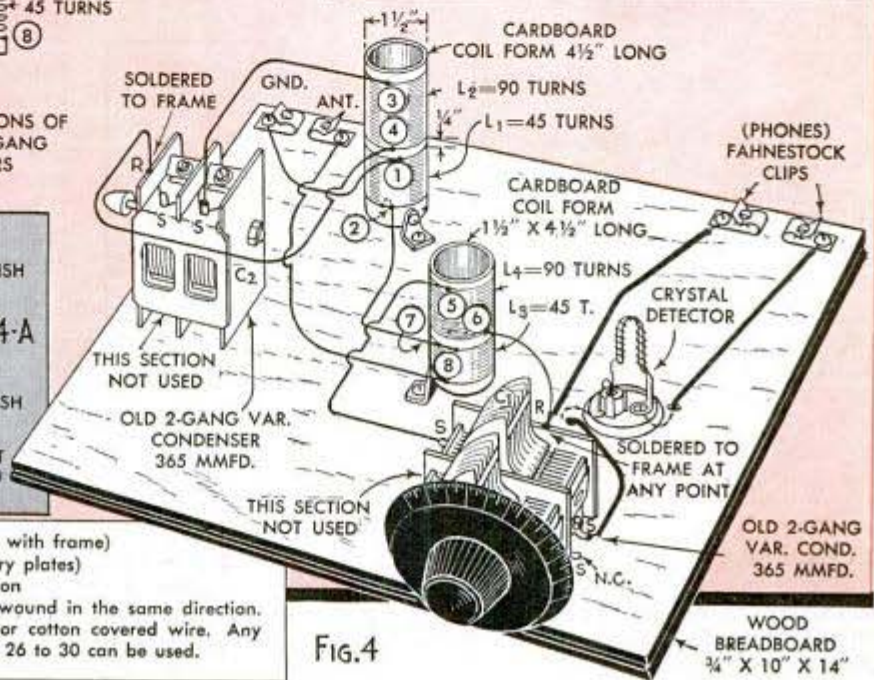
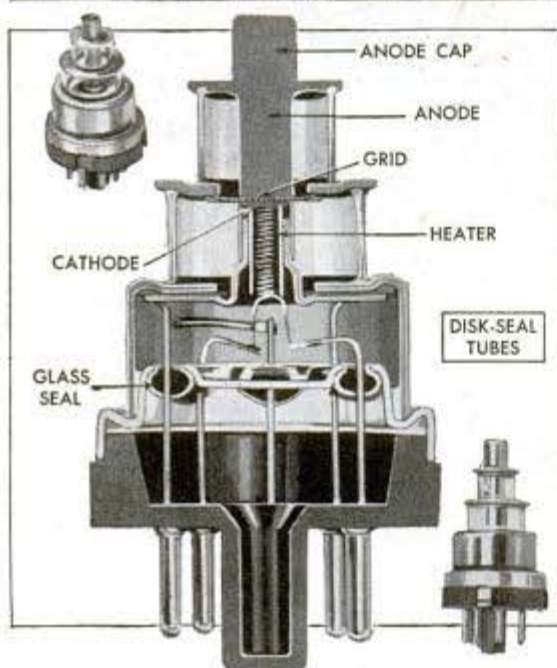


FIG. 4

Electronic Tubes for Postwar Applications



By F. L. Brittin

COMING off the production lines in large quantities to meet the needs of our armed forces are many special-purpose tubes for which engineers will find new peacetime uses. Some types are familiar but others are of strange and unusual design. The new tubes are giving our engineers a decided advantage in the military field and will later provide the basis for a multitude of new public services after the war.

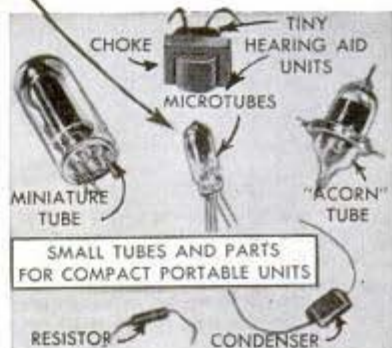
One of the outstanding ultra-high-frequency tubes developed by wartime laboratory workers is the General Electric disk-seal tube illustrated above. The cross-section view shows clearly that the conventional type of grid, anode (plate) and cathode have been eliminated. Instead of the components being fitted around one another as in the past, they are constructed in simple parallel planes, or layers, with the glass and metal fused together in rigid units that will withstand severe jolts. Among radio engineers in the armed services these are

called "lighthouse" tubes because of their odd setback type of construction. Engineers have been permitted to disclose that these tubes will be available to make possible FM radio and television relaying systems for quick postwar network expansion. This type of compact tube construction foretells the production of television transmitters operating in the ultra-high-frequency bands, and many other applications in industrial electronic fields. We probably will see tubes of similar compact types that are largely self-contained circuit units. In other words, a single tube might include a part of the related circuit in a receiver.

Cathode-ray tubes have been highly developed to meet wartime requirements in radar and radio servicing. Improved manufacturing methods for mass production will result in postwar television tubes at lower cost. Each cathode-ray tube must be carefully checked as it comes off the production line. The Du Mont "electronic desk" for time-saving routine production checkup, shown at upper left, permits a single operator to check for brilliance, focus, deflection and leakage at a glance.

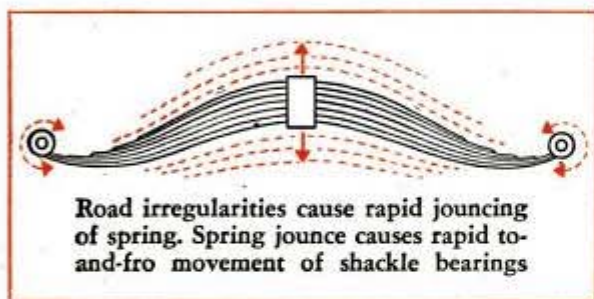
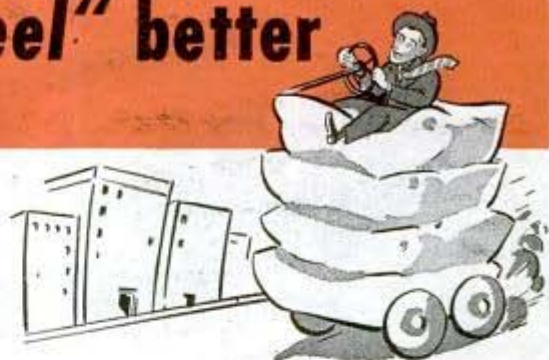
Tiny radio tubes no larger than the end of a lead pencil may be developed into postwar tubes of great sensitivity and amplifying power. Tubes of this "microtube" variety have been employed successfully in hearing aids; their diminutive size is apparent in the accompanying photos. Tiny parts have been designed for tubes of this size which may enable some experimenter to bring out a real "vest pocket" receiver

in the future. The other miniature and "acorn" tubes are types familiar to radio experimenters. These were designed for use in compact portable equipment; similar small tubes are employed in "walkie-talkies" and other portable radio and electronic devices.



HOW SCIENTIFIC LUBRICATION makes your car "feel" better

Ever stop to figure the punishment your car can take even on a smooth highway? Your car jounces continuously over many small road irregularities that cause chassis joints to oscillate with great rapidity, like this:

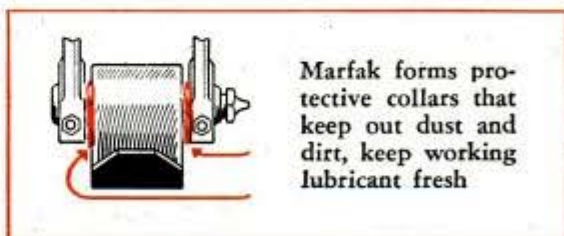


The frictional heat so developed is sufficient to "melt" a poor lubricant right out of a bearing, and oxidation causes it to gum and dry out so that the lubricant no longer offers protection to bearing surfaces. Your car no longer rides smoothly. *You can feel the difference!*

Marfak chassis lubricant is scientifically designed to overcome these driving conditions. You can *feel* its cushioning effect as you drive. The combination of its ingredients gives Marfak both cohesive and adhesive qualities so that it clings to bearing surfaces and resists any tendency to wash out, jar out or squeeze out. These hand tests demonstrate why Marfak sticks to the job:



Marfak also resists oxidation, and retains its superior lubricating qualities far beyond the life of ordinary lubricants. And, because Marfak is self-sealing, it keeps working lubricant in where it is most needed, reducing wear and saving money by eliminating costly repairs.



Change to Marfak today! It will help keep your car on the road!

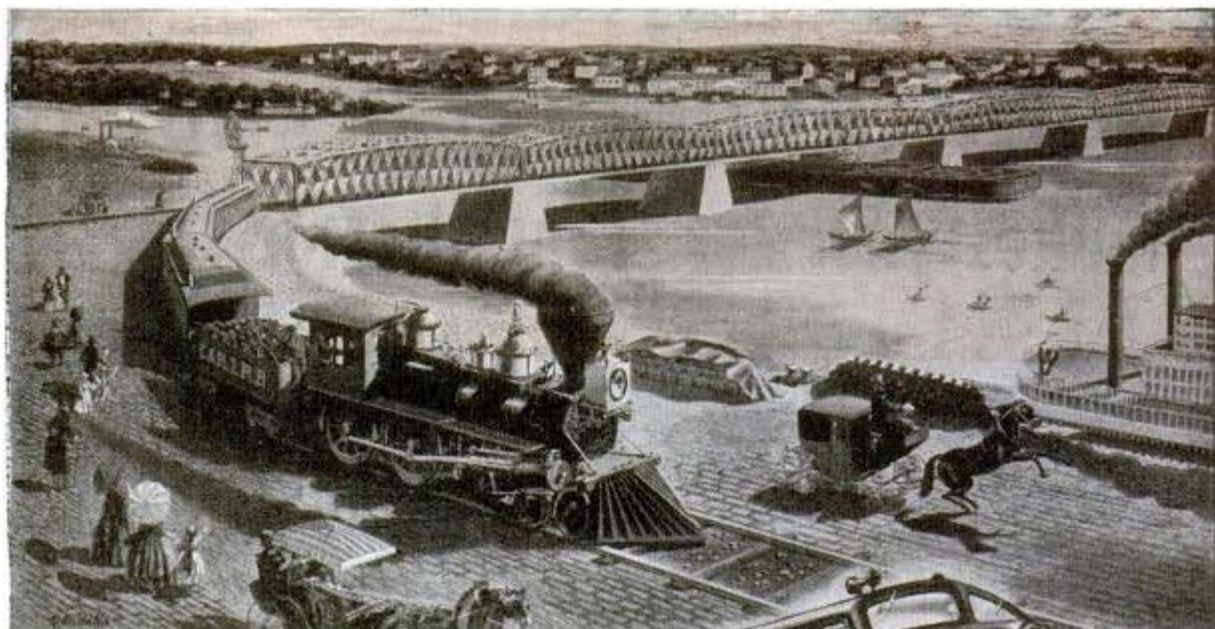
THE TEXAS COMPANY



Don't miss the **TEXACO STAR THEATRE** on Sunday nights with **JAMES MELTON** and famous guest stars. See your newspaper for time and station.

You're welcome at **TEXACO DEALERS**





October 10, 1852, the famous Rock Island steam train, the "Rocket," made its initial trip between Chicago and Joliet, Ill. Several years later the Rock Island Lines opened the first bridge across the Mississippi. With true poetic license, the artist has brought these two events together.



The Rock Island Lines operate a fleet of fast and powerful General Motors Diesel freight locomotives known as the "Hercules." They are fitting railmates indeed to the General Motors Diesels which power the new and modern Rock Island "Rockets" of today.

GREAT THINGS ARE HAPPENING IN TRANSPORTATION

When people discuss travel you'll often hear mention of the big, powerful Diesel locomotives that are hauling so many of America's crack trains.

You may, or may not, know that by far the greater number of these new and modern locomotives are built by General Motors. Railroad men know it. And they will tell you, too, how these amazing GM Diesels have changed all previous ideas of speed with

comfort and safety for passengers; how they have effected economies and efficiencies beyond all previous railroad experience.

It may be your good fortune to ride behind one of these passenger Diesels on your next railroad trip. Or, perhaps you have seen one of these powerful freight locomotives pulling a mile-long loaded train. If so, you'll know why it's a great new day for railroading—with even greater days to come.

ON TO FINAL VICTORY
BUY MORE WAR BONDS



LOCOMOTIVES ELECTRO-MOTIVE DIVISION, La Grange, Ill.

ENGINES . . . 150 to 2000 H. P. . . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland II, Ohio

ENGINES . . . 15 to 250 H. P. . . . DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.



If Junior breaks your spectacles,
 (The frame part, not the glass)
 A twist of Texcel temporarily
 Mends 'em up first class.

(Texcel mends securely—the "stickum's" bonded on!)

And when you put shelf paper down
 And want it anchored there,
 Some Texcel Tape, in place of tacks,
 Will help prevent a tear.

(Texcel means no gummy edges—the "stickum's" bonded on!)



For sealing clothes in mothproof bags
 For mending Baby's book -
 For everyone it's Texcel Tape,
 From Grampa down to Cook.

(Texcel holds and holds—the "stickum's" bonded on!)

Yes, Texcel is an improved tape
 Whose "stickum's" bonded on!
 It won't come off, it won't dry out,
 It's one, like grass and lawn.



Today, most Texcel Tape that's made
 Is being used for war,
 Buy Bonds and Stamps till Victory
 Returns it to your store.

Texcel Tape

REG. U. S. PAT. OFF.

CELLOPHANE TAPE - STICKS WITH A TOUCH

INDUSTRIAL TAPE
 CORPORATION
 A Subsidiary of
 Johnson & Johnson
 New Brunswick, N.J.

**TAKE
HOLD..**



**..OF
QUALITY**

You're sure of top quality and performance when you take hold of a Millers Falls Hack Saw Frame.

No. 84 (shown above) is about the finest frame made. Its excellent design and fine construction details will serve you . . . and several more generations.

Millers Falls offers a complete line of *quality* hand and electric tools. Some are available now. Ask your dealer. He may have yours.

**ONE THING
IN COMMON
QUALITY**



**MILLERS FALLS COMPANY
GREENFIELD, MASSACHUSETTS**

Blackout in the Sky

(Continued from page 49)

finally succeeded in photographing the corona without an eclipse. This was done at the Pic du Midi, an observatory located in the Pyrenees 9,400 feet high overlooking the famous Grotto of Lourdes. Lyot accomplished his feat by eliminating every bit of stray light from his "coronagraph," and by observing only when the sky was exceptionally clear.

It is doubtful if serious attempts will be made to observe the eclipse of July 9 in the United States, as the total eclipse will last only about 30 seconds and the eclipse will occur so near the horizon.

But in Russia big plans are under way to observe the eclipse. The Eclipse Commission of the USSR Academy of Sciences plans to organize 20 expeditions in which 200 persons will participate. They plan to photograph the corona.

Expensive optical equipment is not necessary to observe an eclipse. All you need is protection for the eyes, such as a piece of smoked window glass (made by holding it over a candle flame) or a dense piece of negative photographic film. Ordinary amber glasses are not dark enough for viewing the sun.

It is reliably recorded that a total eclipse of the sun occurred during a battle between the Medes and the Lydians on May 28, 585 B.C. The combatants were so overcome by superstitious terror that they promptly laid down their arms and concluded a peace treaty.

On July 9, 1945 A.D., after 2,500 years, we have made great progress in the understanding of eclipses, but very little in our understanding of each other.

Blessed Event in a Shipyard

(Continued from page 68)

The ship rides down quietly; there is a bedlam of cheers, bursts of music, a lot of waving. Shipyard workers, especially the hundred men who labored on the actual job of launching, watch proudly as the ship floats serenely in the water.

Few of the watchers, as they turn away, have noticed that the cradle is still attached to the hull, but it's still there, visible to the observant eye. It's made of 12 by 12-inch timbers, bolted together. It's the sled on which the ship slid down the ways. The fact that it weighs around 300,000 pounds may surprise you. The men on the ship didn't take that short trip merely for the ride. There is plenty of work for them to

(Continued to page 150)

Man-What a Hose Clamp!

NO GEARS + NO BOLTS
NO THUMB SCREWS



IT'S ALL
ONE PIECE



New Speed Clamp* Features

1. Exclusive, self-locking ratchet type design.
2. Lightest weight—lowest profile—sturdy spring steel construction.
3. Uniform circumferential pressure—no pinch or bind.
4. Faster and easier to install or remove.



Latch by hand



Lock with pliers



Remove with screw driver

Widely used throughout military aircraft. May be used over and over again. Sizes from 1/2" O.D. up. In writing for samples, please give outside diameter of hose with fitting inserted.

TINNERMAN PRODUCTS, INC.
2023 FULTON ROAD CLEVELAND 13, OHIO

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ont. In England: Shipman's Aerossories, Ltd., London

*Trade Mark

Speed Nuts

PATENTED

Trade Mark Reg. U.S. Pat. Off.

FASTEST THING IN FASTENINGS



Speed Clamps for hose connections are engineered and produced by the manufacturers of the famous SPEED NUT shown above.

Today's "Mississippi Mule" is the less picturesque but more reliable motor truck—speeding the cotton crop from plantation to cotton gin—from warehouse to freight yard or levee—from boat or train to textile mill. Two out of four of these trucks are equipped with AC Spark Plugs, specified by engineers and owners alike for utmost reliability. Thousands of them are kept efficient and reliable by the famous AC method of cleaning and regapping every 3,000 miles. You can enjoy equal spark plug satisfaction by following the same practice, replacing worn plugs promptly with AC's of correct Heat Range for today's fuels.

CLEAN SPARK PLUGS SAVE UP TO ONE GALLON OF GAS IN TEN



**SPARK
PLUGS**

BUY MORE THAN EVER IN THE 7TH WAR BOND DRIVE

do; they will, among other things, release and salvage the cradle timbers, stay with the ship while the tugs push and pull her into a "wet basin" and edge her alongside an outfitting dock.

In a few weeks the ship will be outfitted and a trial crew will put her through her paces. After that she will be ready for actual service and will join the endless convoys taking arms, tools and equipment to the fighting fronts.

Once at sea, however, the ship has no identity; the name with which she was christened is shrouded, and she becomes just a numbered unit of a convoy. Only when she returns to an American port, is loaded and at anchor, waiting the signal to join her convoy, is she permitted to display her name.

Meantime, the shipyard crew that built her, the men who launched her, are engaged on other ships. They have a right to be proud. They have built and launched the greatest merchant marine and the most powerful navy the world has ever known.

Railroading Under the "Blitz"

(Continued from page 42)

operating, motive power, signalling, civil engineering, etc., plus a skilled clerical force provided with an intricate network of communications by telephone, telegraph and radio. In emergencies, when wires were cut, they called in specially trained motorcycle dispatch riders. Like a battle headquarters in the field, the control offices followed the movements of all trains, guiding operations by direct contact with the signal towers, depots, locomotive round-houses and yards.

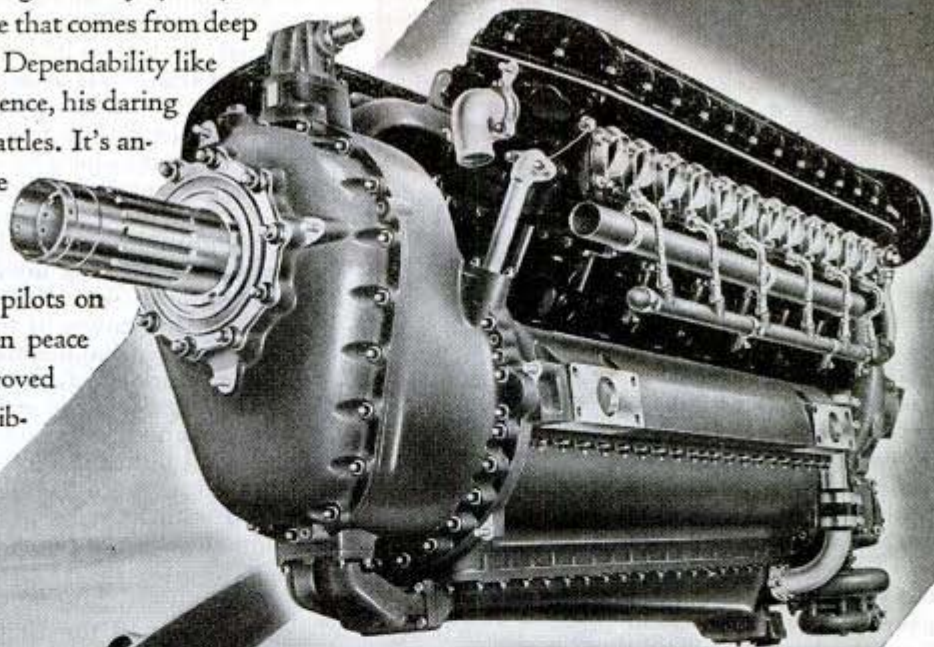
While in peacetime the job of the locomotive crews had not been much different from that of their American counterparts, in wartime the lot of the engineer and fireman changed completely. For example, many of them had to get used to getting their engines ready during a blackout. Driving through a blackout, of course, was even worse, especially on the coast routes where not a glimmer of light could be shown; all glare from the firebox, too, had to be eliminated. The locomotives were permitted to carry only very low-power oil burning lamps which threw no guiding light whatever ahead of the train. The engineer had to strain his eyes to find the dimmed signals, and the lights of towns, villages and individual cottages which normally served as a guide to his location were, of course, missing entirely.

Each member of a British locomotive

(Continued to page 152)

"WE GOT 'EM"

"We came at them out of the sun—peeled off, gave them the works and were upstairs again in a jiffy. Boy, that Allison's an engine!" ★ Praise like that comes from deep down in a pilot's heart! Dependability like that supports his confidence, his daring and his ability to win battles. It's another reason why more than 65,000 Allison engines have been supplied to our fighter pilots on all fronts. ★ And when peace comes, Allison's war-proved dependability will contribute to the fine flying qualities of planes in which you'll ride.



POWERED BY ALLISON

P-38—Lightning
P-39—Airacobra
P-40—Warhawk
A-36 and P-51A—Mustang
P-63—Kingcobra

Allison already has furnished more than 85,000,000 H.P. for use in these planes.

LIQUID-COOLED AIRCRAFT ENGINES

Allison

DIVISION OF
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Every Sunday Afternoon—

GENERAL MOTORS SYMPHONY OF THE AIR—NBC Network

KEEP AMERICA STRONG
BUY MORE WAR BONDS

Have Lovelier Floors . . . Less Floor Care!

For Longer-Lasting Floor Beauty . . .

Yes, floors can now have the same enduring beauty that makes *Simoniz* so perfect for cars. So easily, too! Just flow *Self-Polishing Simoniz* on any floor. It dries in jig-time to a thrilling luster that lasts and lasts. And cleaning—nothing to it! A damp cloth whisks up dust and dirt and your floor gleams mirror-bright again. Why not enjoy this work-saving floor-beauty? Get *Self-Polishing Simoniz* at your favorite grocery, hardware, drug, paint or department store.

THE SIMONIZ COMPANY
CHICAGO, ILLINOIS



SELF-POLISHING
SIMONIZ
FOR FLOORS

crew reported for duty wearing his identity disk, carrying his gas mask and tin helmet, and stocked with extra food. An engineer or fireman never knew for sure when he would get back to the home depot.

Overhauling locomotives presented other wartime problems. Powerful lights obviously could not be employed in the blackout, so the roads constructed special light tunnels for quick inspections. The tunnels were about 80 feet long with a single track inspection pit along the center line. Though not a glimmer of light was visible outside, the inside was illuminated with brilliant floodlighting from fluorescent tubes. The inspection pit was lined with white glazed bricks, and special lighting units were housed in alcoves in the pit walls, so that every inch of the locomotive could be overhauled under adequate illumination. Whenever the large end doors of the tunnel were opened, a master switch cut off all the main lighting. To let employees in and out, there were small wicket doors provided with light locks to prevent any light from showing outside.

Thus, over the 51,000 miles of track from Land's End to John o' Groats, nothing ever really stopped the British railroads. During the Normandy invasion they did such a fine job of transporting U. S. forces that they were given a special commendation by General Dwight D. Eisenhower himself.

At Home in the Jungle

(Continued from page 31)

envy of the enemy as well as our allies. Two lock utensils in which the stove is packed can be used for preparation of hot food for men in vehicles who must be away from the troops for extended periods. The larger utensil will hold two cans of C ration—the meat unit. By placing cans in the containers and putting in sufficient water, these C ration cans are heated in about five minutes. The smaller utensil can be used for heating water for the preparation of coffee. By opening out the six-pronged grate, additional space is provided for placing larger utensils on the stove. Over 1,000,000 of these Coleman stoves have been furnished to the Army.

The field stove is a rectangular metal box measuring 18 by 24 inches, 12 inches deep, with a sectional stove pipe about six feet long. Auxiliary equipment consists of a 13-quart pot, an 11-quart pot, two six-quart pots and two large fry pans. The burner operates efficiently on any grade of gasoline or kerosene. The fuel is fed from a regular "blitz" can—the standard five-gal-

(Continued to page 154)



WHEN IT'S AN EXIDE
... you start

Customer-satisfaction comes first with the dealer in business to stay. You get more for your dollar in service or merchandise if you buy where KNOWN brands of products are featured.

THE ELECTRIC STORAGE BATTERY COMPANY Phila. 32

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BUY TO LAST

Our armed forces need more and more batteries. Therefore, it is a patriotic duty to give your battery good care. Let your Exide dealer check it regularly and recharge it when necessary. The Pledge Certificate which he displays is your assurance that he will do his utmost to prolong the life of your battery, thereby conserving critical materials and manpower.



WILLIAMS BOX "SUPERRENCHES"

► Williams Box "Superrenches," with their thin head walls, permit fast and safe operation where clearances are limited. Offset handles clear obstructions that would otherwise bark knuckles and generally slow up the work. Their 12-point openings grip hex nuts on six sides . . . preventing slippage and rounding of the nuts' corners. Complete rotation of hex nuts is possible with these wrenches where handle swing is limited to as little as 30° . . . less than one-tenth of a full turn.

Williams Box "Superrenches" are made in a variety of popular patterns, including "Structural" and "Striking face" types. All are forged from tough chrome-alloy steel, heat-treated and fully guaranteed. Write Dept. M6 for free Tool Data Sheets.

J. H. WILLIAMS & CO.
BUFFALO 7, N. Y.



DROP FORGINGS AND DROP-FORGED TOOLS

lon container used overseas—through a small hose. The entire stove weighs 80 pounds and can be disassembled and packed into two parts which can be carried by two men.

To make fresh meat available to the soldier fighting in the tropics and jungle, the Army's Quartermaster General has produced a new portable gasoline operated refrigerator which holds fresh meats at 10 degrees Fahrenheit when outside temperatures are 120 degrees or higher.

Living in the jungle is tough. But there are moments, as when on Thanksgiving Day, 25 days after they landed on a certain island, a group of soldiers had the kind of dinner they would have had at home. The menu: turkey, cranberry sauce, mashed potatoes, giblet gravy, hot rolls, fresh butter, coffee, cream, sugar and candy.

"Brother," said one of the soldiers, "when you get a meal like that here, you're really accomplishing a miracle."

When the going gets tough in modern warfare, the U. S. Army always seems to pull one of those minor miracles out of the hat. They don't mean much as far as actual gains on the battle front go, but for keeping the morale of the men in tiptop shape and for insuring that vital esprit de corps when the big push starts, they can't be beat. And, if you look further, there is a machine or a mechanical device behind every one of these minor miracles.

Wings for the Family?

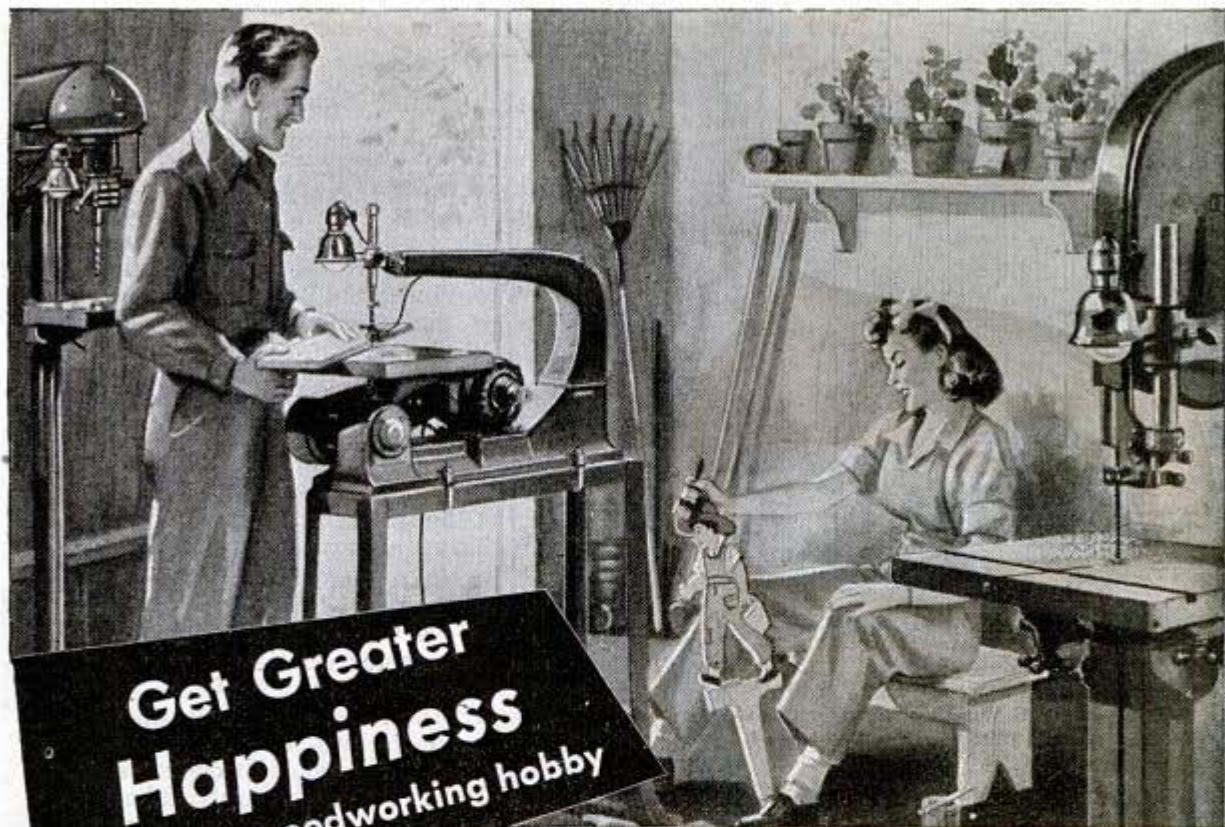
(Continued from page 37)

all will be continually examined and revised as found appropriate.

For the benefit of the less experienced pilots of the future, the CAA is sponsoring a nation-wide "Air-Marker" program which is already being installed in many states. Under this program, each town and check point will be clearly marked; the markers will be so close to each other that getting lost will become almost impossible.

The postwar pilot, in a plane equipped with no more than an inexpensive radio receiver, will get the benefit from a huge network of very high frequency radio stations which will keep him up to the minute on weather information, traffic conditions and special instructions, and will give him full assistance in case of emergency.

Besides this VHF network, there will be another grid pattern of direction finder stations for long-range navigation on a direct line, or Great Circle course. By simple triangulation, it will be possible for a pilot to pin-point his position by tuning in two or more of the invisible beacons.



Get Greater Happiness

from your woodworking hobby

... by enjoying the deep satisfaction of using quality tools —

Delta Homecraft* Power Tools

Whether you enjoy *all* of the happiness woodworking has in store for you — or miss out on part of it, because you seem to be "all thumbs" — depends to a considerable degree on whether or not you enjoy the reliability of *quality* power tools.

It's because quality is so important that Delta Homecraft Power Tools are used by happy hobbyists everywhere. The accuracy and precision *built into* Delta Homecraft Power Tools largely take the place of the manual skill which the old-time hand craftsman acquired only after many years of practice. Once you set a tool for the job, it takes care

of keeping the work true and straight . . . helps you know the thrill of producing attractive, professional-looking work.

The accuracy, dependability, and safety of tools built by Delta, world's foremost maker of home power tools, are being proven daily in schools and war plants all over America.

Right now, War Bonds are the soundest investment for you. When peace comes, reinvest your accumulated savings wisely in Delta Homecraft Power Tools — for a full measure of the fun and healthful recreation that woodworking offers you.



*Trade Mark Reg. U. S. Pat. Off.

These Delta quality features are your guideposts to satisfaction:

Lubricated-for-life ball bearings you don't have to worry about oiling.

Pre-loaded bearings that help assure long-time operating efficiency and accuracy.

Precision-bored bearing seats that help assure accurate alignment of parts.

Precision-ground shafts that help eliminate "wobbling" which throws off your measurements.

Dynamically-balanced pulleys that help eliminate annoying, damaging vibration.

HM-26

Combination Offer on Plans for Projects that are Fun to Build!

- Book on "Garden Furniture and Novelties."
- Book on "Toys, Games, Playground Equipment."
- Nine Trellis Designs.

All for only 25¢!

Order Group "L" by coupon at right. Send coin, postal note, or money order.

Tear out coupon and mail today!

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Please send me Group "L" of Deltacraft publications. I am enclosing 25¢ to cover everything.

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ANCIENT PIPE OF FRANCE



Today you see the

LHS
STERNCREST
STERLING

in FRANCE, and everywhere

Strutting along the Rue de Rivoli, right now, is an American G. I. puffing away on his LHS — and many others are doing likewise, the world over.

That's why LHS's are limited in supply, but not in workmanship or materials.

War over (and would that it were!) we couldn't produce a better pipe than the Sterncrest of today. It's prewar quality, from its briar bowl to its hard rubber bit.

After the war, more models to choose from, but no finer pipes.

\$5

This is No. 46
Plain Finish

Also in Antique finish,
Dozens of other models

Other LHS Pipes:

\$10 — LHS
Sterncrest Ultrafine

\$7.50 — LHS
Sterncrest 14K

\$3.50 — LHS
Certified Purex



Supplies limited
— you may have
to wait for some
models, but it's
worth it!

IMPORTED
BRIAR

AT YOUR DEALERS



Write for "Pointers on Pipes" — FREE

L & H Stern, Inc., Stern Bldg., 56 Pearl St., Bklyn 1, N. Y.

Flashing the News From the Front

(Continued from page 79)

"In one corner of our 'office' is the broadcast 'studio'. Constructed of wood and covered on the interior with tar paper and burlap, it is a far cry from the modernistic studios we knew back home. The microphone sets on a packing box. A kerosene lantern is the source of light as this is written. The windshield from a wrecked Ford passenger car serves as a window."

From this rugged "studio" the first voice transmission for network distribution was made from Leyte on December 23 through the 400-watt transmitter. Its success is considered unusual by many radio engineers, some of whom had been skeptical about the ability of the small transmitter to get across the Pacific even on radiotelegraph.

On occasion newspaper editors have been able to "page" their correspondents through these transmitters by simply sending a message for delivery by courier or by other means after receipt in Europe or the Philippines. Scores of correspondents are using the stations. News commentators employ them for voice broadcasts from points close to the battle fronts and millions of American and other newspaper readers are receiving the benefits of ultrafast radio news of the war through these efficient aids to the press.

Radio has by no means supplanted the cable, but its far greater speed, enormously wider coverage and ability to transmit both telegraph and voice are advantages which indicate, in the opinion of many engineers, that further developments will give even faster wings to communications, not merely across an ocean or a continent but throughout the entire world.

The Navy's Watch on the Rhine

(Continued from page 5)

presented, bottoms had to be flat to accommodate invasion equipment, yet the ships had to cross oceans without capsizing. Tremendous loads had to be carried, but the craft could draw only a few feet of water.

Kingpin of the Amphibious Forces, of course, is the LST, she of the gaping jaws and large stomach. Some even have been converted into small aircraft carriers. Whole trains traveled from England to France aboard LSTs to replace bomb-wrecked rolling stock.

Two huge General Motors Diesel engines, each with 12 cylinders, provide propulsion, long range and great power for the LST. Because of the landing craft the

(Continued to page 158)



Radiophoto — news pictures out of the air!

RCA radiophoto transmits pictures halfway around the world and prints them—in a matter of minutes!

And thanks to RCA research, pictures now come through the receiver (shown above) about as sharp and clear as the originals themselves.

Through RCA radiophoto, today's "news shot" in Honolulu or Cairo can make tomorrow morning's front page.

Advertisements, fingerprints, documents and letters are radiophotoed by RCA Communications—as many as 2000 a month! Even musical

scores—such as the new "Trio" by Shostakovich—are sent by faster, error-proof radiophoto.

RCA has long been a pioneer in all fields of international communications. Progress is constantly maintained by scientific research . . . research that is reflected in all RCA products.

When you buy an RCA radio, or any RCA product, you enjoy a special pride of ownership in knowing that you possess one of the finest instruments of its kind that science has yet achieved.



1945—London to New York—7 minutes



1926—New York to London—1½ hours

Notice the great improvement in clarity, as well as in speed. Because of RCA research, radiophoto prints are no longer blurred by a "pattern." They're about as clear as the original prints thousands of miles away.

RADIO CORPORATION of AMERICA

PIONEERS IN PROGRESS



Say you saw it in *Popular Mechanics!*

**"What a Wonderful Job
HARLEY-DAVIDSONS
Are Doing!"**



Here's another typical letter from Yanks overseas—this time from Sgt. Harry E. G., in the Philippines:

"Want to tell you what a wonderful job your Harley-Davidsons are doing. They did a miraculous job in the Southwest Pacific, and are doing the same now over here in the Philippines. My postwar dreams are of owning a 61 OHV job, and I sure will be glad to get back to the good old days. We have 42 of your WLA's and they sure can take what we have to put them through."

Thanks, Sgt. Harry E. G. — you and a lot of other fellows like you who are yearning for the "good old days" will have your dreams come true when you return home and ride your new Harley-Davidsons on pleasure trips and endurance runs — and take in race meets, hillclimbs and other thrilling motorcycle events.

HARLEY-DAVIDSON MOTOR CO.
Department P. Milwaukee 1, Wisconsin



**HARLEY-
DAVIDSON
MOTORCYCLES**

HARLEY-DAVIDSON MOTOR CO.
Dept. P, Milwaukee 1, Wisconsin

Please send at once free copy of 24-page "Enthusiast" Magazine, filled with motorcycle action pictures and thrilling stories.

NAME.....
ADDRESS.....
CITY..... STATE.....

Navy has more Diesel power today than steam—something beyond the wildest pre-war dreams of Diesel enthusiasts.

About 330 feet long, with a 50-foot beam, the LST displaces 3,000 tons. She is built around the tank deck, which is three-fourths as long as the ship, nearly as wide, and two decks high. She will carry 30 to 40 tanks, or many more jeeps or other vehicles.

Disembarkation is controlled by push buttons in a small room in the port bow. Motors swing open the huge bow doors and lower the cleated ramp. Traffic lights guide the long lines of tank drivers.

Vehicles are driven directly into the LST, or are lowered by elevator from the main deck. Sides of some tank decks are fitted with hundreds of folding brackets

What the Initials Mean

Following is a list of the principal landing craft making up our Alphabet Navy:

- LSD—Landing Ship, Dock
- LST—Landing Ship, Tank
- LSM—Landing Ship, Medium
- LSI—Landing Ship, Infantry
- LCT—Landing Craft, Tank
- LCI(L)—Landing Craft Infantry, Large
- LCM—Landing Craft, Mechanized
- LCV—Landing Craft, Vehicle
- LCVP—Landing Craft, Vehicle, Personnel
- LCP(L)—Landing Craft, Personnel, Large
- LCP(R)—Landing Craft, Personnel, Ramp
- LCR(L)—Landing Craft, Rubber, Large
- LVT(A)—Landing Vehicle, Tracked, Armored
- DUKW—Amphibious Truck

and scores of neatly rolled stretchers to change the invasion ship into hospital ship when required.

Lining the sides and bow of the LST are tanks for fuel oil, lubricating oil, water and ballast. Besides providing stability, the ballast tanks aid in getting an LST off the beach. The stern anchor also helps here. As an LST heads for shore, she drops the anchor and pays out the anchor cable. When ready to leave, the LST starts her anchor windlass and helps draw herself off the beach by reeling in the cable.

Newest, fastest and most versatile of the tank carriers is the LSM (Landing Ship, Medium), designed especially to whip the Jap. Much faster than the LST, and with a shallower draft, the LSM can dart over deadly coral reefs. LSMs received their baptism of fire in the Leyte invasion.

Then there's the LCT (Landing Craft, Tank). Built like a bath tub, 115 feet by 32 feet 9 inches in the beam and not much to look at, she's a demon for work.

(Continued to page 160)

BIRMINGHAM, ALA.
Mean Average Temperature 53.8
During Heating Season

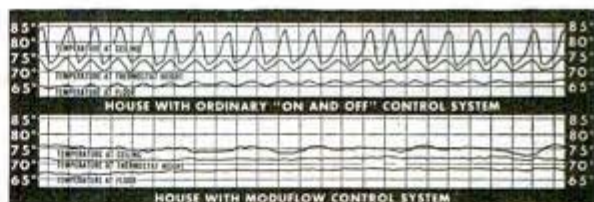


IS YOUR CEILING *750 miles* FROM YOUR FLOOR?

Believe it or not, there is probably greater difference between the temperature at the ceiling and floor of your house than there is between the average temperature of Chicago and Birmingham, Alabama — 750 miles farther South. For, in the average home or apartment, the temperature at the ceiling is often twenty degrees warmer than at the floor. (See chart below.) Unfortunately, the heat that rises to the ceiling is largely wasted, while the floor may be drafty and too cold for comfort or health.

But, Minneapolis-Honeywell has devised a remarkable new heating control system that will correct this situation. It is called MODUFLOW. By an ingenious method of heat control and supply, Moduflow nearly equalizes floor and ceiling temperatures; result, uniformly comfortable temperature from ceiling to floor.

Every home or apartment, however modest, can afford the greater comfort and efficiency of Moduflow. Mail the coupon today for free booklet that tells all about Moduflow.



See the difference — Shown above are actual temperature recordings taken in two identical test houses — one with and one without Moduflow. Without Moduflow,

temperature varies as much as 20 degrees from floor to ceiling. Note how MODUFLOW smooths out the ups and downs of the ordinary system.

MODUFLOW

The New HONEYWELL Heating Control System

Free! SEND FOR THIS BOOKLET

Minneapolis-Honeywell Regulator Co.
2907 Fourth Avenue South
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Please send my free copy of "Heating and Air Conditioning the Postwar Home"

Name _____
Address _____
City _____ State _____

Keep them Winning — Buy MORE Bonds!



CHICAGO, ILLINOIS
Mean Average Temperature 36.4
During Heating Season



**HE HAS
YOUR BATTERY**

Frontline command posts depend on battery-powered field telephones to link combat troops with regimental headquarters! Without full supplies of dry batteries this vital part of war communication would collapse — endangering the lives of fighting men. Thousands of dry batteries are used every day on every front to operate essential instruments and weapons. That's why we have to manage without them here on the homefront. Burgess Battery Company.

Support the 7th! Buy Your Share Today!



**BURGESS
BATTERIES**
IN THE NATION'S SERVICE



The LCT will carry about 300 soldiers or five medium tanks to the beaches. She's conveyed everything from generals to goats, and has been invaluable in the evacuation of wounded. She has served as a repair ship with a complete machine shop on deck.

And rugged! LCT No. 19, loaded with 100-octane gasoline, burned fiercely after a hit by a Jap bomb and was ordered sunk. A British destroyer exploded 13 depth charges under her with no apparent effect! Nine 5-inch shells were pumped into her almost point-blank before No. 19 sank.

Let's not forget the DUKW (Amphibious Truck) affectionately known as the Duck. This happy-go-lucky piece of American machinery can flounder out of the water onto dry land and keep right on going. Born in 1942, the Duck has undergone more than 400 improvements in design and construction. It combines a standard 2½-ton six-wheel drive military truck chassis with an all-steel hull, a propeller and rudder. Rudder and wheels are controlled by the same steering wheel.

In the assault on Arawe in the South Pacific, two Ducks equipped with multi-barreled rocket launchers blasted the Japs from the beach.

Is it any wonder that Amphibs are fiercely proud of their Alphabet Navy and want everyone to know about the queer ships that pass in the night—and day, too?

When We Build Roads Again

(Continued from page 15)

and unloads on the move. Although used before the war on larger earth-moving projects, our Army's engineers have adopted this machine for fast construction of airstrips and roads. A "Baby Tournapull" has been developed especially for airborne operations. Weighing only 5,800 pounds complete with scraper and a roter attachment, it can speed over the ground at 16 miles an hour. The scraper has a capacity of two cubic yards and on a one-way haul of 600 feet will excavate 64 cubic yards of earth every hour. The standard rate per man for doing this work with pick and shovel is 1.3 cubic yards per hour—the little machine increases one man's production almost 50 times!

Having rough-leveled the base or "sub-grade" of the new road, the contractor then sends over a grader. This is basically a straight mold-board or plow, set at an angle, mounted on a self-propelled or towed unit. Its job is to smooth out any imperfections in the surface. The road is now ready

(Continued to page 162)

**FULL STRENGTH
HORSEPOWER
FOR YOUR CAR**



CASITE

Guarantees better and smoother performance or double-your-money-back

CLEANS OUT MOTORS • KEEPS MOTORS CLEAN

Ping . . . Sputter . . . Cough . . . Knock . . . your motor needs a Casite clean-out. At your service station, car dealer or garage—a pint in the crankcase every oil change and a pint through the air intake every three months.

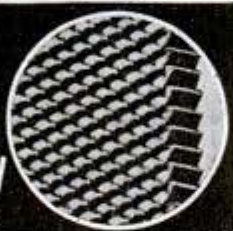
GUARANTEE—Add Casite to crankcase and run through air intake according to instructions, then drive your car 100 miles or for 60 days, whichever is first. If not convinced that Casite gives you better and smoother performance, you get double-your-money-back by filling out guarantee certificate and mailing to The Casite Corporation, Hastings, Michigan. Maximum refund is \$1.30 per pint, twice the nationally advertised price of Casite.



**65¢
A PINT**



"BRUISER" of the file family



THE Nicholson Special Purpose Foundry File is a "roughneck" because it has to deal with tough adversaries. Knocking off fins and sprues from foundry castings, and filing sharp edges of heavy dies, are some of its jobs. Its teeth are stocky and sturdy, with heavy-set edges to resist shelling and breaking out.

Model, tool and fine-instrument makers, assemblers, "hobbyists" and other file users may never need this "bruiser" of the file family. But between it and the tiny "needle" files (used largely by jewelers) with their microscopic teeth is a range of several thousand kinds, cuts and sizes of files—covering a wide field of mechanics.

"Know your files" is one of the first requisites in the training of a first-class mechanic. Nicholson has a book which will prove helpful: "FILE PHILOSOPHY"—48 interesting illustrated pages on file kinds, use and care. For a free copy address—

NICHOLSON FILE CO., 22 Acorn St., Providence 1, R. I.

(In Canada, Port Hope, Ont.)

NICHOLSON
FILES FOR EVERY
PURPOSE

NICHOLSON
U.S.A.
MADE IN U.S.A.

to be paved. For this three machines are needed: the concrete paving mixer, the concrete spreader, and the finishing machine.

The mixer takes broken stone, sand and cement and mixes it in a giant steel drum, discharging the mixture into a drop-bottom bucket. This bucket rides along an out-rigger I-beam and deposits the concrete where it is wanted. The spreader does the rough leveling of the piles of plastic concrete, while the finishing machine, riding on steel rails in back of the spreader, smooths and finishes the pavement to the proper height.

The paving mixer has increased slowly but steadily in size of batch until now it is not uncommon to find contractors paving roads with mixers making three or four cubic yards of concrete at a batch. Sometimes this concrete is delivered to the site of the road from "central mix" plants in "transit-mix" trucks, holding four and one-half to five cubic yards.

The increased output of paving mixers and the use of transit-mix trucks has made it increasingly difficult for various parts of the work behind the paver to keep up. The spreading and finishing, up to recent times, was done by hand. The war especially has accelerated the use of finishing machines to speed up the laborious process formerly done by skilled men.

Now, a gas-engine-driven concrete spreader, operating directly behind the paving mixer, spreads the intermittent batches left by the mixer. The main working part of the spreader is the blade, which spreads the paver batches across the road while the machine is advancing along the steel rail-forms.

The paved road is protected from drying too rapidly, and thus becoming brittle, by a bituminous spray or a burlap cover which is kept moist for a few days. This is called "curing." About a week later the road may be opened to traffic.

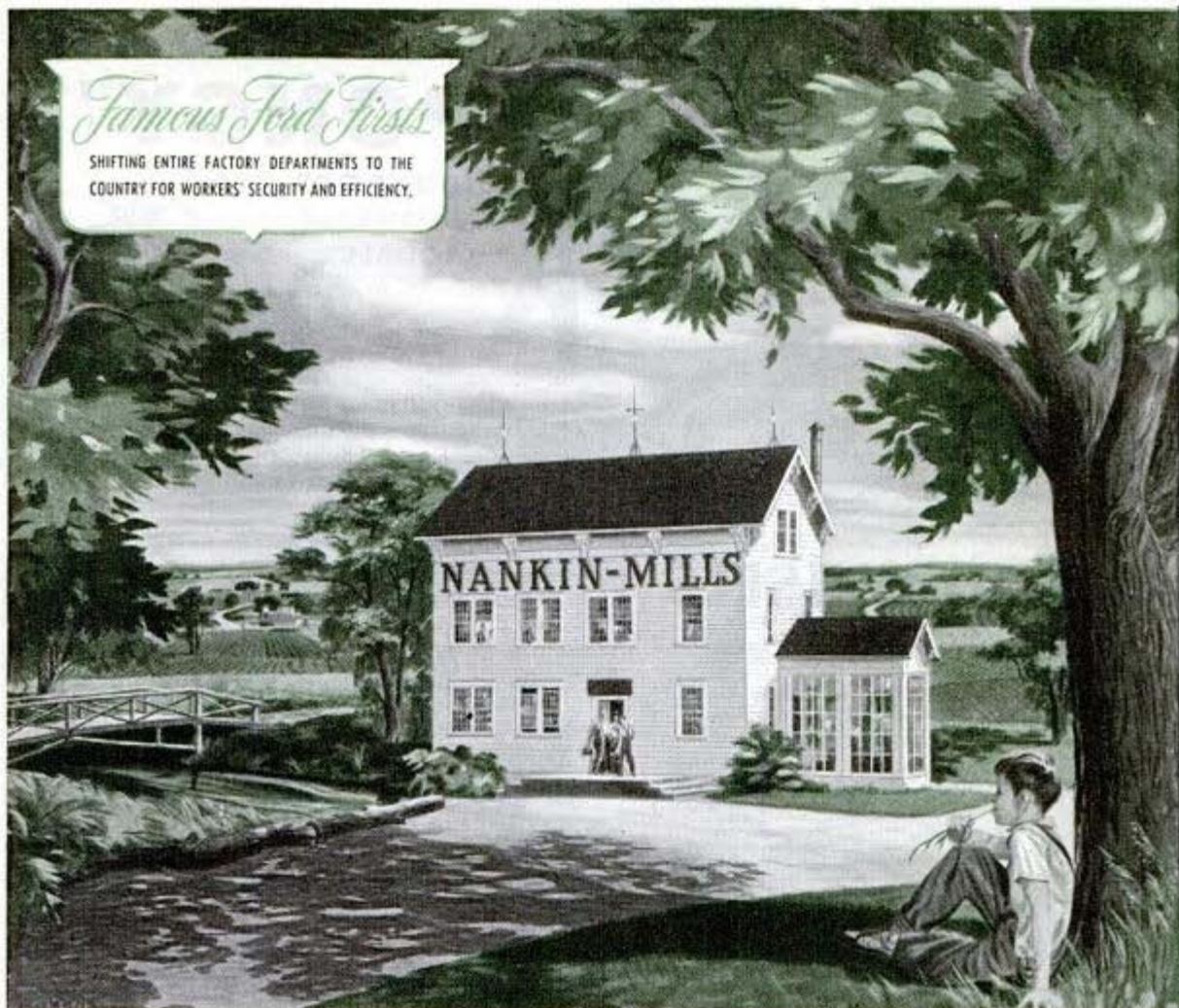
In the United States, the use of the motor vehicle has built up a highway transportation industry which in normal times directly employed approximately 7,000,000 persons. Today, the entire economic structure of the country is built around and is dependent upon the motor vehicle, a fact which rationing has forcibly brought home.

Since the economic and employment future of this country depends upon good highways, any program that succeeds must provide for their construction.

Power is the hub around which this new construction will turn. Gas and Diesel engines in the scores of improved road-making machines will build the great super-highways of postwar America.

Famous Ford Firsts

SHIFTING ENTIRE FACTORY DEPARTMENTS TO THE COUNTRY FOR WORKERS' SECURITY AND EFFICIENCY.



Nankin Mills—one of the first Ford Village Industries

1st

to demonstrate true decentralization



At many different waterpower sites in Michigan you see them—18 "Village Industries" established by Ford.

Here work nearly 5000 men and women who know the peace and security that comes from having "one foot on the soil . . . and one in industry." Many live on their own farms nearby. They earn cash by their shopwork.

These little industries, since 1921, have been setting an example of true decentralization. They are not "branches." They do not duplicate the work of main plants. They are complete, self-contained production departments.

Such true decentralization distributes purchasing power. It assures finer precision on items like gages, lamps, carburetors. It eliminates power waste.

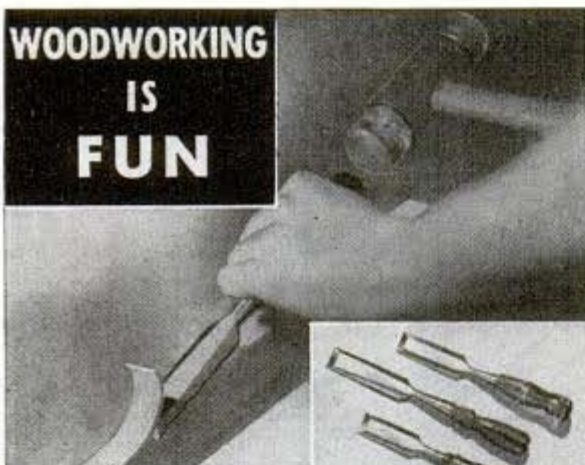
Mr. Ford visions industry becoming "a lot of little centers." By proving the economic possibilities of this plan he has established another Ford "first."

When car production is resumed at Ford, America will profit by such thinking and doing.

"THE FORD SHOW." Brilliant singing stars, orchestra and chorus. Every Sunday, over Coast-to-Coast NBC network. 2:00 P.M., E.W.T., 1:00 P.M., C.W.T., 12:00 M., M.W.T., 11:00 A.M. P.W.T.

EXPECT THE "FIRSTS" FROM FORD!

WOODWORKING IS FUN



when you have



GOOD CHISELS

The satisfaction of fine craftsmanship and real recreation will be yours if you equip your postwar home workshop with good Stanley Tools. Among these, none will be handier than an assortment of Stanley Chisels.

The high grade steel and uniform temper throughout the blade of Stanley Chisels has long been famous with craftsmen. The blades hold a keen edge for a long time. Even after years of use, when grinding and honing has greatly reduced blade length, the fine-tempered cutting edge is still good. There will be many types and width of blades and designs of handles to suit your every need.

Let Experts Help Select Your Tools

Stanley has a free booklet for you, "The Joy of Accomplishment." Crammed full of helpful suggestions for the hobbyist, it contains: a primary list of tools and a special list of tools to be added as needed. You'll also find the big Stanley textbook: "How to Work with Tools and Wood," mighty useful. It's yours for only \$1.00. Mail the coupon today.



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OF THE WORLD

MAIL NOW



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Please send by return mail —

- The FREE booklet: "The Joy of Accomplishment."
- 188-page book: "How to Work with Tools and Wood." \$1.00 enclosed.

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Address

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BRAKE PEDAL "SPONGY"?

YOU'VE GOT
"BUBBLE
TROUBLE"



"Bubble Trouble" is dangerous! A bubble in your brake line can cause accidents! Use FLARE Hydraulic Brake Fluid! Blends perfectly with other first-quality fluids. Operates at 50° F. below zero or 180° F. above.

"Keep your car fit to the finish!"

FOR CAR BEAUTY
AND CARE USE...
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HYDRAULIC BRAKE FLUID

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☆ Accurate guide rides steady on roughest roads. Easy to compensate. HULL STREAMLINE AUTO COMPASS is greatly improved by wartime engineering. Shockproof mounting bracket. Circular free. Price \$3.50.

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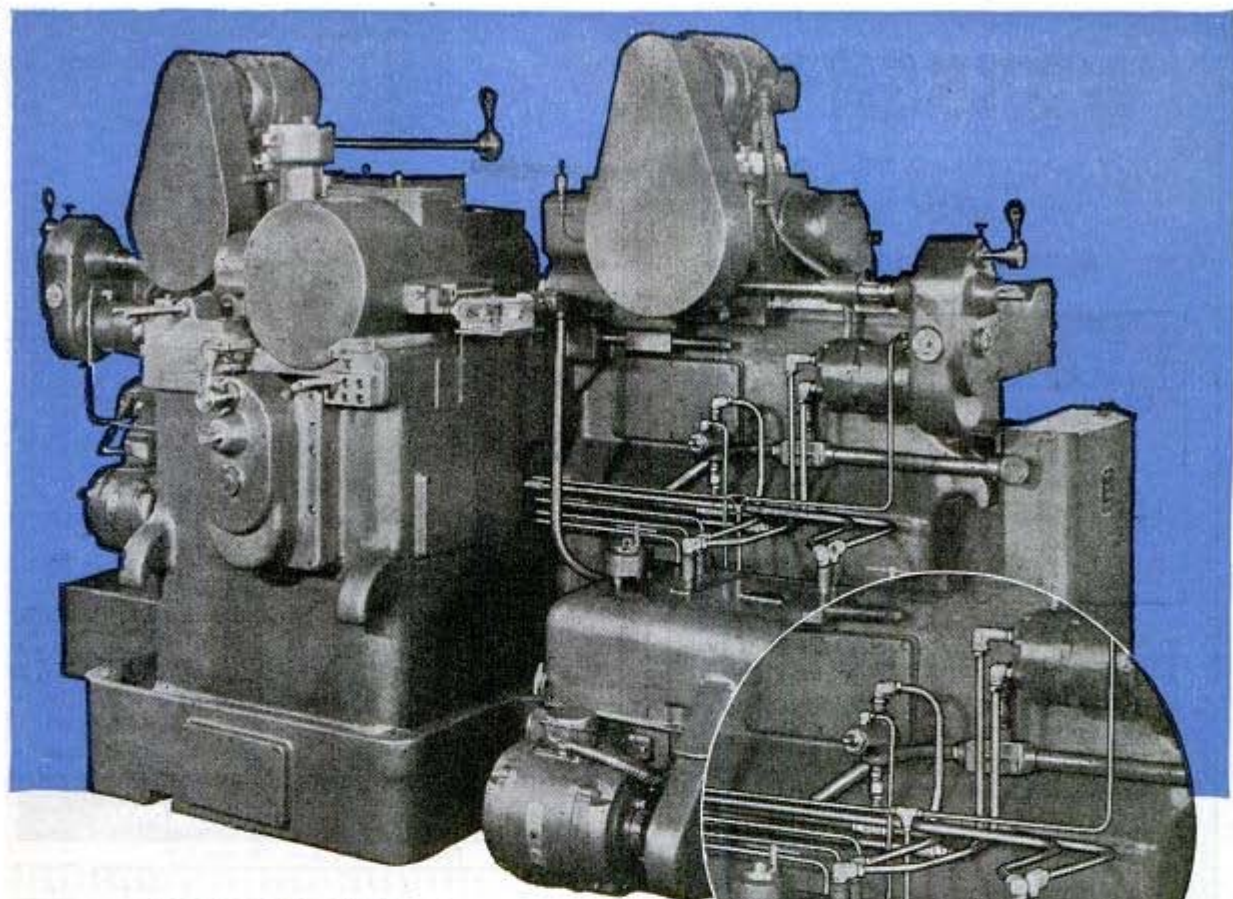


in every battle...
doing vital jobs...
unfailingly...



that's
why
there
are just
a few
left for
essential
jobs at
home

BRIGHT STAR BATTERY CO., CLIFTON, NEW JERSEY



DESIGN FOR A MACHINE TOOL CONTROL by **PARKER**

Consider this as an example of the many types of machine tools that are designed to use tubing systems for hydraulic control and for lubrication.

When a machine tool tubing installation is designed in conformance with sound Fluid Power Engineering principles it will:

- (1) Allow the closest practicable approach to perfect streamline flow which in turn will reduce to a minimum the capacity and pressure requirements on the power source and give a better response to control throughout the entire system.
- (2) Permit the efficient use of available space . . . no matter how cramped this space may be . . . and still provide a system that allows unobstructed service and maintenance on all component units of the system.

- (3) Reduce the number of joints and connections to a minimum . . . each one tight, leakproof and able to withstand excessive abuse, vibration and pressure.

Parker valves, fittings and fabricated tubing—plus Parker Engineering—will give you a simple, neat installation, easy to service, free from troubles, efficient and economical.

Whatever you make—motor vehicles, earth-movers, presses, aircraft, refrigeration or process equipment, ask a Parker engineer for tubing recommendations based on this "know-how". Write to The Parker Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio. Booklet on request.

THE
PARKER
APPLIANCE COMPANY
CLEVELAND • LOS ANGELES
FLUID POWER ENGINEERING

WORKSHOP WISDOM

Repairing wooden toys



HERE'S a quick, proved method of prolonging the life of wooden toys:

1. Pull loose joints apart. Clean off old glue. If joints fit well, reglue with Casco.
2. Loose dowel or tenon joints can be made to fit tightly by (1) wrapping end of rung with piece of cloth saturated with Casco Glue until it fits exactly, or (2) lining the hole with a crack filler made with Casco and sawdust.

Here are the reasons why so many craftsmen prefer Casco...

Unusual strength: Casco sets and hardens chemically, forming a bond that's highly resistant to (1) dampness, (2) heat, (3) time.

Easy to mix: No heating problems with Casco. Casco mixes easily with cold water.

Economical: Casco Glue keeps well in cool, dry storage. Mix Casco as you need it. A little goes a long way.

For greater water-resistance and stain-free veneering jobs, get **Cascamite**. It's a completely stain-free adhesive.



Casco Glue and Cascamite are available in 10¢, 25¢, and larger sizes. At all hardware stores.

WRITE FOR FREE Gluing Guide containing over 40 household gluing hints and other valuable information on the use and preparation of glues. Address Casein Company of America, Dept. PM65, 350 Madison Ave., New York 17, N. Y.

CASCO Powdered Casein GLUE

Sets chemically—hardens permanently!

Say you saw it in *Popular Mechanics!*

ADD POWER to your CRAFT SKILL



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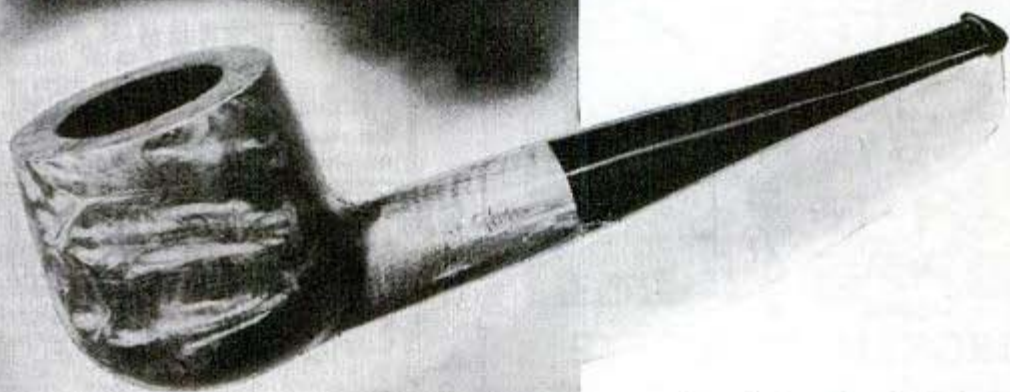


Signet of Quality in Pipes



VanRoy

**YOU CAN JUDGE
A MAN** by the pipe
company he keeps . . .
If it's a VanRoy you
may be certain that
he shuns mediocrity in
all things — and for
so personal a posses-
sion as a pipe, nothing
but the best will do.



*VanRoy Bard
No. 45 Pot Shape \$5*

*If your dealer is short of VanRoys,
remember many of these pipes
are going to servicemen.*

VANROY COMPANY, Inc. • Empire State Building, New York 1

UNCLE NED'S Home Repair HINTS



CRACKED WALLS

You don't have to be an expert to mend cracked walls with Rutland Patching Plaster. Just mix Rutland with water . . . wet the old plaster . . . and apply with knife or trowel. Rutland is the *original* ready-to-use patching plaster. Sets without shrinking or cracking. Extra fine and white. Makes a patch as smooth and lasting as the wall itself.



BROKEN CONCRETE

Get a 25-pound bag of Rutland Concrete Patcher and make broken cement floors, walks, etc., good as new. Rutland is correctly mixed, ready to use. Just add water and apply with trowel.

RUTLAND

REPAIR PRODUCTS

Rutland Fire Clay Company, Rutland, Vt.

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No. 000 ANGLE VISE

For MILLING—DRILLING—GRINDING
FITTING—FILING

Solve Difficult Angle Jobs



Quick, accurate setups at any angle. End make-shift methods—time loss—rejections. Ideal for tool rooms or home workshop. Accurately machined and graduated. Once set it stays locked. Jaws hardened steel—plain or grooved. Sizes 1 1/2" to 8" Jaws.

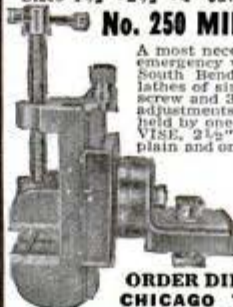
DRILL PRESS VISES

For tool room, machine shop, school shop, home shop or repair shop. Accurately machined. Best semi-steel castings. Adjusting screw of hardened steel with fine pitch thread and long bearing. Jaws hardened steel, grooved or plain. Sizes 1 1/2"-2 1/2"-4" Jaws.



No. 250 MILLING ATTACHMENT VISE

A most necessary fixture for small shops and even emergency work in large ones. Fits any 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon or other lathes of similar sizes. Has graduated vertical feed screw and 360 degree graduation for vertical angle adjustments. Easily mounted on cross slide and held by one T-bolt. Equipped with PALMGREN VISE. 2 1/2" Jaws opening full 2 1/2". Vise has one plain and one grooved jaw for holding round pieces.



MAKES MILLING OPERATIONS POSSIBLE ON ANY LATHE

Width	Depth	Opening	Jaw	Jaw	Jaw	Height	Price
2 1/2"	1-7/16"	2 1/2"	10 1/2"				\$24.75

ORDER DIRECT—Write for Circular No. 347
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8365 South Chicago Avenue Chicago 17, Ill.

TAPE WORMS
ROUND WORMS
(Ascarids)
HOOK WORMS
WHIP WORMS



...you can free your dog of all these worms

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TREATMENT **WORM CAPSULES**

Used by leading breeders. At leading pet, drug, department stores, 50c a package (double size, 75c). Packed two ways: for puppies, for dogs.

Fix Scratches, Dents, Nicks the Professional Way!



Get This Handy Kit!

Repair damaged furniture surfaces with new practical kit. Enables anyone to do fast, easy touch-up jobs like a professional cabinet finisher. Makes furniture and cabinets look new. Every home and shop needs this remarkable kit. Pays for itself over and over!

Amazing Results—Easy to Use

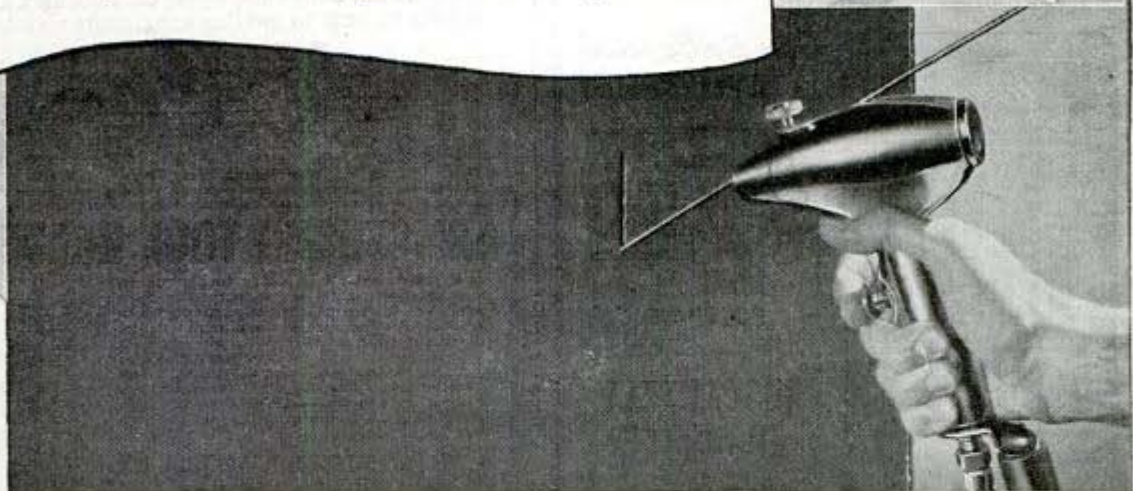
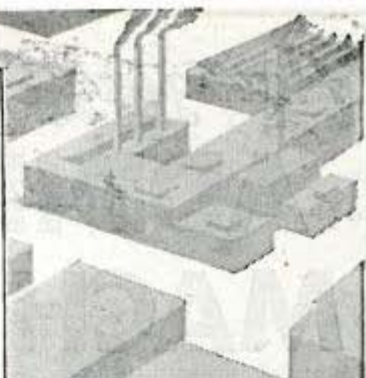
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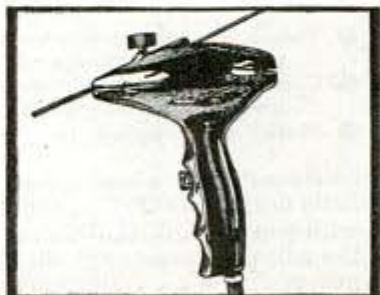


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Close-up of new Pencil Weld Gun



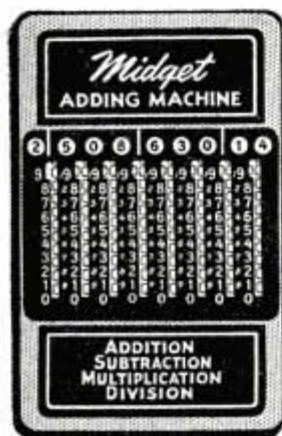
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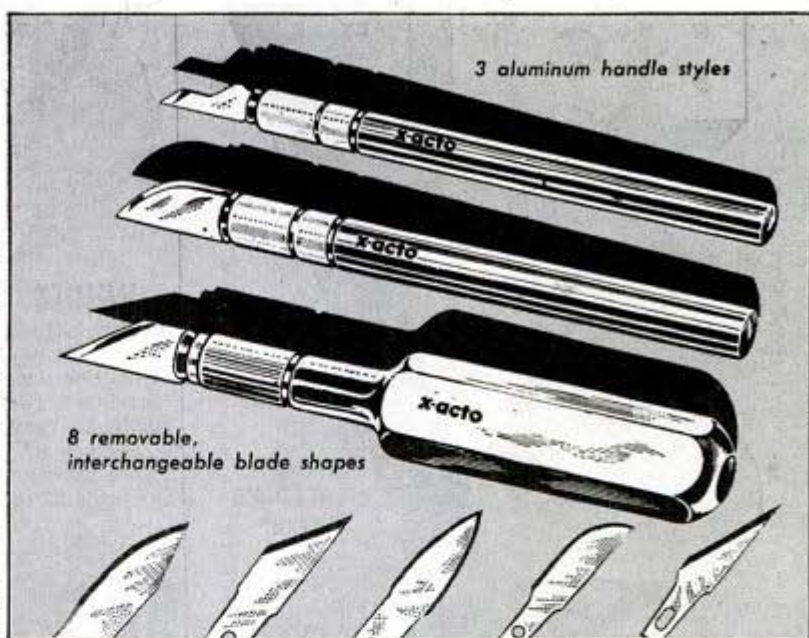
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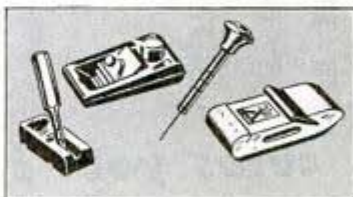


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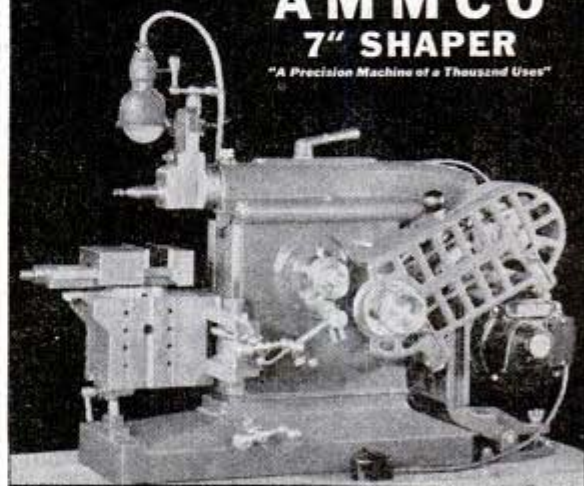
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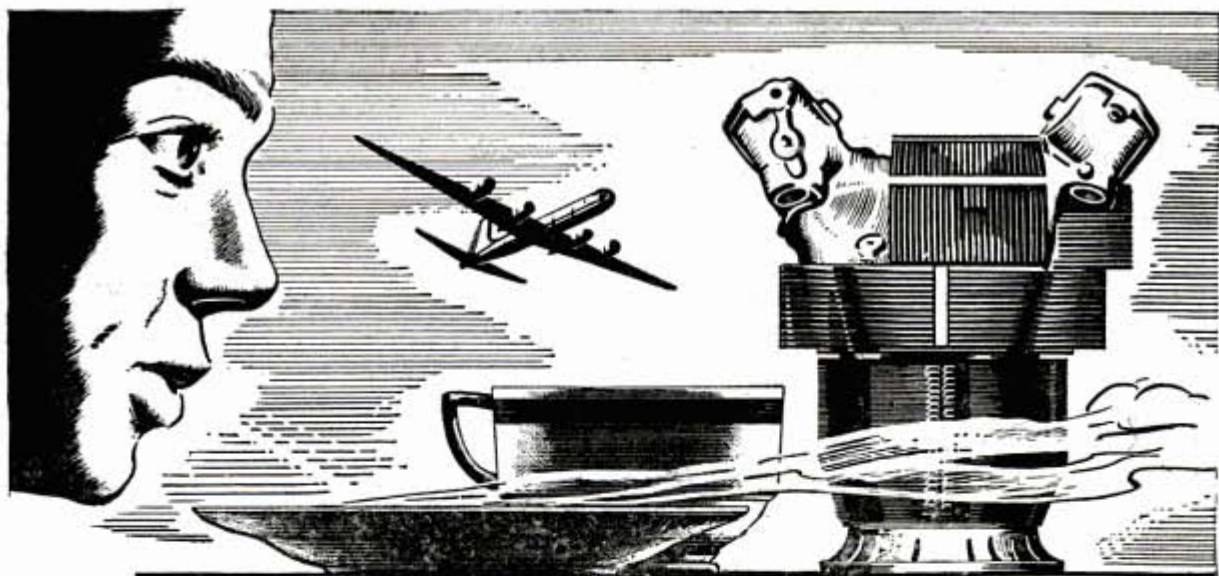
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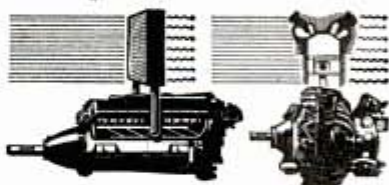


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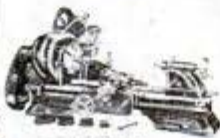
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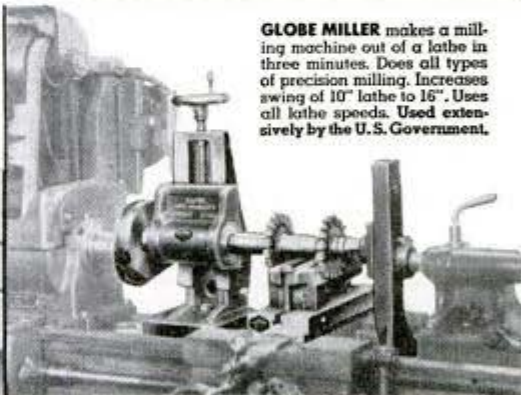
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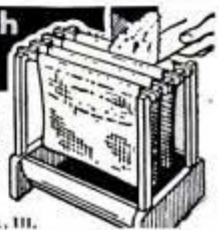


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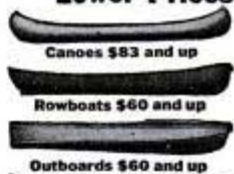
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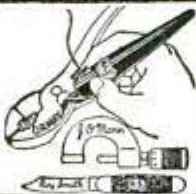
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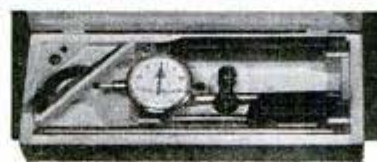
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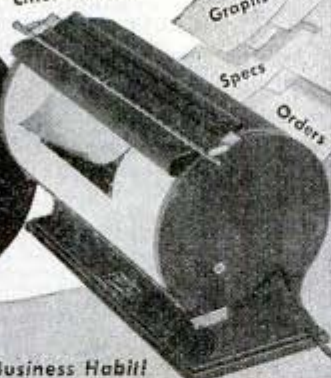
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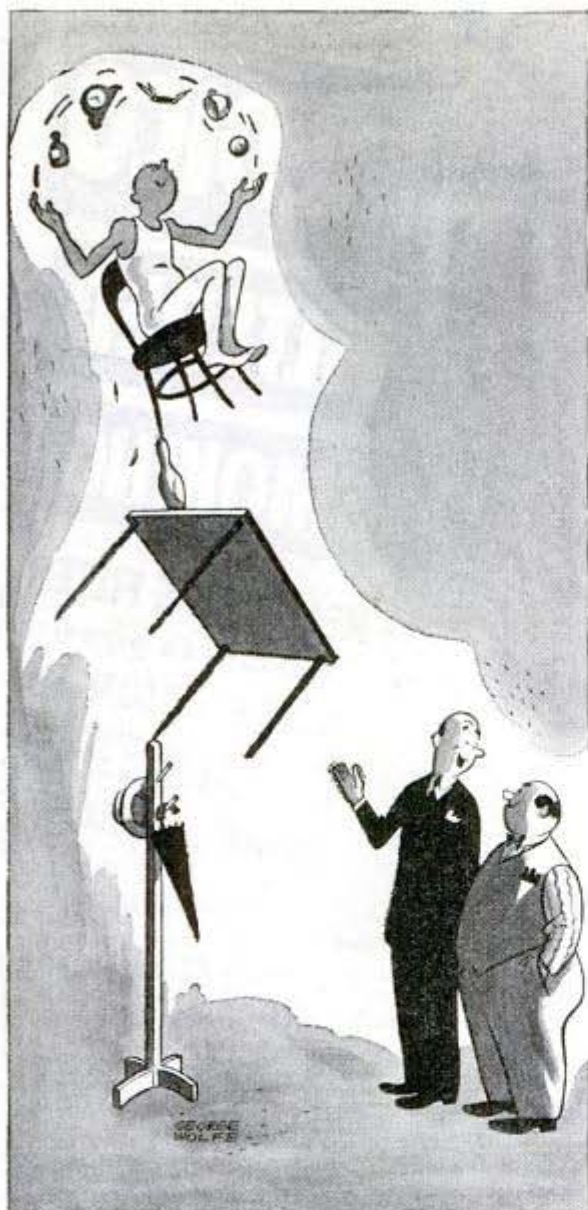
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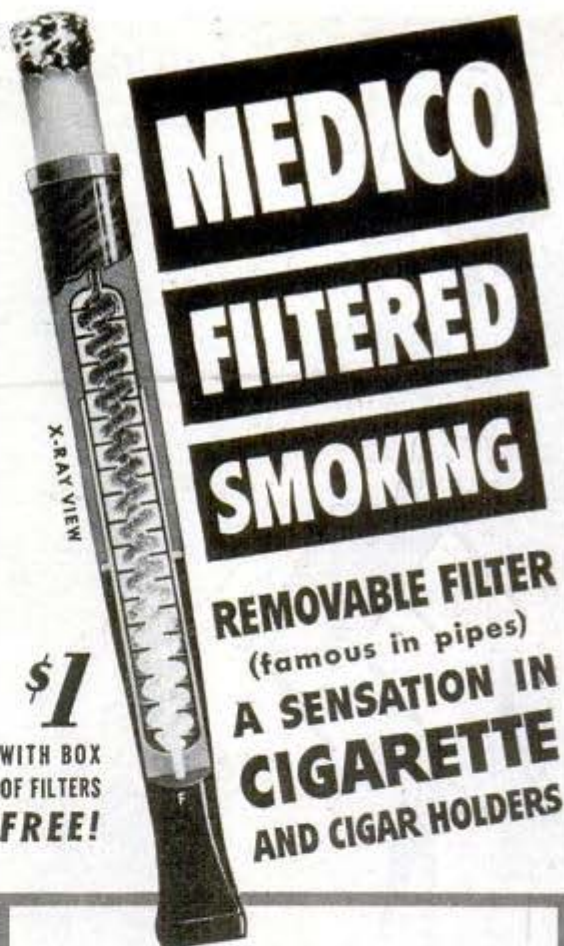
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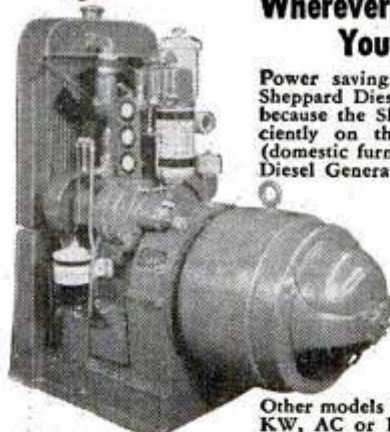
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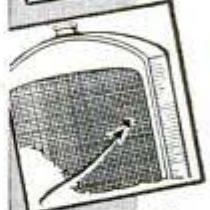
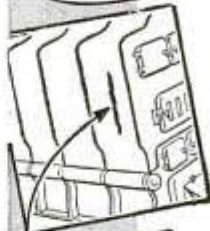
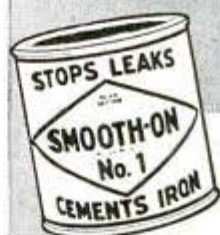
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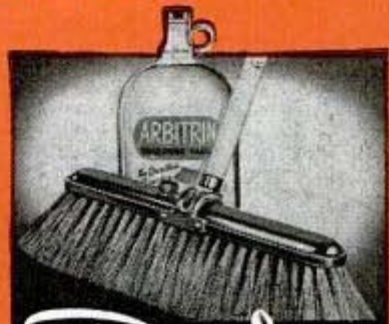
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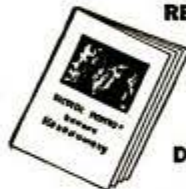


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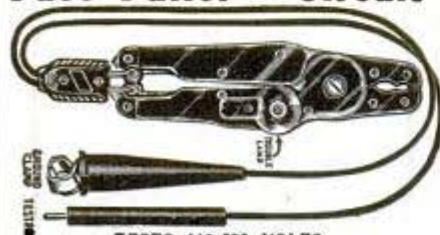
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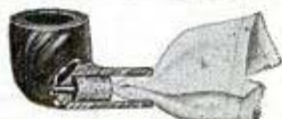
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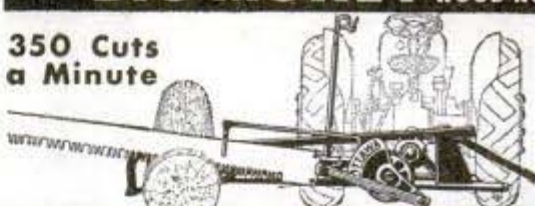
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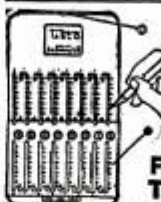
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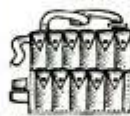
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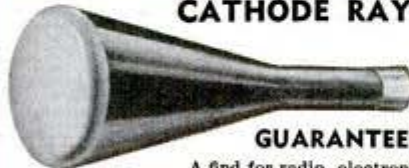
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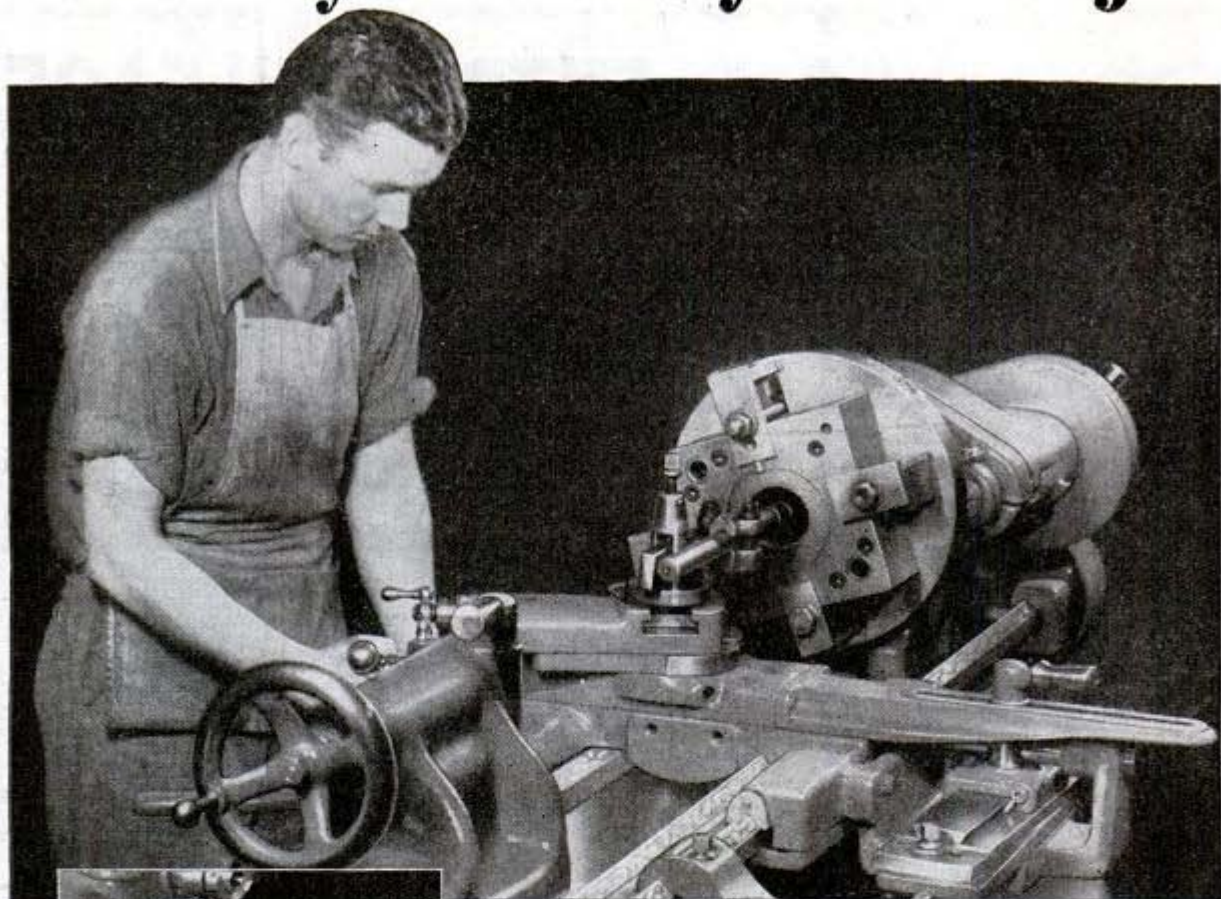
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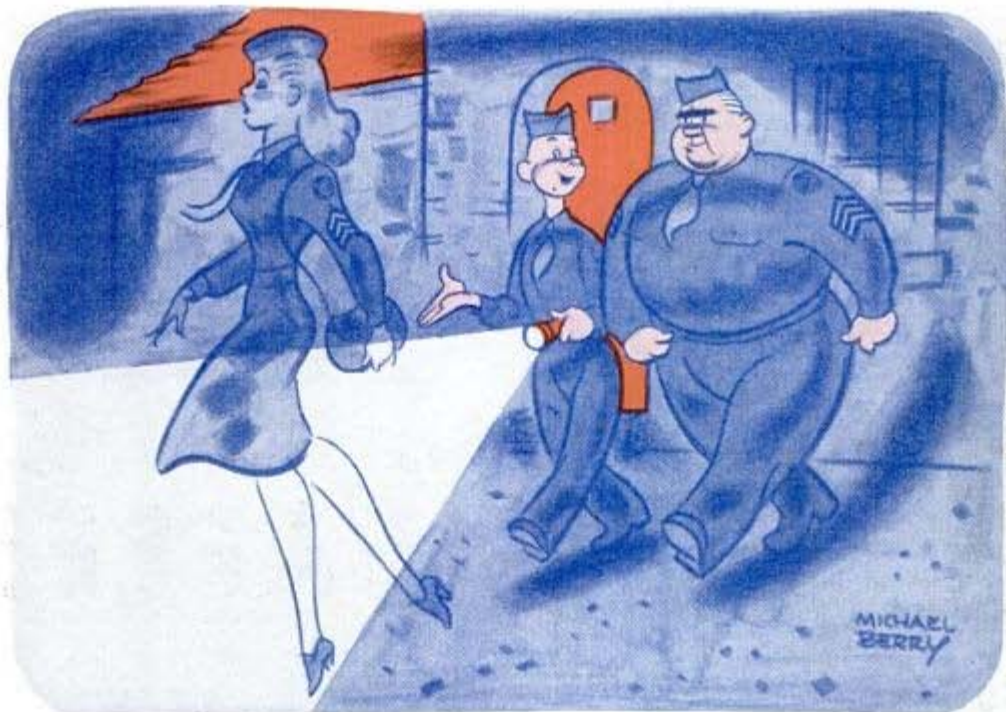
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