

POPULAR MECHANICS MAGAZINE



WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK, GREAT BRITAIN, No. 40424

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30c IN CANADA



ROCKET-FIRING LCVP
PAGE 1

SNIPING THE SNIPER

LET'S FINISH THE JOB

Buy Extra War Bonds



DEAN
CORN-
WELL

WHERE HAVE WE MET BEFORE?

IT was at Tarawa — on the beach at Anzio — in Normandy — in bombers over Berlin — in tank battles, dog fights, and on the high seas — on every fighting front.

These are the recent places where the craftsmanship symbolized by this emblem has been meeting up with the men who are winning the war. And every day sees a new meeting on other fronts as the output of Fisher Body factories moves into the battle lines.

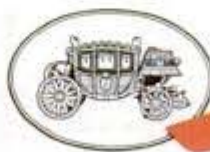
Major assemblies for the B-29 and other bombers, delicate aircraft instruments, big guns of various calibers, tanks — the flood of Fisher Body armament knows no end until final victory.

The Army-Navy "E" flies above six Fisher Body plants for excellence in aircraft production and from two others for tank production, while the Navy "E," with five stars, is flown by still another Fisher Body plant for its naval ordnance work.

Into every single piece go the skills and techniques that have always made the Fisher Body coach a symbol of fine craftsmanship throughout the length and breadth of our land.

Every Sunday Afternoon

GENERAL MOTORS SYMPHONY OF THE AIR
NBC Network



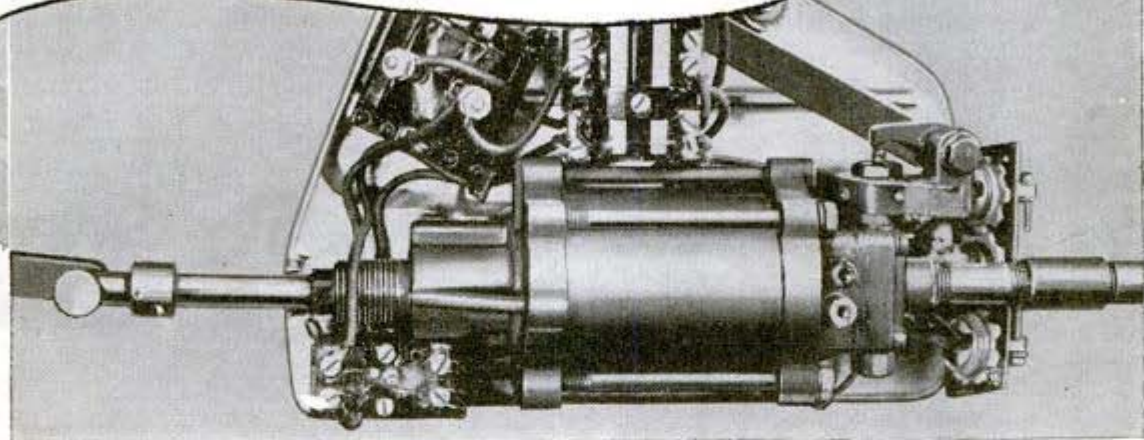
armament
BOX BY

Fisher

D I V I S I O N O F G E N E R A L M O T O R S

Ingenious New Technical Methods

Presented in the hope that they will
prove interesting and useful to you.

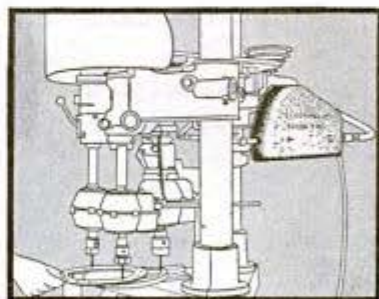


New Electroaire Power Unit Converts Standard Drill Press to Automatic

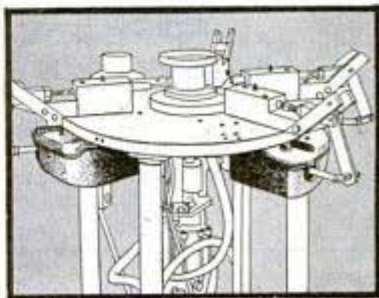
This exact control over feed and retraction speeds permits ready conversion of a standard drill press with tapping head into an automatic tapping machine, capable of producing Class III threads, even with comparatively unskilled operators. By adjusting speed to conform to the lead pitch of the threads being tapped, the tap will cut without forcing threads, and on the reverse the tap will actually "float" out of the part with no strain against the thread angle.

Air-powered jigs and fixtures can be opened, closed, and indexed by the Electroaire Power Feed. The unit can be set for a predetermined number of cycles so that multiple holes can be drilled in the same piece without ejection, by means of an indexing fixture controlled and synchronized by the Electroaire Unit. One operator can run as many as two or three drill presses, turning out top-quality work with few rejects and with a minimum of tool breakage, thus effecting a great savings in time.

Present stockpiles of finest quality materials used in the manufacture of Wrigley's Spearmint chewing gum are now exhausted—necessitating discontinuance of production. When a supply of proven materials—known to be up to the finest standards of quality—is again available, Wrigley's will resume production—And Wrigley's Spearmint will be back to again help you on your job. In the meantime they are manufacturing a war brand. Wholesale but not excellent enough for the Wrigley brand name.



Set up to punch 3 holes simultaneously



Shows holes being drilled
automatically

You can get complete information from Electroline Manufacturing Company, 1975 East 61st Street, Cleveland 3, Ohio

MARCH, 1945

This One



B57N-AGD-P4FL

Z-58

1A

A MODERN SYLLOGISM

MAJOR PREMISE:

Bell Telephone System serves the American Public.



MINOR PREMISE:

Bell Telephone Laboratories develop the facilities of the Bell System.



CONCLUSION:

Therefore, Bell Laboratories serve the American Public.



And that is the *raison d'être* of the Laboratories. For the Bell Telephone System, the Laboratories carry on research studies in all the sciences and development work in all the engineering arts that relate to electrical communication.

For the Western Electric Company, the manufacturing unit of the System, the Laboratories

develop equipment, prepare specifications for its construction, and engage in various engineering activities.

For the Armed Forces of the United States, under contracts of the Western Electric, the Laboratories have undertaken more than a thousand development projects — many with spectacular effect upon our enemies.



BELL TELEPHONE LABORATORIES explore and invent, devise and perfect 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

March, 1945

Vol. 83, No. 3

Next Month

OLD-TIMERS in the Coast Guard consider the year-around Greenland patrol just about the toughest assignment in the 155 years that branch of the service has been in existence. When the Germans gobbled up Denmark, they may have figured its Arctic possession, Greenland, would fall plum-fashion into their mitts. About that time Rear Admiral Ed "Iceberg" Smith of the Coast Guard swung into action. The result is one of the epic stories of the war—a fight against blizzards, shifting ice and Nazis to establish weather bases for the Allies along the ferry-plane route to Europe. "Watch Over Greenland" appears in the April issue.

TNT Special

THE bombs dropped on a single 1,000-plane raid would fill a freight train three miles long. Like every other kind of ammunition, from incendiary bullets to rocket shells, those bombs made part of their trip to the enemy via the railroads. How trainmen handle the "TNT Special" from inland storage depots to ports of embarkation is told for the first time in the April issue.

W-A-R Calling

EIGHT to nine million words a day crackle out over the ether waves from Station WAR, the War Department's Signal Center which is the heart of the largest radio network in the world. Remote outposts in the Pacific are only a few minutes away by radio-telegraph. The signal center, vital link in global warfare, is the subject of an April feature.

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Tips for Moviemakers

EVERY professional movie cameraman has a bag full of tricks, and most of these so-called tricks come under the heading of "lighting." This applies to both outdoor and indoor scenes. Flood lamps or reflectors can be manipulated to give brilliance and depth to pictures made with an 8 or 16-mm. camera, or to focus attention on the proper spot. Wonders can be accomplished with a spotlight equipped with front flaps, called "barn doors" by Hollywood cameramen. An article in the April issue, "Hollywood Tips for Moviemakers," is filled with helpful hints which will give a professional touch to home movies.

Moving the Earth to Win a War

EARLY in the war an American general remarked that victory would go to the side that could move the most dirt—and he wasn't speaking of propaganda. The U. S. leads the world in the production of giant earth-moving machines such as bulldozers, which perform a thousand vital jobs ranging from clearing a path for advancing infantry to digging a ditch for a pipeline at home. The "dozer" family is featured in "They Move the Earth" next month.

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"I'm Not Ready for Reconversion"

NEITHER ARE WE...

He's still giving everything. Until his job is done Universal's job is making the precision optical instruments he needs. We're sticking to that job—100%—until he's ready for us to reconvert.



BECAUSE HIS NEEDS COME FIRST you'll have to wait for **MERCURY II**, the new camera we promised you "soon." It's worth waiting for—the **MERCURY II** is especially designed for color.

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Tough

BUT

OH SO GENTLE

● Millions of motor cars—long overdue on the scrap heap—are still giving faithful, economical service.

Why? Because their owners took good care of them and replaced worn parts before it was too late.

Play safe and watch your engine—particularly the piston rings. Whenever you see signs of ring wear—smoke, oil-pumping or loss of power—see your motor specialist.

If he recommends new piston rings, it will pay you to install Hastings Steel-Vent rings. They *stop* oil-pumping, *check* cylinder wear, *restore* performance.

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PISTON RINGS

TOUGH ON OIL-PUMPING **GENTLE** ON CYLINDER WALLS

In Your Mind's Eye

The Secret of MENTAL CREATING

IF you just like to dream, read no further. There comes a time when your fancies *must be* brought into light—and stand the test of every-day, hard realities. Are you one of the thousands—perhaps millions—whose thoughts never get beyond the stage of *wistful wishing*? Do you often come to from a daydream with the sigh, "If only I could bring it about—*make it real*?"

All things begin with thought—it is what follows that may take your life out of the class of those who hope and dream. Thought energy, like anything else, can be dissipated—or it can be made to produce actual effects. *If you know how to place your thoughts* you can stimulate the creative processes within your mind—through them you can assemble things and conditions of your world into a happy life of accomplishment. *Mental creating* does not depend upon a magical process. It consists of *knowing how* to marshal your thoughts into a power that draws, compels and organizes your experiences into a worth-while design of living.

ACCEPT THIS *Free* BOOK

Let the Rosicrucians tell you how you may accomplish these things. The Rosicrucians (not a religious organization), a world-wide philosophical fraternity, have preserved for centuries the ancients' masterful knowledge of the functioning of the inner mind of man. They have taught men and women how to use this knowledge to *recreate their lives*. They offer you a free copy of the fascinating book, "The Mastery of Life." It tells how you may receive this information for study and use. Use coupon opposite.

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... because Accountants Command Business

Accountants are usually in demand—at better than average earnings.

But today—more than ever before—the competent accountant finds his services at a premium.

Business in war has tightened up the reins and is watching costs—prices—every move—striving to operate on that basis of close control so essential to service and profits.

Then, too, business is working under tighter government regulations, with many more records and reports—war production, priorities, more and larger taxes, wage and hour laws, payroll deductions for Defense Bonds, etc., etc.

The Home Study Way to Accountancy Success

Thousands upon thousands of men have trained for Accountancy with LaSalle—at night—at home.

Their success—their progress—is a matter of record.

Whether their goal was a C. P. A. certificate or advancement in business, our files are full of letters reporting income increases far out of line with the time and cost investment.

Note for instance, these six cases out of many we might cite. (Names on request.)

A cost clerk, J. S. H. became, after completing 30 training assignments, cost accountant. Within nine months, only half through the course, he became chief cost accountant with a salary nearly four times what it was when he enrolled. C. K. was an immigrant day laborer. Within a few months he secured a bookkeeping job. Within a year, he secured three raises. In two years, he was in charge of his company's accounting department, although not yet through the training. W. J. F. moved up from store clerk to assistant bookkeeper after the first ten lessons. Now he is office man-

ager. S. W. N. knew nothing about bookkeeping. With 19 months of training he passed the C. P. A. examination on first attempt and opened his own public accounting office. Although a university graduate, P. M. was a grocery clerk at small wages. Today he is Secretary and Credit Manager with an income 300 per cent higher. Already in cost work, G. N. P. within nine months was earning 40% more; within two years, 100% more. The third year his income went up still more. Now he is manager.

These Men Won Success in Ordinary Times —You Have War Opportunities

Remarkable as is the success of these men—you will have an advantage over them—you will be entering accountancy when unusual national conditions work with you for success.

Conditions not only call for more accountants—but offer unusual opportunities for both quick and permanent success. The need for accountants will increase during war and will continue for years afterwards during the difficult post-war adjustment period.

—If You Can Qualify

Ask yourself three questions:

1. Are you ambitious?
2. Have you determination?
3. Can you see and grasp an opportunity?

If you have determination; if you are ambitious; if you can take advantage of circumstances—prove it by investigating. A three-cent stamp, sixty seconds time, and the coupon below will bring you full information regarding Accountancy training and the opportunities to which such training leads. Then you can judge intelligently.

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Present Position

Address City and State

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250 miles
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3 ounces of...



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Name

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City or Town State

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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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"EVEN BETTER THAN I HAD!"



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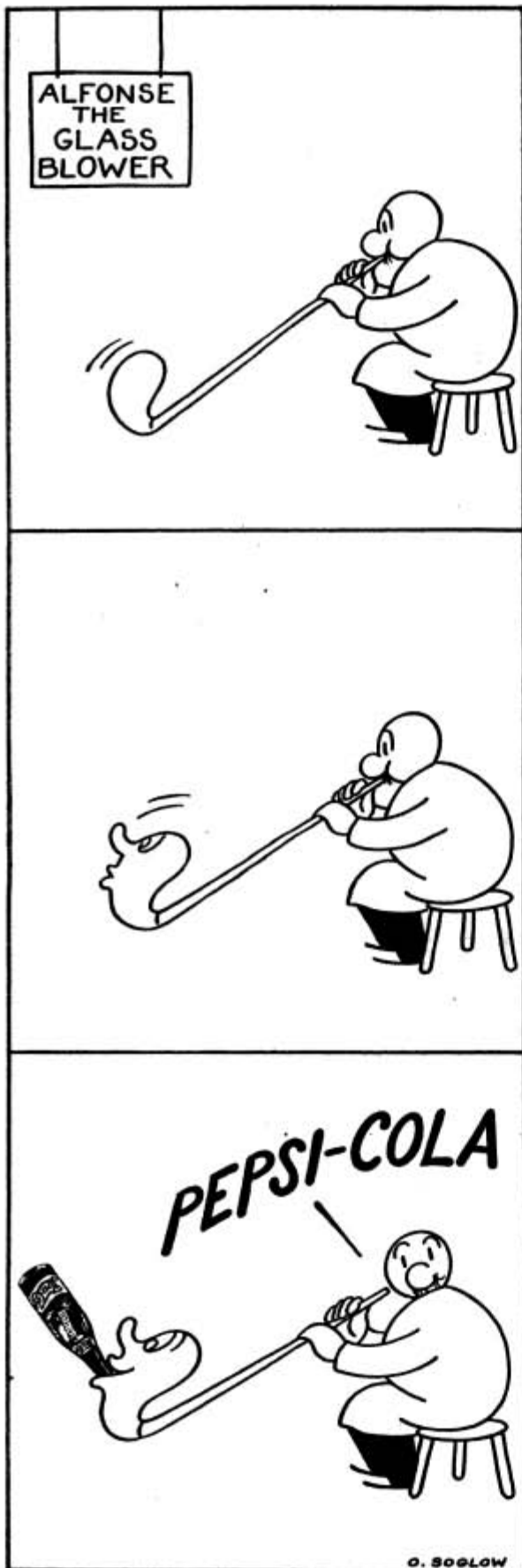
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O. SOGLOW

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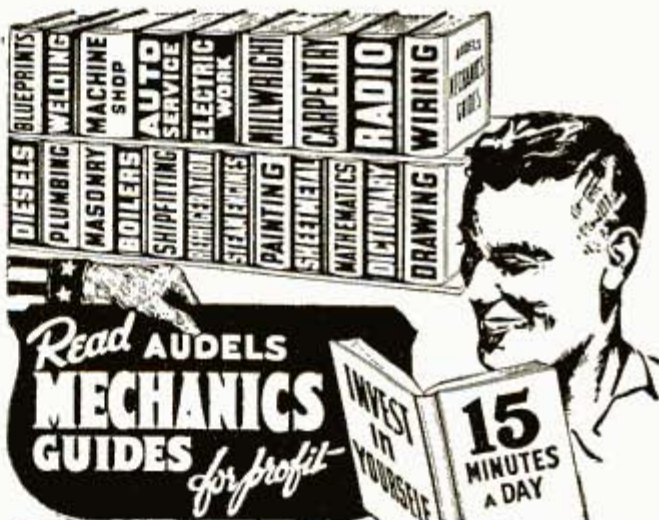
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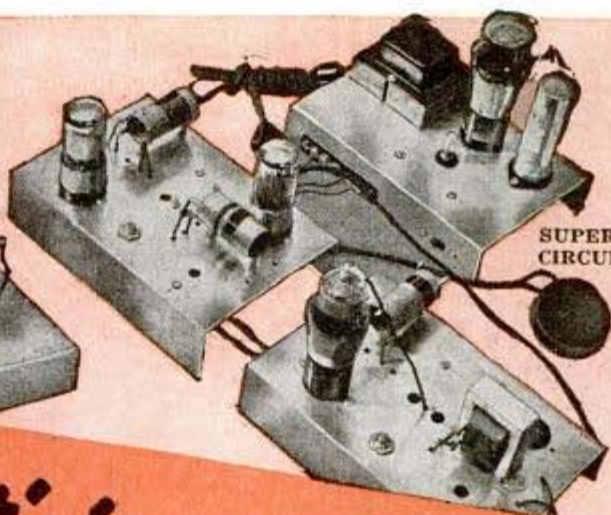
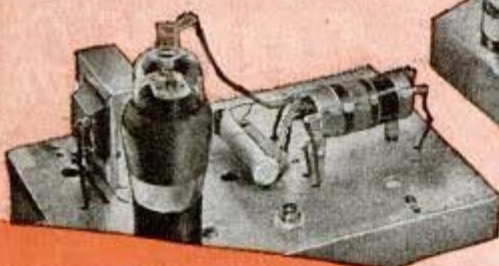


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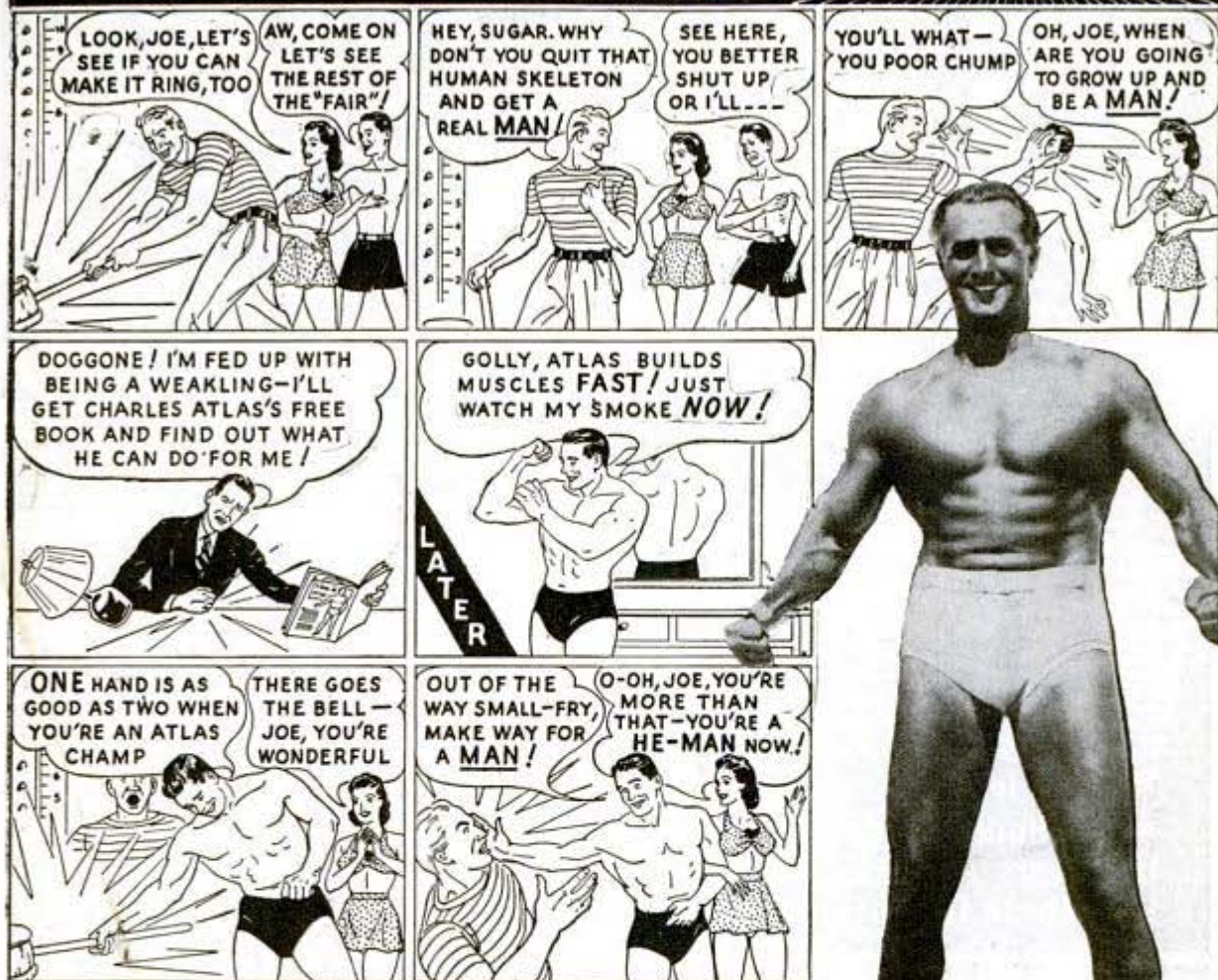
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By S. T. CHRISTENSEN

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.

What to Charge?

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

jobs) were a little difficult to get. But that situation seems to have adjusted itself for many repair parts have today the high priority rating of AA2. After all, we must provide for the health and well-being of our civilian population.

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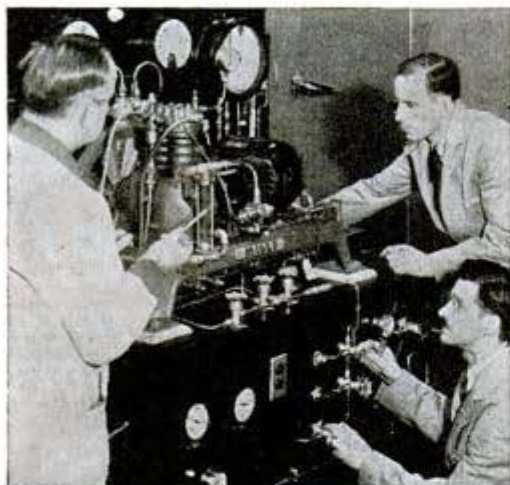
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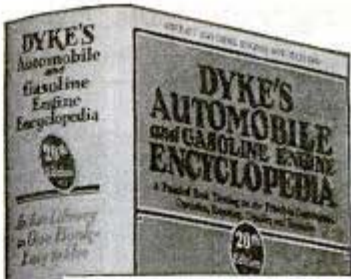
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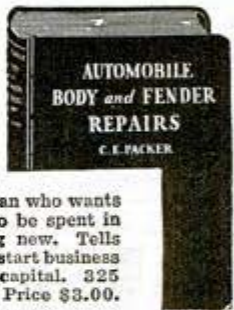
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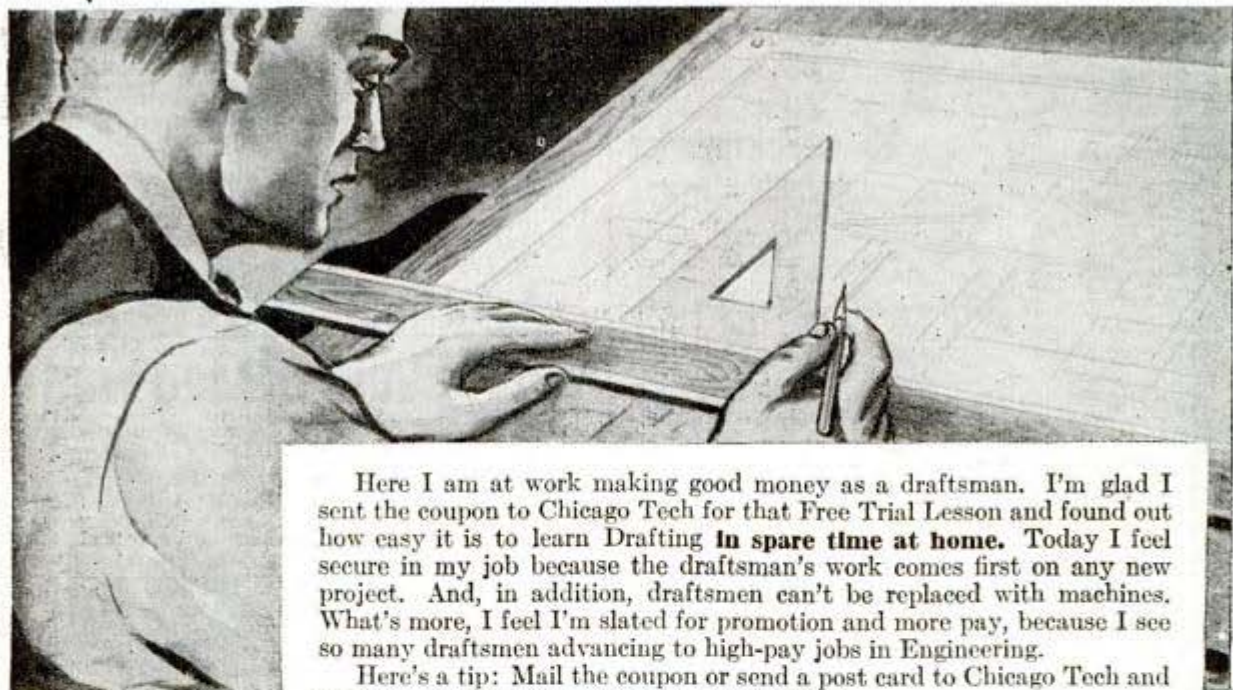
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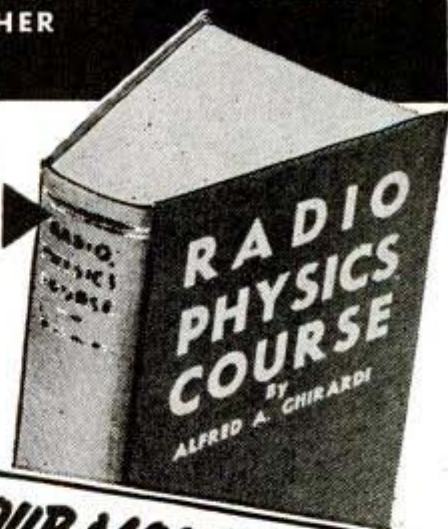
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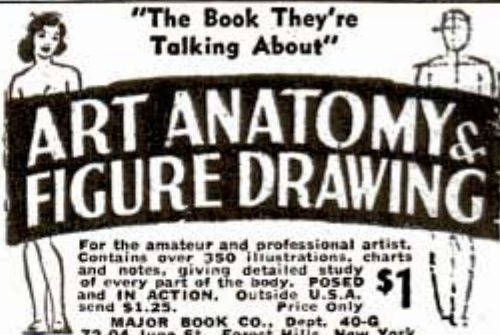
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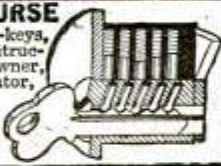
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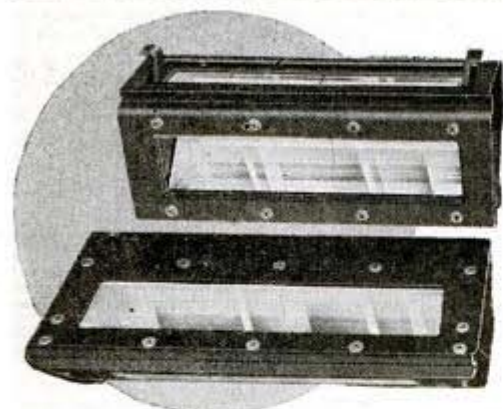
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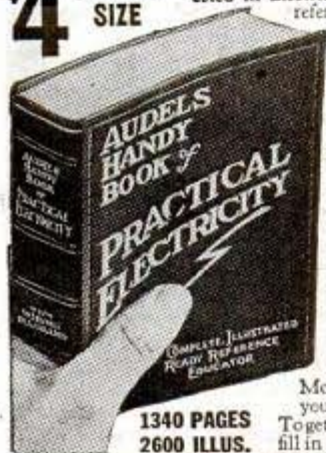
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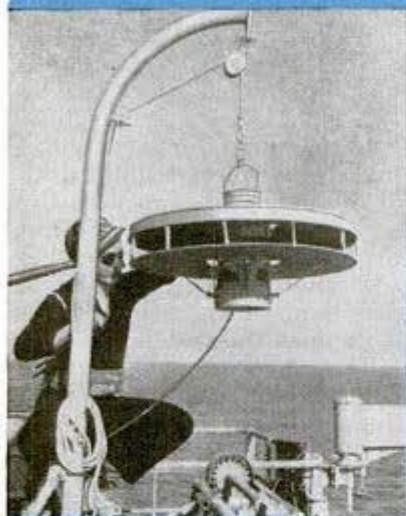
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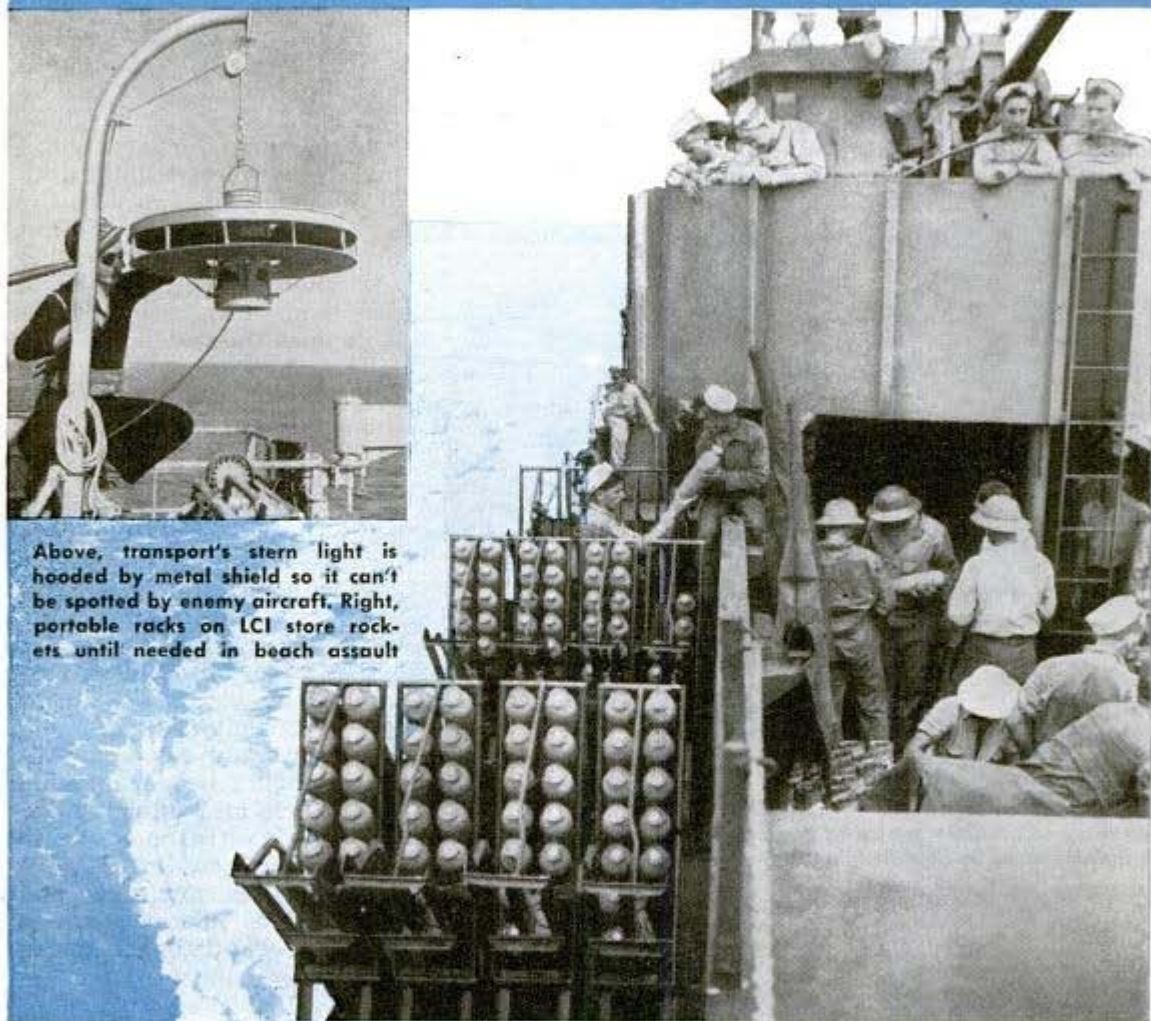
MARCH, 1945

No. 3

BAZOOKA BOATS HIT THE BEACHES



Above, transport's stern light is hooded by metal shield so it can't be spotted by enemy aircraft. Right, portable racks on LCI store rockets until needed in beach assault



By Thomas E. Stimson, Jr.

THE Japs of almost 100 years ago had never seen anything like the American warships with which Commodore Perry forced the opening of Japanese ports.

And the Japs of today have never before seen anything like the 20th century invasion fleets that we are sending against them.

Vast armadas that extend to all four quarters of the horizon were undreamed of a few years ago. Not only are these invasion fleets of unprecedented size; they

are made up in part of extraordinary new ships especially designed for this type of warfare.

Representative of the peculiar ships that have been evolved for amphibious operations is the LSD, called "LS Dog" in Navy phonetics and meaning Landing Ship, Dock.

One of these 465-foot sea-going dock ships might be compared to an empty apple box in that its exterior walls surround a low central deck. This deck is normally not many feet above the water line and is jam-packed with amphibious vehicles. Ar-



Little boats like the LCVP (above) pack the wallop of a much larger vessel, thanks to the installation of portable rocket-launching racks
Official U. S. Navy photo



Landing boat's crew jumps on board (above) as craft is lowered to the ship's rail. Below, a row of pontoon barges equipped with self-propulsion units is launched by Seabees from the deck of an LST



ring off an invasion beach, the LSD swings open the wide gates that comprise its stern, admits water to its ballast tanks and sinks itself until its central deck is flooded and the amphibious vehicles are water-borne. These vehicles move off under their own power to the beaches, climb to dry land and deliver their cargoes where needed, then return to their dock ship for additional loads of supplies.

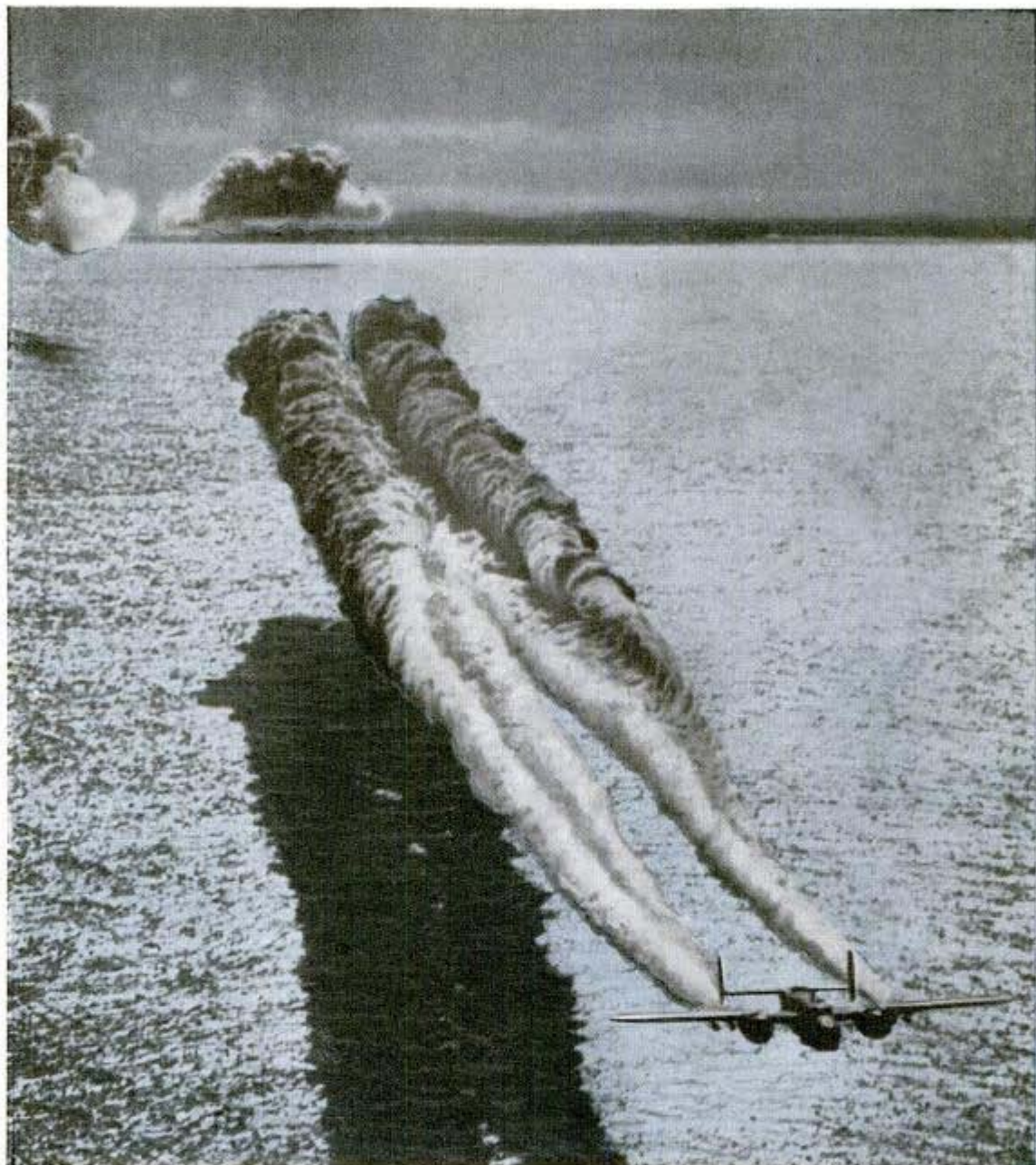
Another special-purpose invasion ship is the LST (Landing Ship, Tanks) that carries 120-foot LCTs on deck. These landing craft, loaded with tanks, were placed on the deck of their mother ship with the assistance of huge cranes, but the ship itself has no hoisting equipment strong enough to pick them up again and deposit them in the water.

The LST has its own way of doing that. When it arrives in the combat area and is ready to discharge its tank-carrying craft, it heels far over to one side, sliding some of its craft off the deck and into the water. Other craft are similarly side-launched from the other side of the ship by regulating the water in the ballast tanks.

Some types of landing vessels have bow doors and ramps so that after crossing an ocean they can steer directly to the beach, opening their bows and allowing the men and vehicles inside to move directly to the land. An LST has such bow doors and often moves in to the beach after side-launching its LCTs offshore.

Six hundred ships, including battleships, aircraft carriers, rocket ships, transports, cargo ships, oilers, hospital ships, and even mine sweepers, net tenders, and salvage tugs, were involved in our initial landing in the Philippines. Not all of them, of course, were gathered in one body for the assault, but all were part of the one operation.

The warships that are assigned to an invasion fleet perform several jobs. First they protect the troop and



After initial bombardment, plane lays smoke screen off Jap-held beach to cover assault by landing craft

cargo ships during the voyage. Next they soften up the landing point with terrific fire just before the landing occurs. This bombardment is co-ordinated with the work of dive bombers and other aircraft from the carriers and is topped off by the rocket-firing Bazooka Boats that move close inshore and rake the beaches with roaring barrages of hundreds of rockets.

From the initial landing until the beach-head has been secured and extended, the warships act as floating artillery. They turn their guns on specific enemy installations and strong points that are reported to them by radio from spotting parties on shore and in aircraft.

This kind of assignment is new in naval gunnery. The targets often are invisible to the crews and yet they must be hit accurately. Slight errors in range might drop the shells among our own troops. This long range demolition is kept up until the artillery units in the landing force get ashore and take over the job.

An invasion fleet presents a weird appearance at sea. Most of the large deep-water ships are camouflaged in dazzle patterns that may consist of zigzag zebra stripes or of futuristic blocks and swirls of paint. Dazzle camouflage makes it difficult to sight a ship and, once the ship is detected, it is intended to give it the appearance



Quartermaster mans the wheel on the bridge of an attack transport

of moving at a false speed or on some other than its true course.

Some of the landing ships in this convoy may wear tropical camouflage while others are decorated with jungle patterns. Protective tropical camouflage may be a sickly green or a combination of greens and light blues that blend well with the coloring of

western Pacific seas. Jungle camouflage is applied to ships and craft that may spend some time tied to a tropical shore. Jungle camouflage blends in with jungle backgrounds. When moored inshore, such ships may also be concealed under a matting of foliage so that from the air they appear to be part of the shore line.

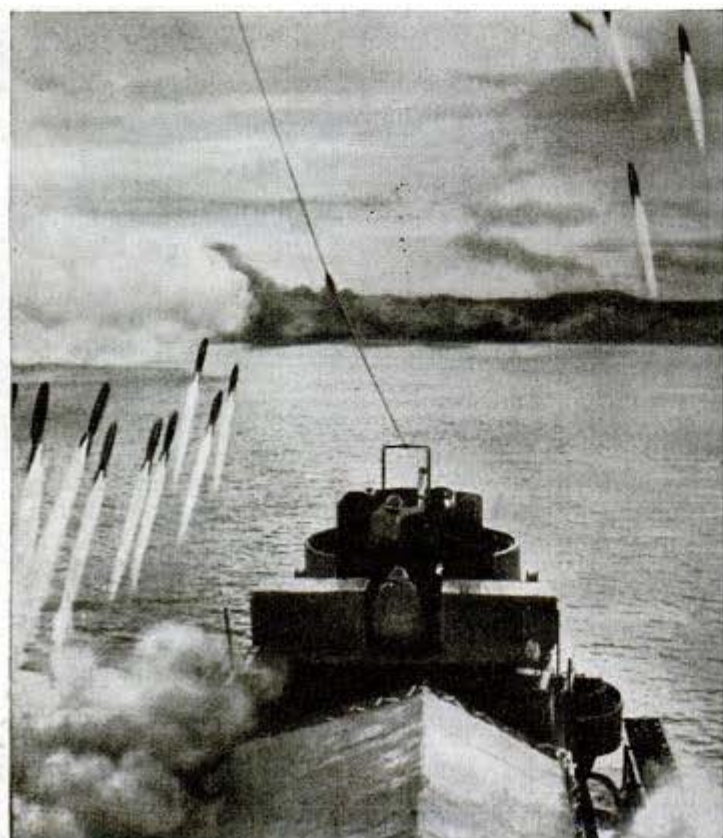
Nearly all of the invasion ships carry nests of landing craft and small boats on deck. Even the fuel tankers do double duty and may be loaded with PT boats on top of loads of oil and gasoline.

The heart of any invasion fleet is made up of APA and AKA vessels. The APAs are the attack transports, the AKAs are the attack cargo ships. An APA may be a converted passenger liner but most of them are a new special class consisting of Victory ships of some 10,000 tons, turbine driven, with interiors designed to accommodate large numbers of men. They carry considerable anti-aircraft protection. The AKA class is similar but has limited troop capacity and larger cargo spaces.

So many transports are needed in fighting this inter-continental war that the crews of these transports comprise a larger number of men than were in the entire U. S. Navy in 1940. To keep up with the production of ships, these crews were trained ashore at operational training schools which have instruction capacities greater than most major universities. At one of these schools a ship is literally taken apart and placed piece-meal in the different classrooms so that the men can be trained to operate the same devices they will operate at sea.

Even such a prosaic subject as how to load a ship with cargo is an important study, for all invasion ships must be combat loaded. That is, material that will be needed last at a beachhead is the first cargo to go into a ship. Equipment

(Continued to page 158)



LCI hurls a barrage of rockets at Jap-held Mindoro beaches as first U. S. assault wave approaches shore



Yanks wading through heavy seas onto the beach of a Pacific island after naval bombardment and rocket barrage has smothered Jap shore batteries. Here lessons learned at Anzio and Tarawa saved lives



Official Navy photographs

Rocket craft off Peleliu Island score hits on D-Day. As they blast away at Jap defenses, a wave of Alligators (below) churns toward shore as vanguard for Army and Marine assault units. The tough amphibious tanks approaching the beach obscured by smoke are armed with machine guns and cannon



"Pigmy Flat-Tops" Carry Both Planes and Cargo



Merchant ships have been converted into double-duty "pigmy flat-tops" with flight decks only 380 feet long by the Royal Canadian Navy. While hunting for German submarines on convoy duty, they carry cargo below their flight decks. Before the start of each trip, wheat is usually poured through the flight decks by means of grain funnels while the decks are temporarily cleared of aircraft. The little carriers are so short that flyers use less than 100 feet for takeoffs and landings. Occasionally United States Navy aircraft carriers also are converted to special purposes. Recently a big flat-top left for an unidentified port resembling a floating garage, since its flight deck was packed with trucks, jeeps and other vehicles consigned to U. S. Marines.

Above, merchant ship converted into "pigmy flat-top" with flight deck 380 feet long. At right, loading "pigmy flat-top" with wheat through grain funnels



"Snow-Eater" Melts The Drifts Away In Railroad Yard

Snow disappears in a jiffy in one Boston railroad yard when the "snow-eater" goes to work. This unit is pushed by a locomotive which also supplies the heat to melt the snow as it enters a tank car. A series of rotating disks throws the snow onto a conveyor belt. The tank car holds 14,000 gallons, equal to 18,000 cubic feet of snow.

New Navy "Lib" Ranges 3,000 Miles on Patrol



With the new land-based search plane, the Consolidated Vultee Navy Liberator (PB4Y-2), the Fleet has acquired "three-thousand-mile eyes." It is used for search and photographic missions, antisubmarine patrols and bombing raids. The long narrow wing is its principal resemblance to the old PB4Y-1 Liberator. The new plane, called the Privateer, has a single-rudder tail assembly, a longer fuselage and a different type of armament. It has six gun turrets, each mounting two .50-caliber machine guns, which afford protection from every angle on lone flights. Beneath the

power-operated ball turret in the nose is a small compartment with a bombsight window. The bomb bays are designed to hold several combinations of auxiliary fuel tanks, bombs and depth charges, depending on the mission. The PB4Y-2 can stay in the air 20 hours without refueling. It is powered with four Pratt & Whitney Twin Wasp engines which were redesigned for low fuel consumption and more horsepower at the takeoff. Retractable wing flaps also help the plane to get into the air with its gross weight of from 62,000 to 65,000 pounds. Top speed is more than 250 m.p.h.



'Automatic' Mask for Army Pilot Regulates Oxygen and Pressure

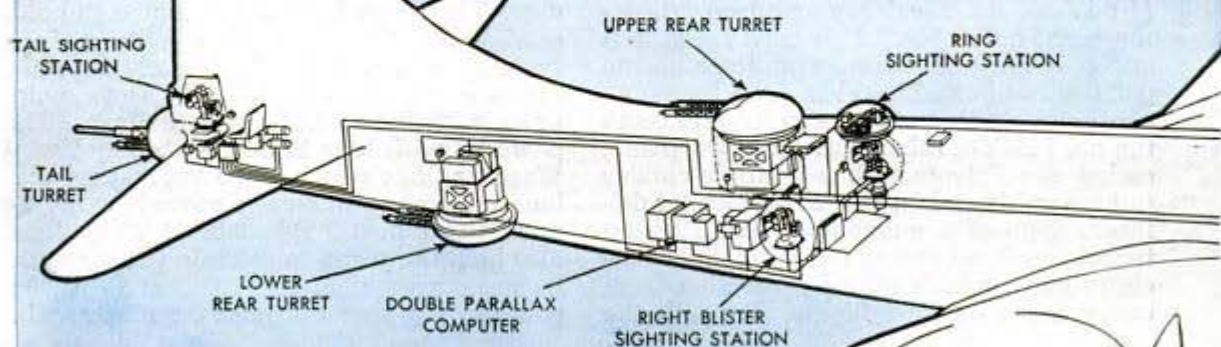
Army Air Force pilots can soar as high as 50,000 feet "into the wild blue yonder" with a minimum of oxygen and pressure worries, wearing a new pressure demand oxygen mask. Its function is to increase the flow of oxygen automatically and deliver it to the pilot under the proper pressure. This enables the pilot to breathe freely and prevents dreaded anoxia. The automatic regulators, which are installed as permanent fixtures at each station in a bomber, supply pure oxygen at 30,000 feet. With the mask, a pilot can function normally for one-half hour at 45,000 feet and at 50,000 feet for short emergency periods. The mask was developed by the aero-medical laboratory at Wright Field in conjunction with industry.

"INSIDE STUFF" ON THE B-29



FROM the bombardier's comfortable seat in the transparent plastic nose all the way back to the tail gunner's position, the Boeing B-29 Superfortress might well be called "the bomber crew's bomber." Its refinements, from pressurized cabin to remote fire control, are designed to bring the crew over the target in fighting trim, to deliver an accurately aimed and deadly blow to the enemy (through the clouds, if necessary), and to enable the crew to fight its way through a swarm of fighters for a safe return to home base.

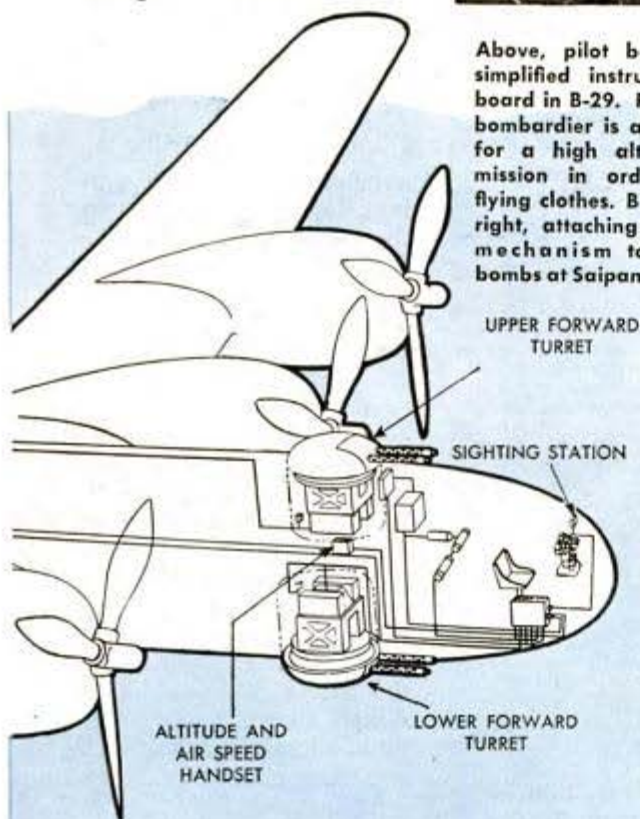
Flight fatigue, which has plagued bomber crews on long missions at high altitude in the European theater, is reduced to a minimum with the B-29's pressurized interior. Hours of breathing through oxygen masks and cumbersome clothing to protect the men from 50-below-zero cold in the thin air of the stratosphere are eliminated. Oxygen masks, of course, are placed by each station, but they are con-



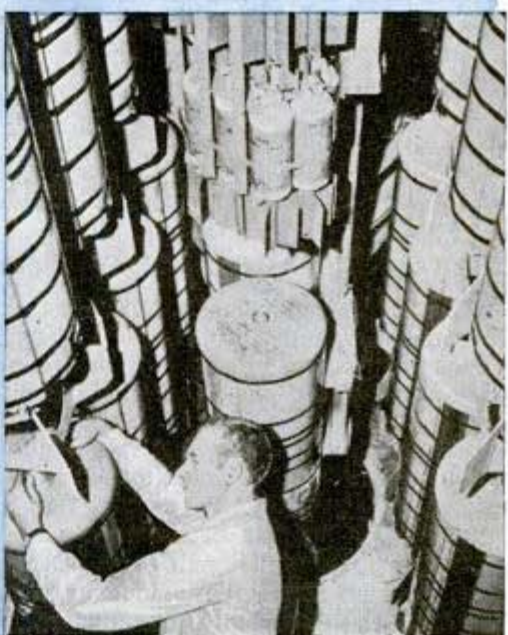
Top, four members of B-29 crew enjoy a few of the comforts of home in rear pressurized cabin equipped with four bunks. Drawing (above) shows sighting stations for the bomber's remote control gunnery system. One gunner can concentrate the fire from three turrets on single target. Left, some of the 30 miles of wire which go into one B-29 to control its 150 electric motors

sidered emergency equipment, like life rafts.

No belly gunner on a B-17 will mourn the loss of that cramped station on the B-29; nor will the Flying Fortress pilot complain about the transfer of numerous gauges and dials to the control panel before the flight engineer on the Superfortress. The "suite at the Ritz"—rear pressurized cabin equipped with four comfortable bunks—gives members of the crew a chance to rest on missions many hours long. This compartment is reached



Above, pilot behind simplified instrument board in B-29. Right, bombardier is all set for a high altitude mission in ordinary flying clothes. Below, right, attaching fuse mechanism to the bombs at Saipan base



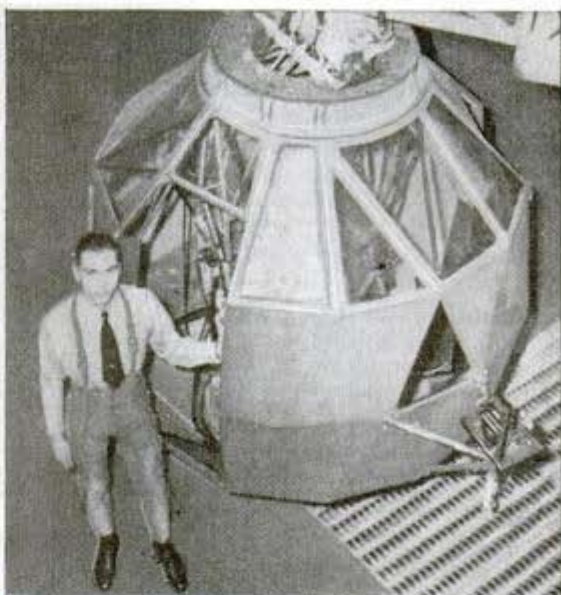
from the forward cabin by a tunnel extending back over the twin bomb bays.

The B-29's remote control gunnery system, with computers between the sighting stations to aim the .50-caliber machine guns in the electrically operated turrets, not only takes the guesswork but much of the drudgery out of being a gunner on a bomber. A chief gunner directs the firing for combat teamwork, and a man at one station can control several turrets. The success of this system has been written in the sky over Japan where the old game of fighters ganging up on a straggling bomber has become a dangerous pastime.

Anti-Gravity Pants Prevent Blackout in a Dive



Top, left, pilot has his anti-gravity pants inflated. Top, right, RCAF officer with the accelerator which tested the suit



girdle and air bladders over the abdomen and legs. Compressed air from the plane's vacuum system inflates the bladder,



Left, cutaway shows how accurately suit fits body's contours in a sitting position

Pilots don't worry about the danger of "blacking out" in high speed dives and turns when they have their anti-gravity pants on. Used secretly by American and British pilots since 1942, the pneumatic suits have high-waisted, skin-tight pants with built-in suspenders and

and automatic valves control the pressure in relation to the gravity pull. Purpose of the suit is to keep the blood from being driven into the lower extremities and to help the heart pump blood to the brain. According to the RCAF, the pants give Allied flyers a tremendous physical advantage over the enemy in lightning-fast dog fights.

Here's a Chance for Inventors to Help the Air Forces

Among 34 inventions sought by the Air Forces is a small, light-weight gasoline engine of one to five horsepower, capable of operating on 100-octane aviation fuel. According to the National Inventors Council, other Air Force needs for which the public is urged to submit ideas are a high-precision, low-friction bearing that does not involve the use of balls or rollers, a liquid or paste which will prevent the formation of ice on airplane surfaces, a material with the electrical properties and heat

resistant characteristics of mica, a simply installed thrustmeter, a shock absorber that does not require the use of synthetic packing to retain the fluid in the strut, and an automatic ground speed measuring device. For parachute operation, the Air Forces seek a device which will release a parachute from its cargo quickly when the cargo hits the ground; low cost aerial delivery parachutes, improved harness with quick-releasing hardware, new canopy designs, and parachute drop test instruments.

ICE CRACKERS *of the* COAST GUARD



WORKMEN at the shipbuilding yards in Duluth, Minn., and Superior, Wis., shook their heads in wonder at the production schedule early last winter. It didn't make sense. The rush schedule called for the completion of three ocean-going cargo ships early in January. They told each other it was like the man who built a boat in his basement and couldn't get it out.

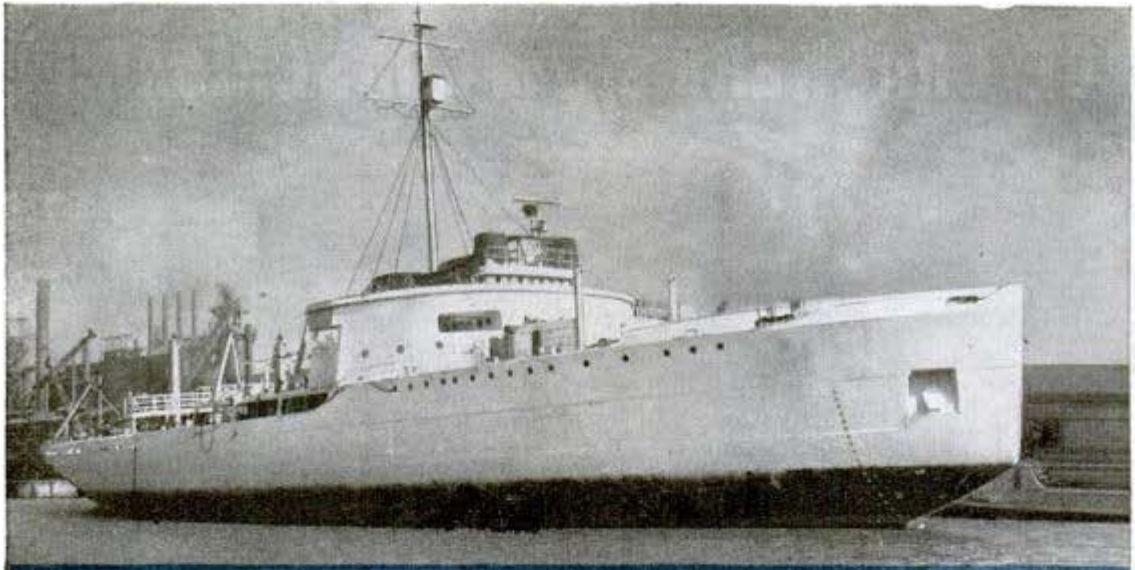
Between these new cargo ships and the sea lay miles of ice-locked passage, including St. Mary's Canal at Sault Ste. Marie, Mich. No ship had ever made a midwinter passage through the 90-year-old Soo locks.

But the Navy only blinked at the 12-inch blue ice on the upper St. Mary's River. Its Coast Guard icebreaking crews are always on the job keeping open vital waterways—the Hudson, Ohio and Mississippi rivers, and the Great Lakes.

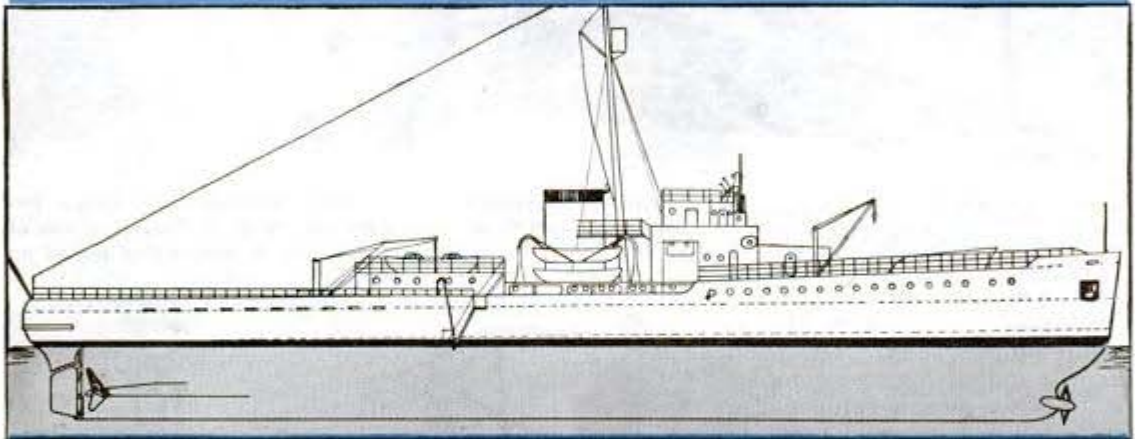
The Coast Guard accepted the 90-year challenge of the Soo locks. The new \$10,000,000 ice cutter Mackinaw was given a chance to make history on its maiden trip. Early in January, this cutter and three other ice-

Down the Mississippi in midwinter, invasion craft follow ice-breaking Coast Guard vessel on way to Gulf. Below, stream of boiling water and axe loosen ice from a buoy being picked up





This is the Coast Guard's new \$10,000,000 icebreaker, Mackinaw, which made history with the first winter passage through Soo locks. The 329-foot cutter has one propeller in bow (below), two in stern



Under a wing pontoon of Coast Guard patrol plane, freighters loaded with war goods can be seen fighting way through ice out of harbor at Buffalo, N. Y. Tug at right is attempting to clear a channel



breakers' smashed a lane through the icy bottleneck from eastern Lake Superior down through the Straits of Mackinac to the open waters of northern Lake Michigan.

Twice during the push through the Straits, it looked as if the ice was going to win out over the Coast Guard; but each time the Mackinaw plunged ahead through windrowed chunks of ice.

The 10,000-horsepower Diesel-driven Mackinaw is said to be the most powerful icebreaker in the world. In addition to two stern propellers, it has one in the bow which agitates the water beneath the ice, making it easier to break. The new 329-foot cutter also has a "rocking-horse" method for freeing itself when lodged in a thick ice floe. This is accomplished by pumps which can dump 400 tons of water from one side of the ship to the other or from fore to aft in two and a half minutes.

Recently, the Mackinaw again made headlines by escorting a 306-foot auxiliary personnel destroyer (originally designed as a destroyer escort) through the lakes and down the Chicago River to Lockport, Ill. Two hundred and sixty miles of the trip was through ice.

Last winter the Coast Guard's icebreaking job was probably the toughest in history, because there was a shortage of icebreakers and personnel and a tremendous increase in water traffic.

In the New York Harbor and Hudson River district, two breakers handle the entire job and keep themselves hopping all winter long. The vessels used are the Mahoning and the Manhattan.

In the harbor and East River there isn't much trouble with ice because of strong tides and the movement of a great number of ships. There are times, of course, when

Making history — cutter leads cargo ships built on Lake Superior through Soo locks early in January on way to the Gulf



Face masks of felt take the bite out of sub-zero winds on winter patrol

the Coast Guard is summoned to dislodge a Liberty or some other vessel.

But on the Hudson above Bear Mountain Bridge things are different. This great stream is navigable all the way up to Albany, a distance of about 150 miles, and the surrounding territory depends to a great extent on river barges and tankers to transport petroleum products.

The Hudson is the particular stamping grounds of the Mahoning, commanded by an ice-wise skipper, Lt. Comdr. Harold Babbitt. The Mahoning goes into action when the first call for help is received at





Mariner uses pressure hose to sluice snow from deck of cutter

the Barge Office from ships or barges having trouble getting through the ice. The big job is to keep the river open from Iona Island down. Iona Island is the Naval Arsenal just below Bear Mountain Bridge at Peekskill. This spot, and the bend in the river at West Point, a few miles north, are

the toughest to keep free of ice. There are pronounced elbows in the river at both these points and the ice tends to pile up on the south banks as it comes down the river.

The Mahoning is a solid, powerfully built vessel especially constructed for icebreaking. Her hull is braced with enough steel to do justice to a battleship while her rounded prow is heavily reinforced. She started working in the Hudson River in 1939 and is of all-welded steel construction, 110 feet long and driven by two powerful General Motors Diesel engines developing 1,300 horses to turn one propeller.

Icebreaking with the Mahoning isn't just a case of pulling back, putting your head down like a fullback and charging the ice. That's all right when the ice isn't too thick. But Hudson River ice often reaches a thickness of 10 or 12 inches, while drift ice will pile up to four feet thick or more.

The Mahoning climbs its rounded prow up on this heavy ice and hangs there. Her weight and vibration finally break the ice and she crashes through. Sometimes such a break will crack the ice for a mile.

Ice that is comparatively thin can open up a seam in a petroleum barge and cause the contents to ignite by friction. The Barge Office issues a daily ice report to all interested parties on the advisability of a trip up or down the river. This report is

Heavy duty icebreaker on North Atlantic patrol carries guns and plane from which this photo was made



based on the report of the Mahoning radioed to New York City from Newburgh every night.

The efficacy of this service is attested by the fact that no ship has ever been crushed or lost because of ice action on the Hudson. However, a few barges that broke their moorings and got caught in the floes have been ground to bits.

Sometimes the Mahoning stands by a ship all night. There was a case last year when a strong ebb tide was bringing a great quantity of ice down the river toward a ship that was tied up at Poughkeepsie. This ice was piling in between the ship and the dock and could easily have crushed her if the Mahoning had not worked all night, breaking up the ice and sending it on its way.

One of the outstanding exploits



Brrr—cutter returning from patrol with ice "camouflage" tossed aboard by heavy seas. Left, ice-coated cabin of an icebreaker on the Hudson River. Below, plow attached to prow of Coast Guard patrol boat Fern breaks ice on Mississippi River to open channel for Great Lakes to Gulf shipping

of the Mahoning took place in February, 1941. The Navy had purchased the world's largest fresh water passenger ship, the Berkshire, from the Hudson River Day Line. This 422-foot, 4,300-ton steamer was tied up at Athens, N. Y., just below Albany, for the winter. The Navy wanted her towed to New York City.

Private tugboat people wagged their heads violently. "Can't be done," they said. "It's impossible for any tug or other boat to get that big baby down those icy channels."

So the Navy, as usual, propositioned the Coast Guard.

When Commander Babbitt and his crew took charge, the betting

(Continued to page 158)





Triple-Threat Photo Plane Carries Bombs and Guns

One reconnaissance plane that can fight its way home is the F-6 version of the P-51 Mustang, the only single-seater photo-reconnaissance craft which can carry a full complement of machine guns and bombs. The F-6 could fight its way to the target area, photograph it, bomb it, photograph the bombed area, and effectively deal with enemy aircraft on the trip home. A variety of cameras can be installed in a special fuselage compartment of the regular production models after they leave the assembly lines, enabling the Mustang to obtain oblique and vertical photographs. While other single-seater fighters must sacrifice either firepower or bomb-carrying capacity when adapted to photo-reconnaissance, the P-51 retains its six machine guns and normal bomb load or long range fuel tanks.

Left, vertical cone is installed in P-51 camera mount. Below, checking camera's sighting aim



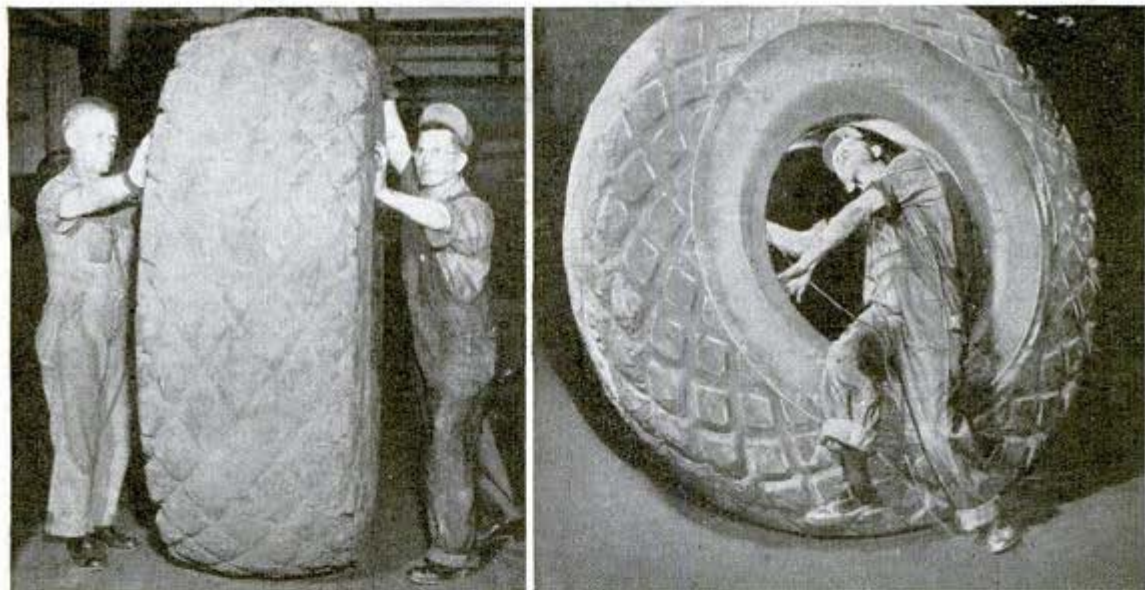
Synthetic Rubber Made of Sand Unaffected by Extreme Temperatures

Silicone rubber, a new synthetic which is as pliable as putty yet bounces like rubber, has been developed by the General Electric Company for a variety of wartime uses. This rubber, made from sand and natural gas, loses none of its elastic qualities in temperatures as low as 60 degrees below zero and as high as 575 degrees above. The compound is known chemically as dimethyl silicone. Silicone stands vibration well. It can be squeezed down to two-thirds of its normal thickness between metal plates and afterward will expand to

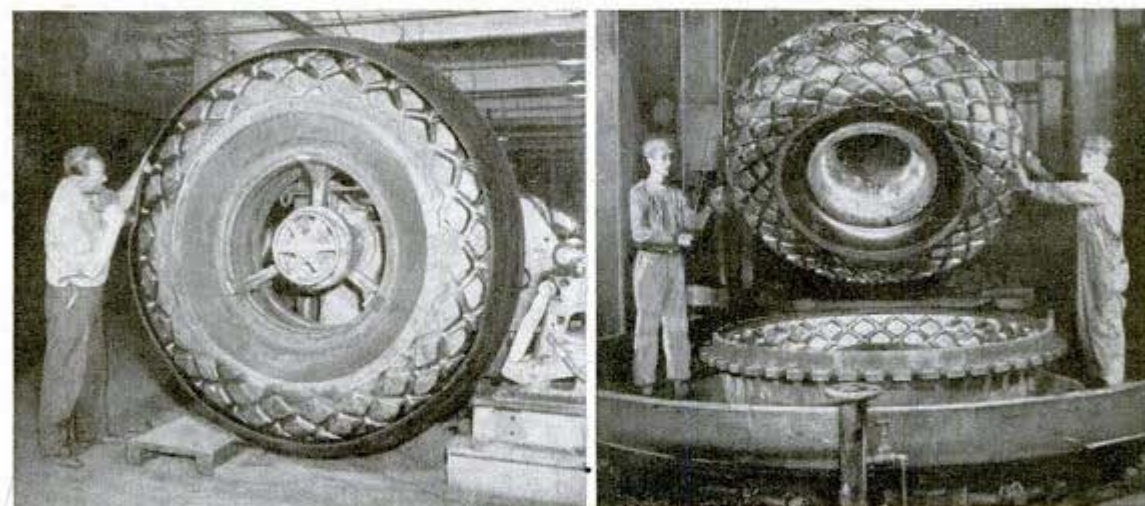
nearly full thickness. It can be made either hard or soft and is used, among other things, as gaskets for B-29 superchargers, which operate at extremely high temperatures. It also supports the lenses in huge Navy searchlights, which must stand severe vibrations every time a battleship's guns are fired as well as extreme heat from the electric carbon arc.

☐ One set of tires on a B-29 Superfortress survived 160 consecutive landings without the necessity for a change.

Retreading Gives Mammoth Tire a New Life



Above, left, largest tire to be given a brand new tread by Goodyear Rubber Company is rolled into receiving room for its face lifting. Then it is thoroughly inspected (above, right) to see if it will stand retreading



Camelback is applied (above, left) in an endless band to buffed surface. Workman already has started to stitch down the camelback. Curing operations completed (above, right), tire is removed from the mold like new

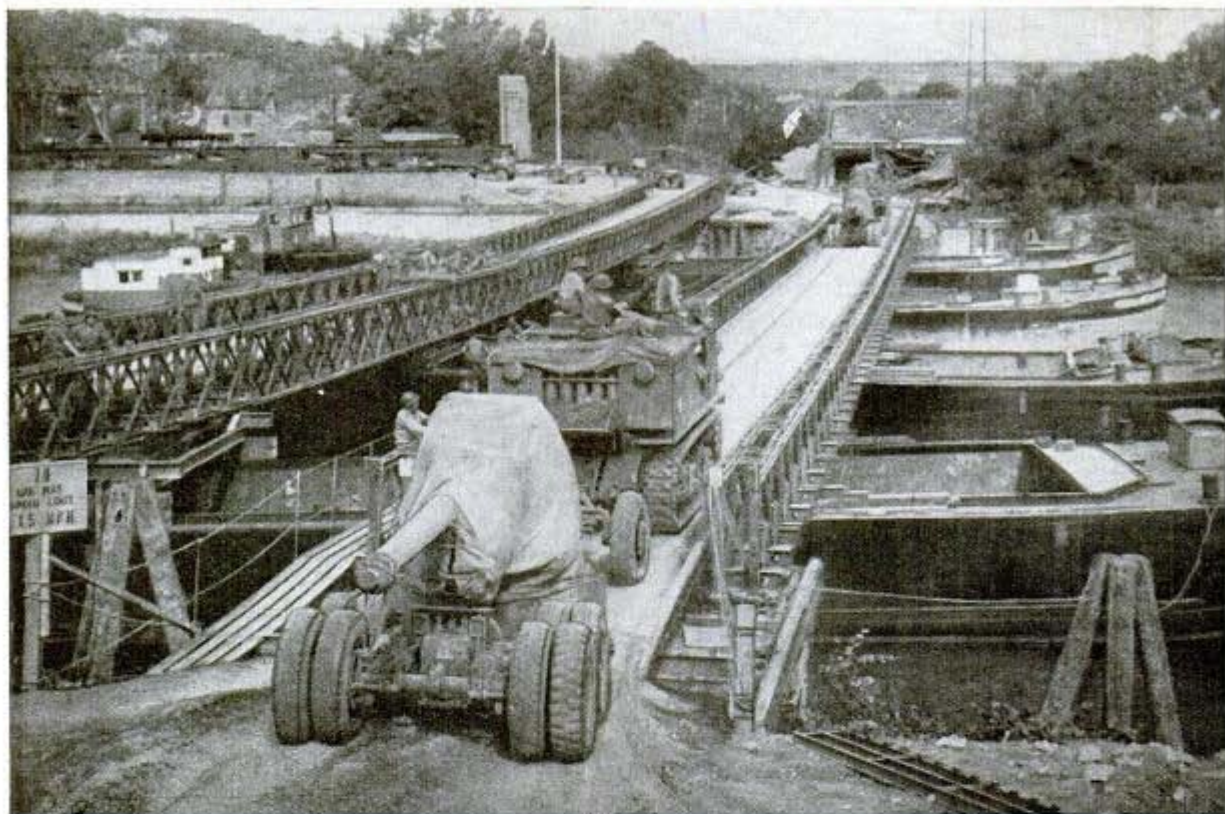
Insulation Sprayed on Like Paint Sticks to Metal or Wood

Any type of wall, tank or duct, whether made of wood, brick, concrete or metal, can be insulated and weatherproofed with a material sprayed on like paint. The coating, which is applied in a single operation, can be sprayed on to any thickness needed from one-eighth to one-half inch. The base for the insulating and protective material is Gilsonite, a high grade asphalt, which is treated to retain a permanent elasticity at low temperatures. It is made in several forms, and the one used primarily for insulation is impregnated with cork. Those designed for weatherproofing provide some insulation by their sealing properties. One

type is sprayed with varicolored slate granules to form a pleasing protective finish; another is available in several colors which are incorporated in the material. The coating can be applied to homes, industrial buildings, water tanks, tin and galvanized sheet metal ducts, freight cars, or any other object in need of weatherproofing or insulation. It is waterproof and fire resistant.

☐ The leading fishing port of the United States in 1944 was San Pedro, Calif., with a total of 550,000,000 pounds landed; on the Atlantic coast Gloucester, Mass., led with 189,000,000 pounds.

BRIDGING THE ARMY'S



Tractor-drawn 155-mm. gun moves across a Bailey bridge erected on French barges over Seine River

By Staff Sgt. John L. Kent

IN THEIR 80-day retreat across France, the Germans destroyed all bridges to hold up the Allies and give themselves time to reorganize. But for all their frantic efforts, they found the Yanks continually on their heels. In spite of destroyed bridges the Yanks kept coming, for when the Germans blew up bridges the Army's engineers built new ones alongside or brought up portable ones.

Continuous pursuit is the essence of modern mobile warfare. Rivers without bridges or with the bridges destroyed are serious obstacles, since they hold up the pursuing army and give the retreating troops time to reorganize. We did not give the Germans this precious time. Temporary bridges were thrown across streams and rivers by our combat engineers, and larger, permanent ones were erected by engineer general service regiments in rear areas.

Building bridges is a task assigned to the Army's

Corps of Engineers. No other body of men can beat them in spanning rivers in record time, often in the face of enemy fire.

While the engineers have a wide choice of types, there is always a specific type of bridge which fits a particular condition. Sometimes standard construction cannot be followed, and the engineers must substitute and improvise. Wood is used instead of steel. Ponton and assault boat combinations

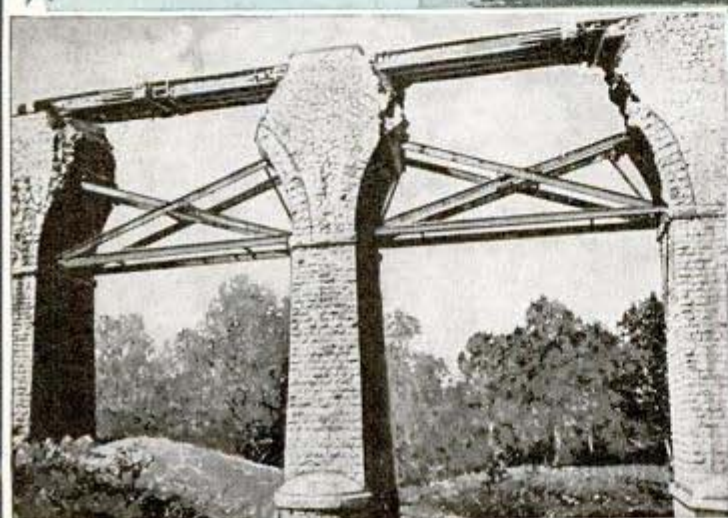


Engineers use parts of Nazi gun to rebuild bridge on opposite page

WATER HAZARDS



Engineers in makeshift dive suits attach hooks to wrecked bridge parts to raise them from water. Below, span rebuilt with Nazi gun carriage



are used. The bridge may be part floating and part fixed. Because of the many expedients they use, engineers are known as "the great improvisers."

In Normandy, the engineers were called on to throw a bridge over the Vire River just below its junction with the Taute-Vire Canal. Time did not permit building anything but a temporary ponton bridge. But even a ponton bridge takes time, especially when the water is deep. Then someone thought of the locks on the canal, several hundred feet down. The gates were raised and the water let out. With the water level



Above, a British prefabricated pier at Normandy made up of small bridges resting on floats. Below, a wilderness bridge on the Alcan highway

only waist high, the engineers waded in, floated the rubber pontons and clamped the steel treadway over them. When the last ponton was bolted and tied, the gates on the downstream lock were shut, and water from the higher lock admitted.

The water floated the bridge higher and higher, until it reached the level of the banks on both sides. The water was then shut off, the ends of the bridge tied and runways built. One hour later trucks were rolling over it.

Army engineers are almost never stumped. In Italy several of them turned divers in order to salvage their own bombed-out floating span from the bottom of the swiftly moving lower Garigliano River, which was under enemy fire at the time. Wearing GI gas masks with a thin rubber hose through which the air was pumped to them from a compression machine on a rubber raft, they went down 25 feet and stood in the rocks and slime of the river



bed for periods of 15 to 20 minutes each. They attached ropes and hooks to the smashed installations, which could then be lifted out of the water by cranes. Soon guns and supplies again were being hauled across the revived bridge toward the astonished Germans.

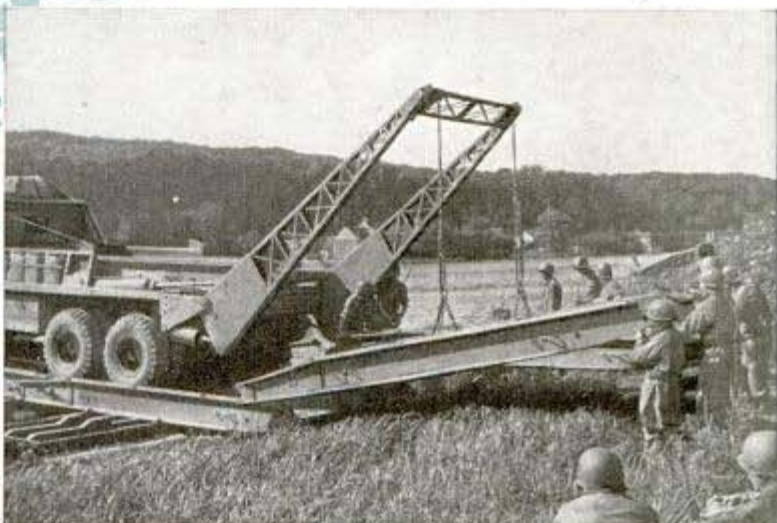
Many of the engineer units now in France, Italy and Germany received their training in the maneuver area swamps of Louisiana and in the frozen wastelands of Alaska. During the building of the great Alcan highway, seven engineer regiments built hundreds of bridges of all types. The Alcan was a bridgebuilder's nightmare. Unstable ground and frozen shifting foundations made the building of permanent bridges precarious. When the engineers built the first set of bridges in the fall of 1942, they expected all of them to be washed out in the 1943 spring flood—and they were!

But the resourceful engineers had built a duplicate bridge next to each crossing; and left it in sections on the banks, alongside. When the flood receded, the standby bridge was thrown across the stream. Traffic on the Alcan continued.

Our Army's temporary bridges are floating bridges of the assault-boat ponton or pneumatic ponton type. The assault-boat type consists of ordinary army assault boats, resembling rowboats, which are anchored across the stream, over which is laid a wooden or steel treadway. The ponton type uses inflated rubber boats similar to the lifesaving rafts used by our airmen when they are forced down at sea. Special steel clamps and retainers hold the treadway to the pontoons and

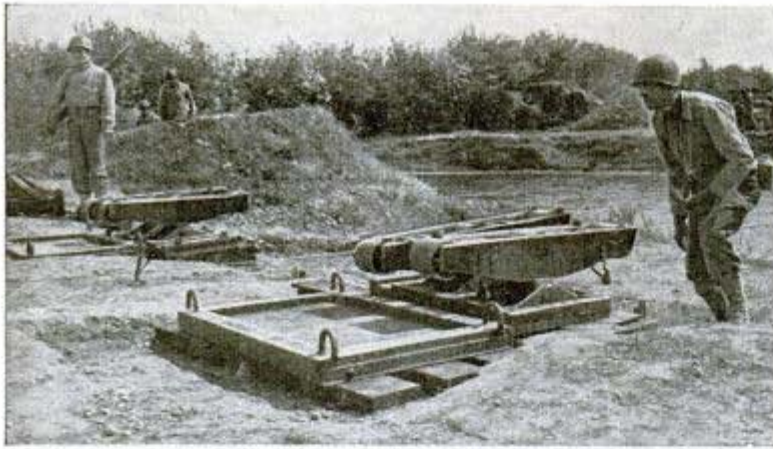


Above, overall view of a loaded bridge truck equipped with hydraulic crane. Among assorted construction equipment are two complete trestles

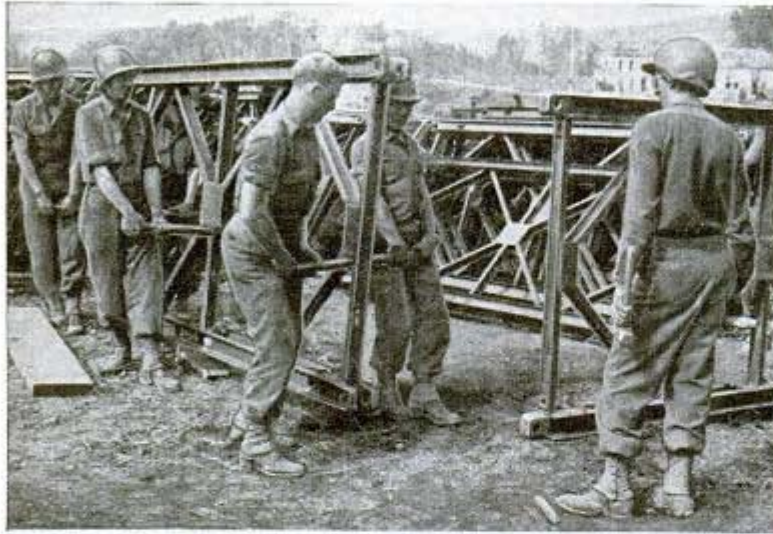


Above, hydraulic truck crane lays final treadway section on ponton bridge over the Seine River. Below, bridging gap left by a blown-out span

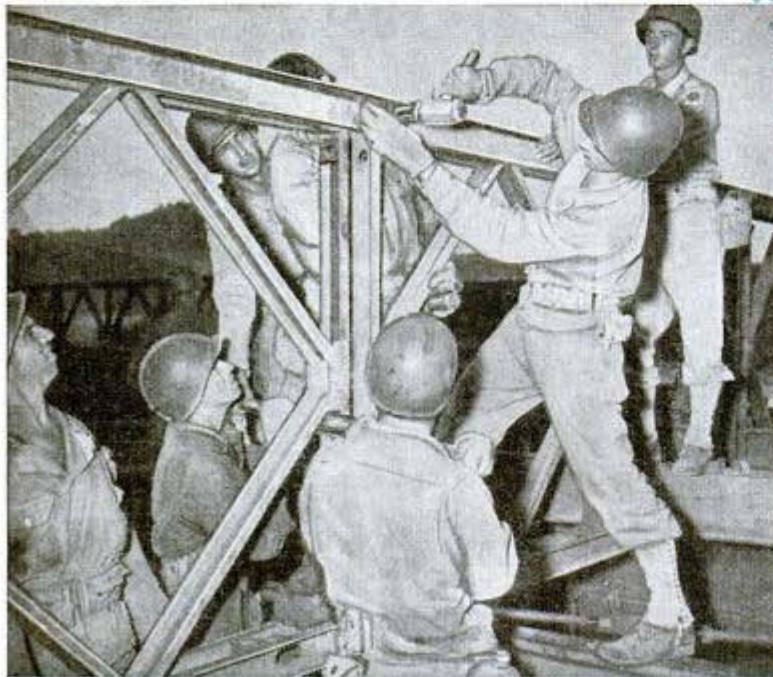




Above, company commander of engineers inspects the rocking rollers of a Bailey bridge. Below, carrying panels which will be joined together



Below, engineer drives pin which holds panels of Bailey bridge together. The spans are prefabricated and can be assembled rapidly at bridge site



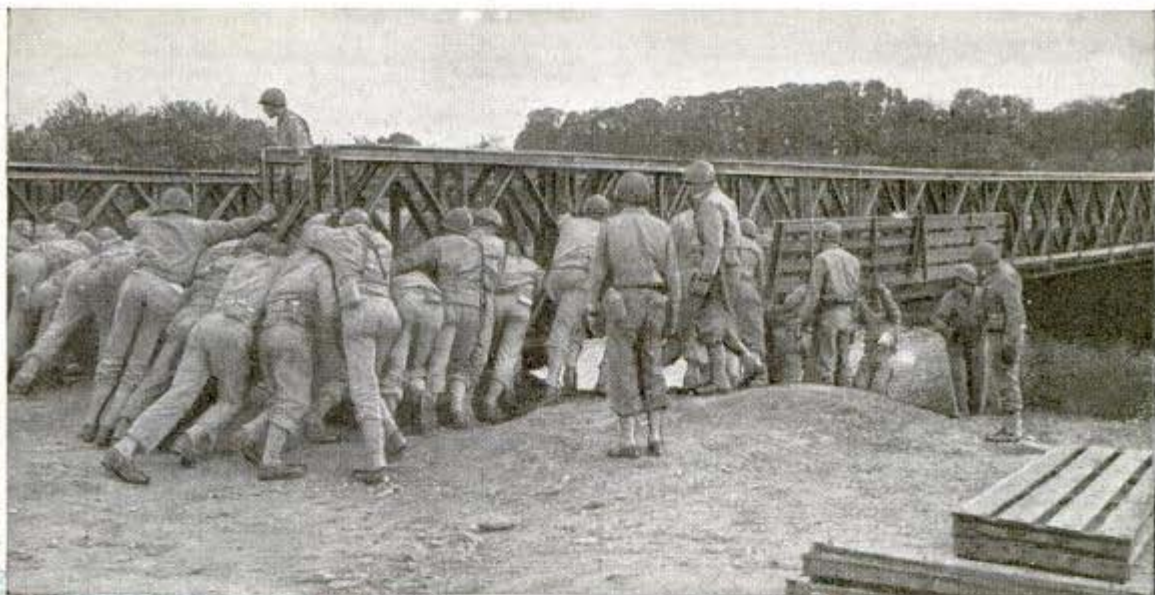
hinges near the ends permit the bridge to give under the load of trucks or tanks moving over it.

In Burma, when neither rubber pontons nor assault boats were available, the resourceful engineers lashed empty oil and gasoline drums together and tied on planking to form a treadway.

In France and Italy our troops are using the 25-ton ponton bridge, which is normally sufficient to meet the needs of an infantry division crossing a river less than 600 feet wide. The bridge is built by an engineer heavy ponton battalion, which also dismantles it when it is no longer needed, and loading it on trucks, holds it in readiness for its next move to some advanced location. The bridge is durable in spite of its temporary nature, and permits the crossing of the trucks of five infantry divisions before requiring repairs.

But the most versatile bridge of this war is the invention of an Englishman—Bailey. The Bailey bridge is a steel fixed bridge of the through truss type. It uses only 29 different parts, completely prefabricated and interchangeable, and like a giant Erector set, can be assembled rapidly in various ways to meet different load and span requirements. The main construction unit is a truss section, 10 feet long and five feet high, called a panel. The strength of the truss may be increased by adding extra panels either alongside the original or above it.

More important at times is the ability to launch this bridge over a stream or ravine from only one side. The bridge is assembled, complete with the 11-foot-wide deck over which the traffic will



run, on one bank and cantilevered into place with special rocking rollers and winches.

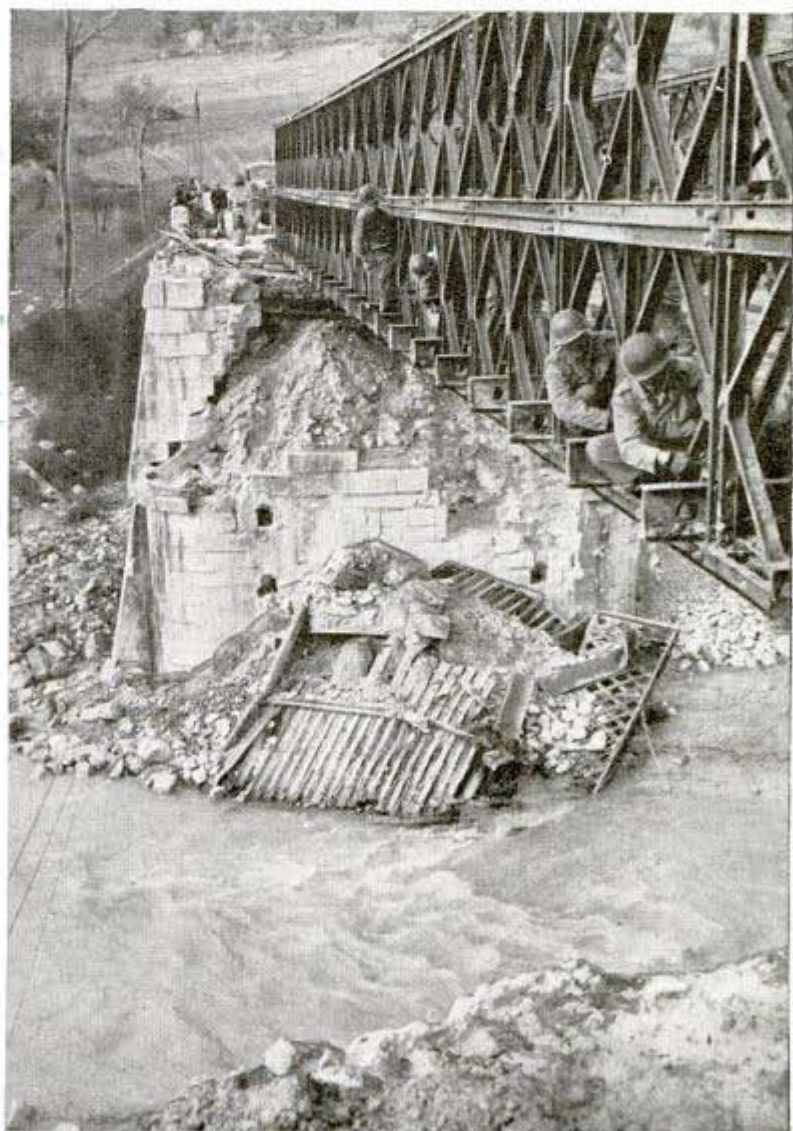
In Italy, sixty such bridges were built in the five days preceding the 5th Army's assault on the Gothic line, for the Germans had destroyed all bridges over the many waterways in central Italy.

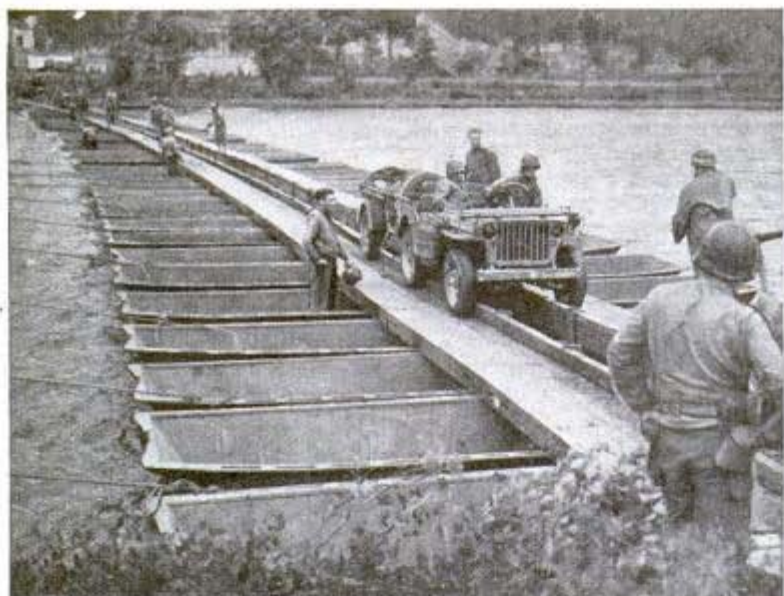
Further south, they destroyed all the bridges over the Volturno, and when our forces reached the banks they first had to build bridges before continuing their pursuit. At one location, a wooden trestle bridge was decided upon and work ordered started the following day.

A platoon from the divisional construction battalion was sent out to mark enough trees suitable for timbers for the pile foundation, while another group of officers and non-coms surveyed the site and marked the places where the bridge piers would be built.

Everything was in readiness for the morning. The drivers "buttoned down" the tarpaulins over the hoods

Above, pushing sections of a Bailey together. Below, American engineers make final check on a Bailey built over Volturno River in Italy





Above, first jeep crosses bridge constructed by Army engineers over the Meuse River in Belgium. They had to fight a raging torrent to build it



British official photo

Above, shoving four tons of chestnut palings into a ditch to form causeway for the tanks which follow. Below, crossing water on ponton rafts



of their vehicles to keep the engines dry should the threatening skies develop rain. With supper over, most of the men turned in. Half an hour later distant thunder and light rain sent the rest into their tents.

The engineers had hardly wrapped themselves in their blankets when the shrill whistles of sergeants and shouts of lieutenants brought them out of their tents. With streams of water running down their glistening raincoats and rivulets of liquid mud eddying around their unlaced shoes, they listened. An order had come through for two of the division's regiments to cross with their antitank companies and vehicles. A light ponton bridge was on the way up from the rear and the battalion was to help build it.

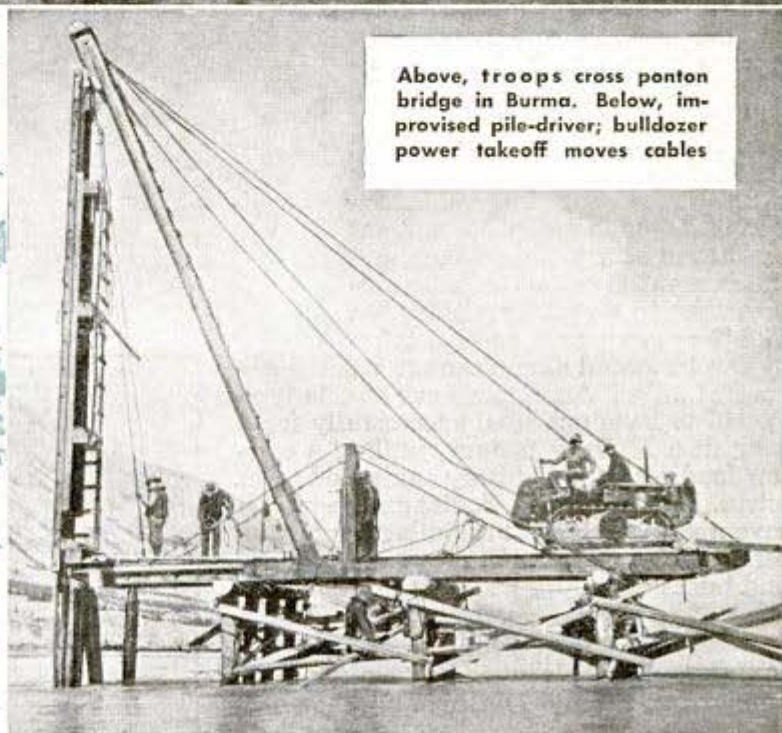
Half an hour later, during the flashes of lightning, one could see hundreds of men cutting trees and clearing an approach to the high bank. At midnight the trucks with the steel pontons and treadways began pulling in. Two of the ponton-carrying trucks failed to arrive, probably lost in the darkness and rain.

The bridge was short several sections, and the major in charge, rapidly



calculating the lengths he had, found that the bridge would not span the river. While looking for a way to stretch the available sections, two of the captains reported that the banks were so steep they would not be able to float the pontoons and build a suitable approach in time. The major and his aides went out to inspect the banks. The far bank, to which they had paid more attention when the preliminary inspection was made earlier in the day, was good, but the bank on their side had a drop too steep for any approach they could build by morning, when the regiments were to cross.

(Continued to page 148)



Above, troops cross ponton bridge in Burma. Below, improvised pile-driver; bulldozer power takeoff moves cables

Nazis Fire "Panzer Fist" Rockets Against Tanks



One of the many types of rocket projectiles introduced recently by the German armies is called a "panzer fist." The projectiles, which are small enough to be held by infantrymen, were used against tanks. Another new Nazi weapon is the use of rocket launchers attached to the sides of huge trucks. The latter were reported used in Warsaw to stamp out the uprising of Polish patriots.

Left, German soldiers wield "panzer fist" rockets, apparently as antitank weapon. Below, rocket leaves launcher mounted on truck

Underground Conductors Operate Vehicle

Tass, official Soviet news agency, reports the development of an electric vehicle that operates without the use of a trolley, rails or storage batteries, picking up high-frequency current to power its motor from an electro-magnetic field formed around underground conductors located at intervals along the highway. The 2½-horsepower motor takes in the current by means of a pickup frame and the current is converted from alternating to direct by a rectifier. The Tass story says enough energy can be stored at one time to run the car several miles. An electric car of this type is said to have operated successfully for a year in a Moscow factory, pulling a one-ton load along a roadway underlaid with wires. Dr. G. I. Babat, Soviet engineer who invented the vehicle, has built several passenger car models and believes that trucks and buses operating within a city could be adapted to his system.

☐ One pound of nickel and chromium alloy can be drawn into 90 miles of wire for military communications.

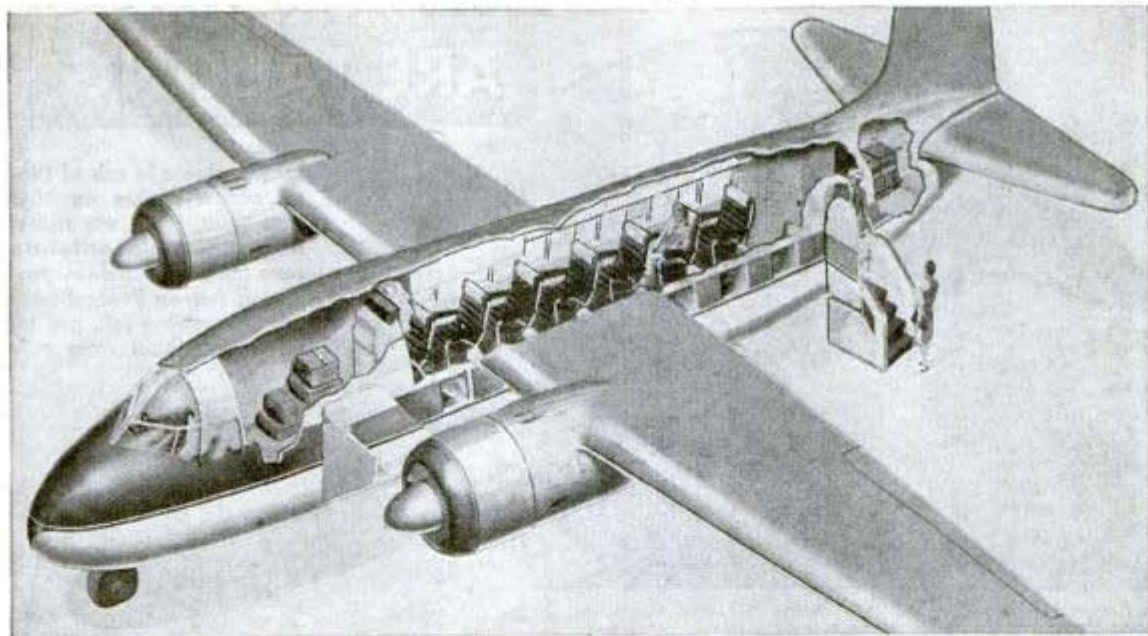


PAPER FOR GI JOE

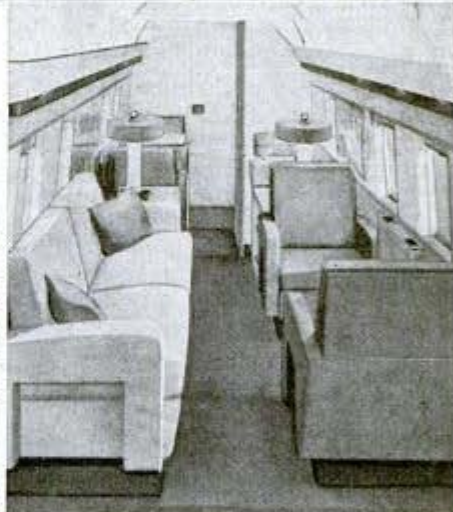
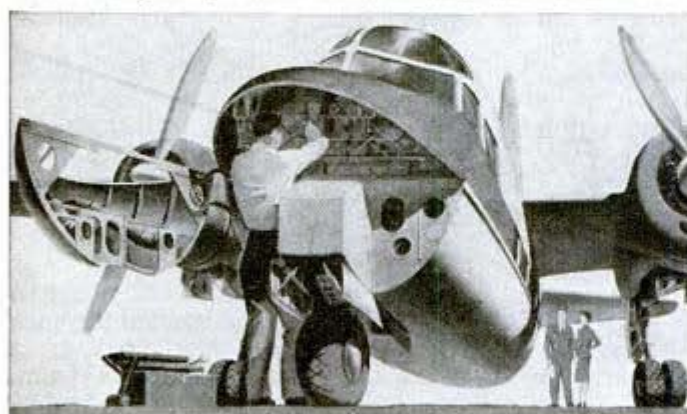
"Good packaging" is what GI Joe calls it when he opens his food rations out there in the Philippines or on the Western Front. The stuff is as fresh as the day it was packed and it takes many thousands of tons of paper to do the job. Shells and other vital supplies find their way to the front lines in A-1 condition, thanks to the protection of paper. So be sure to turn all your waste paper over to your scrap dealer or some local salvage committee. GI Joe needs it.

SAVE PAPER AND SAVE LIVES

Lockheed "Saturn" Is Designed for Versatility



Above, cutaway drawing of Lockheed "Saturn." Right, interior converted to lounge. Below, front-opening nose gives quick access to cargo compartment behind which is movable bulkhead



To "bring flying to Main Street," the Lockheed Aircraft Corporation will introduce an airliner designed for short hauls and interurban service after the war. Described as a staunch, swift plane which will give high performance at low cost, the ship will be known as the Saturn, Model 75. Powered by a pair of 9-cylinder Wright engines developing 525 horsepower each on takeoff, it will be a high-wing monoplane carrying 14 passengers, a crew of two, baggage and cargo. To make it ac-

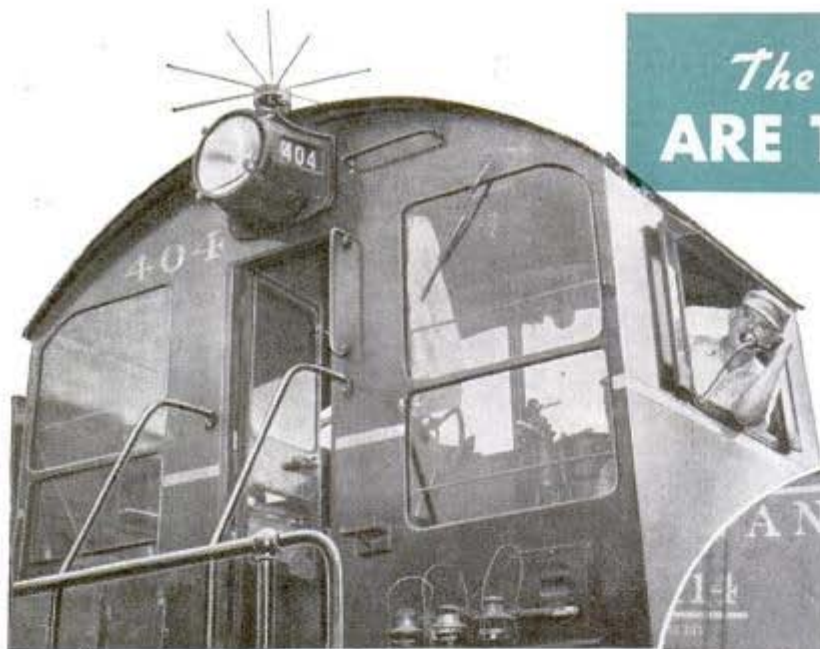
cessible to small airports, its takeoff distance will be 1,055 feet and its landing speed only 73 miles per hour. One of its advantages will be its interchangeable parts, including the dual wheels on the main landing gear, the horizontal and vertical tail surfaces, the elevators and rudders, and the stabilizers and fin. Quick change power plant units also will reduce ground time. Detachable passenger seats and a movable bulkhead permit quick conversion to cargo carrying if necessary.

Penicillin in the Form of Cough Drops Combats Throat Infections

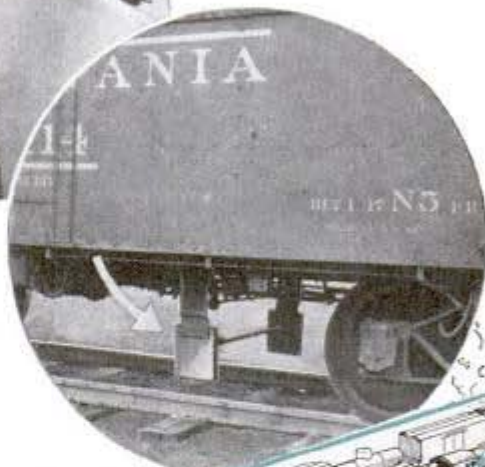
Penicillin in the form of lozenges which resemble cough drops has been used successfully to combat throat and mouth infections, notably trench mouth, according to the British Medical Journal. In some cases, pain, fever and disease germs were

banished in 24 hours. In cases of acute streptococcal tonsillitis, there was "great relief" in 24 hours and within 48 hours all the patients were free of fever. The lozenges are made of gelatin and penicillin plus a preservative.

The RAILS ARE TALKING

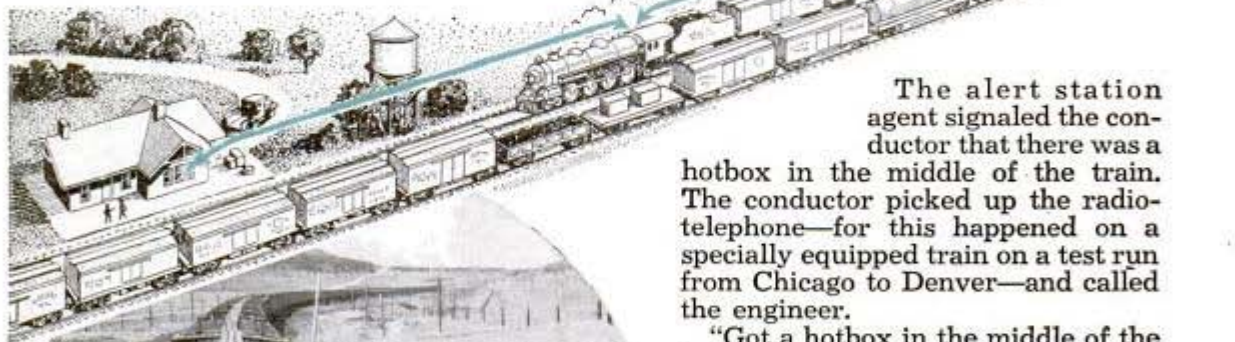


Left, engineer in cab of Diesel switch engine on B&O gets train order via radio-telephone. Note antenna over headlight. Below, projecting bar on Pennsylvania car is receiving coil, picking up radio signal from rails



WHENEVER railroadmen get together these days they are spinning radio yarns. Their conversation, however, does not concern the latest exploits of Fibber McGee and Molly or the newest Bob Hope quip. Their stories are "shop talk," for they have to do with the fascinating business of railroadin' by radio.

"Did you hear the one about the station agent at Buda, Ill., and the hotbox on a Burlington Diesel-powered freight?"

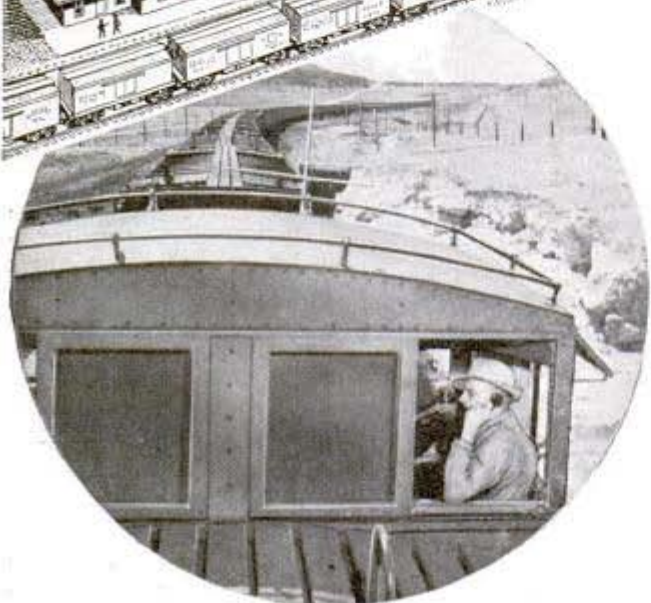


The alert station agent signaled the conductor that there was a hotbox in the middle of the train. The conductor picked up the radio-telephone—for this happened on a specially equipped train on a test run from Chicago to Denver—and called the engineer.

"Got a hotbox in the middle of the train," boomed the voice of the conductor through the loudspeaker in the locomotive cab. "Slow down, and stop at the next station."

The engineer pressed a button on his radio-telephone handset and talked back to the conductor, repeating the instructions. Then a brakeman went back over the top of the train and located the car with the hotbox. The engineer stopped the train at the proper moment so the bad-order car could be set out on a siding with only a few minutes delay.

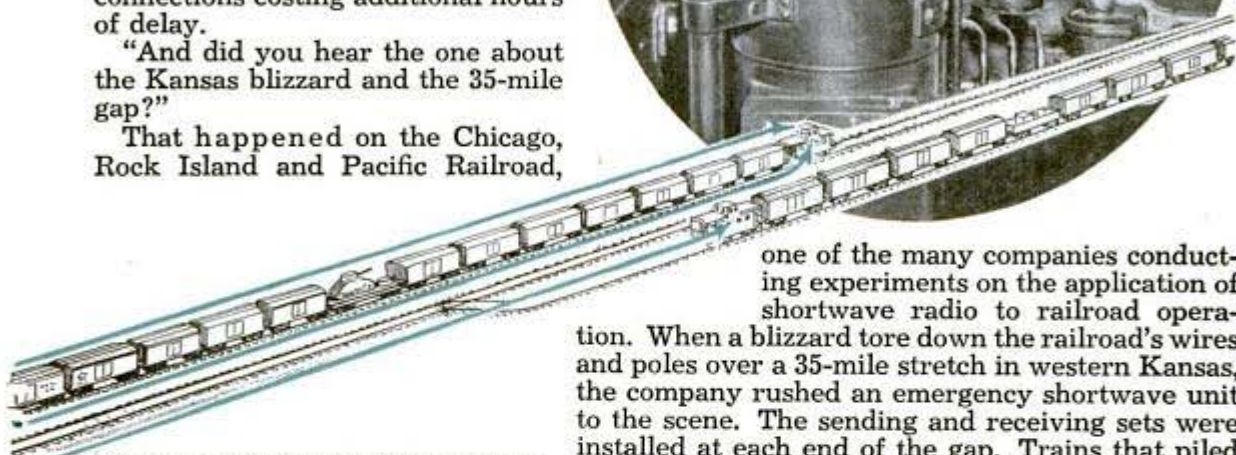
Although locomotive is almost out of sight, Santa Fe conductor talks by radio to engineer



The next day a similar experience with a different ending occurred on an eastbound freight not equipped with radio. Near Ashland, Neb., the conductor was notified of a hotbox. He could not attract the attention of the engineer with hand signals so he had to set the airbrakes. The result was a "pulled" drawbar. That train was delayed two hours, and it held up two other trains for two hours each—a total of six hours delay. But that is only part of the story, for the scores of freight cars composing those trains probably missed many connections costing additional hours of delay.

"And did you hear the one about the Kansas blizzard and the 35-mile gap?"

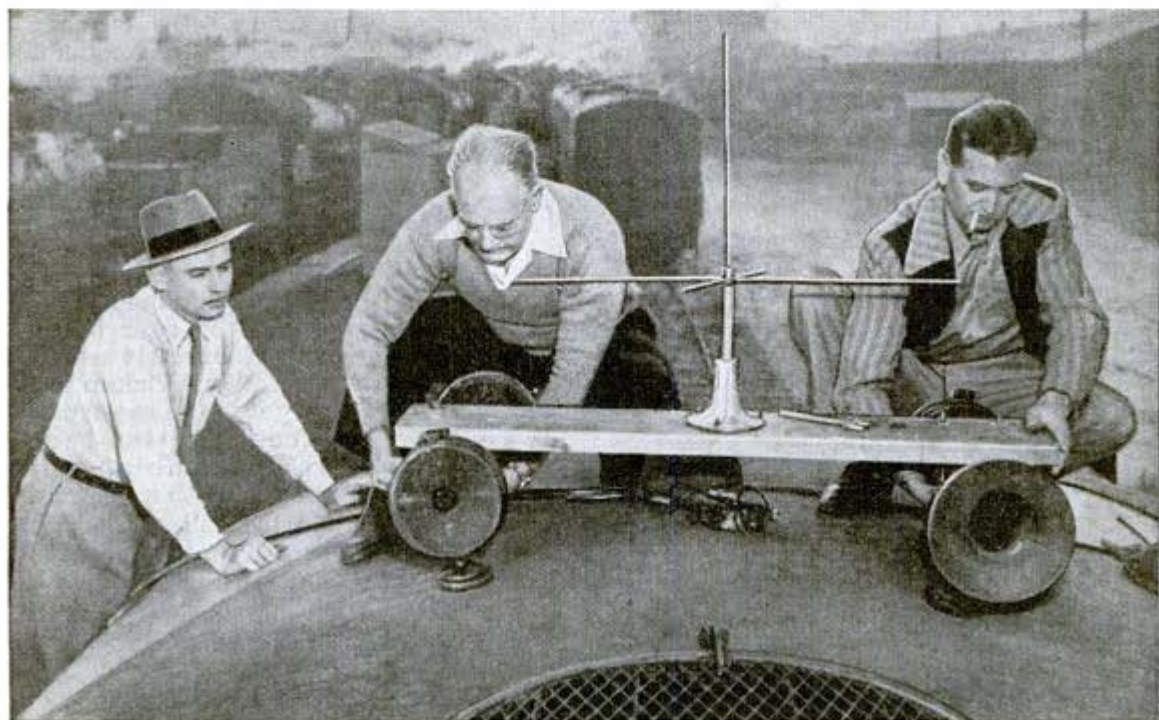
That happened on the Chicago, Rock Island and Pacific Railroad,



Drawing, based on Union Switch & Signal Co. diagram, shows how train equipped with radio can communicate from end to end, with passing trains, station or signal tower. Upper right, Burlington engineer on Diesel switch engine. Below, installing antenna on top of a Santa Fe Diesel

one of the many companies conducting experiments on the application of shortwave radio to railroad operation. When a blizzard tore down the railroad's wires and poles over a 35-mile stretch in western Kansas, the company rushed an emergency shortwave unit to the scene. The sending and receiving sets were installed at each end of the gap. Trains that piled up during the storm were sent quickly on their way.

Radio-minded railroad officials have put experimental frequency modulation shortwave equipment to work in many other ways. The sets are used not only for communication from caboose to locomotive and for bridging gaps in emergencies, but for com-





Courtesy Baltimore & Ohio Railroad
Sending train order launching the radio operation of trains in terminal

munication between passing trains, and from trains to wayside towers and stations. Many railroads with Federal Communication Commission permits, issued for experimental purposes, have equipped Diesel switch engines with FM transmitting and receiving units for communication between yardmasters and the engineers. The messages, relayed through centrally located master control stations, greatly facilitate the making up and dispatching of trains. In one yard, two-way radio helps handle 3,000 cars a day.

Some of the railroads have conducted tests on cross-country runs. The Santa Fe equipped a 70-car freight with ultrahigh-

frequency radio-telephone installations for the 2,200-mile trip from Bakersfield, Calif., to Chicago. The purpose was to test end-to-end-of-train communications under varying conditions on a regular freight schedule.

The equipment on the Santa Fe "Spud Special," which was carrying potatoes to Chicago, consisted of low-powered portable transmitters, superheterodyne receiver and power supply at each end of the train, loudspeakers and telephone handsets. A 17½-inch antenna was mounted on the Diesel locomotive and another on the caboose.

The radio was used to make up the train and for all phases of operation en

route. Many times communication was maintained when the engine and caboose were out of sight of each other.

What the trainmen like best about radio on the railroads is the ease with which it can be operated. Veteran railroaders, who were skeptical at first, insist that it is as easy to use as an ordinary telephone.

There are three types of radio or semi-radio systems used on trains: space radio, rail carrier, or induction radio. The space radio system is the conventional type with the radio wave energy traveling through the air. One advantage of this system is that no wayside wires or other conductors along the railroad are required. The principal problem, which remains to be solved, is the allocation of high-frequency channels.

The rail carrier telephone system uses the rails to transmit signals. The current is fed directly into the rails by the output circuit of the transmitter. Pickup coils carry it to the receiver.

The induction radio system combines elements of both space radio and the rail carrier systems. It functions on electronic principles just as



Trainman points to unneeded emergency valve for airbrake as conductor calls engineer
 Santa Fe photo

ordinary radio does, but the transmission path is through the rails and wayside wires as well as space. The wires serve the same purpose as those used in nation-wide radio hookups.

In the induction system the carrier current is fed inductively into the rails by a transmitting loop. The ground provides the return path for the resultant rail current which, in turn, inductively energizes the adjacent line wires. The wires carry the communication over the territory, and the current in these wires sets up a magnetic field. This induces voltage in the rails which is picked up by the receiving coils. Current carried by rails alone has a tendency to diminish, while the wire transmission serves as a booster. An advantage of this system over space radio is that the field of radiation is confined closely to the right of way. It affords a degree of privacy for railroad communications and does not interfere with ordinary radio receiving sets, according to the electronic engineers. Damage to the tracks does not prevent the system from functioning as in the case of the rail carrier system.

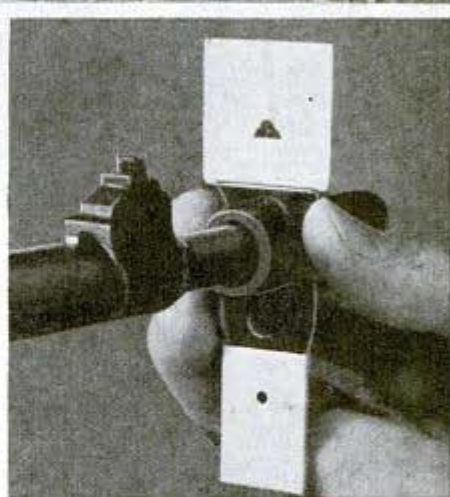
The Pennsylvania Railroad is spending a million dollars this year to install induction radio equipment on its busy Middle Division between Harrisburg and Pittsburgh. Two hundred and ten trains, both freight and passenger, pass over the 245 miles of multi-track on this division every day. The Pennsylvania Railroad in collaboration with the Union Switch & Signal Co. has pioneered the development of the induction radio system.

Aside from providing better communication between trains and stations,

Adjustable Target at the End of a Rifle Tests Student's Sighting



Above, soldier aims his rifle while instructor adjusts movable target. Right, closeup of target



In order to teach sighting on actual rifle sights rather than on the outmoded sighting bar, the Army attaches to the rifle a movable target which to the student appears to be exactly the size of a regulation range target at 200 yards. The instructor adjusts the target up or down, left or right, at the direction of the student until the latter thinks his aim is correct. Then he hands the rifle to the instructor, who looks through the rifle sights to see if the student would have scored a bull's-eye. The target, designed to hold fast in any position, is being made available to rifle clubs.

and between switch engines and yard offices, railroad radio is valuable in expediting routine procedures. It speeds up airbrake tests, the "spotting" of cars under coal chutes, and getting a train under way after the flagman gets aboard. It saves time on sidings, enabling the conductor to notify the engineer the second the caboose is in the clear. The crew of one train can call the attention of the crew on another to hazards like hotboxes and open car doors. Trains on adjacent tracks can be warned of danger along the way. The radio also functions through storm and fog or other conditions that might obscure hand signals. Officials, however, stress the point that radio communication on the railroads serves as a valuable auxiliary and not as a substitute for existing communication systems. When equipment is available after the war, radar is expected to play a similar role with regard to the time-tested safety devices now in use.

22-Foot Ship Propeller Weighs 70,000 Pounds

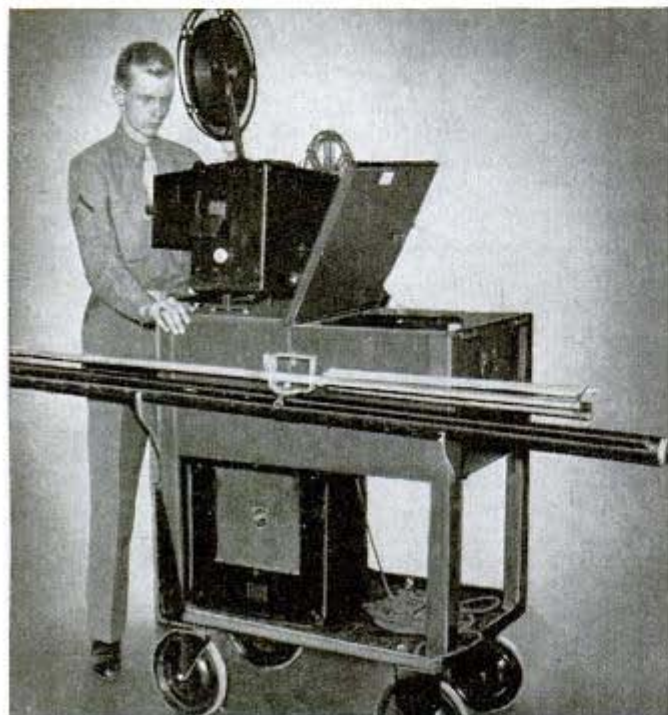


Six giant ship propellers weighing 70,000 pounds each have been built at the Eddystone, Pa., plant of the Cramp Brass and Iron Foundries division of the Baldwin Locomotive Works. The solid bronze, four-bladed props are 22 feet in diameter and were cast in cement molds. Described as 30 percent larger than any other American-built screws, they utilize 11,000 shaft horsepower on combination ore and oil carriers.

Unbreakable Plastic Eyes Can Be Shaped to Fit

All-plastic artificial eyes can be dropped without breaking, won't corrode like glass, and can be re-shaped if necessary to provide an exact fit. Molded from acrylic resin, one of the newer plastics, the eye is said to be more lifelike than a glass eye. It is made from a realistic photographic reproduction of the iris, the black dot of the pupil being located naturally, deep in the eye, instead of close to the surface as in glass eyes. While the average life of a glass eye is from six months to two years, the new eye is practically unbreakable and will last for years.

"Phono-Projector" on Food Cart for Hospital Movies



Mounted on a standard food cart, a "phono-projector" unit has been devised to speed up and improve the screening of sound films for bedridden soldiers in Army hospitals. The unit consists of a 16-mm. motion picture projector wired for sound and a phonograph turntable for fading in and out appropriate recordings before and after a movie. Special wiring for a microphone makes the unit adaptable as a public address system. The cart's mobility saves time in moving the equipment from ward to ward and eliminates assembling and disassembling each time it is used. Designer of the "phono-projector" is Pfc. A. W. Johnson, of the William Beaumont General Hospital, El Paso, Tex.

☐ American farmers are using 250,000 miles of single-wire electrified fence.

0-695

COMBING THE SEA FOR LOST FLYERS



SCORES of American flyers were missing at the end of the air-sea battle that accompanied our landing on Saipan. Some of their planes had been shot down during attacks on distant Jap ships, some had been crippled and hadn't been able to make it all the way back to our carriers, and others had run out of fuel.

According to the hard logic of warfare these pilots could be written off. Their loss was a cheap price for the damage that had been done to the enemy.

But military logic didn't have a chance. As soon as the fight was over, destroyers and smaller craft were sent out along the path that the returning aircraft had used. A life raft with a water-soaked pilot on board was found here, another there. When the search ships returned from their sweeps all but a small handful of the missing pilots had been rescued. The rest, presumably, had been killed in action.

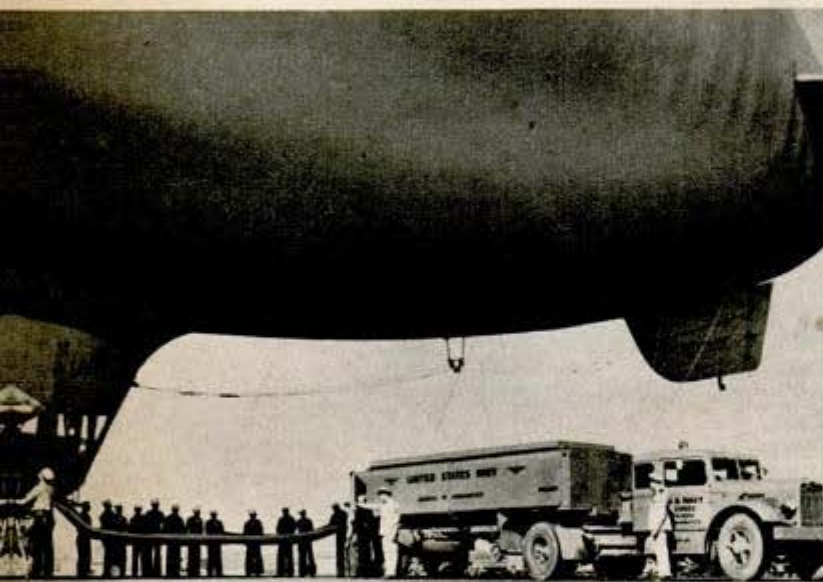
Searching for airmen who have been downed at sea is a standard post-battle activity in fleet operations. Surface craft and seaplanes are often used but much of this work is

Navy helicopter uses hydraulic hoist to lift airman in simulated rescue. Below, trailing cloud from smoke pot can be seen miles away





Above, RAF uses hydroplane for rescues in the lakes of the Nile Delta. Below, replenishing helium gas in lighter-than-air ship used in air-sea rescue operations along American coasts



Above, Naval Air Station's crash boat on way to scene of an air-sea accident. These boats are used for rescue work relatively close to shore. Right, men in water learn how to right life raft that has inflated itself while it is upside down. Hundreds of crashed U. S. flyers owe their lives to rubber rafts which kept them afloat on sea

assigned to new air rescue squadrons that use large PBM flying boats equipped with special rescue gear. In combat areas a rescue crew may have to defend itself against attack at any time.

Usually a pilot can get off a brief SOS before he is forced down. Radio direction finders on the ships that pick up his call get bearings on his position and this information goes at once to the rescue squadrons. Some pilots carry small emergency life rafts, tightly packaged, attached to their parachutes. They can leave their aircraft at a safe altitude, parachute to the surface, and inflate the rafts when they touch the water. Other aircraft carry a collapsed rubber raft in a compartment that automatically opens, allowing the raft to inflate itself and pop out, when the pilot pulls a cockpit lever after he has landed on the water. On still larger planes the emergency rafts are thrown overboard after the plane hits.

All pilots on overwater flights also carry their personal "Mae West" rubber life jackets that inflate themselves when a valve is turned. In addition, each man wears a thick backpad that is part of his parachute harness. This backpad opens by means of a zipper and contains cans of drinking water, compressed food, fishing gear, a compass, knife, and other equipment.

A raft is visible at best only four miles away from 1,000 feet of altitude, under conditions of moderate sea and wind. So even after a rescue plane has reached the ap-



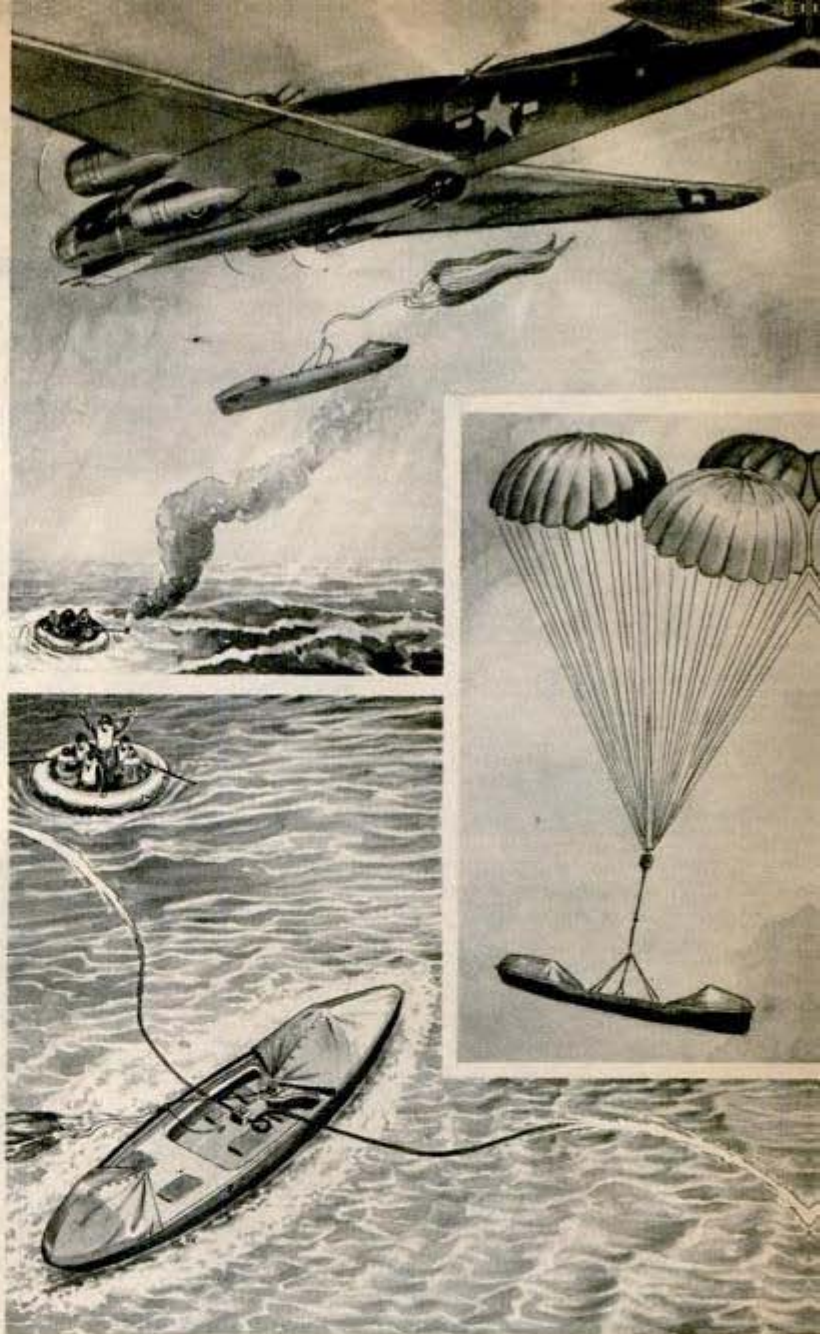
proximate area in which the raft is located, after a flight of possibly several hundred miles, the search may only have started. Usually the pilot on the raft sights the rescue plane while it is still some distance away. Then he assists in his own rescue by spreading a colored "sea marker" on the water, making a large patch that is visible from the air. He may ignite a can of chemicals that produces a dense cloud of smoke that can be sighted 10 miles away from moderate altitudes. After dark he fires a Very pistol to signal any plane that he hears, then uses the flashlight that is part of his emergency equipment to help guide the plane.

The crew of a rescue plane often loses sight of a stranded pilot while they are putting their flying boat down on the water, then they must search for him all over again. In high waves the raft will not be visible a few hundred yards away. Sometimes the rescue crew stops the engines of their craft and listens for the sound of the whistle that each flyer carries. The shrill whistle carries farther than does ordinary shouting.

Navy rescue planes have picked up many B-29 crews forced into the ocean on their way back from bombing Japan and once a Catalina flying boat brought 56 survivors of a torpedoed destroyer out of Ormoc Bay in one trip.

An incident where the rescuers themselves had to be rescued occurred after the second Battle of the Philippine Sea. On the third day after a damaged dive bomber sank, its two-man crew, lying sick on a raft, signaled a PBM search plane. Although the water was very rough, the 16 men in the plane voted to attempt a rescue. In landing, a big hole was torn in the bottom of the PBM, causing the craft to spin and crash after it took off with the castaways aboard. The aerologist died from swallowing too much gasoline. This left 17 men trying to occupy a seven-man raft. They took turns treading water, while they beat off sharks with their paddles. Finally, after many hours, four Helldivers, attracted by a Very pistol signal, dropped food and another life raft and kept patrol over them until they were found by one of Admiral Halsey's destroyers.

MARCH, 1945



Top, motor sailboat is dropped from bomber by parachutes (inset), which carry it gently to water. As the boat hits the sea, two 150-yard buoyant lines (above) are shot out by rockets, enabling the castaways to pull themselves to the craft. Below, rescued airmen hoist sails of airborne lifeboat and head for shore





Above, larger rafts carry apparatus which distills several quarts of fresh water an hour. Right, lookout in car of blimp scans the surface of the ocean

Comparable to the fleet air-sea rescue operations are the rescue activities conducted along each sea frontier in which the Navy, Coast Guard, and Army cooperate. Pilots who are forced down on the water can be certain of rescue if they get off a radio message describing their plight, and they can be fairly certain they will be rescued even if they send no message. Aircraft on overwater flights normally report their positions at regular intervals. When a scheduled report isn't picked up by a shore radio station, the probable area in which the airplane might

be can be determined by working from the point at which the aircraft last reported.

Fast crash boats are maintained at naval air stations for rescue work not too far from shore. Flying boats, amphibious aircraft, and lighter-than-air blimps perform rescue operations farther at sea. Helicopters are also being assigned to the work. The blimps have performed a number of notable offshore rescues. They are able to remain motionless over life rafts or personnel in the water while a rope ladder is



Below, a PBM flying boat rehearses rescue of airmen from their emergency rubber life rafts





Rescue plane zooms over as occupants of raft burn smokepot signal. Below, receiving plane crash information. Wall chart tells rescue team where to search

dropped down to them. On occasion a member of a blimp's crew has descended the ladder and attached a life line to occupants of a rubber boat who were too exhausted to climb, after which they were hauled up to the airship's cabin.

This coastal rescue work has been placed under direction of the Western Sea Frontier and will be continued after the war.

American rescue operations are based in part on the experiences of Air-Sea Rescue, the Royal Air Force organization that has the task of saving Allied airmen who are forced down in the English Channel. More than 1,000 men, four out of every five who have been "ditched" in the Channel, have been brought ashore by ASR life saving crews. On their busiest day they rescued 118 out of 121 American airmen.

ASR maintains a line of shore stations along the English coast at which high speed launches stand by, their engines kept warm for immediate departure. Additional boats, supplemented by aircraft, are stationed out in the Channel during big raids. The latest procedure that has been tried is the use of a bomber that carries a large lifeboat secured to its fuselage. The lifeboat is dropped from moderate altitude by parachute. A smoke pot begins to burn to show the boat's location, and rockets are fired from each side of the boat, carrying 150-yard-long buoyant life lines. Two outboard engines, a sail, fresh water distillation apparatus, and a cooking stove, in addition to food and other supplies are carried. The boat weighs one and a half tons and has a capacity of 36 people.



Three-Dimensional Maps Model Enemy Terrain

Three-dimensional models of enemy terrain made of a variety of materials are used by the armed forces for studying objectives before invasion or bombing operations. Based on aerial photographs, reconnaissance reports, and prewar maps brought up to date, the relief maps are constructed of molds cast from original models and made of rubber, rubber substitutes, plastic, clay or metals depending on the qualities desired and the availability of ma-



terials. Navy pilots studied rubber relief maps on the aircraft carrier USS Tulagi in a briefing session before D-Day in southern France.

Above, intelligence officer brings rubber maps to briefing session. Left, a terrain model of Attu

Robot Voice Pronounces Words as Heard by Partly Deaf



To enable the physician to listen to words the way a partly deaf person hears them, Acousticon Research laboratories in New York City have perfected an Otometer, which speaks with an unique type of sound. When you speak into the microphone of

this apparatus, the robot repeats your words but pronounces them as they are heard by those who are hard-of-hearing. The Otometer changes "peace" into "goof" and "stitch" into "ook," for example. This is accomplished by taking the high-pitched tones out of each word. The robot voice is able to speak in a dozen of the various distorted tones common to the majority of the hard-of-hearing. It talks in three ways—through a loud speaker, earphones, or through vibrators which transmit sound through the bones. However it speaks, the physician listening in hears the words as the patient does, and then tunes the robot through various zones of amplification to find one where the patient can understand the words. The words come via phonograph records or directly from a microphone into which the physician talks.

"Sky Freighter" Gliders Carry Heavy Payloads



of heavy, bulky battle equipment by air. The CG-10 has clamshell doors for loading cargo from the rear of its extra-large, rounded fuselage. It hauls a larger load than any other American glider, and its fuselage has space for 42 fully armed men or one truck.

Left, two views of cargo glider with twin tail booms. Below, glider has clamshell doors at rear of fuselage which admit truck

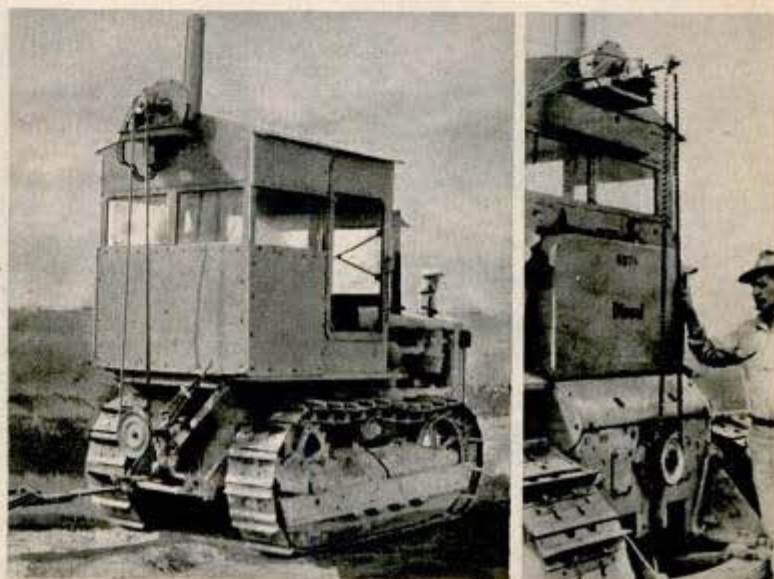


"Sky freighter" gliders designed like huge flying wings are being tested by the Army Air Forces for possible war use, though they are expected to be used first in peacetime. The CG-16 is the first American glider equipped with twin tail booms. Its very wide fuselage is divided into two compartments for the delivering



'Cat's' Air-Conditioned Cab Keeps Out Dust, Heat, Wind

Dust, heat and chilling winds no longer bother Gale Rogers of Armel, Colo., a farmer who built an enclosed cab for his Caterpillar tractor and then air-conditioned it. The air inside the cab is constantly circulated by a fan powered by a special belt from the tractor's rear power takeoff. The chimney on top of the cab serves as a ventilator. Lubrication for the blower comes from two lines connected with the tractor's force feed lubrication system.



SHARPENING *the* NAVY'S CAMERA EYES



Navy photos

Operator at control board is "dubbing in" sound effects and dialogue for Navy film made on "location." Below, drying aerial film on improved automatic blower in lengths of 50 feet



IF THE 365,000 photographs a year handled by the Navy Office of Public Relations were the only product of naval photographic units, the chances are that such an institution as the Naval Photographic Science Laboratory would not exist.

But the photographs taken by the Navy at the rate of a thousand a day to acquaint the public with its important activities are a minor item. Nine-tenths of naval photography is used for highly technical purposes which play a vital role in the conduct of modern warfare.

These technical purposes include combat photography, identification, mapping, observation, reconnaissance, spotting, training, recruiting, and historical record. Fleet maneuvers are recorded on film for tactical study. The camera captures the flight of projectiles and their ability to penetrate armor plate. Medical research on strange tropical diseases is aided by photographic records in color. Naval cameramen go so far as to record the movements of stars for the Naval Observatory.

POPULAR MECHANICS

There was a time when every new photographic problem—and the war has created hundreds of them—was a headache to the Navy. The need for one center to sift these problems and fill the requests of all bureaus and naval establishments prompted late Secretary of the Navy Knox to order the construction of the photo science laboratory at the Naval Air Station, Anacostia, D. C. It is believed to be the finest institution of its kind in the world.

This three-story laboratory, which is staffed with experts in every field of photography, was designed by engineers of the Eastman Kodak Company. Commander Thorne Donnelly, USNR, officer in charge, stresses the fact that sending out combat photographic units, while important and dramatic, is not the primary function of the laboratory. Its purpose is to improve the quality of stills, color pictures, movies and sound effects. To this end, thousands of tests are conducted on all manner of processes and equipment. For example, every aerial camera that goes into a Navy plane is tested in the laboratory.

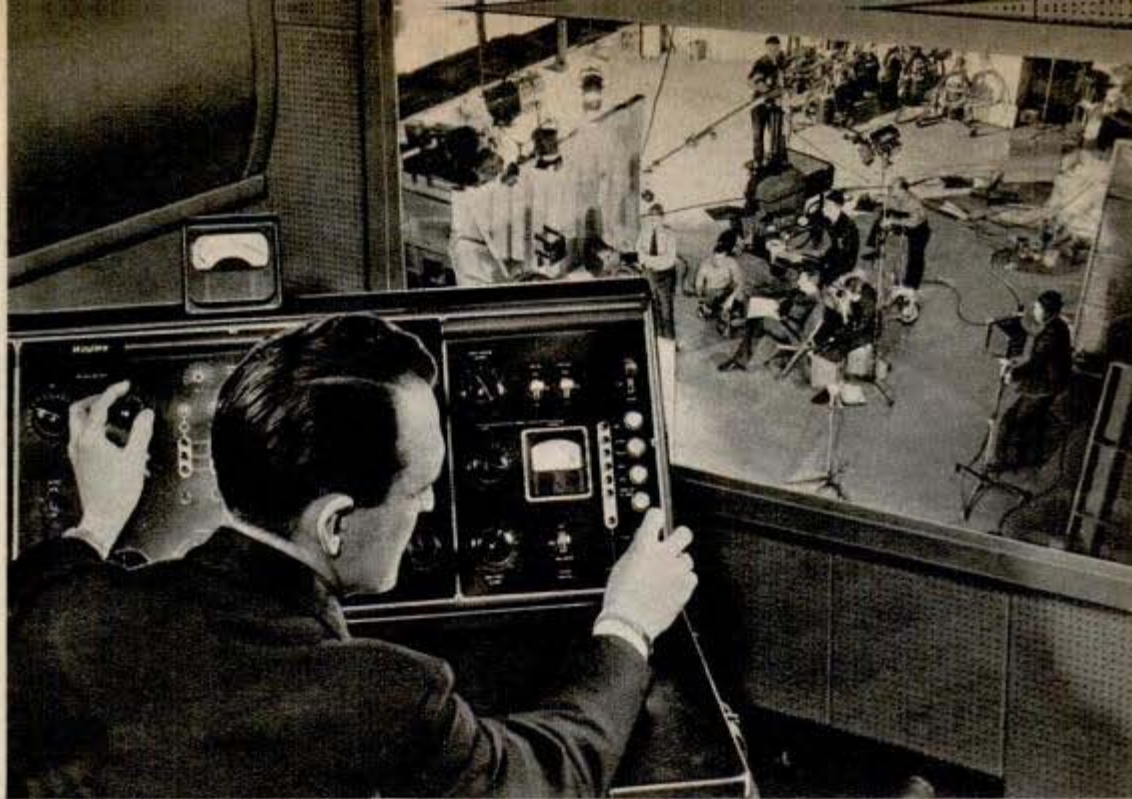


Movie crew from the photo science laboratory uses portable equipment. Below, "shooting" training film for Navy divers



Left, checking aerial camera; each one is tested in laboratory before issue to the fleet. Below, giant tanks hold chemicals





Ex-Hollywood technician regulates sound track as he watches motion picture crew at work on modern sound stage in Anacostia laboratory



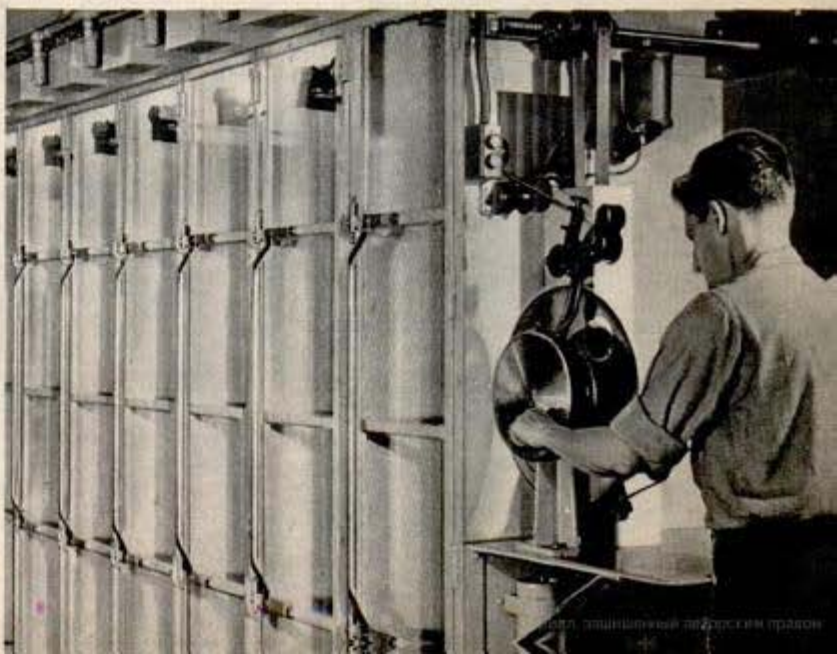
Above, testing aerial camera at 90 below zero in "Arctic" room guards against failure on operational flights. Right, drying cabinet on the "assembly line"

Typical research problems concern film defects under tropical conditions, off-color results, or a certain type of lens that is not producing sharp enough images. Filter characteristics are analyzed, also dye solutions, paper, and scores of other pertinent items which can make or mar the finished product.

The staff of about 700 technicians, many of them recruited from the motion picture industry, are constantly making improvements. Despite the emphasis on research and testing, the laboratory's processing division has facilities for developing and printing about one hundred million feet of film a year.

Among laboratory highlights are a 60 by 100-foot sound stage with a 44-foot ceiling, printing equipment with high speed units that turn out 20,000 feet of film in eight hours, the "interpretation" rooms where combat and reconnais-

(Continued to page 154)



Outdoor Spotwelder Hung From Crane

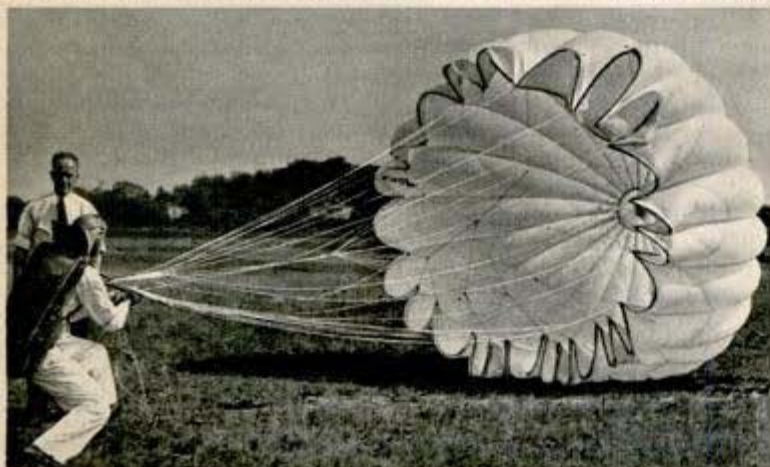
Already extensively used in inside manufacturing operations, spotwelding moved out of doors recently at the Glenn L. Martin aircraft plant in Baltimore, Md. A portable spotwelder, assembled by Martin engineers, consists of a control and transformer unit and a hydraulically operated welding gun. The unit, which is held over an airplane by a traveler crane, was used to attach a steel part to the baffle of a PBM Mariner exhaust system. Power is supplied by a 500-foot cable with an additional eight-foot line extending from the transformer and control to the welding gun. The welds produced in this manner are said to be of production quality.



Parachute Opens and Closes Like Umbrella for Fast, Driftless Descent

To permit 'chutists to control the speed and general direction of their descent, a parachute rigging which acts much like an umbrella has been devised by A. R. Nailor, a pioneer parachutist in northern Ohio. The parachute can be blossomed and closed

alternately as often as the 'chutist finds it necessary, with an easy pull on the rigging. By dropping free in "steps" the 'chutist can reduce wind drift to a minimum, which would permit him to avoid dangerous landing spots toward which he might be floating. By closing the 'chute frequently he also could hasten his trip earthward—an advantage if dropping into battle or escaping from enemy planes. The control is accomplished with a special attachment which includes a small rubber tubing in the 'chute hem circling the rim, and a pull cord of nylon extending down through the center ring which acts as the hoist attachment.



"Fountain Pen" Marker for Parcels Writes in Waterproof Colors

Markers which look and work like fountain pens while using various colors are available for shipping clerks. They can be used to write the address in small or large letters on wet or dry surfaces, including asbestos, aluminum, copper, Cellophane, wax, and textiles. Seven colors are available, all of which are said to be instantly drying and water-, weather-, and abrasion-proof.



File on Quil Markers
1971/1/17

SNIPING THE SNIPER



They're still fighting on Bougainville. This Yank sniper has the "comfort" of sandbags and a roof

THE American countersniper could just see his target, a dark patch in the foliage of a tree that he judged was 700 yards ahead. He raised his sight to that elevation and corrected for a slight side wind. Now he was all set.

His first shot had to kill. Otherwise the crack of his bullet plowing through the air would warn the enemy sniper and then the report of the gun would give away his position. If he missed he might be killed himself a few seconds later.

Through the telescopic sight the target

seemed to dance and jiggle but he knew that this was only the magnification of his own heart beats. Heat waves, too, were swimming across the scene but these would not affect his aim. He lined up the sight's cross-hairs, slowly squeezed the trigger, and fired. Through his sight he saw the target slump, then tumble to the ground.

Some foreign armies depend on sheer mass of fire power in battle but the tradition in the United States Army since the first days of the republic has been to make every shot count. Good shooting, in war

Here's how a bazooka looks when fired in the dark. Launching kicks off a blast from rear as well as from front





Sniper in camouflaged suit fires rifle grenade at a tank

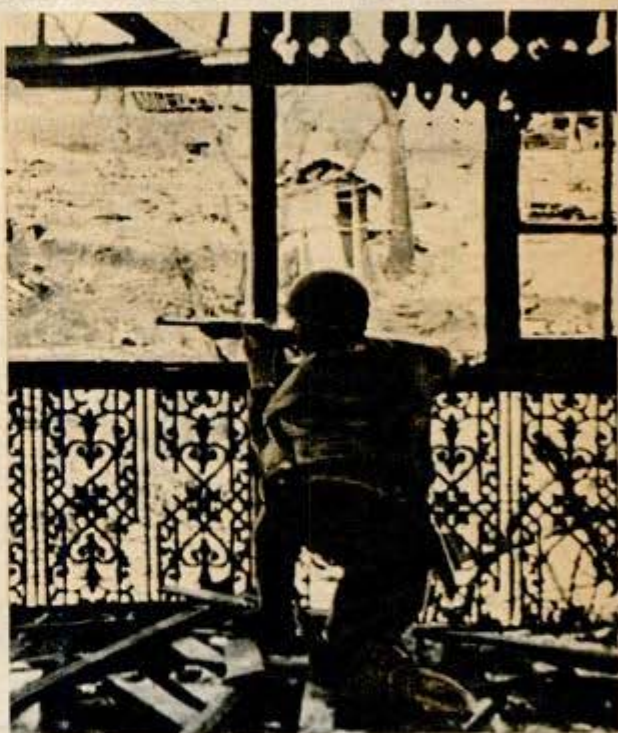
or peace, is a matter of pride with every American who handles a gun.

The best shots in the army are the expert riflemen and the best of these become the army's snipers. Not all expert riflemen can qualify for this dangerous duty. A man-hunting sniper must be a good scout as well as a good shot. Above all he must be calm and patient in the face of danger. A sniper who becomes flustered and exposes himself unnecessarily or who misses too many shots doesn't live long.

The standard assignment of a sniper is to pick off key enemy personnel who expose themselves but in this war the main job of American snipers is that of countersniping. Our enemies are retreating on all fronts. With each withdrawal they usually leave a few good shots behind to hold up our advance. Sometimes this rear guard consists of individual snipers, sometimes of a few suicide machine gun squads.

When that situation occurs in a certain sector of the European front someone usually steps to a field telephone and broadcasts a call for Sergeant Frank Kviatek. "Hardtack," it is explained to him, "there is a Jerry sniper up here who has gotten a couple of our men. Come on over." Ten minutes later, possibly, you hear the single shot that removes the cause of the trouble.

At the last report "Hardtack" Kviatek had 27 notches on his rifle, each representing a German sniper he had killed. Those notches don't include the several dozen enemy soldiers that he has killed with rapid fire weapons, nor the 11 prisoners he has brought in. The Silver



Above, sniper watches from a window for a Jap. Below, bazooka shell hitting U. S. training tank





Huge transparent model of Garand rifle's firing mechanism and breech built at Camp Roberts, Calif.

Star was awarded to him for one day's work in which he wiped out four Germans. First he got two who had command of a crossroads, then he knocked out a German paratrooper captain hidden behind our lines, and last he spotted a sniper who was concealed behind a chimney. With no time for protracted stalking of the latter, he called for a bazooka. The first shell fired

brought down chimney, sniper, and all.

All good snipers know that any one of a dozen things can throw them off their target and that they must compensate for each. They know, for instance, that as the day gets warmer their shots will strike higher than they did in the colder morning. A 15-degree increase in temperature raises a bullet's impact by five inches at 500

yards. A good sniper knows whether he habitually shoots higher, or lower, on a dull day than on a bright day, and he corrects for it. He knows that he must always adjust for more than the actual range in shooting uphill and less than the actual range in downhill shooting.

He has learned to shoot from the left shoulder as well as from the right and this allows him to expose the least amount of his body when shooting from the left side of a protecting object. He knows that

Four Yank riflemen crouch behind barricade, covering troops crossing Seine River on ferry



POPULAR MECHANICS

keeping his ammunition at body temperature makes for the most consistent shooting.

He knows, too, that a man in a prone position head-on makes a target 25 inches wide and that a man's head and helmet form a target about 10 inches tall. He knows that he should aim about 20 inches in front of a walking man in order to hit him, and he knows at what ranges he can be certain of hitting such targets. A good sniper is able to hit a 6-inch disk at 500 yards and kill an enemy at up to 800 or 1,000 yards.

Like the Germans, the Japs are specializing in sniping. The Japs are good at concealment but they are not all crack shots. A favorite stunt of Jap snipers is to lie concealed until our front lines are well beyond them, then open fire on unsuspecting troops. They are usually shot down before they do much harm.

Another stunt of the Jap snipers is to conceal themselves in small caves which are completely sealed except for a small hole through which a rifle can be aimed. These one-man forts could do a lot of damage except that the small firing port limits the sniper's field of fire. Usually the



Trainee hurls a grenade (indicated by arrow) after a tank has crossed his foxhole. Below, sniper covers tank during maneuvers





A soldier aims rifle with telescopic sights from concealed position. In most cases only the muzzle of his gun would be visible

Americans don't bother to shoot it out. When a sniper's cave is located, a flame-thrower merely walks up from one side and burns the sniper out with a burst of fire aimed through the cave's opening.

Not all infantrymen can qualify as expert riflemen or even as sharpshooters, but all of them can shoot proficiently with a number of weapons. Before they go into

mathematical odds of being hit. Entering a house through a door or window, a soldier is taught to make his entry as fast as possible and then immediately get his back to a wall until he has completely inspected the room.

The men learn to step over sills instead of on them to avoid the possibility of setting off a booby trap and they take stairways two or

three steps at a time to reduce the chances of treading on a stair that may be booby trapped. When a man detects such a trap he lets it alone but warns the man behind him.

A man always carries his gun with one hand near the trigger in going through a window so that the rifle can be aimed and fired with the least delay if a target is found. Village fighters know that the whole body below the eyes is blind and so in descending into a basement, they go down with a rush until they are low enough to see any enemy who might be waiting for them. These tricks of their trade plus accurate shooting accomplish two things at the same time—the men get the jump on the enemy, thus keeping alive, and they drive the enemy back toward defeat.

Left, infantryman drops behind sheltering tree trunk to fire at target



Junk-Built "Locomotive" Hauls Fuel, Supplies

Built entirely of salvaged material, a gasoline "locomotive" to pull fuel and other supplies over regulation railroad tracks at the Houma, La., Naval air station was assembled by Frank P. Hatfield, machinist, of Harriman, Tenn. The hybrid machine is a truck with special wheels to fit the rails and can be hooked onto railroad cars that need moving at the station.



Chain Feeds Electric Drill In Awkward Positions

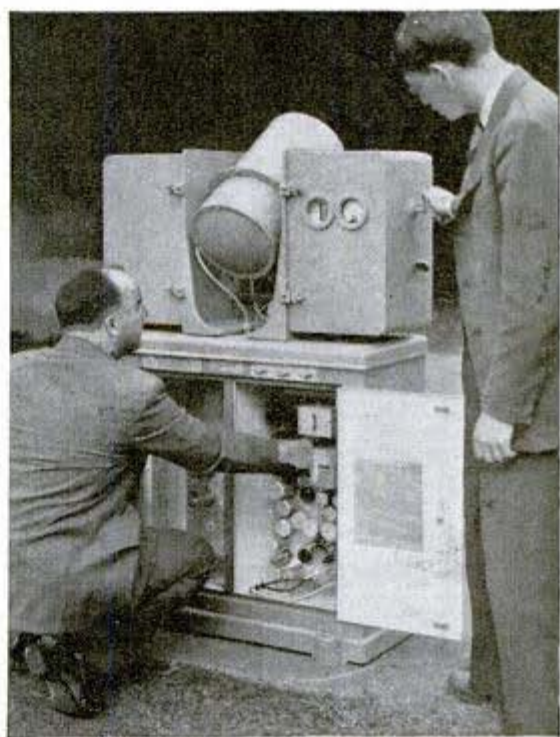
Drilling in hazardous or awkward positions—overhead, head-high, or on ladders—is safe and easy with a new drill attachment which eliminates the need for pushing the drill to maintain pressure. A simple turn of the handle provides the pressure by means of a ratchet and chain arrangement. The operator needs only to guide the tool while controlling the pressure by operating the handle. The attachment can be used on any electric or air drill equipped with a pipe handle.



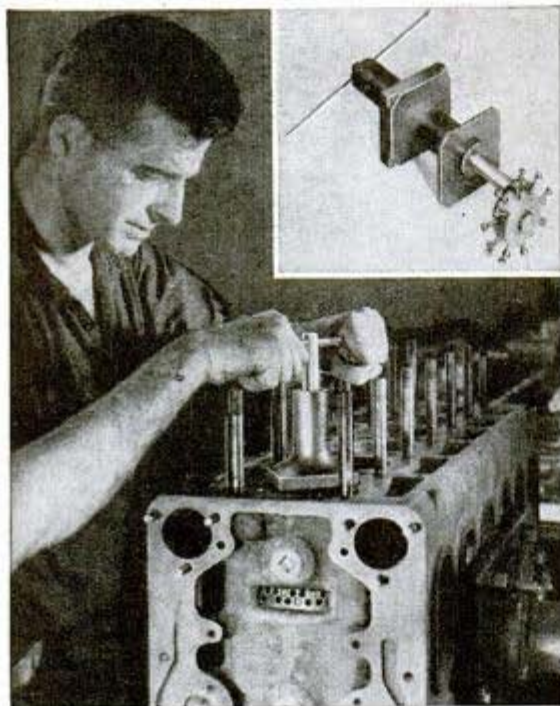
Invisible Beam Is Shot Into Sky To Measure Cloud Height

Ultraviolet screens made of dark purple glass are used by the Army Signal Corps in a cloud height determining system worked out by the United States Weather Bureau in conjunction with General Electric engineers. The screens filter out all visible light from a powerful little match-shaped mercury lamp, which operates at such high temperatures that the screen occasionally gets hotter than boiling water; therefore it is built in small panes to localize shock caused by exterior temperature changes. A projector shoots the invisible beam up to the cloud base and the ceilometer, actually a photoelectric scanning device, indicates the location of energy reflected from the cloud base. The ceiling height is then computed by triangulation.

Between 620,000,000 and 625,000,000 tons of bituminous coal were mined in 1944, a world's record, exceeding the 1943 output by about 30,000,000 tons.



Tool Cleans Cylinder of Carbon Without Removing Piston



Cleaning the carbon from the air intake ports of the two-cycle Diesel engine is done better and quicker with a carbon removal tool, which operates without removing the pistons or pulling the cylinder sleeves. The tool's head, which carries two rows of eight punches each, is mounted to a shaft by an eccentric cam and is so designed that when it is lowered into position the punches are automatically aligned with the ports to be cleaned. Only four turns of the handle are required to punch the carbon out of all 64 ports in each sleeve, which results in a saving of at least three and a half hours for the whole operation.

Sugar Suggested as "Brain Fuel" To Raise Flyers' Ceiling

To raise their ceiling, airmen should reach for sweets instead of a smoke before high altitude flights, according to experiments reported to the Aero Medical Association by three Harvard University professors. Tests showed for the first time, they reported, that very small amounts of carbon monoxide handicap the human body in the stratosphere, while other tests showed that a flyer's ceiling can be raised a mile if he takes about an ounce and three-fourths of sugar just before taking off. The carbon monoxide—which could come from engine exhaust gas, tobacco smoke or gunfire—is harmful because it reduces the oxygen-carrying ability of the blood and thus might prevent the brain from getting

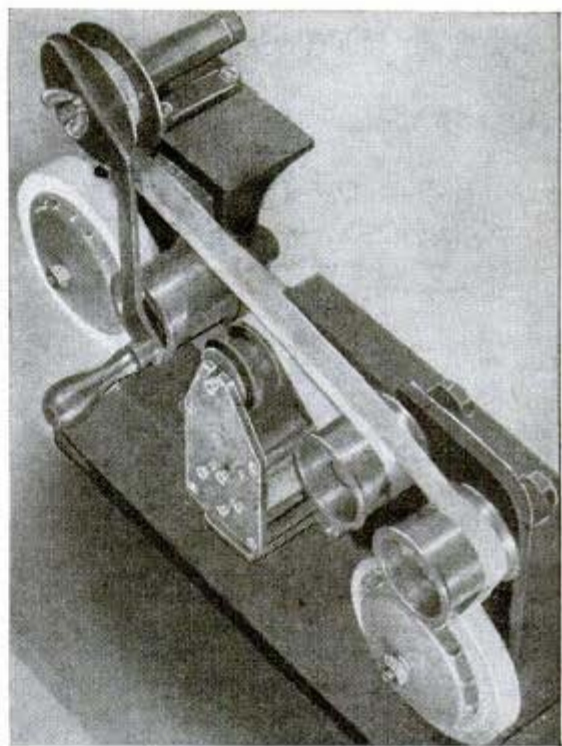
enough oxygen for proper functioning at high altitudes. Carbon monoxide from three cigarettes would be equal to an altitude of 8,000 feet in its effects on visual sensitivity, the scientists discovered. Sugar, which is almost the only thing the brain can use for fuel, raises the airmen's ceiling by counteracting the lack of oxygen.

Common Garlic Destroys Germs That Penicillin Won't Kill

Allium sativum (better known as garlic) is used as a base for a germ killer called allicin. It will destroy some germs not attacked by penicillin, according to Dr. John Hays Bailey of the Winthrop Chemical Company, Inc., Rensselaer, N. Y. While allicin has only about one percent of the effect of penicillin on some types of bacteria, such as staphylococci found in boils, it stopped the growth of bacillus paratyphosis which penicillin does not destroy.

Printer Labels Cellulose Tape And Adds Laminating Strip

Cellulose tape, which is being used increasingly for labeling wire terminals, parts, accessories and overseas shipments, can be marked easily with a hand-operated



printer with movable type. The unit lays another strip of tape over the printing, a laminating process which seals the ink between the two tapes and gives it resistance against wear, oil, gasoline and salt water.

an 18-foot, transparent acetate plastic model of the new craft in scale. Blueprints of the real ship were used as guides. Plates, duplicating steel slabs to come, were rolled to exact size. Masts and funnels were fabricated precisely. Cargo booms which actually lifted loads were installed. Electrical wiring and pipes of metal were run through the hull in proper places. The various sections and quarters were named with signs.

Then a diagram of the shipyard was painted nearby on the floor. Foremen and assistant foremen by the hundreds were called in to study the model. Then each was referred to the floor layout so he could learn the easiest way to route materials and parts into the section of the hull where his crew would be working.

The Higgins Industries, which had pioneered in building shallow craft for the bayous of New Orleans and Central America before the war, used models to study the underwater action of landing boats when "hitting the beach." A 48-foot tank was installed, with a width of six feet and a depth of three feet. Miniature models of all landing craft were made with motors driven by compressed air. Every type of

beach bottom was fashioned in miniature—coral, sand, or rock. Moving picture machines were set up and as the boats "hit the beach" each was photographed through the plate glass front of the tank. These movies became the standard course of study in landing craft design and operation.

One of the most carefully guarded "mid-gut colonies" in the world is the Taylor Model Basin in Carderock, Md., where every type of naval vessel flying Old Glory first hit the water in exact miniature scale for dynamometer tests which would indicate the probable effect of design and weight on speed. In the same building where American vessels are being tested in miniature, the types of craft constructed by the enemy are being turned out in miniature on a mass-production basis so that crews will recognize the enemy under unfavorable conditions and at great distances.

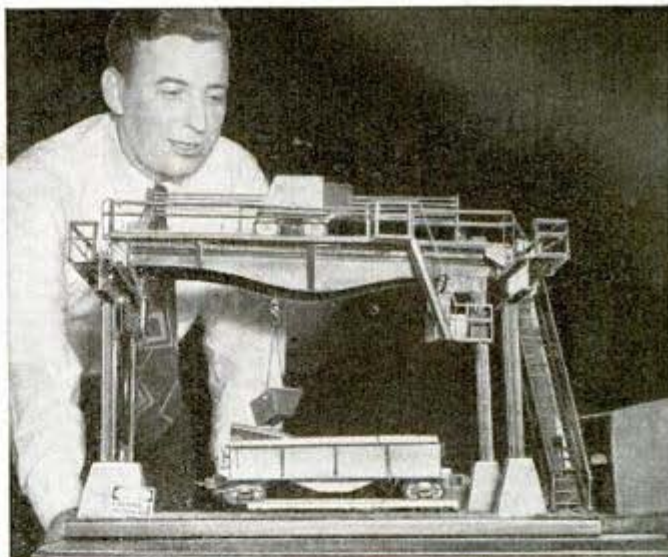
Even the towing tanks, which actually are miniature canals with the towing machinery suspended above them, are reproduced in transparent lumarith plastic in smaller sizes. They are so light that they can be moved to a table or desk to test the hydrodynamic properties of seaplane hulls



and floats. By observing the deflection resulting from specific loads suspended from the tracks, engineers are able to correct the calculations of deflections of the actual tow tank. One such miniature is used at Langley Field, Va.

Boat builders have for centuries attributed wayward water habits to the individual personality of each craft. Actually, these variations in performance were the result of faulty design. Thanks to tank testing of miniature models during the war, the hundreds of thousands of new seagoing craft perform just as they are supposed to. There are no skittish "Mary Janes" that refuse to take full left rudder working for Uncle Sam.

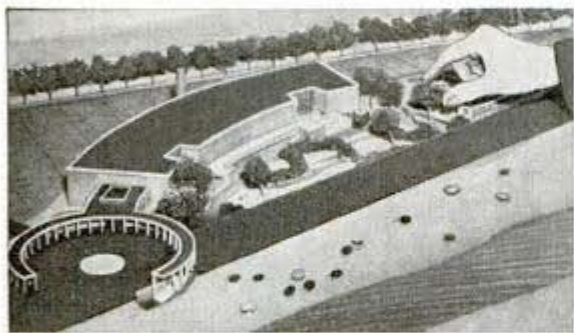
Tank testing is based on the principle that a boat's performance is governed by water resistance. To test a given hull, it is towed in miniature through the towing tank at definite speeds by known units of power. The resistance set up by the towed model is measured by sensitive instruments



Above, small-scale overhead crane for teaching safety in the mill. Models often are used to emphasize safety rules

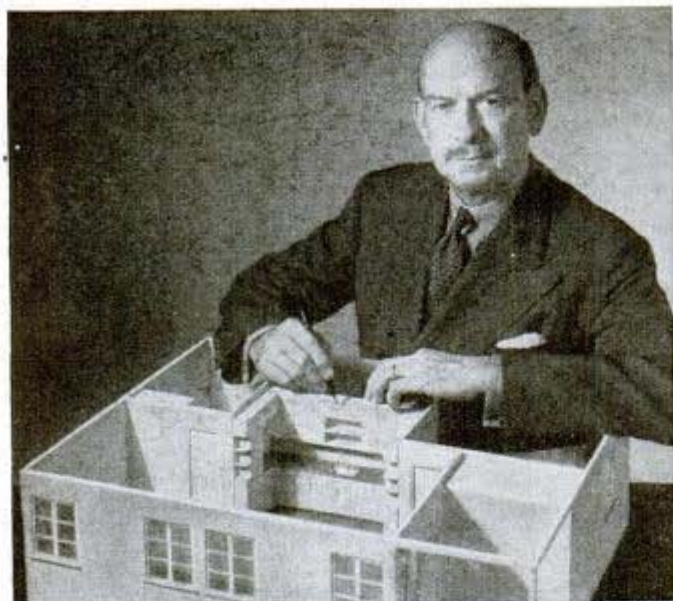
from which it is possible to determine the power requirements of the full size hull.

But some corporations have other uses for miniature models—to save the lives of



Inset, model of the modern Oceanarium which will be erected at Coney Island. Right, miniature of an entire shipyard which takes up one whole floor of a yard building. This enables operators to devise most economical and efficient work sequence





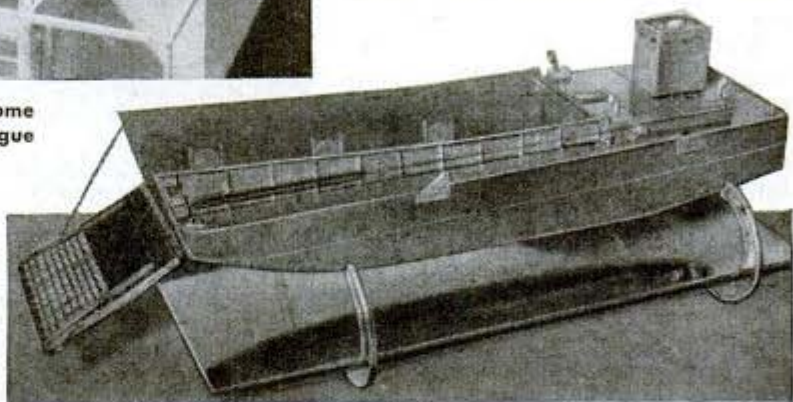
Above, model of prefabricated home designed by Walter Dorwin Teague

workmen. A safety engineer for the Carnegie-Illinois division of U. S. Steel has an accurate scale model of a giant crane by which accidents can be made to order for the eyes of men not familiar with the working hazards.

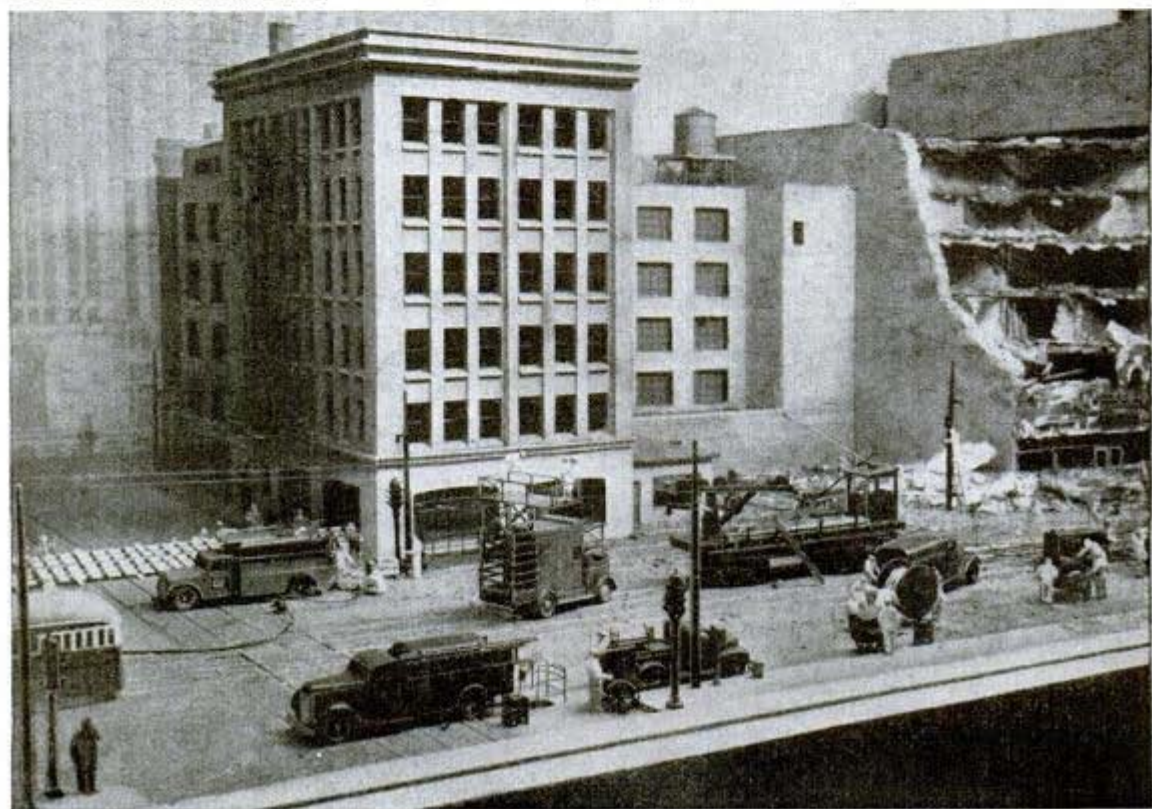
A. L. Stevens and Associates photo

Another miniature model which aids safety is used by larger coal mines. In small scale, the entire mine is often reproduced. Here safety engineers show miners how to escape in case of an explosion, or where to erect barricades.

Probably more airplanes have been reproduced in model form than any other device, all the way from recognition models to precise scale miniatures tested in tiny wind tunnels. The Glenn L. Martin Company has a model plane which can be taken apart and re-assembled piece by piece, both to teach workers what goes into plane manufacture and to work



Above, a model of a Higgins boat. Below, facsimile of a city street showing damage and how repair equipment would operate in event of a bombing



out problems in design for peace as well as war.

The automobile of tomorrow is the miniature of today. Miniature scale models are built by manufacturers to give designers and engineers a "bird's-eye" view of the planned product, a slant more accurate than any sketch can furnish. The manufacturers have used the same system for sizing up the guns and tanks they are producing during the war.

The war uses of models run into the thousands. Accurate reproductions of invasion coasts fix the terrain and defenses in the minds of the servicemen until they feel they have already been ashore at the spot. Models of German villages, both miniature and full-scale, taught our servicemen street and house-to-house fighting and they were familiar with the appearance of Germany before they ever saw the country. In addition, model making provides many a homesick soldier and sailor with a hobby to pass the time at a distant outpost.

On the home front are models of elegant store fronts, store fixtures which will simplify salesmanship, factories which will turn out improved peacetime products, dwellings which will spring up by the hundreds of thousands, schools, museums, docks, apartment groups—in fact, a whole new world already exists in miniature, awaiting the day when it can become as big as reality.

New Resin Gives Rigidity To Synthetic Rubber

A synthetic rubber resin that imparts rigidity to synthetic rubber itself has been developed by the Goodyear Tire and Rubber Company. Although it is unsuited for use in tires, the resin will have importance in wire and cable insulation, safety helmets, golf ball covers, and similar products where hardness, light weight and impact resistance are desired. The resin also eliminates the use of carbon black as a reinforcing agent in certain compounds, making possible the production of synthetic rubber products in color, such as household items, kitchen equipment and toys.

Streetcar Fitted Out as a Library Makes Rounds in City



At top, children boarding traveling streetcar library. Below, choosing books in car, which has bookshelves in place of seats

Books are made available to citizens of Edmonton, Alberta, with a library streetcar. This traveling public library makes its regular rounds on the streetcar system just like the mobile libraries in rural areas. Every week it circulates thousands of books, for both children and adults, in this city of 100,000 population.

☛ Synthetic blood plasma produced as a byproduct in the manufacture of sugar is reported to have been developed in Sweden.



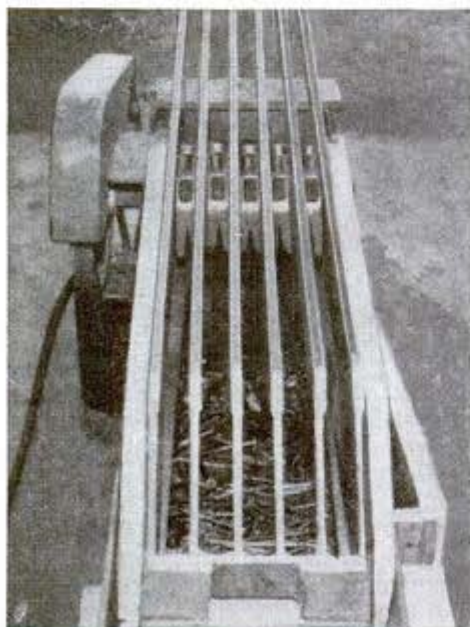
*Clever,
These Yankees!*

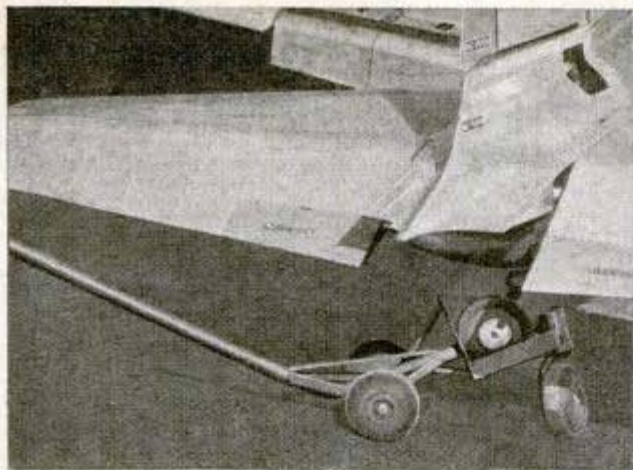
Below, a Jeep Laundry built by U. S. Engineers at Castle Shop on Oahu. Clothes are tossed as drum seesaws lengthwise. Power is supplied by back wheel of jacked-up jeep



Nothing is more typical of American ingenuity than the countless on-the-spot inventions by workmen—often with salvaged materials—to make their tasks easier or less costly. The tool above, suggested by a Douglas Aircraft employee, both locates and drills a hole; formerly a tool was used for locating, then the drill was inserted. Use of the drill guide saves almost 10 man-hours per plane

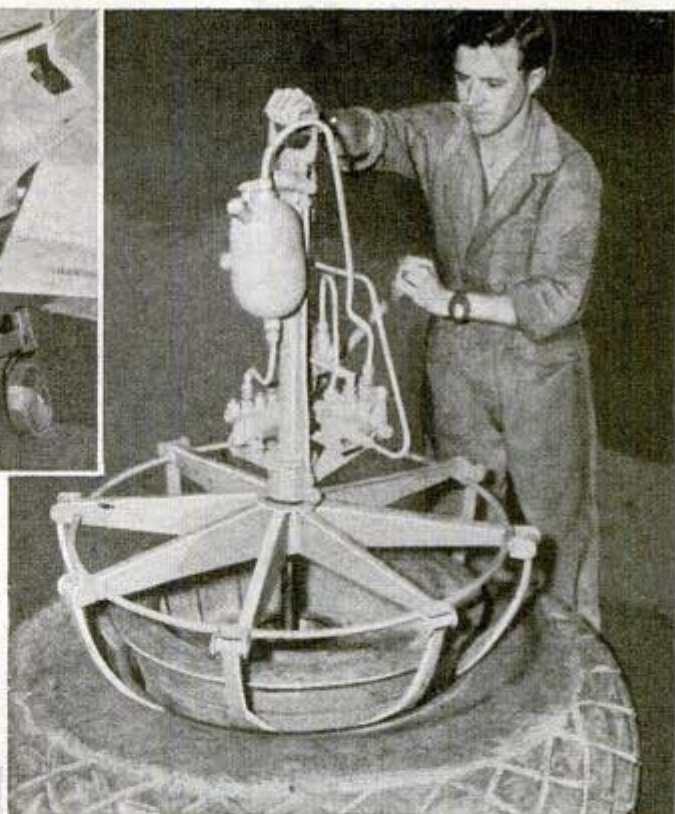
For speedy removal of nails from reclaimed lumber, a multiple nail puller was devised at the R. G. LeTourneau plant in Peoria, Ill. (below). The nails are started by hand, then the board is moved over five hammer heads which, welded to five others on a shaft, rotate at 600 r.p.m., driven by a ½-horsepower motor



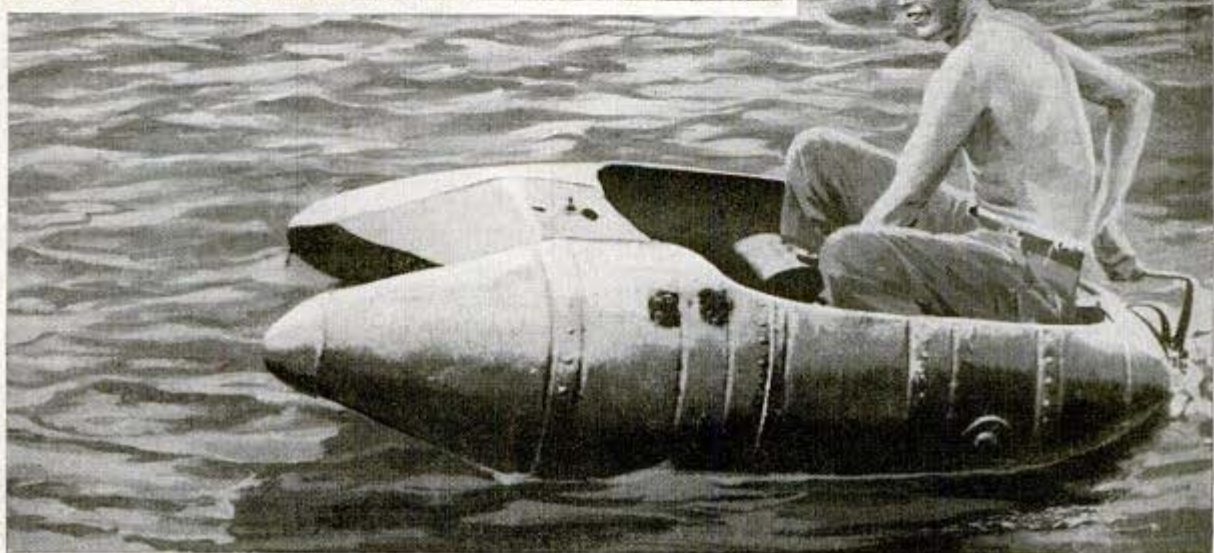


AAF, Cochran Field, Ga.

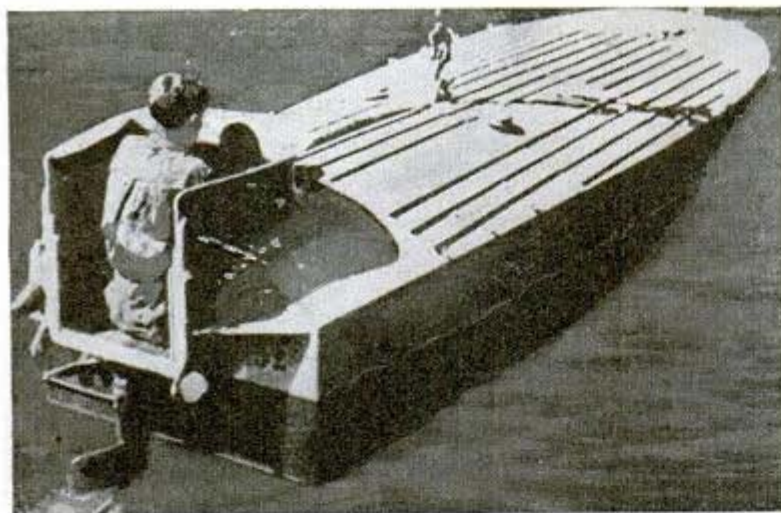
Above, with an extra wheel inserted below its tail wheel carriage, tail wheel lift dolly is used as a truck. The hydraulic tire remover at right was invented at an AAF depot in Italy. The 8-pronged gadget is placed over the wheel, with the shaft extending down through the hub, and screwed into a disk fitting into hub on other side. It whisks tire off undamaged



Left, an artillery unit in Italy made a road out of 105-mm. shell cases in order to pull Bofors gun over it and into firing position. Below, a homemade motor boat which was designed and built by a 10th Air Force corporal in India from the discarded belly tank of an RAF Spitfire and other materials which he salvaged



Explosive-Laden Speedboat Jettisons Pilot Near Target

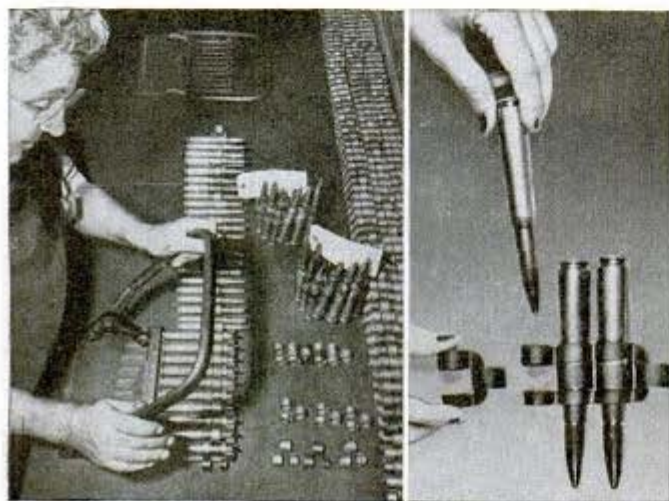


Allied shipping in the English Channel is reported to have been attacked by Nazi speedboats packed with explosives and controlled by one man. When the "suicide boat" comes to within 50 yards of the target, the pilot drops off into the water, after releasing a spring which disengages the floor from the boat. The boat continues on its lethal course and the man uses the floating floor for a raft until picked up by a patrolling ship.

Cabinet Tumbles Clothes For Quick Drying

Fussing with a clothesline in the back yard or basement no longer is necessary if you have an automatic drier that makes the operation entirely mechanical. The clothes simply are dumped into the drier, an automatic dial is turned and soon the clothes are either completely dried or damp-dried, ready for ironing. Uniform drying is assured by an internal mechanism that tumbles the clothes and exposes them to warm air that is free of dust and soot. Temperature of the clothes while drying can be controlled.

☐ Plywood has been produced from timber which had been felled 35 years ago, rot having touched only the outer few inches.



Cartridge Belt "Vanishes" As Bullets Are Used

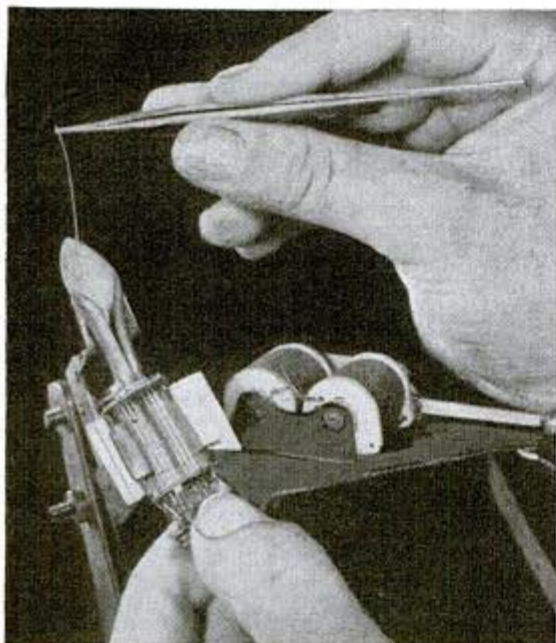
It looks like ordnance magic. As the flexible belt feeds .50-caliber cartridges into the machine gun breech, it apparently vanishes into the air instead of emerging empty on the other side. The "disappearing belt" actually is a disintegrating belt of breakaway links—simple, interlocking devices that not only hold the cartridges together but are themselves held together by the cartridges. Each pair of links is joined by inserting a cartridge into the tube they form. As

each cartridge is fed into the breech it is withdrawn from the belt, freeing one of the two links which hold it in place and thus bit by bit disintegrating the belt.

Gear Shaper Cuts All Teeth In a Single Operation

Gear cutting is vastly accelerated by a new machine which cuts all gear teeth at the same time. It is capable of rough and semifinish cutting 60 to 100 gears an hour, depending upon the job. Using radially fed form-tool blades with a shear-cutting action, it employs a circular cutter head consisting of a ring with the blades arranged on the inner circumference. When the gear wheel is placed on the work holder in the machine it is automatically clamped and the cutter head lowered into cutting position. Each stroke of the blades is adjustable and the correct sizing of the work is also automatically controlled and adjusted. To sharpen blades or to change over to another type of gear to be cut, the entire inner cutter-head assembly is changed.

"Lily Jig" Guides Tiny Filament Into Miniature Radio Tube



Substituting scientific accuracy for blind chance, a jig shaped like a lily has been devised to assist threading the filament through an almost microscopic hole in a miniature radio tube. Formerly the task was performed laboriously by hand, a slow and delicate process. The new type jig is reliable in getting the filament through the hole and placing it in the proper position where it may be vibrated into place.

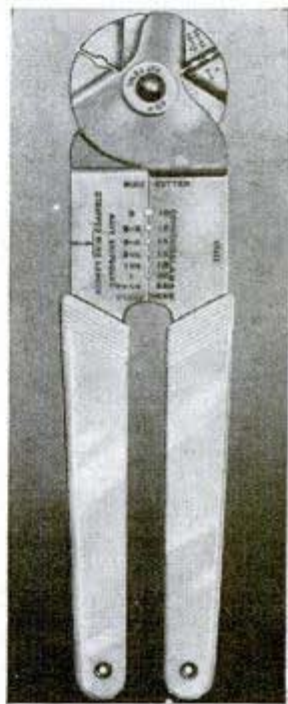
Transparent Casts for Wounded Are Made of Plexiglas



Plastic splints and casts, lightweight and far less conspicuous than those of metal or wood, are being tested by Army and Navy medical officers. Neck braces and other supports are easily molded from Plexiglas—the same stuff used to make the transparent noses of big bombers. The plastic aids for wounded veterans were suggested by Clarence A. Renfro, a tool designer at the Consolidated Vultee Aircraft plant in San Diego, Calif.

Plier Strips, Cuts, Crimps Wire

Operating like a pair of pliers, a pocket-size combination tool not only attaches solderless terminals on electric wires but goes through all the steps of preparing the wire for the terminal, since it also can be used to cut the wire and strip its insulation. The proper length to be stripped and terminal stud hole sizes are indicated by the gauge marks notched on the tool, which has molded plastic handles that are fully insulated.



PUTTING AIR TO WORK



This, of course, is the secret of the power in compressed air, and the reason that machinery valued at \$150,000,000 is produced each year to keep air circulating for industrial purposes.

Compressed air drives the drills that are indispensable in the mining of coal and iron; it ventilates shafts and tunnels; it aids in keeping out water when mines are being dug; it operates the vibrator drills that quarry limestone; it helps steer the ships that take these minerals to the blast furnaces; in the blast furnaces, almost three tons of compressed air are necessary to make one

Skilled glass blower blows into hose to seal a 500-watt radio transmitting tube. Below, applying rivets by compressed air

CONSIDERING its importance, man is amazingly accustomed to taking his environment for granted—especially that towering ocean whose bottom he inhabits, the ocean of air.

It's easy to overlook this tenuous sea because its weight, about 15 pounds to the square inch, is equalized by the internal pressures of the body. But let that weight be radically altered, as it is when man swiftly descends into the depths of that more familiar, watery sea, or as it is when he speeds into the rarefied regions of the stratosphere, and man's dependence upon his atmospheric ocean is evident.

In the turbulent mood of a hurricane, air can level a whole countryside, as it did in the first New England hurricane, or can disperse whole fleets—the fate of the storied Spanish Armada. But properly controlled, air can forecast the weather, operate blast furnaces, steer a ship, tear down mountainsides or deliver the mail.

Air that has been compressed to greater than normal density seeks to expand when released.





Compressed Air Institute photo

Air tool (above) is used for carving wood patterns

ton of steel; brakes on the trains that take the steel to munitions plants are air-controlled; and then in the plants, air operates vibrators that help to mold machine parts, and the riveters, grinders, impact wrenches, vises, automatic chucks and other machine tools that fabricate the parts.

On the ship, tank or plane that finally goes into battle, compressed air has its jobs, too—activating landing gear, operating a vessel's ammunition hoists and winches, firing torpedoes.

Air compressors go right into the mines, supplying power for jackhammers, drifters, drills and air-operated hoists. These compact, mobile compressors are mounted on flanged wheels to fit rail tracks, and are built to clear the low ceilings.

Larger tunnels, such as those that carry vehicular traffic under rivers or through mountains, would be untenable were it not for a constant flow of fresh air to the workmen. Great blowers take air under pressure into the most remote crannies of these man-made caverns.

Perhaps the most familiar use of compressed air is in the drilling machine seen in use by pavement repair gangs or in construction through rock foundations. Chat-

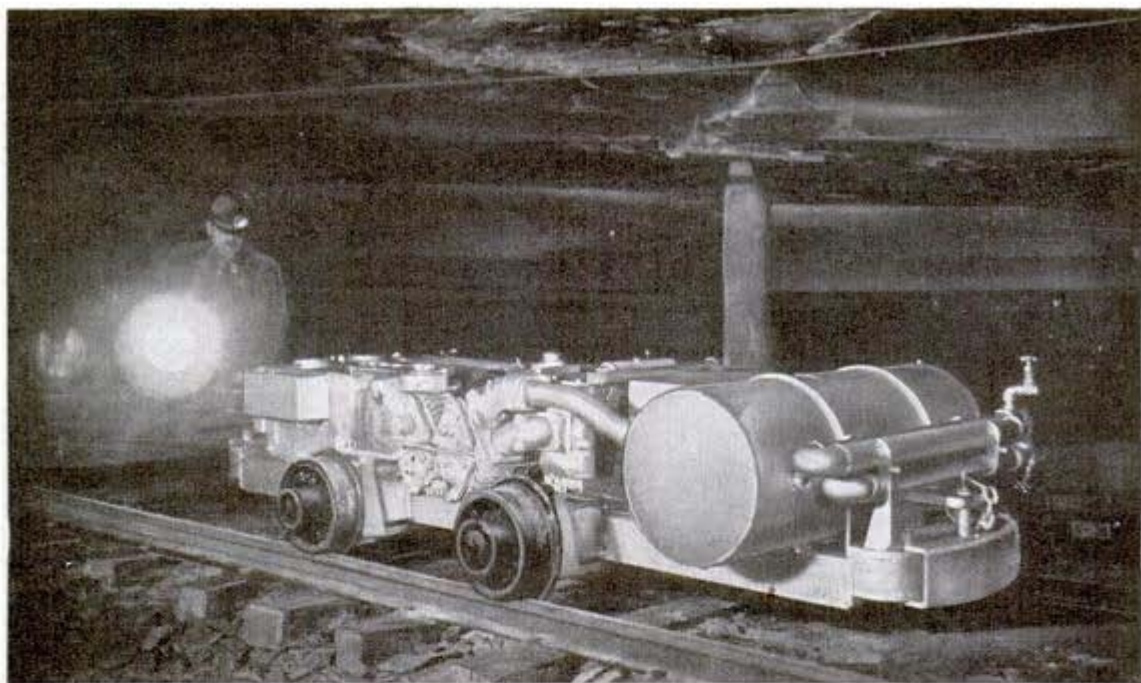


Westinghouse photo
Above, the electric fan, elementary method of putting air to work, helps dry clothing



Courtesy Walter Kidde & Co.
Above, a drawing shows how carbon dioxide gas under pressure lowers landing gear in emergency. Below, sandblasting plane parts





Low-slung, two-stage air compressor plant on flanged wheels is used in bituminous coal mines

tering air drills have been the literal ground breakers in most of the prodigies of road building in modern America.

Industry uses air for almost endless purposes. Blasts of warm air are used to dehydrate food, so that 25,000,000 pounds of nutrition may be shipped without the added weight of some 50,000,000 pounds of water it once contained.

In the finishing of airplanes, ships and vehicles, compressed air sprays on evenly the coats of camouflage paint. One bomber assembly plant constructed a paint-spray-

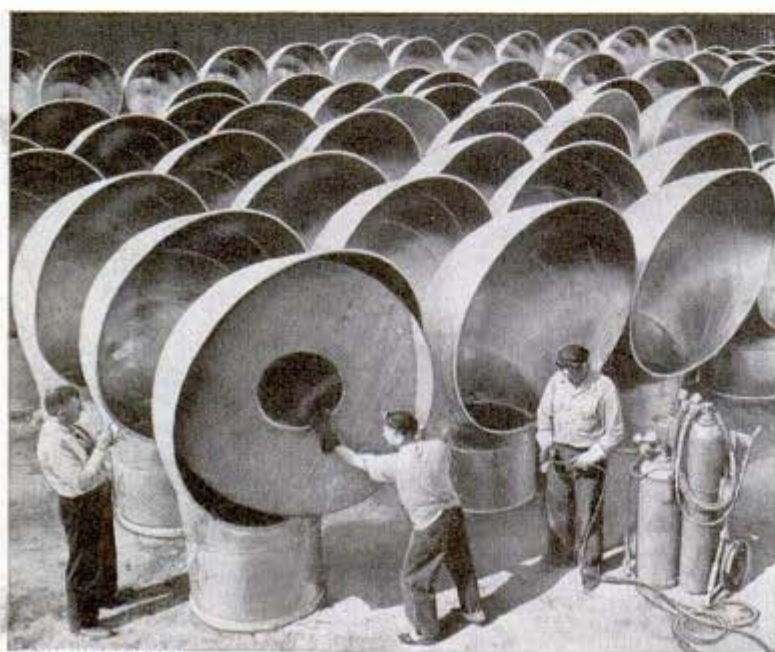
ing booth large enough to accommodate a four-engined plane, and air circulates through the room at the rate of 700,000 cubic feet a minute. For every pound of paint, 5,250 pounds of air are used.

In a new process developed at Westinghouse Research Laboratories, shiny die blocks of steel emerge from a cooling chamber, air-hardened to the point where they can cut glass. The same company utilizes blasts of air in circuit breakers to blow out powerful electric arcs. These giant breaths extinguish an electric arc rated at 1,500,000 kilovolt amperes.

Many remarkable achievements are being recorded through the application of air tools to wood pattern making. New types of woodcutting tools are light and compact, and give to wood carving the flexibility and beauty of the finest artistic efforts of the sculptor. Besides saving manual effort, air-driven tools vastly increase the productive capacity of their operators.

Compressed air drives a stream of sand against metallic parts to remove roughness and corrosion.

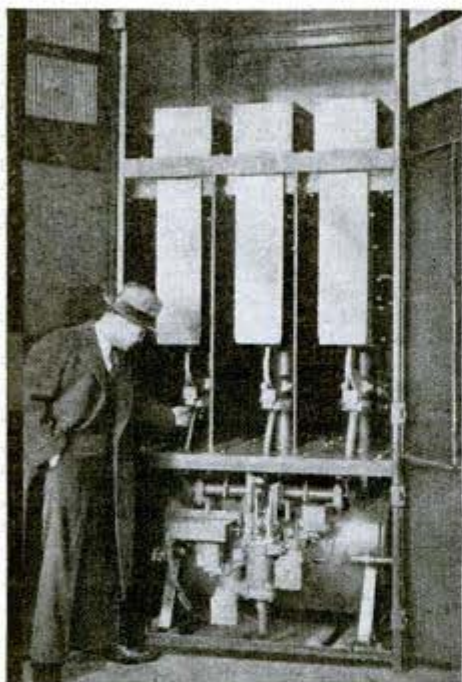
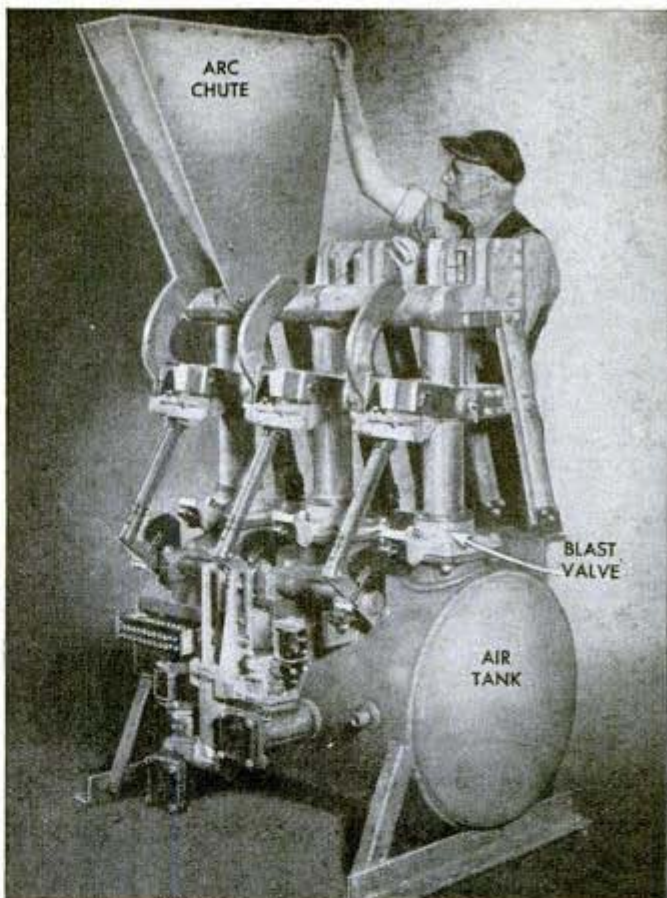
Cowl ventilators which carry refreshing air to holds of ships



Powell Press photo

At General Electric, an air turbine, believed unique, simulates the actual operation of a steam turbine, except that compressed air instead of steam is used for the driving energy. The air-test turbine has speeded up measurably the developmental work on the buckets and nozzles which largely determine the operating efficiency of a steam turbine. Efficiency of turbine diaphragms has been improved to the point where they

Circuit breaker shown below and at right, partially assembled, "blows out" electric arc rated at 1,500,000 kilovolt amperes

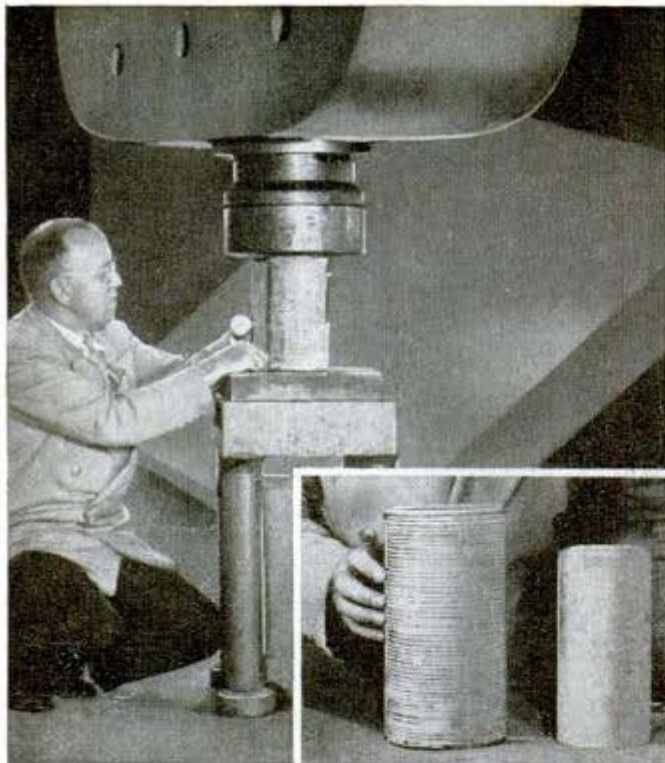


absorb only about 3 percent of the velocity energy of the air or steam driven through them into the bucket wheels. Efficiency of bucket wheels is measured by the amount of "shaft work" they take out of the motivating force—air or steam.

(Continued to page 148)

Below, compressed air activates the drill which pierces rock to pave the way for blasting a highway through mountains





Wire-Wrapped Concrete Is Stronger Than Steel

As light as aluminum and stronger than structural steel, a new type of structural column has been developed at Northwestern University Technological Institute for use in high buildings and long-span arch bridges. The column is made up of 85 percent by volume of concrete and 15 percent by volume of steel. The extremely high strength concrete is wrapped about with a high strength spiral steel wire, which is always under tension, to form a core which is then covered with a fireproofing concrete. It is claimed that an eight-inch core with two inches of fireproofing concrete covering will take a safe load of 1,000,000 pounds; in laboratory tests it carried a load of 2,500,000 pounds without reaching the elastic limit of the steel. The product is said to be easy to manufacture.

Tablets Decontaminate Polluted Water Without Changing Its Taste

"S.C.I. Tablets" made of a special formulation of succinchlorimide are quick-acting water-decontamination pills. One two-grain tablet dissolved in a quart of water kills very large numbers of intestinal pathogenic bacteria within five to 10 minutes at various temperatures in the presence of organic matter. Dysentery ameba cysts are

killed within 20 minutes in a dosage of five two-grain tablets in a quart of water. George F. Reddish, chief bacteriologist at the Lambert Pharmacal Co., of St. Louis, Mo., developer of the tablets, announces that the pills are stable and safe and that they do not change the appearance or taste of water so treated.

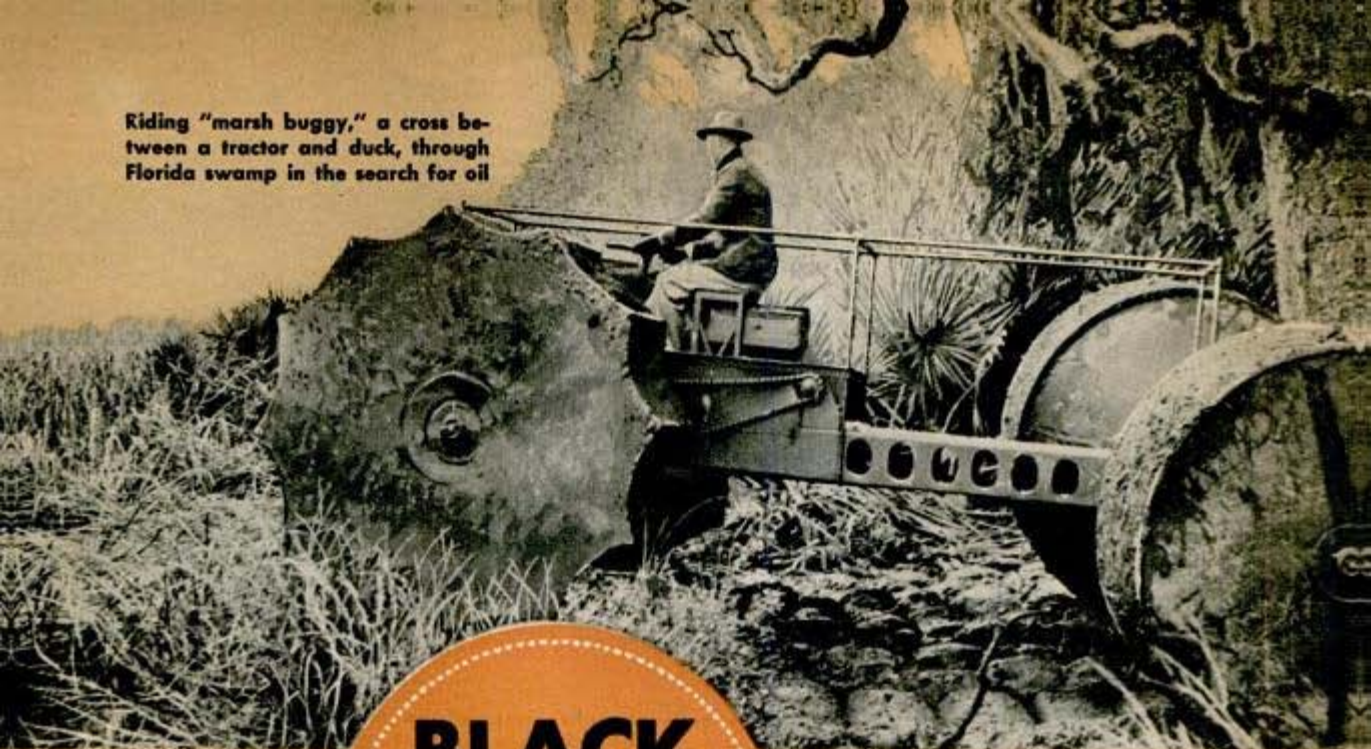
Dial Trains Signalmen In Wigwag Code

Semaphore training without the waving of flags is accomplished with a two-way dial that sends on one side and receives on the other. When a letter is dialed the flags are shown in their proper position and the letter appears in a small circle. This training device permits a man to practice receiving by himself. Tests show that it takes twice as long to teach a man to receive messages as it does to send them, since receiving calls for a reversal of the visual image, which is not easy for most people.

Everyone is color-blind at birth and a child is one and a half or two years old before his color vision is fully developed, according to the Better Vision Institute.



Riding "marsh buggy," a cross between a tractor and duck, through Florida swamp in the search for oil



BLACK GOLD RUSH

Below, derrickman guiding drill collar which has just been lifted from the pipe rack to derrick floor. When bit is screwed in the collar will be ready to "go in the hole" to cut rock away

THE biggest treasure hunt in history is on—the search for oil in regions where it is not known to exist. This "wild-cattin'" has attracted not only big oil industries but outside companies and individuals, for the stakes are high.

Known reserves of 20 billion barrels are being depleted by tremendous wartime demands, and by 1950 other reserves of 14 billion barrels must be found to meet domestic needs. Who will find the new oil fields? The answer is the great corporations with their newest scientific devices—and the ordinary guy with a lucky break.

A new subterranean frontier is awaiting those who will look for it. According to the Standard Oil Company of New Jersey, it is composed of more than 750,000 square miles in the United States which have never been explored for oil. This is territory proved favorable to oil deposits. There are some 2,500,000 square miles of oil-bearing type of rock formation in the country.

The black gold rush is founded on the future demands of millions





Man-made "earthquake" recorded by seismograph helps determine depth and angle of rock formations to reveal possible oil traps in earth

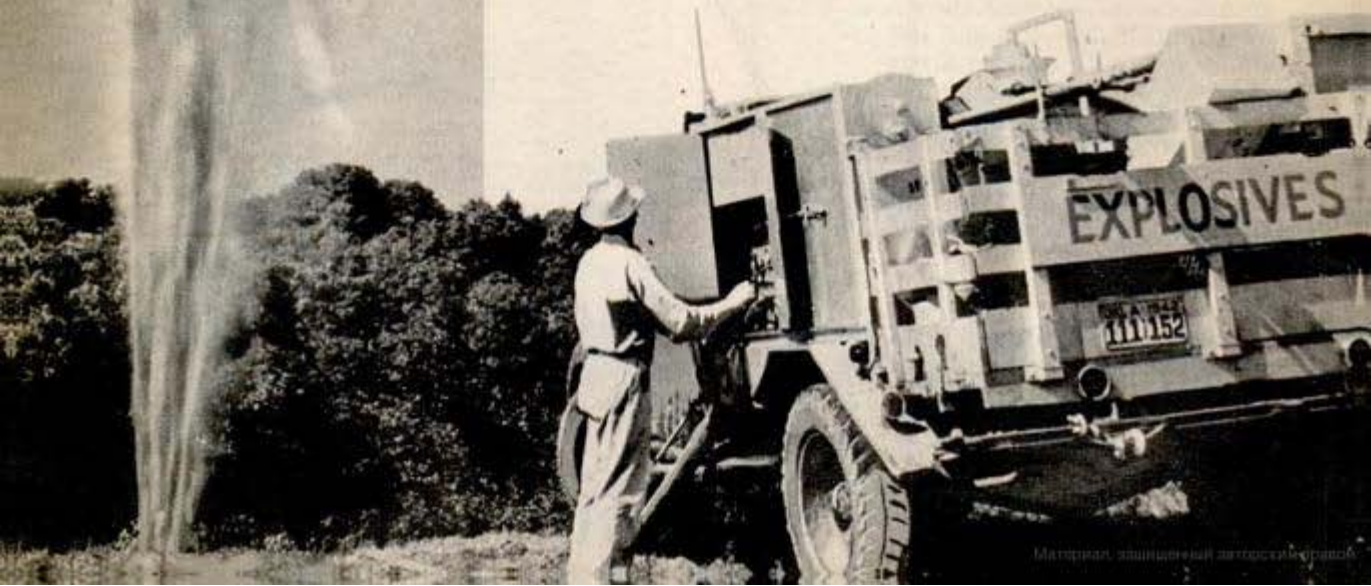
of new cars, trucks, tractors, planes, Diesel engines for ships and locomotives, and the new synthetic rubber industry, plus the dozens of new uses discovered for petroleum derivatives during the war. Experts predict a demand of 1,895,000,000 barrels in 1950, an increase of about 150,000,000 barrels over the wartime peak last year.

The postwar gold rush gates will be thrown wide open to prospectors, wildcatters, lease "hounds," investors, oil field workers, veterans, white collar jobholders, laboratory technicians, refinery employees, landowners such as farmers, or anyone with a zest for adventure.

Naturally, most will want to picture themselves as fortunate finders and millionaire owners of oil wells, which is against the law of percentage; but the lightning of luck still strikes in the search for oil.

John Bath, Jr., recently began drilling a water well on his Greece City, Pa., farm and struck oil at 65 feet. Then there is the case of "Dad" Joiner, a hunch player, who discovered the East Texas field, the greatest single oil pool in the world. Instead of drilling in the middle of his field, he picked the extreme edge and hit it. A stone's throw

Setting off explosive charge by remote control to activate seismograph



away the under surface was barren of oil.

In Mississippi, the scene of the latest black gold rush, the pupils of the Heidelberg public school are learning the oil business along with their regular lessons. Wells in the schoolyard paid the school \$25,000 down and are putting \$1,000 a month in the bank.

T. D. Lewis, a farmer nearby, has a 14,000-barrel-a-day well on his property. Owners of small farms are buying groceries in Heidelberg stores with \$500 bills and the prosperous storekeepers have the change in the tills.

Strangely, back in 1860 the state geologist wrote a report describing the Mississippi oil formation in excellent detail. But nobody did much about it. Now, at last, the



Above, preparing to run casing gun perforator into hole. Left, reading magnetometer which reveals mass of rock under ground that may form oil basin; gravity meters are used for the same purpose. Midway on derrick below, operator can be seen steadying pipe as rotary helpers on the floor below "stab" the pipe

Heidelberg field is rated as a 100,000,000-barrel find; another at Cranfield is of the same size, and a third at Eucutta is estimated at 50,000,000 barrels. Oil averages \$1.19 a barrel and land that formerly brought \$5 is selling for \$5,000 an acre.

Estimates of the recent strike at West Edmund, 15 miles from Oklahoma City, keep rising until it is expected to be one of the biggest ever discovered. It is now figured at 117,000,000 total future barrels. It was discovered by a Russian, Ace Gutowsky, using a "doodlebug," or homemade divining rod which oil company geologists insist is no good. But these same geologists said the West Edmund prospect was no





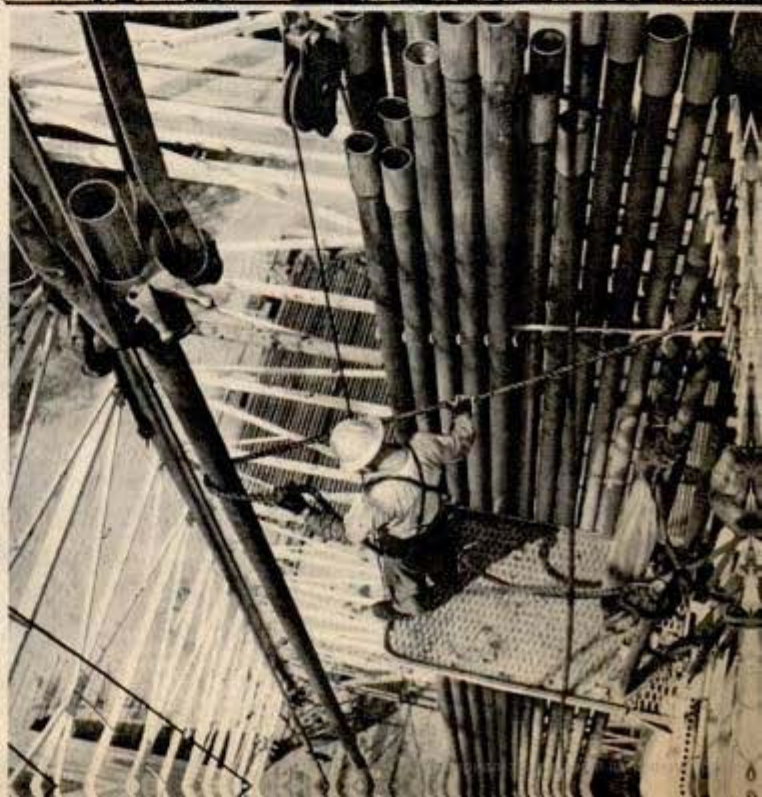
Top left, examining the bit that cuts through the rock to drill hole thousands of feet deep. Fast-drilling "fishtail" bit (above) is used until hard formation requires rock bit. Bottom, lifting a long section of pipe from a hole



good, too, and several major companies rejected the field. Now most of them are buying leases from Gutowsky. Everybody hasn't struck it as rich as Gutowsky, yet oil payrolls are up \$500,000 a month in the town favored by the new black gold rush.

The big fellows are doing all right, too. Standard Oil of California set a program of a well a day and exceeded the figure by 50 percent. Out of 135 wells sunk, 110 produced. The Navy, which is floating to victory in a sea of oil, is getting 19,000 barrels a day from 20 new wells in the Elk Hills, Calif., petroleum reserve.

A new oil field in the vicinity of Spring, in southern Texas, was indicated by a successful drilling sponsored by New York City bankers. Phillips Petroleum is



just beginning to develop a new 30,000-acre field in Alberta, Canada. Big-time outfits are exploring in Maryland, Georgia and Alabama.

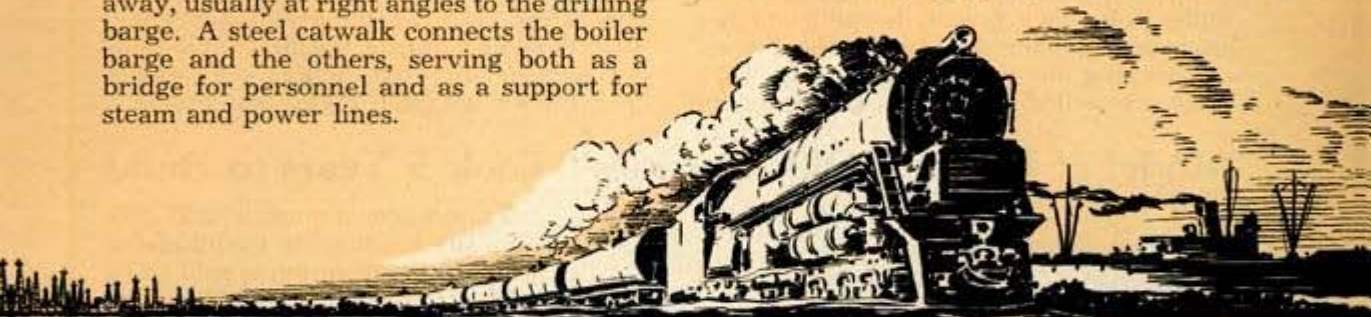
Florida, long thought to be a likely spot for oil, finally delivered recently for the Humble Oil and Refining Company. The strike was made in the swampy Everglades in southern Florida. The effort and expense to which this company has gone to find oil in Florida and along the Gulf Coast illustrates the revolutionary new devices and methods being employed. Two important tools were submergible barge oil rigs and marsh buggies, engineered to work in muck and water.

The derrick and drilling equipment is mounted on two steel barges, 120 feet long, 24 feet wide, and 10 or 12 feet deep. These barges, six feet apart, are connected with bolted transverse trusses. Towed to the desired drilling location, the sea cocks are opened to fill them with water, and they are sunk to the floor of the bay, lake, canal or river to form a solid foundation for drilling operations.

A third barge carries the boilers, auxiliary boiler plant equipment and electric generators. It is submerged about 150 feet away, usually at right angles to the drilling barge. A steel catwalk connects the boiler barge and the others, serving both as a bridge for personnel and as a support for steam and power lines.



Mast-derrick of rotary drill is mounted on a truck and is used for drilling the seismograph shot holes. At bottom of page, gravity meter is rock "detective"

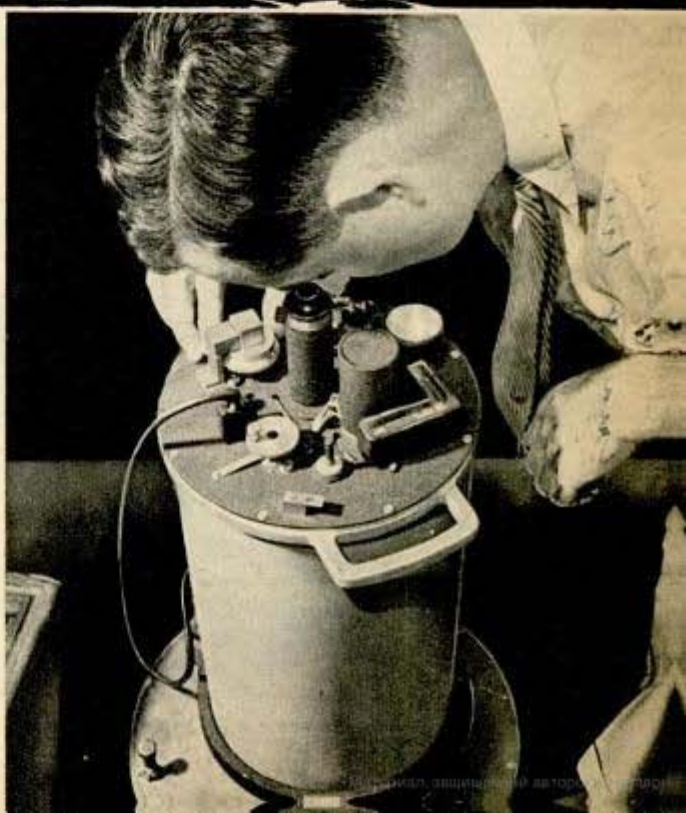


The location for a marine well is marked by two lines of pilings driven in the ground just far enough apart to accommodate the six-foot spread between the twin barges. The barges must be spotted exactly over this location. To hold them in position while they are submerged, each barge is equipped with a heavy pipe which is dropped through a casing sleeve in the bottom of the hull into the clay or sand.

The depth of water in which this operation is practical varies in different areas, depending upon the tides. Eight feet is about the maximum depth in which the barge equipment is normally operated.

The marsh buggy, a combination tractor and duck, is used by prospectors to transport men and tools through the swamps. Its great metal wheels carry them over terrain where the water is too shallow for boats and the muck and mud too deep for ordinary land vehicles. The motor is con-

(Continued to page 150)



Waterproof Tanks Hit Beach With Guns Blazing

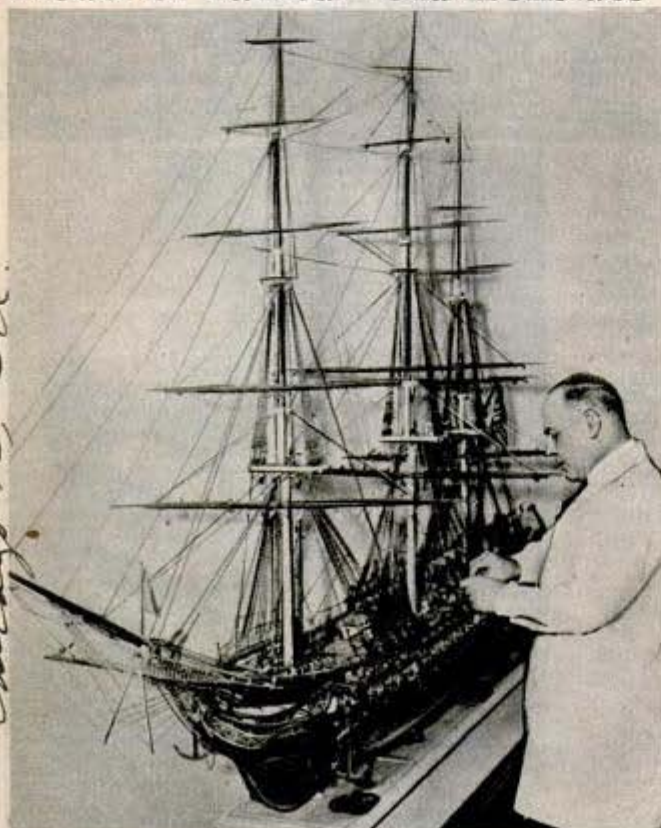
Emerging onto enemy beaches like grotesque, mechanical sea monsters, spouting flame and smoke, Sherman tanks have surprised Axis forces in many an Allied invasion across water barriers. The tanks are capable



of leaving landing ships and going ashore under their own power, keeping engines, crew and powder dry during the "swim" and coming out with guns blazing. Their hulls are sealed with a plastic compound

and paint. Steel exhaust chutes which resemble gigantic periscopes project from the rear of the tanks. The waterproofing must be 100 percent effective, for a little sea spray could upset intercommunication between the tanks. As the final touch, Allied engineers fitted explosive charges, operated at the flick of a switch, which blow off all the waterproof coverings as the tank hits the beach. Crewmen were drowned during the first tank-wading experiments but actual self-landing operations have been highly successful.

Model of Famed "Old Ironsides" Took 5 Years to Build



From topmost mast to its 54 cannon, the latest scale model of the warship Constitution is said to be perfect in detail. It took Theodore Morales, Chicago model maker, five years to build the model, which is two more than were required to build the original. The model is 8 feet, 2 inches long and 6 feet high. It is made of mahogany and walnut and copper-lined.

Alkaline Salts Solution Protects Tin Cans

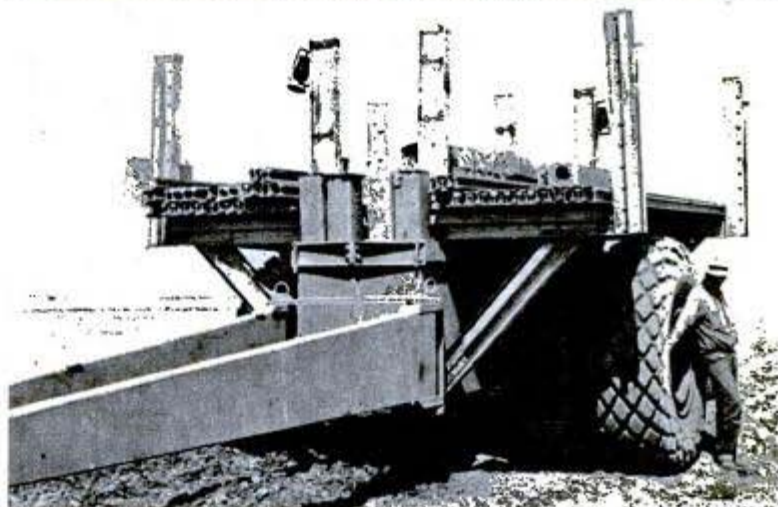
To protect them from outdoor exposure in hot humid weather, tin cans, after being filled and sealed, are dipped into a hot solution of alkaline salts which cleans the surface and forms an invisible film over the tin. No lacquer or enamel is used as in present protective processes. Tests show that this method, developed by Battelle Institute, Columbus, O., effectively delays pinhole corrosion and keeps cans bright and clean.

*Mr. Theodore Morales
1319 Belmont Ave
Chicago 13, Ill.*

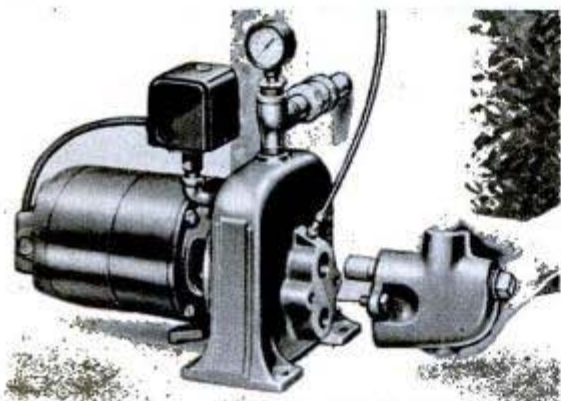
"Giants" Pack Soil To Build Runways For Big Planes

When United States Army engineers rebuilt Mather Field, near Sacramento, Calif., to accommodate heavy cargo planes and bombers, they developed two giant pieces of equipment to speed the job. One is an 85-ton pneumatic-tired roller, and the other a sheepsfoot roller with 18-inch feet and a total weight of 38 tons. The rollers, which pack the soil before heavy pavements can be laid, eliminate ordinary methods of excavation and packing by layers.

Top, 76,000-lb. sheeps-foot roller packs subsoil. Right, pneumatic roller carrying ballast



Quickly Changed Fittings Convert Pump for Deep or Shallow Well



Water can be pumped from a deep or shallow well with a dual-purpose pump which has only one moving part. If the water level changes, the pump is quickly converted by removing tap bolts with ordinary tools and attaching simple fittings. The moving part has no gears to wear out, and the system contains no stuffing box to leak or repack. Only a durable rotary seal ring is subject to wear, and this is easily replaced. All internal parts can be removed as a unit to facilitate servicing, without disturbing suction or discharge piping. The pump is said to be quiet in operation, and it requires no repriming.

Fast LSM Joins the Invasion Fleet for Action Against the Japanese

Newest addition to the "landing ship class" of the United States Navy is the LSM (Landing Ship, Medium) which is designed for duty in the Pacific. This landing ship is 203 feet long and is said to be faster than previous types of landing craft and more easily maneuvered. The tank-carrying LST, largest of the beach vessels, is 328 feet long.



MARCH, 1945

FRIENDS of the YANKS



"Siwash," Marine mascot and veteran of Tarawa, takes time out for refreshments. Below, "Parky," a favorite of 415th Infantry at Camp Carson, Colo.



Leaning out of waist gun position on B-17 (above) is "Lady Moe," a three-foot-high donkey acquired by the crew in Africa on a shuttle mission. She cost them 400 francs. Left, ready for the stratosphere with a special oxygen mask, this police dog has accompanied one crew on several missions



At the sound of "all clear," mongrel pup "Tojo," adopted by five Yanks on jungle island, emerges from air raid shelter located near his "Mutt Manor"



Right, baby wallaby from New Guinea favors high altitude equipment, especially if it happens to include fleece-lined shoes



Left, with a "bring-on-the-Japs" look in her eyes, lion cub "Duchess" goes ashore with Marine



American eagle, Leatherneck mascot at air station, shows a Marine how to look tough



Chicken-Wire Belts Carry Peat From the Fields



Left, peat moss drying in the sun. Above, conveyor takes it to depot. Below, wheel-barrow conveyor gathers it in fields

Canadians have mechanized their peat moss industry. On some of the larger peat bog properties a chicken-wire conveyor belt system for hauling the peat from the field is rigged up on homemade wooden wheelbarrows which can be moved along trenches from which peat moss has been dug. Many peat diggers use various forms of makeshift conveyors to carry the moss to the depot after it has been allowed to dry in the sun.

Snug Paper House Costing \$51.20 Is Erected in 59 Minutes

Made up of panels only an inch thick, a weatherproof paper house developed at the Institute of Paper Chemistry, Appleton,



Wis., took only 59 minutes to set up. The experimental building, which is 16 feet long, eight feet wide and eight feet high, consists only of waterproof paper, except for 49 pounds of glue, metal fasteners, clear plastic windows, and wood window frames. The paper is "fortified" by an inexpensive treatment and is composed entirely of low-cost chipboard made from waste paper and covered with fireproof paint. The insulating quality of the paper and internal design of the panels kept the house comfortably warm during a subzero wave accompanied by wind. The building also withstood driving rains and a windstorm strong enough to damage small farm buildings and blow down trees. The paper house piles into a neat stack of 21 rectangular panels.

Robot Map-Maker on a Jeep Plots Route as It Travels

Known as the odograph, a mechanical map-maker can plot the route of a jeep, tank or truck as the vehicle in which it is mounted speeds along. The device has an electronic magnetic compass, a power pack, and a plotting unit that actually draws the maps, all connected by electrical cables and flexible shafts. Officially called the M-1 Automatic Road Reconnaissance De-

vice, it also can plot the position of an objective relative to a given base, tie gun positions together, and be used in land navigation, reconnaissance tours and the tactical control of movements. Field commanders using the instrument must know both the distance traveled, which the odograph determines by means of a speedometer attached to the transmission, and the direction of travel, which is pointed out by a magnetic compass. The two factors are integrated mechanically in the plotting unit and passed through a robot "brain" to a pencil which draws a map of the route traveled. The odograph can plot to any scale from 1 to 20,000 to 1 to 500,000.

Surgery "Jelly" Absorbs Water 300 Times Its Weight

Gluten sulfate, a jellylike material produced from the action of an acid solution on wheat gluten, absorbs from 100 to 300 times its weight of water. During this process it changes from a cream-colored solid to a clear odorless and tasteless jelly. It has been used by surgeons to absorb body fluids after operations. Other uses, according to the American Chemical Society, include the making of ice cream.

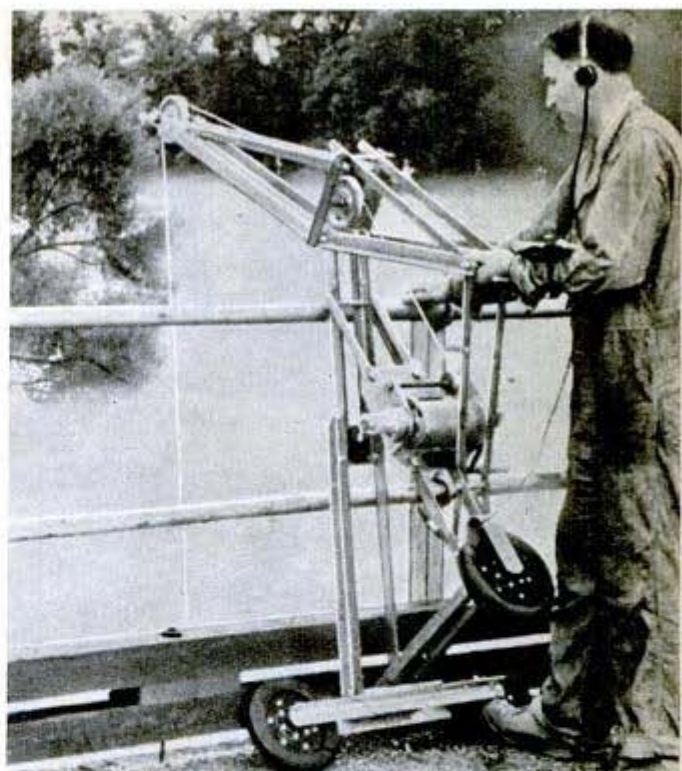
Legs Steady Funnel on Drum To Allow Horizontal Filling



Thanks to a funnel which sprouts legs, it is no longer necessary to upend heavy drums and barrels and fill them in a vertical position. Strong steel legs, slotted to fit the rim of the drum, hold the funnel in a position from which it cannot slip. Both hands are left free for pouring.

MARCH, 1945

Geologists "Fish" for Data With Crane and Reel



Some members of the Interior Department's geological survey get paid for fishing from rustic bridges. But they search for data, not fish. They are stream-gauging experts and their job is to record vital information about the depth, speed and other characteristics of each stream. They use a specially designed crane and reel.

Plastic Mold of Metal Surface Is 2/1,000,000 Inch Thick

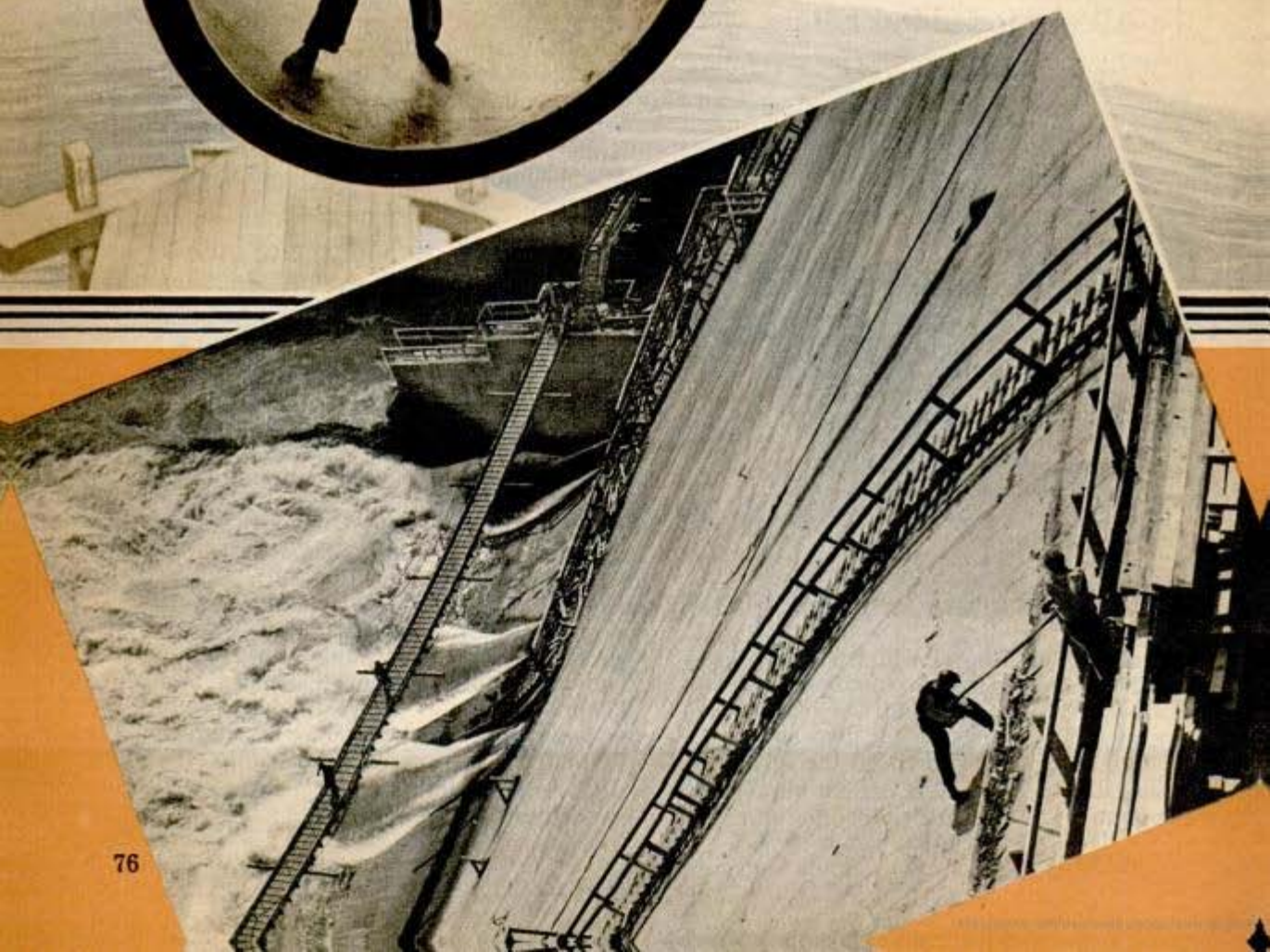
In order to study metal skin structure under a microscope, the metal surface is reproduced in a plastic mold 2/1,000,000 of an inch thick—one thousandth as thick as the Cellophane wrapper on a cigarette package. A very dilute solution of plastic is placed on the surface and then allowed to drain off, leaving a thin coating which follows the hills and valleys of the metal surface. According to Dr. David Harker of the General Electric Research Laboratories, the replicas are strong and tough for their size but must be handled with the utmost delicacy. To remove the mold a small disk of fine wire gauze is placed on it, Cellophane tape is pressed down on the gauze and then the tape is raised from the specimen with the replica stuck to it. The tape is removed by forceps before the mold is placed under the microscope.

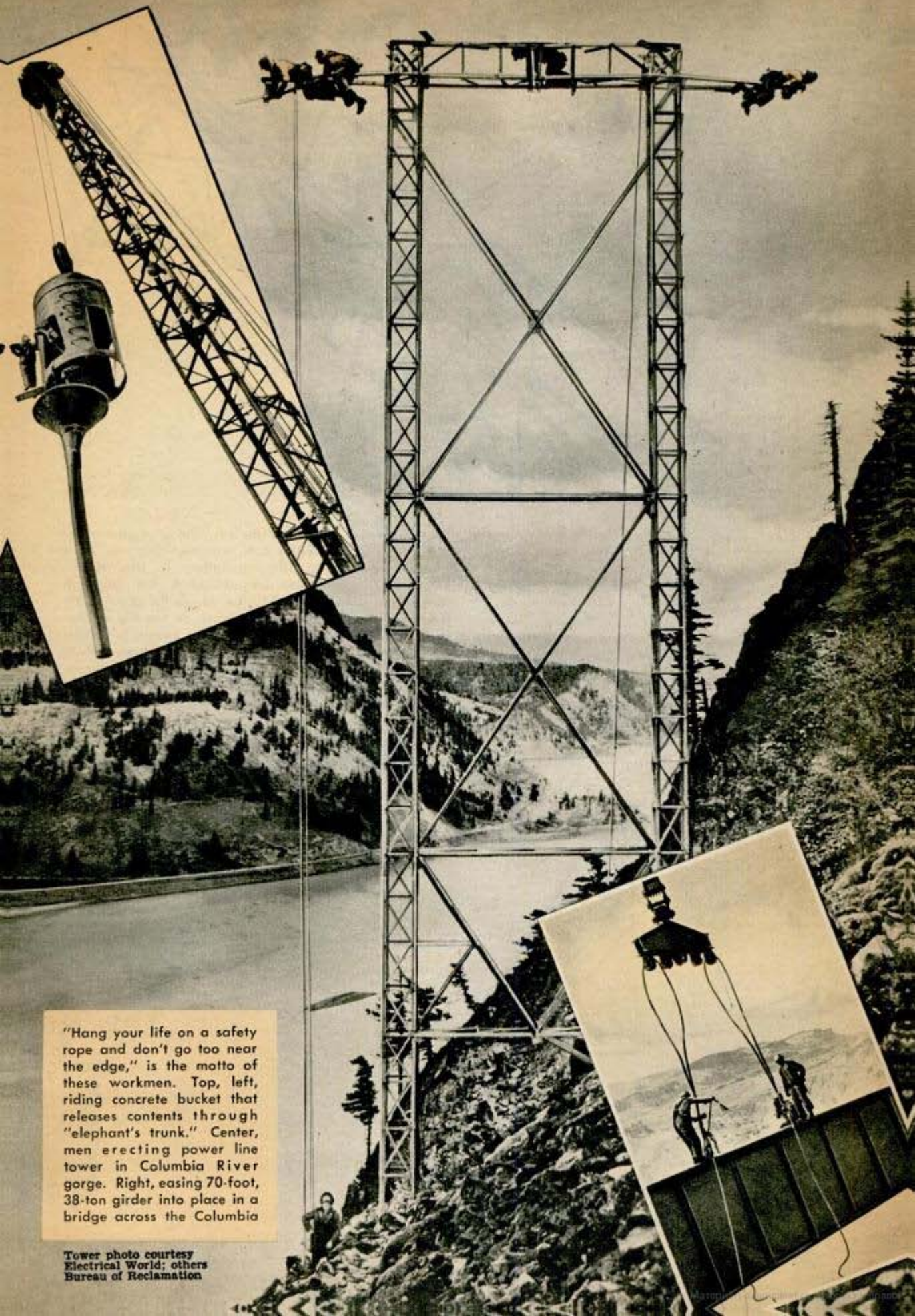
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Aerialists ON THE HOME FRONT



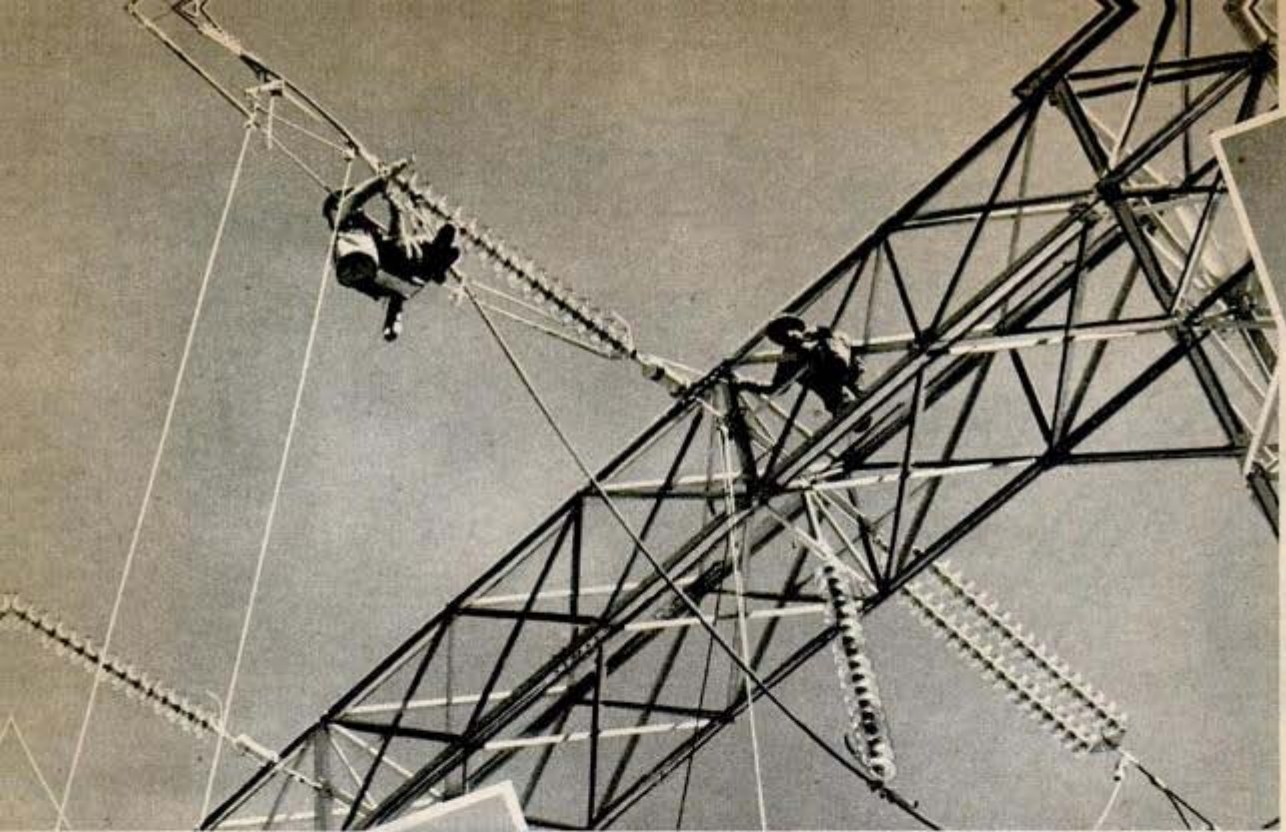
If you are one of those persons who cannot stand atop a stepladder without getting dizzy, the pictures on these pages are not for you—nor are the jobs which they portray. These jobs on lofty perches are just as essential to the home front as the aerial feats of Army and Navy flyers are to the war fronts. Left, workers high above Grand Coulee dam "hitchhiking" on conduit. Below, workman held by safety rope as he performs "routine" job of removing trash gutter from the face of Norris dam



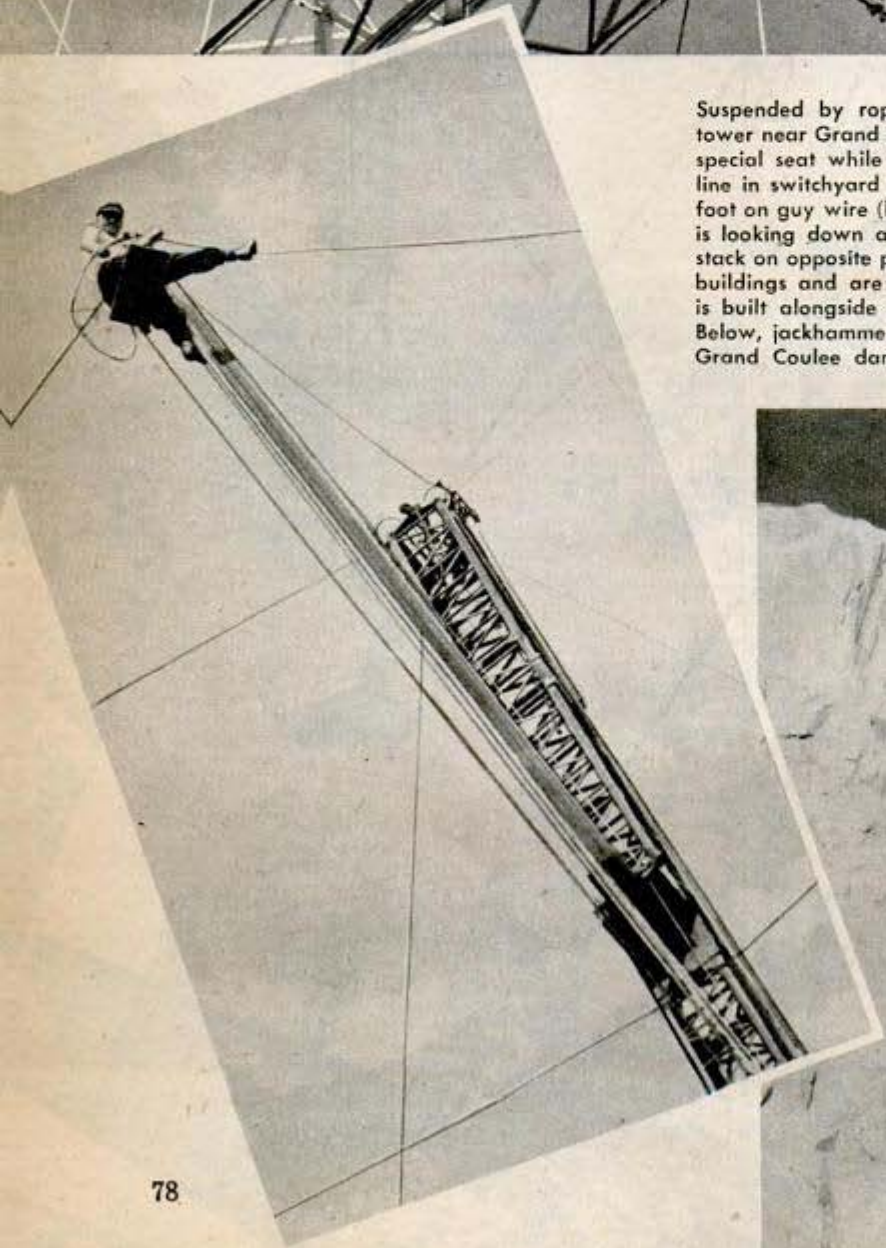


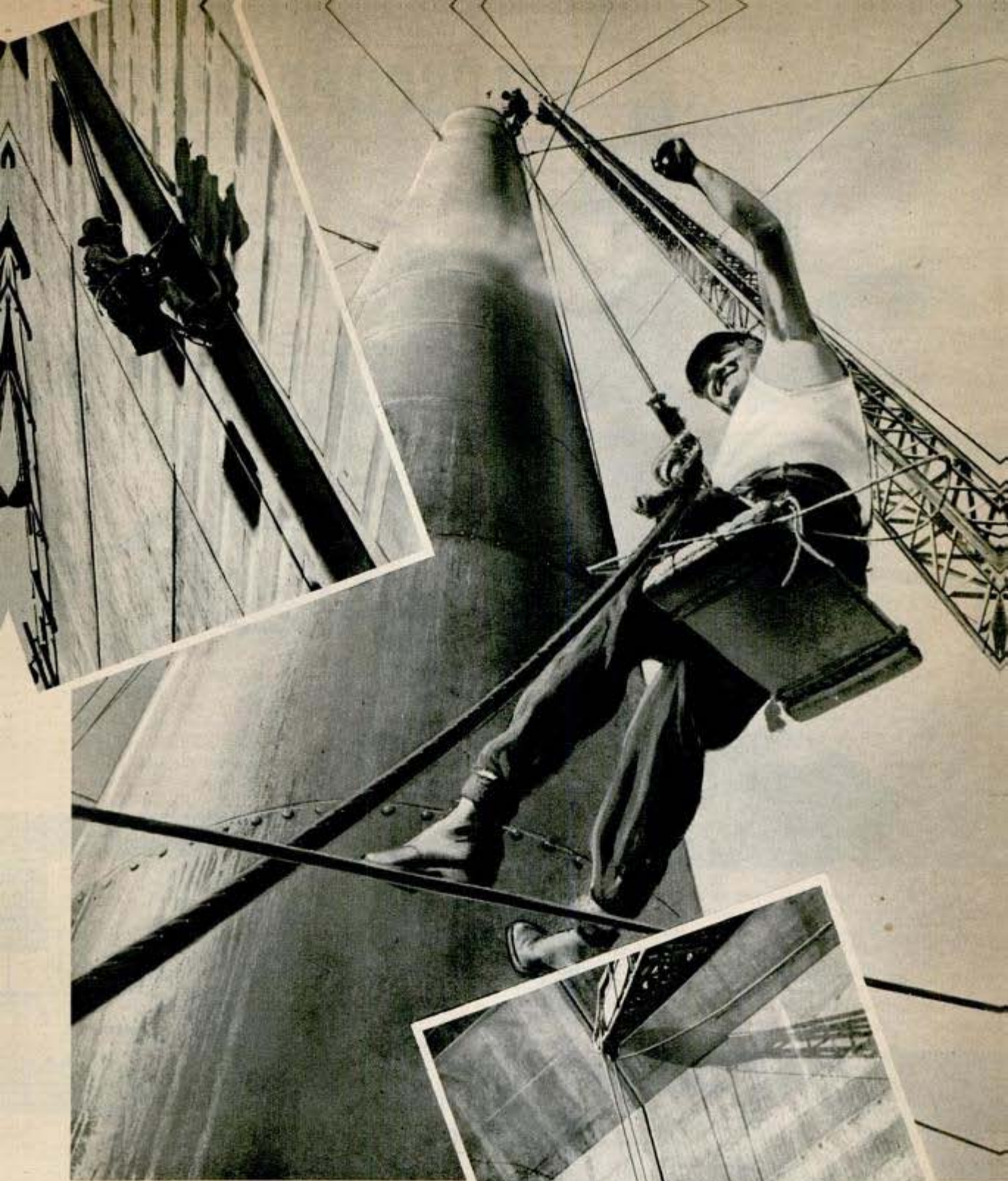
"Hang your life on a safety rope and don't go too near the edge," is the motto of these workmen. Top, left, riding concrete bucket that releases contents through "elephant's trunk." Center, men erecting power line tower in Columbia River gorge. Right, easing 70-foot, 38-ton girder into place in a bridge across the Columbia

Tower photo courtesy
Electrical World; others
Bureau of Reclamation



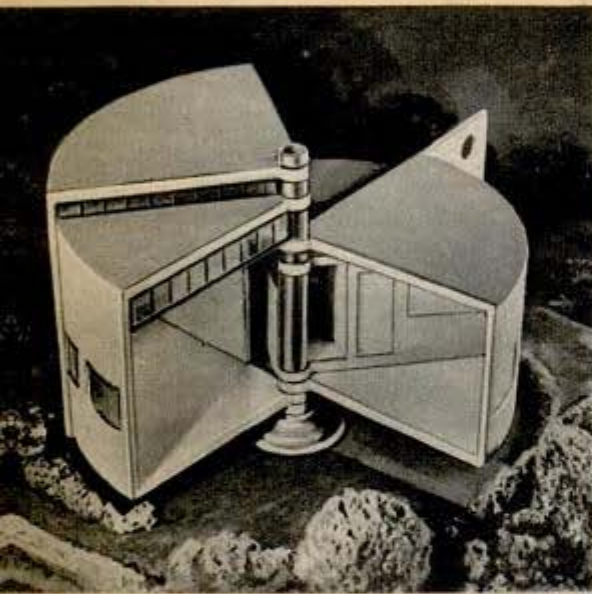
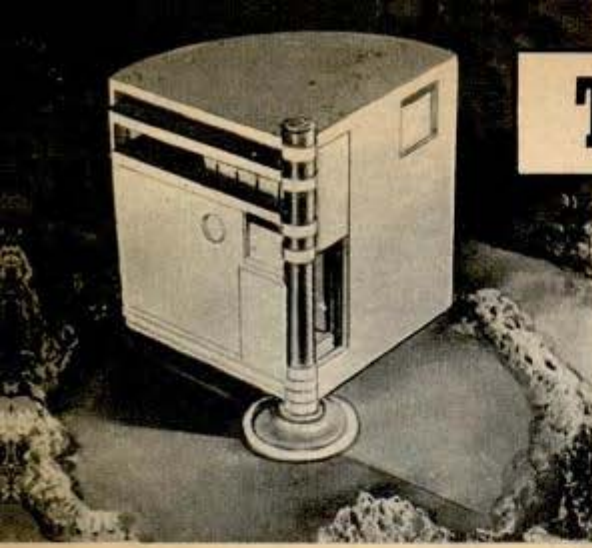
Suspended by ropes and pulleys above a skyscraper tower near Grand Coulee dam, workman "reclines" on a special seat while installing equipment on transmission line in switchyard above dam abutment. The man with foot on guy wire (left) is 270 feet above the ground. He is looking down at fellow workman on the big smokestack on opposite page. The guy wires extend to nearby buildings and are used to brace the steel tower which is built alongside smokestack that is being torn down. Below, jackhammer operator at work on a ridge above Grand Coulee dam could double as mountain climber



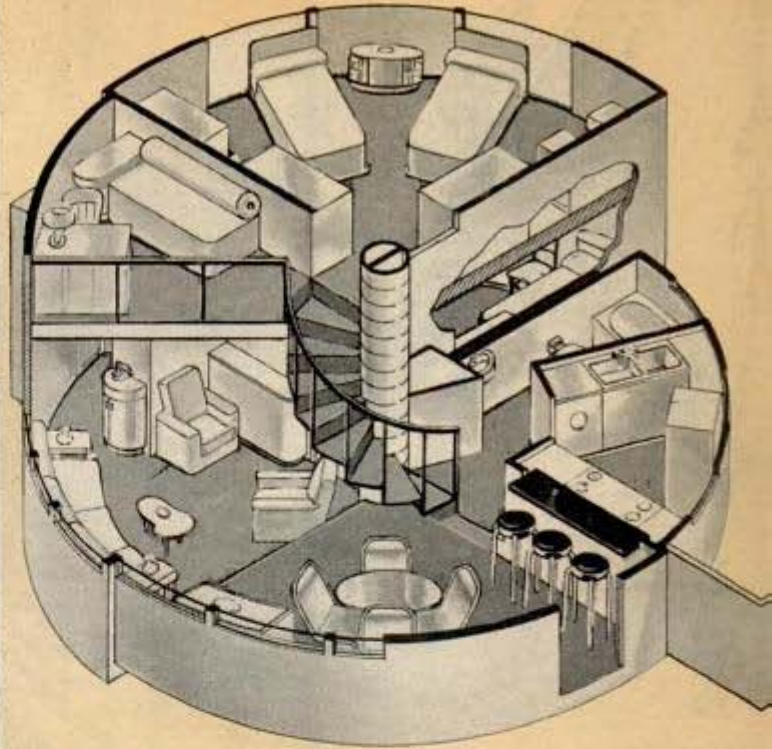


In bosun's chair suspended by block and tackle (top insert), TVA workman cleans and paints embedded steel at navigation lock in dam. Center, smokestack wrecker waves arm to signal for adjustment of guy wire. It took four men just three days to level 180-foot smokestack. Man at work on top of the stack is a welder. Right, if they carve their initials here no one will ever know, for this is side of 550-foot-high dam that holds back the Columbia River. A crane is used to lower workers, who use chisels and patching material

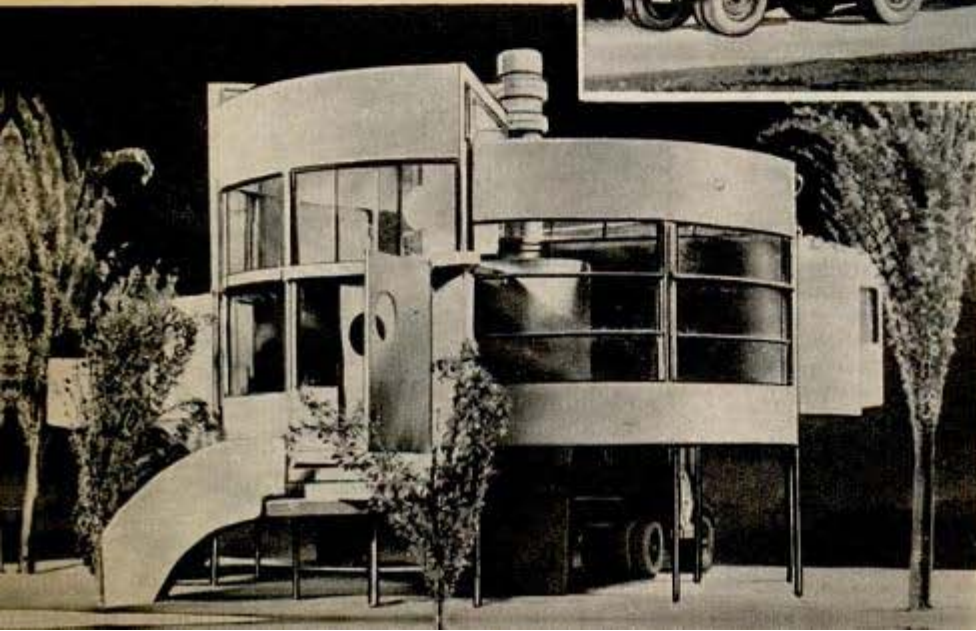
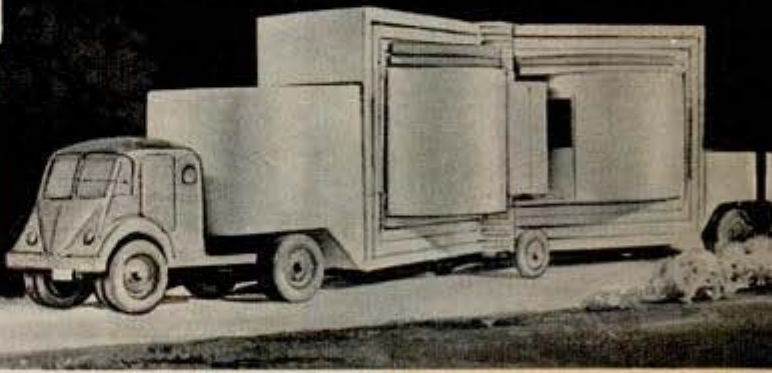
TELESCOPE HOUSE



A circular house which expands both vertically and horizontally has been proposed for the postwar market. By telescoping sections, the owner can adjust the size of his home at will. Top, model of house with sections telescoped. Above, model of house expanded into four rooms on one floor

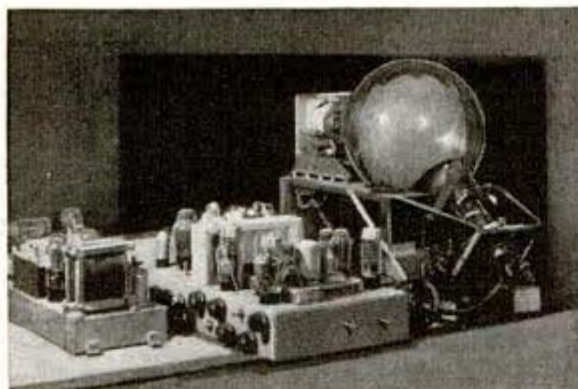


The house is composed of a series of pie-shaped cantilever sections which swing out, fanwise, from central supporting mast. Two-story model (above) has two more bedrooms upstairs

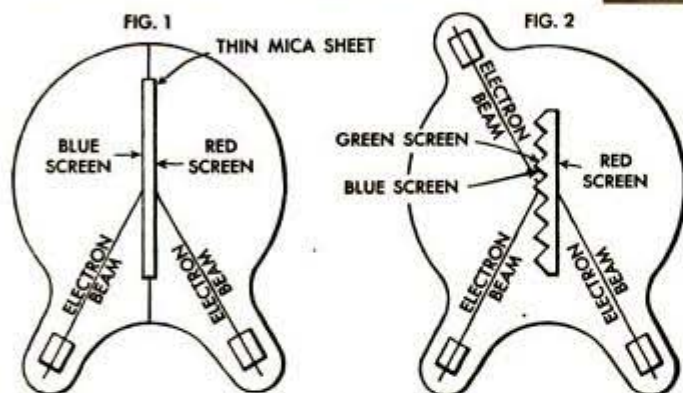


House can be loaded on a trailer (above) for delivery to site. F. J. Zavada, designer, says it may be possible to deliver finished units, fully equipped, direct to owner from factory. Left, exterior view of a model of a telescope house. Utilities are built into the structure as complete units—packaged kitchen, bathroom and living room. Lightweight materials may be used to eliminate much dead weight

Television in Color With a Two-Sided Screen



Above and at right, the cathode-ray tube which gives television in color. Below, Fig. 1 shows arrangement of phosphor coatings for two colors. Fig. 2 shows two surfaces on one side of the screen for a 3-color system



Television pictures in two or three colors are made possible with a new cathode-ray tube, the Telechrome. The picture appears directly on the tube's double-sided transparent screen, and no revolving color disks are necessary as in earlier systems. For the

two-color system, one side of the screen is covered with orange-red fluorescent powder and the other with blue-green powder. Two cathode-ray beams scan opposite sides of the screen, and the images are superimposed to give a picture in natural color. For the three-color system, another beam is required and the back side of the screen is ridged. One side of the ridges is colored green and the other blue. The Telechrome and the color system it employs were developed by John L. Baird, English television engineer. For stereoscopic viewing, colored glasses can be used. Baird has also worked out a system for stereo viewing without the use of glasses, but it is still in the experimental stage.

Armored Jeep Protects Airborne Scouts

"Little Ironsides" may never have a poem written about its exploits but it proved to be a safe and convenient means of transportation for scouts of the 82nd U. S. Airborne Division on the battlefronts of Holland. The paratroopers bounded the open seat of their jeep with steel sides almost as high as their heads, mounted a machine gun next to the driver, installed a two-way radio and put a sheet of iron in front of the radiator, then went zipping over the front on reconnaissance tours.



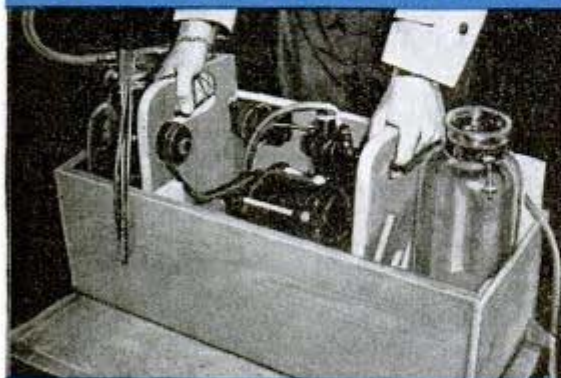
☞Horses have the largest eyes of any land mammal.

MEDICS IN DUNGAREES



Signal Corps photo

This portable X-ray unit takes the guesswork out of probing for bullets or shell fragments at field hospitals. Generals and Army doctors credit it with saving hundreds of lives. Here it is used for training medical personnel at a field service school in the European Theater of Operations. The 399-pound unit fits into three small trunks. Below, field suction apparatus for mobile surgical team



ANYBODY knows you don't have to be a doctor to be a mechanic, but in this man's war it is almost necessary to be a mechanic to place medical miracles within reach of seriously wounded Yanks on the front lines. Fast-moving medical units at the front are as mechanical as a tank battalion, and their equipment—from portable X-rays to collapsible operating rooms—is far more complicated.

The men who are performing these medical wonders within the sound of gunfire, and sometimes within rifle and machine gun range of the enemy, take on the appearance of combat troops. They get mud on their shoes, barbed-wire rents in their trousers, and two-day beards. But to a Yank bleeding to death on a stretcher, they look far better than a Park Avenue surgeon in cut-away and top hat.



Jeep carries medical corpsmen and pulls an emergency trailer

Their mobile operating rooms are moved on two or three trucks or on their backs and are set up in one or more tents. They must be close to the battle line to save the lives of gravely wounded soldiers who would die if they were to be moved even a few miles to a field or evacuation hospital. Semimobile hospitals cannot begin to keep the pace set by such armies as those of Lt. Gen. George S. Patton and Lt. Gen. Courtney H. Hodges during the swift-moving battle in France.

After the break-through at St. Lo and other whirlwind advances in the race across France, mobile medical units followed on the heels of speeding troops. They handle only the most serious cases of head, chest and abdominal wounds.

Litter patients are swung aboard a hospital ship after being transported by landing boat from hospital barge. Note patient with magazine



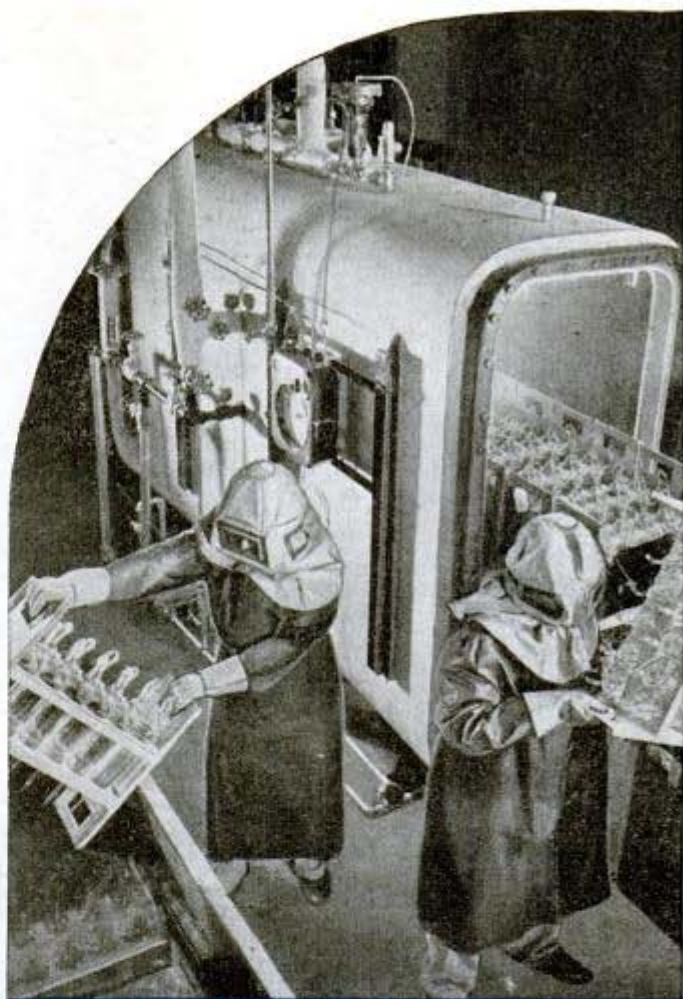
During the last war, the death rate among such cases was about 70 percent. One medical unit attached to an infantry division in France has kept this front line death rate under 10 percent.

"If proper medical care is to be given wounded men," said a spokesman in the surgeon general's office, "the surgical teams must keep pace with the attack. Medical personnel and equipment that do not arrive in time to be of service are nothing less than impedimenta."

The finest equipment the Army can devise helps the medics in dungarees keep the pace and perform with a high degree of efficiency. The advance auxiliary surgical groups, working in collaboration with evacuation hospitals within the combat zone, travel in their own trucks, supply vehicles, jeeps, planes and on foot. They work in teams organized like firemen and are available for duty wherever they are needed.

The teams, each composed of four officers and 33 enlisted men, can carry a 25-bed surgical hospital on their backs. This includes all of their instruments, tents, dressings, gasoline sterilizers, blood plasma, water, medicines and other supplies. One crew carried such a hospital from Port Moresby to Buna in 40 days, and in Italy, the Western Front and the Philippines surgical units literally carry their hospitals in their hands into areas where roads are impassable. The teams have their own auxiliary power units for electric current; a pint of gasoline sets a portable generator to turning out enough electricity to light a field hospital.

In addition to the "pickaback" hospi-



Courtesy William R. Warner & Co.
Intravenous solutions of dextrose and of sodium chloride are sterilized in this autoclave at 240 degrees Fahrenheit. Below, kitchen and refrigerator unit of mobile hospital is formed by two vans back to back. Units like these kept pace during race across France





This dental X-ray is used in well-equipped office on board Navy barracks ship. Below left, plastic vacuum pump is used by Army Medical Corps to extract the venom from snake bite wounds. Below right, wounded veteran from overseas "checks out" of hospital plane

tal, surgical operating trucks are also used on the front lines. These are two-and-one-half-ton, six-wheeled vehicles. The medical teams work in tents attached like two rooms to the rear of the truck, and several teams can work at the same time. The operating rooms have screened windows and are double-walled and lined with white duck to heighten the illumination.

Stairs lead up to the inside of the truck, which is used for storage of supplies, instrument cabinets, sterilizers, and chest pharmacies where the doctors can fill their own prescriptions. With medical teams working around the clock, from 80 to 100 men can be operated on in 24 hours in one of these mobile units.

Other mobile units, not of an emergency nature, include optical and dental vans with complete facilities.

One surgical outfit designed for air transport consists of three operating rooms 16 by 16 feet, complete with screens, floor and roof. This unit can be set up in less than half an hour.

The field instrument that has evoked perhaps the highest praise from our generals, Army doctors, and even the GI Joes, is the portable X-ray machine. It takes the guesswork and the pain out of probing for bullets and shell fragments, and has saved the lives of hundreds of men since its debut in the Tunisian campaign. The machine can be fitted into three small trunks with a total weight of only 399 pounds. Many of these units are flown to the front where they can be set up, ready for use, in 15 minutes.





The operating table in this field hospital is crude, but much of the portable equipment is the last word in medical science. Below, marine on treadmill at naval research hospital



The importance of X-ray examination for military wounds is revealed by a case of air raid injury reported by the Journal of the American Medical Association. A man was brought to a hospital with a thigh injury which at first glance appeared to have been caused by an embedded bomb fragment. But the X-ray pictures showed an unexploded cannon shell

buried in the tissues—an armor-piercing shell that explodes on impact!

Under normal procedures the shell easily might have been exploded during the operation. While the patient was left in happy ignorance of his predicament, a tense surgeon deftly performed the most dangerous and successful operation of his career.

Some of the equipment in the mobile hospital is so new that many of the officers never heard of it in civilian practice. An example is the electrical locator, a scientific “diviner” that locates hidden bits of metal.

It resembles a portable radio, and the dial not only registers the location of shell fragments but it can be used in determining their depth to an accuracy of one-tenth of an inch. The probe, or finder, is about the size of a large fountain pen and is made of stainless metal or Bakelite.

This instrument was first used on a large scale at the Tripler General Hospital in Hawaii after the attack on Pearl Harbor. In one difficult case, the locator was used in the removal of a machine gun bullet lodged in the spinal canal. The doctor who officiated reported that it was doubtful if this bullet would have been found by X-ray alone.

Another miracle-performing instrument is the surgeon’s “radio knife,” an electrical device that prevents excessive loss of blood by sealing small blood vessels as

Military truck teams up with cargo plane to rush containers of blood to the front



they are severed. This is used primarily in brain surgery.

Special medical kits have been developed for parachute troops, for the Arctic, the jungle, and for beachhead operations. The outfit, which is something of a medical marvel in itself, contains a pocket surgical kit, bandages, sulfa drugs, splints, morphine, plasma, iodine, safety pins, clinical thermometer, diagnosis tags, and even an indelible pencil.

After a wounded man has been given first aid, there are special litters, zipper sleeping bags composed of two lightweight mattresses, chemical heating pads, and scores of other things to help make him comfortable. Patients who have ridden in them say that even a jeep ambulance has its advantages.

The Navy has a portable hospital developed for amphibious landings. Every piece is designed so that it can be carried through the water from landing barges to the beach. The largest single piece of equipment is the refrigerator.

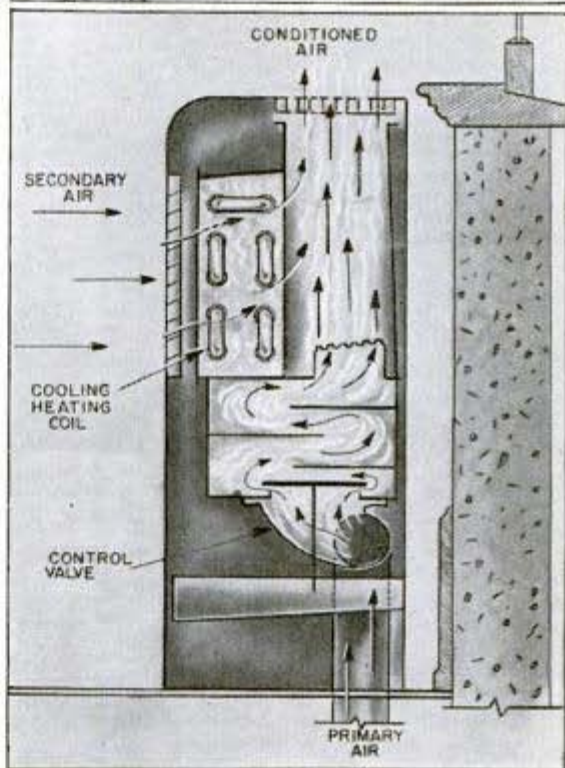
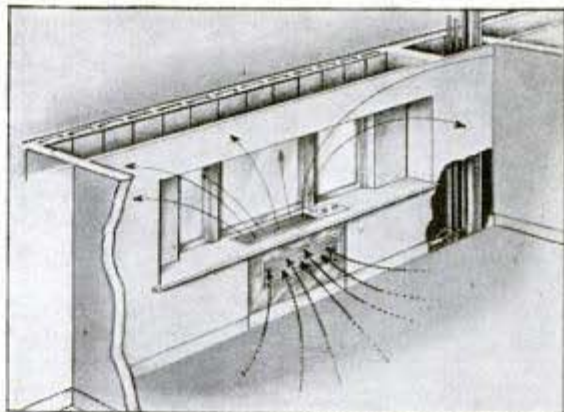
The bulk of the work performed by the medical corps is by no means confined to the hospitals. The men must watch over sanitary installations of all kinds and be on constant guard against such diseases as malaria, typhus, yellow fever and dengue. In the South Pacific the chances of a soldier getting malaria are probably five to 10 times greater than his being wounded by the enemy.

In the jungles, medical corpsmen wage a never-ending battle against malaria-bearing mosquitoes. A boon in this fight is DDT, the newest and most effective insecticide ever known. It is so deadly to insects that a mosquito or fly will die if it touches a surface sprayed four months previously. The "mosquito patrol"—consisting of a specially equipped Marine Corps torpedo bomber—on one Pacific island reported complete "air supremacy" with no mosquitoes left.

Helping the doctors at the front to fight diseases like malaria and even common colds, infections, and other menaces to the health of Yanks overseas are an imposing array of new drugs. They include sulfadiazine, penicillin, atabrine and a host of others that have never made the headlines. In one instance, a new method for the treatment of burns saved the lives of all but six of 400 soldiers seared by flaming oil.

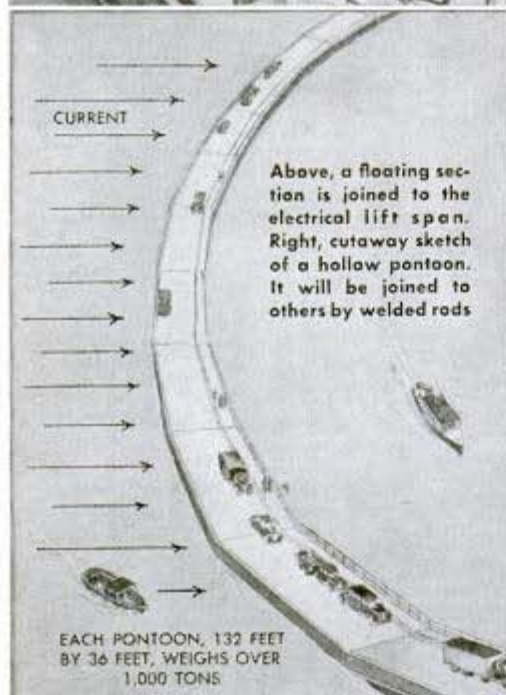
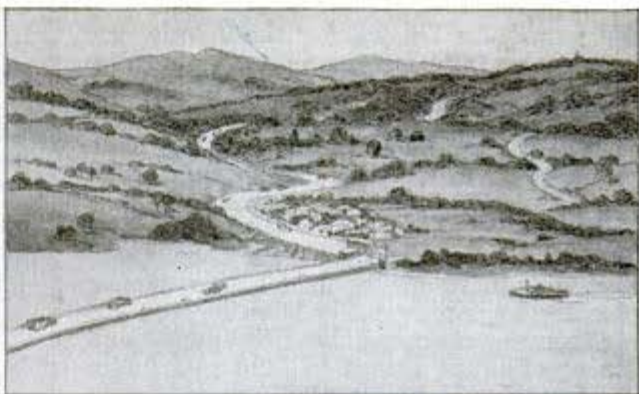
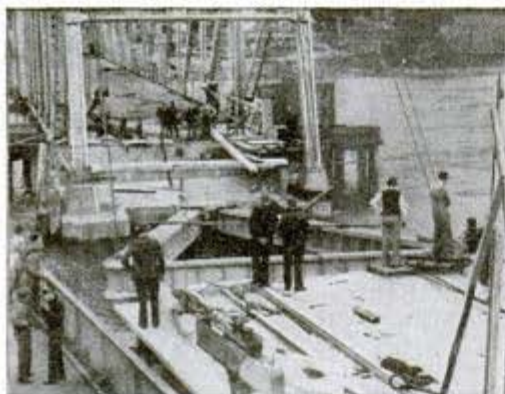
When the medics in dungarees get back home, their kits will contain many miracles that will help make America a healthier nation. Meanwhile, they are trying to break their own all-time record: a death rate of about 2 percent among the wounded not killed outright. During World War I, this mortality rate was about 9 percent.

"Indoor Climate Control" For Individual Rooms

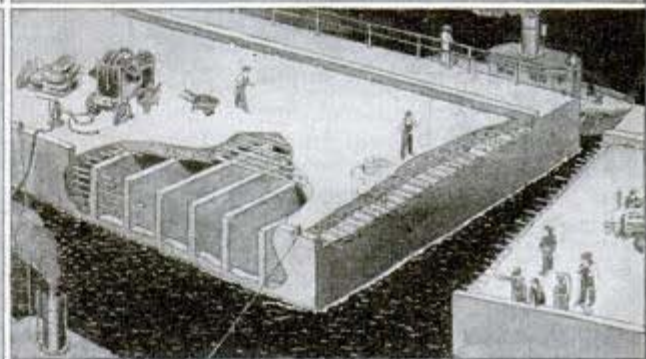


A new system of "indoor climate control" has been devised by the Carrier Corporation for large buildings with many small rooms. The method eliminates return air ducts and reduces the air supply conduits to six inches or less in diameter. "Thinking valves" regulate the heating and cooling action of the unit in each room the year around, and any room supplied from the same central conditioner can be heated or cooled to suit the comfort of the occupant. The central air conditioning apparatus is only about one third the size required by other systems. The key to the system comprises small high-pressure fans which discharge the conditioned air at static pressures and velocities much higher than formerly considered practical.

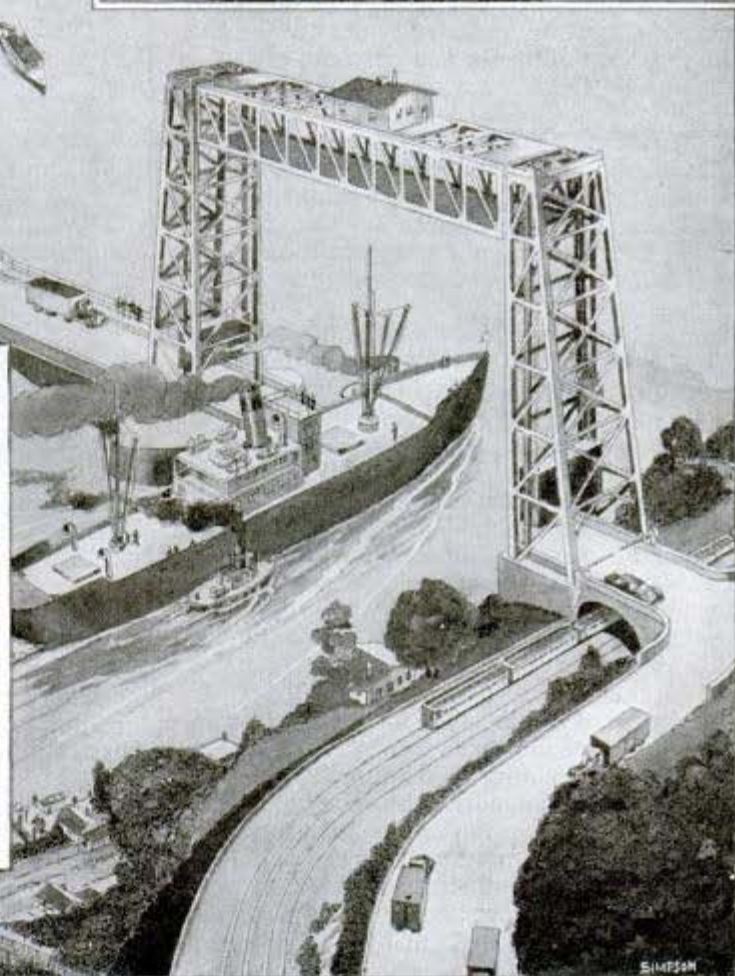
Floating Bridge Bends Arch Into River Current



Above, a floating section is joined to the electrical lift span. Right, cutaway sketch of a hollow pontoon. It will be joined to others by welded rods

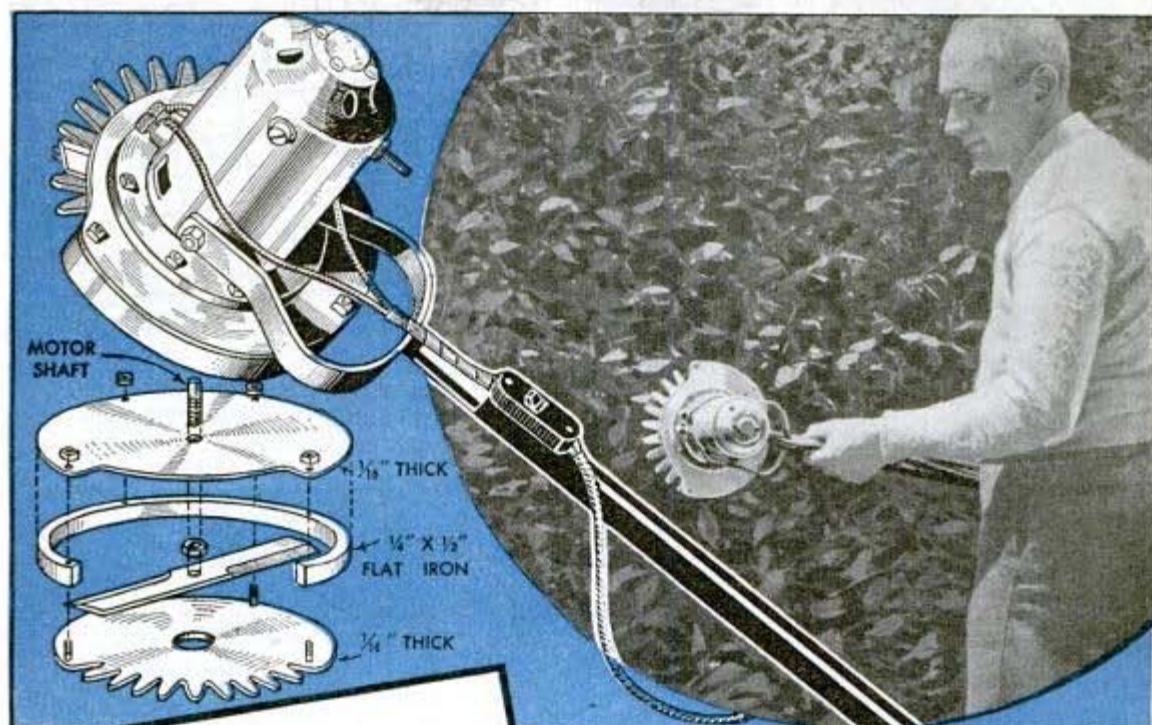


A floating bridge which rests on the water instead of on pillars has been built across the Derwent River at Hobart, Tasmania. The span, which is 3,165 feet long, employs the arched bridge principle but on a horizontal plane. Curving like a great bow upstream, the bridge presses sideways with the push of the current against the bow. It consists of 24 hollow, concrete pontoons, each weighing more than 1,000 tons. Welded together, they make up a 30-foot roadway. At one end ships pass under an electric lift section which can raise to 180 feet



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The CRAFTSMAN



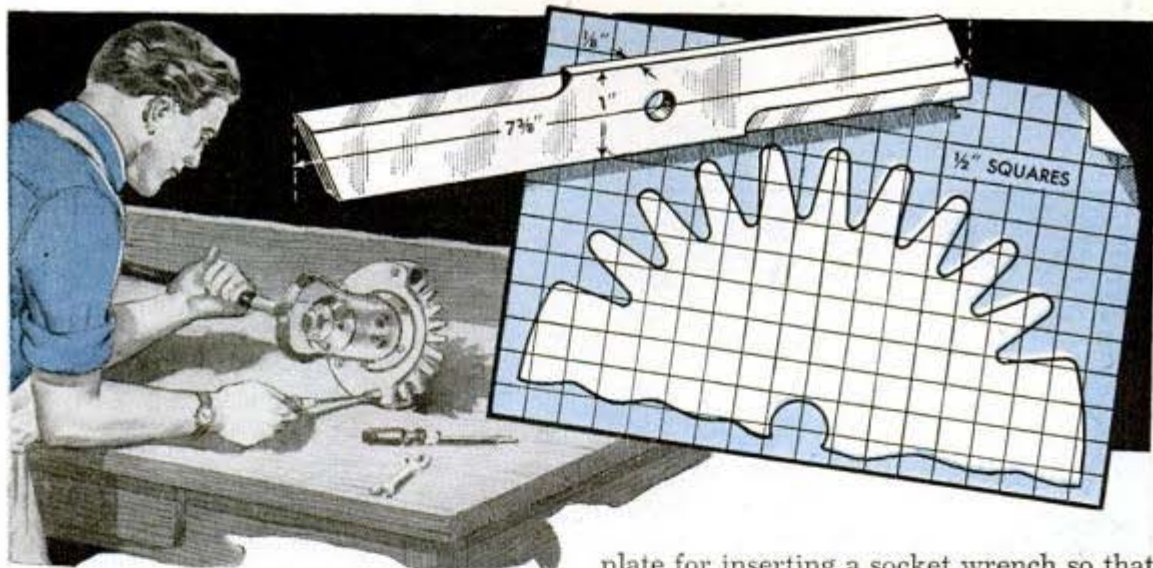
Electric HEDGE TRIMMER

By Bruce E. Stevens

IMPROVED from an old vacuum cleaner, this electric hedge trimmer is fast, efficient and easy to handle. Also, it can be used not only on privets and similar shrubbery, but on weed patches and in other places that cannot easily be clipped by a lawn mower. To convert a vacuum cleaner into a hedge trimmer of this kind, first remove the sweeper housing, including the suction fan. The assembly usually can be taken off merely by removing a few bolts that secure it to the motor housing. Next, substitute a new housing as shown in the illustration. This consists of top and bottom plates, with a flat metal segment between them which forms the side. On the trimmer shown in the illustration, sheet aluminum was used for the plates and spacer in order to assure light weight. However, $\frac{1}{16}$ -in. sheet iron or other similar material can be used for the plates, but the spacer must be of heavier stock so that it

can be drilled for bolts, which hold it in place between the plates. Overall sizes of the plates are not given as they are determined by the particular type of vacuum cleaner you use. The lower plate is serrated nearly halfway along its edge to form teeth between which twigs of shrubbery enter to be cut off by a rotating knife. The width and depth of the teeth and the slots are given in the cross-hatched pattern.

For the knife, you can grind down an old file of suitable size. Dimensions of the knife shown are correct only when the bottom plate is the size given in the pattern. For a plate of a different size, the length of the knife must be varied accordingly, although its thickness need not exceed $\frac{1}{8}$ in. In general, the knife should be long enough to extend to within about $\frac{1}{8}$ in. from the tip of the teeth, and the center hole should fit the motor shaft snugly. To drill a hole in a file, it is necessary first to remove the temper. This is done by heating the file to a dull red and then allowing it to cool gradually. After removing the temper and



drilling the hole, the file should be ground to a knife edge on opposite sides as shown, so that the cutting edge is toward the bottom plate, taking into consideration the direction in which the blade will move on the motor shaft. Also, it is important to balance the knife to avoid vibration. When the knife is completed, it should be heated to a cherry red and quenched in oil or water to harden it. Two nuts hold the knife on the shaft, one above and one below. A large hole should be drilled in the bottom

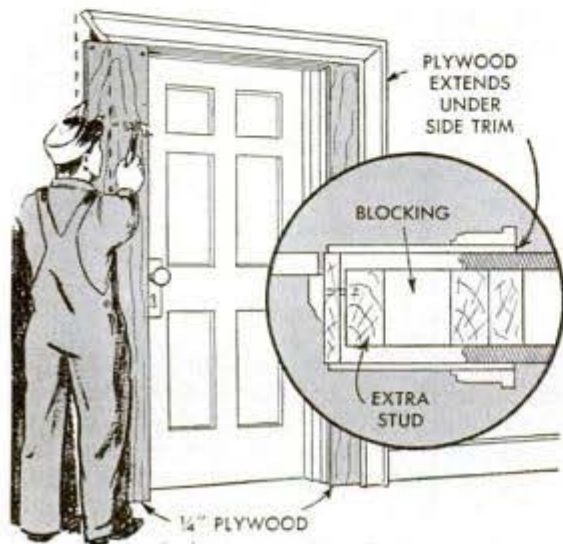
plate for inserting a socket wrench so that the lower nut can be tightened whenever needed to prevent the knife from slipping.

The original vacuum-cleaner handle is retained because its length counterbalances the weight of the motor and enables the operator to guide the head without much effort. On some types of vacuum cleaners the switch for the motor is located at the end of the handle. The switch may be left at this location and operated with the right hand; or it may be mounted near the motor, as shown in the illustration, where it will be visible at all times.

Easy Method of Installing Narrow Door in Wide Opening

If you have a door that you would like to use in an opening that is several inches too wide, you can do an attractive job without plastering, which usually leaves a patched effect. If it is necessary to center the door in the opening, install extra studs and attach the door frame to them in the usual manner. Then bridge the space be-

tween the frame and original edges of the opening with $\frac{1}{4}$ -in. plywood, letting it extend back under the full width of the trim as shown in the circular detail. It will be necessary to block out from the sides of the extra studs a distance equal to the thickness of the lath and plaster. If it is not necessary to center the door in the opening, the frame can be set against one side of the opening, thus making it necessary to install only one extra stud. If this is done, the space between the extra stud and the side of the opening is bridged with plywood as before. Plywood also is placed over the plaster an equal distance on the other side to balance the appearance of the door. The plywood should extend under the trim.

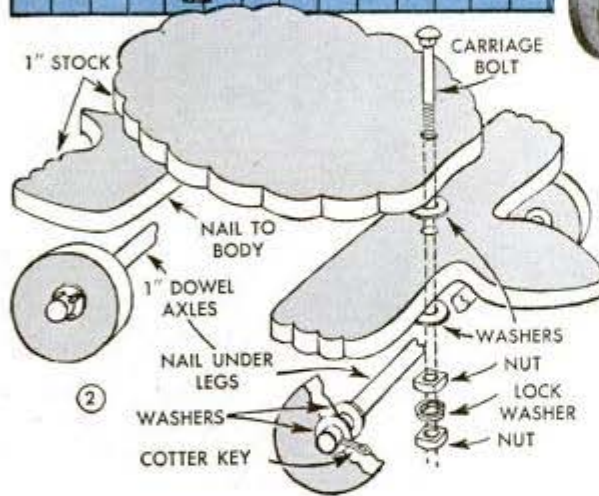
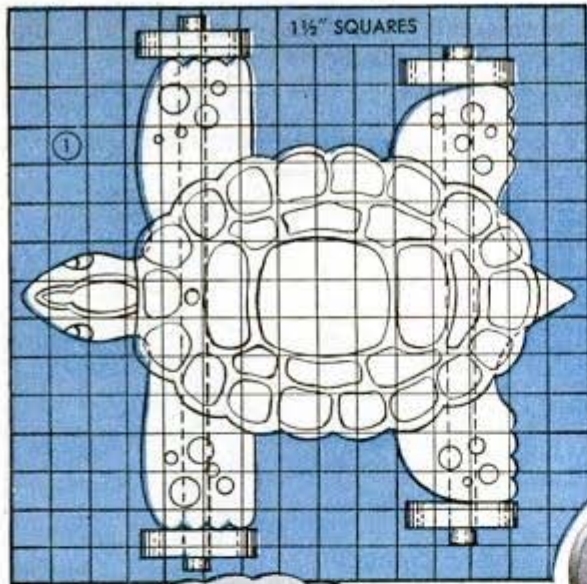


Bottle of Soapy Water Is Handy When Going on a Picnic

Before going on a picnic I dissolve a little soap in a bottle of water and take it along to wash the children's hands. A few paper towels or some pieces of cloth cut about 15 in. square complete the washing kit and save our regular hand towels.

Emily Nelson, Toronto, Ont., Can.

There's Nothing Slow About This Racing Turtle



Steered with the feet, this wheeled turtle can be pushed or pulled. If pulled, a rope is tied through a hole in the head. Cut the parts as indicated in Fig. 1 and assemble as in Fig. 2. It's best to use hardwood, which will stand the strain better than softwood. However, if the latter is used, wheels and axles should be made of hardwood. Paint the wheels orange, the legs green with orange spots, and the body orange with green spots. Put a 1-in. spacer between the body and legs to prevent the possibility of pinching the fingers

Gauge Assures Accuracy When Installing Door Locks

When installing one or more door locks of identical type, this gauge will enable you to mark accurately the positions for all mortises, holes and screws with a mere tap of a hammer. In addition to this, its use assures that all locks will be located exactly the same distance from the floor. The gauge consists of a wooden strip long enough to reach from the floor to the desired lock position on the door and a short block screwed to the strip as shown. Screws projecting slightly through the block and strip mark the desired positions on the door. If desired, the gauge can be made adjustable in height by using a strip a little shorter than the distance from the lock to the floor, and attaching a slotted extension piece held by a bolt and wing nut.

☞ Sawdust used with soap and water makes a good hand cleaner to remove grease.



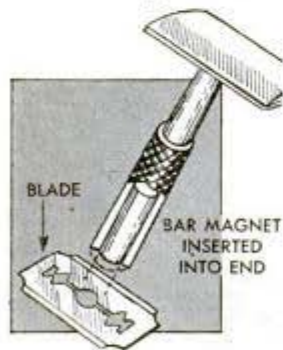
An Easy Way to Drain and Refill Water Pan Under Grindstone



If you have a grindstone of the type that rotates in a water pan that has to be drained after use each time because the stone softens if allowed to remain in water, here is an easy way both to drain and refill it. Drill and tap the lower end of the pan for a small pipe nipple. Then slip a length of hose over this and attach it to a water can. In use, merely raise the can above the level of the pan and the water will run into it. When finished using the stone, lower the can as indicated by the dotted lines and the water will run back into it.

Laurence Slater, Afton, N. Y.

Magnet in End of Razor Handle Helps to Pick Up Blade



Picking up a safety-razor blade that has been laid on a flat, smooth surface is no trick if you have a small bar magnet in the end of the razor handle. The magnet can be cemented into a hole flush with the end of the handle.

Oiling Electric-Clock Motors

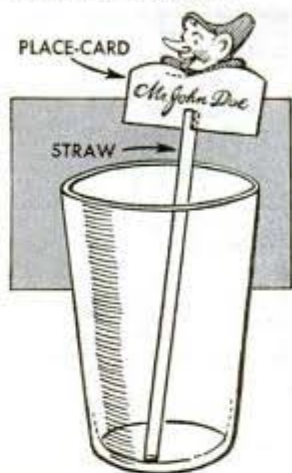
After a few years of service it is not unusual for an electric clock to become noisy. In a particular type of clock the noise will be found to come from inside an enclosed rotor which has a small driving gear projecting from the side and engaging the regular gear train in the works. To stop the noise on this type, place the clock back down with the gear pointing up vertically.

With the clock in this position, place several drops of light machine oil in the little depression around the gear shaft. Then immediately place the clock in a refrigerator. As the air inside the unit cools, it contracts and sucks the oil in through the shaft opening.

G. A. Kauber, Niagara Falls, N. Y.

Novel Place-Card Holders

Colored drinking straws provide unusual holders for place cards if they are slotted to receive the cards. The straws can be cut in half or used whole, and are inserted right into the beverage glasses. A safety-razor blade will be found handy for slotting the straws.—Albert E. Fenn, Chicago.



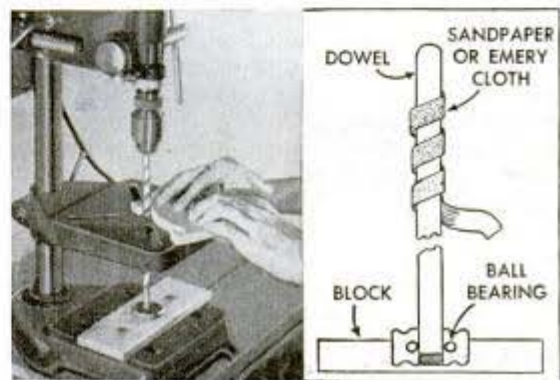
Perfectly Formed Pie Shells

If your pie shells bubble or shrink during baking, bake them between two pie tins of the same size. The tins should be of light material such as tin or aluminum. After 10 min. in the oven, remove the top tin and continue baking until as brown as desired. The result will be a smooth-bottomed shell that is perfectly formed.

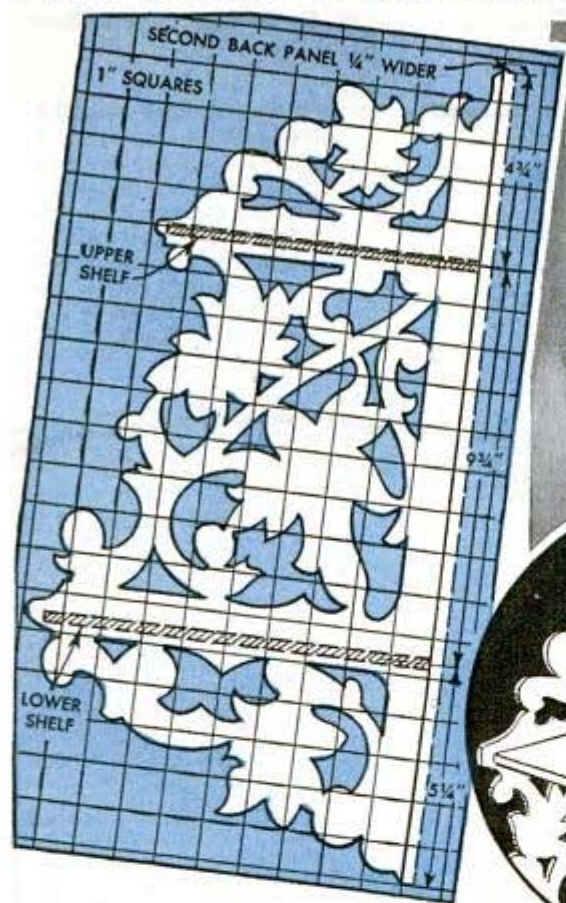
Margaret Deutsch, Duluth, Minn.

Sanding Stick for Drill Press

For sanding work having concave curves with small radii, a dowel wrapped with abrasive paper and rotated in a drill press is ideal. One end of the dowel is gripped in the drill chuck and the other end works in the ball-bearing of a roller-skate wheel which is set in a wood block and clamped to the drill-press base.



This Corner Shelf Has Scrollsawed Leaf Design



To "brighten the corner" of any room, this scrollsawed shelf in pleasing leaf design is just the thing for holding a small clock or bric-a-brac. Children like it, too, as a handy niche for their small porcelain or carved figures and other trinkets. To make the shelf, first re-draw the design shown in the cross-hatched pattern on heavy paper ruled off into 1-in. squares. Or, if you have a "postcard" projector, you can transfer the design to a large sheet of paper or directly to the wood, and just trace the lines. The most pleasing wood to

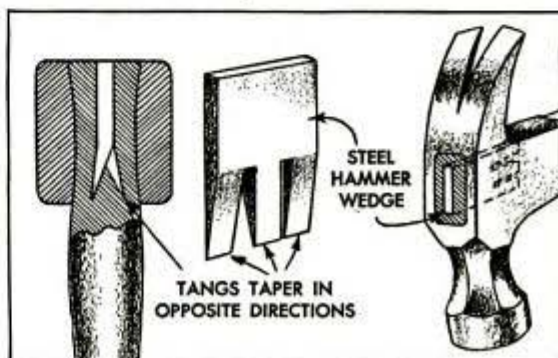
use for the sides is oak, maple or walnut about $\frac{1}{4}$ in. thick, but you can use plywood or any other suitable material if you intend to paint it. Because one side of the shelf overlaps the other, as shown in the circular detail, it should be as much wider as the thickness of the stock. The same material may be used for the shelves as for the sides. They first are cut square, then rounded at one corner, and are attached with glue and brads.

Norbert Engels, South Bend, Ind.

Non-Loosening Wedges Hold Small Tools Firmly on Their Handles

If you have trouble keeping a steel wedge from working out of the end of a tool handle, use a wedge like the one shown, which can be made from a flat piece of metal. Slot it in two places to provide three equal parts or tangs. Then bevel or taper the two end tangs on one side and the center tang on the opposite side. When the wedge is driven into the end of a handle, the tangs will bend slightly in opposite directions and thus secure the wedge firmly in place.

Arvid Bohlin, Montoursville, Pa.



Solving HOME

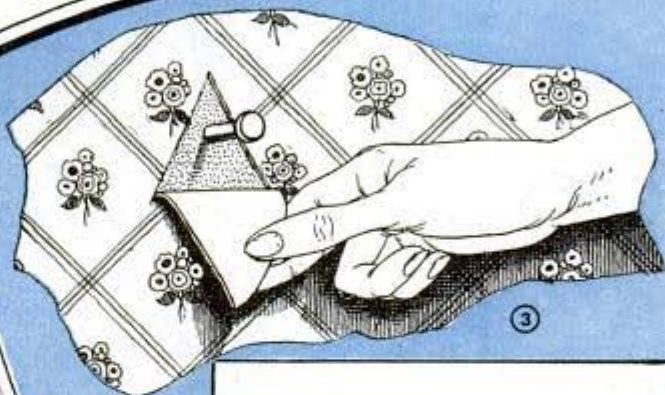
1: A small accessory cabinet to hook over the edge of a bathtub is convenient for keeping toilet articles within easy reach. The cabinet is made of thin wood and has two rubber-covered hooks to fit the tub. 2: If you store your clothesline in a shopping bag, it is less likely to become entangled. When putting up the line, pay it out of the bag as you go, and when only part of the line is needed, the unused portion is left in the bag, keeping it from being soiled on the ground



1



2



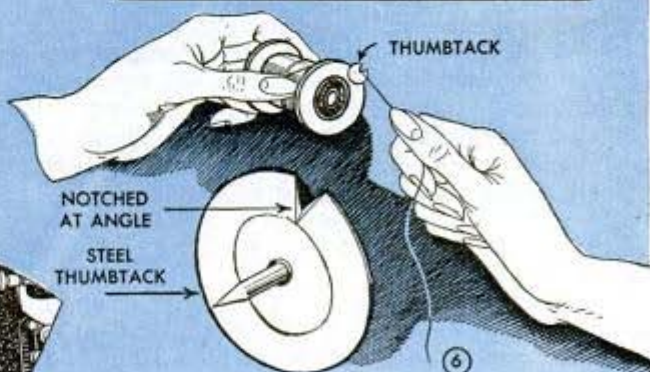
3

3: Before driving a nail in a papered wall to hang a picture, slit the paper and fold down the tab. When the picture and nail are removed the tab can be pasted back in place. 4: To repair utensil handles, use a paste of water glass and chalk colored by lampblack or other powdered dye

PLASTIC REPAIR



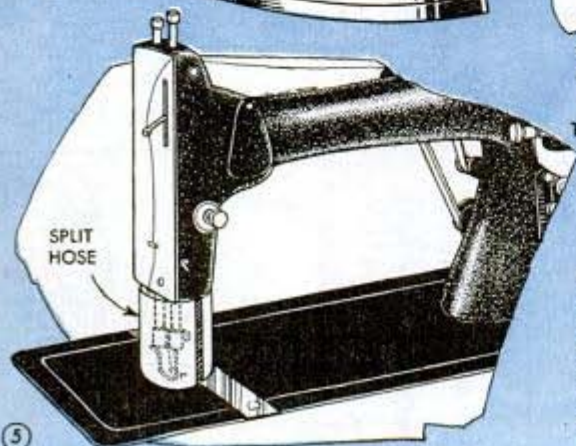
4



THUMB TACK

NOTCHED AT ANGLE
STEEL THUMB TACK

6

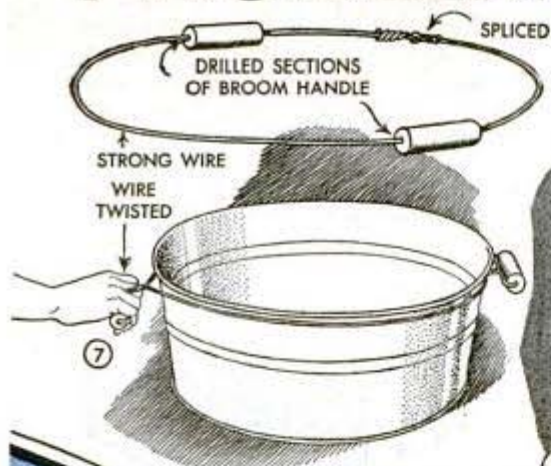


SPLIT HOSE

5

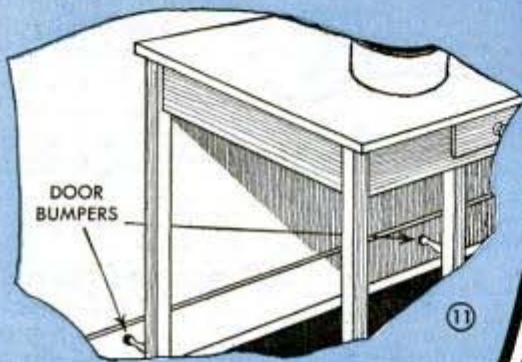
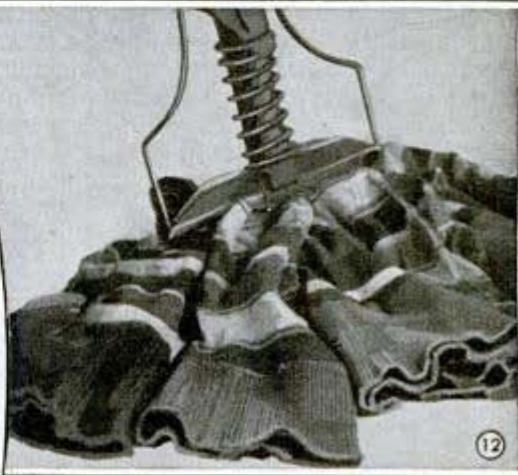
5: To prevent her small child from operating a sewing machine and injuring its fingers on the needle when she had to leave the machine for a few minutes, one mother slit a short piece of hose and slipped it around the needle and foot. 6: A cutter for use on a spool of thread can be made by notching a thumbtack as indicated. The edges of the notch are sharpened

PROBLEMS



7: If you have a tub or other container with a rim around the top but no handles, here's a way to provide them. String two short handles on a wire, splice the ends together and bring the wire around the tub, just under the rim. Twist the handles to tighten the wire. 8: It's easy to make a pair of clinker tongs. First, cut an L-slot at one end of a length of pipe and bolt or weld a U-prong to it on the side opposite the slot. Next, fit a wood handle over the other end and then insert a rod. Bend the end at right angles to work in the slot as indicated, and then curve it toward the U-prong. A clinker can be gripped securely by twisting the rod

9: For less handling and easier selection of phonograph records, it's a simple matter to show both titles of a record on each side, using gummed labels. 10: A tight metal screw cap on a glass jar can be removed easily if it is held in a flame a few seconds to expand the metal. Use a cloth pad to remove the cap



11: If a kitchen table is kept close to a wall, and the edge mars it, two rubber-tipped door bumpers driven into the rear legs will prevent the trouble. 12: Instead of discarding worn socks, save them until you have several pairs. They will provide a good dry mop

Drying Rack Folds Against Wall When Not in Use



Here is a rack for drying towels, garments, etc., that you can fold down out of the way when not in use. It's easy to make, too, because all you have to do is drill a wood strip for as many dowels as required, hinge this to a mounting block and screw the block to a wall. A short wood piece, also hinged to the block, supports the rack in the open position as indicated.

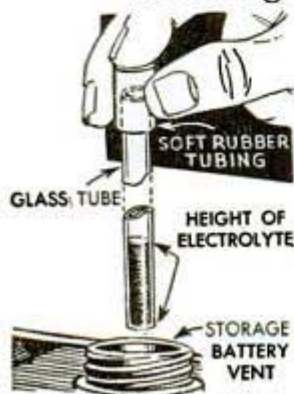
I. M. Fenn, Chicago.

Burning Sawdust in Fireplace

Sawdust is an excellent supplemental fuel for fireplaces. Place the dust in 10-lb. paper bags, packing it down well and folding the top in tightly. When a good fire is going in the fireplace, put the bag of sawdust in the back against the firebrick. The bag will burn away, exposing the dust which burns slowly, thus creating additional heat inexpensively.

Ralph K. Coffman, Arlington, Va.

Gauge to Measure Electrolyte In Storage Battery



A 6-in. length of $\frac{3}{8}$ -in. glass tubing having a short piece of soft rubber tubing slipped over one end will provide a handy gauge that will eliminate all guesswork as to the height of the electrolyte in your storage battery. To use, merely insert

the tube into the battery cell to the top of the plates. Then place a finger over the upper end on which has been placed the rubber tubing, and withdraw the tube. The height of the liquid in the tube will be the same as its height above the plates in the battery. It will be a good idea to scratch the tube to indicate the liquid height when the battery is full. This will enable you to determine quickly whether or not water should be added to the battery cells.

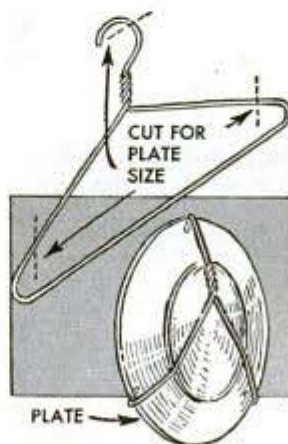
Spiral Cuts on Wood Spindle Laid Out With Tape

When you have a wood spindle that is to be decorated with spiral cuts or grooves, adhesive tape will enable you to lay them out accurately. First wind a strip of tape spirally around the work, making the



tape the same width as that desired for the grooves. Then wind a second strip of tape of the width desired for the spacing between the grooves, butting the edges of this strip against the edges of the first one. This second strip assures uniform spacing of the grooves. Peeling off the strip of tape first applied to the work gives an accurate guide for making the spiral cuts.

Easy Way to Make Plate Hanger



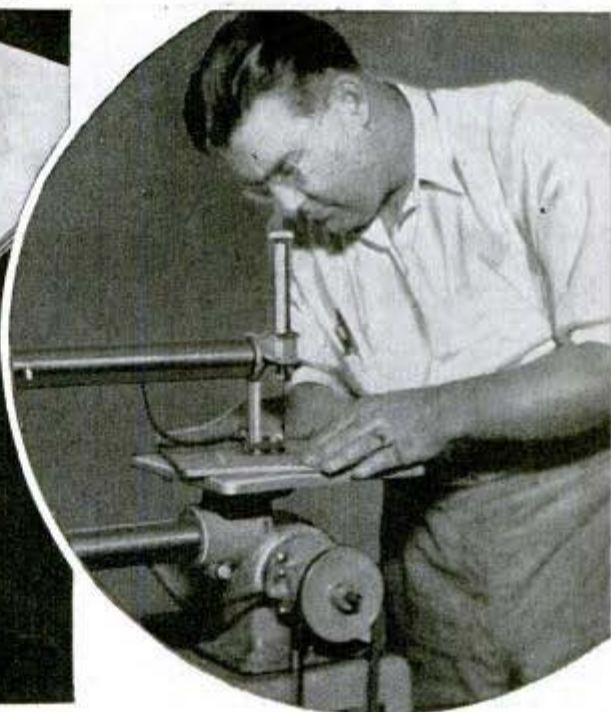
Hangers for decorative dinner plates can be made from wire coat hangers with ease. All that is necessary is to cut the hangers as indicated in the drawing, locating the two lower cuts according to the diameter of the plates. After bending short hooks on the severed ends of the

hanger wires, insert the plates and hang them on nails at the forks where the lower wires of the hangers join.

G. W. Butchart, Owen Sound, Ont., Can.

☞ The glaze will disappear from a grindstone, in which dirt and bits of metal have become embedded, if you hold a piece of ice against it as you turn it slowly.

Picture Lapel Pins Jigsawed From Thin Wood



It's easy to glue an attractive picture to thin wood, saw it out and attach a clasp to the back. That's all there is to making colorful lapel pins such as the one shown here. You can select suitable pictures from magazines or you can use photos—even one of the wearer. Plywood or hard-pressed board $\frac{1}{8}$ in. thick is used for the back. After sawing, sand the edges carefully and

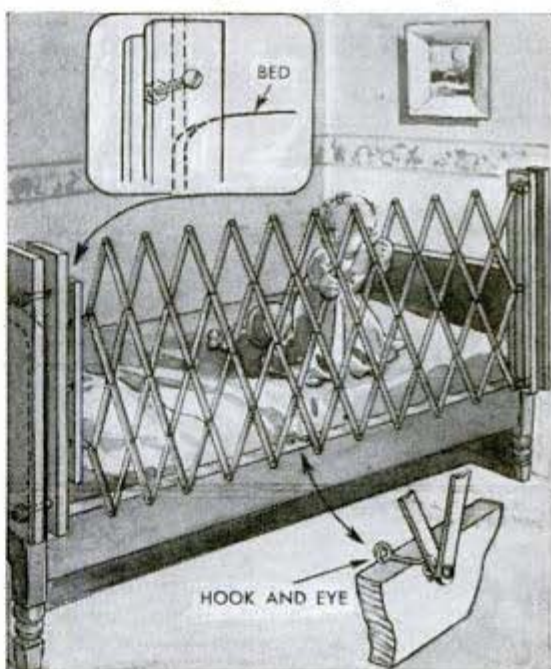
then put on the clasp, which can be taken from a discarded brooch. An ordinary safety pin will do if no regular clasp is available. Strong household cement of the imitation-solder type generally will hold it in place securely. A coat of spar varnish or transparent lacquer applied over the entire surface as a protection against moisture will add to the pin's appearance.

Folding Safety Gate Converts Bed to Temporary Baby Crib

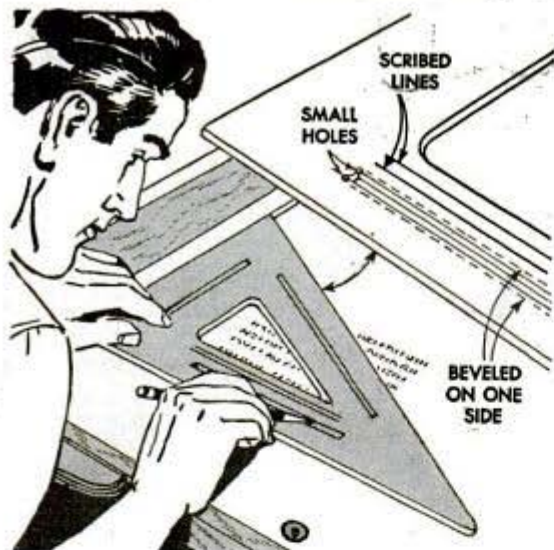
Instead of purchasing a baby crib, which the child would soon outgrow, we bought a bed that could be used later and converted it to a crib. To do this, the bed was placed in a corner of the room with the low foot end against one wall as indicated. In this way, it was necessary to close only one side of the bed to keep the baby in it. This was done with a folding safety gate. Wood strips were clamped to the head and foot of the bed for mounting the gate, using cloth between the bed and strips to avoid marring the finish for later use. A hook and eye can be used at the center of the bed rail to keep the child from pushing the gate out at this point. The gate is easy to push to one side when tending the baby.

T. E. Dahl, Yakima, Wash.

☛ To thread a needle with wool thread first twist a tiny piece of cotton on the end of the thread. This makes a smooth end which will allow the thread to slip through the needle without difficulty.



Slots Cut in Draftsman's Triangle Save Time When Lettering



Two or three slots of different widths cut in a triangle will provide a lettering guide that is always at hand, and will make it unnecessary to draw dimension lines. Two scribed lines above each slot will aid in spacing the lettered lines. Before cutting the slots, small holes should be drilled at each corner to prevent splitting the triangle.—J. A. MacDonald, Stamford, Conn.

Water-Pump Thumping Silenced With Rubber Hose

Automatic electric water pumps sometimes thump noisily when the pressure increases too fast for the pipes to accommodate the sudden volume of water. To eliminate this disturbing noise, cut out a 12-in. section of the supply line near the pressure tank and substitute a piece of hose, pushing it a few inches over the pipe ends and securing it with hose clamps. The rubber will expand under the increased pressure and thumping will not occur.

Smoothing Tops of Canning Jars

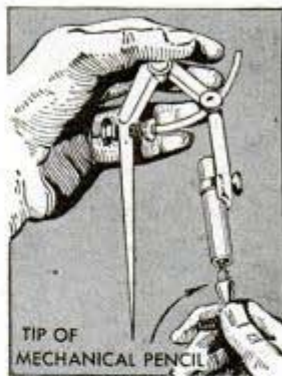


If you have some glass canning jars on which you cannot use vacuum-type lids because the upper edges of the jars are slightly rough, here is an easy way to smooth them. Tack a strip of waterproof emery cloth of 90 or 100 grit to a smooth board, using a

strip about 4 in. wide and 16 or 18 in. long. Stretch the abrasive taut, place the mouth squarely on the abrasive and rub it back and forth. Use water on the cloth to prevent clogging.—Wm. Fried, Cincinnati, O.

Improving Carpenter's Compass

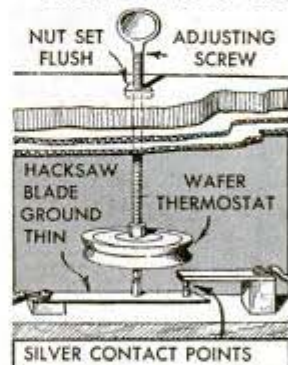
If you have a compass which uses a short stub pencil that has to be pointed and re-adjusted occasionally, it is easy to fit it with an automatic pencil. Just remove the lead end of a cheap automatic pencil and drill the end of a small dowel so



that the pencil can be inserted. The dowel should be of a size that can be substituted for the regular lead pencil in the compass.

Thomas B. Owens, Cleveland, Ohio.

Wafer-Type Thermostat Controls Homemade Electric Brooder



This inexpensive thermostat that anyone can make will solve your problem of controlling a homemade electric brooder, incubator, etc. All you need is a wafer thermostat, which can be purchased or taken from an old water-heated

brooder or incubator. This is attached to the end of an adjusting screw and mounted so that the lower side will press against spring contacts as indicated. The contacts are made from any thin, spring metal. An old hacksaw blade that has been ground thin will do. You can make the contact points from silver wire, or you can use discarded ignition points from a car.

F. Hayward, St. Petersburg, Fla.

WRITE FOR POPULAR MECHANICS!

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HOW TO MAKE

Reprinted
Home Kinks

Porcelain Repairs

47

ON YOUR SINK, RANGE, REFRIGERATOR

REPAIRING chips and scratches on porcelain or synthetic baked enamel is so simple that no housewife need hesitate to undertake the work. A variety of special patching products is available, usually at dime or hardware stores.

Stick porcelain: As the name implies, this type comes in stick form and is made fluid by heating. Use any thin flexible knife, such as a paring knife, and heat it over a gas or alcohol flame, as shown in Fig. 2, holding the Porcelstix at the end of the knife. Melt off enough to fill the hole and then apply, Fig. 3. Don't worry if you get a little too much on—it dries in five minutes and can be scraped down cleanly and easily with a razor blade. Advantages of this product are speed and a clean, solid patch not easily affected by mild oven heat, cold or fruit juices. Only disadvantage is that white as the stick is,



it is not as white as porcelain enamel. For better color matching, you can go over the patch with white enamel or lacquer.

Porcelain putty: Usually a very good

1 STICK PORCELAIN IS SIMILAR TO STICK SHELLAC. IT MAKES A GOOD PATCH BUT IS NOT AS WHITE AS PORCELAIN ENAMEL

2 HEAT KNIFE TO MELT STICK

3 APPLY MELTED CEMENT

4 USE FLEXIBLE KNIFE

5 SAND OR SCRAPE LEVEL

6 APPLY WITH PENCIL BRUSH

PORCELAIN PUTTY IS LACQUER IN PUTTY FORM. IT SHRINKS SLIGHTLY ON DRYING AND SHOULD STAND OVERNIGHT BEFORE SCRAPING OR SANDING

PORCELAIN GLAZE IS LACQUER IN PASTE FORM. IT IS APPLIED WITH A SMALL BRUSH. SUBSTITUTE PUTTY OR GLAZE CAN BE MADE BY ALLOWING ORDINARY WHITE LACQUER TO STAND IN OPEN DISH UNTIL IT THICKENS

Three ways to patch small chipped places in porcelain are shown in photos above. All methods will give good results with a minimum amount of skill, but don't expect the color of the patch to match the color of the porcelain



USE 5/0 PAPER FOR SANDING

white, this product is knifed into the defect, Fig. 4. It should stand a little above the surrounding surface since it will shrink slightly on drying. Allow plenty of drying time, at least overnight, before scraping or sanding smooth. If you sand smooth, use 5/0 paper backed with a felt or cork block, as shown in Fig. 7. With a little practice, you can get a perfectly level patch with a razor blade, used as shown in Fig. 5.

Porcelain glaze: This is thinner than putty—ideal for very small defects. Just take a brushful and apply, as in Figs. 1 and 6, let dry at least overnight, and then sand or scrape. This is usually the best white. Both putty and glaze can be homemade by taking ordinary lacquer or enamel and pouring off a small quantity in a dish. Let it stand in the open air until it thickens to the desired consistency. You can speed the work by adding dry powder color (zinc white or titanium dioxide) to the lacquer.

General rules: Whatever method you use, make a practice patch before starting actual work. Be sure the surface to be patched is clean. If there is an "island" in the chipped place, pry it out. Warm the

COMPLETE REFINISHING SCHEDULES

REFRIGERATOR EXTERIORS

- 1—Wash thoroughly. Let dry. Wipe with alcohol or lacquer thinner on cloth.
- 2—Sand lightly, 3/0 silicon carbide.
- 3—(If old surface is badly checked or chipped all over.) Apply coat of white primer-surfacer. Sand thoroughly when dry with 3/0 paper, with water as lubricant. (If old surface is good.) Apply coat of white primer. Do not sand.
- 4—Apply first coat of white lacquer enamel.
- 5—Patch all holes with lacquer putty.
- 6—Sand patches smooth.
- 7—Apply second coat of white lacquer enamel. Scuff sand.
- 8—Apply mist coat of straight thinner. Let stand at full gloss.

REFRIGERATOR INTERIORS

- 1—Wash thoroughly. Let dry. Allow refrigerator to come to room temperature.
- 2—Spray or brush one coat of white shellac enamel.

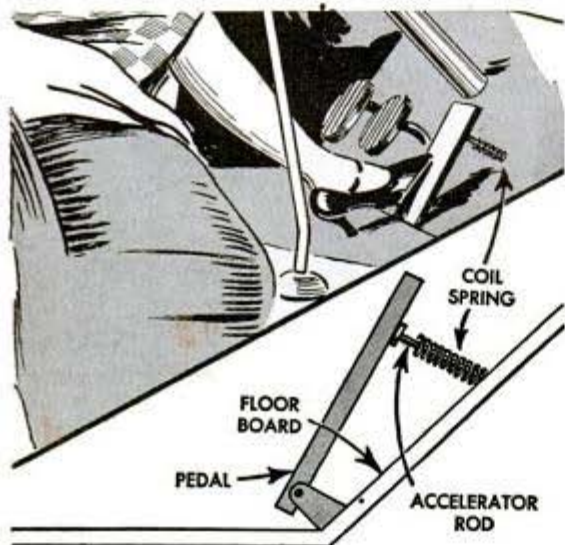
KITCHEN RANGES

Follow same schedule as for refrigerator exteriors, but use air-dry-or-bake synthetic undercoats and top coats. Turn the oven on to bake the various finish coats over and around oven; let other parts air dry until fully hard.

surface slightly with a warm cloth before patching. Do not expect perfection—it is almost impossible to apply a direct patch and get a perfect color match.

Complete refinishing: This is preferably done by spraying. Follow the schedule shown. Do not attempt to spray lacquer or enamel directly over a porcelain finish—always use a primer or surfacer to get necessary bondage between old and new finish. On kitchen ranges, the best product to use is an air-dry-or-bake synthetic. This will bake hard over the oven at normal oven heat, and will air-dry nicely on other parts. For refrigerator interiors, the best product is white shellac enamel. This sticks fairly well without a primer and has a definite advantage in that it dries without odor. Most other lacquers and synthetics will contaminate milk and butter for several days after application.

Spring Under Accelerator Pedal Acts as Governor on Car



In order to drive a car under a certain speed, yet be able to exceed this speed when necessary, one motorist put a spring under the accelerator pedal as indicated. When the pedal is pushed down under normal foot pressure to contact the spring, the speed of the car will not exceed the predetermined rate. However, harder foot pressure will compress the spring when it is necessary to travel at a higher speed. To install the spring, drive the car at the desired speed and measure the distance from the pedal to the floor. Then cut a compression spring to a length equal to this distance and slip it over the accelerator rod.

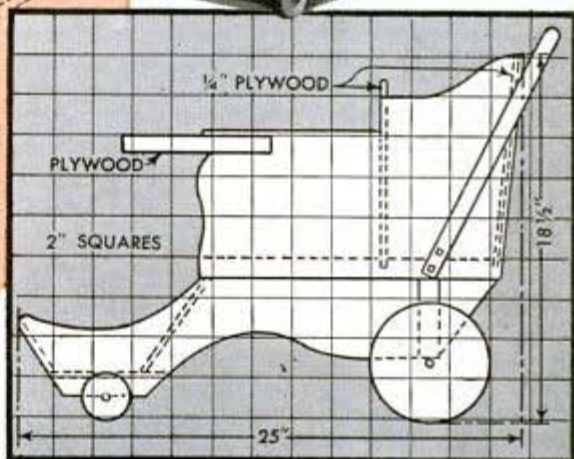
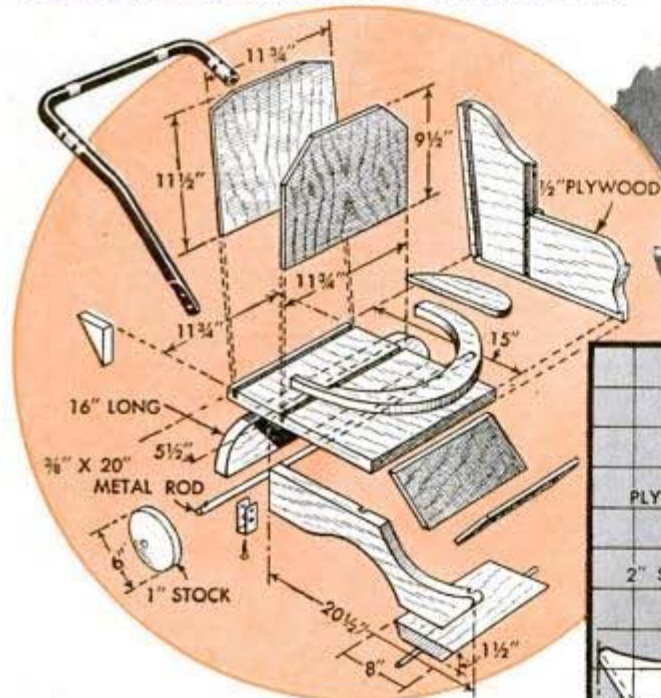
E. W. Harmon, Hobart, Ind.

Insulation board of the soft kind makes an excellent backing for archery targets.

WOODEN STROLLER

has space for extras

WHEN mother goes shopping, baby can go along in this wooden stroller, which has a rear compartment for carrying extra blankets or clothing and shopping parcels. When this space is not used, the front panel, which fits in a groove in the sides and bottom, may be lifted out to provide additional room for the child to lie down. Plywood is used for front and rear panels, sides, arm rests and guard rail,



and heavier material for other parts. The stroller is assembled as shown in the cross-hatched pattern. Side pieces, which are grooved as shown, are glued and screwed to the seat after which the rear panel is glued in place. Arm rests and the curved guard rail are attached with screws. A cross support for the axle is screwed to the seat and braced by a triangular piece at each end. The axle, a length of metal rod, is fastened to the support by two U-shaped pieces of flat iron, through which screws are inserted into the axle to keep

the latter from turning. Also, the axles are drilled at the ends to take cotter pins, which hold the wheels in place. Although not shown, washers should be placed over the axles on both sides of each wheel to facilitate revolving. For the handle, a length of 1-in. tubing or flat iron is suitable. This is bent to the shape shown and secured with bolts.

It Is Easy to Convert Pieces of Old Hand Files for Use on a Jigsaw

Satisfactory substitutes for manufactured jigsaw files may be made from straight, round, triangular or square files and from flat files that have parallel sides. Pieces 3/4 in. long are used with one end ground 1/4 in. round for a distance of 1 in. Small files may be set in solder in the end of a

piece of 1/4-in. o.d. metal tubing. For machine use, the files must be made with the teeth cutting on the pull or downward stroke of the saw.

☐ Brown sugar will not become lumpy if it is stored in a mechanical refrigerator.

Tacks Hammered Into Play Board Are Pegs for Yarn Outlines



To most children, a hammer and some tacks will supply hours of amusement. Just supply them with a smooth board about 15 by 20 in. and let them pound tacks into it at random. Then, after they are tired of this pastime, a ball of yarn can be brought out to continue the fun. Looped over the tacks, the yarn can be strung to outline animals, boats and other familiar objects.—Mrs. Hal Geihm, Aurora, Ill.

Tube Patches Used as Tire Boot

A firm, rigid and long-lasting boot for small breaks in tires can be improvised from two equal-size pieces of ordinary tube patching, somewhat larger than the break, cemented together and dried while being pressed in a vise. After the edges have been beveled, the improvised boot is placed over the cut in the usual manner.

Leonard Wright, Kokomo, Ind.

Glue Compound Seals Bottle Containing Volatile Liquid

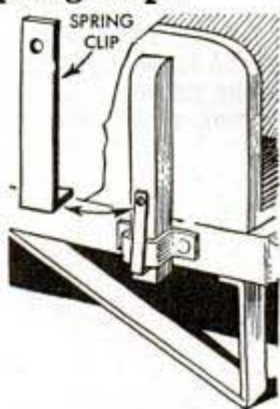


When a bottle containing volatile liquid is stored for some time the contents are likely to evaporate unless the bottle is sealed. To do this, dip the end of the bottle into a hot solution consisting of liquid flake glue, 4 parts, and glycerine, 1 part. When dry, the

mixture will form a tough film over the cap or cork and neck of the bottle. The film is easy to peel off when the bottle is to be uncorked.

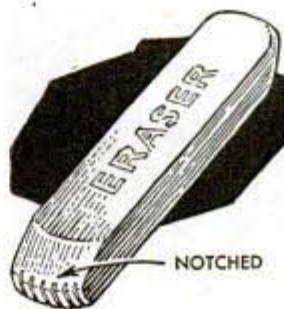
Removable Sides of Wheelbarrow Held by Spring Clips

If your wheelbarrow has detachable sides which sometimes jump out of their stirrups while going over rough ground, they can be secured by means of spring-steel clips. These are shaped as shown and are about $\frac{3}{4}$ in. wide and 4 in. long. The



clips are screwed to the cleats of the detachable sides and are bent to fit under the stirrups. When you wish to remove the sides, merely disengage the clips.

Notched Eraser Stops Smudging



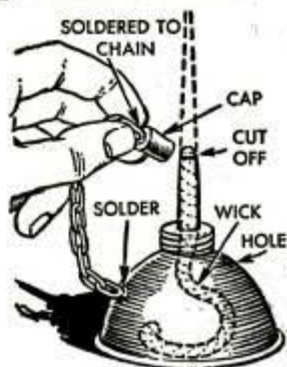
When using a pencil or ink eraser that makes black smudges on the paper, a few notches cut into one end of the rubber about $\frac{1}{8}$ to $\frac{1}{4}$ in. deep will eliminate the trouble. You will find that erasures can

be made faster and neater with less rubbing when an eraser is altered in this way.

Michael Ligocki, Gary, Ind.

Alcohol Lamp From Oilcan

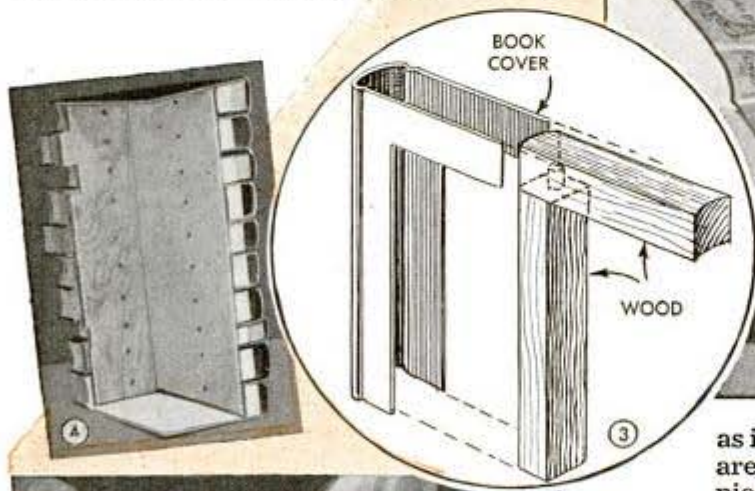
It is an easy matter to make an alcohol lamp from a small oilcan. Just cut off the spout an inch or so above the can, insert a wick and provide a cap to extinguish the light. This can be a piece of tubing closed at one end and attached to the can with a short length of small chain. A tiny vent hole should be drilled in the can close to the screw top.



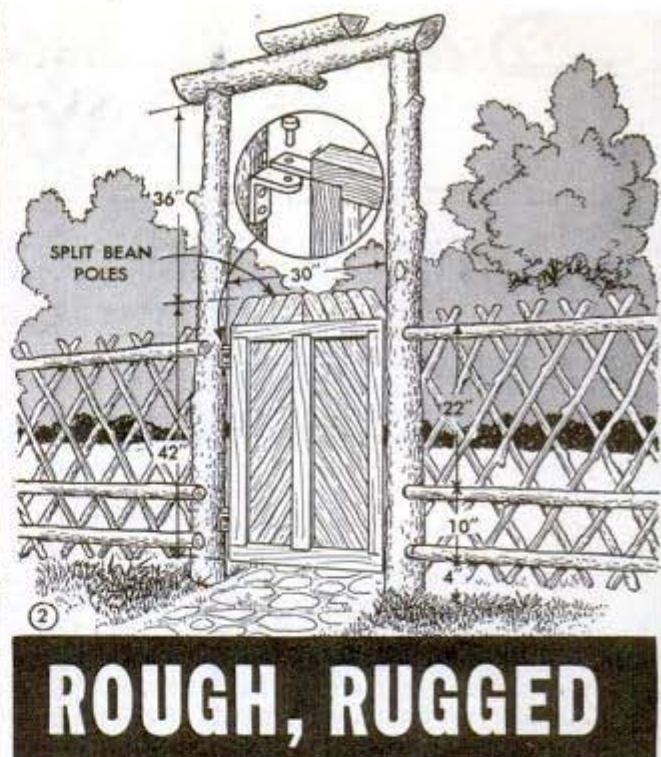
Larry Katz, Brookline, Mass.

Dummy Books Form HIDEAWAY

NO ONE would suspect that what appears to be only a trough of books is really a cleverly disguised hideaway behind which is space for temporary concealment of personal items. The trough, shown in Fig. 1, is made of $\frac{1}{2}$ -in. wood and consists of bottom, back and side pieces, the latter being scrollsawed for appearance. The "books" are all fastened together to form a single unit, which is lifted off, as in the illustration, to disclose the hideaway. Actually, only the covers of old books are used—as many volumes being selected as are needed to fill the trough. After removing the covers, take the smallest one and cut out a section from each side as in Fig. 2, leaving a strip about 1 in. wide along the top and edge adjoining the back. Using the cutout portion as a template, cut all except two of the other covers in the same way. As the two remaining covers are used at the ends, only the right cover of one and the left cover of the other are cut away, the outer covers being left uncut to conceal the hideaway between them. The cut covers are glued to wooden L-shaped blocks

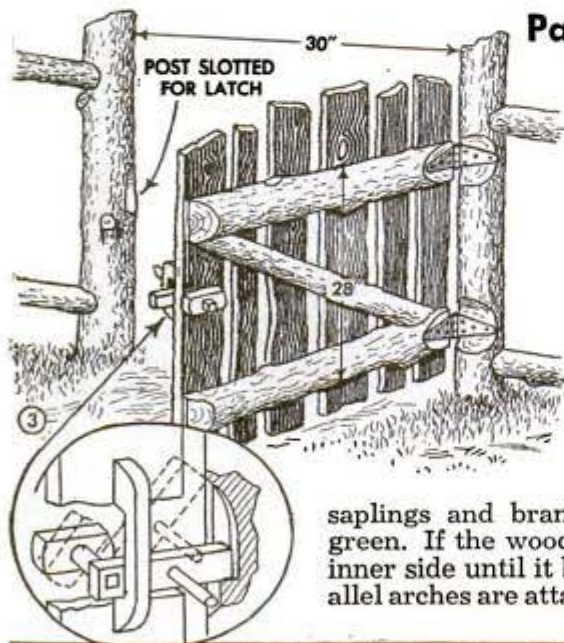


as in Fig. 3 and the imitation books are held together by screwing two pieces of plywood or hard-pressed board to the blocks as shown in Fig. 4. To simulate pages, the top edges of the blocks should be coated with heavy paint. A comb drawn through the paint as shown in Fig. 5 produces the effect of pages. The illusion will be heightened if a fine comb is used on some, a coarser comb on others, and none at all on the rest. To avoid mixing different colors and so ruining the book effect, the comb should be cleaned thoroughly in turpentine or other paint solvent after being used on one "book" and before being used with a different color on another.—Charles and Bertram Brownold, Woodmere, N. Y.



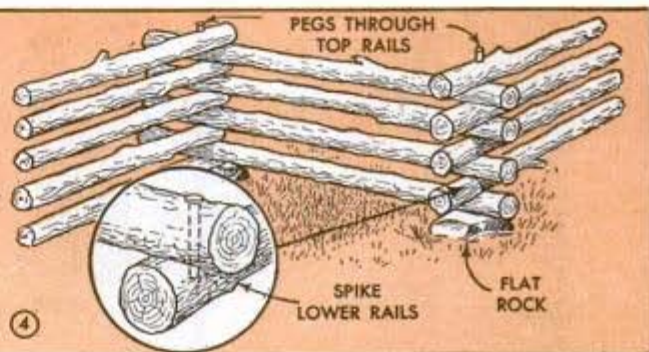
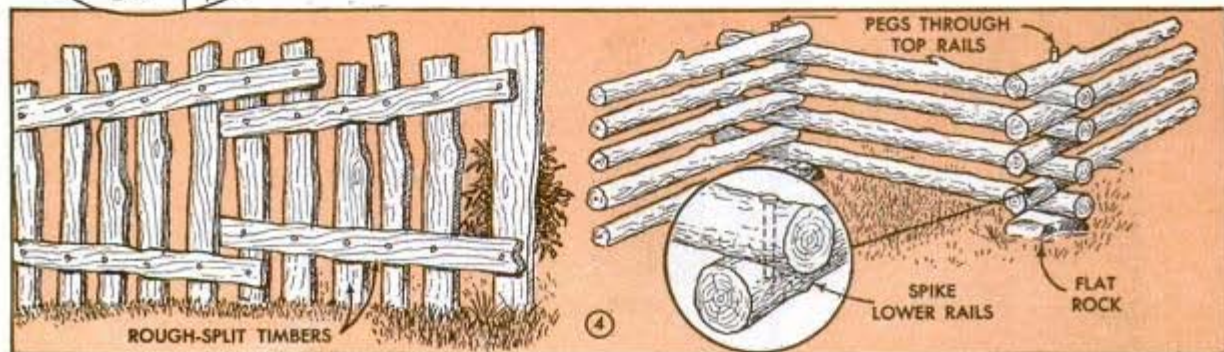
ROUGH, RUGGED

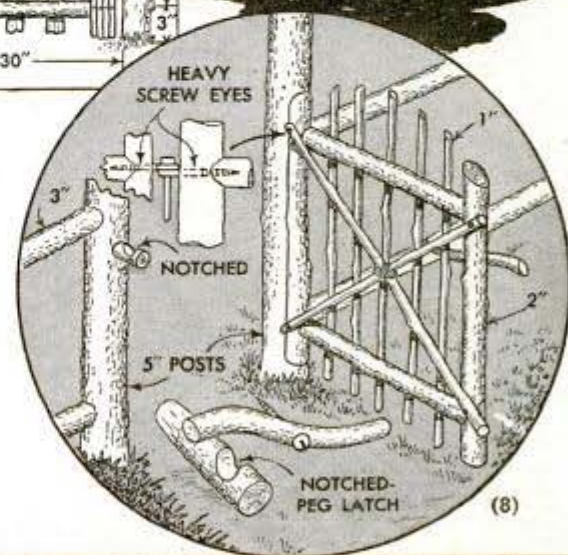
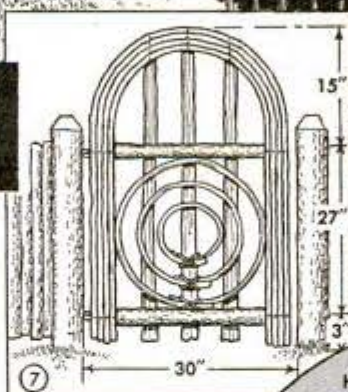
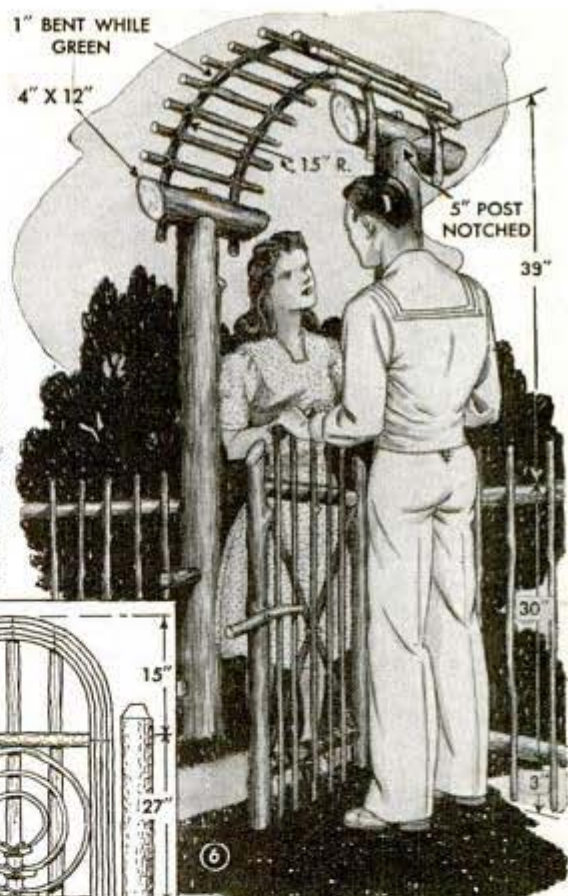
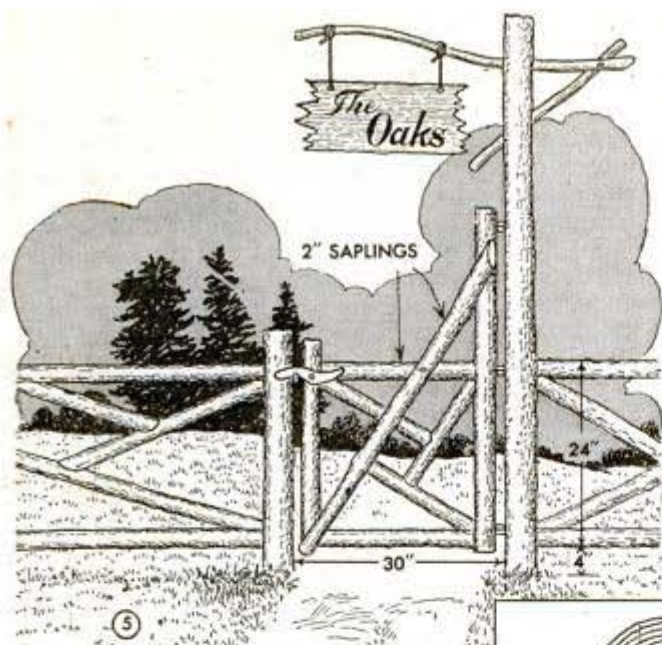
Part 2: Gates, Fences, Summer House



IN BUILDING rustic structures only seasoned material should be used, except members that are to be bent to a curve. These are best handled green and should be bent around a wooden form and allowed to season before installing on the permanent frame. Bark left on the pieces adds to the interest. But if it is of the variety that peels readily when dry, it should be removed. Screws are better than nails for assembling the parts, as they can be tightened if the wood shrinks. Where posts are set into the ground the ends should be tarred or creosoted to forestall decay.

The arched gateway in Fig. 6 is built of saplings and branches, the two arched members being bent green. If the wood selected is difficult to form, shave down the inner side until it bends easily. The short pieces across the parallel arches are attached with raffia or heavy brown cord. Pickets

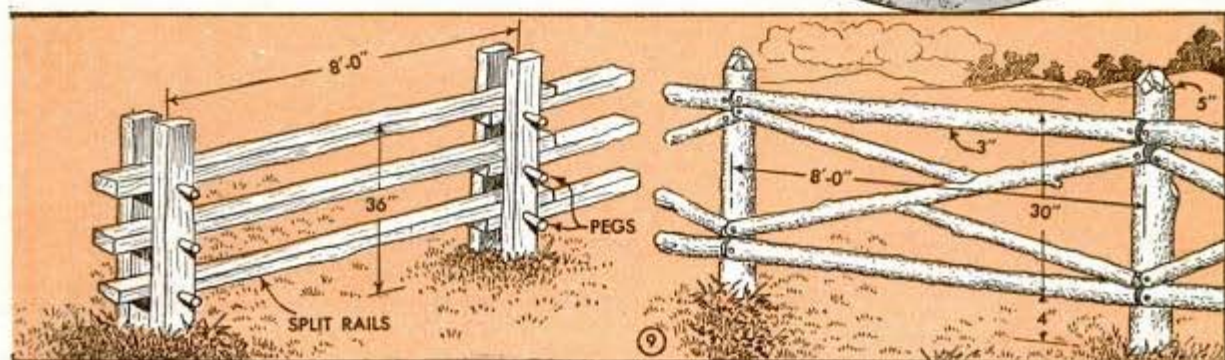


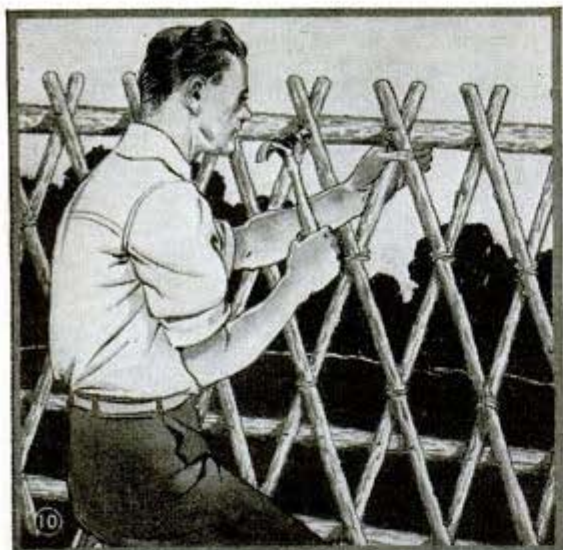


and RUSTIC

are 1-in. sticks nailed in place. If the wood tends to split, small pilot holes should be drilled. A notched peg and pivoted stick serve as a latch for the gate, which is detailed in Fig. 8. Hinges are heavy screw eyes with bolts through them.

An attractive gate suitable for a rail or slab fence is shown in Fig. 3. Rough-hewn slabs with artificial knotholes are nailed to a frame of split saplings and hung on strap hinges. A wooden latch locks in a slot in the gatepost. The herringbone gate in Fig. 2 is an easy project in localities where split stakes are available in quantity. The split members, when nailed with the flat sides against a board frame, form an attractive panel effect. Bolts through metal angle brackets serve as hinges. A commercial latch is used. The diamond-pattern fence adjoining the gate consists of sticks nailed





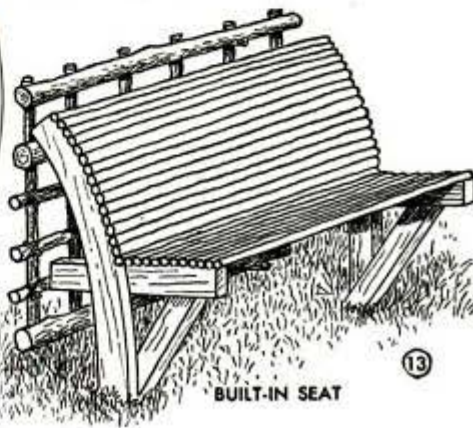
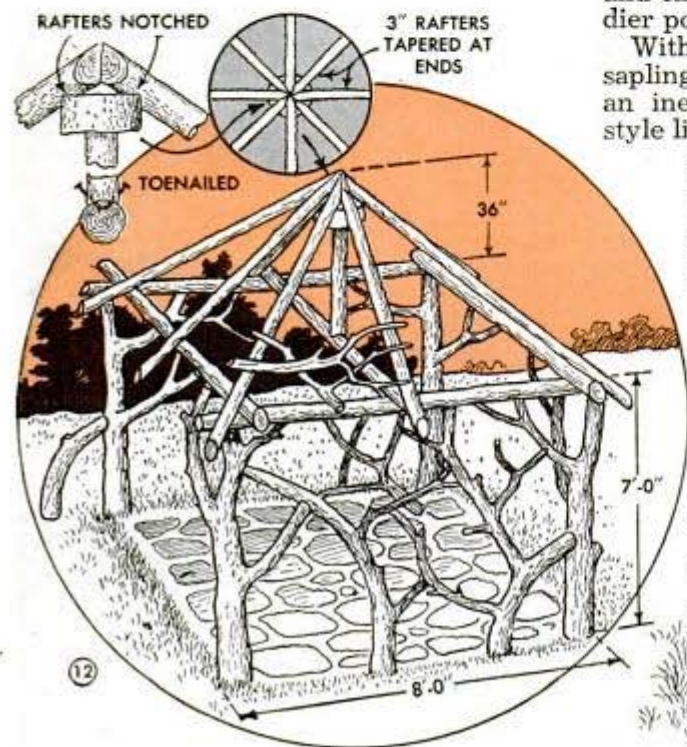
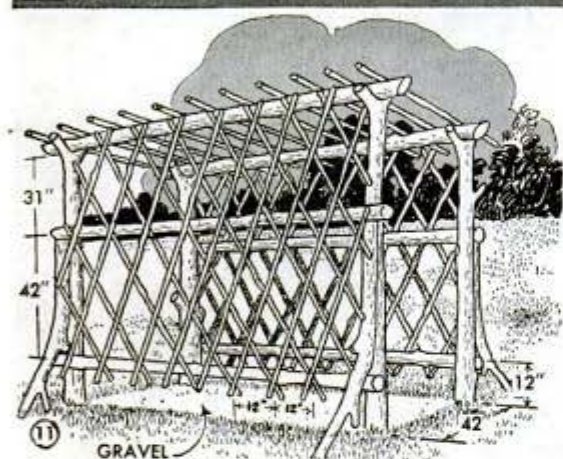
or bound to horizontal members as in Fig. 10. Other pleasing designs in gates are possible with green willow switches, the gate in Fig. 7 being a good example. The willow bends readily to a small radius and is secured to a rustic frame with brads and raffia. A more rugged type of gate, with name plate included, is presented in Fig. 5.

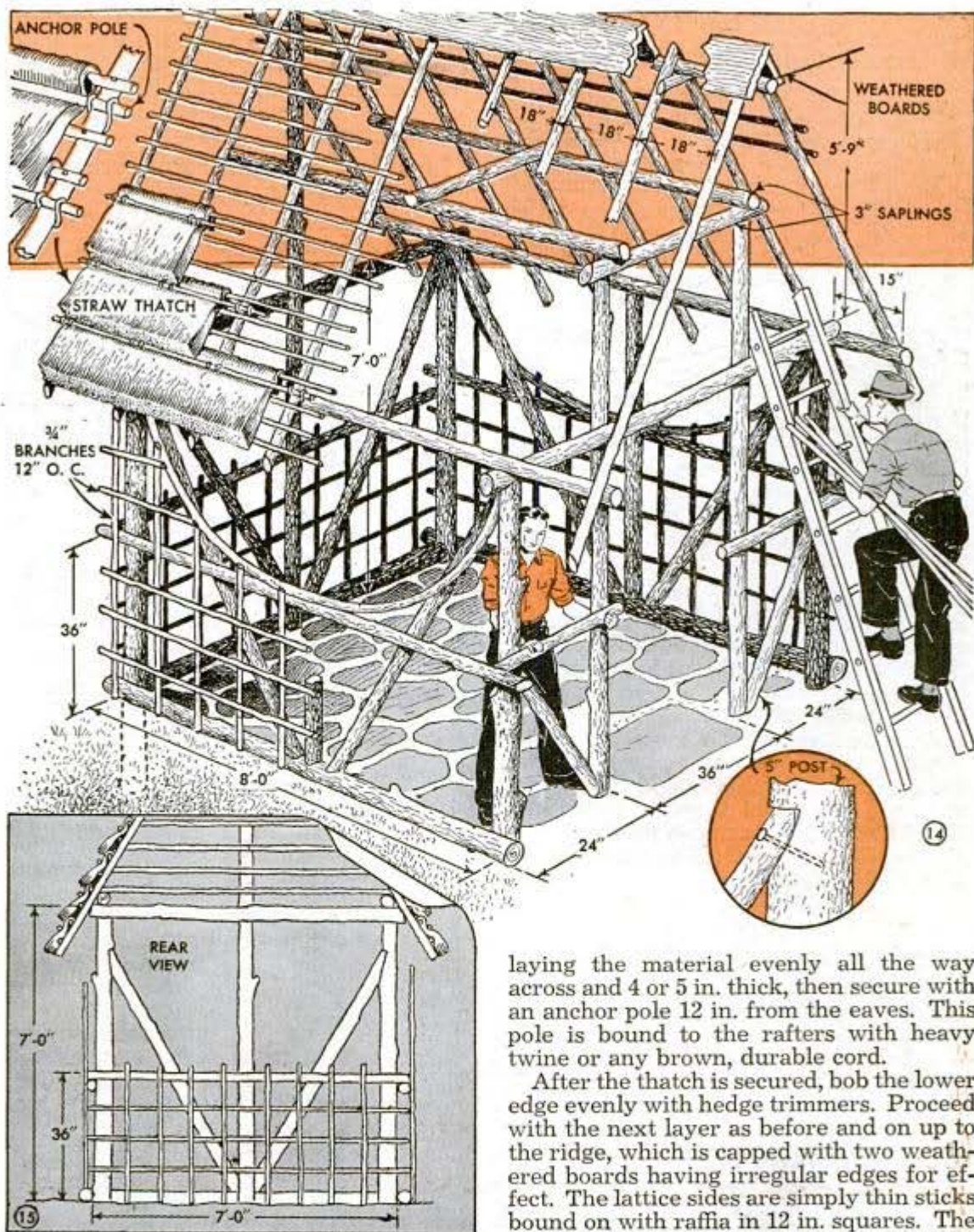
In sections where timber is plentiful the log fence in the right detail of Fig. 9 is a good type. Reminiscent of boyhood days on the farm, the rail or "snake fence" in the right detail of Fig. 4 is an adaptation of the original, but has no stakes at the joints. Instead, it is secured with spikes, which are driven as the rails are laid. The two top rails are held together with hardwood pegs, and each section rests on a flat rock.

A really informal fence is made of rough-split timbers, or slabs assembled as in the left detail of Fig. 4. Discarded telephone poles split to form three-cornered rails are excellent where a ranch or farm-type fence is desired. After the posts are set, you simply lay the rails in between them, one on top of the other, as in Fig. 1. The only white-washed fence in this group is illustrated in the left detail of Fig. 9. The rails are rectangular in section and are spaced a few inches above each other on hardwood pegs.

An unusual arbor for a garden walk is shown in Fig. 11. It is built on substantial corner posts and braced at each side with a diamond-pattern trellis of light sticks. Fig. 12 shows a design for a very unconventional arbor that can be made of odds and ends from a brush pile, once the sturdier posts, plates and rafters are obtained.

With a supply of seasoned and peeled saplings at hand any handyman can build an inexpensive summer house in rustic style like the one in Figs. 14 and 15. Green wood may be used if assembled with lag screws which can be drawn down as the wood shrinks. Smaller pieces are bound with raffia or grass rope, adding to the rustic effect. The sturdy corner posts and other





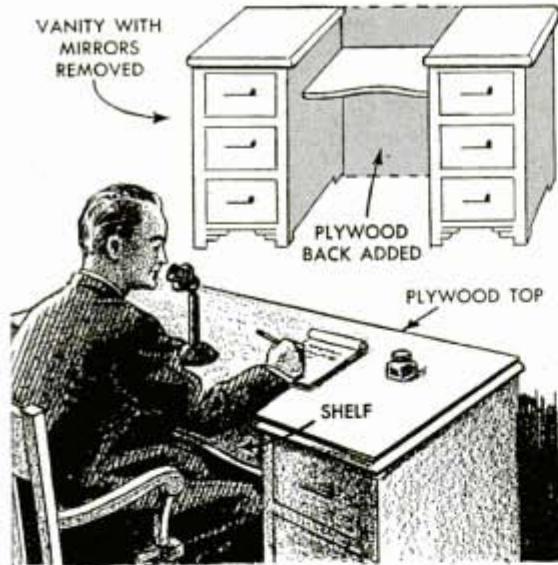
uprights are set 18 in. into the ground. Assemble the "plates" or horizontal members at the eaves and then the diagonal members or braces. The latter are important. After the horizontal beams about 3 ft. above the eaves have been installed, proceed with the rafters and ridge pole. Rafters are "sheathed" with long sticks which may be lapped here and there and on which the thatch is laid. The latter may be oat straw, marsh hay or even fairly straight twigs, such as willow. Start at the bottom,

laying the material evenly all the way across and 4 or 5 in. thick, then secure with an anchor pole 12 in. from the eaves. This pole is bound to the rafters with heavy twine or any brown, durable cord.

After the thatch is secured, bob the lower edge evenly with hedge trimmers. Proceed with the next layer as before and on up to the ridge, which is capped with two weathered boards having irregular edges for effect. The lattice sides are simply thin sticks bound on with raffia in 12 in. squares. The curved member on each side should be bent and bound into place while still green. Lay a flagstone floor, or old brick in basket weave or herringbone pattern and be sure that the surface is at least 2 in. above grade, and crowned, so that water will not accumulate. If permanent seats are preferred to movable furniture, they can be made as shown in Fig. 13, provided, of course, that they are installed before the flooring is laid, as the seat uprights are sunk into the ground.

(To be continued)

Old Vanity Dresser Is Converted To Provide Knee-hole Desk



If you have a vanity dresser that is no longer suitable for its regular use, it can be converted into a knee-hole desk for your den or playroom. All that is necessary is to remove the mirrors and install a top. This can be of plywood, hard-pressed board or other suitable material. Attach the top with glue and screws, countersinking the screw heads and filling them with plastic so that they are not visible. Or, if desired, you can use finishing nails, sinking the heads and filling the holes with a suitable plastic.

F. G. Altrichter, Philadelphia, Pa.

Spring Stops Gearshift Flutter

If vacuum gearshifts on Chevrolets flutter or jump out of gear when driving, install a friction spring on the vacuum-cylinder valve rod. Its steadying effect will prevent oscillation and stop the flutter.

Hal Geihm, Aurora, Ill.

Covering Wire Binding on Book Prevents Marring Surfaces



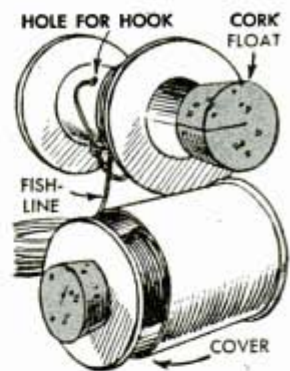
When using a notebook with a spiral wire binding it's a good idea to put a strip of paper or cloth over the binding as indicated. This will shield it so that there is no possibility of scratching the surface of a desk or table. The cloth

can be attached with glue or household cement. If paper is used, it should be of the heavy manila type so that the wires will not wear through it quickly.

Thomas Trail, Baltimore, Md.

Handy Container for Fishlines

An empty adhesive tape container makes an ideal case in which to carry fishlines and hooks. All that is necessary is to punch 2 or 3 small holes in the spindle to receive the hooks, the lines being wrapped around the spindle. If desired, a cork float can be inserted into the end of the case. In this way, lines and hooks can be carried safely in the pocket where they are protected against moisture and also prevented from becoming entangled.—B. W. Savage, Lake, Miss.



Checkers Stored in Playing Board

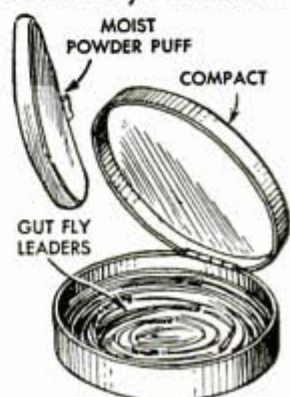


One of the most convenient methods of storing checkers is to put them inside the board. As shown in the drawing, the latter consists of two thin pieces separated by square strips on three sides. The board is pivoted

with two screws inside a narrow wood frame, with a friction catch at one end. Pressing one side of the board upward disengages the catch so that the checker compartment is exposed.

Old Compact Holds Fly Leaders

By removing the powder compartment of a lady's compact it can be used as a case for gut fly leaders. If a small powder puff is kept in the compact and moistened occasionally it will keep the leaders pliable and ready for use when wanted.



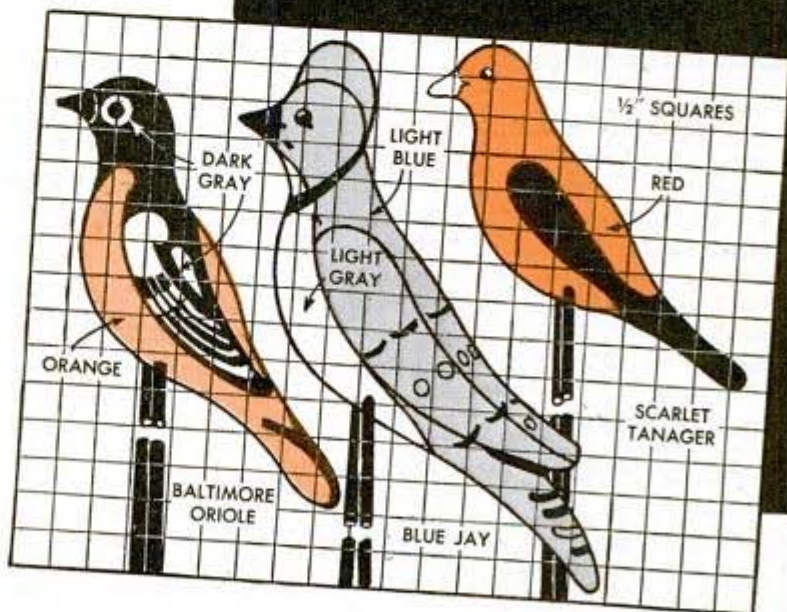


MOLDED BIRDS *for the Lawn*

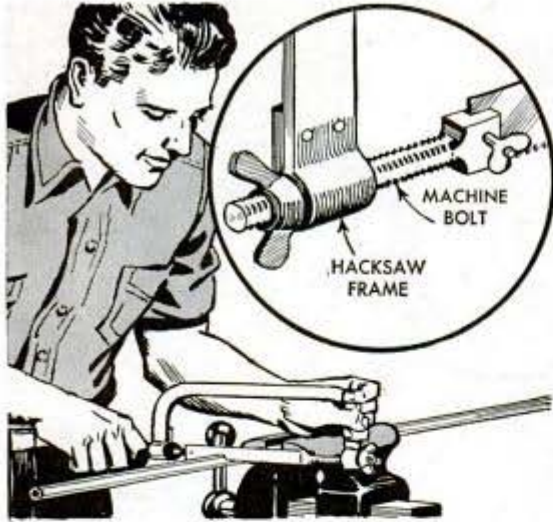
POSED pertly on their long wire legs, these molded birds add a realistic touch to any lawn or garden. They are cast in cement and are colored with ordinary oil paint. First shape them in wax or modeling clay to provide patterns from which the molds are made. A funnel-shaped piece of clay is added to the underside of the pattern to provide an opening in the mold for pouring and for insertion of the legs. The mold is cast in a box that can be taken apart easily. The box is filled halfway with plaster of paris, after which the pattern is coated with heavy oil, such as motor oil, and is pressed halfway into the plaster, where it remains until the plaster has set. When the pattern is removed, the mold is given two coats of shellac. After the shellac has dried, oil is applied to both pattern and mold, in which the pattern is replaced. Then more plaster is poured to fill the box. When dry, remove the box, separate the mold and then apply shellac to the upper half. Be sure that both halves of the mold are oiled thoroughly before pouring each casting.

Now, mix together portland cement, 3 parts, plaster of paris, 2 parts, and fine sand, 1 part, adding just enough water to form a mixture that can be poured. When pouring the cement, rock the mold gently

to remove air bubbles. Finally, insert two lengths of wire for legs and let the mixture set for 15 min., or until hard. Then remove the casting and submerge it in water for 24 hrs. After a thorough drying, the casting is painted and later coated with spar varnish for luster. The three models shown in the cross-hatched pattern will enable you to make many different species simply by changing the markings and coloring.—Dick Hutchinson, Ithaca, N. Y.



Attachment on Hacksaw Frame To Use Broken Blades

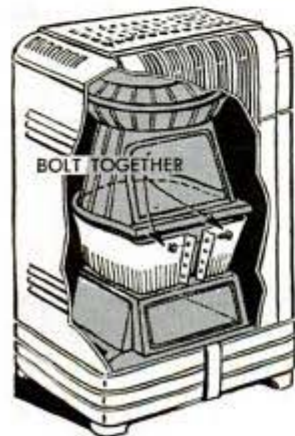


Hacksaw blades that have broken off a few inches from one end can be used if you have a clamp, like the one shown, to hold them in the frame. The clamp is made from a machine bolt by grinding down the head to the shape shown and then slotting it to receive the blade. A thumb screw clamps the blade in the slot. The threaded end of the bolt is squared or otherwise shaped to fit the end of the saw frame and fitted with a wingnut.

Preserving Leaf Collections

One simple method for preserving four-leaf clovers and other leaves is to dry them in a pad or book for about a week, then brush a little clear nail polish over the spot where the leaf is to be mounted. After the leaf has been put in place and the polish dried, another coating of polish should be applied.—V. Beedney, Sioux Falls, S. D.

Cracked Heating Stove Repaired By Using Sheet-Metal Band



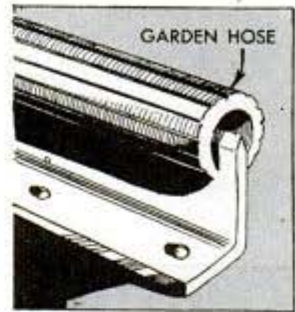
Being unable to replace the cracked firepot on our heating stove, I repaired it by tightly clamping a sheet-metal band around the pot so that cement put in the crack would not fall out. The band was cut to cover the entire outside surface, the ends being bent outward and

drilled for bolts with which the band was drawn tightly around the firepot.

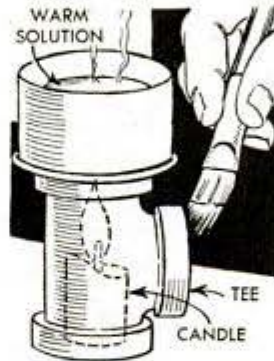
Sadie M. Lasky, Queen City, Mo.

Edge of Foot Scraper Shielded With a Piece of Hose

To avoid any possibility of his children's falling on the sharp edge of a foot scraper, one farmer shielded it with a piece of garden hose as shown. The slight inconvenience of removing and replacing the shield to use the scraper is small cost to pay for safety of the children.



Candle Stove Keeps Glue Warm



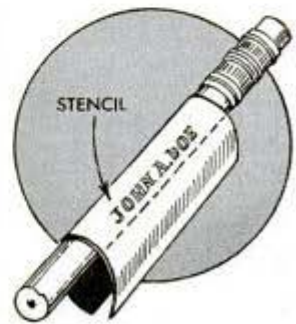
When working in a cool basement or other place where it is necessary to keep glue warm, a simple stove for this purpose can be improvised from a large pipe tee which is set over a short piece of candle as indicated. Used in this way,

the side opening of the tee serves as a flue for the escape of combustion gases from the burning candle.

Ronald Eyrich, Milwaukee, Wis.

Stenciling Your Name on Pencils

It is a simple matter to stencil your name neatly and permanently on pencils. With a typewriter cut a small piece of mimeograph stencil with the desired name and lay it over each pencil in the manner indicated, grasping the edges of the stencil to hold it in good contact. Then, gently dab a cloth pad moistened with ink onto the stencil. Printers' ink thinned down to the consistency of corn syrup is the best. After the pencils have been imprinted, bake them in front of a reflecting or bowl-type electric heater until the ink is dry and hard.



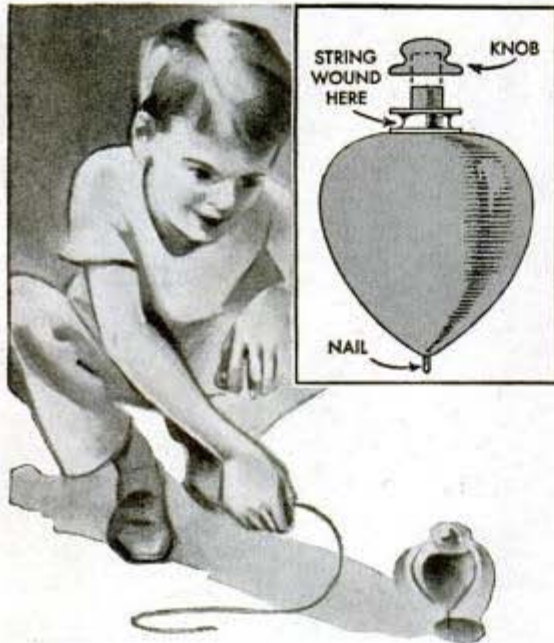
Woven Effects Produced With Molding Slices



Slices of molding can be used to decorate book ends, panels of small screens, desk accessories and shelves, or to cover the sides of window boxes and other articles not usually made of grained or finished wood. Ornate effects can be had by using various kinds of shaped molding, or by staining or painting alternate pieces to give a checkerboard or figured pattern. To begin, cut the molding into slices of a thickness to suit the job. If you use a circular saw, clamp a piece of thin plywood to the table, making a slot in it just wide enough to clear the saw and prevent the slices from falling through. If the molding is sliced with a handsaw, jigs to make straight and miter cuts like those shown in the lower right-hand detail will enable you to do the job accurately. Apply thick glue to the base or surface to be decorated. Then press in the first row of pieces and apply glue to their undersides so that

they will be attached not only to the base but to each other as well. Although it is unnecessary to use pressure if the glue is thick enough, you can clamp the pieces while drying, using a piece of scrap wood and a clamp as shown in the circular detail. By clamping in this way, you can glue the other side of the work while the clamped part is drying. Without this precaution the pieces already applied may be dislodged. If you intend to finish the work in one color only, this may be applied after the pieces have been glued, but in using two or more colors it is better to paint the pieces before gluing them in place to keep the colors from running together.—Charles and Bertram Brownold, Woodmere, N. Y.

Pull-String Top Is Easy to Turn In Your Wood Lathe



When made correctly this top will spin from 1 to 2 min. It can be turned out in quantities in a lathe. Hardwood is the best wood from which to make the top, but other wood may be used. It can be any diameter desired, but the reel or spool around which the string is wound should be small enough to give the top a good speed. To spin, first wind the string on the reel. Then, holding the top on the floor by the knob, give the string a quick pull and lift off the knob.

A. C. Simonsen, Portland, Oregon.

How to Remove Decalcomania

To remove decalcomania before repainting walls or cabinets, apply a coating of acetone with a cloth, allow this to penetrate for a minute, then rub lightly with fine steel wool. This method avoids scratching the background surface with scraper or sandpaper.—Mildred Anderson, Chicago.

Belt Speed Reducer Made Easily By Using Old Car Water Pump



A speed reducer or countershaft for belt-driven machines is made easily by using a cone pulley and an old water pump from a 1936 model V-8 Ford. Remove the impeller from the pump and then slip the pump over

a short 2-in. pipe nipple screwed into a floor flange. It may be necessary to file one side of the nipple so that the pump can be tilted correctly to line up the shaft. Bolt or weld the pump to the nipple. You can use the regular pump pulley on one end of the shaft and the cone pulley on the other end.—F. W. Becker, Gloversville, N. Y.

Ash Trays on Card-Table Legs Are Always Out of the Way

These handy little ash trays are fastened to the legs of a card table where they are out of the way, yet are within easy reach of the players. Made from 3½-in. lengths of 2-in. metal tubing, which have disks soldered to one end to form the



bottoms, the trays have keyhole slots in the sides near the tops to slip over the heads of screws driven into the table legs. The trays are easy to remove for cleaning, and can be painted or otherwise finished.

Herman R. Wallin, Washington, D. C.

Making Paper Transparent For Tracing Work



For quickly sketching in traced lines in some types of work, one artist makes use of a spot-remover bottle, which has a plush moistening top and is filled with dry cleaner. The plush top is passed over the drawing paper, causing it immediately to become transparent. The tracing is made

before the paper dries, or several applications of the cleaner can be used. After the cleaner evaporates, the paper returns to its normal opaque condition.

Ken Murray, Baltimore, Md.

☞ To make sure that poison medicines are never administered by mistake, fasten the corks or screw caps in place with pieces of adhesive tape, which can be removed easily, yet help to avoid accidental poisoning.

Sink Hookup to Conserve Water From Cistern

In our home the hot-water supply tank is located quite a distance from the sink with the result that considerable water was wasted in draining the pipe line from the tank to the sink each time hot water was wanted at the sink faucet. To save this waste water, which came from a cistern and had to be conserved, especially during dry seasons, a hookup was installed as indicated to return the water to the cistern. A tee and valve in the supply pipe near the sink, as shown, connected to a line leading to a downspout. The pipe could run directly to the cistern if more convenient. In use, the valve is kept open until the cold water runs from the supply pipe, then the valve is closed and the sink faucet opened. — John W. Belsley, Morton, Ill.



Snap-On Door Keeps Small Child Out of Open Bookcase

In order to keep our baby from getting into an open bookcase, I fitted it with a snap-on door that could be put on or taken off easily. The door was a piece of hard-pressed board cut to fit nicely over the

front of the bookcase. You will find that the color of some of this material will harmonize well with the finish on most furniture. The door can be held in place with friction catches at the top and bottom. Screw half of each catch to the door and the other half to the underside of a couple of the shelves where they will be inconspicuous when the door is removed. A decorative knob at the top of the door will aid in handling it.—M. A. Jacobson, Chicago.



Drawings Traced From Book Without Marring Pages

The next time you want to trace a drawing or diagram from a book you can do it without marring the page in any way if you use a piece of clear celluloid. Place this over the drawing and place your tracing paper on top. You can see the drawing through the paper and celluloid and the latter will provide a writing surface to prevent the pencil from creasing the book page. You will find this idea especially handy when you want to copy material from textbooks and magazines or from books in a public library.

House pics from
Rhode Island 87

Dwain Nelson
2320 Coleridge
Utt.

HOME LANDSCAPING

Mr. Peters



Generally, the pyramidal type is used against narrow columns of wall space and beside entrances, while the semi-erect and the lower-growing prostrate forms are best under windows. Broad pyramidal forms are out of place along short foundations. Choose narrow columnars for narrow spaces, and under windows use varieties that will grow no higher than the sills. These should be shearable; therefore avoid using tall spruces and firs. The junipers, arborvitae and dwarf mugo pines (all shearables) supply an abundance of form and color.

What to select: Vigorous conifers cannot be produced cheaply. Propagation is by seeds, cuttings and grafts. Young plants are set in rows close together, and so cultivated. Before crowding begins, they are lifted, the roots are pruned back, and then the trees are transplanted farther apart. This process

By Robert Stahler

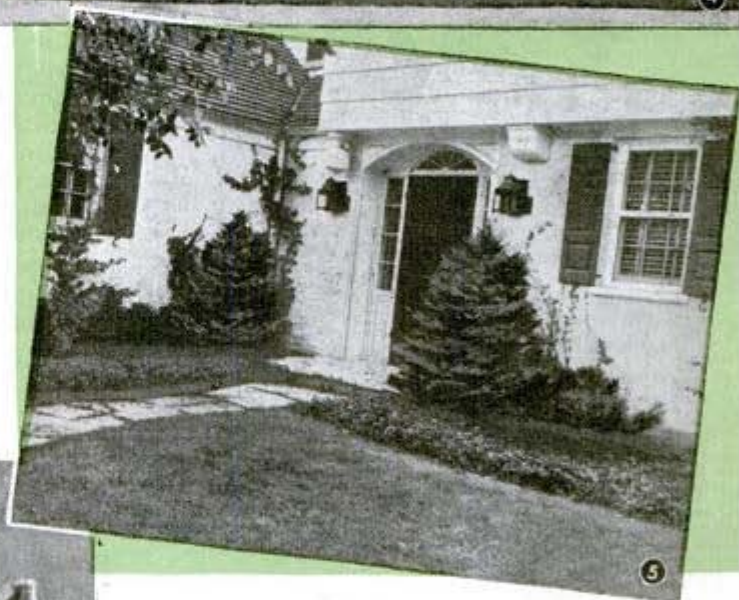
IN FORM and color, evergreens are so varied that, if judiciously placed as shown in Figs. 1, 2, 4 and 5, they will beautify almost any landscape without the addition of other kinds of plants. For proper effect, the shape and size of the evergreen should conform generally to the architectural pattern against which it is to be placed. The various shapes are shown in Fig. 9. These are: A, creeping or prostrate; B, globular; C, semi-erect; D, narrow columnar; E, broad columnar; F, narrow pyramidal; G, medium pyramidal; H, broad pyramidal. The pyramidal forms may be bought in tall, medium and low-growing varieties, and are suitable either for group planting as windbreaks and screens, or as single specimens.



with EVERGREENS...

may be repeated four or five times. In catalogs, the symbol X means that the tree has been pruned and transplanted. Thus, the description "XXXX" means that the roots have been pruned four times and the tree transplanted each time. Such a tree will have a compact root system and top growth; it will be thrifty, in contrast to the cheaper tall, sparse specimens that were left to grow at random from their seedling stage. If price is a consideration, buy the small X'd varieties rather than the inferior taller ones. You should specify, too, B&B trees—those having balled and burlapped roots, as shown in Figs. 7 and 11.

A partial list of evergreens includes the following: Arborvitae—perhaps the most adaptable of all. The American varieties do well on ordinary soils that are not too heavy, and are quite hardy. The Chinese varieties are beautiful, but are a risk north



of Pennsylvania. More than fifty forms are under cultivation. Although they grow best in full sun, they will tolerate some shade. Cedars, as a class, are ornamental, but their large size limits their use. The Blue, the Deodar and the Lebanon are the best known. Firs, for the most part, do not thrive in the dust and smoke of cities. The Concolor is the best known of this group. Junipers are a decorative form. They are the least likely to be attacked by insects. Extremely tolerant of shearing, they can be kept within bounds, which is one of the many reasons for their choice in home planting. Generally they are hardy, only a few being somewhat tender. Both the Irish and Swedish junipers are in this class and may show winter damage, the Swedish to a lesser degree. Spruces are mostly tall-growing, and are better fitted for specimen planting and for wind-



CHARACTERISTICS OF CONIFERS				
Group	Type	Average Height (1) (in ft.)	Color	Form (2)
Juniper	Meyer	3	Blue-green	C
	Globe	3½	Lt. green	B
	Savin	—	Dk. green	A
	Pfizer's	3½	Green-grey	C
	Goldenrod	3½	Golden-yellow	C
	Koster's	3	Blue-green	C
	Japanese	—	Blue-green	A
	Andara	—	Silver-green	A
	Spiny Greek	6	Blue	E
	Blue	18	Blue	H
	Chinese columnar	17	Blue-grey	D
	Pyramid	17	Grey-green	F
	Irish	15	Blue-green	D
Swedish	20	Blue-green	D	
Tamarix	—	Bright green	A	
Pine	Dwarf mugo (3)	4	Dark green	B
Cedar (4)	Silver	15	Silver-blue	F
	Concolor red	17	Green	F
	Red	23	Silver-green	F
Arborvitae	American	40	Green	G
	Pyramidal	15	Green	D
	Globe	3	Green	B
	Golden	40	Golden-yellow	D
Spruce	Koster's Blue	40	Blue	H
	Colorado Blue	60	Silver-blue	H
	Shiner (5)	—	—	—
	Black Hills	40	Green	H
	White	70	Green	H
	Norway	100	Green	H
Fir	Concolor	80	Green	H

- (1) In cultivation; wild species may grow taller
 (2) See Fig. 9
 (3) These may be cut back
 (4) Not true cedars
 (5) A species of Colorado Blue. Always buy these balled and burlapped



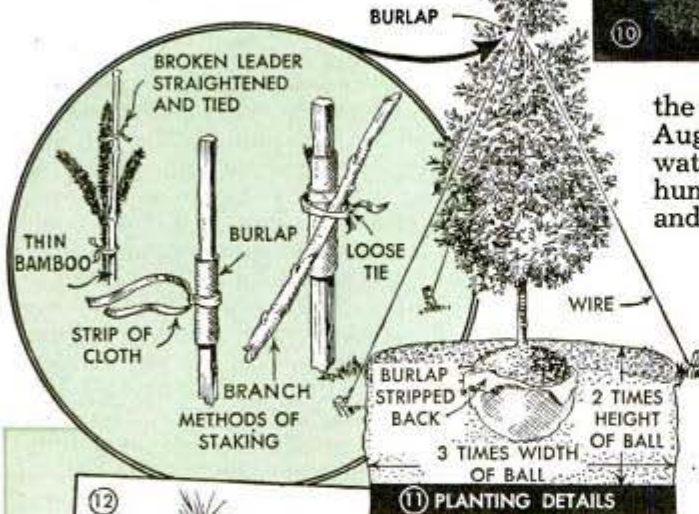
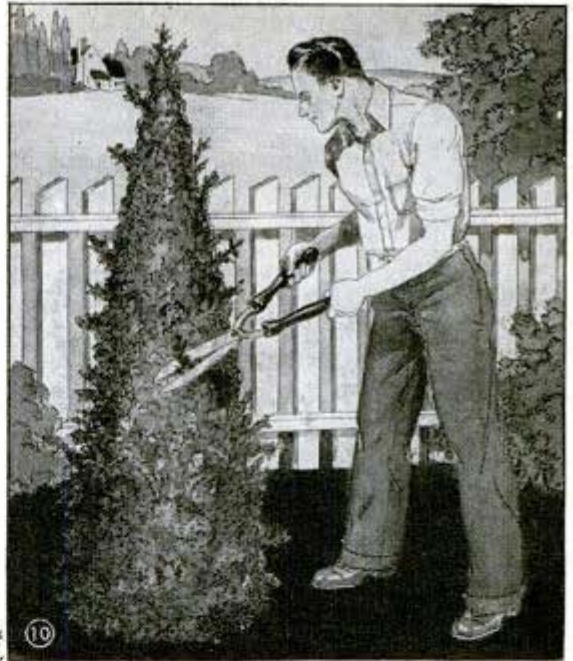
breaks. The blue color of the Colorado and Koster's (a grafted form of the Colorado) is too intense and striking for combining with other varieties in foundation or group plantings. Hemlocks are graceful trees that often attain great size, and are used mostly for this purpose. Yews are superb for low hedges. The bushy Japanese form is quite hardy, and perhaps is the best of this kind. Fig. 12 shows the characteristic appearance of several of these species.

Where to plant: Before planting, set stakes of the estimated height of the trees you will use, and allow between them the spread you will permit the trees to attain. Set the trees as in Fig. 11, tying the stakes as indicated in the circular detail. After staking, it is a good idea to provide a burlap shield around the newly planted tree, as in Fig. 6, to protect it from being uprooted by the wind. Don't plant too close to the wall of the house; reflected heat burns the foliage, causing it to drop off, Fig. 8, and the light is restricted, resulting in sparse foliage on the rear, or shaded side. Fortunately, most conifers are adaptable to various soil conditions. The common American arborvitae is sometimes found in a swampy environment, yet does well on comparatively dry garden soils. But because conifers are adaptable, they are too often placed on soils wholly unsuitable. In their native habitat, they are mostly residents of slopes, where nature is in the process of soil making. The soil is gritty; mixed into it is the decaying debris of leaves, needles and twigs, called humus. Often the roots are under great rocks, which are prime conservers of moisture. The slopes furnish perfect drainage. Here the trees grow to heights never reached in cultivation.

Preparing the soil: To plant the trees, strip the sod and work the soil deep and fine, Fig. 7. Mix humus and plant foods thoroughly into the soil down to a depth of about 12 in. Damp peat, not soaked, mixes better with the soil than when dry. B&B trees can be set in early winter in many parts of the country, even well into the North, if given the proper depth of mulch, Fig. 3. Spring is the best time to plant, but

mid-summer planting is not recommended.

It is a waste of money to apply nitrogen at planting time. Phosphorus and potash in bone-meal will combine with the soil with little loss by leaching, but nitrogen escapes. Moreover, the shortened root systems are inadequate to supply the moisture needs of the new growth that nitrogen forces. Four to six months can elapse before using nitrogen; if you have used leaf mold for humus, a year may well go by. Peat has almost no food value. If it is the source of humus, apply twelve pounds of dry sheep manure per 100 sq. ft. and work it in, four to six months after planting. Other forms of vegetable or animal nitrogen may be used, but avoid chemicals. To keep the food supply constant, each year apply 15 lbs. of bone meal, 2 lbs. of potash, and 12 to 15 lbs. of sheep manure. Use half of



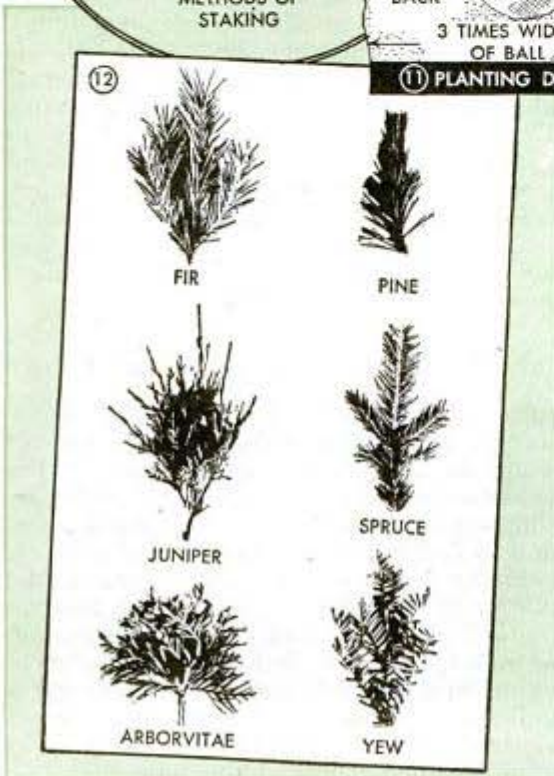
the latter in early spring; half in early August. Work in these materials and water thoroughly. Using plenty of humus not only keeps the soil open and light, but also enables it to retain large quantities of moisture, which is essential for dense foliage, health and vigor.

Fall and spring care: Don't let conifers begin the winter in dry soil. Soak the ground thoroughly to root depth at least. After the first freeze, apply the winter mulch. Remember that evergreens are more or less active at all times, even in winter. If the ground freezes to an appreciable depth, the trees suffer for want of moisture exactly as they would during a summer drouth. Partial damage or complete destruction of the trees results.

In early spring, remove all but an inch of the mulch; then when the ground dries to a workable condition, apply plant foods and work them and the inch of mulch into the soil, the latter to keep the humus supply constant. Cultivate at 10-day intervals, until hot weather begins. Meantime, don't neglect the moisture supply, but, of course, do not flood the soil. Doing so will result in a soured soil. The ideal soil is evenly moist from near the top down to a considerable depth, but not soaking wet. A thorough drenching at 10 to 14-day intervals will, under normal conditions, suffice.

When hot weather sets in, apply the summer mulch, and apply nitrogenous fertilizer in early August.

Pruning: Pruning of conifers consists mostly of shearing to control height and





spread. Such work is easily done on dwarf mugo pine, arborvitae, juniper, yew and cypress in spring and early fall. Young specimens of fir and spruce are sometimes pruned by pinching back side branches slightly, Fig. 10. However, it is best to let someone familiar with evergreens do this work for you. Remember that you cannot control height and spread of fir and spruce as you can with ordinary shrubs. Fir and spruce will show a stubby effect if pruned, and their recovery is slow. If the leader is cut in an effort to limit height, the growth is thrown to the sides; if the sides are clipped, the strength goes to the top. A correct balance, which makes for a beautiful pyramid shape, cannot be achieved by using the knife. While any top growth can be cut back, the root system remains intact and constantly extends itself. And as it extends, it throws more strength to the top. It is advisable, therefore, to plant spruce

and fir only where they will have plenty of room to develop. Never prune the low branches of conifers, unless these are dead; they should spread from the ground up.

Insects and disease: Though conifers are a healthy group and are more or less immune to serious insect and disease attack, you should nevertheless be on the alert. In fall look for bagworm nests, which are pendant bags made of bits of leaves bound with silk and suspended by the same material. Remove and burn them. The spruce budworm cuts off the needle-like foliage and weaves it into a web shelter. The larvae of these two insects, also those of the gypsy moth, emerge in spring and attack the foliage. Control is by spraying, Fig. 13. Use a lead arsenate spray applied when the weather warms in early spring; repeat in 10 days.

Aphids or plant lice are of a different type from those found on flowering plants. Many form galls. Spray with a miscible oil in early spring before new growth begins, and only on a sunny day, temperature at 50 degrees or more, with no chance of it dropping within six hours. The oil must dry quickly, else damage will result. Oil sprays are injurious to some junipers whose needles form cup-like depressions.

In hot weather, red spider is most likely to attack. Only about $\frac{1}{10}$ in. long, they are most difficult to see, as are the webs they weave. Treat them with dusting sulphur. Use it weekly, but never within a month after using oil. Borers and beetles have little chance of affecting a healthy evergreen, but may attack a weak one.

Only a few conifers are subject to serious diseases. The white pine is seldom planted, because of white-pine blister rust. Wood rots are more often encountered in forest and other dense growth. If dead wood develops, prune it out with a sharp tool. "Cedar apples," caused by a fungus that produces soft spongy masses of yellow-orange color, may attack junipers and should be carefully cut out.

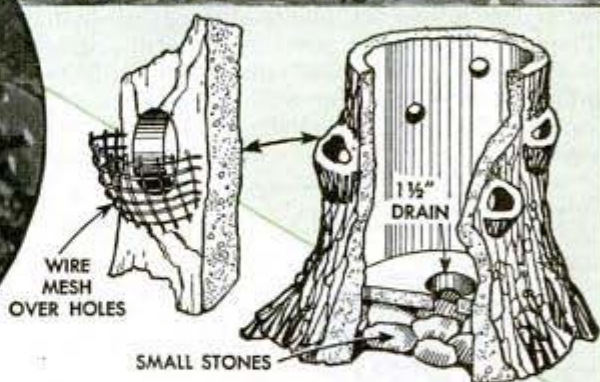
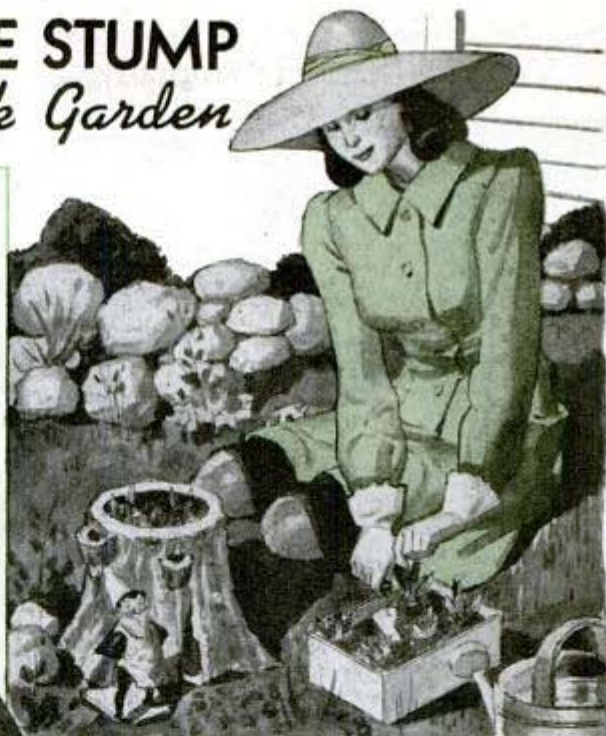
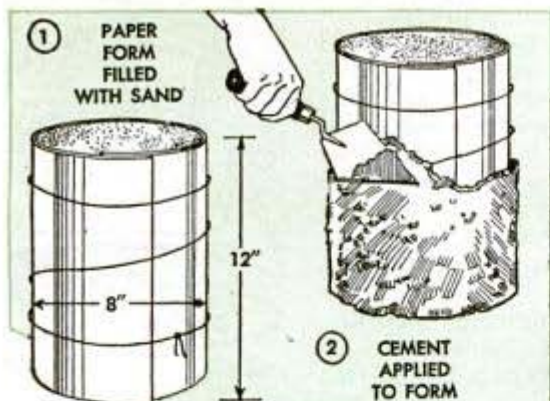
Preignition Caused by Hot Spot in Combustion Chamber

If your car will not run at high speeds without spitting through the carburetor, likely the trouble is caused by preignition—some part of the combustion chamber becomes sufficiently hot to ignite the fuel charge before the spark occurs at the plug. The trouble probably can be traced to carbon, a valve that does not close tightly, or a plug that operates too hot. First, be sure that the correct type of spark plug is being used. Then, before removing the cylinder head to check for a hot spot, look over the following adjustments which might cause trouble: A too-lean fuel mix-

ture or a clogged fuel line at the carburetor screen. Insufficient cooling due to lack of water in the radiator. A stoppage in the water system, such as a defective pump, or slipping fan belt. Overheated spark plugs due to leakage where they screw into the cylinder head, or a weak or worn fuel pump. If all of these are in order, remove the cylinder head and check for a carbon or metal projection that might be heated to white heat at high speed. Or look for a valve that is burning because it does not close tightly. Likely it is warped or is adjusted incorrectly at the tappet.

EVERLASTING TREE STUMP

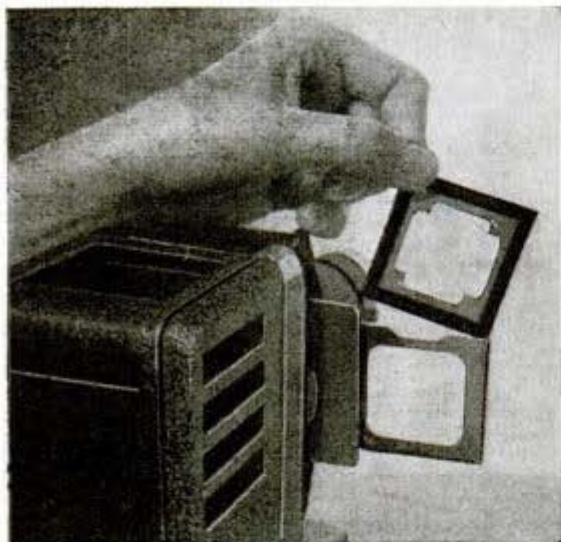
"Blooms" in the Rock Garden



LIKE a real tree stump, this long-lasting one of cement can be "planted" in the rock garden and filled with soil for growing plants and flowers. It is formed by laying cement over a rolled-paper form and adding knot holes as a realistic touch. If you intend to make several stumps, the diameter of the paper forms can be varied. Heavy wrapping or roofing paper is best. The form is tied with twine and then filled with sand, Fig. 1, to support and keep it shaped. A disk of the same paper, cut to fit the top, is laid over the sand, and a 1½-in. layer of cement is troweled over the entire form, including the top, as in Fig. 2. The cement mixture is made of fine, sharp sand, 2 parts, portland cement, 1 part, and water to make a thick paste. After this has set a while, but before it is dry, several openings about 2½ in. in diameter are scooped out at random for knot holes, and in the top, which will be the bottom of the stump, another hole, somewhat smaller, is

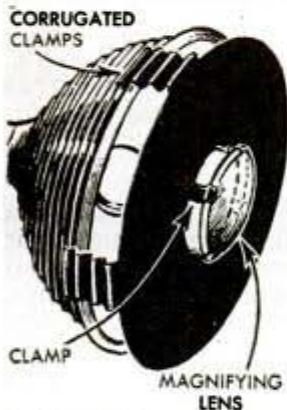
made for a drain, as shown in Fig. 3. When the form has set hard enough to handle, it can be turned over and wire mesh pressed into the cement around the knot holes, after which cement is troweled on to form the knots. Bark is simulated by laying on cement in small dabs and troweling them down. It is best to copy these details from a real tree. The stump now can be set out in the garden over a small mound of stones to provide good drainage, and cement applied to represent large roots. As a finish, a thin coat of cream-colored oil paint is applied to the top rim to represent wood, and the trunk is painted as natural as possible in browns and grays. The stump is filled with soil, and small plants and flowers are set out to grow. As the knot holes open into the stump, plants set in them will grow there as well as in the main trunk. If desired, a gnome or other similar garden ornament can be placed near the stump as added attraction.

Special Slide Lines Up Projector Vertically and Horizontally



Lining up miniature projectors for both vertical and horizontal slides is simplified by using a special blank slide as shown. There is no need to use two separate ones to determine their positions when projected on the screen. The slide has a mask cut so that the outlines of the horizontal and vertical pictures are shown on the screen.

Flood Reflector Doubles as Spot



Photoflood lamps can be used as spotlights by attaching a metal shield fitted with an ordinary magnifying lens. The shield, of scrap sheet metal such as an empty oil container, is cut large enough to cover the reflector entirely, leaving four tabs about 2

in. by 4 in. which are bent as shown to clamp over the reflector rim, and are corrugated so as to be adjustable at various distances from the lamp. Four small tabs are left when cutting the opening in the center, and are bent to form clamps to hold the lens in place.—R. Scott, Saltsburg, Pa.

Photos Washed in Kitchen Sink Stopped With Force Cup

The kitchen sink can be used for washing photoprints by attaching a force cup over the drain to keep the running water at constant level. Drill through the handle

socket of the cup so that when water reaches the top of the plunger it will overflow, and then insert a 2-in. wood screw on each side through the plunger bowl at an angle, as shown. Slight pressure on each side will force the screws outward to engage holes in the drain plate, and when the pressure is released, they will return to their original position to clamp the plunger securely. To have a greater depth of water, place a short pipe nipple in the handle socket, being sure that it does not extend as high as the sink edge or the water will overflow onto the floor.



John H. Dunnemin, Grand Rapids, Mich.

Roomy Wooden Darkroom Sink Drains Into Lavatory

For washing prints and films, a roomy, lightweight, portable sink made of common lumber will serve the needs of photography hobbyists who do not have access to fully-equipped darkrooms. Since the sink is lined with rubber matting, there is no danger of leakage, and no plumbing is required because water can be drained from a single vent into a lavatory bowl or laundry tub. Size is optional, though for comfort it should be high enough to permit working without stooping. The one pictured here measures 22 in. wide, 8 in. deep and 5 ft. long, and was made of 3/4-in. stock, with 1 in. by 4 in. legs. For a sink of this width, 36-in. rubber matting should be used, with the surplus laid high on the sides and the corner folds tucked under and tacked to the frame on top to prevent leakage. A drain hole cut through the tank and rubber lining is fitted with a metal drain collar which has a locking nut screwed up from beneath to pull the matting tightly against the frame.

H. M. Tenny, Denver, Colo.

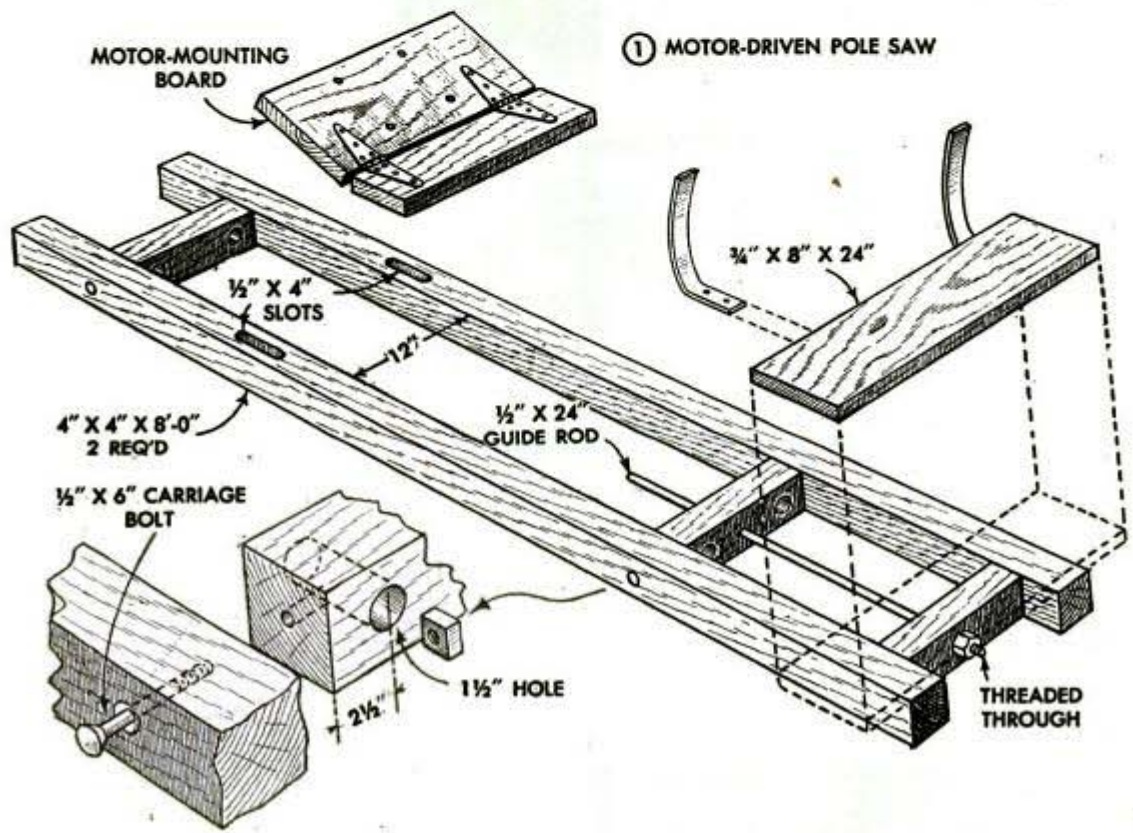
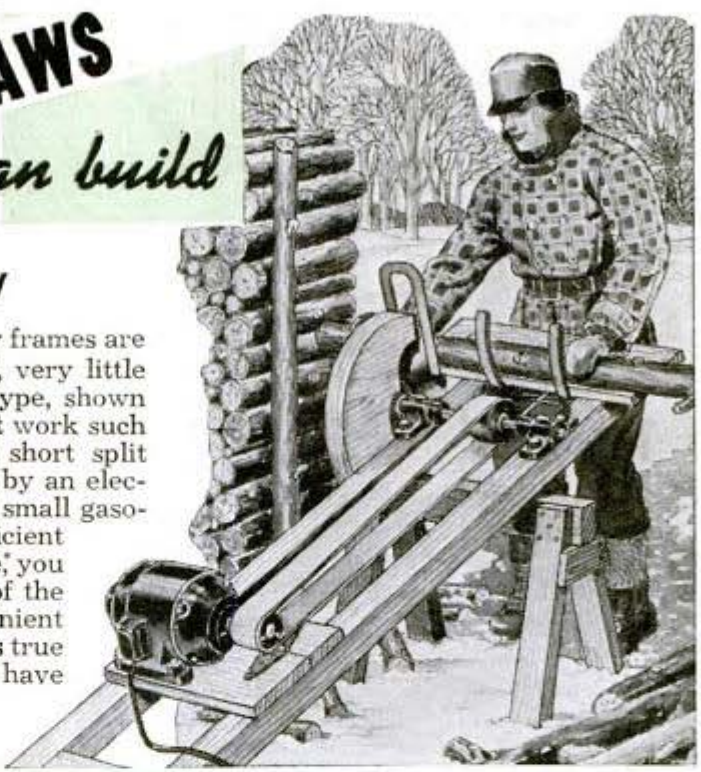


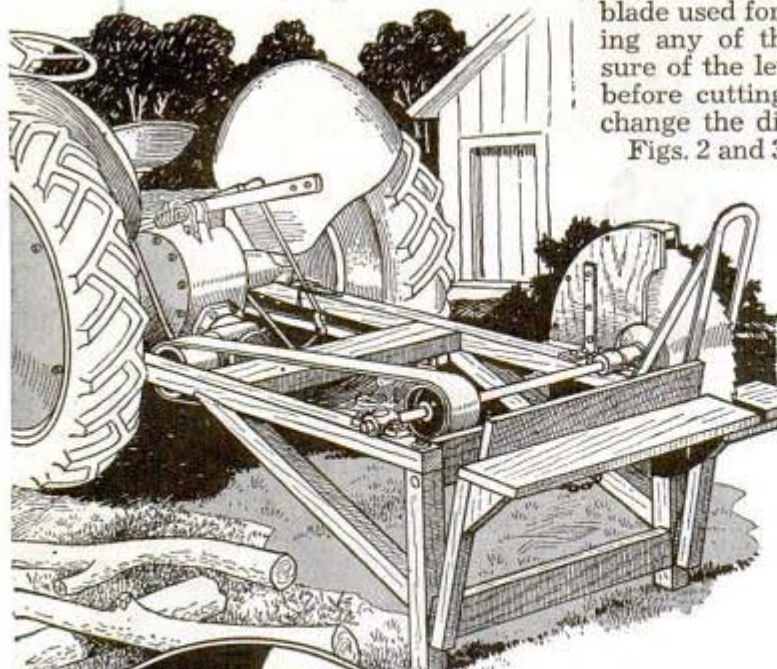
SHOP NOTES

Power CORDWOOD SAWS you can build

By W. C. Lammey

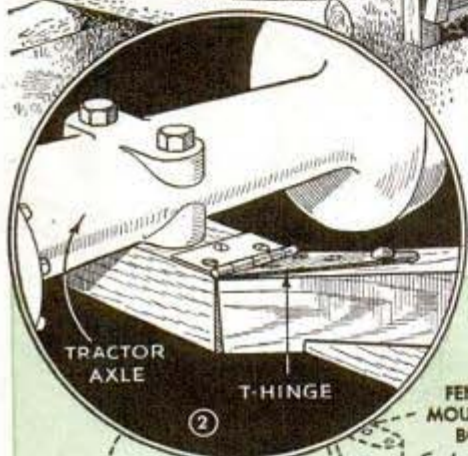
THESE simplified cordwood-saw frames are built principally of hardwood, very little metal being required. The first type, shown in Fig. 1, is intended for very light work such as sawing up tree trimmings, short split lengths of cordwood, etc. Driven by an electric motor of 1/2 hp. or more, or a small gasoline engine, it makes a fast, efficient outfit for this kind of work. In use, you simply support the carriage end of the frame on a sawhorse at a convenient height. Be sure the saw blade runs true and that the teeth are sharp and have a wide set. This latter precaution is very important on any



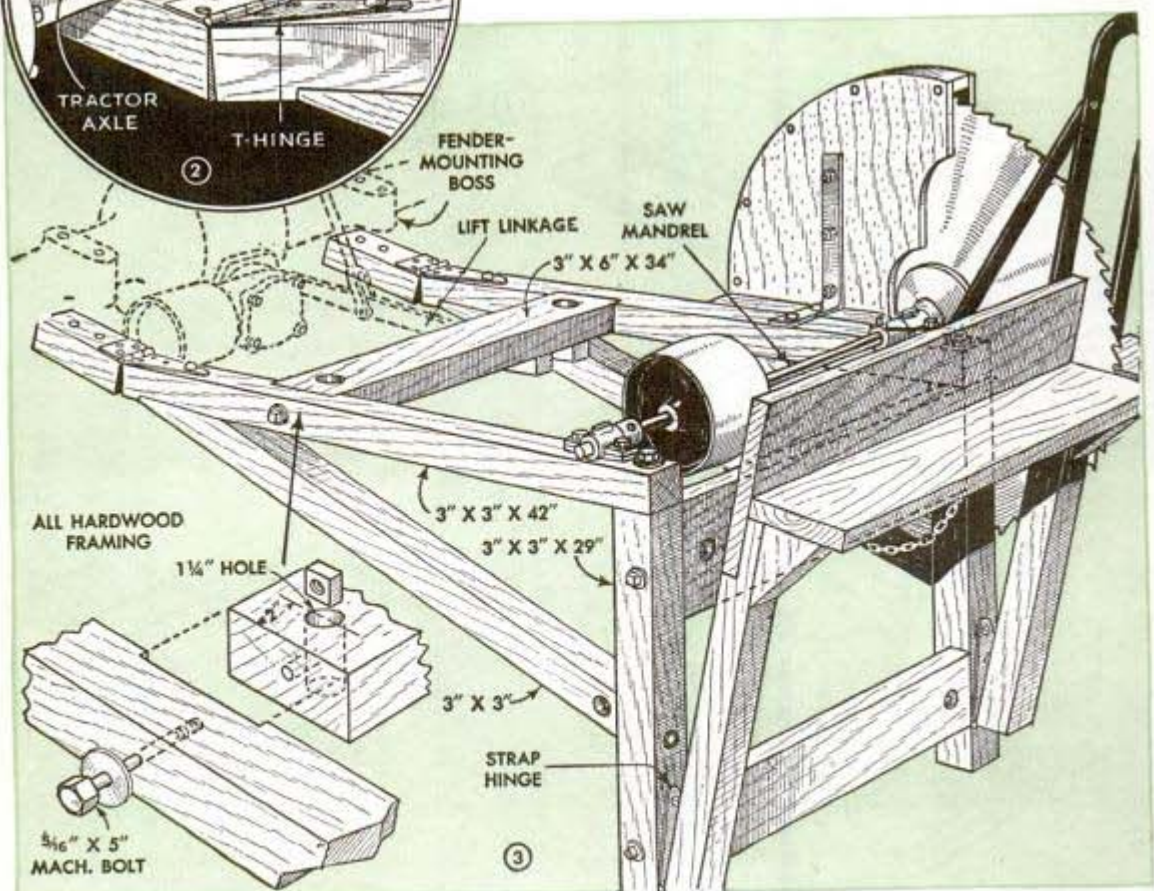


blade used for cutting cordwood. In building any of the saw frames shown make sure of the length of the mandrel at hand before cutting stock as you may have to change the dimensions.

Figs. 2 and 3 detail another type of frame to be attached to popular makes of small tractors. In some cases the saw frame can be bolted to the fender-mounting bosses or implement-mounting pads, which are cast on the rear-axle housings. The original frame was used on a popular tractor equipped with a hydraulic power lift. By using one lift arm and one drawbar link as shown by dotted lines in Fig. 3, the lift can be made to raise and carry the saw frame for transport. Where the lift cannot be used, the saw frame can be supported in the raised position with a chain. When making the frames, cut and fit lengthwise members before the cross members. In this way, you can determine the required length of the latter and avoid any waste of stock. In some instances it may be necessary to cut the saw man-

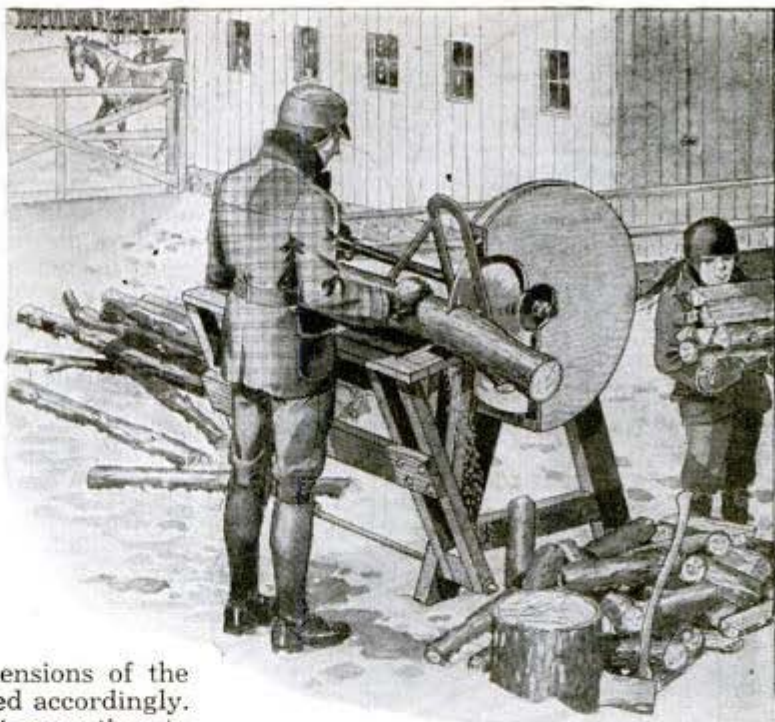


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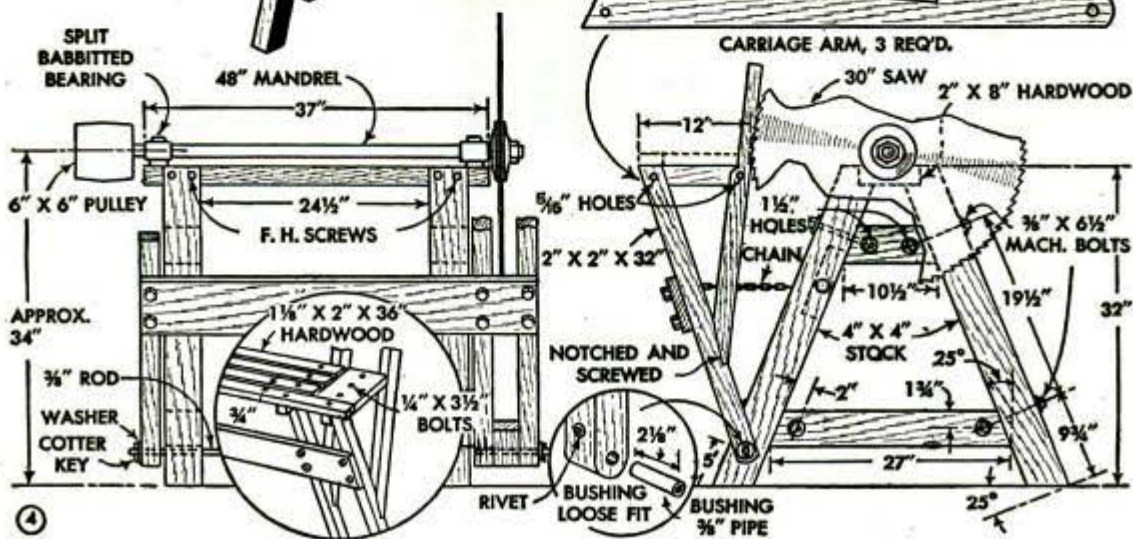
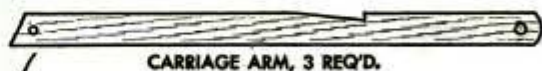
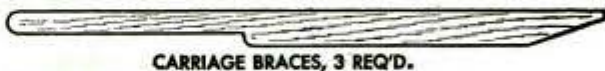


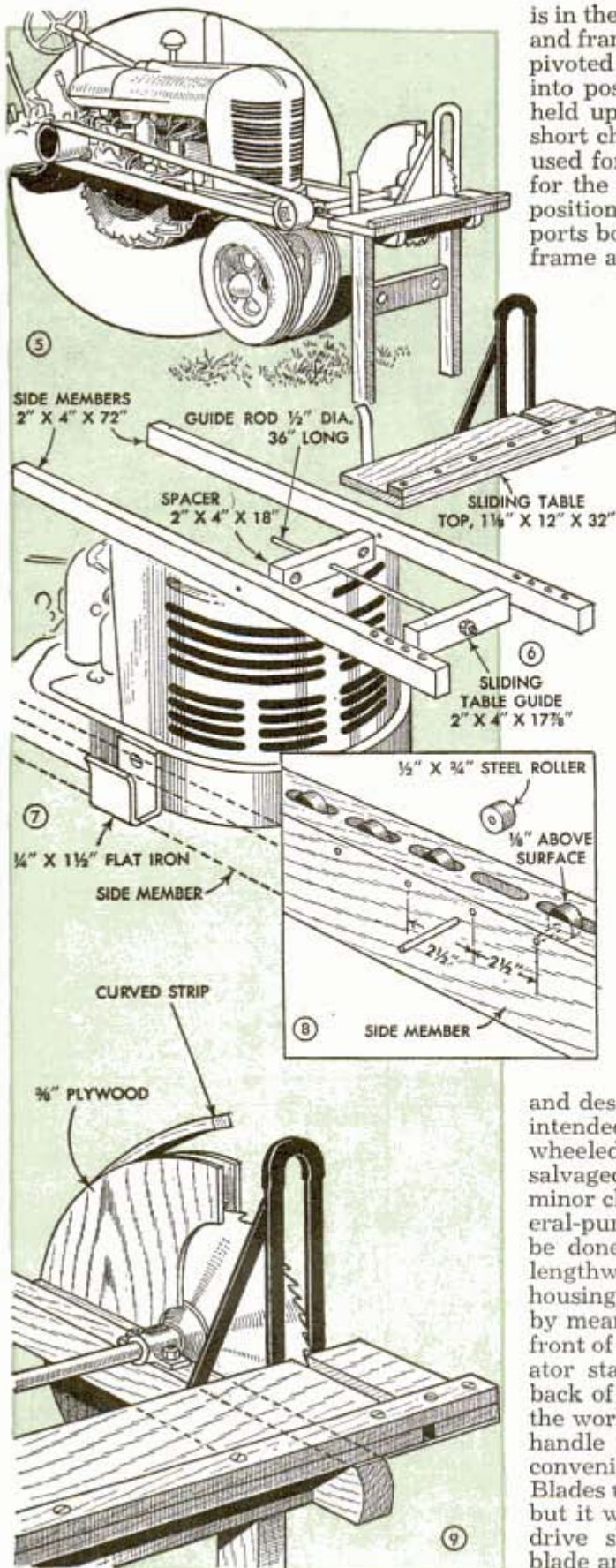
drel to suitable length and have it machined for some distance back from the pulley end so that the pulley can be placed between bearings as in Fig. 3. Be sure that the end of the mandrel shaft does not project more than $\frac{1}{2}$ in. or so beyond the bearing. A projecting shaft end is dangerous as it may catch loose clothing.

A stationary frame for heavier work is detailed in Fig. 4. Although not shown, skids easily are added to this frame if desired. If the mandrel is fitted with a balance wheel, the distance between bearings will be shortened from that shown, and the width dimensions of the frame will have to be altered accordingly. Although it takes somewhat more time to join the frames with the type of bolted joints detailed, the method has the advantage of rigidity and durability. Moreover, if the wood shrinks and the joints loosen, the whole frame can be tightened.



Figs. 5, 6 and 7 show a frame which, with some minor adaptation, can be fitted to the front of almost any tractor having side frames that ordinarily are used for attaching implements. Note that when the saw



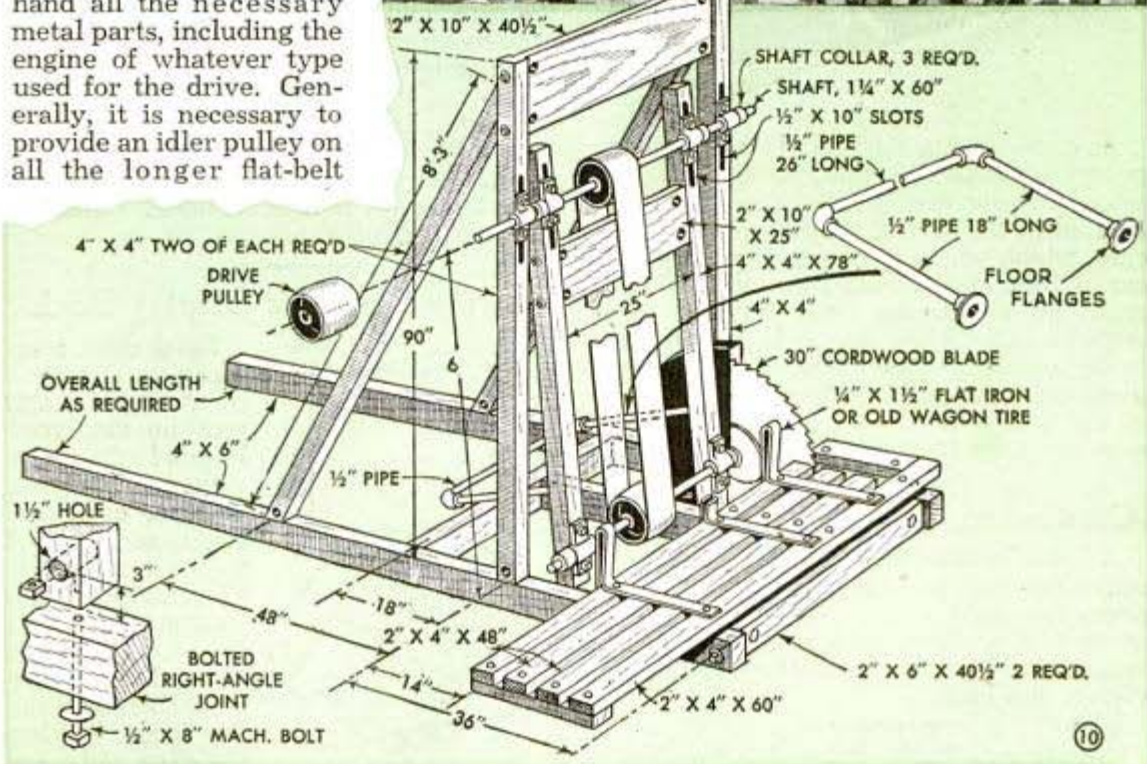


is in the operating position, Fig. 5, the table and frame are supported on legs, which are pivoted to the frame and swing downward into position. For transport, the legs are held up against the frame by means of a short chain or hook. Hardwood should be used for the legs and 2 by 6-in. hardwood for the crosspiece. When in the transport position the frame rests on U-shaped supports bolted to the front end of the tractor frame as in Fig. 7.

Carriage tables that move horizontally can be provided with rollers if desired. Fig. 8 suggests a simple way of fitting these rollers under the carriage. Disks 1/2 in. thick are cut from a piece of 3/4-in. steel shafting with a hacksaw and center-drilled to take a 10d nail loosely so the roller will turn on the nail. Holes are bored and slots chiseled in the frame piece to take the rollers as indicated. A strip of flat iron screwed to the bottom of the carriage board will make a suitable "track." Use hardwood for all frames, and finish with two coats of spar varnish or implement paint to protect the wood. Fig. 9 shows a simple and effective saw guard made from a piece of plywood and screwed to the frame back of the blade. A curved strip is screwed to the plywood edge just outside the circle of the saw teeth. Such a guard does not interfere with removing the blade, yet offers protection against one of the greatest dangers to the operator of a cordwood saw, that of a sliver or small piece of wood or other object falling on the blade when it is running.

Fig. 10 shows a cordwood saw similar to a swinging cut-off saw and designed for heavy work. This saw is intended for mounting on a truck or four-wheeled trailer and can be driven with a salvaged automobile engine. With some minor changes it can be mounted on a general-purpose tractor also. This usually can be done by bolting the rear ends of the lengthwise frame members to the rear-axle housings and supporting the forward ends by means of a cross member bolted to the front of the tractor frame. In use, the operator stands between the frame members back of the saw and swings the blade into the work. The table is stationary. Helpers handle the logs which can be cut to any convenient length for several men to carry. Blades up to 36 in. in diameter can be used, but it will be necessary to shift the upper drive shaft so that the larger-diameter blade and the mandrel will clear the table.

If you use different size blades an adjustable stop should be provided. All shaft bearings should be provided with pressure grease fittings. Only certain of the dimensions are given on the frame. Changes necessary to adapt the design to use of salvaged pulleys, shafting and other parts must be left to the builder as dimensions must be changed to suit what one has at hand or can obtain. Some machining usually has to be done on the saw mandrel to adapt it to use with this design. Don't cut any valuable stock or timbers until you have at hand all the necessary metal parts, including the engine of whatever type used for the drive. Generally, it is necessary to provide an idler pulley on all the longer flat-belt



drives. The idler should run on the slack side of the belt nearest the driven pulley and just how it is installed depends on the type of idler and mounting you have or can obtain. When you mount the mandrel on any of the frames that are attached to the tractor, it's a good idea to provide slots so that you can shift it forward or backward. This will enable you to make the proper adjustment for table travel into the saw blade. And of course steel angles are better than wood for making almost any design of cordwood-saw frame.

Two final and important precautions:

Always make certain that the blade is tight on the mandrel before starting, and do not exceed the recommended speeds for the size blade you are using. As an example of the latter, the speed of a 30-in. blade should not exceed 1,500 r.p.m. A speed of 1,200 r.p.m. is safer, while larger diameter blades should run proportionately slower.

Grease-sealed ball bearings with a 1/2-in. hole make excellent collars for a shaper. Because this type of collar remains stationary, the usual burned mark is eliminated from the work.

Salesman's Cardboard File Case Attached to Roof of Car

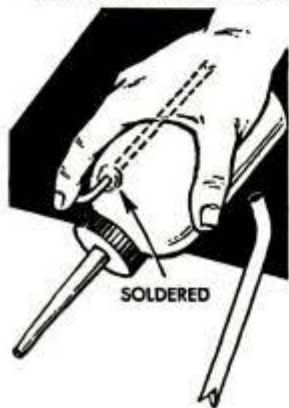


In order to have his cards and various papers arranged so that he could easily select them as desired while making calls, one salesman used a small cardboard file case, which was attached to the top of his car within easy reach from the driver's seat. To attach the case, buttons were sewed to the fabric lining inside the top to engage buttonholes which were cut in pieces of tape glued to the ends and sides of the case. With this arrangement the case could be removed whenever desired.

Cardboard Softens Muslin Buff

A loose muslin buff can be made much softer for final polishing work by fitting a paper or light cardboard ring between every two or three cloth rings. The paper rings should be about one-third the diameter of the buff.

Small Air Tube Repairs Oilcan



If a large oilcan loses the snap action in the bottom so that oil cannot be forced out, just drill a hole in the can near the top and solder in a small tube as shown. The tube should be notched at the lower end so that it can rest against the bottom

of the can without preventing the entrance of air. In use, hold a finger over the upper end of the tube and then lift it slightly whenever you want oil to leave the can.

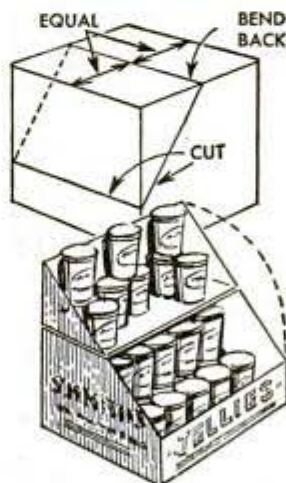
John Krill, Youngstown, Ohio.

Lock Rims Chained to Truck Tire For Safety When Inflating

After being injured by a lock rim that flew off while inflating a repaired truck tire, the driver of a road-service car now chains the rim to the wheel as indicated. The chains are passed between the wheel spokes and around the tire and rim where they are fastened by inserting one end link through the other, a bolt being run through the projecting link to secure the chain. It takes only a few minutes to attach and remove the chains, which prevent the lock rim from flying off if it is loosened while the tire is being inflated.



Carton Provides Display Rack



Food cans, soap bars and other packaged goods can be displayed to good advantage right in their own packing cases if the latter are cut to form neat display racks. To do this, cut diagonally across the ends near the corner and then across the front, leaving the top side intact. Then fold the severed portion of

the case back on the top as indicated. This forms a display case with one shelf and an open front.

Safe Way to Cut Coil Springs

When cutting a coil spring, danger from flying pieces can be avoided by running a wire through the spring and tying the ends together to form a loop. This will confine the force of the severed spring within the length of the loop.

George K. McKeowan, Painesville, Ohio.

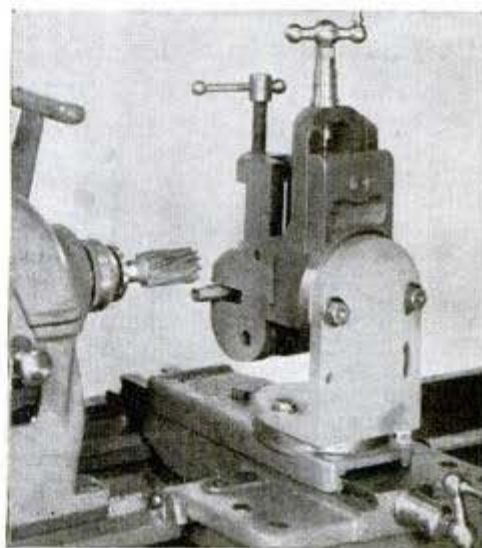
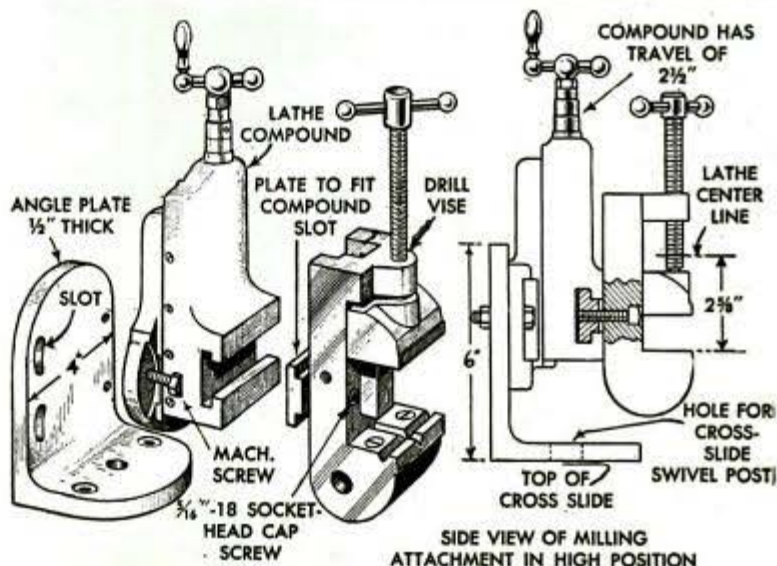
MILLING ATTACHMENT

uses lathe compound

OCCASIONAL jobs of light milling can be done on the lathe with the use of this simple attachment. The three parts of the unit are standard, and all perform their individual jobs as well as functioning as a unit in the milling attachment. The first item is an angle plate, which should be at least $\frac{1}{2}$ in. thick, and can be either cast or cut from standard angle-iron stock. The work-adjustment part of the attachment is the regular lathe compound, while the work-holding portion is a standard drill-press vise. The method of assembly is apparent



from the photos and drawings. Only a few dimensions are given as the unit will vary, depending on the swing of the lathe, size of compound and drill vise, etc. In planning this for your own lathe, first make a rough side view of the assembly. Start with the lathe centerline, and locate the lower jaw of vise $2\frac{5}{8}$ in. below this. Sketch in the lathe compound as it appears when fully advanced, then locate the angle plate in relation to the top of cross slide. If the lower jaw of the vise is $2\frac{5}{8}$ in. below the centerline, and the compound has the usual $2\frac{1}{2}$ -in. travel, the milling attachment can be raised to center stock as small as $\frac{1}{4}$ in. diameter. Another set of holes in the angle plate for a "low" position will be found useful when swinging large cutters. The low position should be such that the bottom of the drill vise just clears the top of the lathe saddle. One of each pair of holes in the angle plate is drilled oversize or slotted so that the unit can be adjusted with vise jaws exactly horizontal. The top photo shows the set-up for cutting a keyway with a large cutter, the milling attachment being mounted in the low position to the outer face of the angle plate. The lower photo shows a set-up for cutting a flat on a shaft, the milling attachment being mounted in the high position to the inner face of the angle plate. The angle plate mounts on the cross slide in the same position ordinarily occupied by the compound.



Upper Edges of Large Skid Boxes Shielded Against Wear

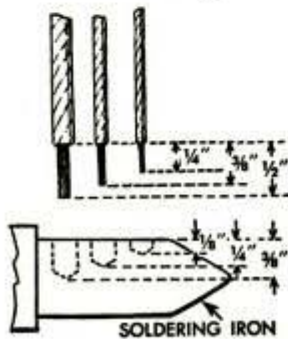


Noticing that the upper edges of the canvas-covered skid boxes used in his store wore rapidly by contact with objects being slid into them, one store owner fitted the boxes with wooden shields as indicated. Each shield consists of three strips nailed together to form a groove on the underside as indicated in the upper detail, the edge of the box fitting into the groove to hold the shield in place.

Sticking Tape on Damp Surfaces

If masking tape refuses to stick during damp weather, moisten a cloth in paint thinner, alcohol or similar liquid, and rub the surface of the work with it. This dries out the moisture and gives the tape a good contact.

Small Wells in Soldering Iron To Dip Ends of Wire



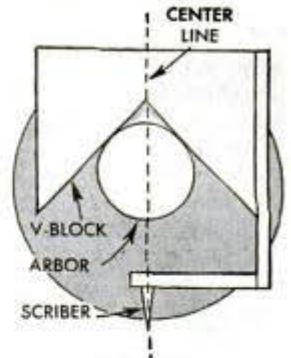
and filled with solder. The iron kept the solder molten and the job was done quickly. The holes were varied in depth as indi-

cated, since some wires had to be coated farther back from the ends than others.

Fred Lettino, Astoria, Long Island, N. Y.

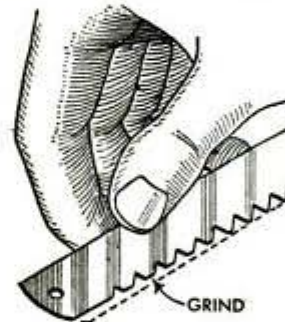
Simple Scriber for Centering A Milling-Machine Cutter

Here is a fixture that will enable you to quickly center the cutter of a milling machine on the work. The fixture consists of a V-block to which is fastened a scriber as indicated, the scriber point being located exactly in line with the center of the block. To use, merely place the fixture over the machine arbor, level it and then scribe your center mark.



Wm. Slamer, Milwaukee, Wis.

Avoiding Breakage of Saw Blades



You can avoid breaking teeth from a hacksaw blade when starting a cut if the teeth at the front end are ground down on a slow taper for a distance of about 2 in. as indicated. This allows each succeeding tooth to bite progressively into the work a little deeper than the one ahead.

This treatment is especially effective on extremely hard, high-speed blades.

Russell J. Hunt, Chicago.

Shavings Removed From Work By Blower on Drill Bit

If shavings obscure the layout markings when you are working with wood on a drill press, wrap a piece of tape around the drill so that one end projects about an inch. When the drill rotates, the projecting tape will blow away the shavings.—W. Kraatz, Rialto, Cal.



LIMESTONE SPREADER

Saves Time and Material

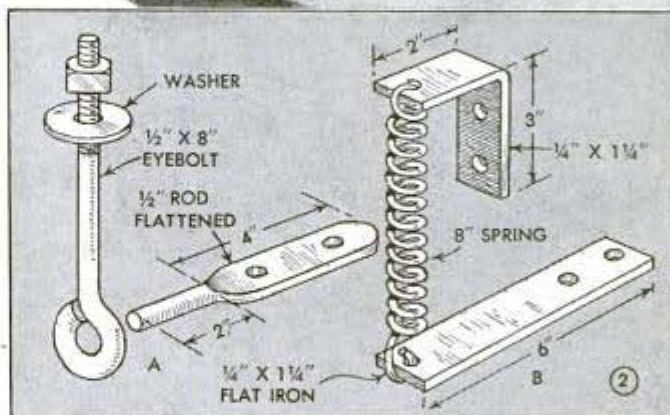
HERE'S a practical and inexpensive spreader for handling any finely-ground fertilizing material such as rock or lime phosphate, limestone, etc. It is made almost entirely of wood, only a few pieces of flat iron, rods and bolts being required. It will operate satisfactorily at speeds up to 10 m.p.h. Fig. 1 shows the spreader in use on a truck, but it operates equally well on a rubber-tired tractor trailer or an ordinary farm wagon. About all that is necessary to adapt it is to change the length of the hangers and perhaps the "knocker" or agitator arm.

On a farm wagon, the knocker-arm contacts on the wheel can be clamped to the spokes.

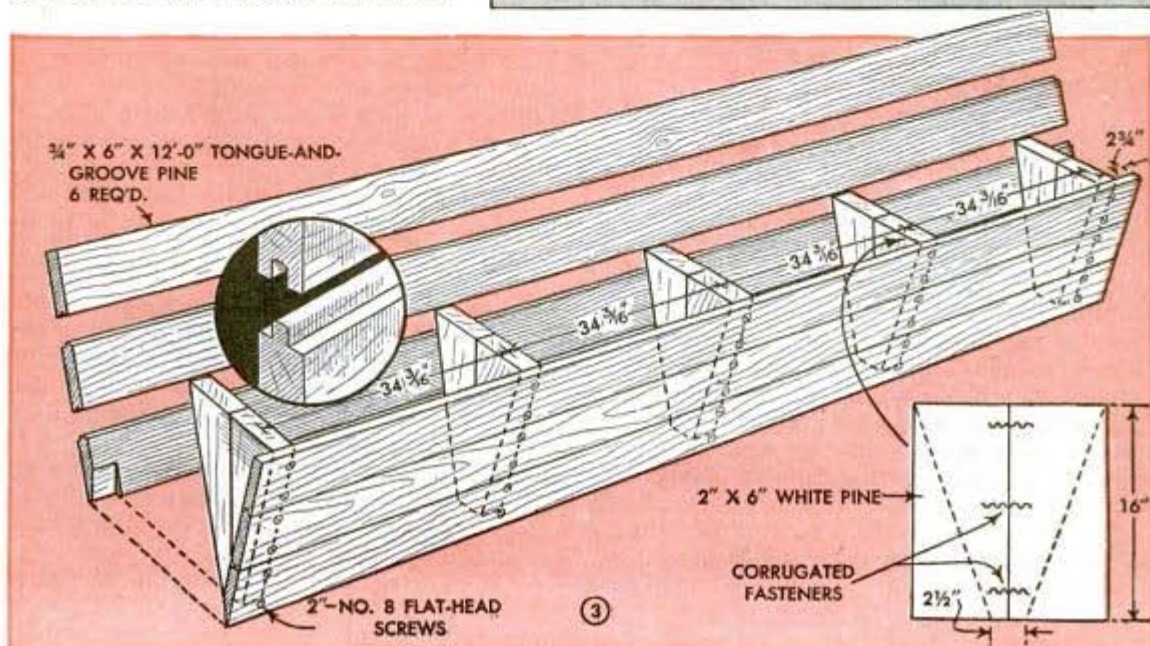
The hopper, Fig. 3, is 12 ft. long overall and is divided into four compartments. The compartments add to the strength of the assembly and also make it easier to keep a uniform amount of material in the hopper. However, the hopper can be made somewhat longer or shorter, and wider at the top and deeper if desired. In any case the inside width at the bottom should be 2½ in. The ends of the lower



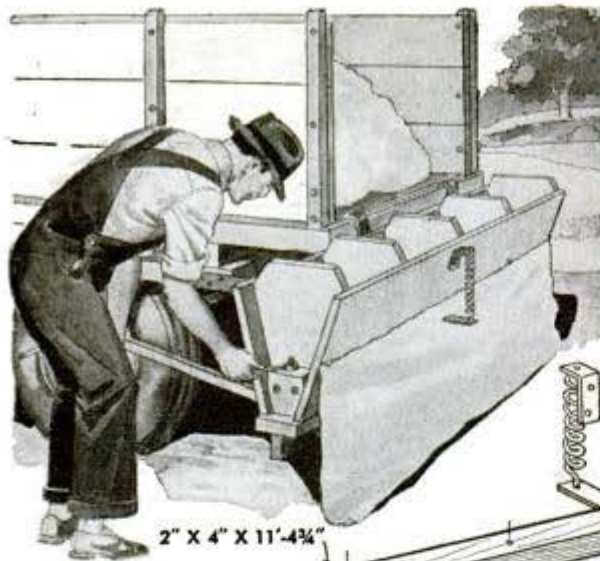
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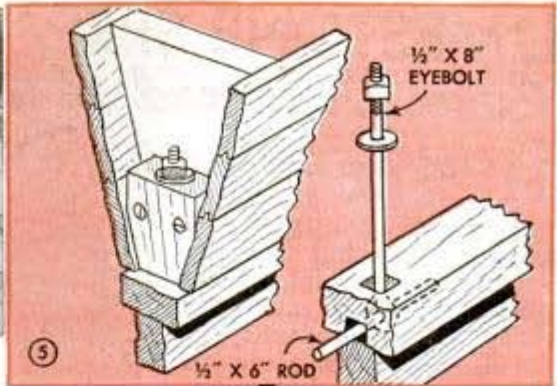
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2" X 4" X 11'-4 3/4"

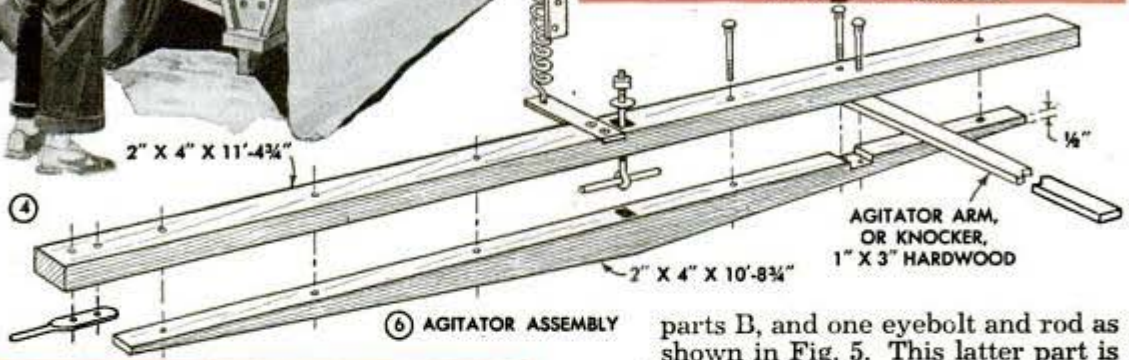


5

1/2" X 6" ROD

1/2" X 8" EYEBOLT

4

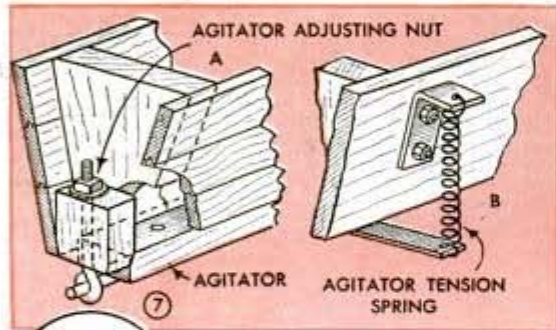


6 AGITATOR ASSEMBLY

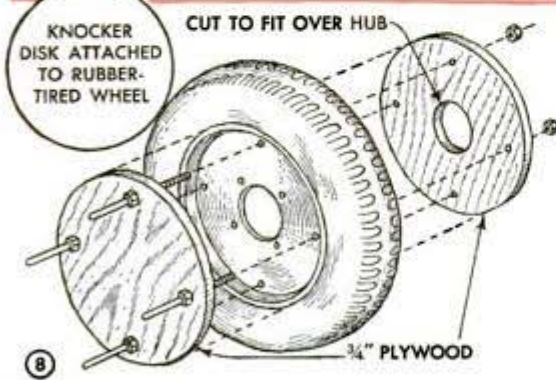
AGITATOR ARM, OR KNOCKER, 1" X 3" HARDWOOD

2" X 4" X 10'-8 3/4"

1/4"



7



8

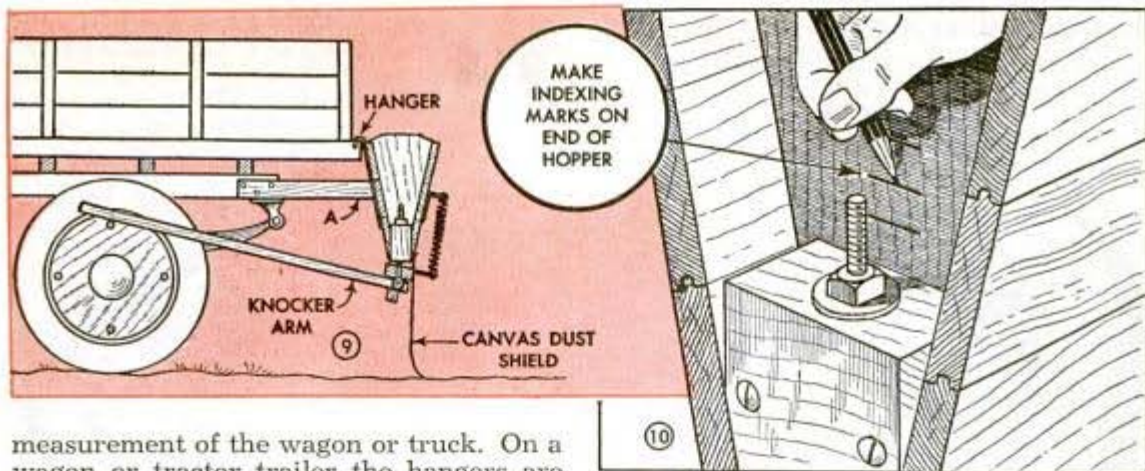
boards are notched to take a 2 by 4-in. block as shown. Be sure the partition pieces are all the same size, and before assembling paint all joining edges with an oil paint. Use screws in assembling. They hold much better than nails. Plane the edge of each of the bottom boards flush with the partition pieces so that the bottom of the hopper is square across. Parts shown in Figs. 2 and 5 can be made by a blacksmith or a welder. Two each of parts A in Fig. 2 are required, but only one each of

parts B, and one eyebolt and rod as shown in Fig. 5. This latter part is assembled at the center of the hopper. Parts A and B of Fig. 2 are shown in position in Figs. 6 and 7.

The agitator consists of two lengths of 2 by 4-in. stock assembled with bolts as in Fig. 6. The lower stiffener is tapered from the center toward the ends. Although not essential, the tapers cut down the weight somewhat without weakening the piece. Note, in Fig. 6, the position of the center pivot, which is detailed in Fig. 5. The exact position of the agitator arm is not given as this has to be determined by measurements taken directly from the truck, trailer or wagon on which the spreader is to be used. Once the location is determined the arm is bolted in place as shown in Fig. 4. It's a good idea to use waterproof glue in all joints of the hopper and agitator.

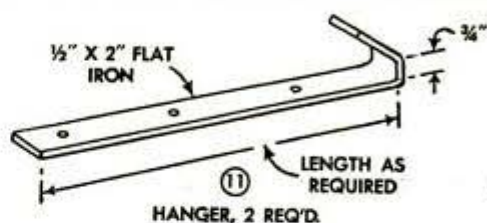
Fig. 8 suggests one way of fitting a knocker disk to a rubber-tired wheel. Of course, the construction of the wheel will determine how the knocker disk is to be attached. On some types of disk wheels it is not necessary to drill holes for the knocker pins as there are equally-spaced openings near the rim. The knocker pins are lengths of 1/2-in. iron rod threaded from one end to such distance that they will pass through the disks and project about 6 in. as indicated. Be sure to cut an opening in the outer wood disk for the valve stem. A similar arrangement can be made for use on wood-wheeled farm wagons, using larger diameter wood disks.

The hopper is supported on hangers as in Figs. 9 and 11. Length of the hanger is not given as this has to be determined by



measurement of the wagon or truck. On a wagon or tractor trailer the hangers are simply hooked over the endgate, and on a truck they usually can be hooked to the bed. Ordinarily, the bottom of the hopper should be about 24 in. from the ground and in most cases two braces will be required to hold the hopper level as at A in Fig. 9. Nearly all users fit the hopper with a canvas dust shield as in Fig. 1. This prevents loss of the fine material. The completed spreader should be given two coats of oil paint to prevent warping and shrinking.

To determine the setting for a given amount of fertilizer spread per acre, first draw the agitator snugly against the bottom of the hopper by turning down the nuts on the three eyebolts as in Fig. 4. Then release the nuts a given number of turns until the agitator moves freely without binding when actuated by the knocker assembly. This will give a check setting. Then fill the hopper with a known quantity of fertilizer and drive across the field until the spreader is empty. Measure the distance traveled in feet. Then multiply the width of the hopper by the distance traveled and divide by 43,560. As an example, assume that 300 lbs. of material in the 12-ft. hopper cover a strip 1,820 ft. long; 1,820 ft.

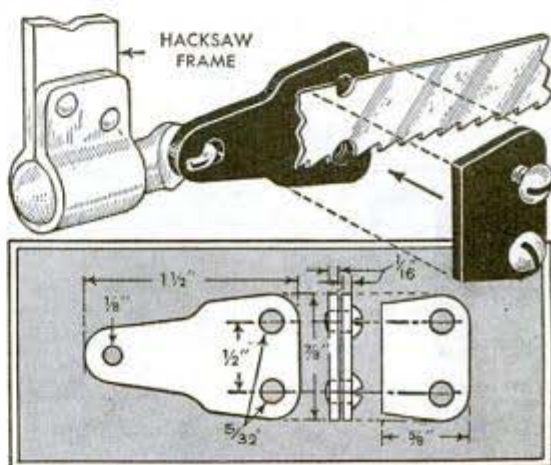


multiplied by 12 ft. equals 21,840 sq. ft.; 21,840 divided by 43,560 equals .501, or approximately one-half acre covered. More or less can be spread by adjusting the agitator. When you have the spreader adjusted for the amount or amounts desired, make index marks at the ends and center of the hopper as in Fig. 10. The marks then will enable you quickly to set the agitator to spread any given amount. Always adjust the center pivot whenever you change the setting of the end pivots.

Constructional details on limestone spreader printed by courtesy of the Agricultural Experiment Station, College of Agriculture, University of Illinois; Englert Engineering Co., Nashville, Tenn.; and Ruhm Phosphate and Chemical Co., Mt. Pleasant, Tenn.

Simple Clamp Holds Broken Hacksaw Blade in Saw Frame

Hacksaw blades often are broken off near the end, and being so hard that they cannot be drilled, are discarded because they cannot be used in the saw frame. However, with a simple clamp like the one shown the blades can be held in the frame. The clamp consists of two pieces of flat metal shaped as indicated, and drilled and tapped for two screws which clamp them over the blade. Notice that the edges of the blade are slotted to fit part way around the screws.



☐ If soap and water do not clean grimy shop windows, try a weak solution of oxalic acid and water. It's best to wear rubber gloves, as the acid may burn the bare hands.

Sharpened Hook on Ice Scraper Turns Cakes for Washing



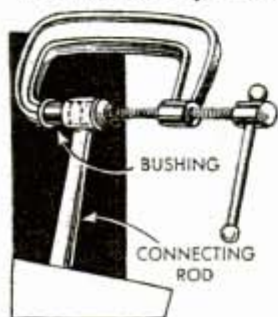
Much of the labor of turning cakes of ice for washing before delivery can be eliminated by attaching a flat-iron hook to the shank of an ice chisel or scraper. In use, the hook is driven into the top edge of a cake, with the chisel blade held flat against the side as shown. The shank, extending above the cake, then is used as a lever for turning the ice.

Oiling Improves Jute Rope

Jute rope will be flexible, tough and weatherproof if it is soaked in linseed oil. Coil it uniformly in a container—a dishpan will hold up to 50 ft. of $\frac{3}{4}$ -in. rope—and pour a gallon of oil over it. Let it soak overnight. The rope absorbs little of the oil, which then can be used for other purposes. Unlike wetting, which shrinks rope, oiling expands it a little. It is believed that by oiling jute rope, it will give as good service as unoiled manila rope.

Edward Elsas, Kansas City, Mo.

Easy Way of Installing Bushings In Motorcycle Connecting Rods



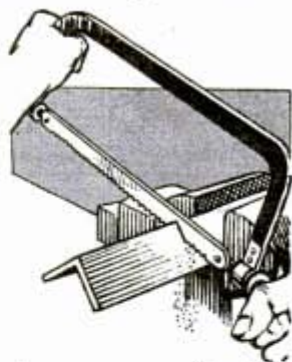
When installing new connecting-rod bushings and wrist pins in a motorcycle engine, it is not necessary to remove the rods from the motor or the motor from the frame, if you use a C-clamp to press

the bushings into place. This method prevents any possibility of distorting the rods and also saves work, as it is necessary to remove only the cylinders and pistons.

W. M. West, Dallas, Tex.

How to Hacksaw Angle Iron

When cutting angle iron with a hacksaw start at the center on the back side as indicated instead of cutting down one side and across the other as is often done. This will save time by requiring fewer strokes of the saw. Also, the saw will cut more smoothly because more of the teeth will be engaged in cutting through both sides of the angle at the same time.



Cardboard Cushions Egg Bucket

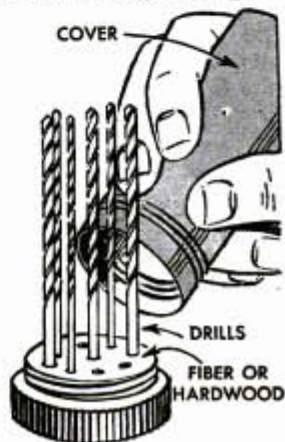


Accidental breakage of eggs when carried in a bucket or wire basket was avoided by one farmer who cushioned the container with corrugated cardboard. Three thicknesses of the cardboard were placed in the bot-

tom of the container and two around the sides as indicated. If desired, the cardboard can be glued in place to keep it from falling out.

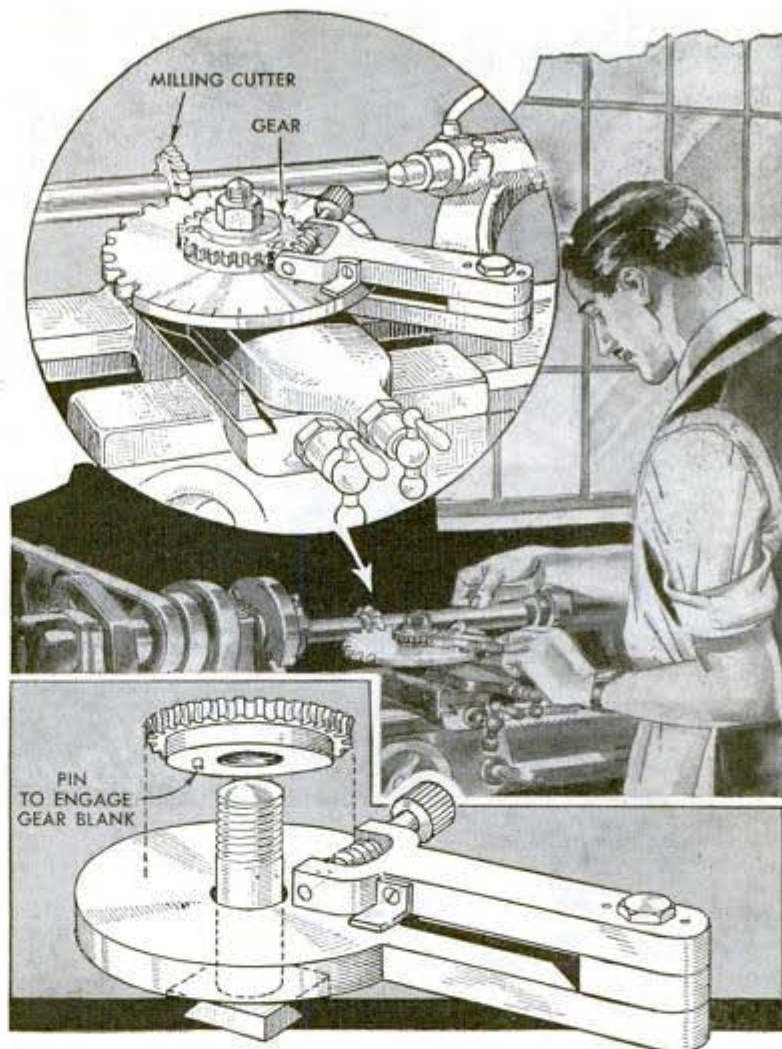
Small Drills Kept in Container Used for Stick Shaving Soap

An empty shaving-soap container of the type shown provides a handy cover for small drills, taps and similar tools. All you have to do is to fit a piece of fiber or hardwood in the bottom of the container and drill it to take the tools.—P. Soutar, Windsor, Ont., Can.



Lathe Attachment to Cut Your Own Small Gears

With this simple attachment and a lathe milling cutter any lathe owner can produce his own gears for experimental purposes, and for other uses where accuracy is not too critical. The attachment is made as shown in the lower detail. The bolt through the center supports the attachment and has the head shaped to fit the T-slot of the lathe cross slide. This bolt also serves as an axle for the gear blank, which is turned by means of a worm and gear assembled as indicated. The arm carrying the worm is attached with one bolt and two pins. Notice that a pin on the underside of the gear is used to engage a small hole in the gear blank for turning the latter. Before setting up the gear blank in the attachment, turn it to correct diameter and thickness. Lay out the tooth positions on a piece of paper and then glue this to the blank. The gear blank is fed into the cutter with the cross slide and should engage the blank at its exact center. This will make a cut with a curved edge, but still produce a gear satisfactory for many uses. After a tooth has been cut, the nut on the supporting bolt is loosened and the blank turned to the next



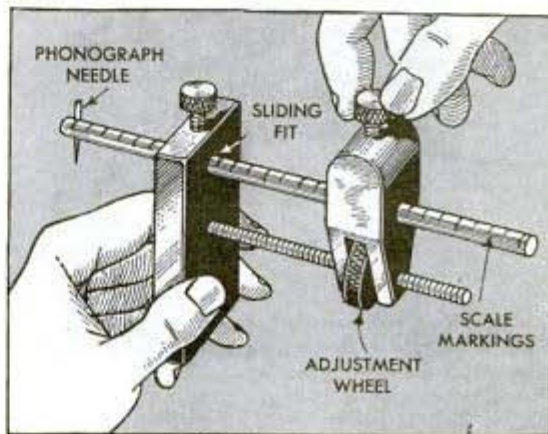
tooth position by means of the worm. A pointer fastened to the worm arm will aid in doing this accurately. Any roughness in cutting can be smoothed with a file.

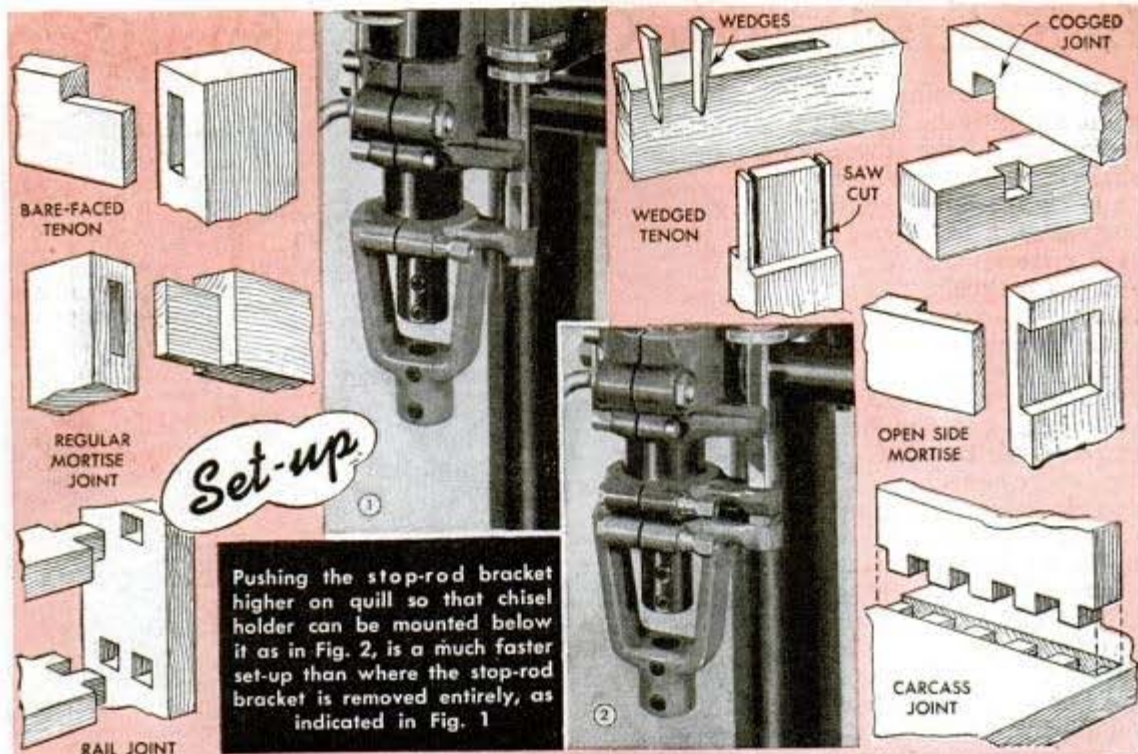
T. W. Cleaveland, Weston, W. Va.

Adjusting Wheel on Marking Gauge Permits Close Setting

Where extreme accuracy is required in setting a marking gauge, much of the time lost in making the adjustment can be saved by using a gauge like the one shown. Use of a small adjustment wheel permits very fine adjustments to be made with ease, and by loosening two thumbscrews, the scribing rod is moved readily to make wide adjustments. The entire assembly can be made, or a commercial gauge can be fitted with a similar adjusting feature. On a homemade gauge a phonograph needle provides a good scribing point, especially if the gauge is to be used on metal.

Cpl. Frank W. Debski, Salinas, Calif.





Pushing the stop-rod bracket higher on a quill so that chisel holder can be mounted below it as in Fig. 2, is a much faster set-up than where the stop-rod bracket is removed entirely, as indicated in Fig. 1.



Hollow-Chisel

By Sam Brown

MORTISING on a drill press with the use of a hollow chisel is so fundamentally simple that many craftsmen neglect the finer points of this phase of wood-working. You can do better, faster, cleaner work by observing the simple rules of correct practice.

Set-up: Some drill-press manufacturers advise the removal of the stop-rod bracket. The hollow-chisel holder is then pushed onto the quill and fastened to the stop rod. This set-up, shown in Fig. 1, is practical but involves needless work and time. The best set-up is shown in Fig. 2. Here the stop-rod bracket is not removed but is simply pushed to a higher position on the quill, the chisel holder being mounted below it.

Bit clearance: Most workers adjust bit clearance by sighting across the end of the chisel. This method is very inaccurate. The proper way is to set the clearance at the time the chisel is mounted, allowing about $\frac{1}{32}$ in. between the chisel shoulder and holder, as in

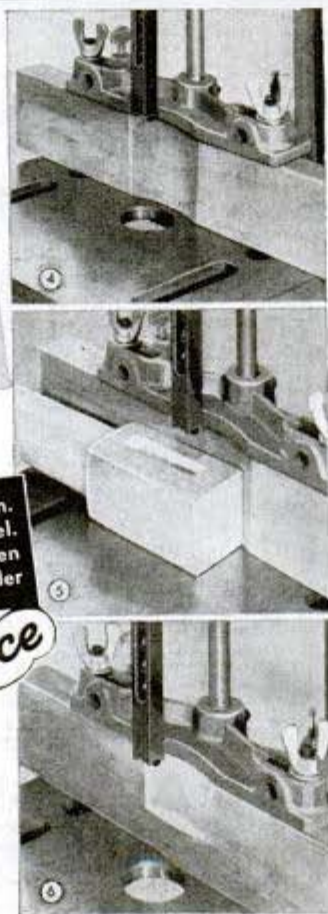


Bit clearance

Set clearance of $\frac{1}{32}$ in. when mounting the chisel. Push bit up tight, then advance chisel to holder

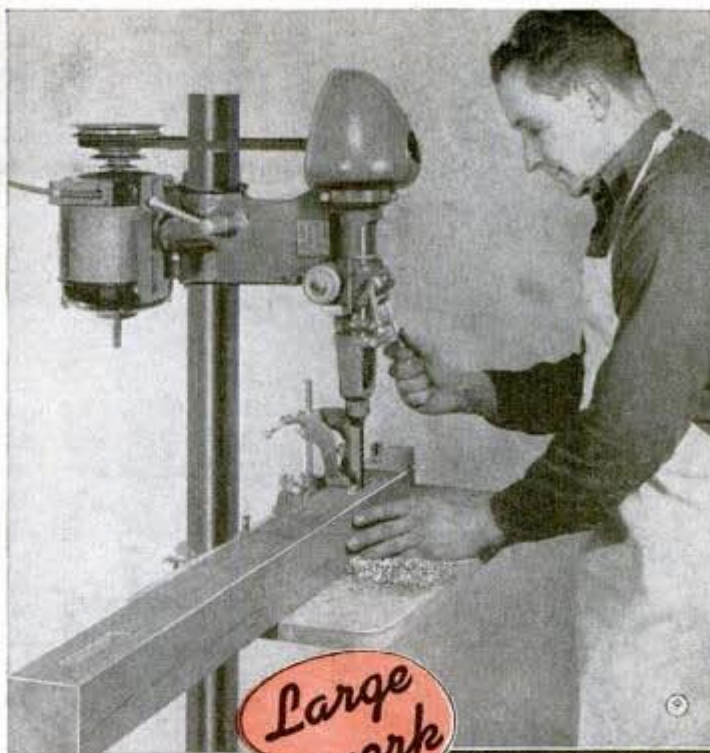
Fence

A fence wholly or partly cut away at center is useless when mortising work with short flats. Correct by turning the fence around and making partial cut on new face, as shown in Fig. 6





Mortising speeds under 800 r.p.m. result in big chips which jam inside the chisel, causing overheating. Speeds of 1800 to 3000 r.p.m. give a fine chip, easily ejected, as shown below



Large work such as storm sash and doors is difficult to hold on standard drill table. An auxiliary wood table with longer fence is better

MORTISING

Fig. 3. The bit is pushed up tightly and fastened, after which the chisel is pushed home to give the clearance. Although $\frac{1}{2}$ in. is nominal clearance, slightly more should be allowed when using chisels over $\frac{1}{2}$ in.

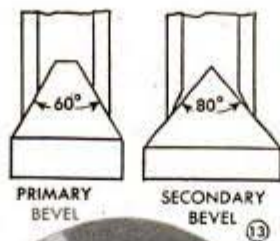
Fence: Some standard mortising fences are wholly or partly cut away at the center as in Fig. 4 to permit their use in routing and shaping operations. This type of fence is unsatisfactory when mortising work with a short square section as the work tends to get out of line, Fig. 5. If you have this type of fence, turn it around and make the cut-out as before, but only part way across, as in Fig. 6.

Speed: A mortising speed of 2400 to 3000 r.p.m. should be used for softwood; 1800 to 2400 for hardwood, when using chisels up to and including $\frac{1}{2}$ in. square. Larger chisels will require a reduction in speed. Too slow speed often causes burning as a slowly rotating bit picks up a big chip, and the stream of big chips has a considerable wedging and heating action when passing through the chisel. Notice in Fig. 7 the large chips and how the chip stream does not clear the work. Fig. 8 shows the result of a higher speed—very fine chips that pass easily through the chisel without binding. An auxiliary table with larger surface and longer fence as in Fig. 9 is almost a necessity when mortising doors and other large work.

Bits and chisels: The standard bit for mortising is a double-flute pattern with knife spurs and no point as shown in Fig. 10. This is a very smooth-cutting bit in softwood and generally is satisfactory for all types of cutting other than production runs in hardwood. The brad-point bit is a heavy-duty style designed especially for production runs in hardwood. The hog-type bit has corrugated edges. It is claimed that this style of bit runs much cooler



Various bit and chisel styles are available. The standard items pictured above are briefly described in text



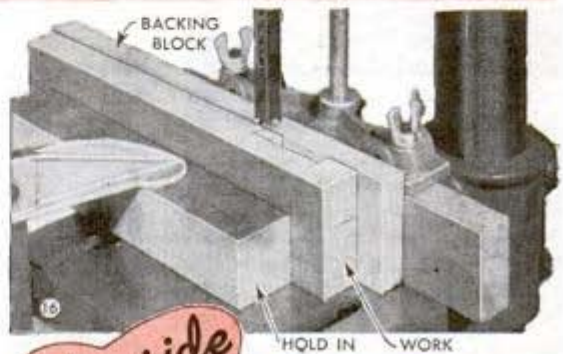
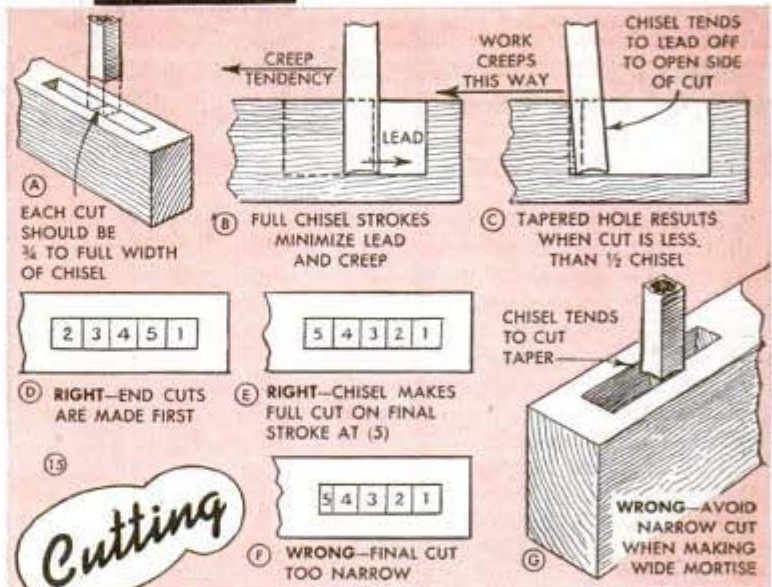
An abrasive cone run in drill press is best equipment for chisel grinding

because of the chip-breaking action of these edges. A standard chisel has one opening, rather high up on the blade, and a hard-wear chisel for production work has two openings, one on either side, for quicker chip relief. A standard chisel can be converted to this style by grinding the second opening, Fig. 11. Chisels also can be obtained in oval, triangular and oblong shapes.

Sharpening bits and chisels: A hollow chisel actually is an arrangement of four ordinary woodworking chisels arranged four-square. Like the woodworking chisel, the cutting angle should be blunter for hardwoods than softwoods. Also, a primary and secondary bevel are used to simplify sharpening. This can be done with a flat file, a cone grinding wheel or wood cone shape covered with 80-grit aluminum oxide or emery paper. Figs. 12 and 13 show the operations. For average work, a primary bevel of 60 degrees is satisfactory. The secondary bevel should be about 80 degrees. The chisel is sharpened on the secondary bevel only, until repeated sharpening makes this bevel longer than one-half the thickness of chisel wall, at which stage the primary bevel is again ground. The ex-

treme corners of the chisel are not touched by the cone and should be pointed up with a square file, as in Fig. 14. Bits are sharpened the same as ordinary woodworking bits, filing the cutting edges through the throat and the spurs from the inside.

Cutting: The one important rule to observe in actual cutting is always to take a cut three-quarters to full chisel width as at A in Fig. 15. It can be seen that since one side of the chisel is open, the chisel tends to lead toward this open side, the work at the same time creeping in the opposite direction. A full chisel stroke as at B minimizes this tendency while a paring cut aggravates it as indicated at C. A good method of working, which eliminates possible tapering at the ends of the mortise, is shown at D where the two end cuts are made first. A continuous running cut, E, is also satisfac-



The side mortise

Tendency of chisel to run out in cutting side mortise is prevented by use of backing block

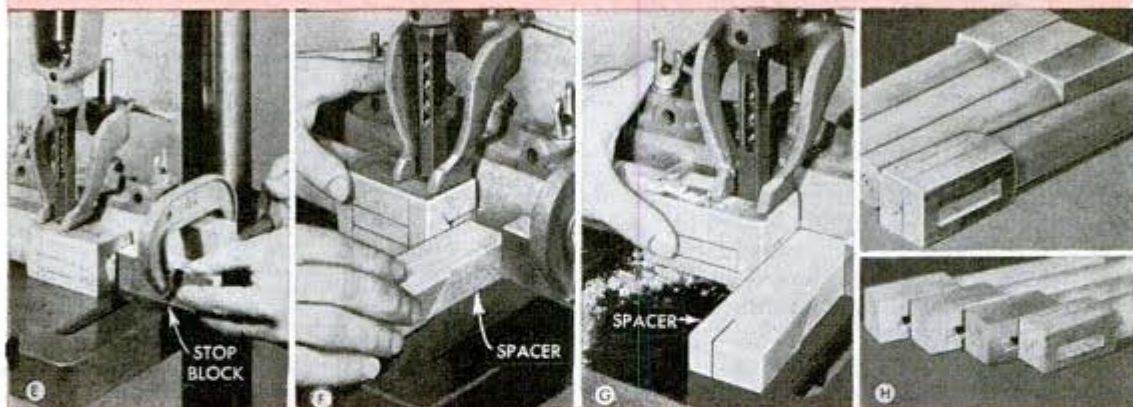


A Make assembly of legs four-square with best surfaces outside. Mark outside facing edges and cut rails after mortises have been made

B Select any one leg and lay out position of mortise on the two sides not marked, taking measurements from the face sides of work

C Arrange legs on bench with all marked (face) sides down and away. The master leg is at front and is used in setting drill press

D Advance chisel to correct depth as indicated by mark on end of master leg. Clamp quill in this position and set stop-rad nuts



E Advance the chisel to contact work at end of mortise. Adjust fence to suit and clamp a stop block to the fence to limit travel of cut

F Advance chisel to opposite end of mortise. Use spacer block between stop block and end of work. Recheck travel and fence setting

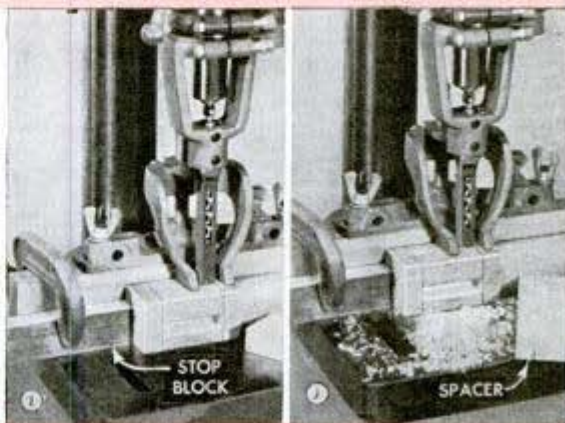
G Cut the mortise. For average work it's best to make the two end cuts first, then clean out the remaining wood between the cuts

H Turn work end for end and replace on bench with marked (face) sides down and away. Cut mortise on top side of remaining pieces

tory providing the final cut is nearly full chisel. The wrong way of working is shown at F, where paring final cut may cause tapering. Similarly, a wide mortise should be made with two or more equal rows, and not one thick and one paring cut as at G.

Side mortise: This is another example where provisions must be made to prevent the natural tendency of the chisel to lead out. In this case a backing block of the same width as work provides solid support, as shown in Fig. 16. Both the work and backing block are held by means of a "hold in" which is clamped in place.

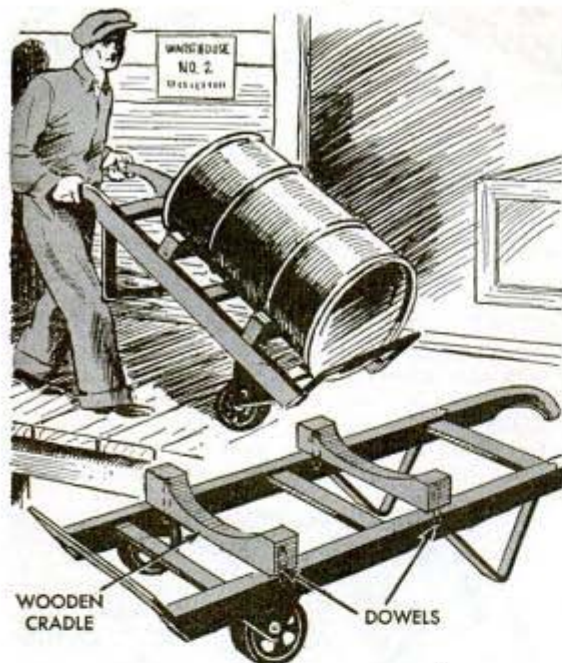
Work schedules: A definite schedule of operations speeds the job and results in clean work. One of the most important schedules in craftwork is concerned with the making of tables, chairs and similar work. A schedule for this is illustrated and described above.



I Pick up the master leg and place it on drill table in the same position as it occupied on bench. Remove the stop block and clamp at opposite end of fence

J Cut the mortise. Repeat on other legs. Note in all cutting that the legs take same position they occupy on bench—always with face sides down and away

Removable Cradles Hold Drums On Warehouse Trucks



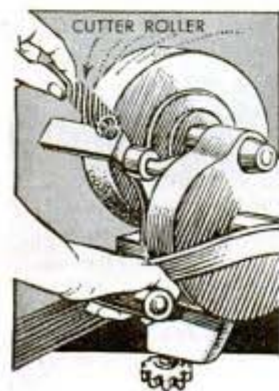
In a warehouse where drums, barrels and boxes had to be moved with the same trucks, removable cradles were made for the trucks so that the drums and barrels could be moved without holding them. The cradles were shaped from blocks of hardwood and were provided with dowels which fitted into holes drilled in the truck side pieces. In this way, the cradles could be put on or taken off in a moment.

A. H. Waychoff, Phoenix, Ariz.

Paper Gaskets Kept From Drying

Paper water-pump gaskets will not dry out when removed from the car if a coat of heavy oil or grease is applied as soon as they are taken out. Such a coating will also eliminate shrinking and curling, so that the gaskets can be used again if new ones are not available.

Honing Pencil-Sharpener Cutters



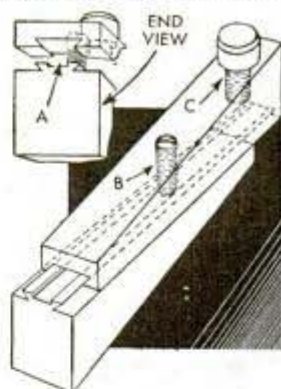
Roller cutters on pencil sharpeners, like other cutting tools, must be sharpened occasionally. To do the job easily, remove the cutters, insert a nail long enough to provide a good grip, and hold one roller at a time against an emery wheel so that the

roller rotates while being sharpened. The roller should be held at an angle, putting the cutting edge of the flutes straight in relation to the wheel, which must, of course, run against the edge, not with it.

W. E. Osmundson, Albert City, Iowa.

Sliding Parallel Has Extension Pin

You can make your own set of sliding parallels and besides add an extension pin that will enable you to obtain measurements beyond the normal range of the gauge. Use tool steel, and when milling or shaping the dovetail, recess a channel, shown at A, on which setscrew B will seat to lock the gauge. Extension pin C is a length of $\frac{5}{8}$ -in. tool steel threaded to screw into the upper surface as shown. Several of these of varying lengths should be made so that a full range of measurements can be obtained by adjusting the height of the pin.



H. D. Chapman, Mt. Rainier, Md.

Sinker Removes Snarls in Fishline



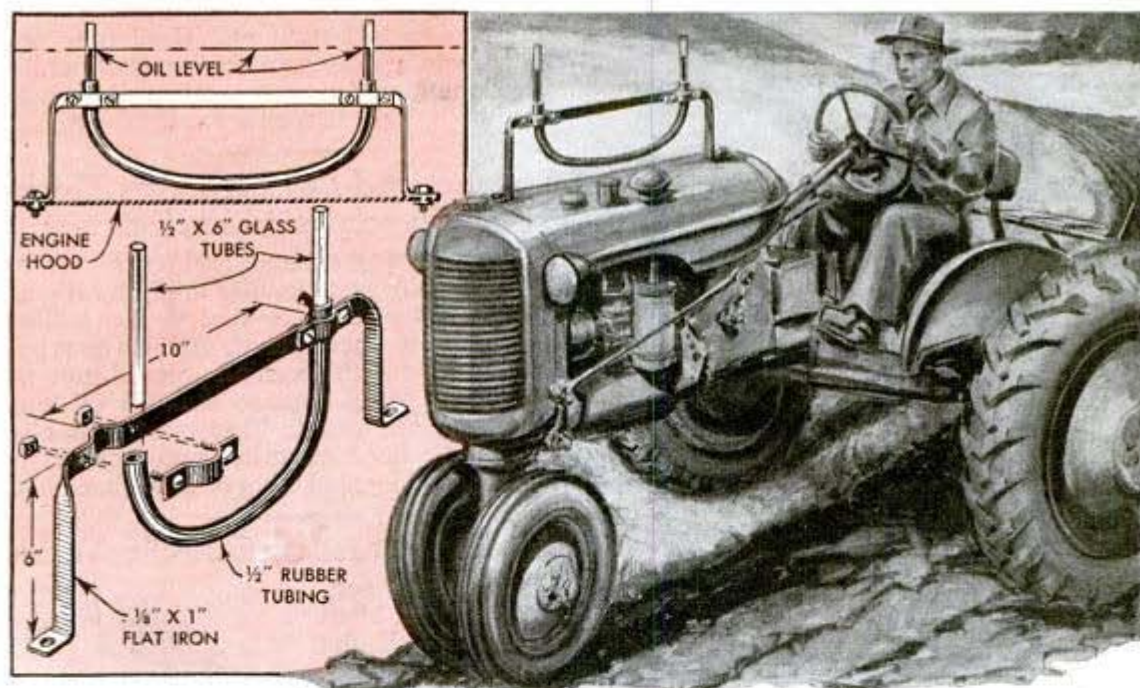
The next time your fishline becomes snarled and knotted, try this simple method of freeing it quickly. Open one eye of a lead sinker and use it as a hook to pick out the tangles and knots.

Receptacle in Wire Waste Basket For Tiny Pieces of Waste

In an office where bits of paper, pencil shavings, etc., passed through wire-mesh waste baskets and were scattered over the floors, the janitor attached receptacles to the baskets to receive these waste particles. The receptacles were clean tin cans cut at the tops to form tongues, which were bent down to hook over the edge of the baskets.



Simple Tractor Level Saves Time in Terracing



This improvised level enables the tractor driver to lay out terraces across medium slopes quite accurately. To assemble it, drive the tractor onto a level surface and attach the flat-iron bracket to the engine hood, centering it along the length of the hood. Then, assemble and clamp the rubber and glass tubes in place as indicated, and pour in enough No. 20 engine oil to rise about halfway in each tube. Adjust the height of the tubes until the oil level measures exactly the same distance from

the top of each. When laying out a terrace, the driver guides the tractor by watching the level of oil in the tubes. Some farmers using this device make an idle trip across the slope with the tractor moving very slowly to assure an accurate layout before starting to grade. Distance between the tubes is given as 10 in., but this may be more if desired. On some tractors that have low seats a greater distance between the tubes will make the level easier to read.

W. C. Lammey, Sandwich, Ill.

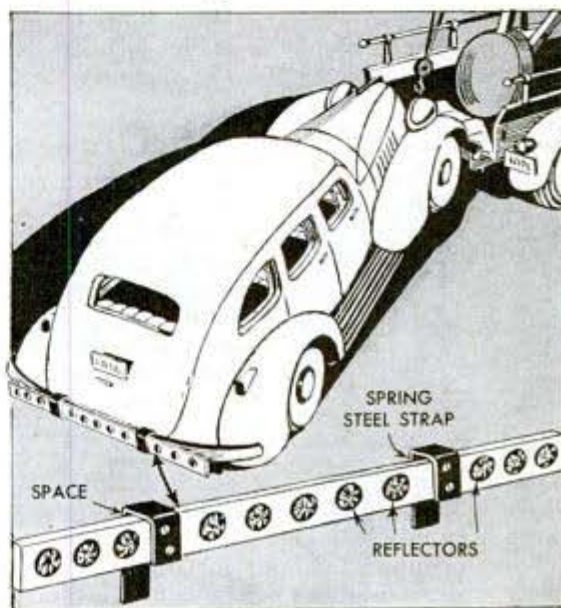
Reflector Assembly Clips on Rear Bumper of Towed Car

In the absence of usable taillights on some wrecked cars, the driver of a tow truck uses a number of red reflectors, which are mounted on a wood strip. This is fitted with a couple of metal clips so that it can be instantly attached to the rear bumper of the towed car. The clips are shaped from spring steel or other springy material and are screwed to the reflector strip as indicated.

Stopping Rear Main-Bearing Leak

When a rear main-bearing leak is caused by seepage past the surfaces of the bearing cap and block, the leak can be stopped by covering both mating surfaces with shellac.

☐ The square pieces of steel used in band-saw guides should be turned over at periodic intervals to equalize wear and prevent cutting deep ridges in the guides.



Turning of Small Logs in Sawbuck Avoided With Sickle Sections



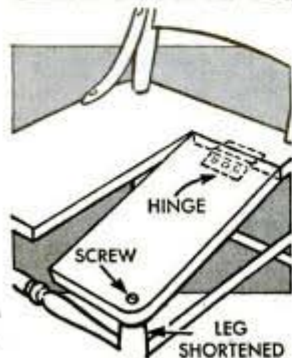
To keep small logs from rolling or turning in a sawbuck, screw a couple of sickle sections to the sawbuck as shown so that the logs will rest on them. Sections of the self-sharpening type which have fine teeth along their edges are best for this purpose.

Oil Line Clips Are Held Firmly By Valve Grinding Compound

To keep wire clips and oil line brackets, held by cylinder-head bolts, from turning when screwing down the head, I put a small amount of coarse valve-grinding compound on the under surface of each clip and bracket. Then no matter how tightly I screw the nuts down on them, they remain in place.

Charles Swope, Danville, Pa.

Chair Altered for Injured Person



By shortening the upper end of one leg of a chair and then tilting one half of the seat you can adapt it so that a person with a stiff knee or injured hip may sit in it normally against the back rest without discomfort. To determine

how much to shorten the leg, the intended occupant should sit on books or some other elevation placed on the chair

with the injured leg assuming its most comfortable position. The distance from this height to the chair seat will indicate the amount to be cut off. Used thus, the hinge acts merely as a means of attaching the sloping seat section and not as a pivot.

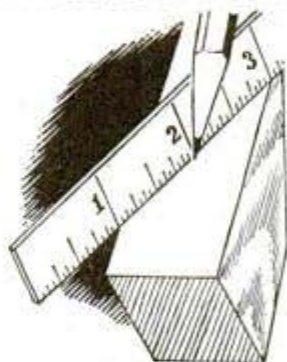
F. B. Veirs, Jr., Oakland, Cal.

Hot Linseed Oil Preserves Floors Of Wagon and Truck Boxes

Floors of wagon boxes and trucks can be preserved by occasionally applying a coat of pure linseed oil, heated to the boiling point and brushed on hot. After a coat has been applied, the vehicle should not be used for several days so that the oil may penetrate the wood. This treatment also makes the floor smoother and less apt to be damaged by shoveling or other hard use.

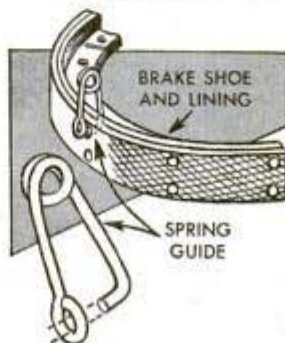
Center Located on Odd-Size Work

Locating a center of work often is difficult if the width of the work is not readily divisible into halves. A simple way to do it is to lay a rule diagonally across the work with the 1-in. mark at one edge and the 3-in. mark at the other. The



2-in. mark then will accurately locate the center. This method can be used to mark off the work into any number of divisions by moving the rule so that the distance between the edges of the work is divisible by the required number of sections.

Spring-Wire Guide Locates Holes In New Brake Lining



As an aid in positioning holes to be drilled in new brake lining so that they will coincide with the rivet holes in the shoe, bend a piece of spring wire, of the same diameter as the holes, to the shape shown, with an eye at one end

into which the tip, bent at a right angle, will fit. In use, place the brake lining in position, insert the tip of the guide in the rivet hole and press the eye against the lining. Then drill through the eye.

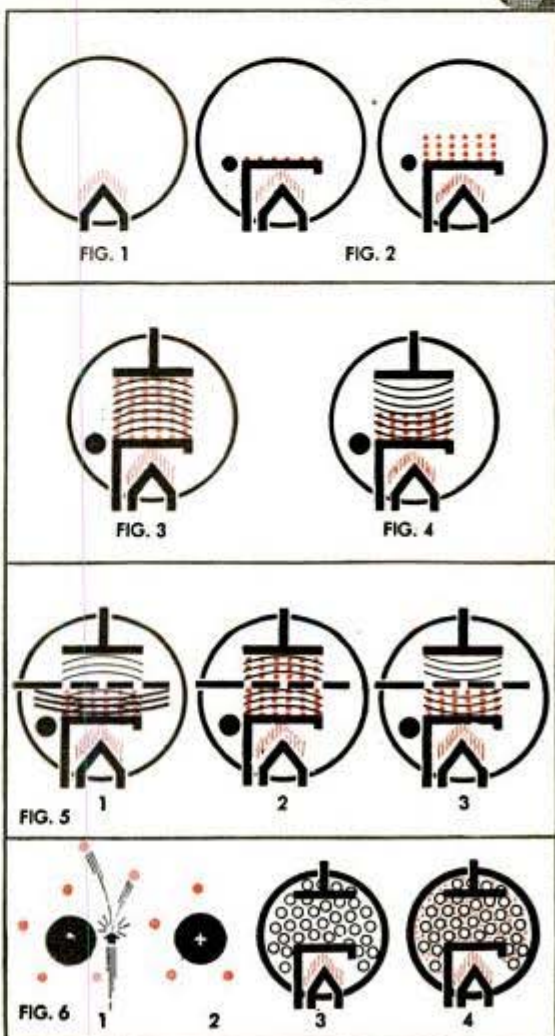
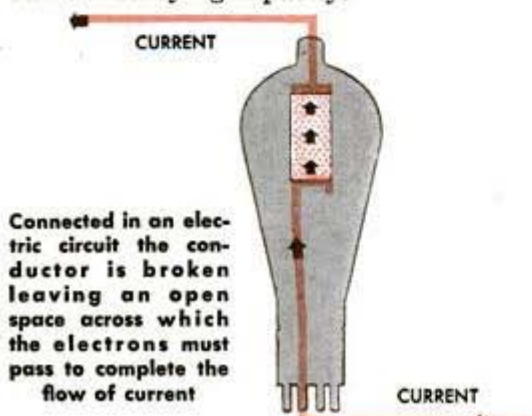
An ELECTRONIC TUBE Is a Valve

By F. L. Brittin

CONTROLLING the flow of current through an electrical circuit as a valve regulates the flow of water through a pipe, the electronic tube is actually an electrical valve. Unlike the water valve, the electronic tube has no moving parts; its action is completely electrical, therefore it operates at the speed of light. Some tubes smoothly regulate the current flow, others can instantly stop or start it.

All electronic tubes are basically the same; the General Electric FG-57 "thyatron" is a commonly used type. Symbol **Fig. 1** shows its heater that heats the cathode which gives off electrons, as illustrated in **Fig. 2**; the dot indicates a gas filled tube. The anode (plate) is the other end of the conductor in the tube; when a positive voltage is applied to it, the plate attracts billions of electrons that are "boiled" off the cathode as in **Fig. 3**, and current then flows through the tube. **Fig. 4**, negatively charged, the plate cannot attract electrons.

Fig. 5 symbols illustrate what the grid (control electrode) does: (1) when more than a certain critical value of negative voltage is applied to the grid, electrons cannot reach the plate; (2) when negative voltage is reduced, electrons flow to the plate; (3) flow stops when plate voltage becomes negative; then cycle repeats. **Fig. 6** illustrates ionization: (1) an electron is knocked out of a neutral gas molecule; (2) a molecule having lost an electron is positive; (3) these positive molecules are called ions; (4) when enough ions form they neutralize the negative field, thus permitting more electrons to reach the plate for greater current-carrying capacity.



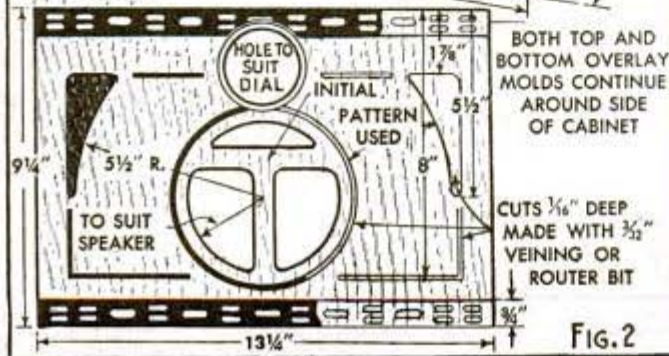
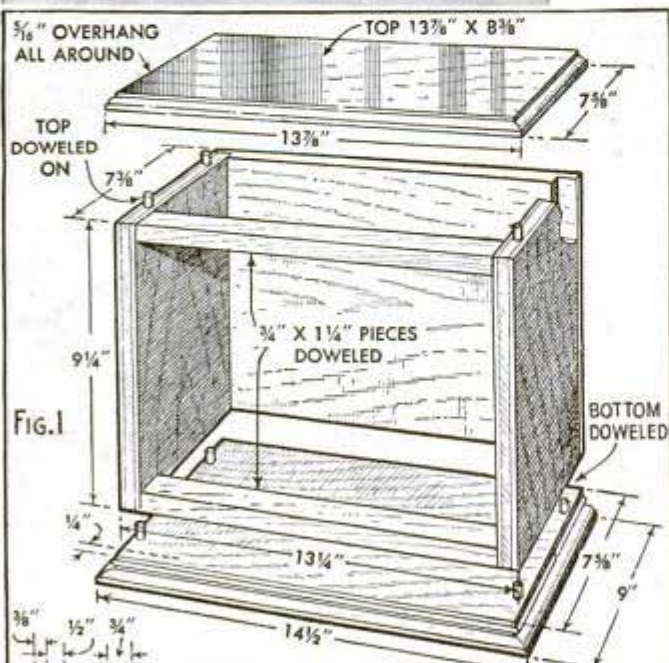
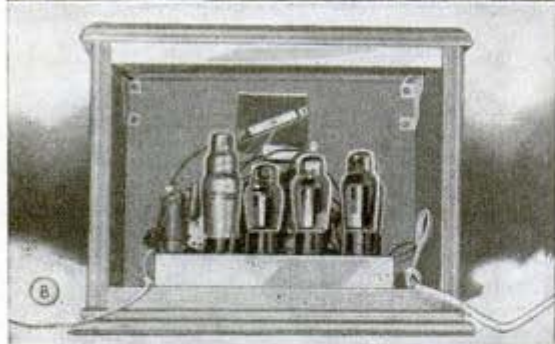
DE LUXE CABINET for Small Set

By C. E. Troutt

ORIGINALLY made to replace a broken plastic radio case, this unusual cabinet may be adapted to any size of table-type receiver chassis, and your own initial can be used to decorate the speaker grille. To produce the two-tone effect, the top, front and bottom may be made of any dark colored scrap hardwood such as mahogany or walnut, and the veneered panels should be of a light color such as aspen or primavera.

Photos A and B show the completed cabinet; an "exploded" rear-view sketch of the assembly appears in Fig. 1, and the front panel details are given in Fig. 2. The $\frac{1}{4}$ -in. front and $\frac{5}{8}$ -in. top pieces should be veneered on both sides to prevent warping; the bottom is 1 in. thick and the sides are of $\frac{3}{4}$ -in. plywood.

Make a template of thin wood for the recessed corners and veining line around the speaker opening. Note that the straight veining lines all stop short of the openings and corner designs. Fasten the template to the back side of the front panel as shown in photo C, then place the work, template down, with one corner of the opening over the pin in the router table. The light veneer being thus cut away, the darker wood will show through. The lace mold, detailed in Fig. 2, is made of a single thickness of dark veneer on the router. Emery boards such as ladies use in manicuring are handy to remove the burrs in the small openings. This mold overlay is glued in place before the top and bottom are attached. Finish with clear lacquer or varnish.



Meet the Men

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The Navy and Merchant Marine send rapid ship-to-ship messages by battery-powered flasher signal lights when radio might give a ship's position to the enemy.



It's difficult to locate men drifting in the sea! Water-tight battery lights on buoyant lifesaver suits have saved the lives of many torpedoed Merchant seamen.



For emergency communication by voice, the Merchant Marine uses a portable megaphone to broadcast orders and instructions. Dry batteries power the megaphone.



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Deadly flamethrowers are blazing the road to Victory! Dry batteries create the spark that sends these efficient weapons into instant, flaming action against the enemy.



The Signal Corps man with a Walkie-Talkie has freedom of speech as long as he has plenty of dry batteries! Handie-Talkies are also powered by war batteries.



When they come Home — Burgess Batteries will be back again, too ...powering flashlights, radios, telephones, instruments and controls for millions of homes, farms and industries throughout America.

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Army Air Forces planes on every fighting front. It can be seen in the powerful 24-cylinder Allison "3420's".

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P-38—Lightning
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LIQUID-COOLED AIRCRAFT ENGINES

Allison
DIVISION OF

Indianapolis, Indiana



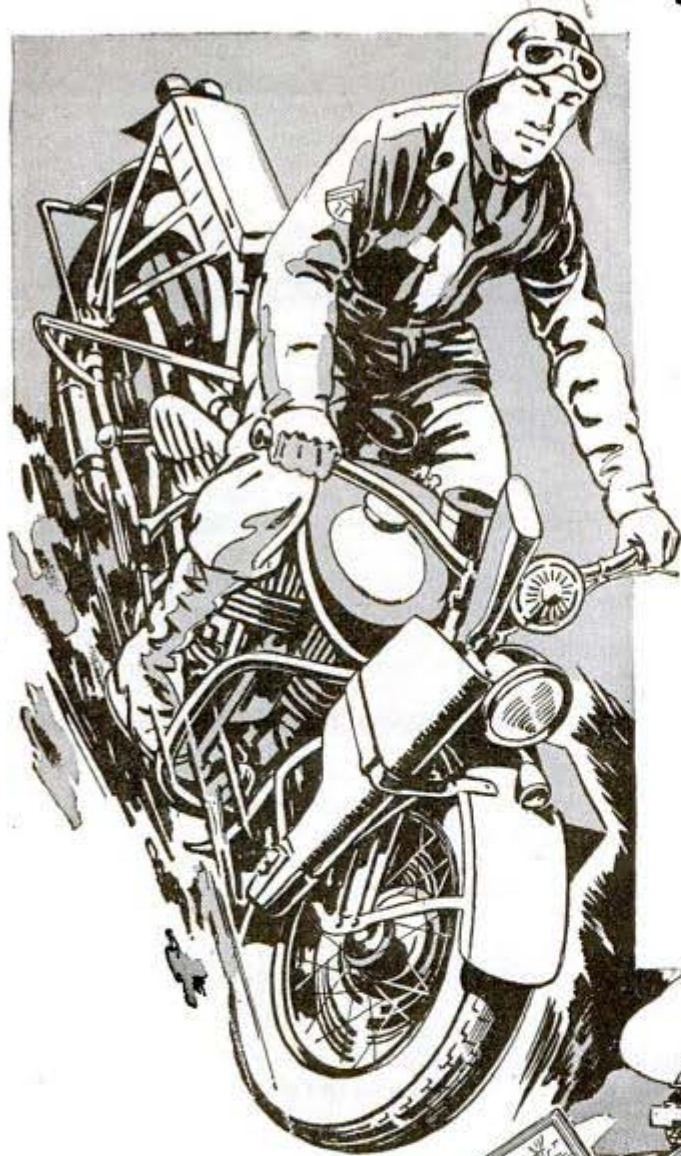
Every Sunday Afternoon

GENERAL MOTORS SYMPHONY OF THE AIR — NBC Network

KEEP AMERICA STRONG
BUY MORE WAR BONDS

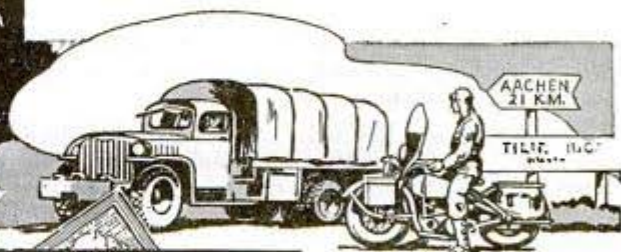
"HARLEY-DAVIDSONS *Really* TAKE THE

ROUGH TRAILS!"



FROM somewhere on the European front comes this letter from Pfc. Dick H. — "In the Signal Corps we use Harley-Davidsons for dispatches and they really take the rough trails. Here it isn't all sunshine, either, so we have plenty tough going. But Harley-Davidsons *get the messages through*. In one of our packing boxes, we found a note from one of your workmen, quote: *We won't quit building till it's over over there* — A friend, unquote. We really like that note and like it fine!"

That's right, Dick — we **WILL KEEP ON BUILDING** — so all you fellows can end the war *quicker* — and come home to enjoy motorcycling days on *your own* Harley-Davidsons.



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Please send at once free copy of 24-page
"Enthusiast" Magazine, filled with motor-
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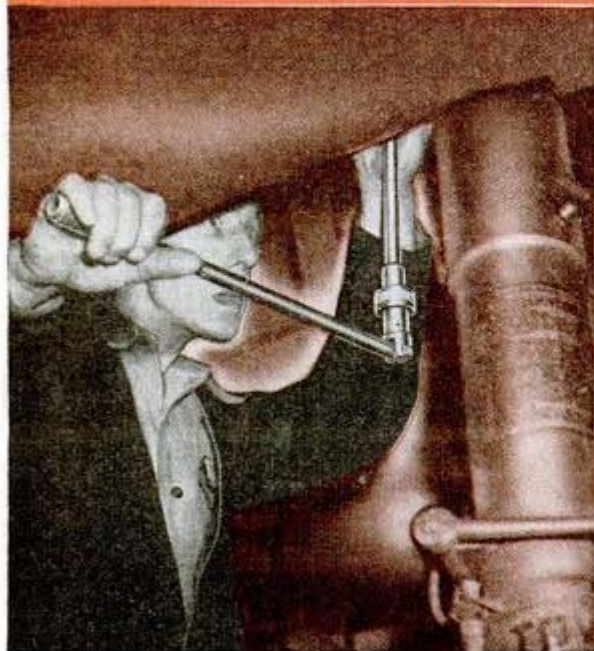
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For more Speed
in the "Tight Spots"



— USE FLEXIBLE, VERSATILE SNAP-ON "COMBINATIONS"

Remember back when "tight spots" were roundly damned as "bad design". Today they are the accepted penalty of *good design* . . . the unavoidable result of packing incredibly high performance into sharply restricted dimensions.

And for the toughest tight spots there are modern Snap-on tools . . . versatile "combinations" that reach into deepest pockets, grip hidden nuts securely, turn them easily, swiftly, solidly. The instant adaptability of Snap-on sockets, handles and ratchets, multiply the range of a compact Snap-on kit into hundreds of speed tools for specialized applications. *And frequently save the cost of specially designed one-job tools!* There are 3,000 Snap-on tools for production, assembly and maintenance operations. Write for catalog of the complete Snap-on line.

SNAP-ON TOOLS CORPORATION, 8062-C 28th Ave., Kenosha, Wis.



Putting Air to Work

(Continued from page 63)

The notable "pontoon tow bridge" spanning a canal from the plant of the Odenbach Shipbuilding Corporation into Lake Ontario uses compressed air to inflate lifting pontoons, which raise the bridge above roadway level to where it can be swung into a dredged bay, to permit exit of ships into the lake.

Beneath many of the city streets are pneumatic tubes which whisk mail, messages and packages from place to place. The Pentagon Building in Washington is equipped with 25 double pneumatic tube lines, each 1,000 feet long. London, Paris, Berlin, New York and Boston have pneumatic conveyor systems under the street to carry mail, 25 miles of tubes under New York streets and six miles under those of Boston. The New York system handles more than 7,000,000 pieces of mail a day.

In certain chemical plants, where reactions are carried on at extremely low temperatures, compressed air, from which the last trace of moisture has been removed, is used to operate valves and other controls that are subjected to freezing temperatures.

Some processes require pressures up to 6,000 pounds per square inch, and alloys of high tensile strength and exceptional resistance to corrosion are necessary for building these machines.

Compressed air is used for such diverse purposes as the agitating of pickles in canneries, spraying insects, regrooving tires, moistening tobacco in cigarette factories, operating milking machines, stopping fires in gas mains, and aerating sewage.

From the diver, fathoms below the surface of the sea, to the airplane pilot, swinging down his landing gear for an emergency landing, air under compression has uses as diverse as the activities of modern, mechanical-minded man.

Bridging the Army's Water Hazards

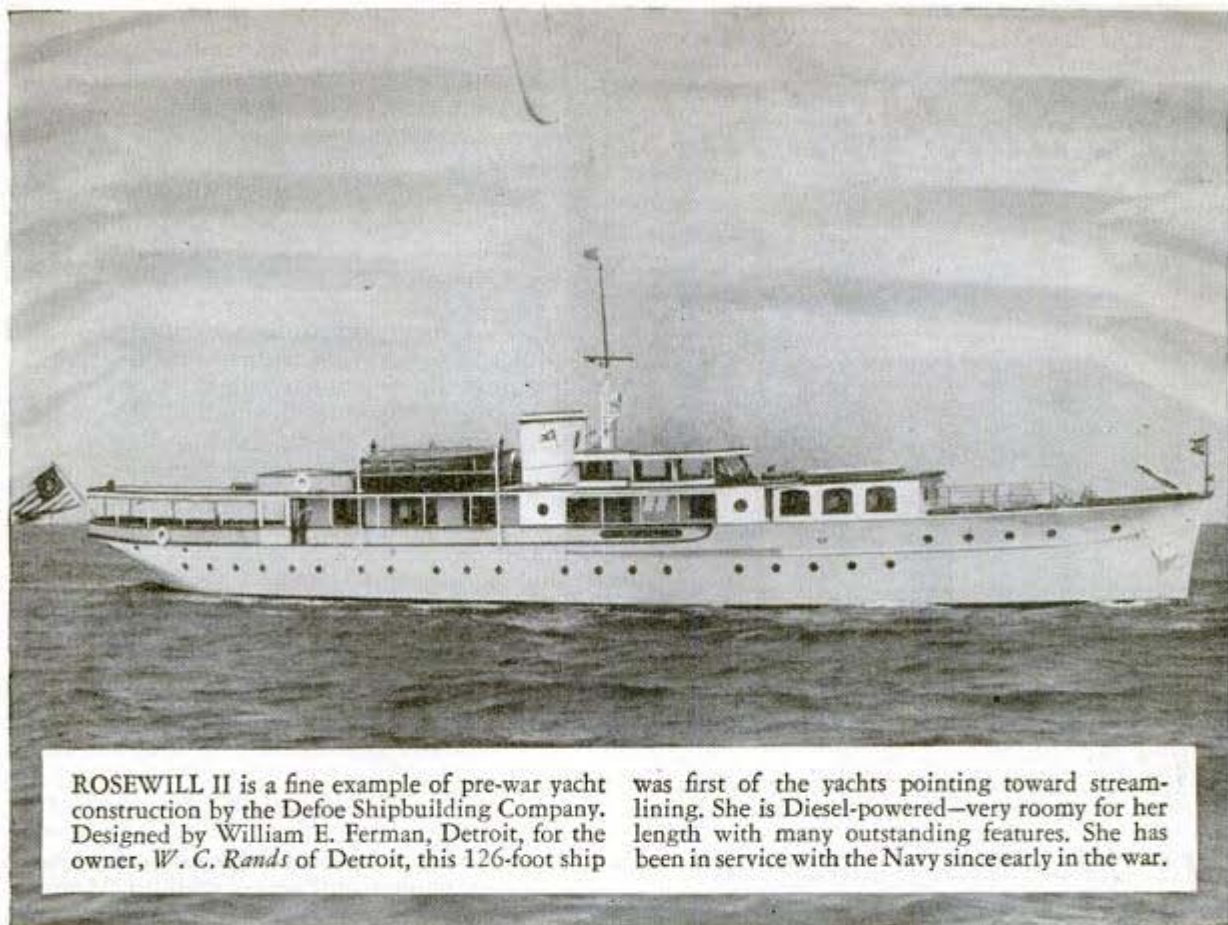
(Continued from page 25)

Walking over the muddy bank, the major hit on the solution. Ordering two bulldozers brought up, he set them to cutting a deep path in the bank by pushing the earth from the bank into the river.

The rain continued without a letup.

The bulldozers gnawed at the brown earth, which turned to slushy mud when rolled over several times by the blades of the roaring tractors. Little by little the earth was pushed into the river and a val-

(Continued to page 150)



ROSEWILL II is a fine example of pre-war yacht construction by the Defoe Shipbuilding Company. Designed by William E. Ferman, Detroit, for the owner, W. C. Rands of Detroit, this 126-foot ship

was first of the yachts pointing toward streamlining. She is Diesel-powered—very roomy for her length with many outstanding features. She has been in service with the Navy since early in the war.

When It's Clear Sailing Again

In these crucial days every shipbuilder is producing only for Victory. So Defoe's job for the duration is to build fighting ships for the Navy. But some day there'll be clear sailing again for pleasure vessels. Then, it will be anchors aweigh for safer, swifter, more beautiful new yachts, embodying new materials, new power plants, new comforts and economies. One of the most interesting developments for ocean-going yachts will be seen in the advance of instrumentation. This will include the magic of radar, improved radio, electro sounding and gyro-compass control—combining the most perfect ship protection in the history of the sea. Postwar private craft built by Defoe naturally will reflect this organization's forty years of yacht-building experience as well as the new techniques and high standards of precision craftsmanship developed here in record-breaking construction for the Navy. Defoe's Yacht Division invites correspondence and will give individual attention to all inquiries.

CUSTOM YACHT DIVISION

DEFOE SHIPBUILDING COMPANY, BAY

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Defoe



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

BACK THE ATTACK
—BUY WAR BONDS

SHIPS FOR VICTORY
SERVANTS FOR PEACE

Avoid another winter of...

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STEP UP HOME COMFORT WITH
BALSAM-WOOL ATTIC INSULATION!



Icy entertainment—freezing guests! Even though fuel must be saved, you can avoid those bone-chilling evenings. It's easy and inexpensive to make your home far more comfortable—now—by installing Balsam-Wool Attic Insulation.

Laid like a rug in your attic, Balsam-Wool will save up to 20% in fuel . . . by keeping precious heat from escaping through the roof. And Balsam-Wool has everything an insulation needs to give you permanent results. It's windproof, moisture-proof and fire resistant . . . proved in thousands of American homes.

GUARANTEED SATISFACTION—Balsam-Wool—"the Aristocrat of Insulation"—is sold under a money-back guarantee of complete satisfaction. See your *lumber dealer* about buying Balsam-Wool on easy monthly payments—or, mail the coupon for complete information.

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Please send me more information about modernizing homes with Balsam-Wool and Nu-Wood. I am a home owner , renter , architect , contractor , student .

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ley was formed. This valley, extending to the river's edge, was to be the approach. It became longer as the earth piled up in the river in front of the machines. In two hours the river was narrowed by almost 50 feet, the swirling waters eating a little of each bladedful pushed out into the stream.

With 50 feet taken up by the built-up earth embankment, the pontoons available could span the river.

Anchoring the pontoons was troublesome. Floating logs and debris continually hit some of the pontoons, knocking them out of line, and the engineers jumped from one to the other to tighten the bolts holding the treadway to the floating rafts.

The few lights permitted were useless, and more by feel than by sight the engineers bolted the last section and took up the slack on the guy wires and upstream anchor cables.

At dawn the trucks of one regiment arrived and dispersed in the vicinity of the engineers' camp while the damage caused by the rain to the earth runway and approach was repaired. A timber corduroy road, made of logs laid across the roadway, was built.

Precisely at 7:00, while the engineers were milling around their field kitchens drinking coffee, the antitank company with its light trucks and jeeps pulling 37-mm. guns began to cross. The rifle companies and signal trucks followed.

A few hours later the noise of battle on the far side was evidence that our forces had caught up with the enemy—thanks to the engineers!


Black Gold Rush

(Continued from page 69)

nected by chain and sprocket to the huge balloon front wheels which do the driving. Although the driver's seat is near the front, it is the rear wheels which guide the buggy

(Continued to page 152)

**Model Builders
Attention!**



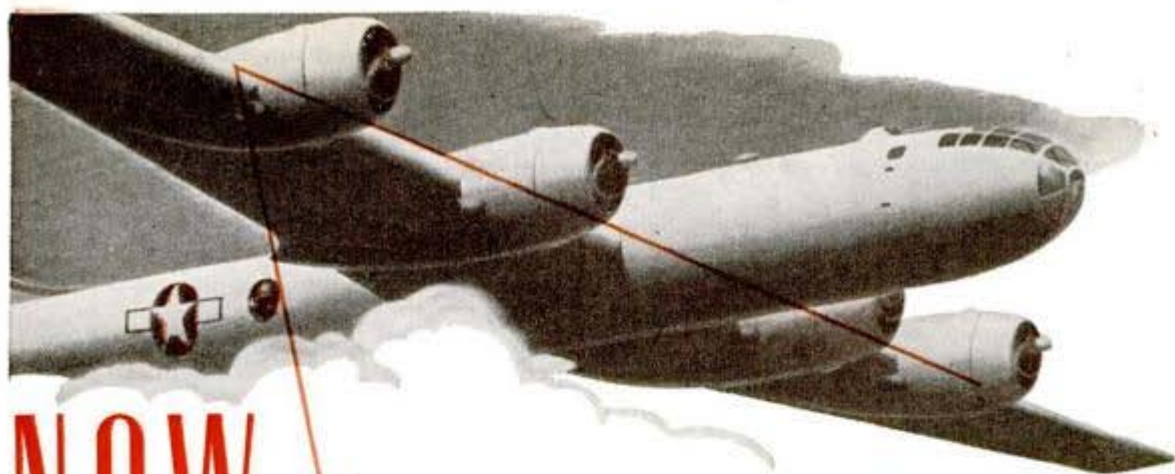
	V	V-2	V-3
Hex	1/2"	3/8"	3/16"
Thread	3/8"-24	1/4"-32	1/4"-32
Thread Length	7/32	7/32	3/32
Weight, Grams	8	3 1/2	2 1/2

Actual Size V-Plug

Champion spark plugs for model gas engines give the same dependable performance as regular Champions. Silliment sealed. Sillimanite insulator. Alloy needlepoint electrodes for easy starting. One piece construction.

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Bringing the same performance, dependability and extreme quality to automotive spark plugs that are required of spark plugs for a high-flying Super Fortress is the latest achievement of Champion Spark Plug engineers. Champion's research and engineering background, because it is exclusively devoted to the production of better spark plugs, brought invaluable experience to aviation from the automotive field. But wartime aviation put spark plugs to many extreme tests—stratospheric flight, supercharging, violent temperature fluctuations, 100 octane gas—all of which Champion-Ceramic Aircraft Spark Plugs met with extraordinary success. *Today* these same qualities, the same basic materials, precision manufacturing and design are yours in spark plugs for your car. Demand Champions, the spark plugs with aircraft prestige and efficiency. Champion Spark Plug Company, Toledo 1, Ohio.



Buy War Bonds
More Than Before

DEPENDABLE

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The Best Marlin RIFLES SINCE 1870

● Marlin is ready to produce its outstanding line of accurate, dependable .22's as soon as war contracts permit. They will be the best Marlin in history—built to standards of performance and long life that made the name famous. Now is a good time to look over the Marlin line. Send for catalog today!

**Illustrated: Model 80-DL
CLIP MAGAZINE REPEATER CAL. .22**
8 shots "at a clip" for small fur-bearing game and pests. Recommended for target practice by N.R.A. A man-sized gun at a low price.

Model 81-DL 25-shot Repeater. Bolt action tubular magazine .22 for general purpose hunting of small game, without need of frequent loading.

Model A1-DL Automatic .22. Six quick shots at fast-moving small game, crows, hawks, etc. Shoots regular and high speed .22 long rifle.

Model 39-A. Lever Action Repeater. By many considered world's best all-around light rifle. Only lever action .22 made. All working parts exposed by turning of single hand screw.

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SEND FOR CATALOG
Handsomely illustrated pre-war catalog, with full specifications of Marlin Guns.

THE MARLIN FIREARMS CO.
New Haven, Conn.

Enclosed 3c for mailing catalog of Marlin Guns.

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PM-3

WATCH THE INFANTRY ——— THEY CARRY THE GUNS!

on land and act as a rudder in the water. Land speed ranges from four to a maximum of eight miles an hour; speed in water is appreciably lower.

The balloon wheels are seven feet in diameter, three feet wide, and weigh approximately 500 pounds each. The rear wheels, being smooth, are only six feet in diameter and weigh about 350 pounds. They are three feet wide at the hub and taper to a two-foot width.

Concave sections on the face of the front wheels serve to form traction lugs which enable the buggy to move through mud and slush. Because of their great width the four wheels keep the buggy from sinking in mud and because of their buoyancy they hold up the buggy so that the water level remains about 12 inches below the floor.

An extra feature for extremely difficult operations is a series of two-by-eight-inch wooden paddles which are attached by bolts to special flanges on the front wheels and extend four feet beyond the outer side of the wheels to give extra traction in high marsh grass or water.

Socony-Vacuum and Cities Service have another remarkable drilling operation on a man-made island eight miles off Charlottetown, Prince Edward Island, Canada. Drilling crews battled snow, ice, rain, fog and a 10-foot tide. Before drilling was begun, an island had to be built. Eleven miles of logs were used to construct the walls of a crib and 8,000 tons of rock and concrete were put in it to form a surface area of 9,000 square feet.

Among other innovations being tried are smaller-type portable rigs and well cleaners carried from site to site on trucks.

Standard Oil of New Jersey is experimenting along two lines which may soon change the exploration picture. These are really twin laboratory methods, soil microscopy and geochemistry, both of which are directed toward the discovery of hidden oil by extremely minute variations in the oil and gas content of soil.

This research seeks to make it possible to distinguish the difference between gas and hydrocarbon materials seeping upward from an oil pool and the similar material forming near the soil's surface. If it is successful, the oil prospector of the future may be a chemist in a laboratory. It is even possible that the little fellow, in years to come, will be able to buy an "oil kit" and make his own tests of likely spots. Many of them now depend on doodlebugs and hunches, but there are definite ways in which an oil strike can be indicated without scientific equipment. The simplest of

(Continued to page 154)

Delta Homecraft Power Tools illustrated are Delta Scroll Saw and Delta Lathe.

More Happiness for your money

—greater hobby satisfaction...when you work with quality Delta Homecraft* Power Tools

Trouble-free performance assures you of lots of homecraft fun and healthful recreation...

If you could ask the thousands of Delta homecraft hobbyists the reasons why they prefer Delta Homecraft Power Tools, you would probably get many different, enthusiastic replies. But, taken together, they would all "boil down" into one word — *quality*.

Delta Homecraft Power Tools have always had a reputation for *quality* — "hidden values" in construction that mean you get more for your money.

You can't always see Delta quality with your eyes — and yet you can tell it's there!

For one thing, the *accuracy* of Delta Homecraft Power Tools proves they are

quality tools. You enjoy greater assurance of seeing a project turn out according to the plans.

The *dependability* of Delta Homecraft Power Tools means quality, too. A flick of a switch and they're ready to give you the economical, unflinching performance you expect.

And, because of quality, Delta Homecraft Power Tools are *safe* — meeting the highest safety standards of schools and industry.

To be sure that you enjoy a full measure of the pride and pleasure that comes from using your hands to make good-looking things, include *quality* power tools in your homecraft hobby plans — Delta Homecraft Power Tools!

Right now, save to make your dreams come true — and at the same time, do right by our fighting men — by buying War Bonds.



Delta's "hidden" construction values that give you more for your money:

- 1 Double-sealed ball bearings you don't have to worry about oiling, because they are lubricated for life.
- 2 Precision-bored bearing seats that assure accurate alignment of parts.
- 3 Bearings that are pre-loaded — an extra manufacturing operation that insures longer bearing life.
- 4 Precision-ground shafts, to assure true, accurate performance.
- 5 Dynamically-balanced pulleys, to eliminate annoying, damaging vibration.

HM-23

Free Colorful Delta Book!

Shows you how to get started in homecraft. Illustrates modern shop layouts — in color. Tells how manual hobbies aid mental health. Mail the coupon for your free copy of "Happiness Is In Your Hands."

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Tear out coupon and mail today!

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Please send me my free copy of "Happiness Is In Your Hands" picturing the ideal creative hobby and telling how to get started in it.

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TRANSCONTINENTAL RECORD

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by Army-Boeing-Wright

SEATTLE TO WASHINGTON—6 HOURS, 3 MIN., 50 SEC.

MORE THAN 383 MILES AN HOUR

AC Ceramic Aircraft Spark Plugs fired all four of the great Wright "Cyclone" engines which carried the mammoth Boeing-built Army transport 2,323 non-stop miles—and broke the speed record for planes of any size.

Achievements like this demand *utmost reliability*—the quality for which AC Spark Plugs have been known to motorists, operators of buses and trucks, yachtsmen, and farmers since 1908. This same reliability is also now serving our armed forces, in the air, on the ground, and on the water—and is keeping essential transportation on the job all over America.

AIRCRAFT SPARK PLUG →



AC
SPARK
PLUGS

SPEED FINAL VICTORY—BUY WAR BONDS

these is to watch for oil scum in water wells, bubbles in ponds which might indicate the gas is greater in volume than marsh gas, and the presence of tarry sands in stream beds.

A bit more scientific, but not requiring above-average intelligence, is the study of favorable rock formations, a project which may be pursued in most public libraries. In general, a dish or pan-shaped formation with solid rock below is necessary to hold the original oil deposit. These can be detected by outcrops of rock and an examination of their direction to see if they perform the same function as the rim of a pan.

If the outcrops are granite, the time has been wasted because the favorable kind of rock is sedimentary such as would be deposited in a sea bottom, since marine growth was necessary to produce the original oil. Up to this point of general exploration the amateur can get along as well as the oil company geologist. But since the oil-holding basin may be hundreds of miles across, the next job is to plot its shape.

Three scientific methods are most commonly used. A seismograph is used to record shock caused by explosive charges and reflected from solid rock. This gives depth and angle of the rock formation.

The gravity meter and magnetometer are other devices used for much the same purpose. The gravity meter works because the force of gravity is greater as registered near a solid mass of underground rock. The magnetometer is also deflected by such masses.

Not many people realize the United States is one of the few nations in the world where a man can strike oil below the ground and collect on it because of our system of free enterprise concerning mineral rights. After all, what fun would there be in a treasure hunt if you had to give the treasure away?

Sharpening the Navy's Camera Eyes

(Continued from page 42)

sance pictures are studied, and the important still photography division where hundreds of negatives and prints are handled every day.

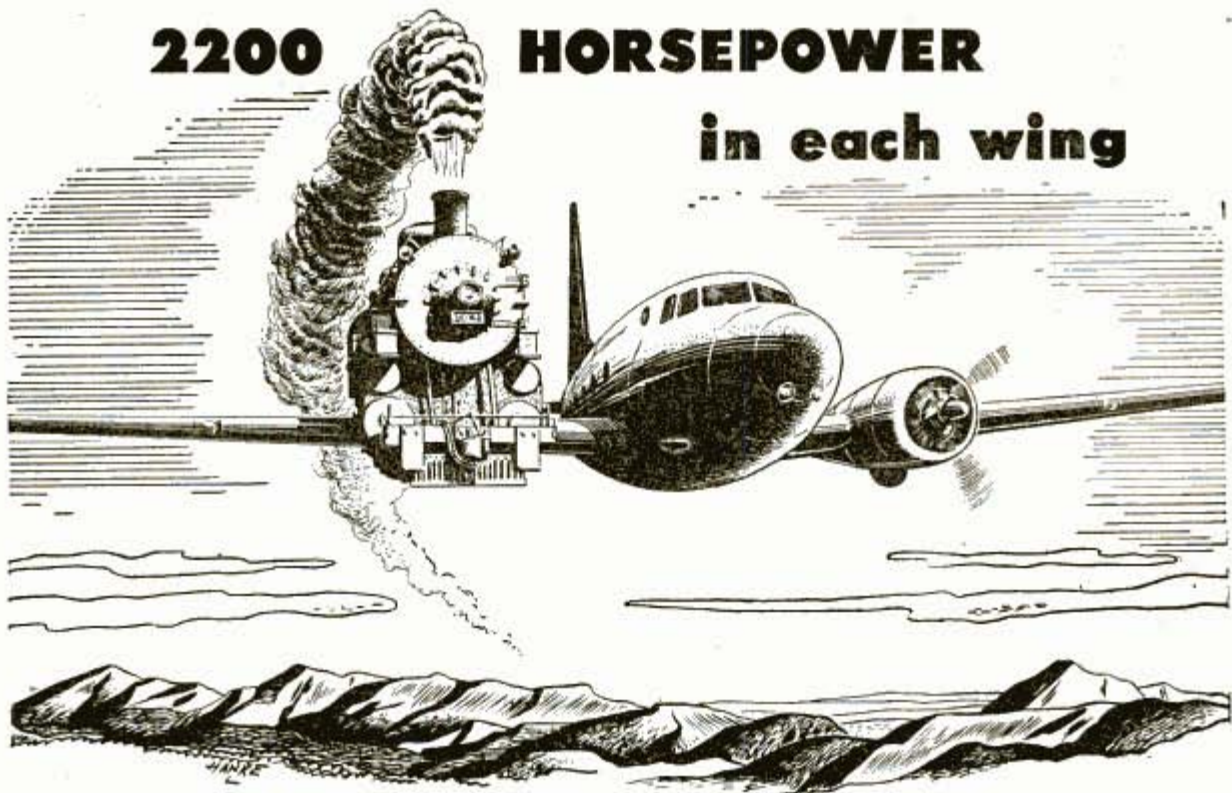
The still division includes a color section which is equipped to handle the latest processes. Color photography is invaluable in reconnaissance for the detection of camouflage. The Japs are experts at jungle camouflage, but the color camera can make faded foliage stand out like a beacon.

(Continued to page 156)

2200

HORSEPOWER

in each wing



SHOCK ABSORBER: On the power strokes, each piston in a Wright Cyclone has to absorb a blow of 15,000 pounds, or a force equal to the weight of three elephants. The full weight of this force hits a piston face only $6\frac{1}{8}$ inches in diameter.



WEIGHT-KILLER: This is the Wright-designed forged cylinder head which cuts weight from aircraft engines. Stronger than cast aluminum heads, its extra power cuts weight per HP. This cylinder alone will turn out 150 HP, enough to power three training planes.

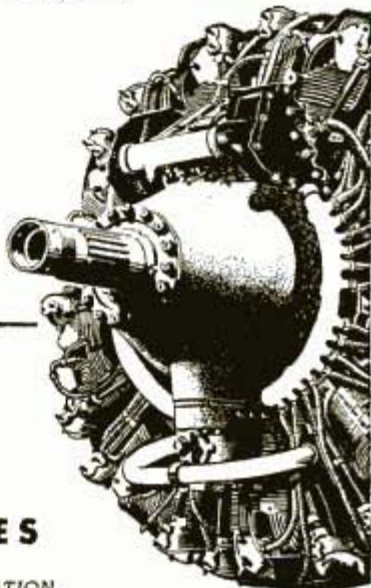
Equal in power, a locomotive and a Wright Cyclone aircraft engine make an amazing contrast in size and weight. Both develop 2,200 HP. Yet the Cyclone, with its 55-inch diameter and weight of only fractionally over a pound per horsepower, would fit easily into the cab of the 200-ton locomotive.

A vast difference in bulk is one reason why locomotives ride on rails while Cyclones fly. All aircraft power is a specialized field—tremendous power packed into small space at low weight, but Wright engines lead this field, for they are highest in power, lowest in weight. That's why Wright engines have powered leading planes for 25 years.

Write for "ENGINEOLOGY"

a 100-page booklet on the "Why" of engines

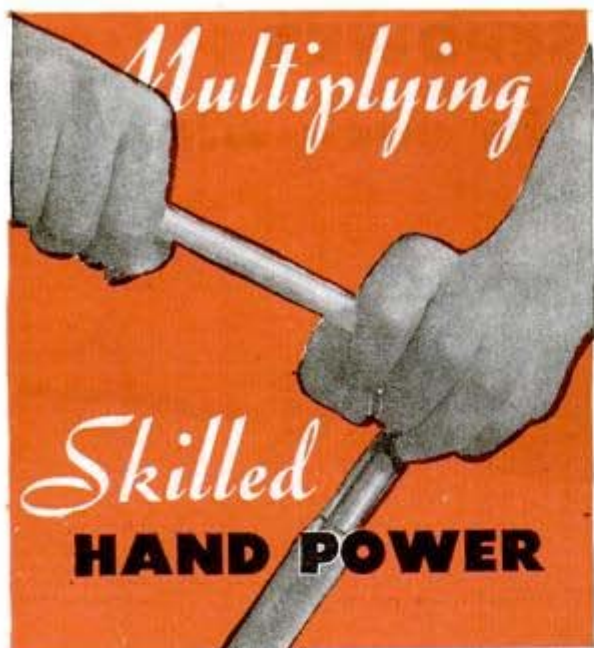
A complete, non-technical booklet on engines and their relation to planes and propellers. Describes operating principles of engines. Explains combustion, supercharging, ignition, carburetion. Just send twenty-five cents in stamps or coins to: Wright Aeronautical Corporation, Dept. P.M., Paterson 3, New Jersey.



WRIGHT

AIRCRAFT ENGINES

A DIVISION OF CURTISS-WRIGHT CORPORATION



WILLIAMS' "Super-sockets" actually are more than wrenches; they are an extremely flexible system for multiplying the skill and productivity of human hands. "Super-sockets", with their almost endless combinations of handles, parts and different socket types, enable the operator to assemble a special tool to exactly fit the particular job at hand.

Five different patterns, with drives ranging for 1/4" to 1" square, cover every application. They provide the utmost in speed, safety and power. Write Dept. M-3, for free Data Sheets Nos. 4, 9, and 24 describing these time-saving tools.

J. H. WILLIAMS & CO.
BUFFALO 7, N. Y.



DROP FORGINGS AND DROP-FORGED TOOLS

Aerial cameras are tested under all conceivable conditions, from subzero temperatures to tropical conditions of extreme heat and dampness. The aerial division also produces intricate photomosaic maps made of many photographs carefully matched to minimize distortion.

Another important division is devoted to motion picture photography. This division supplies camera crews for special assignments and for making newsreels, in addition to conducting research to improve Navy movies. Along with other producing units, its activities are governed by the "operations" center at the laboratory. Here all approved work orders are received. These may include making training films, recording the launching of a new cruiser, or filming the Battle of the Philippines.

If it is a training film, the subject is often of a restricted nature which could not be entrusted to commercial photographers. Script for the film is prepared in the writers and directors division and a director and camera crew are assigned. If part of the film is to be animated, this will be done in the art and animation division where many former employees of the Disney and Schlesinger studios work. Later, if sound is to be used, that will be taken care of by the sound division. Part of the film may be made in the studio and part on "location" with portable equipment.

Other divisions of the laboratory include the motion picture processing branch, which processes all types of movie film; the graphic arts division, which makes large photolithographic reproductions, photostats and multilithographs; the technical division, where chemicals are analyzed and lenses tested; the supply division, which can produce any one of 3,000 items on a moment's notice; the personnel division, where experienced photographers are trained for special jobs, and a music division which employs an 85-piece Navy symphony orchestra for recordings.

Aside from its primary task of improving methods to pry secrets out of the enemy, the laboratory is making a lasting contribution to the science of photography.

Hydrogen Gas Piped to Divers Replaces Helium or Nitrogen

By mixing hydrogen gas with oxygen, a Swedish engineer has found a substitute for the helium-oxygen mixture used by deep sea divers. The hydrogen mixture, like helium, is said to be nonexplosive. A substitute for nitrogen is desirable for depths of more than 260 feet, below which nitrogen has a narcotic effect on the diver.

"I got a 6½ lb. bass the first time I used the JITTERBUG!"



Jack Holland, Albany, Ga.

"We had fished in the Flint River for about an hour with no luck. I then decided to try a frog Jitterbug I had bought the day before, and boy howdy! I got a 6½ lb. bass, then a 2½ and a 1¾ pounder. This was the first time I had ever used your Jitterbug so I just had to write you. I am a photographer for the Albany Herald so I made a picture of the biggest bass with the Jitterbug I caught it on."—Jack Holland, Albany, Ga.



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on Jitterbugs and
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Frog
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MALLORY

Ice Crackers of the Coast Guard

(Continued from page 15)

was 5 to 1 the job couldn't be done. With the assistance of the 165-foot Coast Guard cutter Comanche and the small icebreaker Arundel, they went to work. The Comanche tugged, the Arundel broke ice and the more powerful Mahoning lashed herself to the rear of the giant steamer to act as a brake. In case the Comanche got stuck in the ice the Mahoning would reverse her engines and keep the big steamer from running over the Comanche.

The Berkshire is a side-wheel boat with her paddle wheel housings sticking out from the sides of the ship 10 or 15 feet. Ice tended to pile up against these, and the Mahoning would have to break it away.

The trip down the river was a nerve racking journey. Through one narrow gorge the convoy took 12 hours to go one mile! Here the ice had drifted to a depth of four feet and had to be "shaved" away. But the Mahoning and her helpers brought the big ship through.

Commander Babbitt is careful to point out that his crew deserves all the credit for the tough assignments that are completed successfully. Often working in layers of warm clothing, including felt face masks to keep their faces from freezing, the men endure hardships that would make the ordinary civilian shudder.

However, the crew considers the assignment on the Mahoning a "rest." They are mostly Coast Guardsmen who have been sent back from the battle fronts to get them out of combat for a while, and heroes sleep in every bunk. Their heart is in their work, too, for they know the Coast Guard icebreakers are playing an important role in speeding necessary supplies to fighting Yanks overseas.

Bazooka Boats Hit the Beaches

(Continued from page 4)

that is to go ashore with the first few waves of men must be loaded last, on top, where it can be reached at once.

Some of these top priority items seem to have no obvious connection with fighting. Dump trucks may be the most important cargo on one ship; water distillation units or even a saw mill or prefabricated houses may be essential cargo on others.

The reason is that an invasion may bog down if no roads are available for hauling artillery inland, or if no landing strips can be provided for fighting and bombing planes. Dump trucks and other heavy road-

(Continued to page 160)



"You can't beat a Savage, Jim"


"Those rifles and shotguns in the rack are the same ones I'm showing you in these action pictures. I've been using Savage guns for years. They're real game-getters and they'll double your shooting thrills.

"Take a look at that Savage model 99. It has everything I want in a big game rifle. Notice its streamlined design... its lightning-fast lever action. It sure has a real wallop, too. You saw what happened to the buck in the picture! Then there's the Savage model 720 automatic shotgun (that's the gun I'm using in the duck pictures). For 'scatter gun' shooting I consider it first in speed, balance and dependability.

"What about 22's? Sure, Savage made a complete line of 22's and medium power rifles for target and small game shooting. They're accurate and a pleasure to handle, too... real man-sized rifles. Just the thing for 'off season' pest hunting, target shooting or plain and fancy plinking. No sir, Jim, you can't beat a Savage. They're tops!"

Savage Arms Corporation
Plants in Utica, N.Y. and Chicopee Falls, Mass.

WAR PRODUCTION COMES FIRST . . .

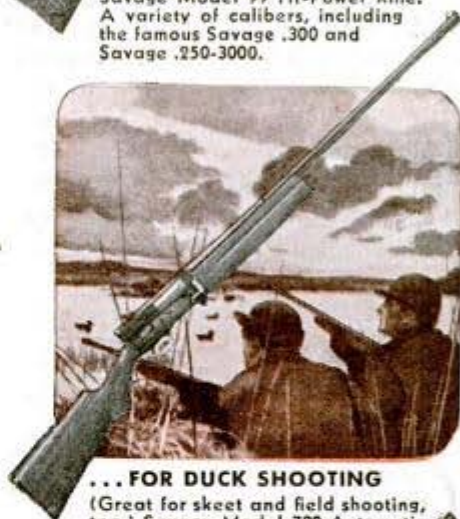
 Savage has produced over 2,000,000 military arms, including Browning Cal. .50 aircraft machine guns, Thompson submachine guns, and rifles. Of course, the requirements of our armed forces will continue to come first... but YOUR Savage will be worth waiting for.

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LAWN MOWERS AND REFRIGERATION EQUIPMENT

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matic... bolt action repeater...
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WORLD FAMOUS FOR
DEPENDABILITY AND
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159

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building equipment are vital for building roads and airports. Construction must start as soon as possible, often while active fighting is still going on only a few hundred yards away.

Water distillation and chlorination equipment is just as necessary. Most western Pacific waters, being untreated, carry the germs of dysentery and other diseases and must be purified for drinking. Prefabricated housing, of course, and the lumber that can be obtained with a saw mill, are needed for erecting hospitals, warehouses, and headquarters facilities after the beach-head has been won.

En route, an invasion fleet never acknowledges coded radio messages transmitted to it nor does it use any of its own transmitters. Radio silence is preserved until the minute of H-hour. From then on the air is literally jammed with messages on scores of frequencies. Hundreds of transmitters that range from portable hand sets to the powerful long range radios of fleet units are then in constant use. The whole vast operation is a secret until that minute, then the whole world learns that the United States has carried the fight to its enemies again.

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**Red Cross Takes 'Main Street'
To Yanks at the Front**



Above, Red Cross members "shoot the breeze" with a sergeant in Iran as he drinks coffee at mobile snack bar. Below, doughboys hear an impromptu piano program



Diversions which symbolize Main Street to lonely American fighting men are driven right into front-line sectors in clubmobiles, bookmobiles and other vehicles by Red Cross field units. In Iran the portable "jamboree" tours from station to station in a Train Mobile Theater Unit. This consists of two converted box cars built by the soldiers themselves, one for recreation facilities and one for the crew's living quarters. The former includes a movie projector, doughnut machine, ice cream freezer, lending library, newspapers, magazines, and phonographs. Besides its many field services, the Red Cross has collected 10 million pints of blood plasma since the outbreak of the war. Mounting demands for Red Cross services in the war theaters have increased the organization's budget to \$200,000,000 for 1945, a sum the "home front" must provide.

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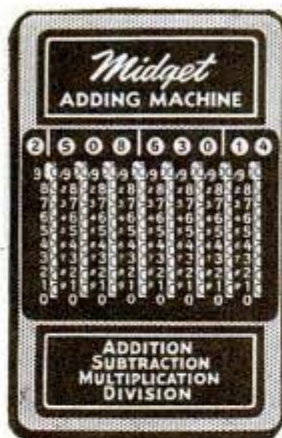
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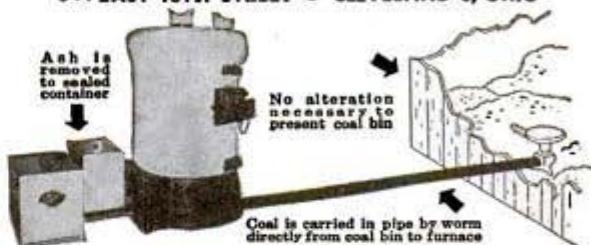
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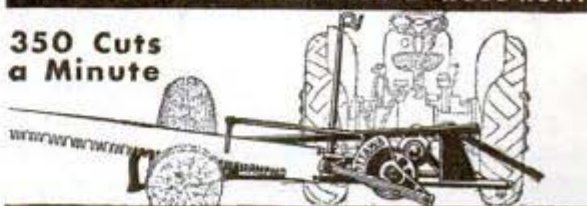
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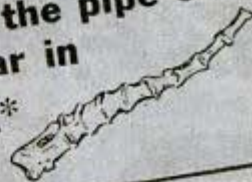


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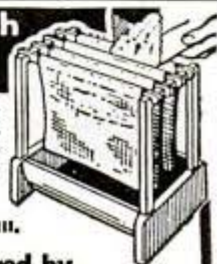
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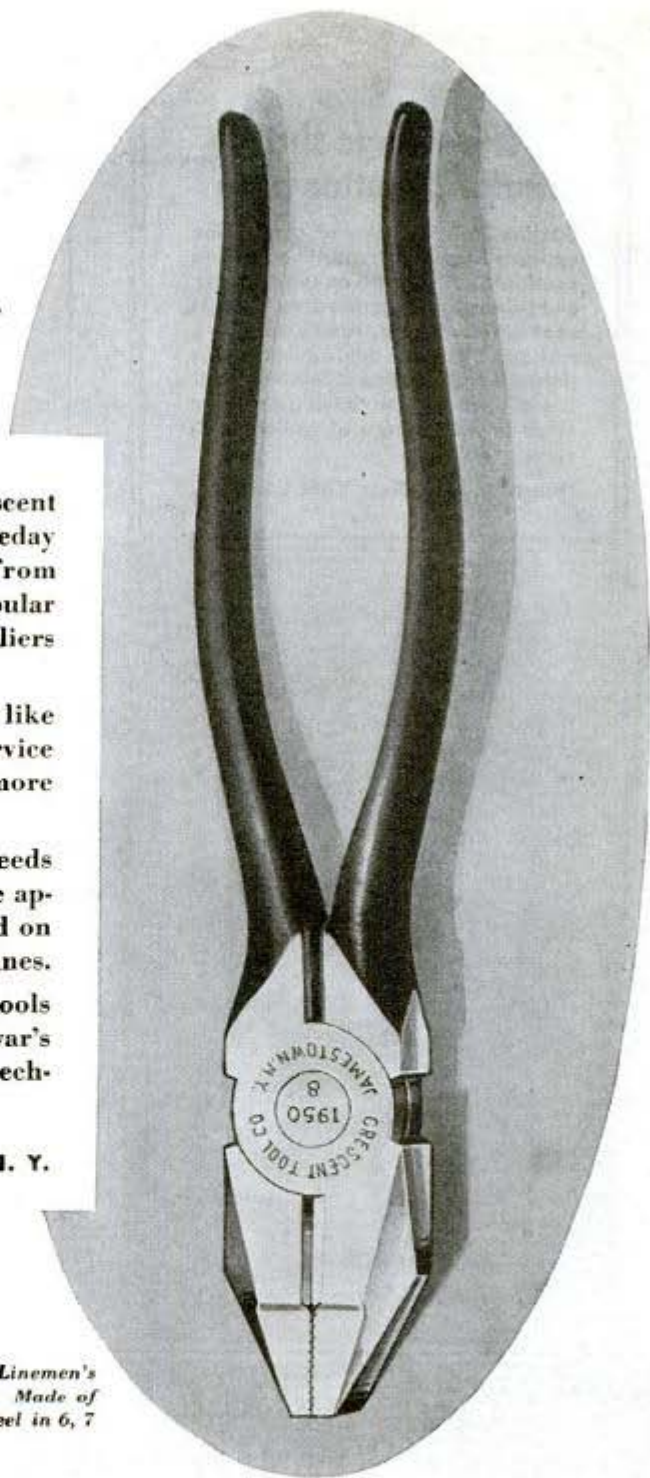
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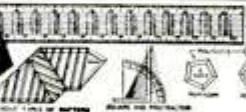
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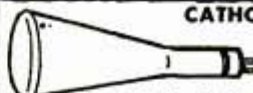


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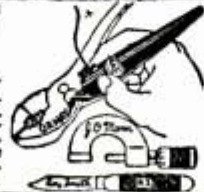


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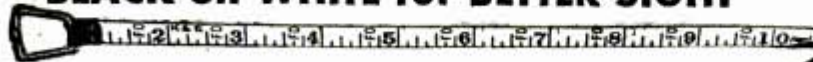
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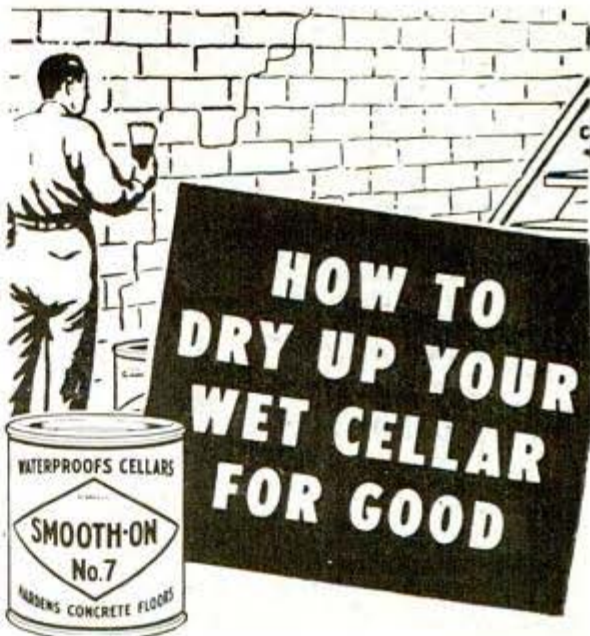
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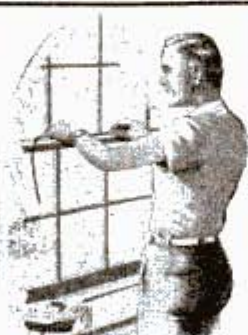
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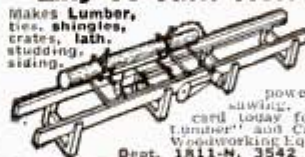
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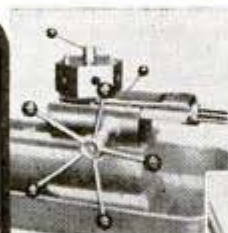


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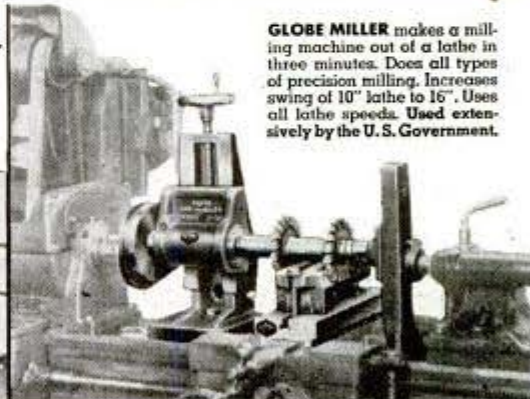
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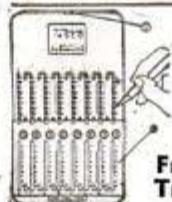
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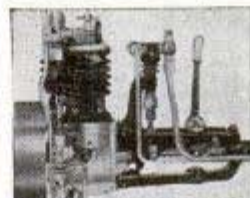
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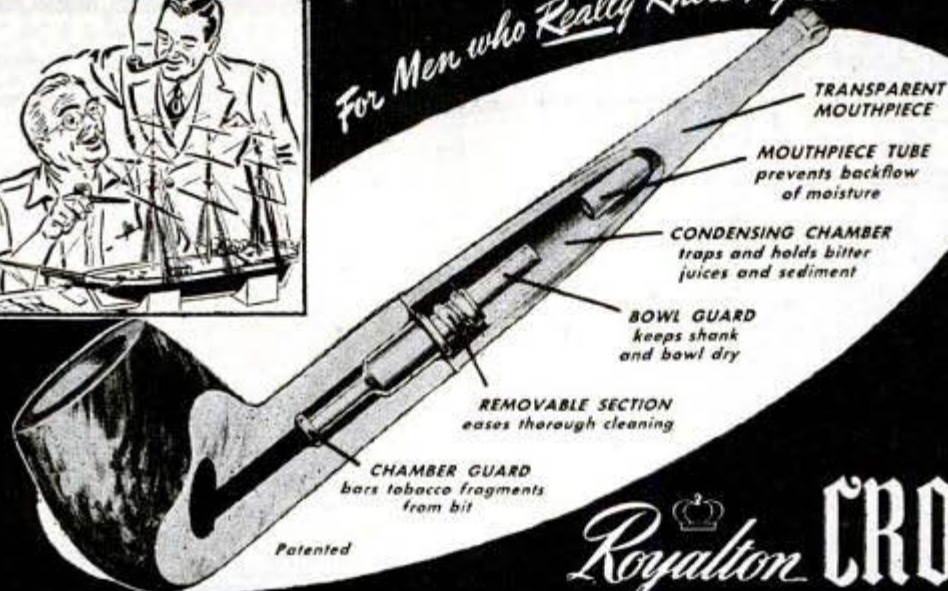
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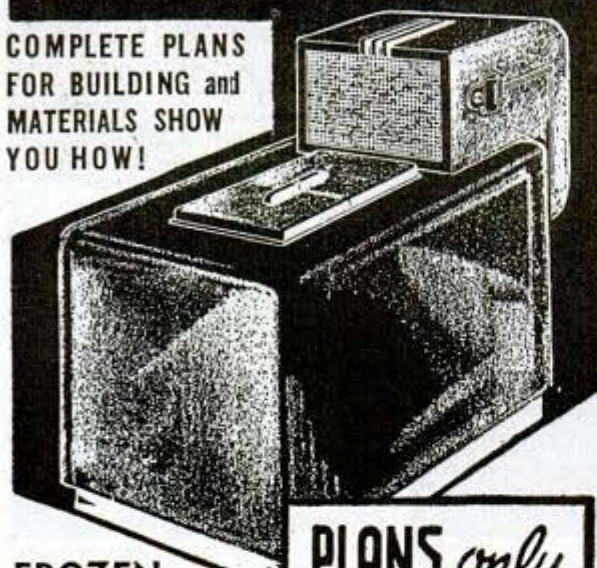
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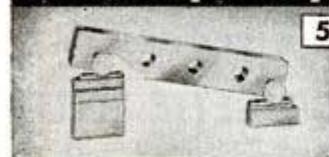
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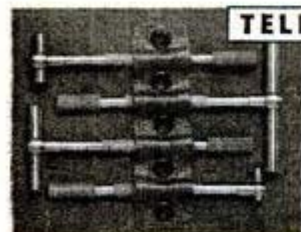
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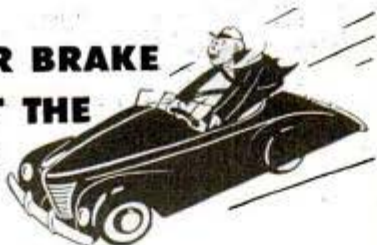
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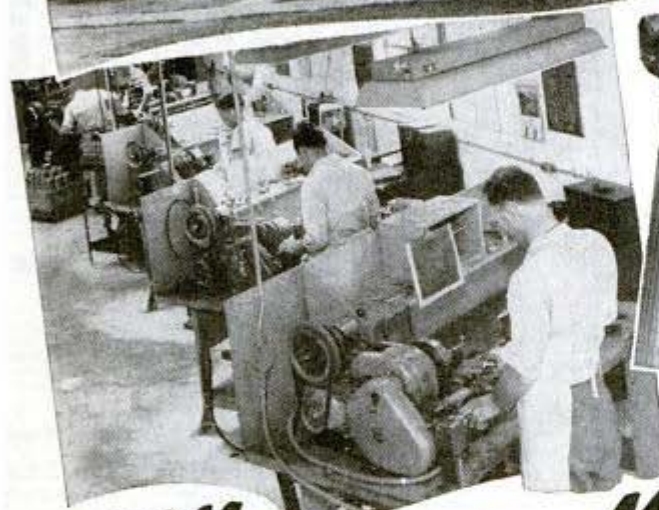
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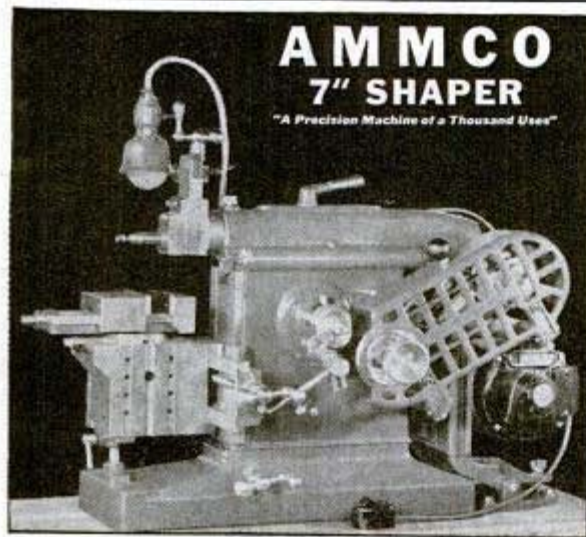
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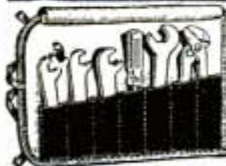
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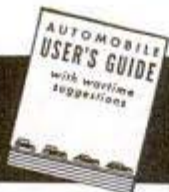
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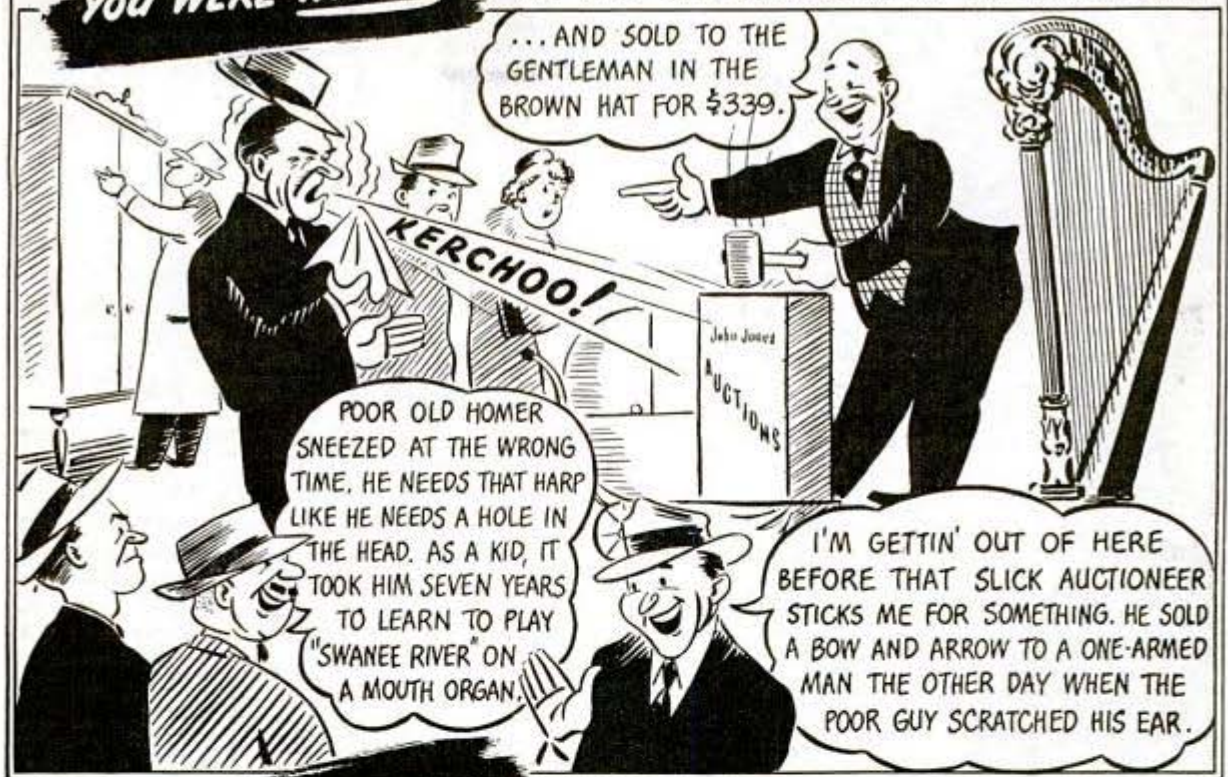
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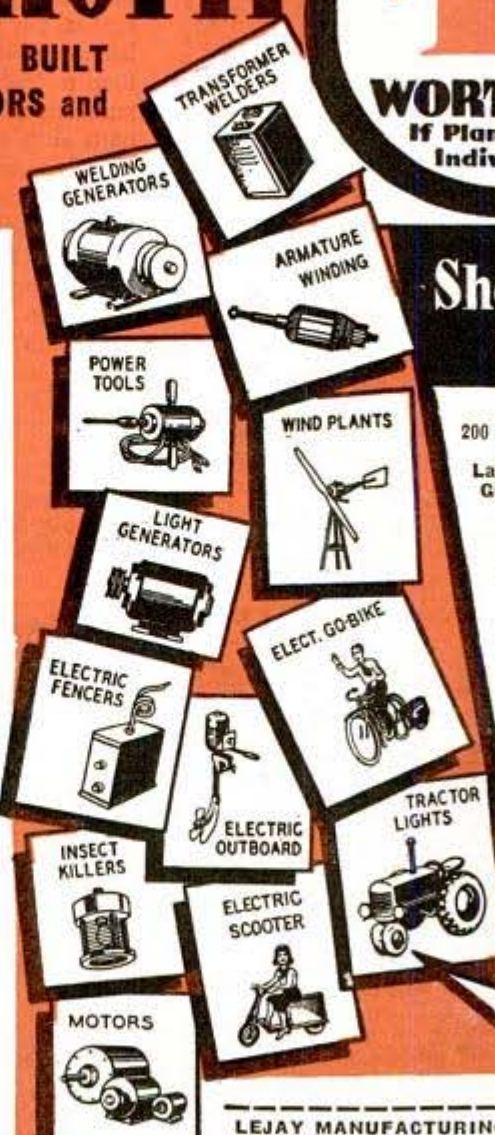
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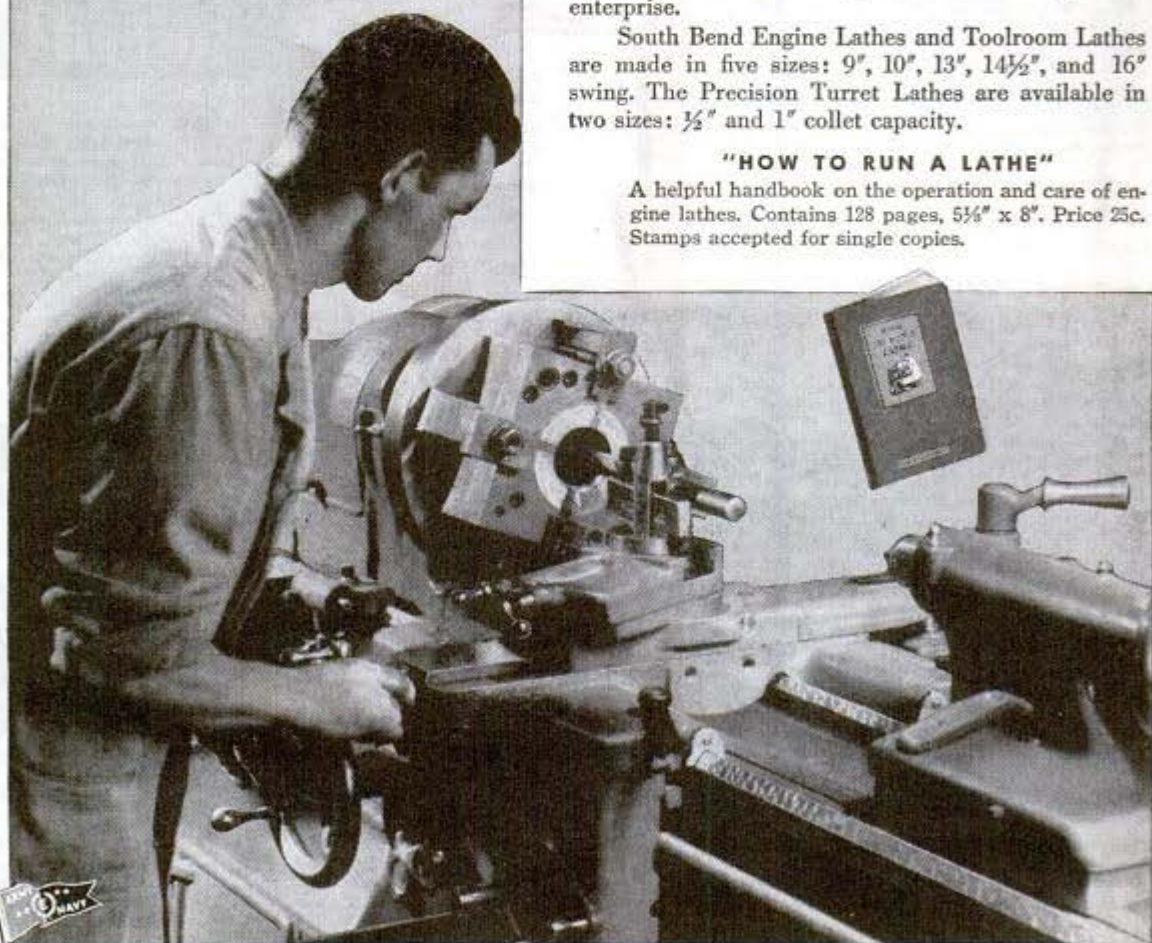
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