

POPULAR MECHANICS

MAGAZINE

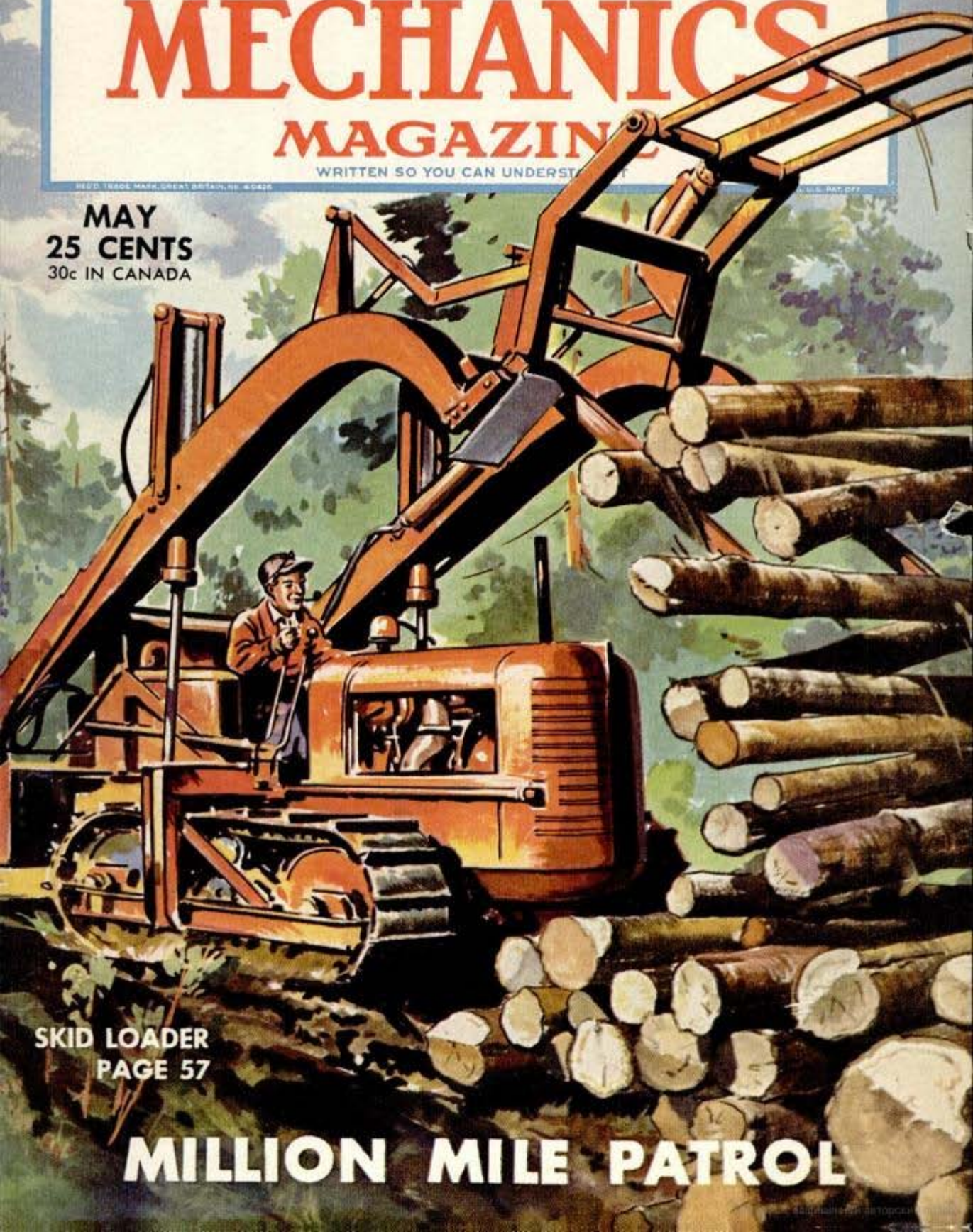


WRITTEN SO YOU CAN UNDERSTAND

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SKID LOADER
PAGE 57

MILLION MILE PATROL

LET'S FINISH THE JOB

Buy Extra War Bonds



DEAR
CORN
WELL

STRICTLY SUPER

IT'S a great day for our side whenever our flyers sweep out over the target in those fleets of B-29 Superfortresses.

Of course, Fisher Body does not make the complete Superfortress. But it does make huge dorsal fins, horizontal stabilizers, rudders, elevators and ailerons. Yes, and flaps, wing tips, outboard wings and turret parts, too.

More than that, Fisher Body makes engine nacelles—using more than 18,000 jigs and tools to turn out the 3,000 parts in each nacelle.

Fisher Body is proud of its part in building this great Boeing-designed ship. All the skills and techniques inherent in the Fisher Body organization are concentrated on giving super-workmanship to the Superfortress. Yet it is but one of many war jobs including big guns, deli-

cate aircraft instruments, tanks and assemblies for other bombers.

And you may be certain that as long as war equipment is needed, the fine craftsmanship symbolized by the "Body by Fisher" emblem will keep right on backing up the courageous crews who pilot these great superplanes.

Every Sunday Afternoon
GENERAL MOTORS SYMPHONY OF THE AIR
NBC Network



armament
~~BOXY~~ 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

UNTIL HIS JOB IS DONE...

there's no let-up for us, either

A man in battle eats and rests with his gun ready for action. His is a full-time job. As long as *he's* on the job, serving him is a full-time job for 1543 of us here at Universal. So if you have to wait a while longer for that fine new photo and home movie equipment we promised you, you'll understand... the armed forces still need all the precision instruments we can make.

WORTH WAITING FOR! *Cinémaster 8mm. home movie cameras and projectors will feature important improvements born of Universal's war work in precision instruments. Mercury II will be the minicamera designed especially for tomorrow's color photography.*

MERCURY II



CINÉMASTER



UNIVERSAL CAMERA CORP.

NEW YORK • CHICAGO • HOLLYWOOD

There's only one flag
we're prouder of!

Peacetime Manufacturers of Mercury, Cinémaster, Corsair Cameras and Photographic Equipment

MAY, 1945

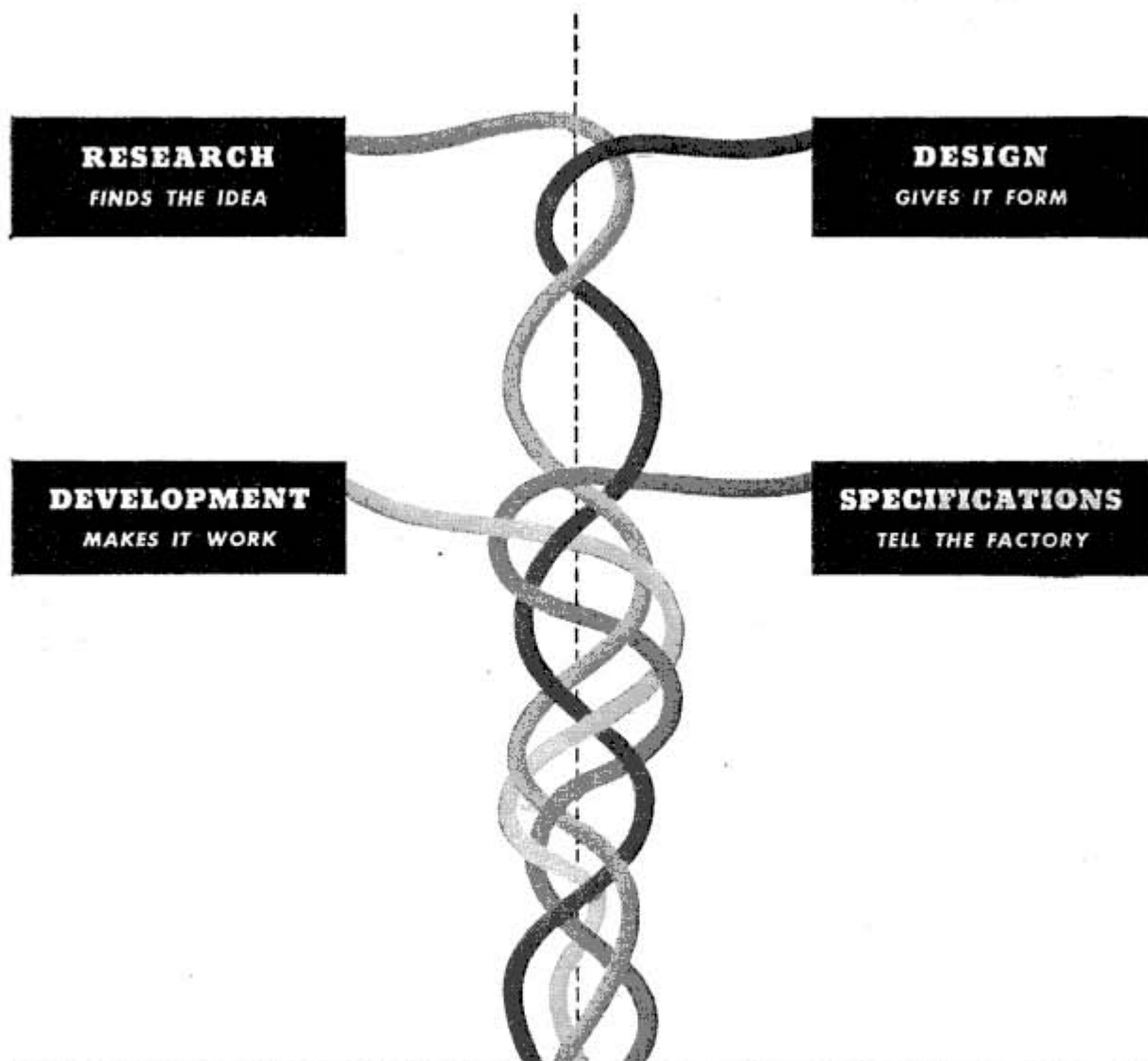
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1A

WEAVING COMMUNICATION HIGHWAYS



BELL TELEPHONE LABORATORIES

brings together the efforts of 2000 specialists in telephone and radio communication. Their wartime work has produced more than 1000 projects for the Armed Forces, ranging from carrier telephone systems, packaged for the battle-front, to the electrical gun director which helped shoot down robots above the White Cliffs of Dover. In normal times, Bell Laboratories' work in the Bell System is to insure continuous improvement and economies in telephone service.



Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

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

Next Month

WITHIN 10 years after the war there will be 400,000 small private planes buzzing about America's skyways if—and here is the catch—these planes can be made to serve a useful purpose and not be the expensive playthings of prewar days. Before the family can sprout wings, says T. P. Wright, Civil Aeronautics Administrator, industry must produce a safe, four-place plane to sell for \$2,500 and provide us with "front-door transportation." An authoritative article by Mr. Wright appears in the June issue.

IF THE Japs had ever guessed that one day a U. S. task force would sail 8,000 miles without returning to base they might have held their fire at Pearl Harbor. How our Navy is able to range the vast Pacific is told by Captain F. L. Oliver in "The Train That Follows the Fleet."

EVERY once in a while the sun and moon stage an inspiring show, possibly to remind us of their tremendous effect on the earth. Looking forward to a total eclipse of the sun on July 9, a noted astronomer tells some startling facts about our celestial neighbors in "Blackout in the Sky."

YANK jungle fighters are proud of their new lightweight rocket guns and mortars, but what they are shouting about from the tree-tops is a portable ice cream machine. It is one of a score of ingenious items described in a June feature presenting GI Joe "At Home in the Jungle."

POSTWAR cooks will have to wear fur-lined mittens if the ambitious plans of the frozen food industry materialize. One item is frozen egg bars to be broken off like chocolate squares. "Zero in the Kitchen" tells what's ahead.

Volume 83

MAY, 1945

Number 5

Managing Editor.....Roderick M. Grant
Assistant Managing Editor.....Wayne Whittaker
Shop Notes and Crafts Editor.....E. R. Haan
Radio and Electronics Editor.....Frank L. Brittin
Art Director.....Frank Beatty
Associate Editors: James R. Ward • Paul F. Healy • William E. Taylor

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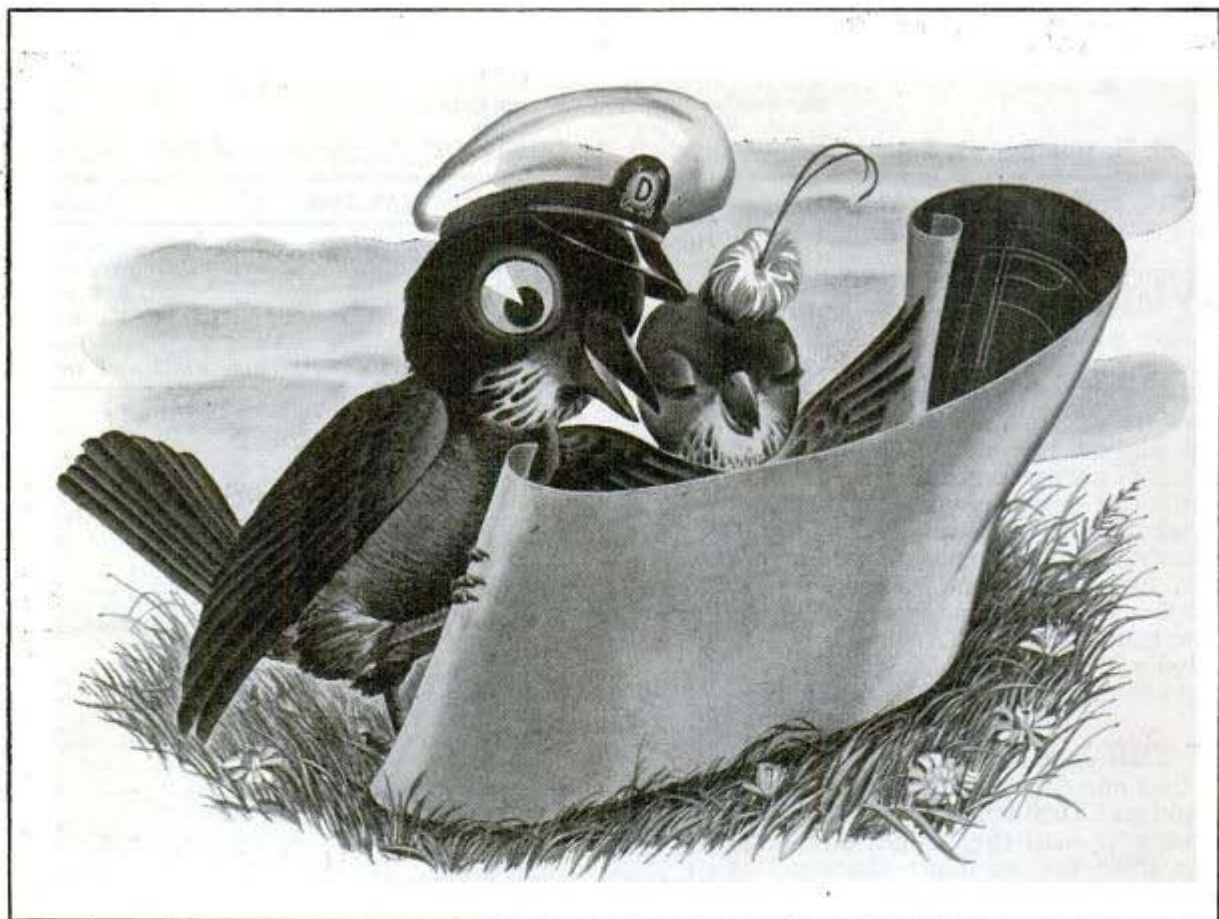
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Blueprint of Happiness

THIS year *you* probably will not experience the great thrill that comes from poring over the blueprints for a home of your own. But we can tell you that your postwar home will be well worth waiting for!

● ● Yes... and today, while you're investing in War Bonds to help crush the Axis, remember you're also creating a nest-egg that will finance that home when you're ready to build it!

● ● The techniques of functional design and compact construction which enabled Defoe to build 137 fighting ships for the Navy since we entered the war, will be turned to producing quality-built homes after Vic-

tory. In addition to the economies of volume production, these new homes will introduce concepts of beauty and comfort, heretofore unknown in their price range—plus individuality of design and exterior treatment.

● ● Today, like ourselves, you have the double duty of performing your war-time task and buying your limit of War Bonds to hasten Victory.

● ● But *you* and *we* may both plan ahead around these scientifically designed homes that not only will offer greater dollar-for-dollar value to home buyers but will also contribute to better American living standards and full employment.

COPR. 1945 DEFOE SHIPBUILDING CO.

HOUSING DIVISION—DEFOE SHIPBUILDING CO.,

BAY CITY, MICHIGAN

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

BACK THE ATTACK
—BUY WAR BONDS

Defoe

SHIPS FOR VICTORY
SERVANTS FOR PEACE

Ingenious New Technical Methods

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



New Fluorescent "Flud-Lite" Magnifiers Increase Efficiency of Inspectors, Assemblers, Toolmakers and Machinists!

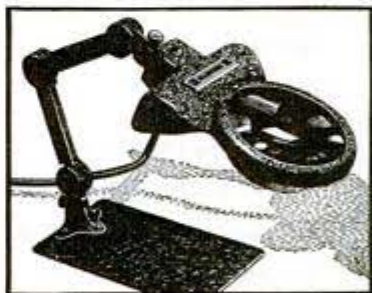
For use in every war-busy plant, this newly devised "Flud-Lite" Magnifier, increases eye-efficiency—reduces error—takes strain off the worker. The device, available in two models: bench-type (illustrated), and portable-type (without base and friction joint arms), does two vital jobs:

- (1) Magnifies the work through a high-quality five-inch diameter lens.
(For supermagnification, an attachment is available which doubles the power of the lens.)
- (2) Floodlights the work with a built-in, glare-free, daylight fluorescent light.

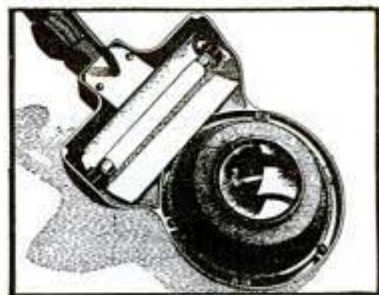
Frame and arms of "Flud-Lite" are die castings, ribbed for strength and efficiency. Durable black finish. Magnifier operates on AC current, 110-120 volts, 60 cycles. Precision built throughout, it's a help-on-the-job worth remembering.

Remember Wrigley's Spearmint Chewing Gum, too. Our guarantee of the product has always been uniform highest quality. That guarantee still holds, even though that familiar wrapper is now empty, because we have ceased manufacture of Wrigley's Spearmint Gum; And we will resume production only when we *know* we can make it up to Wrigley's Spearmint standards.

*You can get complete information from Stanley
Electric Tool Division, The Stanley Works,
New Britain, Connecticut*



Bench type "Flud-Lite" Magnifier,
with adjustable friction arm joints.



Bottom view, showing built-in
fluorescent daylight lamp.

Z-65

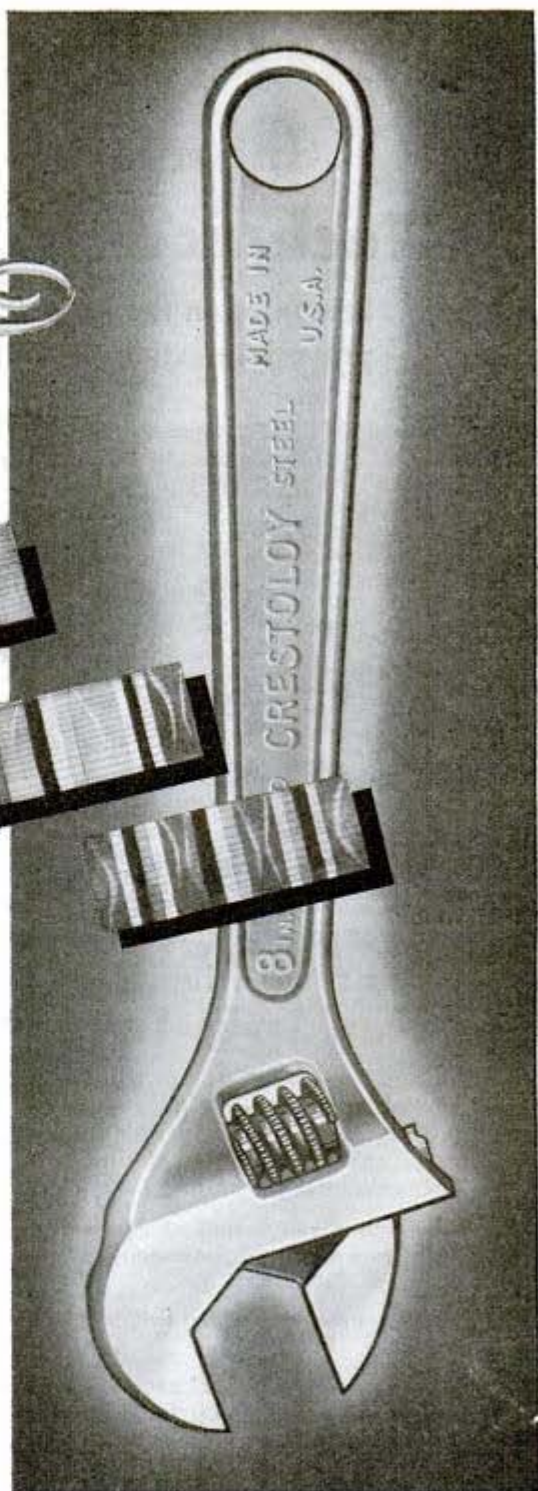
IT WEARS A LOT OF *Ribbons*

★ ASK our veterans returning from the far corners of the globe and you'll find that the **CRESCENT WRENCH** wears a lot of ribbons too. It has worked on everything from bulldozers to bombers ... on more than one occasion it has spelled the difference between getting back and getting "taken".

Someday, this famous Crescent Wrench will be back at work rebuilding for Peace. In the meantime, make the ones you have last. Available Crescent Spare Parts will keep them working.



CRESCENT TOOL COMPANY, JAMESTOWN, N.Y.



CRESCENT TOOLS

Give Wings to Work





If YOU were Boss would YOU promote "YOU"?

Be honest now—

suppose that a better job had opened up in your company—carrying with it promotion and more money—could you qualify?

If you were boss, would you select "YOU" for that better job?

Consider before you answer.

First of all, could you *fill* the job? Has your experience fitted you for the step forward—have you been preparing for promotion apart from experience gained on the job?

Or have you just been filling a niche, doing daily tasks well but making no real and intelligent effort to learn and qualify for the job ahead so that if an opening should occur you would be ready to fill it?

The man who gets real promotion is the one who makes his own breaks—the man who slaves in the ordinary job at low pay just wishes and dreams of promotion and more money. Which are you?

Business is always willing to pay the man who knows—and pay him well. The man who is ready and willing to take responsibilities—and capable of

directing the efforts of other men is a valuable asset to any business organization. He never wants for a good

job and above average earnings. He gets ahead.

We have helped thousands of men achieve promotion and more money—success sometimes beyond their dreams—a success that was started by a coupon similar to the one below.

Get out of that rut—don't be satisfied with a mediocre job at small pay—be a success in business—this coupon may be your first step.

So send it today—right now—tomorrow never comes for the man who consistently puts things off.

La Salle Extension University A Correspondence Institution

Dept. 564-R

417 S. Dearborn, Chicago 5

If you can help me get the ability and knowledge for real promotion, I want to know it. Please send me your free 48 page booklet telling how I can succeed in the field I have checked below. I understand you will send this without obligation to me.

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Position.....

Address.....Zone, if any.....

City and State.....

WHAT EVERY AUTOMOBILE OWNER OUGHT TO KNOW ABOUT... PYROIL

DOES PYROIL HELP TO START YOUR CAR? *Yes.* Pyroil prevents dry starts. It gives oil the property of clinging to metal surfaces — instead of permitting it to drain off.

YES
NO

DOES PYROIL PREVENT EXCESSIVE CYLINDER WEAR? *Yes.* Dry starts mean metal rubbing against metal. Pyroil maintains a layer of lubrication between pistons and cylinder walls.

YES
NO

DOES PYROIL PREVENT CORROSIVE CONDITIONS? *Yes.* Pyroil protects metal surfaces against rust. Pyroil also suspends gums and sludges as they are formed.

YES
NO

IS PYROIL HARD TO GET? *No.* Next time you buy gasoline—ask your service man to add Pyroil—and add life to your car.

YES
NO

Manufactured and Guaranteed by Pyroil Company,
W. V. Kidder, Founder,
55 Pyroil Building, La Crosse, Wisconsin



PYROIL Adds Life to Your Car

PYROIL COMPANY

55 Pyroil Building, La Crosse, Wisconsin

I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

Name.....

Address.....

City or Town..... State.....

WHERE-TO-BUY-IT INDEX

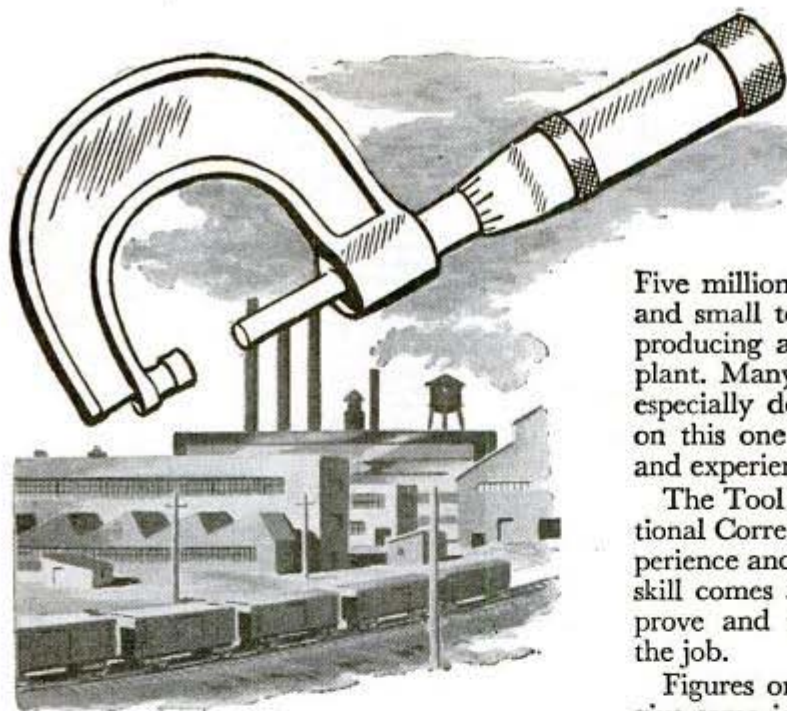
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Five million tools, jigs, dies, fixtures, gauges and small tools are needed by the machines producing airplane engines in just one U.S. plant. Many of the machine tools had to be especially designed for the work to be done on this one job. That takes real knowledge and experience.

The Tool Designing Course of the International Correspondence Schools makes such experience and knowledge available to you. The skill comes as you study in your spare time, prove and apply what you learn right on the job.

Figures on the tools used in a single plant give some idea of the vast dimensions of the tool designing field. You know, too, that change and improvement is constantly going on. *All that means demand for tool engineers.*

Manufacturing conversions will make the demand even greater. Now is the time to prepare for it—and assure yourself of a *solid, well-paid future.*

You can't learn Tool Designing overnight. You *can*, by mailing the coupon, set yourself on the road to mastering this great profession.

5 million tools IN 1 PLANT!

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Without cost or obligation, please send me full particulars about the course before which I have marked X:

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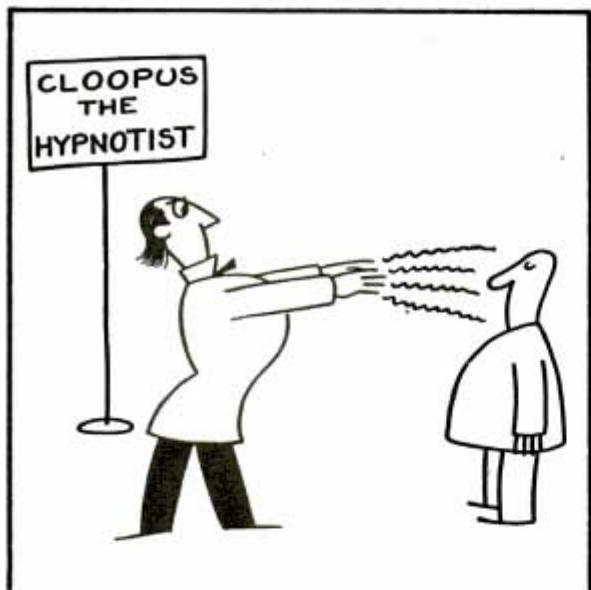
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City..... State..... Present Position..... Working Hours..... A.M. to..... P.M.

Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada.

British residents send coupon to I. C. S., 71 Kingsway, London, W. O. 2, England.

DISCOUNT TO DISCHARGED VETERANS—SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES



O. SOGLOW

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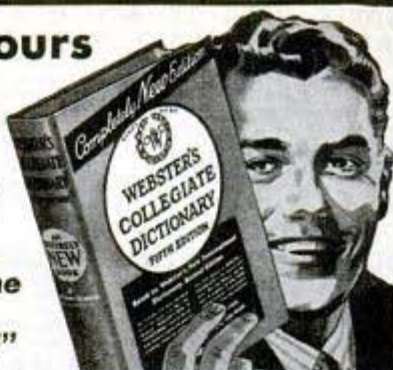
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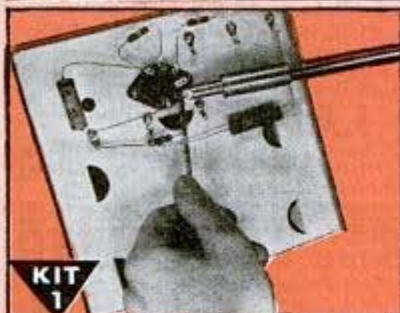
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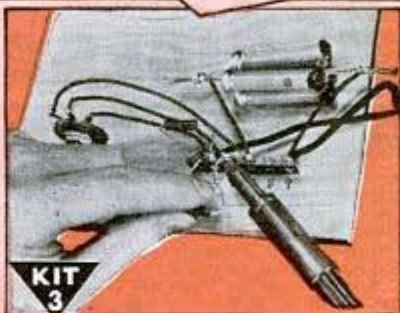
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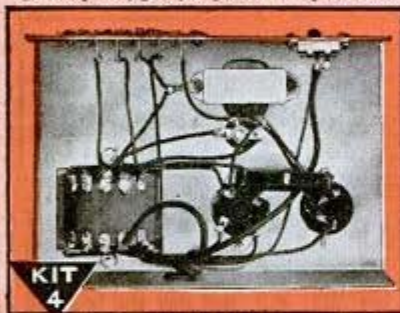
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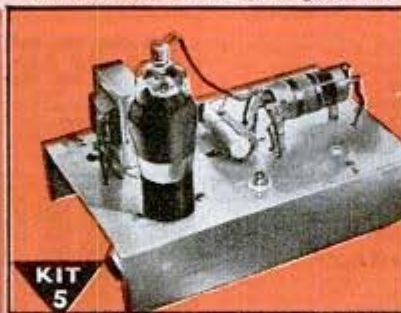
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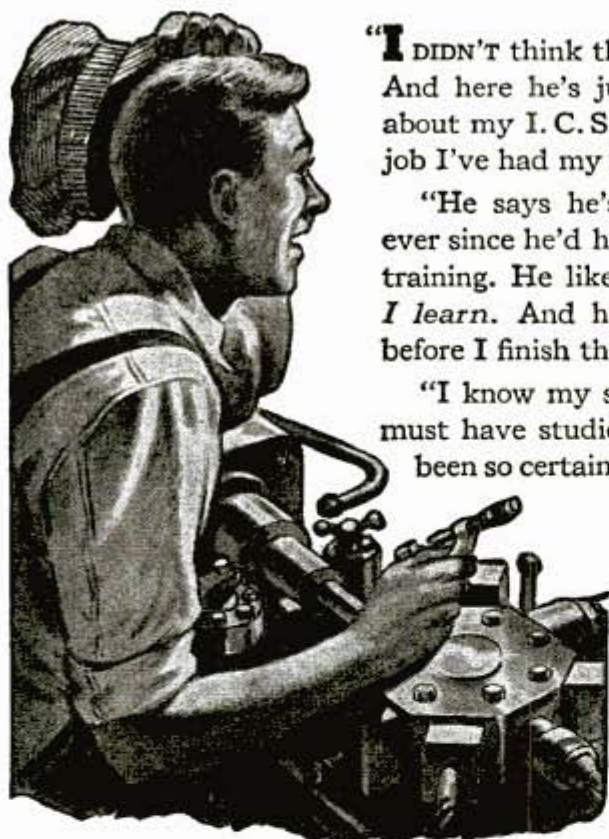
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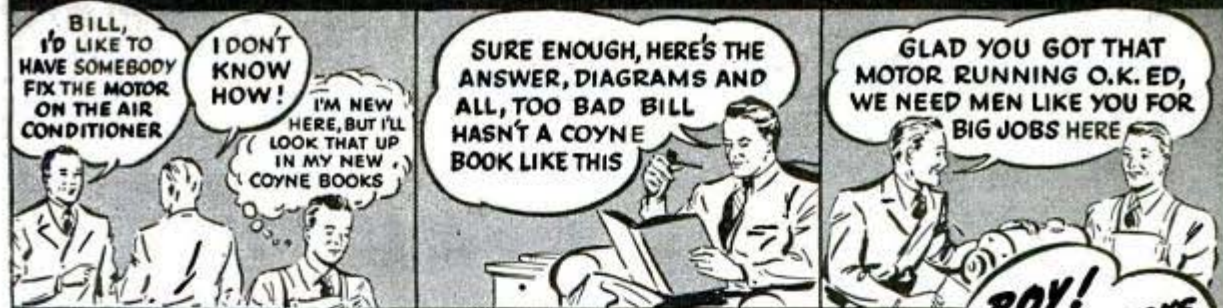
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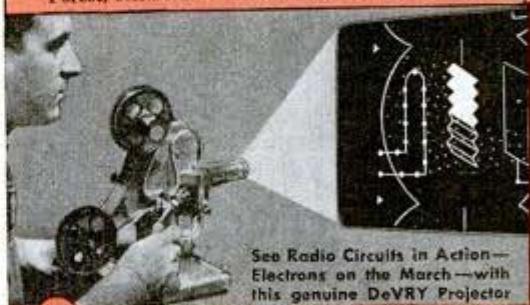
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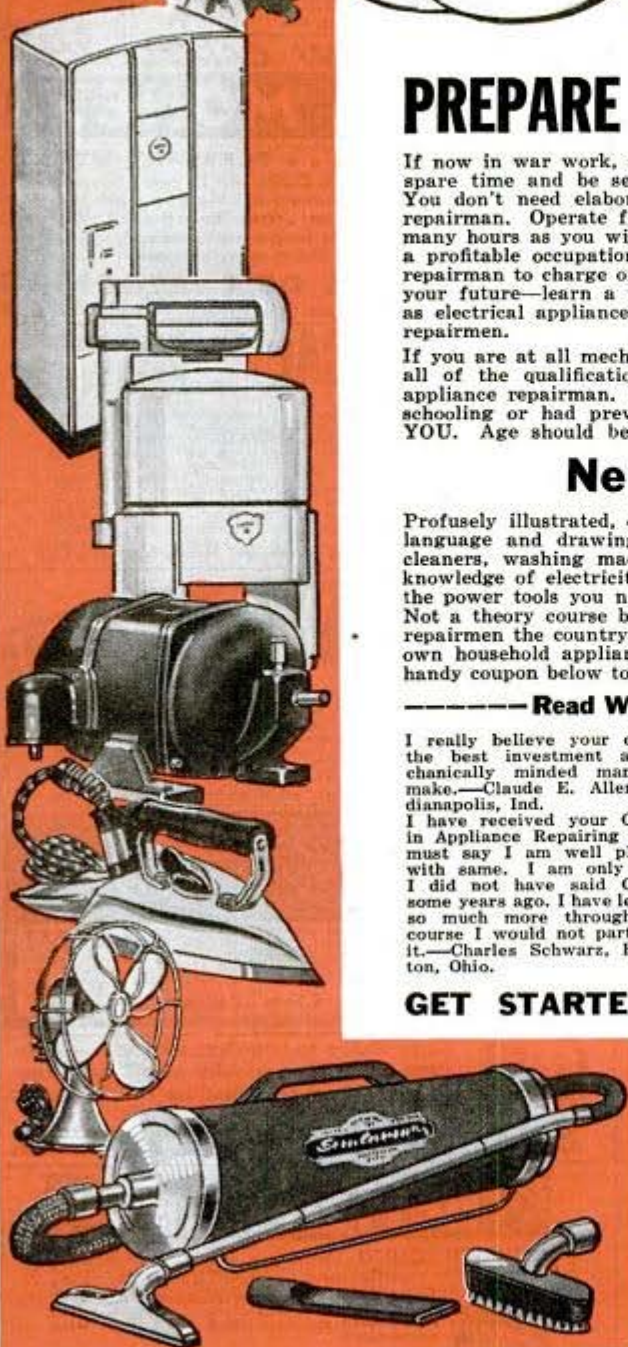
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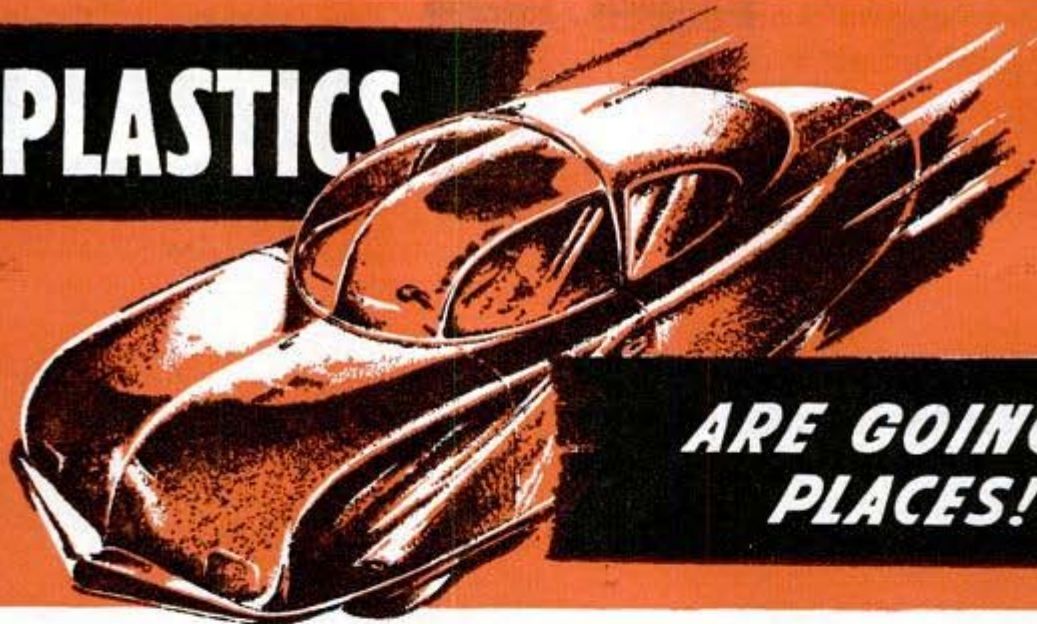
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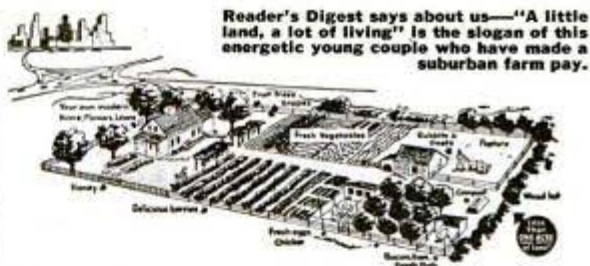
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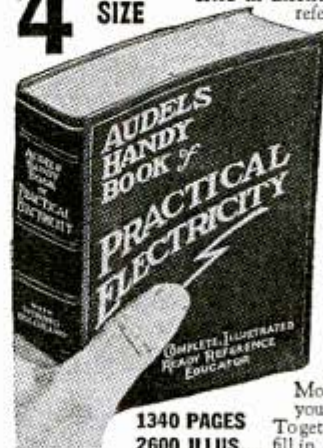
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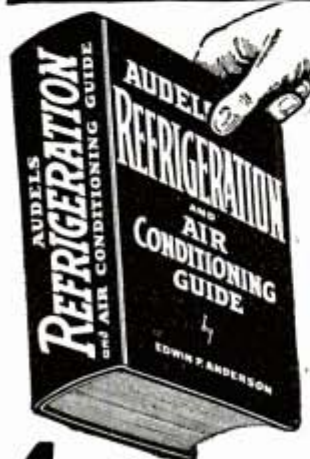
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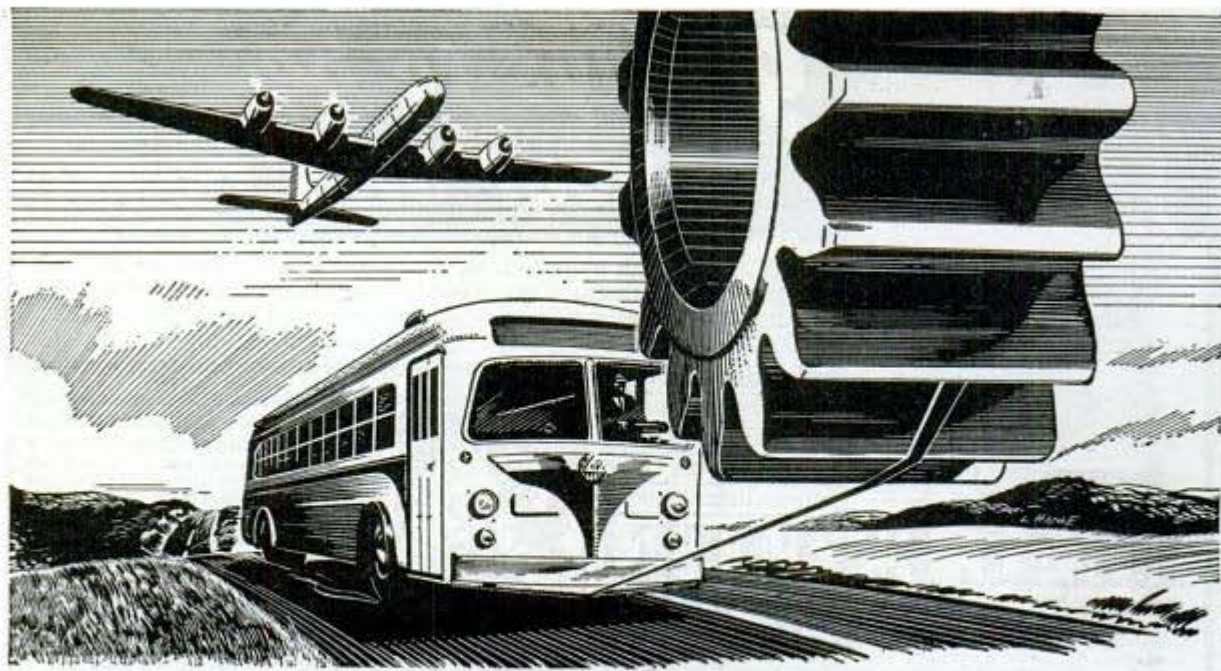
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TRAFFIC COPS: One job of gears in Cyclone is to slow down propeller to an efficient speed. If blade tips turn too fast, get above the speed of sound, the propeller vibrates, loses power. In some models of Cyclone 18, the propeller turns over only 35 times for each 100 revolutions of crankshaft.



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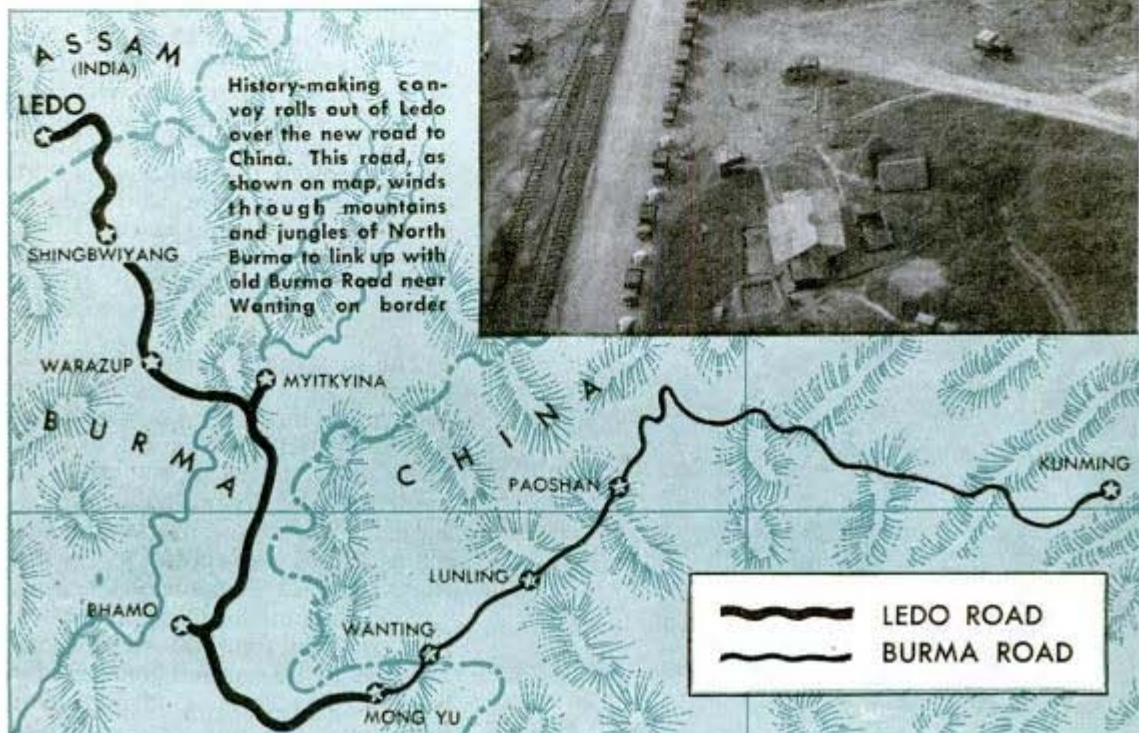
THE ROAD THAT COULDN'T BE BUILT

By Wayne Whittaker

WHEN Brigadier General Lewis A. Pick led the first triumphant truck convoy over the Ledo Road across North Burma to China early this year, he must have looked back to a memorable October day in 1943.

That was the day General Pick arrived in Ledo, India, to take command of what was probably the most bogged down road building project in the history of man. Fifteen months later, this project, which his men call "Pick's Pike," was hailed around the world as one of the greatest military engineering achievements of World War II.

When General Pick arrived on the scene, it looked as if the British engineers were right when



MAY, 1945

1



Chinese soldiers at Myitkyina wave to trucks of first convoy over road. Below, loading ammunition at Ledo



they branded the project "impossible." Our own U. S. Army Engineers had taken up the task at "Mile 0.00," just outside of Ledo, where the British had given it up 10 months before.

During those 10 months, our engineers had pushed the road only 42 miles through the rain-soaked jungles of the Naga Hills and over the Pangsau Pass into the Patkai Mountains of Burma. At this rate it would have taken about nine years to build the 478-mile Ledo Road through the mountains and down the Hukawng Valley to a juncture with the old Burma Road on the China border. The Japs cut the Burma Road, the only Allied land route to China, a few months after Pearl Harbor.

The first detachment of American engineers had at their disposal only a few bulldozers, some dilapidated British trucks, a few Chinese mule pack trains, and an assortment of untrained native laborers. The road had advanced about 39 miles when the torrential rains of the 1943 monsoon season turned the new highway into a sea of mud. Fuel for the lead bulldozers had to be carried forward by coolies. Rivers rose 45 feet in a few days, washing out embank-

ments. Bulldozers and trucks skidded over steep cliffs.

The U. S. Engineers, who slept in water-logged tents or bamboo lean-tos, were soaked to the skin all of the time. The thick, matted jungle seemed alive with purple leeches whose bites festered. The discouraged crews received reports from natives that Jap patrols had been seen only 35 miles ahead. This was March, 1943. A large contingent of Japs actually advanced within 79 miles of Ledo, but later withdrew to their supply base near Shingbwiang.

When floods disrupted the coolie supply line, gasoline and other supplies were dropped to advance units by parachute. At "Mile 42.5," building was virtually at a standstill, and when General Pick arrived crews were working only one eight-hour shift. Ahead lay more jungle, never before crossed by a white man, precipitous mountain passes, scores of flooded rivers, and thousands of Jap snipers.

Although General Joseph W. Stilwell had informed Generalissimo Chiang Kai-shek that the U. S. Army would build the lifeline into China, it looked as if the doubters were right. These doubters included many noted engineers who had announced flatly that the Ledo Road could never be built. They only had to point to any one of a dozen obstacles to prove they were right.

First, the Japs controlled most of the terrain along the proposed route which led through Shingbwiang, Myitkyina and Bhamo. There were no detailed maps of the region and no soil charts—a vital factor in road construction. During a single



Troops cheer General Pick, chief engineer of road, as he rides in decorated jeep under posts at junction of Ledo and Burma Roads



China-bound jeeps pause at Myitkyina for a check of motors, gas and tires. Below, this is what happens to sections of the jungle highway in monsoon season when floods wash away gravel topsoil





Native of Burma (center) lends a hand while two Yanks clean gun mounted on their truck. Jap snipers were menace to road builders



Crew unloads gasoline from huge cargo plane landed at Myitkyina. Below, U. S. Army Engineers prepare to build temporary bridge over 50-foot washout on Ledo Road to keep supplies moving into China



monsoon season in Burma, 175 inches of rain have been known to fall, sending streams on rampages and flooding entire valleys. Other obstacles included an almost impassable 270-mile stretch of jungles and mountains, tropical diseases, a supply line that extended back 12,000 miles to the U. S., and a native labor problem that was complicated with religious and inter-tribal feuds.

"I hear they call this the road that can't be built," said General Pick at his first staff meeting in Ledo. "I've been told that all the way from the States. Too much mud, too much rain, too much disease. From now on we're forgetting this defeatist spirit. The Ledo Road is going to be built, mud and rain and disease be damned!"

From that moment things began to boom in the jungles of Burma. Headquarters were moved immediately to the most advanced point on the road and crews began working night and day. There were no flood lights for the night workers, so buckets of burning Diesel oil had to serve as flares. Looking down from the heights at night they created an effect that would have delighted any Hollywood director.

Every sanitary precaution was taken to protect the health of the men, and hot meals were available at all hours. There were a recreation program and movies to boost morale. The greatest morale boosters, however, were the new trucks and armored bulldozers, and the establishment of maintenance depots manned by first-class mechanics. One of these shops had 200 mechanics and at times there were 250 vehicles waiting to be repaired.



A few feet and centuries apart—a Burmese cart stops at side of the road as an Army truck roars by

General Stilwell visited the camp a few weeks after General Pick's arrival. The Japs were 54 miles ahead, just beyond Shingbwiyang.

"Can you build us a jeep road to Shingbwiyang by January 1?" General Stilwell asked.

The date was November 3, 1943.

"No," replied General Pick, "but we will build you a military highway and have it done by that day."

If General Stilwell looked dubious, he had good reason. Before him stood a bulldozer stalled in mud up to the stacks. Between the road head and Shingbwiyang was some of the roughest terrain in the world.

Fifty-seven days later, on the morning of Decem-

ber 27, the lead bulldozer pushed into the edge of Shingbwiyang—four days ahead of schedule. Behind it was a convoy of 55 trucks carrying Chinese troops along the

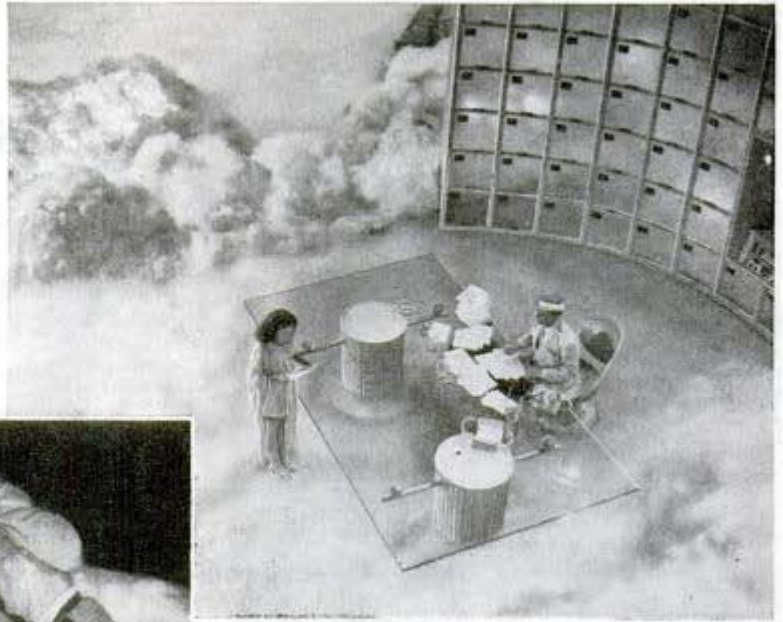
(Continued to page 154)



Convoy trucks "gas up" from pipe line that follows the road

Hollywood Spins Glass Heaven for Film Fantasy

Unable to hire a technical adviser straight from the Pearly Gates, Hollywood fabricated its own idea of heaven from spun glass for the comedy-fantasy, "That's the Spirit." The director's seven-year-old daughter supplied some of the fanciful innovations, in case you wonder. The spun glass used is a type developed for war work and never



Here is heaven according to Hollywood, created with spun glass. Left, director and aid whip up a cloud



had been used before by the movies. Film-land's technical men let themselves go in creating novel effects with the glass. They feel sure no one is going to write indignantly: "Your ideas of heaven are all wrong. I know because I've been there."

Hunters in GI Camouflage Suits Fool Ducks Just as They Do the Japs

Stalking ducks, coyotes, and rabbits after the war won't be as thrilling or as satisfying as hunting Japs but it will be made easier by wearing the GI camouflage suits currently used in jungle and wooded combat areas. Air Force men stationed at the Laredo, Tex., gunnery school discovered while hunting in their spare time that cam-

ouflage suits eliminate the need for blinds or concealed spots for duck hunting. Wearing green and brown "commando clothes" which blend into the scenery, the gunners squat on a river bank and fire at ducks which sit on the water a few feet away. The camouflage is said to be equally effective in sneaking up on other wild life.



Color Camera Films Surgery From Glass Enclosure

Field hospitals are making color records of wounds and operations with a special 35-mm. camera developed for the Army and Navy. The camera fits into a glass enclosure, called a Surgiscope, which can be attached by a clamp to an operating table for use by the surgeon or an attendant, and which can be sterilized like other surgical instruments. A built-in flash provides for nine exposures without removing the camera from the scope. Focusing mechanism and shutter are automatically set when the film is wound to eliminate double exposures. The camera can be used for either color or black and white pictures.

THE FIGHTING LADY WILL BE BACK

By Lt. James Prinz

United States Naval Reserve

BEFORE the great carrier strike on Tokyo in February, the OWI beamed radio broadcasts to Japan which should have given the Nips cause for thought. Chanted over and over again were these words:

"The Fighting Lady is coming to Tokyo . . . the Fighting Lady is coming to Tokyo . . . the Fighting Lady is coming to Tokyo . . ."

Well, the Fighting Lady and a great fleet of sister carriers, battleships, cruisers, destroyers, mine-sweepers and submarines steamed right up to Tokyo's front yard—and Tokyo did little about it. We shot Jap planes out of the air,

Marine flyer in group assigned to carriers lands his Corsair



Just a fraction of our Pacific power, these Third Fleet ships show why we rule sea. Below, carrier pilots get final briefing before the Tokyo raid





Many mighty U. S. battleships roam the Pacific. The USS South Dakota rides against the sky in this photograph from hangar deck of a carrier



Wings of U. S. Navy plane are seen over Fujiyama, volcano landmark, as carrier-based craft strike at Tokyo. Below, part of mighty task force, the first to drop anchor in waters that were Japs' before Pearl Harbor
Official U. S. Navy photos



burned and strafed aircraft on the ground, bombed engine and assembly plants and attacked shipping. The historic raids of February 16, 17 and 25 are only a sample of the fate that awaits the whole Japanese homeland.

Tokyo papers please copy: The Fighting Lady and her sisters will be back.

I've fought the Japs in the South Pacific so I've met them before. But I can say the raid on Tokyo was big league stuff. We're getting at them now where it really hurts. It's taken us three years to reach areas from which we can deliver punishing blows at the empire. It has required a vast amount of long-range planning, mountains of supplies and lives of a lot of good men. But the Japs will pay for it.

When we got the word that Tokyo was to be our next target, I suppose I felt like all the pilots in my squadron. Tokyo was a magic name and the operation would be historic. The Navy had been near Tokyo before—when Admiral Mitscher in the old USS Hornet carried General (then Colonel) Doolittle and his B-25 pilots on the first raid against

Tokyo on April 18, 1942.

But this was different. That first strike was for morale purposes as much as anything else. We were taking a licking in the Pacific and we had to prove to the people at home that we could hit the Japs if the production lines turned out the needed ships and planes.

In a little less than three years the picture had changed. By February of this year we had carriers to spare and all the other ships that go with them. Our anti-aircraft fire was as much as 100 times more effective than before the war. We had skillful pilots and the best planes in the world. You would have been proud of American military might if you could have seen the gigantic task force tugging at anchor before it set out for Tokyo.

We knew we had the stuff to hit Tokyo with—and hit it hard. But in our minds lurked the question: "What would Tokyo hit us with?" We were up against a new proposition this time. It was not just the United States fleet against the Japanese



Pilot held stick with hands and legs for 100 miles to land this plane

fleet. This was carrier aviation against land-based aviation.

It is a choice theory of some aviation strategists that a Navy simply can't stand up to land-based air power. Land-based planes, they argue, can fly longer distances, can carry heavier bomb loads, can be massed in greater numbers. They deem it suicide for a fleet to tangle with land-based air power. And here we were, with Admiral Mitscher in command again, preparing

Jap dreams of conquest go up in smoke as carrier-based planes fire oil tanks in a raid on a Nip fuel dump





Torpedo-bomber's pilot and crew report to Navy Intelligence after attack

to go right to the heart of the enemy. Is it any wonder some of us swallowed hard when we were told our target was Tokyo?

We had rendezvoused at a secret base. As we plowed toward Japan the temperature began to drop. Supply officers on all ships broke out heavy, cold-weather clothing. We moved with a weather front—cold and overcast—hoping to approach Tokyo under its cover, as the Japs had done at Pearl Harbor and Midway.

The morning of February 16 was icy and the weather nasty. The temperature hovered around 45 degrees and a 50-mile-an-hour wind set your teeth on edge. The task force was still undetected by the Japs when

position was antiaircraft fire. On the way back to the ship we worked over a couple of destroyers south of Tokyo Bay.

Other fighter planes from the task force were hitting fields all around Tokyo. Jap radio announcers screamed and gibbered—and stations went abruptly off the air. As our planes moved inland, the Japs sent up a few planes but they didn't prove aggressive.

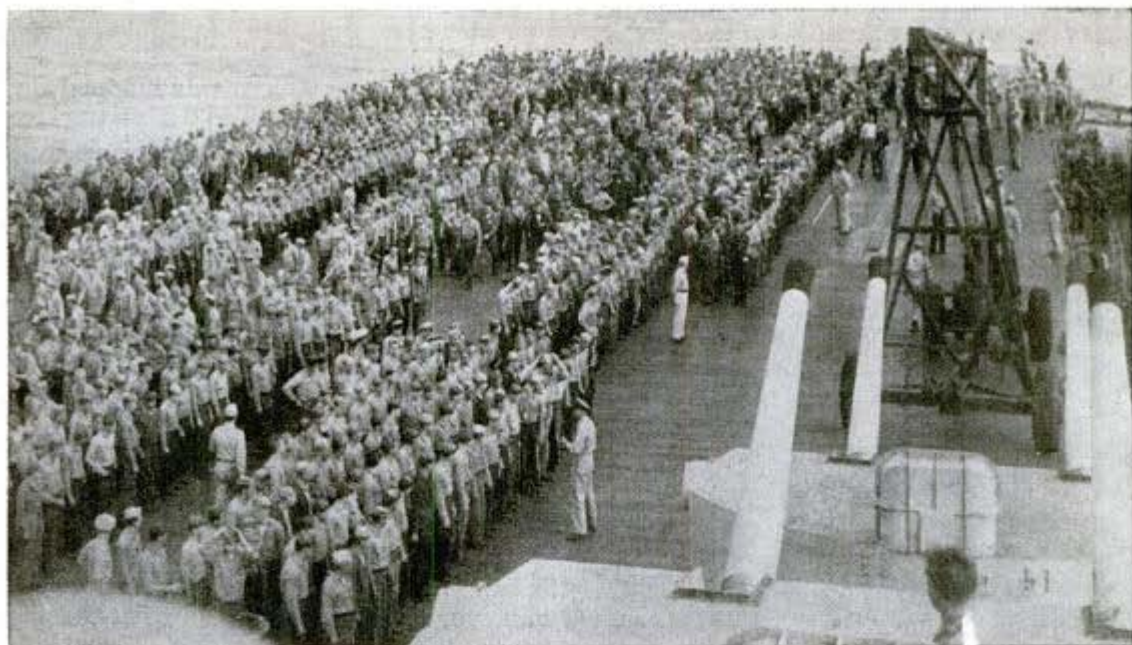
To a Navy fighter pilot, a Jap plane is usually easy picking. An American fighter has been trained to meet and defeat aerial opposition. Flying skill and better quality planes weigh the odds heavily in his favor, as much as 20 to 1. And when the Japs came up that first day, we promptly knocked them down.

The second day belonged to the dive bombers and the torpedo pilots, although we fighters went along to protect them and for photographic duties. My job on February 17 was the latter. But I was also carrying loaded machine guns and a 500-pound bomb—just in case I saw a likely target.

It was nasty weather again as we took off. But just as we reached the mainland of Japan the

Black smoke hid this war plant when Navy attackers left Tokyo





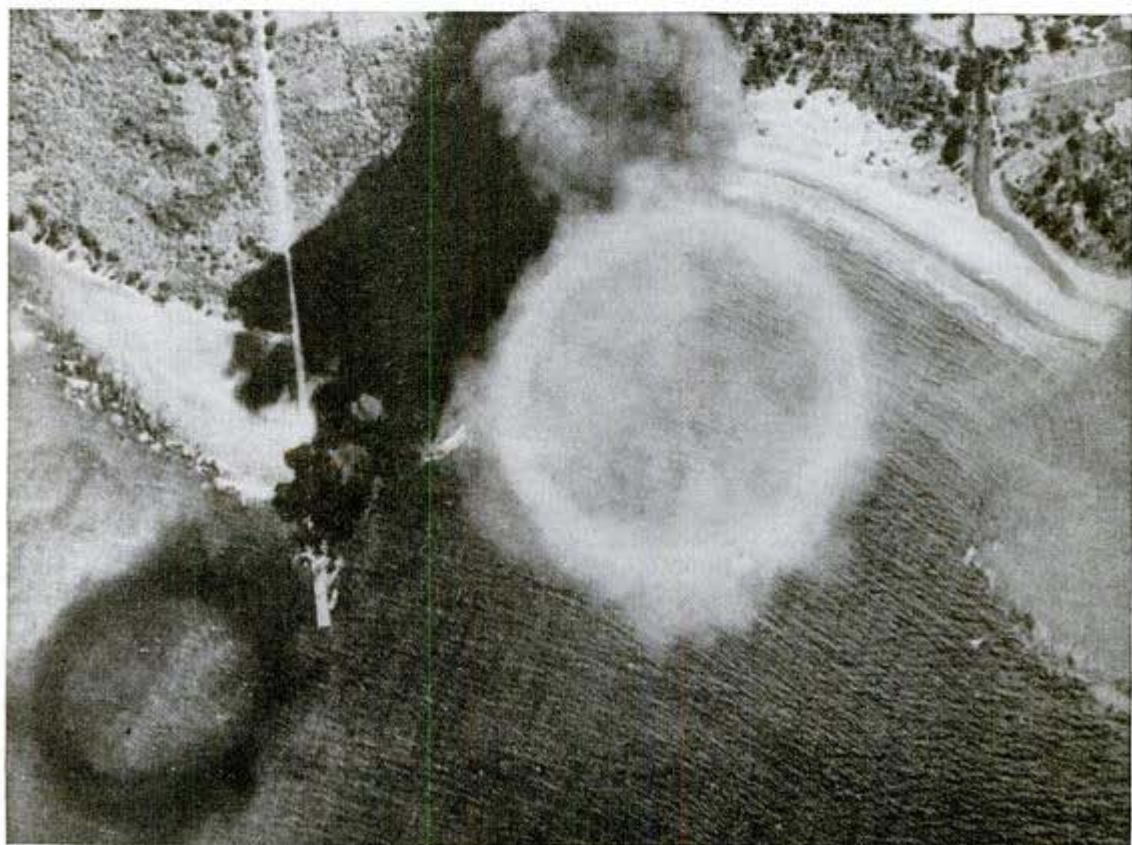
clouds broke and the whole Tokyo-Yokohama area lay crystal-clear below us in a world of blue sky and golden sunshine. Off to the left was Fujiyama, blanketed with snow and pretty as a calendar picture.

But we didn't have much time to admire the scenery. There was work to be done. While I took photographs of airfields that had been strafed and bombed the day before, our bombers and torpedo pilots were wreaking havoc on Japanese engine plants, assembly and air frame factories.

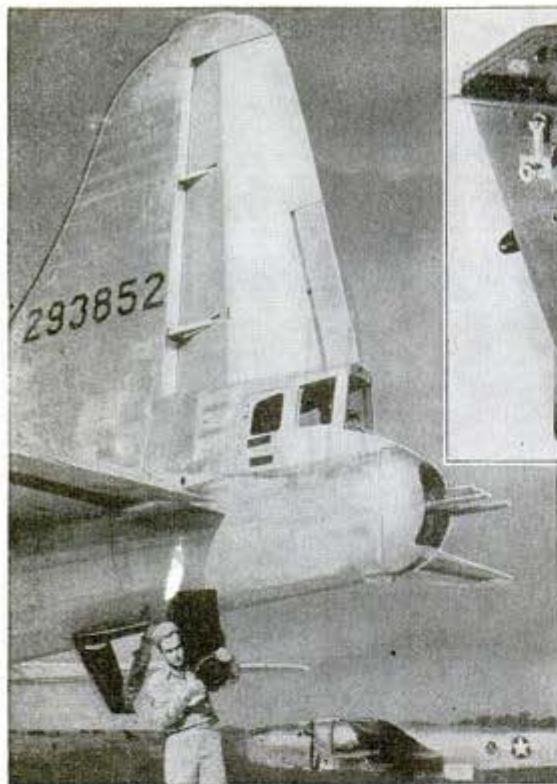
(Continued to page 160)

Our target, Tokyo.
Scene on carrier
as men learn goal
from the skipper

**Navy flyers blow
lovely and costly
smoke rings with
Jap oil on Luzon**



Big Cameras Map Tokyo With 24-Inch Lenses



Tokyo was mapped for B-29 raids with the world's largest aerial camera, the Fairchild K-18, in what military authorities consider one of the outstanding photographic jobs of World War II. The camera, a 70-pound instrument with a 24-inch telephoto lens, was developed specifically for taking large scale pictures from extremely high altitudes. It operates automatically from remote controls, clicking off its giant negatives at intervals

ranging from one to 120 seconds, or whatever time is needed to give proper coverage. Its magazine holds a 150-foot roll of 9½-inch film which gives 9 by 18-inch exposures. The large area covered by each picture greatly reduces the time each B-29 reconnaissance crew must spend among the bursting flak. The sharpness of the lens permits negatives to be enlarged to three or four diameters without blurring.

Japs Attach Pontoons to Tanks for Amphibious Operation



During the campaign in the Philippines our troops captured a Japanese tank which was equipped fore and aft with removable pontoons. Unlike our famed Alligator, Buffalo, Duck and Weasel, which were designed and built for amphibious operations, the Jap tank, in an apparent search for an answer to landing problems, has pontoons which are removed after landing. They must be reinstalled before the tank can take to the water again.

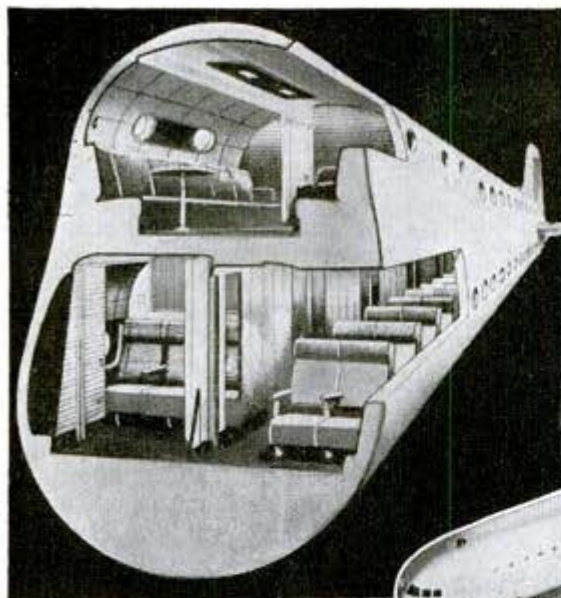
Left, with pontoons removed, Jap tank looks like any other. Below, bow pontoon discarded after landing



Plastics for Navy Ships Resist Fire and Shock

Asbestos and glass are used in new plastics developed for the Navy to resist fire and shock during battle. General Electric chemists found other fillers gave off fatal gases during fires. The asbestos is bound with phenolic resin, while layers of glass cloth are bonded with melamine resin.

Winged Hotel Will Fly to London in Nine Hours



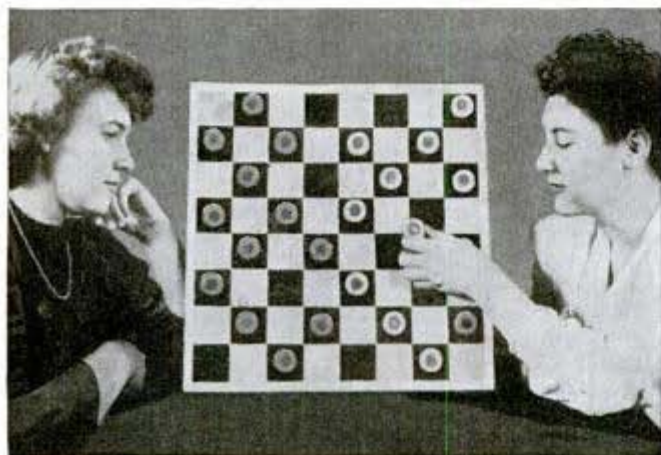
Upper deck of Clipper as shown in cutaway is divided into two passenger sections. Lower deck has rooms, seats. Right, model of plane



weigh 320,000 pounds, 12 times the size of present standard twin-engined commercial aircraft. Length is 182 feet, and wing span 230 feet, more than twice the Liberator

Stiff foreign-flag competition on long distance airlines will be met by Pan American World Airways with a fleet of 204-passenger land-based clippers to be built by Consolidated Vultee Aircraft Corporation. The ships will fly transatlantic and transpacific routes. Six engines equipped with pusher type propellers will produce power equivalent to more than 300 average automobile engines, driving the clipper 310 to 342 miles an hour. Cabins will be conditioned for 30,000 feet altitude to permit dodging of storm areas. Each clipper will

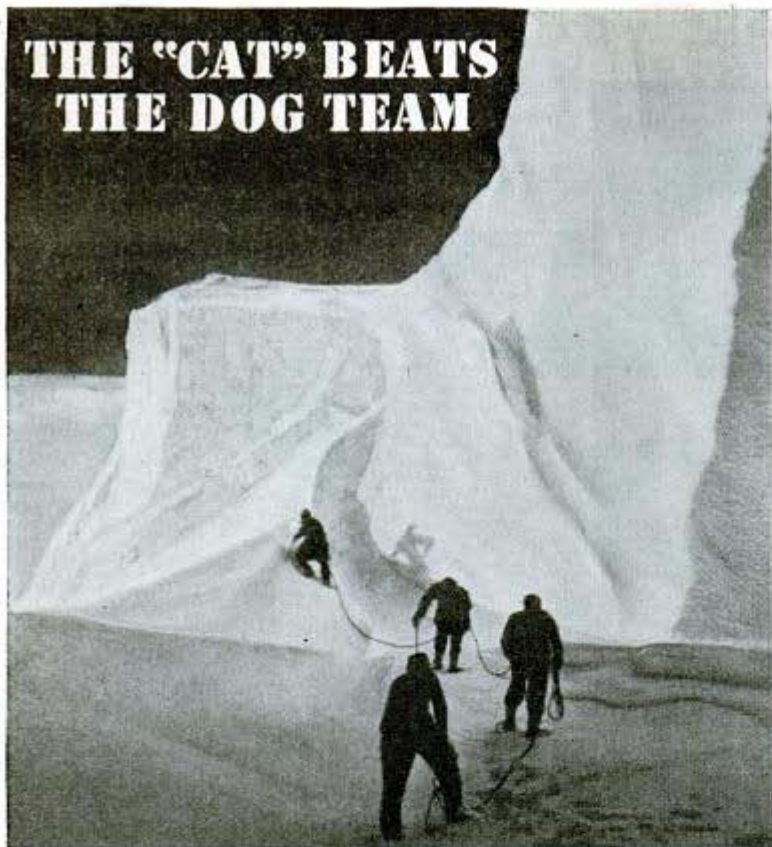
B-24, and equal to the height of a 21-story building. With a payload of 50,000 pounds, made up of the 204 passengers and 15,300 pounds for baggage, mail, and express, the clippers will have a range of 4,200 miles, and will be able to fly from New York to London in nine hours. Comfort will be paramount, with the double-decked ships providing nine staterooms, accommodating two persons each, and 12 berths in one section. Luxurious lounges and rest rooms are to be provided. Despite the ship's size, one pilot will be able to handle it in the air.



Magnetic Checkers Stick Even in Roll of Ships

Wounded veterans can relax at checkers even while aboard hospital ships, trains or planes if they have the magnetic checkerboard developed by a General Electric engineer. The board can be played on vertically, a boon to patients unable to raise their heads to read books or play games that must be in horizontal position. The steel board uses powerful Alnico magnets set into the checkers. A small metal disk in the top of the checkers permits crowning for kings.

THE "CAT" BEATS THE DOG TEAM



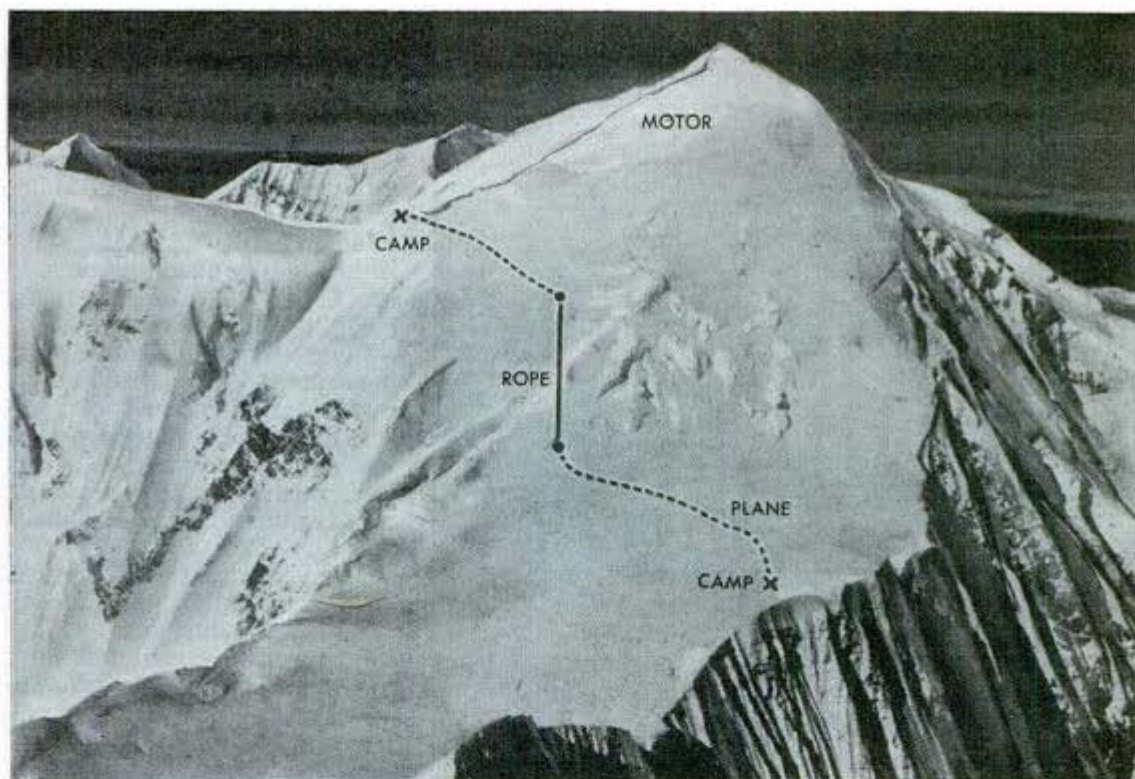
Rescue party searching for crashed plane in Mt. McKinley National Park, Alaska, travels final lap afoot, clutching ropes. They had been hauled up to the 7,000-foot level by the Caterpillar snow sled shown below

By
Arthur Evans Wilcox

ACCORDING to Alaskan legend, the inventor of the crawling tractor conceived the idea for his device while prospecting in the hills of that remote area. But only recently has the sourdough Alaskan become convinced that the caterpillar type tractor, or any other mechanical conveyance, can replace the reliable and picturesque dog team. It took a tragic airplane crash to bring it about.

A C-47 plane, with 18 soldiers and one civilian aboard, had crashed in the wild and desolate mountains adjacent to Mt. McKinley in north central Alaska. No more inaccessible spot can be found in all the northland. Winds that rip and tear away huge blocks of ice and snow and temperatures that are beyond the





range of liquid type thermometers are ordinary in this lonely region where the chinook is unknown and the sun gives little other than light.

The plane wreckage was found after an intense search of several days, during which scores of planes soared over the snow-clad mountains and droned through deep canyons and valleys and over glaciers. It was espied high on the steep and icy slope of a mountain in the southwest corner of Mt. McKinley National Park, the northernmost and second largest of our national parks. How to get to the wreck and recover the bodies of the victims was a problem that caused Army officials several sleepless nights. When Grant H. Pearson, superintendent of Mt. McKinley National Park, telephoned them that the National Park Service would gladly aid in any rescue efforts, he was rushed by plane to Army base head-

The plane, with 19 men aboard, had crashed 500 feet below this unmapped Alaskan mountain peak. Line shows precarious route taken by the 44 rescuers, who braved 50-mile-per-hour gales and 33-below-zero cold. The party carried heavy equipment on the "Cats" and was supplied oil and food by plane. The tractors' splendid showing may make dog sleds (below) obsolete





A C-47 circles camp made by rescuers before dropping supplies. Right, the rescuers find pieces of wrecked plane

quarters near Anchorage, Alaska.

Pearson has spent nearly 20 years as a ranger in Mt. McKinley National Park and during that time he estimates conservatively that he has "mushed" dog teams at least 20,000 miles. He believed that he could take a dog team into places where a mechanical conveyance would bog down; but he soon changed his mind.

After examination of the wreck from the air, Pearson was asked by Army officials if it were feasible to reach it. He agreed to lead an expedition into the icy wilds provided that he be allowed to choose the soldier-members of the crew, that the Army furnish all necessary supplies and equipment, and that he be in charge of all operations. When the officials agreed, Pearson asked for dog teams. Sure, the

Army had dog teams, but it insisted it had something far better and faster. Pearson was skeptical. Army officials produced one of the pint-size M-7 snow tractors and invited Pearson to try to stall it in mud, water, ice or snow. He tried and failed. A trailer was hitched on and again he tried and failed. He drove it up the steepest hills, through the deepest, the fluffiest and the most heavily crusted snow, pulling the trailer loaded to the limit. The snow tractor was driven back to the Army post and Pearson decided that canine-powered vehicles were on their way out.

A little later an array of soldier mountain climbers, ski and snowshoe experts, radio operators, weather observers, mechanics, cooks and a physician disembarked from a railroad caboose at Mt. McKinley Park, ready to plunge into the rugged mountains with Pearson as leader. Three new white snow tractors were unloaded, along

(Continued to page 156)



BEACHMASTERS BOSS THE ASSAULT



Navy signalman waves flags to direct an LST to the proper landing point during an amphibious operation "somewhere in the Pacific." Below, heavy trucks race over mesh roadway through a cut made by bulldozers

By Thomas E. Stimson, Jr.

WITH jeeps and jeheemies, ducks and weasels, and scores of oddly shaped ships and vehicles, America's amphibious armies have given the lie to the military doctrine which states that an invasion force can never land successfully on a strongly-defended shore.

That theory became dubious at Guadalcanal. It took a beating at New Guinea and tottered in the Marshalls. It was disproven without a doubt in Normandy, the Marianas, the Philippines and Iwo Jima. Part of the secret of how this is being done is told here.

From the time the first wave of assault





Beachmaster yells instructions to men through huge bull horn, while signalman directs incoming landing craft



Rockets are loaded onto landing boat (above) to give it the punch of bigger vessels. Below, a jeheemie picks up disabled boat so 'dozer can tow it inland for repairs



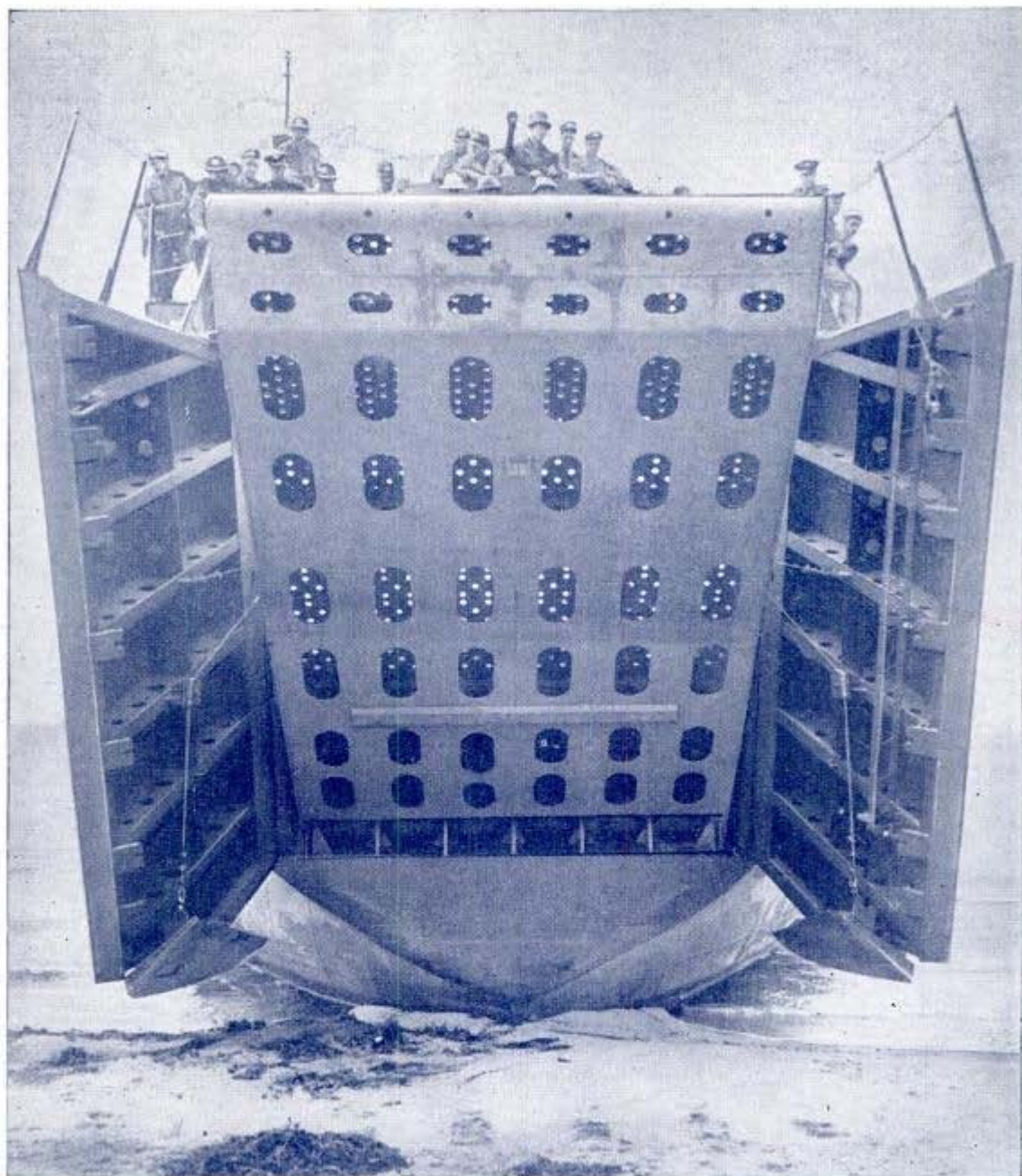
troops hits the beach the scene of an amphibious landing seems one of utter confusion. Men are scattered along the shore in apparent haphazard fashion. Aircraft appear to wheel aimlessly like flocks of pigeons overhead. From the transports on the horizon scores of landing craft plow back and forth. Other craft thread their way across this traffic and still others simply move in giant circles offshore. The concussions of naval gunfire, the whumping of bombs, and the noise of dive bombers add a kind of fourth dimension to the confusion.

The fact is that the turmoil is in perfect order. Every one of the tens of thousands of men, every one of the scores of ships and each of the hundreds of small craft and airplanes is doing a specific job. All are integrated into one vast plan that moves on a minute-by-minute schedule.

On Red Beach the beachmaster puts down his walkie-talkie and snaps an order to the signalman at the portable blinker. "Tell the control boat that Red Beach needs two loads of .30-caliber machine gun ammunition." To a signalman with semaphore flags he directs: "Bring in that next wave of LCVPs. We'll get the weasels and the small 'dozers ashore right on time." He hurries on, roaring other orders to distant men through his portable horn.

If you could watch one of the invasion craft come through the surf and drop its ramp you would begin to understand the long-range planning and attention to detail that go into an amphibious invasion.

An LCM has a bulldozer on board whose driver already has his engine



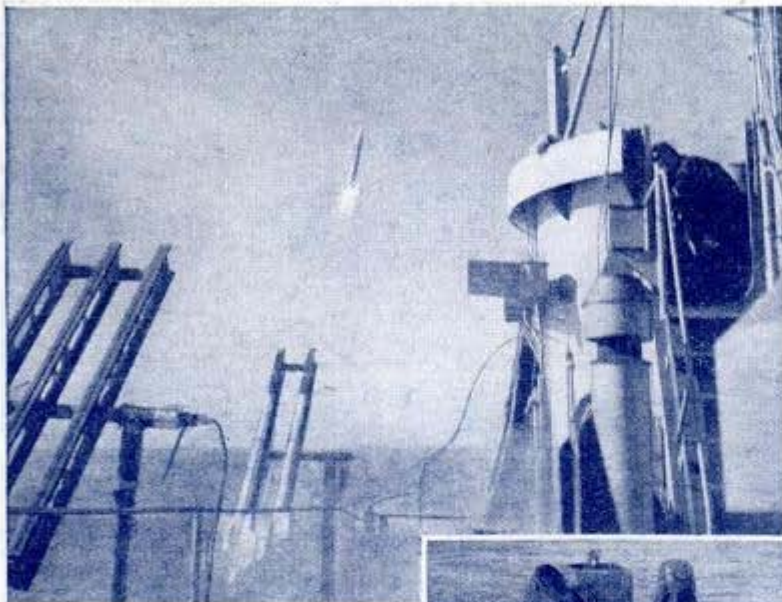
With anxious doughboys peering over the ramp, an LSM grinds in for a dry landing on a steep sand beach

started and warmed up. The minute the LCM ramp drops into the water the bulldozer starts down the incline and across the beach, dragging a cargo sled behind it. Halfway up the beach it unhooks its tow, moves ahead, lowers its blade, and begins to tear a roadway through the high bank beyond. Not a command is needed, not a moment is wasted.

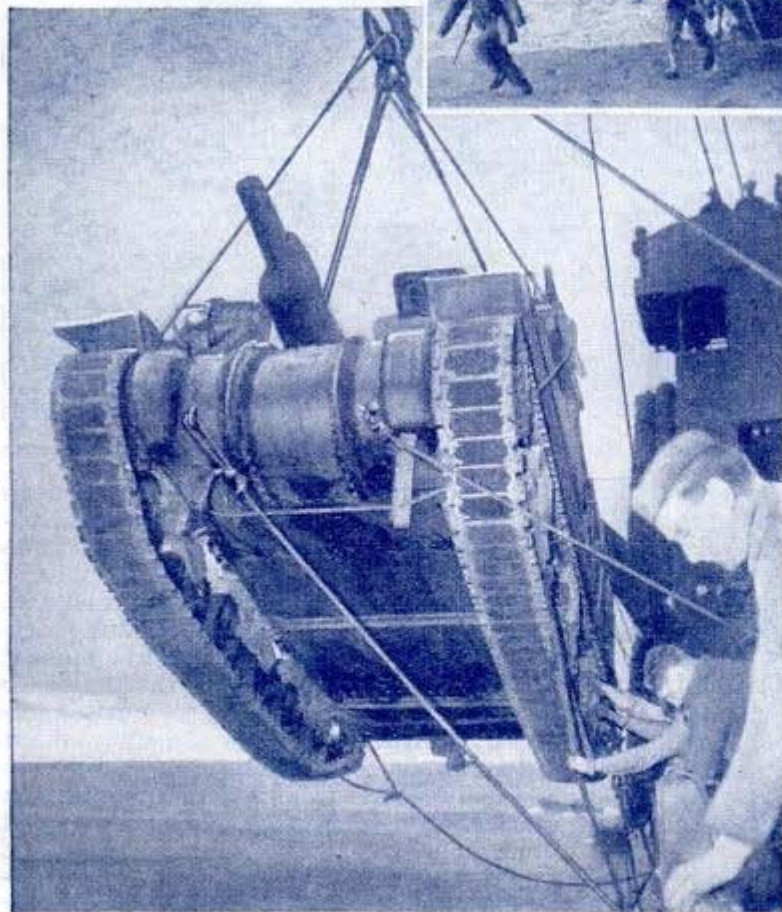
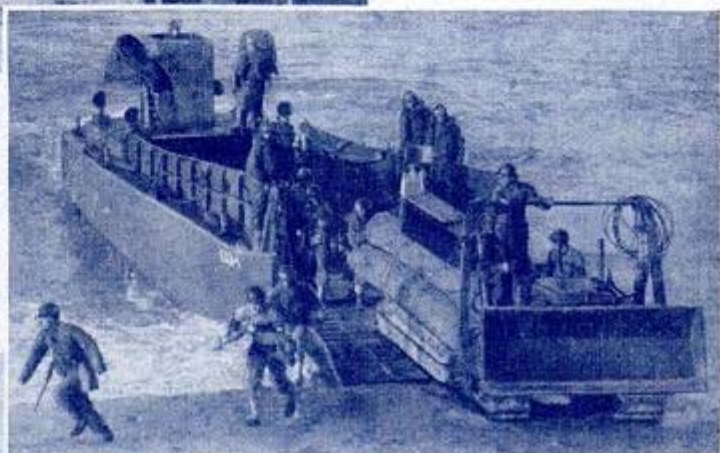
Meanwhile a squad of men who have splashed their way ashore from an LCVP gather around the cargo sled and unroll from it long lengths of heavy wire mesh. They stretch the mesh to the water line and stake it down, forming a roadway over the soft sand that leads up to solid ground.

By now the LCM has retreated to deep water. A larger landing craft, solidly loaded with big six-by-six trucks, moves in to the same spot. The ramp comes down and the leading truck roars across the beach, using the mesh roadway that hadn't existed five minutes before. Without a pause it climbs through the cut that the bulldozer has barely finished. Truck after truck follows, highballing supplies and ammunition inland to the front lines.

Once a battle was lost all for want of a horseshoe nail. For want of such a small item as a wire cutter in the right hands at the right time it is conceivable that an amphibious landing could be endangered or



Swarms of rockets pop from this LCI to soften a beach prior to an invasion. Right, small bulldozer leaves landing craft pulling a cargo sled loaded with wire mesh that will be used to form a roadway over the soft beach. Below, a self-propelled gun is swung over side of a transport to be set on a landing craft waiting below

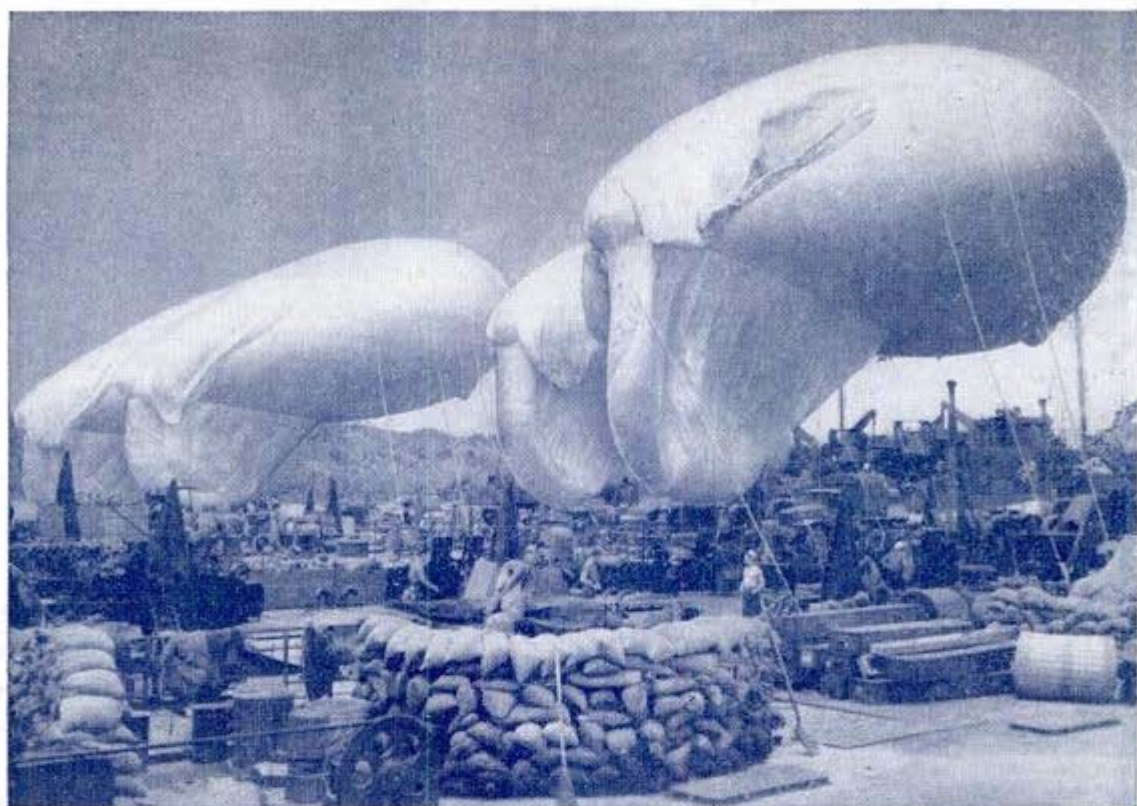


delayed. A wire cutter is just the tool for hastily cutting loose from its sled the wire mesh that is used as a truck roadway over a soft beach. The wire cutter has to be ordered months before the invasion, put in the right place on the right ship, and transported possibly 6,000 miles.

For want of a dry gun at a crucial moment, too, it is conceivable that an invasion might fail. Every rifle and machine gun and submachine gun

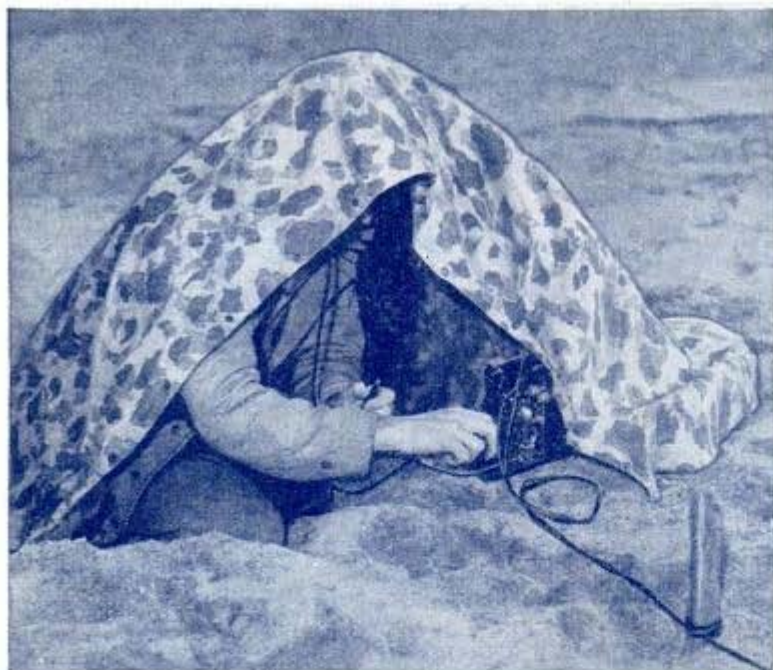
is carried in a waterproof wrapping, which is stripped off instantly when the men reach dry ground. Heavier guns are also waterproofed ahead of time for protection during the few seconds in which they may be exposed to the surf.

Possibly a truck or a jeep can be driven dryshod from the ramp of its landing craft but a high wave might swamp it and kill its engine. As a precaution, all vehicle engines are completely waterproofed. Air tubes that extend to the top of the windshield are connected to the carburetor intake, the crankcase breather, and the gas tank. Rigged like this, the vehicle can be driven through water that is chin-high over the driv-



Barrage balloons hover above landing ships and beach storage points to help prevent attack by enemy aircraft. Below, a self-propelled howitzer on a tank chassis drives through the surf toward a beach from the ramp of an LSM. In an amphibious assault, each weapon moves toward the shore on a split-second schedule





Field telegraph operator conceals himself under jungle suit. Below, troops and ship's company relax by watching a boxing match on deck of an attack transport

Navy platoons and Army detachments. The sailors dress in khaki for shore duty. The Navy personnel in the shore party is known as the beach party.

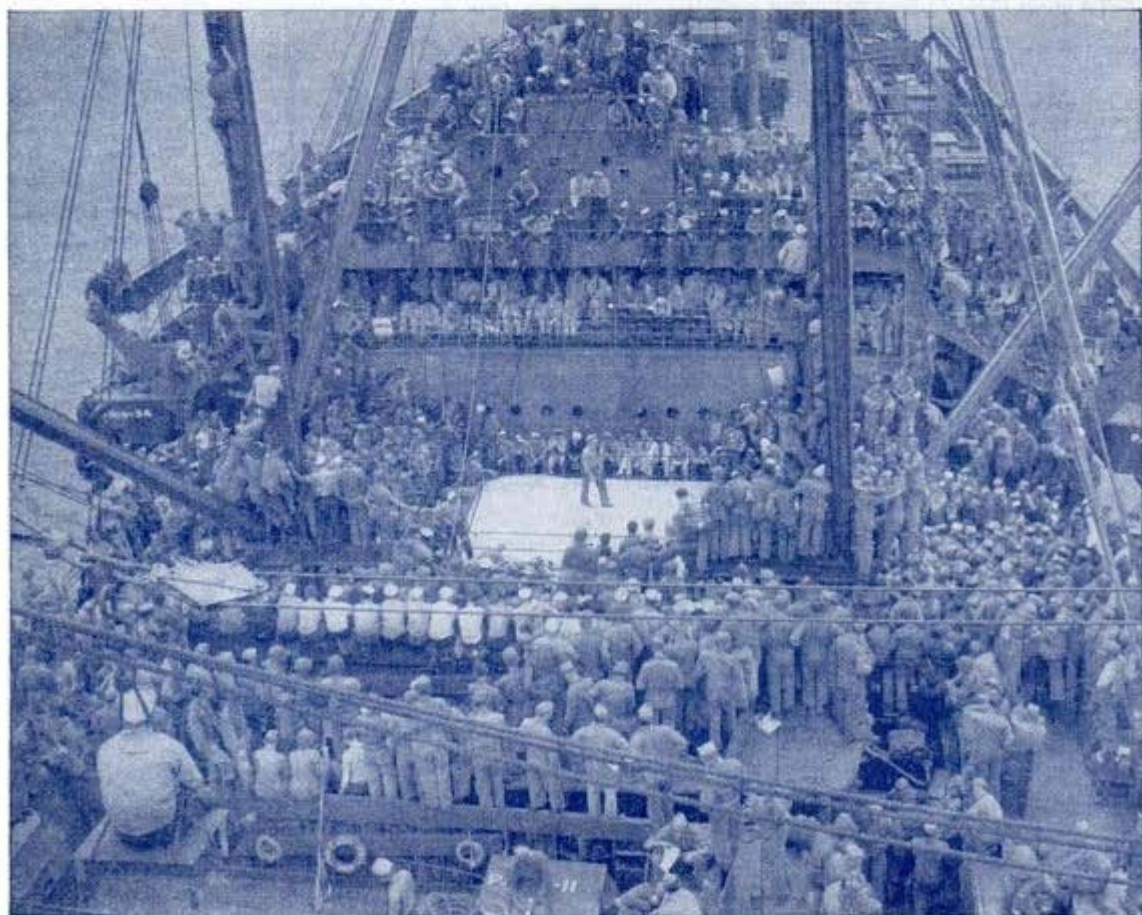
One of the first tasks of the shore party is to outline the landing areas with markers visible from the sea. That is, a landing region that may be a number of miles long is often divided up adminis-

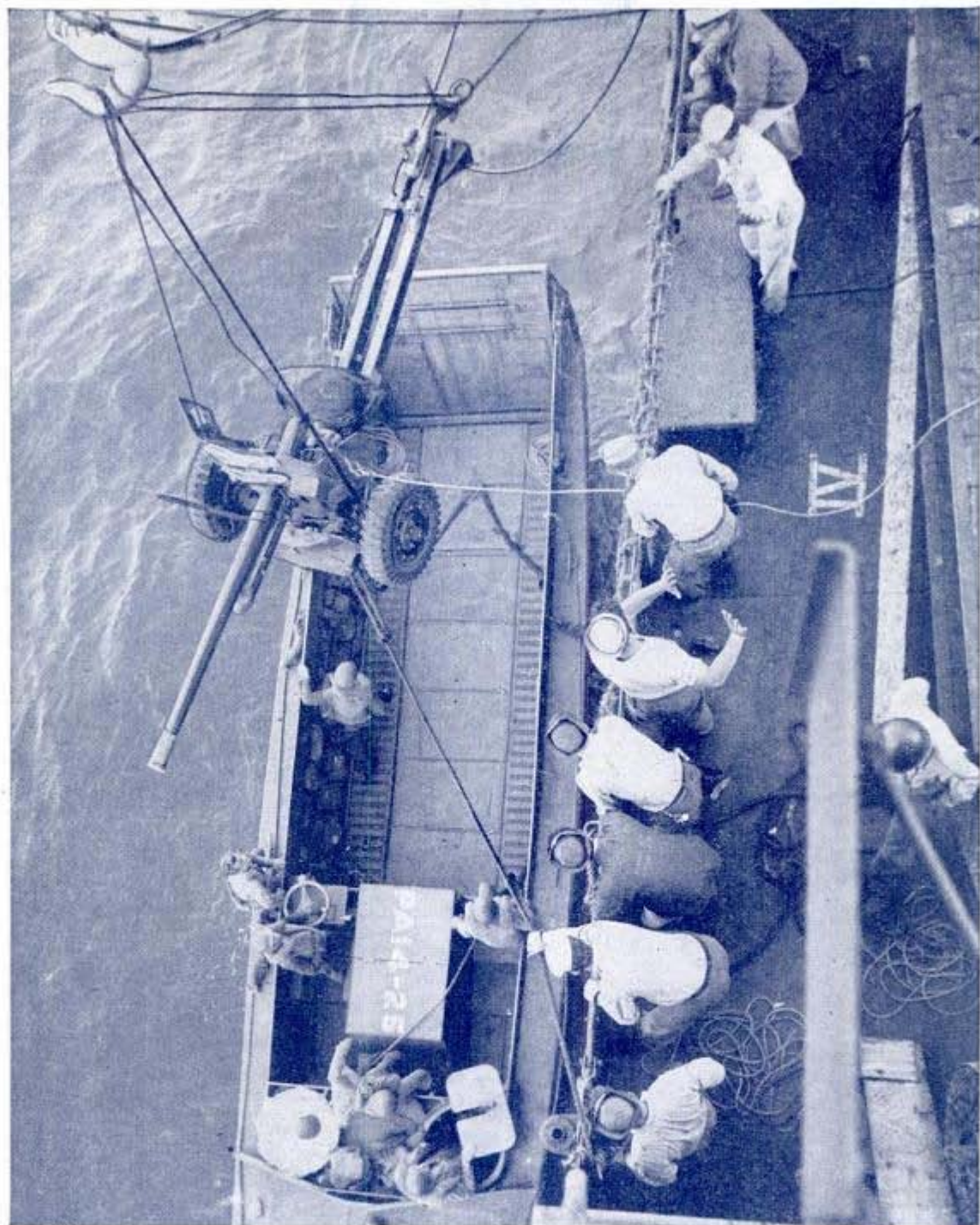
er's seat without danger of stalling.

Thus the success of an invasion from the sea depends on a whole lot of little things. Merely landing an army of men on a beach would be foolhardy; it must be immediately provided with all the implements of war, large and small, that will allow it to smash inland rapidly before the enemy can gather its forces and counterattack.

To control this inflow of men and materiel and to perform the thousand and two jobs incidental to the landing, a special military unit called the shore party lands among the first few waves of men.

The group is made up of





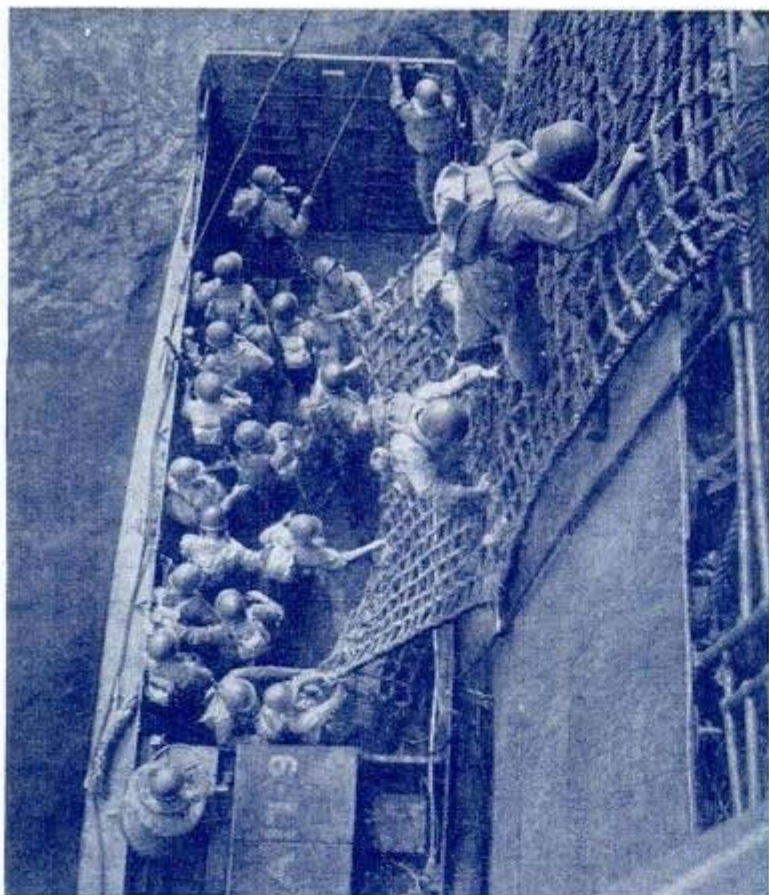
Prepared to smear dug-in Japs, a field artillery piece is swung down into a landing craft from a transport

tratively into zones known as "Red Beach," "Purple Beach," "Green Beach," and so on. The ends of each beach are marked with distinguishing flags so that incoming landing craft can direct themselves to the proper points.

Included in the beach party is a hydrographic reconnaissance section that removes underwater and beach obstructions, marks underwater dangers, and buoys safe paths for the landing craft. The beach

party's medical section sets up evacuation stations to which wounded men are brought for first aid and for transfer to out-bound landing craft. The beach party's boat repair section puts slightly damaged craft back into service. These experts employ ungainly jeheemies that can pick up a landing craft in the surf and trundle it above the high tide line.

Special salvage craft lie off the beaches, ready to pass a tow line to a landing craft



Infantrymen climb down the side of a transport into a landing craft. Below, LCI puts troops ashore on a tropical isle without opposition

that has the misfortune to broach broadside on the sand. Other vessels are equipped as fire boats for fighting flames that might be started on a landing craft by enemy action.

Chiefly, the beach party's task is that of regulating the maze of boat traffic so that men and supplies can move across the beach in orderly fashion. The beachmaster is the center of a communication network that extends from the fighting units to the transports offshore. He may order a wave of tank-carrying LSMs to delay their scheduled landing so that badly-needed artillery can be brought ashore first. He oversees the return of the wounded to the boats and maintains a flow of rations, water and fuel inland. Through him orders go to the control boats that dispatch landing boats loaded with supplies to the beaches where they are needed.



The beach parties and the other elements of the shore party must stay at their posts while the front lines move inland. Most of the shore party men must work in exposed positions. They are the special target of enemy aircraft, mortar fire, artillery, and snipers. Each man digs himself a foxhole near where he is stationed, but he can't take time out from his duties to fight back when attacked. For self protection the shore party has its own weapons section that does its fighting for it while the engineers and transportation units perform their assigned functions.

No operation as vast and complicated as an amphibious landing can go off without a hitch the first time it is attempted. To reduce the possibilities of failure every landing is practiced ahead of time in full scale. Under the administration of the Training Command, Amphibious Forces, Pacific Fleet, all the men, ships and vehicles that will participate in a Pacific landing operation go through full dress rehearsals.

Never before have war maneuvers of such complexity been held. A whole invasion convoy, protected by warships and aircraft, steams toward some lonely Pacific shore or island on Rehearsal D-Day. Even though it is only practice, each operation is shrouded in deep secrecy.

Naval gunfire pounds the cliffs. Rocket ships dart in to pulverize the beaches. Mine sweepers move inshore to clear the approaches. Dive bombers seek out possible enemy installations.

Then the armadas of specialized landing craft and amphibious vehicles dash toward the beaches under the protection of additional carrier-based aircraft.

Land mines are exploded along the beaches as the first waves of men hit the sand. Soaked, harassed by battle noises from tremendous loud speakers, the men dig in. Then they pick the soft spots and advance, working their way up to dummy Jap positions.

Casualties are designated and these men are given the treatment they would receive in battle. Each is bandaged properly and the ones marked as badly wounded are returned by stretcher parties to the beaches, then to ships. Rehearsals as complete as these disclose any weak spots in equipment or tactics, allowing time for the plans to be reworked if necessary before an actual invasion begins.

The Allied landing in Normandy was a fabulous undertaking, gigantic in size and breathtaking in sweep. Large as it was, this European beachhead was eclipsed by the scope of our initial landing on Leyte in the Philippines. Ahead are amphibious operations that are vaster still.

Toaster That Doubles as a Stove Cooks Complete Breakfast



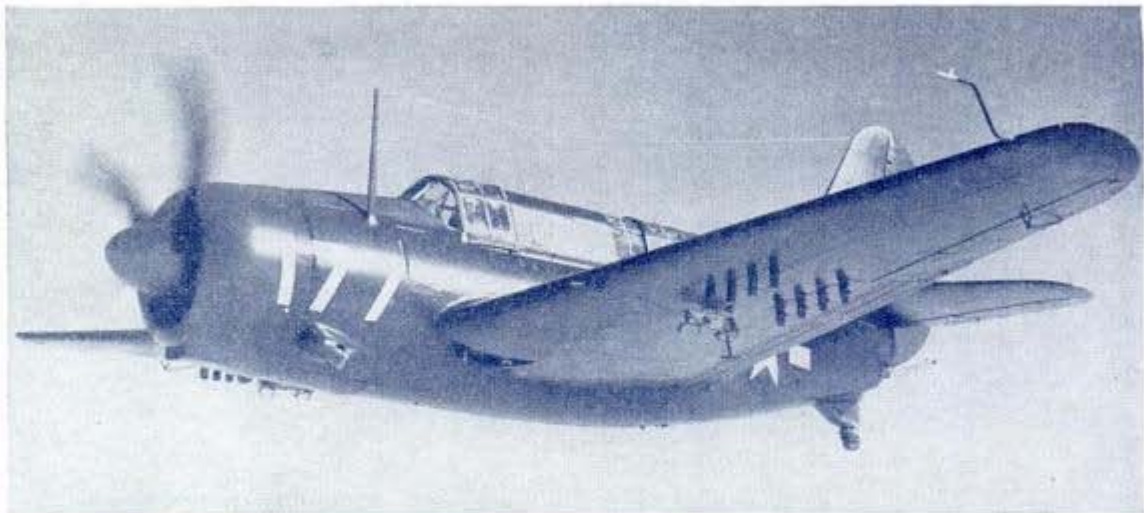
Light meals can be cooked almost anywhere—in an office, a bedroom or a train—with the aid of a combination electric toaster and cooker. The unit's top plate provides quick heat for coffee making, for frying meat and vegetables, for popping corn or making fudge. At the same time a pull-out compartment underneath makes toast, grills sandwiches, or broils meat. The unit operates from any electric outlet supplying 60-cycle, 110-volt current.

Plaster Pencil Repairs Cracks By "Handwriting" on Wall

Writing on the wall seals rather than defaces cracked plaster when you use a pencil-like stick made of a composition substance. The process requires no mixing. The filler is simply drawn along a hairline crack, as if scrawling on a blackboard with chalk, and then smoothed out with a finger. The substance hardens in 24 hours but will not dry out while in stick form. After drying, the repaired cracks can be painted without using a sealer. The stick also can be used to fill larger cracks and holes in wood.

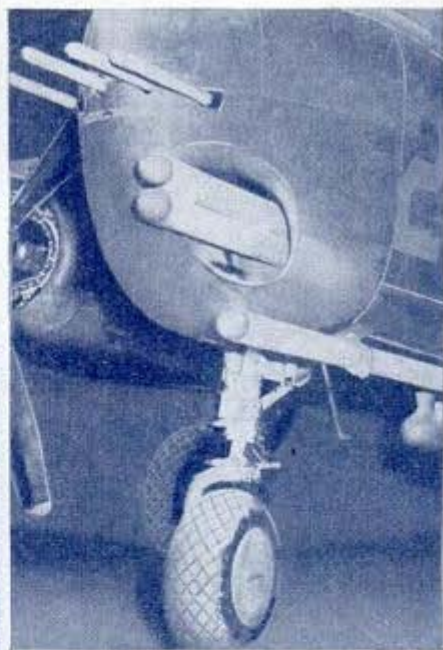


Cannon, Rockets, Bombs Add 'Muscle' to Planes



A deadly, versatile sky weapon is the Curtiss SB2C-4 (above), officially called the Helldiver but nicknamed "the Beast" by the fleet. It carries eight 5-inch rockets under the wings, twin 20-mm. wing cannon, a 1,000-pound bomb load in wing racks, and another bomb load in the fuselage. Perforated "swiss cheese" diving flaps brake down speed and give truer diving aim

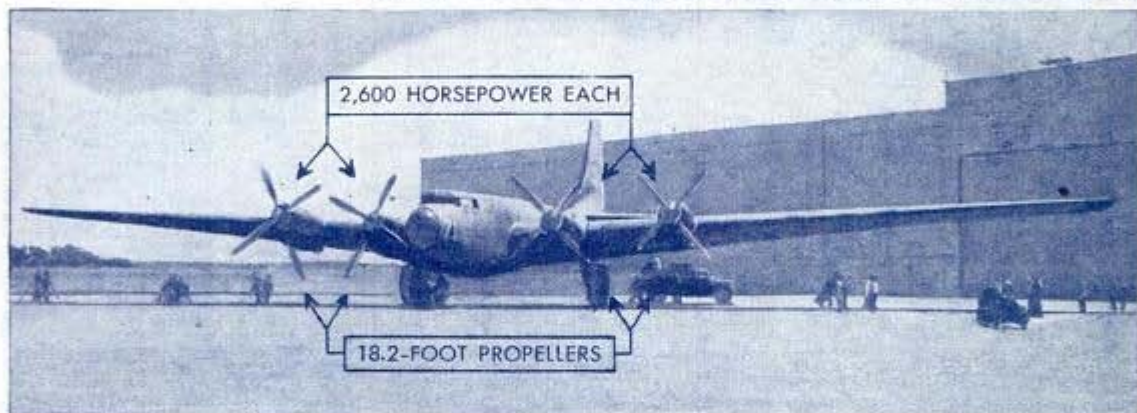
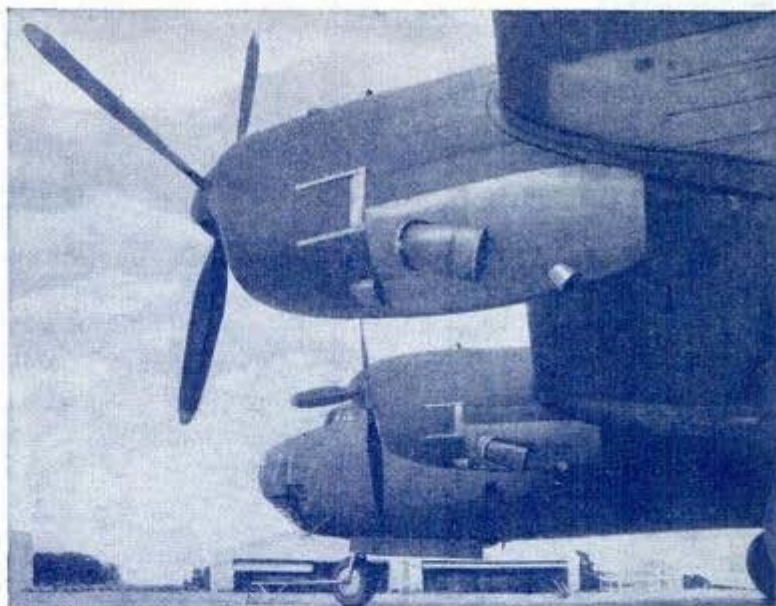
Bigger guns, rockets and bombs are fortifying Allied warplanes. White arrows, above, point to two of four fast-firing cannon in belly of Black Widow; dark arrow indicates ammunition belt



A new type explosive—a canister containing 26 twenty-pound antipersonnel bombs—is fitted under the wing of an RAF Typhoon, a fighter-bomber (left). It explodes without causing a crater that might impede advancing Allied infantrymen. Above, the Mitchell B-25 can "sneeze" rockets from a launching apparatus that pokes out of its nose

World's Largest Engines Lift Giant B-19 Plane

Four new 2,600-horsepower engines were recently installed in the world's largest experimental bomber, the B-19, to give it increased speed, altitude, range and load-carrying capacity. The liquid-cooled Allison engines are among the largest and most powerful engines on any plane. Equipped with turbo-superchargers, they will lift the AAF's 80-ton "flying laboratory" into the stratosphere at 35,000 feet, according to Wright Field engineers. The bomber's 18.2-foot propellers are described as



the largest in service. They are mechanically synchronized and the inboard "props" can be reversed for braking. Other new equipment includes improved radio devices and a demand type oxygen system. A specially designed panel records temperatures

from one engine at 140 points. The huge aircraft, which has a wing span of 212 feet and is 150 feet long, has provided valuable data for the development of big bombers. Built for an 18-ton bomb load, the plane is being stripped to serve as a cargo carrier.

Side Light on Automobile Fender Helps to Make Night Driving Safer

Added to the list of "accidental" discoveries is a side light for automobile fenders invented by a Blairsville, Pa., insurance man. His invention was prompted by a tumble into a drainage depression one night when he stepped from his parked car. The lights, attached low on the sides of the front fenders, throw a 180-degree arc. They permit oncoming cars to see through blinding headlights and also "cut un-

der" fog. Other advantages include illumination for changing a tire and for backing up as well as reading street signs.





MAKE YOUR OLD TACKLE DO

By Lyall Smith

HUNDREDS of thousands of anglers all over the nation are in the same boat this year. The sad part about this boat is that it contains no new fishing tackle.

Manufacturers of the 1001 varieties of tackle so close to the heart of every angler have been working overtime since 1941 on equipment to gaff a couple of hard-fighting lunkers called Tojo and Hitler. They haven't had time or material to make new plugs, lines and rods.

But the fact that an-



The author holds up an early morning catch to show that he practices what he preaches about putting new life in old tackle. The matted feathers of fly (right) are revived with steam bath. Below, brace clamped in vise holds plug for sanding and repainting



gling supplies are just empty spaces on the shelves of sporting goods stores is no reason for dyed-in-the-wool fishermen to revert to the hickory stick, bent pin era. Not if they possess just a speck of skill.

When you look inside the tackle box you haven't touched since you banged it shut last summer, you'll think it will take more skill than you possess to make what's there last another season. That's the first sign that you are a normal fisherman.

However, if you want to do some fishing this year you'll go to work



One outboard motor does work of two on these canoes. Left, flies dipped in solution of paraffin and gasoline will float like new



hold a piece of sandpaper around the plug while you revolve it with the other. This is done by turning the brace handle. It assures a smooth and accurate sanding job. If the plug is in very bad shape and has cracks and dents that are too deep to be removed by sanding they can be filled in with plastic wood.

A spray gun is best for applying a new finish to your lure, but if you lack such equipment an excellent job can be done with a small brush held against the plug as it is turned slowly in the brace. A good grade of thin lacquer is the best type of paint to use, and it's

and make your old tackle look like new. It's not only easy but fun. Here's how:

Take that bedraggled plug and remove all hooks and screw caps. Then fit the plug nose-first on a narrow screw, the other end of which is fitted into an old-fashioned gear-type brace. By inserting the handle of the brace in a vise with the handle up you will have the equivalent of a small lathe.

With one hand you can

Spring on end of line doubles as sinker and snagproof device. Rebound of spring frees line





Tasty items for bass or pike are these homemade pork rind pollywogs

mixed on the basis of one part sulphate to 10 or 12 of water.

This will coat the hooks with a copper deposit, but to complete the job it's necessary to rinse them in plain water and then douse them in a solution of one ounce of photographer's hypo mixed with 10 ounces of water to which a few drops of hydrochloric acid have been added. When you are through your hooks will be coated with a dark blue protective cover that will stand all the wear and tear of a heavy fishing season.

If you are a bass fisherman who prefers a bait that has an attraction for wall-eyed and northern pike you can stretch that resourcefulness of yours a little more and come up with an ingenious home-

made lure. With a metal die cast in the shape of an overgrown pollywog you can stamp your own baits out of a pork rind.

Similar results can be obtained with a sharp razor blade and a pollywog pattern cut from stiff cardboard. Trace the pattern on the rind and then cut out the pork chunk. Take a piece of red yarn about two inches long and stitch it through the wide part of the pollywog for eyes and you have one of the most attractive pork baits you've ever stuck on a leader.

Let it dry, attach the hooks and screw cap—and presto! You have a brand new plug in place of one that in prewar years would have been tossed in the ashcan. And as long as you've gone this far, don't forget to sharpen your hooks. A few swipes with a sand or whet stone will suffice. A good protection for your hooks is an old-fashioned fishermen's trick of immersing them in a weak solution of copper sulphate

If you are a fly fisherman you still have a fairly good market for replacements and new patterns. However, if you are so inclined, it's fun to tie your own. But for renovation there is nothing better than the simplest home remedy for making your bedraggled flies perk up and look like new.

For matted feathers on both wet and dry flies the most effective way to spruce them up is with a steam bath. Just put a couple of cups of water in the kettle and let it boil,



With colored thread, bright feathers and a monkey wrench for a vise you can tie your own flies. It just looks hard

hold the fly over the spout when the steam begins to come out and rotate it in the hot vapor. Hackles will spring up to their original position and the feathers snap to attention in a hurry.

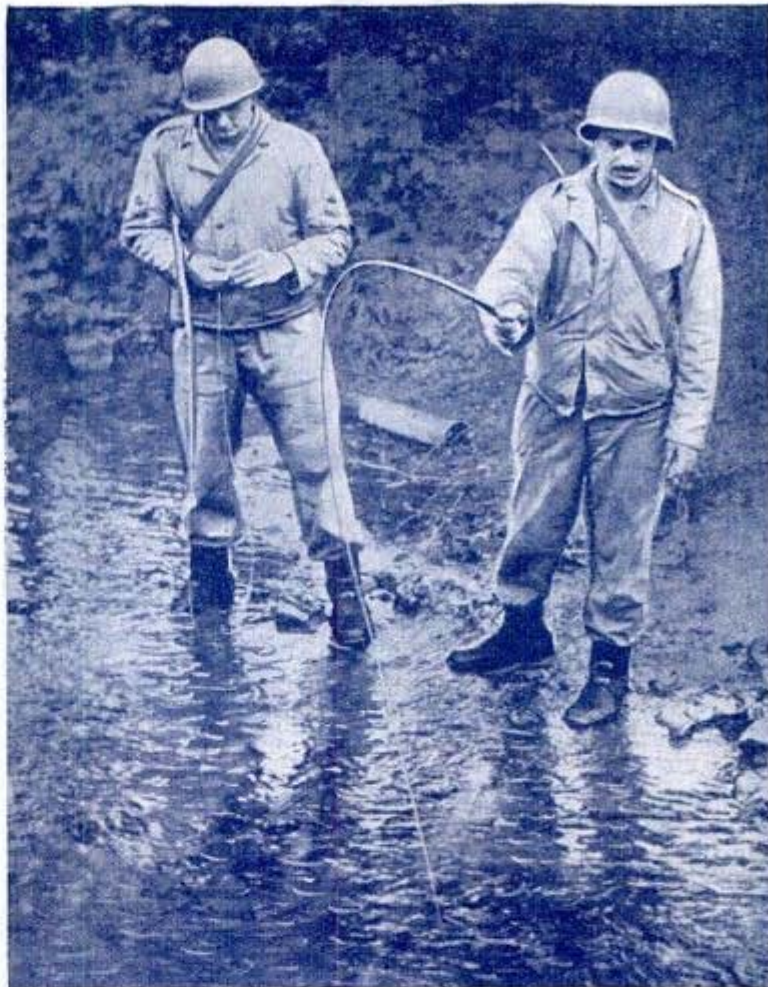
For dry fly fishermen who find it difficult to buy a bottle of paraffin mixture to make their favorite fly float properly there is also a homemade solution. Buy a cake of paraffin and shave off a little pile of narrow slices into a half pint of gasoline. Shake well until the paraffin dissolves and then dunk your fly in the mixture. Let it dry and your problem is solved.

By this time you should have dug out your boots and waders from the same spot you discovered your tackle box. If you were wise last summer when the season ended you would have dried them out well and suspended them in a cool dry place by a rope halter. But if you didn't the chances are that you have some cracks and holes. And that means you'll have to indulge in a mending job or else take your boots to a vulcanizing station.

It's easy to put your reel in working condition. Simply take it apart and wash every part with gasoline to cut away the grease and dirt that accumulated through the months of its inactivity.

Ingenuity should be the middle name of most anglers, for each one has his own ideas about rigging up his tackle for various conditions. My biggest surprise in many seasons of dunking a lure in waters in all parts of the nation came last summer on a trip to Door County, Wis., a narrow peninsula that hooks out into Lake Michigan.

The area is famed for



Two Yanks in Germany rigged up a fishing outfit and caught some trout as a treat for their signal unit. Below, stuffing a prewar boot with paper adds to its wear

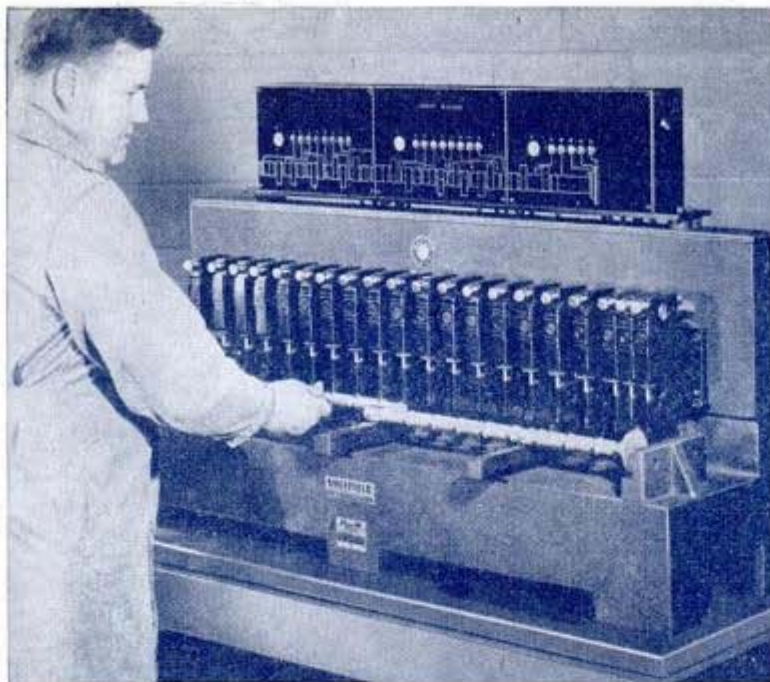


its small-mouth bass. In the spring and fall, the sportive small-mouth are close to the surface and can be taken by casting, but in the summer months they lie in 15 to 20 feet of water off the rocky bottom of the lake.

We had the usual supply of bell-shaped weights in our tackle boxes and were rigging out our lines by attaching a weight on the end of the line and fixing a leader with a minnow about a yard up from the weight. But when we cast out the line our troubles began. The bell-shaped weight would sink to the bottom as intended but then would lodge between the rocks.

(Continued to page 152)

Lights Point Out Errors as Gauge Tests Camshaft

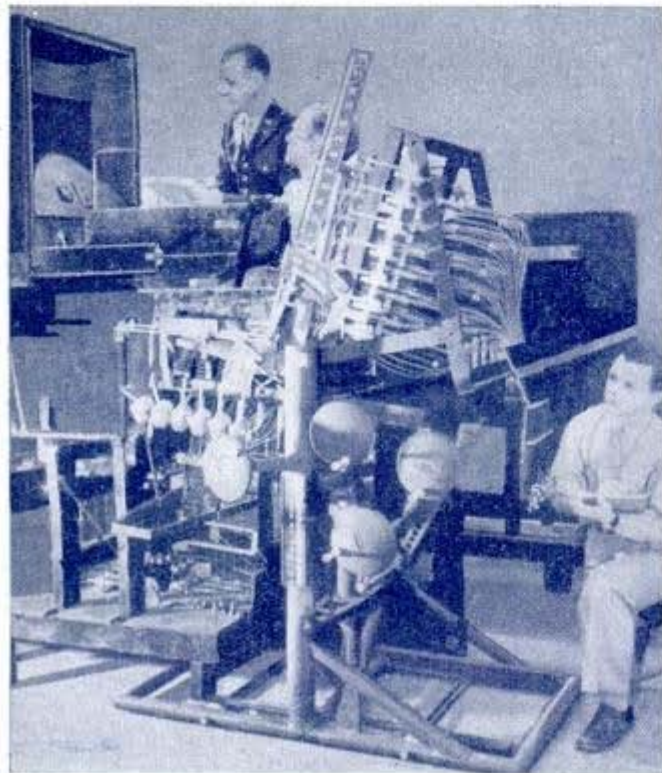


Red and green signal lights make it easy to check 21 outside diameters of a master camshaft in a single rapid operation on a multiple gauging instrument. Each of the 21 gauge heads actuates a set of two individual signal lamps mounted behind a common port light in the light case. The lights remain off when the dimension is within tolerance limits. A bulb glowing red means the dimension is under the minimum, while a green light signifies the dimension is over the maximum. The operator need watch only a master light, which is dark when all dimensions are within tolerance.

7-Cylinder Aircraft Engine Develops 700 H.P. on Low-Octane Gas

Short range cargo planes and military trainer planes can be designed around a 700-horsepower engine burning low-octane gasoline. Developed by Curtiss-Wright, the Cyclone 7, a seven-cylinder, air-cooled radial engine, delivers 700 horsepower. The

combustion chamber is designed for fuel of an octane rating much lower than that used by military planes today. Horsepower output would be correspondingly greater if higher-octane gasoline were used. To improve lubrication within the engine, special oil jets in the crankcase direct a continuous flow of oil into each cylinder barrel. Many of the engine's parts are interchangeable with those of the 9-cylinder Curtiss engine.



Test Chair Finds Ideal Seat For Aircraft Pilots

To find scientifically the most comfortable and most efficient seat for the average pilot, the Air Force's aero-medical laboratory at Wright Field, O., rigged up an "easy chair" which tests the reactions of different-sized flyers. Supporting pressure is recorded automatically during the test by a system of gauges and meters.

ⓄAbout 18,000 different types of bearings are made for war purposes, the Army Air Force alone requiring approximately 100 million bearings in addition to 35 million steel balls and 25 million roller bearings.

MAKING UP THE MONSTERS

HAVING learned that you like to be scared half out of your wits by thriller pictures, Hollywood has created a whole menagerie of weird monsters for your entertainment.

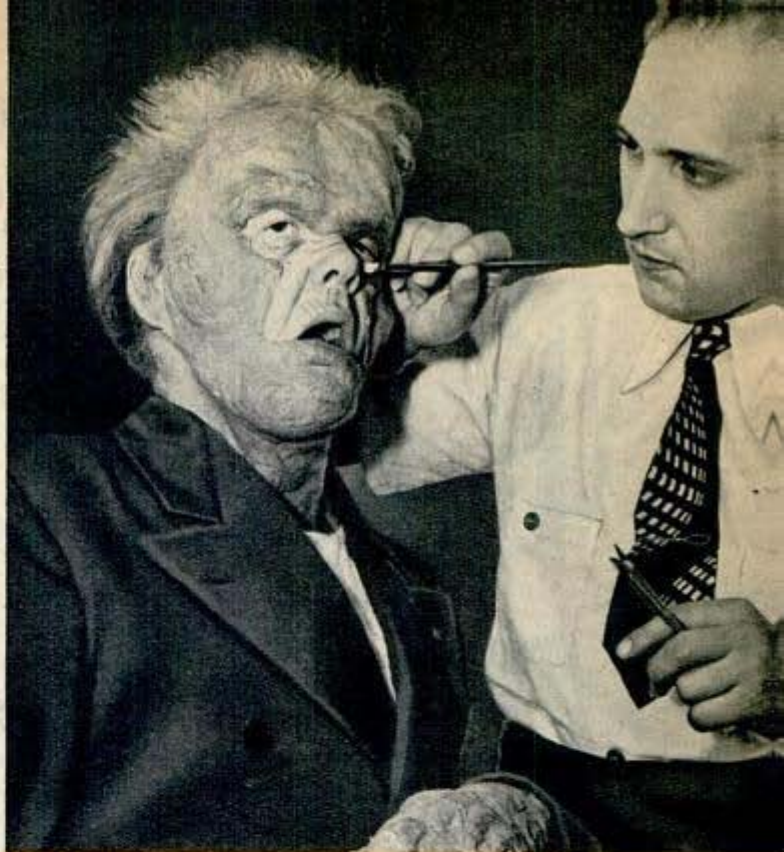
Zombies with staring eyes, werewolves with hairy faces, and living mummies that rise from their tombs are recreated from literature or are built up from the imaginations of scenario writers. Ape men, supernatural beings, and mysterious fiends give audiences their share of chills and shivers.

Some of these ghoulish characters are so scary in appearance that Universal Studio has a rule forbidding all actors who are made up as monsters to eat their meals in public, between scenes. They frighten their own friends.

Thriller pictures such as "The Mummy's Curse," "Son of Dracula," "Mad Ghoul," "Wolf Man," and "House of Frankenstein" are compounded of low key lighting, to increase the weird effects, plus lots of dramatic suspense. But principally their sensationalism is based on the genius of the make-up men.

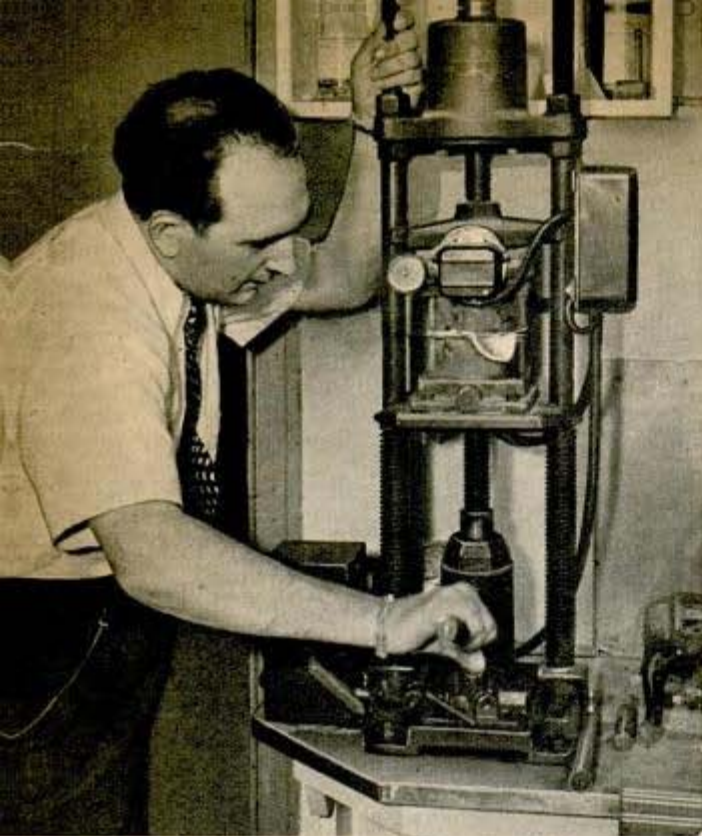
In the old days it was easy to create a gruesome character simply by designing a horrible mask; today these immobile coverings are rarely used. An actor can't talk through a mask, nor can he change his expression, and a mask is unconvincing in close-ups.

Instead, make-up men today rebuild and reshape the faces of actors with "three-dimensional make-up" to achieve the absolute realism that is necessary to make a spooky picture convincing. They have learned how to make mobile masks that move with an actor's own features. They blend wigs and portions of masks to an actor's face so perfectly that their work can't be detected, on or off stage. They place a beautiful actress



How reel monsters are born: make-up man adjusts partial mask before applying material that will blend mask into exposed parts. Below, an actress puts on hand and leg coverings for the role of an ape woman





To create synthetic flesh RKO make-up expert molds rubber-like plastic in special press. Right, man is changed into a zombie by painting eyes on a rubbery mask which covers the upper portions of his face

in a make-up chair and within an hour transform her into a hideous, snarling, fanged ape woman who looks so realistic you are afraid to approach her.

Maurice Seiderman, make-up artist at RKO-Radio, did something new recently when he was asked to create some zombies, the "living dead" who feel no pain and are characterized by immobile, staring eyes, for the picture "Zombies on Broadway."

Seiderman has developed a new rubber-like plastic that he molds into bits of synthetic flesh, attaching the pieces to an actor's face so carefully that they appear to be part of his features. Seiderman's genius helped make "Citizen Kane" one of the most realistic pictures ever filmed. For that screen play he created six dozen different chins, ears, jowls, and hairlines for Orson Welles, providing minute changes of appearance that represented "Citizen Kane" at 37 different stages of life.

The problem in creating a zombie was to leave most of the actor's face untouched but to provide over-sized eyes that didn't shift or change expression. From a mold of the actor's face, Seiderman made two plaster casts. One was laid aside and to



the other he added clay, remodeling the face to the shape he desired. Then he made a mold of this rebuilt cast. Laid over the other original plaster cast of the face, this mold fitted perfectly except in the areas that he had reworked. Some of his plastic was placed in these voids, and the cast and mold were then squeezed together in a specially-built mechanical hot press. The result was a bit of synthetic flesh permanently molded in the shape of the additions that Seiderman had made to the

Synthetic flesh is blended over the eyes of an actor

POPULAR MECHANICS

plaster cast of the face.

Glued to the actor's face, these additions fitted perfectly over his features and changed his whole appearance. Normal in other respects, his face now had large, glaring eyes. Seiderman completed the transformation with make-up paints, painting in the eyeballs, lids, and brows. Small holes cut in the centers of the synthetic eyeballs gave the actor limited vision. More make-up joined the edges of this eye-mask to the rest of the actor's features so perfectly that on the screen the actor looked like a real zombie.

The Frankenstein monster is the star of Universal's stable of horrors. His make-up is the creation of Jack Pierce, veteran make-up artist. Compared to some of the other characters he has created, this monster is a relatively simple problem. His squarish head is created mainly by padding, under a skinlike covering that is pulled down tightly over the actor's natural hair. Careful smoothing of the artificial skin plus proper make-up to conceal its edges provide the realistic effect you see on the screen. The electro-knobs on the monster's neck, by which he apparently is given the power to think and move, are nothing more than lightweight metal cups glued to the skin.

Most spooks and unnatural monsters have some basis in folklore or literature, and screen realism is built up by making these weird beings as much like their descriptions as possible. Consider-



Hot air dries the make-up that shapes this wrinkled mask to the monster's face. Below, completing the face mask of the wolf man, make-up expert arranges hair that is made of sea kelp, which photographs as stiff, shaggy locks





Studio man touches up mummy mask worn in shots filmed at a distance from camera to save hours of make-up time

able research is undertaken before Pierce sits down to create the final screen appearance. To a certain extent it is possible to suggest some of the being's character in its appearance, costuming and actions, so that audiences can instinctively feel how it is going to behave.

Pierce starts by making several sketches of the face. In designing the appearance of a werewolf he bases these sketches on descriptions of werewolves to be found in old Welsh tales. From these sketches one is selected as having the desired features, and Pierce then makes a miniature model of the face in clay. This model, perhaps reworked several times before it is perfect, becomes the basis for the make-up that he will apply to the actor.

In giving an actor the appearance of a half wolf-half man, Pierce models a wolfish nose in rubber composition that is fitted over the actor's nose. He makes fangs and artificial teeth that fit over the actor's teeth. He builds up a shaggy wig representative of a wolf's head. Additional hair is applied to the actor's face each morning, augmenting the wig, and is cut, curled, and singed to complete the transformation of the actor's appearance. The wolfish hands and feet are glove-like coverings to which

artificial hair has been attached. Practically all the hair used for horror make-up and costuming consists of the thin strands of a particular kelp found off the California coast. This kelp has a glossy appearance and a shagginess and stiffness that photograph very realistically.

When Universal decided to use a living mummy in some of its thrillers, Pierce recreated as exactly as possible the appearance of an actual mummy. Photographs of the mummy of Prince Seti I of Egypt were obtained from the Cairo Museum and with these for reference Pierce performed one of the most unusual and at the same time tedious jobs of make-up.

Each wrinkle on the mummy's face consists of a strip of cotton, applied while the actor stretches his skin. With the skin relaxed again, the cotton strips wrinkle realistically and at the same time are pliant enough to respond when he moves his features. Clay is brushed over the artificial wrinkles, then special make-up is applied for color and to give the effect of dryness.

Eight hours of solid work are required for making up the mummy and clothing him in his wrappings. To avoid losing this time day after day when a mummy thriller is being filmed, the shooting of the scenes is arranged so that all scenes in which close-ups of the full figure appear are shot on the same day. Close-ups of the face alone are made on a different day, it being unnecessary to costume the actor completely when his face alone is to appear. On still another day shots in which only the mummy's hands appear are made. Finally, Pierce provides a mask that duplicates the exact make-up of the mummy's features and is used instead of tedious make-up for distant shots.

Not all make-up problems are this complicated. A handsome actor can be given the appearance of innate cruelty merely by shaving his hair and plastering his ears tightly to his skull. That simple change converts him into a bullet-headed person who makes an ideal thug or hangman. A temporary cauliflower ear, likewise, is easy to achieve. The make-up man merely spreads a film of rubber cement over an actor's ear, waits for the cement to dry, then bends the flap of the ear forward and presses it down tightly. The pudgy ear can be restored to normal just by pulling it open again.



Meet some of Hollywood's least attractive characters—top, left, the "living mummy"; top, right, a gorilla; center, Frankenstein monster; below, left, the wolf man; and below, right, a zombie, one of the "living dead"

Bulldozer Tows Train of Jeeps Across Stream



When the water proved too deep for the versatile jeep to negotiate under its own power, giant bulldozers were called into

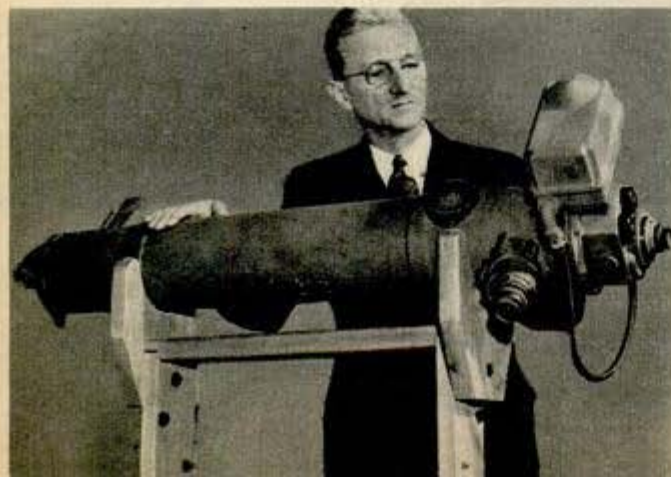
action to tow the jeeps across a river in Luzon. Four jeeps were hauled in a train without difficulty by the powerful 'dozers.

Howitzers on Tanks Lob Shells Over Obstacles to Targets

Buildings and hills obscuring targets are no barriers to the new 95-mm. howitzers mounted on British tanks, for the guns simply lob the shells over the obstacles. Firing high-capacity shells filled with high explosive or smoke, the howitzers can lay down a smoke screen to cover advancing troops and blind the enemy. In their first test during the landings in Normandy, the howitzers shelled invisible targets behind the beaches, proving their ability to knock out enemy mortars and gun positions, sniper nests in buildings, machine guns and anti-tank guns.



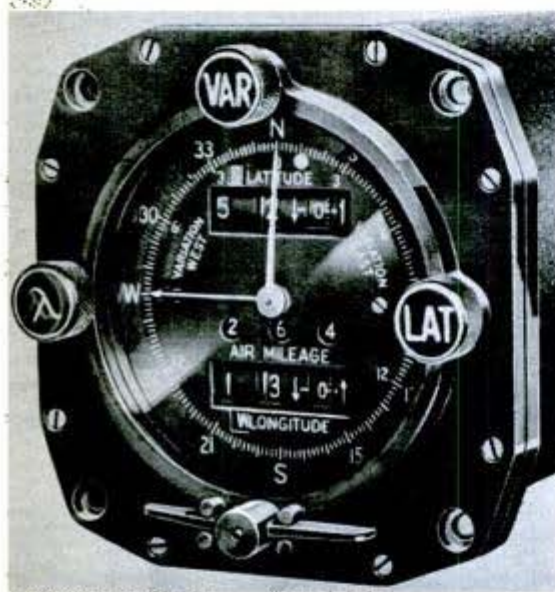
Color Images on Range Finder Improve the Aim of Antiaircraft Guns



Dual color images are employed to increase the accuracy of a new range finder for antiaircraft batteries. The operator gets his bead by bringing two different color images into coincidence, the result being a natural color image. A height-to-range converter then comes into play as information is relayed to the director, which makes automatic computation of all factors.

Rolling Cafeterias Deliver Lunches In Shipyard

Hot meals served from 30 rolling restaurants—"lunch trailers" drawn by rubber-tired tractors—are delivered daily to workers in the California Shipbuilding Corporation's yards in Los Angeles to save time and foot mileage. The motorized tea wagons are staffed by 180 girls who dispense food over the counter cafeteria-style.



"Brain" Tells B-29's Position To Navigator at a Glance

Helping to chart the course of B-29 Superfortresses in their raids on Japan is the air position indicator, whose "brain" gives continuous readings of the ship's exact latitude and longitude. Developed recently for the Army Air Forces, the device eliminates hours of calculation by the navigator. The indicator, about as big as a quart milk bottle, is mounted on the instrument panel and has two separate indicating counters which show degrees of latitude and longitude. The dial also tells nautical air miles flown, and the plane's correct compass heading. Physical data obtained from measurement of air speed and compass direction is computed into an "air plot," translated and indicated in terms of latitude and longitude by the mechanical brain of the air position indicator.

X-Ray Ink Bares Papers Hidden in Briefcase

Special X-ray ink used to mark documents as secret permits their detection at once, even when hidden among other papers in a briefcase. The suspected case is placed in an industrial X-ray unit and viewed through a fluoroscope. A document marked with the ink, a special compound that becomes prominently visible under X-rays, was instantly spotted although hidden in a stack of literature 1½ inches thick, in a briefcase. Use of the ink for secret records, plans and blueprints is expected to provide additional safeguards for such documents at war plants.



THE IMPOSSIBLE



The contingent of "winter soldiers" was divided into three crews—one to haul materials on speeders (gasoline-driven cars), another to put up wire, and a third to tie wire in place. The reels of copper wire were loaded on sleds, sometimes drawn by hand (at left). Usually the men quit work at dark, about 5 o'clock, and returned to the base camp on speeders. Occasionally, vigorous shoveling was necessary to free the speeder from snowdrifts 40 or 50 feet high. Lighted signal flares often had to be held against the engine to keep the carburetor from freezing. The cold also froze the soldiers' faces and clothes. The job was to be finished in four months; bad weather made it six

Winning a war requires some odd, dangerous assignments which have nothing to do with combat. One of the toughest missions in the North Atlantic was accomplished when 25 Signal Corps technicians installed a telephone line up an icy trail to the top of a 2,000-ft. mountain in Newfoundland. Special Army railroad cars to fit the narrow gauge track of the island's only railway became the crew's home during the operation. One car was converted into a mess hall (right) and kitchen, while canvas cots were set up in the others. Below, GIs working on top of one of the poles



A soldier (below) hauls a freight sled up the mountain. Often they chopped holes to make their way up the slick ice. A slip meant a slide of 500 feet or more down the slope



TOOK SIX MONTHS



Even such a routine task as installing a crossarm (above) was hard in Newfoundland gales. The chief problem was getting supplies up the hazardous mountain. Each man was his own pack mule until the sled dogs arrived. "Punkin," a puppy (above right), became the crews' mascot. When ice on the railway was not too thick, a speeder (right) with trailer attached was employed to haul crossarms and heavy copper wire over the deep snow to extend the line



Sturdy dog teams like the one below hauled the equipment over the last stretch of the perilous line. Eighteen huskies could pull a heavy load all the way up the slippery, crusted mountain in 3½ hours. The hard-working GIs also were helped out by Newfoundland civilians, who felled trees and installed poles



Plastic Light Bulb on Life Jacket Attracts Rescuers at Sea



Life jackets equipped with lighted globes of red and clear plastic clipped to headgear or shoulders guide rescuers to survivors at sea. The bulbs are illuminated by a battery in the pocket of the jacket or vest and can be turned on or off by pulling the jack from the plug. They can be unclipped and used for signaling.

Tube Measures Star's Twinkle Or Tests "Soup" for TNT

With an improved electronic tube smaller than a 25-watt light bulb, you can measure the amount of electricity in the light of

Engineer shoots 25,000 volts of electricity through electronic tube with a spark coil to test vacuum
Westinghouse photo



a star. Containing only a millionth of the normal amount of air present in the atmosphere, this supersensitive tube is used by war industries to detect impurities in steel, explosive compounds such as TNT, and plastics. Two electrodes are linked to a tube circuit and inserted in the solution to be tested. The small amount of electricity thus produced throws a scale-like meter off balance. By determining the voltage necessary to restore this balance and comparing it with previously computed charts, chemists can find out in a jiffy what is in the solution. Formerly, this was a long and involved process of analyzing specimens which first had to be dissolved in special liquids. When used to measure starlight, the tube is placed in the "eye" end of an observatory telescope and connected to a photoelectric cell.

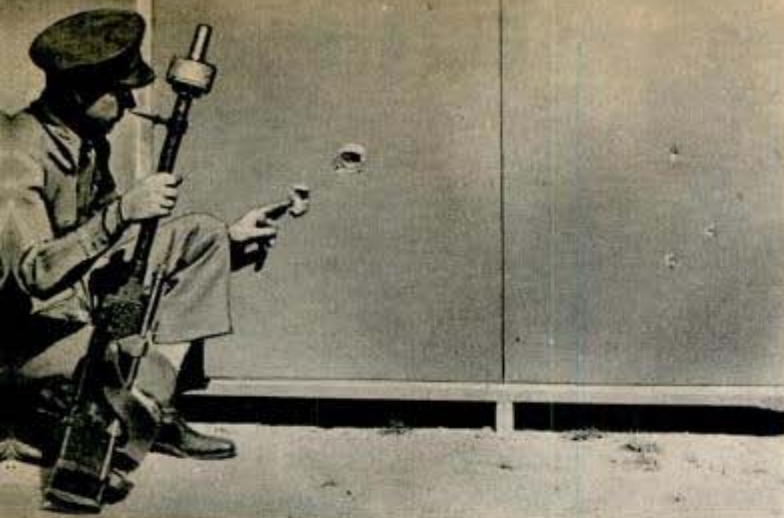
Camera Under Fighter's Wing Films While Guns Strafe



Fighter planes have added rapid reconnaissance photography to their job in battle areas where close air-ground operations move too swiftly for tactical reconnaissance and photo reconnaissance planes. The fighters film their own strikes with a standard Air Corps camera mounted in a special bracket under the wing, and shock-padded with sponge rubber. An arm extending forward holds an adjustable clevis to raise or lower the camera for bore sighting. Flight behavior and bombing and strafing performance are unimpaired, and there are no added duties for the pilot. Using this installation, fighter planes have taken successful reconnaissance photographs in a number of missions against the enemy.

PLAIN
PLATE

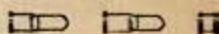
ARMOR
PLATE



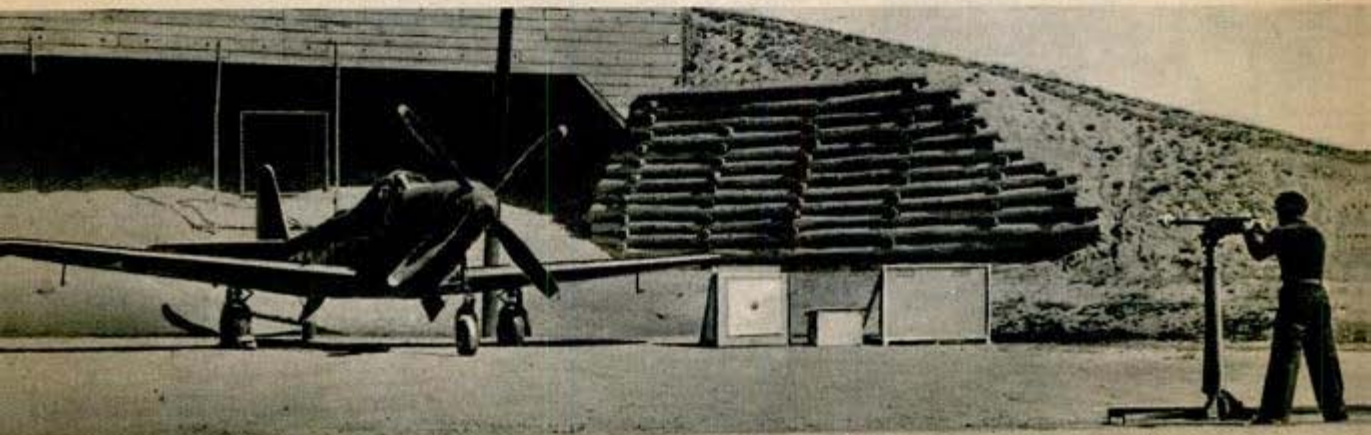
To inject realism into aerial sham battles, Army Air Force gunnery schools use frangible bullets, which disintegrate on impact with specially treated armor plate. The two holes with jagged edges pointed out above show what happens when the slugs hit an ordinary plate. The armor plate next to the plain plate has been hit three times, leaving only smudges. It is specially treated duralumin and is used to armor the gunnery-training P-63 Kingcobra. Below, when one of these bullets strikes a box target, it goes through the paper, strikes a sheet of the armor plate and splatters into a sugary powder. Here some of the disintegrated bullets are sifted



DISAPPEARING BULLETS



Under the special duralumin skin of the P-63 is a radiosonic device that makes a lamp in the nose (top) flash vividly every time a frangible bullet strikes the plane. At the same time a counter (above) in the plane shows the number of hits that have been scored. Below, a gunnery officer fires a machine gun point blank at a Kingcobra but does no damage—with slugs that disintegrate. The disappearing, harmless bullet is made of a lead and plastic material



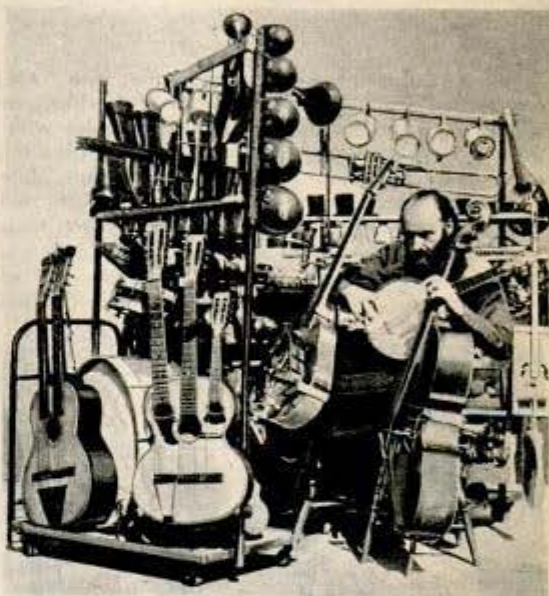
HOMEMADE MOUNTAIN MUSIC

POSSIBLY you've never heard of a "gooch gadget" or a "hootnanny," but chances are you've listened to them, or their equivalent, on the radio. Most hill-billy and cowboy bands have some such queer devices among their instruments.

Country songs and tunes have attained such popularity in recent years that nearly every radio station broadcasts at least a few every day. Some bands are heard on national radio hookups. "New San Antonio Rose" and "You Are My Sunshine" are only two of a long list of western songs in



"Herman the Hermit" plays his three-necked combination of mandolin, steel and standard guitar. Right, he tunes electrified one-man band before broadcast. Key identifies the instruments, below



- 1—Tuned temple blocks
- 2—Tuned frying pans
- 3—Shakophone chimes
- 4—Horse's hoofs
- 5—Ten-string banjo
- 6—Valve trombone
- 7—Tuned coffee pots
- 8—Tuned sheep bells
- 9—Harp
- 10—Tuned dinner bells
- 11—Accordion
- 12—Banjorine
- 13—Cornet with bulb horn
- 14—Tom-tom drum
- 15—Bass bulb horn
- 16—Single string instrument consists of comb, old broom and cigar box
- 17—Tuned sleigh bells
- 18—Chinese lute
- 19—Brush snare drum
- 20—Door bells, etc.
- 21—Piano
- 22—Cello, doubles as bass fiddle
- 23—Bass drum
- 24—Triple-necked mandolin-guitar
- 25—Banjola
- 26—Snare drum
- 27—Tuned bulb horns

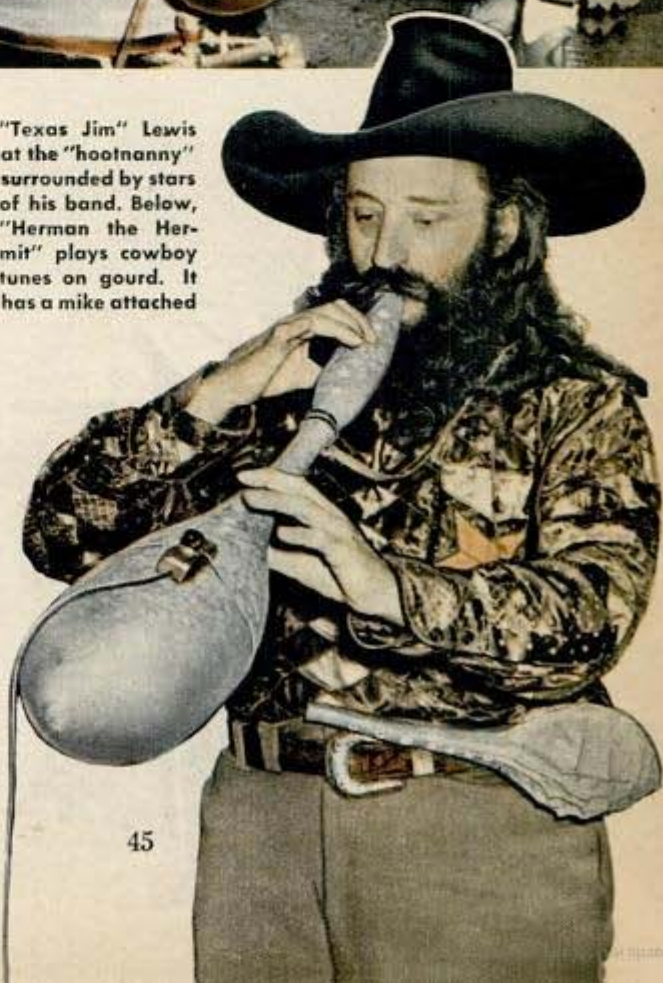


the hit class. As many as 10,000 persons dance to the Saturday night music of cowhand orchestras at county barn dances put on by "Foreman" Phillips in Los Angeles. Chicago's National Barn Dance on Saturday nights is a long-established favorite with radio listeners across the country.

Basically, a western or hillbilly band is a five or six-piece string group with fiddles, bass fiddles, steel guitars, rhythm guitars, and single-string guitars. Drums and a piano usually are added for dancing. But nearly every band is augmented by a variety of other instruments—standard types, foreign instruments or antiques, and homemade musical devices.

The gooch gadget built by one of the "3 Shiftless Skonks" trio of Happy Perryman's "Happy-Go-Lucky Mountaineers" is one of these homemade contraptions, consisting of novelty instruments and noisemakers arranged so several may be played at the same time. A foot-operated bellows provides air which blows various horns while the operator beats out tunes on a set of hollow temple blocks.

"Texas Jim" Lewis at the "hootnanny" surrounded by stars of his band. Below, "Herman the Hermit" plays cowboy tunes on gourd. It has a mike attached





Herman plays Chinese lute with one hand while he operates keyboard of antique dulciana. Playing a banjo below are two Perryman hill boys



Just as curious is "Texas Jim" Lewis's hootnanny which he operates from a bicycle seat. Hanging on a framework are press-bulb horns, gongs, bells, sirens, and other noisemakers. Lewis and his hootnanny can carry a tune with the rest of his musicians. It also provides novelty sound effects.

Other hillbilly and cowboy musicians extract music from dried gourds drilled for mouthpieces and finger holes. A tambourine, a stick of timber, a strand of baling wire, and a pump handle to control tension of the wire form a one-string instrument. A broomstick, a strand of wire and a cigar box make another hillbilly instrument. Tones akin to a bass viol's are obtained from an iron tub, a washboard and a piece of heavy wire.

Champion maker of homemade instruments and a dean of all hillbilly musicians is "Herman the Hermit" who, in the last 12 years or so, has broadcast some 300,000 songs and tunes in 15,000 hours on the air. This bewhiskered singing musician has appeared in more than 100 motion pictures. He is proficient with about 60 standard types of instruments and nearly 40 additional foreign and homemade instruments.

"Herman the Hermit" plays a banjo with his feet, he obtains musical notes from a "suitcase," he carries a tune with his "musical teeth," and he draws notes from tuned sets of bottles, coffee pots, and frying pans.

He devised his foot banjo so he could play other instruments with his hands at the same time. A foot treadle turns a wheel, and special steel picks attached to the circumference of the wheel strike the banjo strings. Meanwhile, his left foot presses against wooden levers that hold down the strings on the banjo's finger board. The picks are spaced for fox trot time.

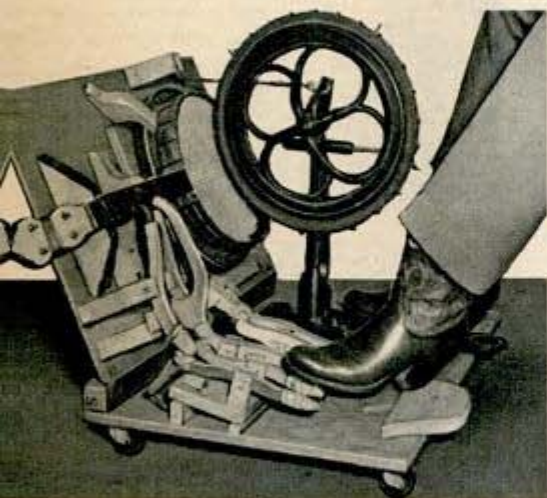
Ingenious as it is, the foot banjo doesn't compare with "Herman the Hermit's" one-man band, a conglomeration of 60 or more musical and noise-making devices mounted on a three-sided framework and placed so all may be reached from a central chair.

This "poor man's orchestra" is built around a small piano, a tiny organ, an accordion, and a set of foot-operated drums. An air machine furnishes suction for the organ and another air pump provides pressure for the accordion, allowing each to be played with one hand. Included are tuned sets of sleigh bells, sheep bells, cow bells, bull bells, frying pans, coffee pots, dinner bells and temple blocks. Guitars, banjos, mandolins and other stringed instruments are all within reach. Attached to the chair in which "Herman the Hermit" sits is an additional drum, a bass horn and a cornet, the last two operated by pressing an air bulb. Electrical pickups attached to instruments are used instead of ordinary microphones, both for

recordings and radio broadcasts.

Surrounded by his instruments, Herman may begin a tune by using his left foot to carry the down beat on a bass drum, his right foot for the after beat, his left hand for the piano, and his right hand playing a 10-string banjo that is securely mounted above the piano keyboard. Meanwhile he sings. He can play as many as five instruments at once and make six complete changes before he finishes, playing a total of some 30 instruments during a song. To acquire certainty and speed in his changes he practices in the dark.

Incidental effects include a klaxon, a cuckoo, tuned tonettes, a police whistle blown by pressing an air bulb, horse's hoofs, foot-operated castanets and door bells. A three-necked instrument that is



Ned Ward, 5, gets early training from "Hezzie" Trietsch, above, washboard virtuoso of Hoosier Hot Shots of National Barn Dance. At left is foot banjo devised by "Herman the Hermit." Right foot turns wheel to which picks are attached as left foot controls wooden fingers on keyboard. Below, the "3 Shiftless Skunks" perform with the "gooch gadget," mixing horns, whistles and what have you

a combination mandolin, steel guitar and standard guitar, and an old device called a dolceola, a sort of combination accordion and piano, are among Herman's other novel contraptions.

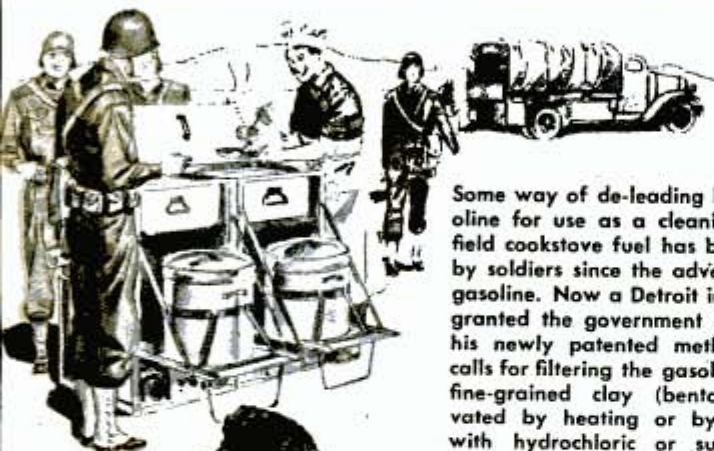
Hillbilly songs and western laments used to be considered low-brow music, principally because the melodies are simple. Many of the oldest of these songs and tunes, some brought across by the early settlers, were handed down from generation to generation without ever having been put on paper. In recent years most of these old songs have been recorded, taking their place in the musical history of the country. The western songs being written and sung today are the modern offspring of the original old-time tunes.



By the Way -



Edna Pat is an AAF career girl with a record that will be hard to beat. She is a Flying Fortress whose four Wright Cyclone engines have flown her for more than 1,314 hours—equivalent to more than ten trips around the world—without an engine overhaul. Engineers say an automobile could match the feat by traveling 260,000 miles at a mile a minute without doffing its cylinder head for a valve, piston ring and bearing check



Some way of de-leading leaded gasoline for use as a cleaning fluid or field cookstove fuel has been sought by soldiers since the advent of ethyl gasoline. Now a Detroit inventor has granted the government free use of his newly patented method, which calls for filtering the gasoline through fine-grained clay (bentonite) activated by heating or by treatment with hydrochloric or sulfuric acid



The tornado of steel grit blown in a sand-blast cabinet used to wear out the cabinet's boiler-plate floor within three or four hours. The problem was solved, amazingly, by covering the floor with a protective sheet of compar, a flexible rubber-like plastic made by Resistoflex Corporation, which proved 250 times as resistant to abrasion as the boiler plate

Corporation, which proved 250 times as resistant to abrasion as the boiler plate



From Russia comes word of cotton grown in natural colors—green, rose, brown and lemon—from which fade-resistant textiles are being woven



To help conceal the machine gun nest or pillbox, tracer bullets are used which do not start burning until they are 100 yards from the muzzle from which they were fired



The opening scores of a new musical composition by Dmitri Shostakovich, Russian composer, were flashed from Moscow to New York recently by radiophoto over RCA Communications. The first page took just twenty-four minutes in traveling the 4,000 miles

Remote-Control Gun Is Fired From Inside Car

Mounting of a Bren gun on a pillar above armored cars enables the operator to control firing from inside while protected by the thick armor plate. The car was used successfully by the British in their sweep through France and Belgium. In addition the vehicle carries a Thompson submachine gun and is equipped with radio. A six-cylinder engine is mounted at the rear and drives the fighter around at 60 m.p.h. If the tires are damaged the car can "run flat" for as much as 58 miles across country.



Latest Spitfire Flies 450 M.P.H. With Five-Blade Propeller

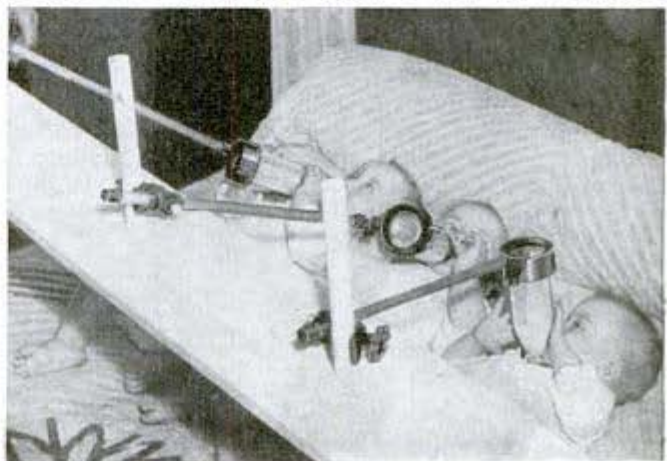
Newest and fastest edition of the Spitfire is the model XIV, which can go 450 miles per hour over a tactical range of 300 miles. The speed is generated by a 2,000-horsepower Rolls Royce Griffon engine using a five-blade propeller. Its swiftness, however, has not lessened its maneuverability. Once two RAF pilots who were chasing a formation of Focke-Wulfe 190s found another group of 190s on their tails. They overtook and shot down two of the enemy fighters ahead, then turned their Spitfire XIVs sharply enough



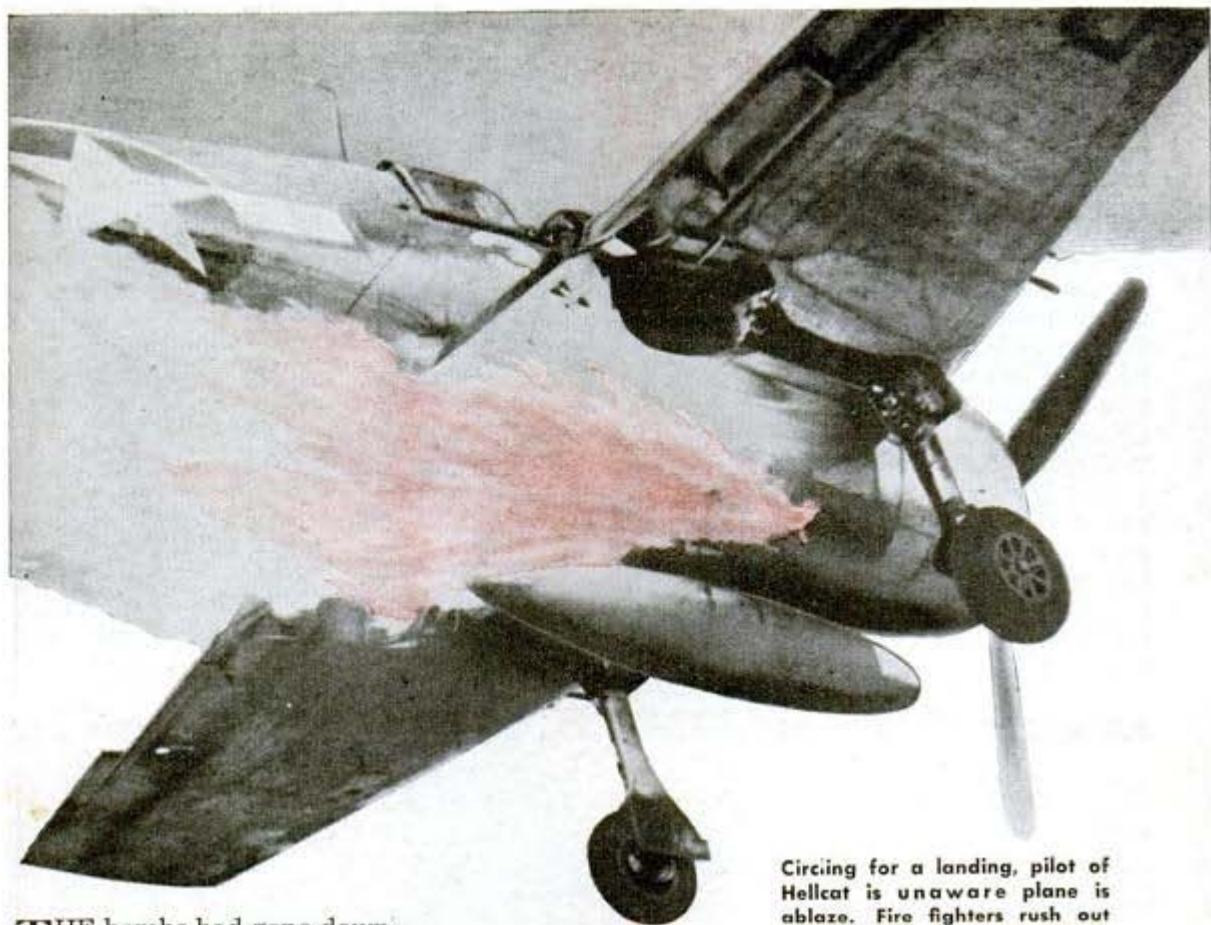
to outmaneuver those behind. Another pilot flying the latest Spitfire shot down three German fighters in five minutes.

Metal "Arms" Hold Milk Bottles So Triplets Can Feed in Unison

Only a robot with three arms could feed triplets simultaneously. That's why Raymond McLeod, father of three babies in Weymouth, Mass., rigged up a board across the infants' bed, inserted poles in the board and attached metal "arms" to the poles. The "arms" hold milk bottles in a convenient position for the babies.



Hot box "detectives" sound an alarm bell in the cab of Electro-Motive Diesel locomotives whenever a truck journal heats up to more than 220 degrees.



Circling for a landing, pilot of Hellcat is unaware plane is ablaze. Fire fighters rush out as craft hits the deck, below. They saved both plane and pilot

THE bombs had gone down, "smack on the nose," and the big plane was on its way back when the flak got it. Not that the flak mattered so much. One engine and part of a wing were ablaze. And as if that were not enough, gas fumes filled the ship.

Then, almost miraculously, the flames disappeared. The gas fumes remained, however, and the pilot, Lt. Bernard T. Kuhlmeier, said when he landed, "I couldn't even see the instruments on the panel in front of me." Nevertheless, he came down safely and the ground crew took over.

The real story of that bombing mission, as with thousands of others, is the efficiency and dispatch with which that deadly, most feared of all air enemies—fire—is conquered.

Improvements in airplane fire extinguishing systems have kept pace with advances in planes since the war began. These systems are installed in planes and are part of every air base's vital ground equip-



FIRE FIGHTING IN THE SKY

ment. Basis of most of them continues to be the versatile carbon dioxide gas—CO₂ or the familiar soda pop gas—but many new chemicals and chemical preparations have taken over fire fighting duties.

One of the newest and most effective fire extinguishing agents is methyl bromide. This chemical saves up to 50 percent in the weight of the system, and is efficient at extreme temperatures or altitudes. Combined with nitrogen, employed as an expellant, methyl bromide maintains a uniform pressure in its containers of 250 pounds per square inch through a temperature range of 65 degrees below zero to 160 above, thus making it effectively usable throughout practically the entire arctic-tropic range.

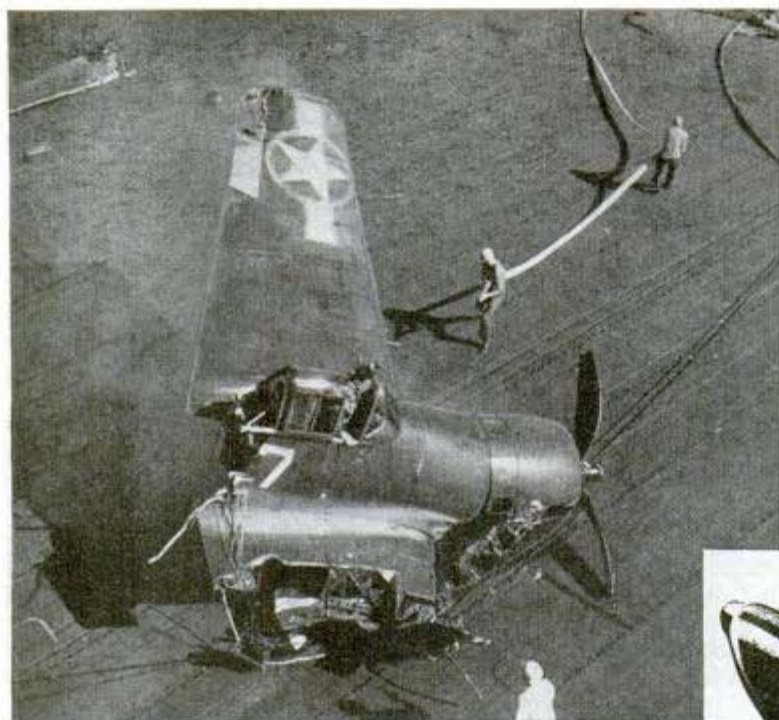
A complete methyl bromide system for a four-engine bomber provides protection in practically every part, including the engine nacelles; the extinguishing lines in phantom look much like the veins of the ship. The pilot or an associate, by remote control in the cockpit, can operate valves which instantly smother a fire in any part of the ship, without affecting other parts.

Every time we exhale, however, we produce the most commonly used of all



Asbestos-clad fire fighter shows how combination nozzle works. Below, extinguishing a flaming B-17, in England





passed carbon dioxide in helping Air Group One to make its great record. Operating from an Essex Class carrier, this group shot down 101 Jap planes, destroyed 104 others on the ground and sank or damaged 38 Jap ships, including three carriers. Its planes were the first cannon-firing warplanes built for carriers—Navy Curtiss Helldivers.

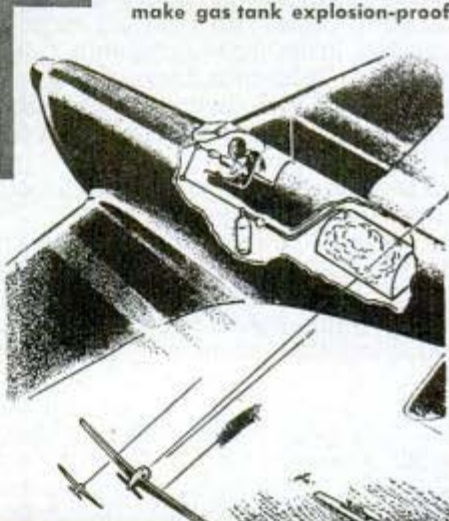
In one case, a Group One pilot crash-landed

Fire fighters get set as pilot lands half a plane. Below, a carbon dioxide system used to make gas tank explosion-proof

fire extinguishing agents: carbon dioxide. In the Pacific, this gas is saving countless lives, not only in putting out fires of all types, but in many other ways, for carbon dioxide fills even the small cartridges that inflate life belts and boats. It is used, too, for emergency operation of airplane hydraulic brakes and landing gear.

Apart from the valor and ability of the pilots and the efficiency of their planes, few factors have sur-

Below, giant fire truck turns all its nozzles on plane blaze

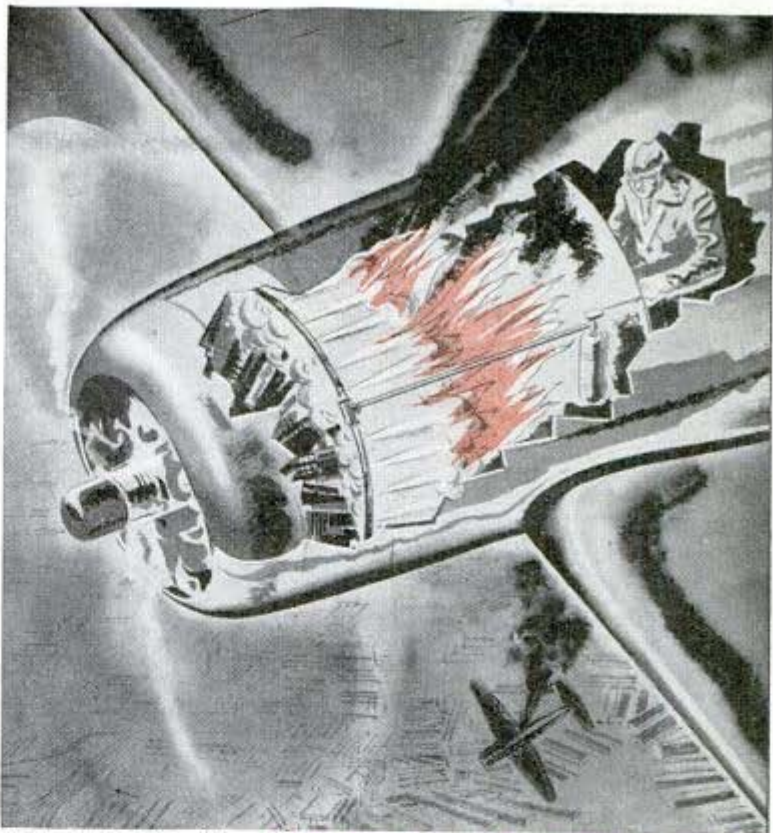


his ship on the deck of a carrier with the lubrication and hydraulic systems shot away by Jap flak during combat. With this almost fatal damage, he would have been a goner, from fire if nothing else, had it not been for the carbon dioxide system in his Helldiver. As it was, the plane was not afire when it landed.

Soda pop gas has one property that sets it apart from all other gases. More of it can be squeezed into a small space. As a result, it is easy to ship, easy to install in the cramped, tight confines of a plane, and easy to use. About one quart of carbon dioxide in liquid form will fill two and one half barrels when released, expanding to about 450 times its compressed volume.

Thus you will find carbon dioxide in handy extinguisher form for individual use, you will find it used for explosion-proofing empty spaces in wings and fuselages, and you will find it in systems such as those around the engines of a fighter plane, where a pilot need only pull a handle, expelling the gas from a perforated ring, to kill an engine fire in a matter of seconds.

Bullet and explosion-proofed gas tanks have been much in the news. Formerly, when an enemy bullet penetrated such a tank, a few drops of fuel would leak out before it was sealed, creating dangerous vapors, tops among the plane's fire hazards. A spark or a tracer bullet could set off a devastating explosion. Now, before a pilot goes into combat, he pulls a control which floods all empty tanks and empty spaces around tanks with carbon dioxide. If incendiary bullets hit the tank, there is no oxygen to support fire or explosion.



Walter Kidde & Co. photo 140 22 JAN 47 NY 6 NY
 Drawing shows built-in fire extinguishing system for plane engines. Pilot pulls handle and carbon dioxide from perforated ring kills blaze. Below, levers in cab of fire truck control overhead boom and nozzles



CARDOX CORPORATION
BELL BUILDING
CHICAGO, ILLINOIS



Stream of carbon dioxide and water begins to pour from the overhead boom nozzle of fire truck. Boom is moved from cab

All types of planes, military and commercial, have some sort of fire fighting equipment; even the crates of yesteryear had handy fire extinguishers. Today the installation of fire extinguishing apparatus is a primary consideration of design and construction from the blueprint to the finished product. The giant Mars flying boat has a new type fire system protecting its

huge built-in gas tanks, fume-tight compartments, engines, auxiliary power plant and all other parts of the ship. It is understood that a still newer system has been designed for other big planes, but details are a military secret.

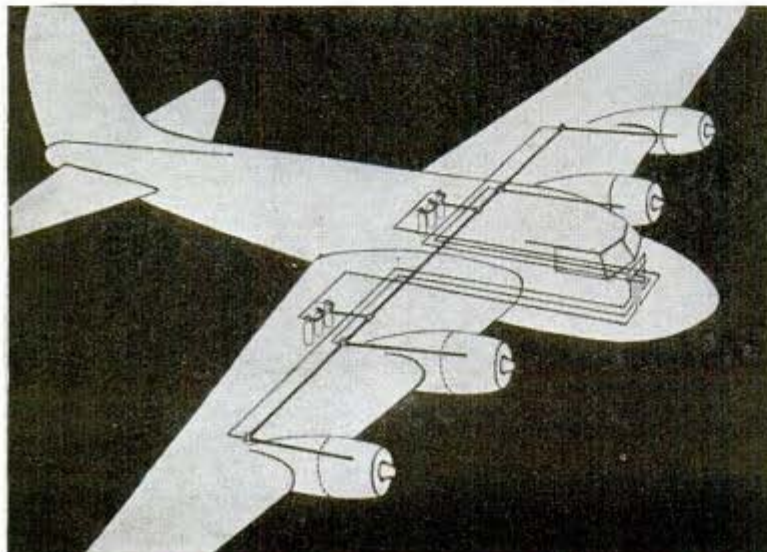
Fighting airplane fires does not end with protection in the air. Many times a ship will land in flames—its fire extinguishing system shot away or disabled—and ground crews must do the flame killing job. For this purpose, all branches of the armed services have special equipment, much of it built around the use of chemical "foam"—several compounds are employed to produce this fluid—and sturdy asbestos suits, with helmets that make the fire fighters look like figures of a nightmare.

There are countless stirring incidents of plane fires being put out on the ground. Recently a big Army B-17 was taking on 3,000 gallons of 100-octane gas when a 45-mile gale broke a line and sprayed both plane and gas truck with the fuel, which ignited. First, truck and plane had to be separated to prevent explosion of the gasoline supplies in both. This was done with a specially built airfield fire truck which also "knocked

down" the flames. The extinguishing job was completed with ordinary foam equipment, and damage was held to a minimum.

Mammoth crash-fire trucks are stationed at various Army air fields. Discharging powerful streams of carbon dioxide and water as it rolls up to a gasoline fire, a truck permits quick rescue of flyers trapped within walls of flame.

Each truck is equipped with an overhead boom which will swing out on either side or straight ahead, and will pour out a stream able to quench flames 50 feet away. The boom nozzle has a discharge capacity of 2,500 pounds of carbon dioxide a minute. A second nozzle is mounted forward of the radiator. Both can be operated from the truck cab. Linear sweep nozzles just below the front bumper spread a thick blanket of carbon dioxide



American LaFrance-Foamite photo
Sketch of new methyl bromide system to put out flames in air

AMERICAN-LA FRANCE-FOAMITE CORP.
303 ERIE ST
CHICAGO, ILL.

and water spray ahead of the truck.

In addition, two 100-foot lengths of hose with insulated playpipes and nozzles unreel from sides of the truck. Other lines are fitted with bayonet-type nozzles that can be plunged through a fuselage to flood the interior with carbon dioxide. Still other lines carry water and have combination nozzles that produce a solid stream or fog.

A six-wheel drive moves a truck through mud and rough terrain at high speed. Each airport fire engine carries three tons of carbon dioxide in a main tank, a special mechanical refrigeration unit keeping the gas at low pressure. This tank also provides pressure for a 500-gallon water tank, eliminating the conventional fire engine pump.

Until recently, the general design of aircraft fire extinguishing systems involved an average quantity of only 7.25 pounds of carbon dioxide gas which provided individual protection for only the accessory compartment and the carburetor air intake stack. These provisions appeared inadequate, and the Civil Aeronautics Authority called a conference of manufacturers of aircraft fire extinguishing systems, aircraft makers and representatives of the armed services. It was decided to institute an intensive fire test program under the supervision of the National Bureau of Standards.

The results of these tests, plus the added improvements made by the Army and Navy, have made American fighting planes the safest in the world from the standpoint of fire hazard. These advances already are being incorporated into civilian passenger planes.

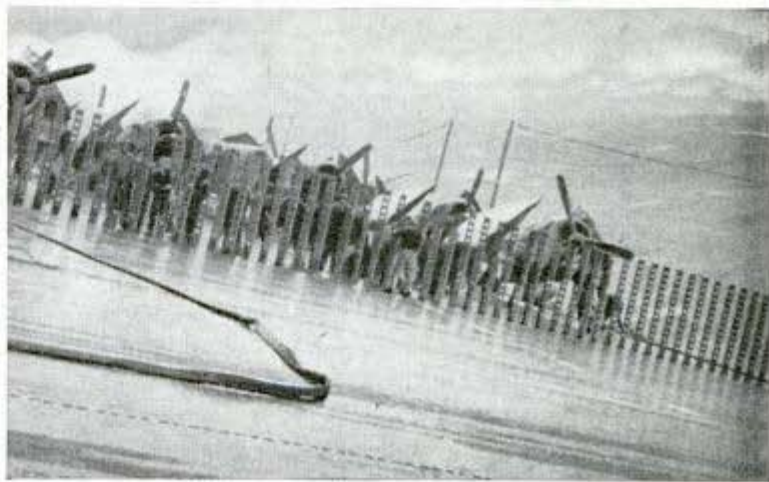
Light Shows Size, Shape of Molecules



Making plastics without knowing the size and shape of the molecules of which they are built is like laying bricks in the dark. Two new instruments, developed at the Polytechnic Institute of Brooklyn, are taking the guesswork out of the manufacture of such items as synthetic rubber, plastic jewelry and nylon stockings. As a chemist gazes into one instrument, a solution is poured into a glass chamber through which light is directed. The scattering of light enables the observer to determine the shape of large molecules. The other device, based on the same principle, is a shortcut for estimating weight. This method is said to be a vast improvement over viscosity tests used in the past.

Iron Stakes Protect Planes on Rolling Flat-Top

Whenever United States Navy aircraft carriers begin to pitch and roll violently in a storm, iron palisades or barriers are thrust up along the flight deck. The stake fence protects the planes on deck from both the wind and the sea. Sometimes a flat-top rolls as far as $27\frac{1}{2}$ degrees.



Truck Rides "Tightrope" Across Deep Ravine



Photo courtesy FIREPOWER

Army trucks can be made to do a tight-rope act to cross a deep ravine. This spectacular method of wire rigging was devised by the Rigger and Wrecker Section at the Fort Crook, Neb., Ordnance Automotive

School. The soldiers threw a cable across the ravine and back again, running it through pulleys spaced apart on one side and tying it to truck winches on the other. "Dead men" held down the pulleys and the winches pulled the cables taut, thus making a cable track in mid-air. The truck was put on the cable track with the cables riding between dual wheels, which also had been attached to the front of the vehicle. With another cable and winch the truck was drawn across the gap.

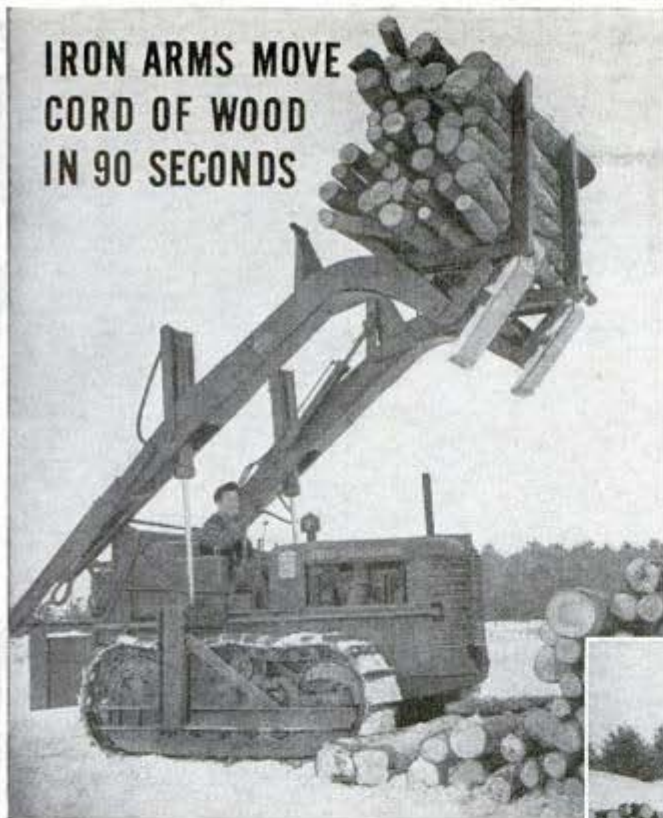


Yanks Build "Jeep Sedan" From Scrap-Pile Parts

Ordnance repair men at a U. S. 8th Air Force bomber station in England worked for six weeks in their spare time to produce a streamlined version of the peacetime jeep. Only salvaged material from junk piles was used to build this "jeep of the future" out of the versatile GI vehicle.

☐ A pound of coal makes enough steam to haul one ton of freight 10 miles, and five or six tons of water are removed from bituminous mines for every ton of coal produced, according to the Bituminous Coal Institute.

IRON ARMS MOVE CORD OF WOOD IN 90 SECONDS



the load is to be dumped. There the arms are again raised to a 45-degree angle, and after getting into proper position, the "skid" arms open like those of a man over a woodbox. The tractor-loader unit is easily maneuvered in the woods or in a lumber yard. It can be used to speed the loading of trucks, for shifting piles of material, or for handling anything from light shavings to solid rock. It is expected to find many uses in the timber industry, in saw mills, lumber yards and paper mills.

ON THE COVER, a painting of the skid loader shows it dumping wood. At left, loader is shown holding a stack of wood aloft as driver backs away from pile. Forward arms release load

History was made recently in the Wisconsin woods when a puffing steel giant eased up to a wood pile, slipped strong arms around a cord of wood, lifted it high and then deposited the heavy load in a truck. The entire operation required just a minute and a half—a job which would have taken 25 husky men to handle in the same time. This steel woodman is called a "skid loader" by its inventor, E. A. Drott of Milwaukee, who believes it may revolutionize loading operations in the logging industry. It operates on much the same principle as a man who picks up an armful of firewood, carries it to a woodbox and drops it. In fact, that is exactly how the inventor got the idea. The steel arms which do the loading, clamping and lifting are mounted on a Diesel tractor. First, the tractor pushes the two lower "skid" arms into a stack of pulpwood. Then the top arm, which is hydraulically operated, is dropped down on the pile, holding the load firmly against the lower arms. When the load is secure, the entire mechanism is tilted back, lifting the two arms to a 45-degree angle high over the driver's head. The tractor backs away from the pile and lowers the tightly-clamped load onto ski runners which are shoved along to where



Pictures at right show steps in loading operation. Top, two lower arms of skid loader dig into pile of pulpwood. Center, upper arm grips logs, tractor backs up. Bottom, load is deposited on the truck

Yankee Sailors Learn Old and New of Sea Duty

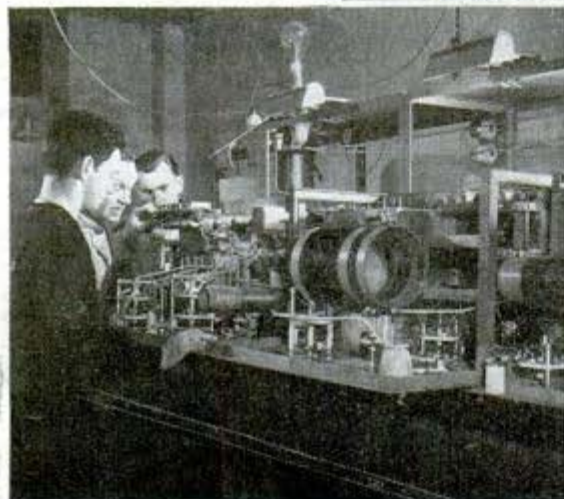


U. S. Maritime Service photos

U. S. Maritime Service seamen take a busman's holiday while in San Francisco waiting for assignment, and inspect world's largest model of sailing ship. Model of the clipper Preussen is 10 feet long, took builder 5,000 hours. National Maritime Day is May 22, and the Service is intensifying its efforts to obtain men for vital ship transport to maintain the flow of war goods to our boys

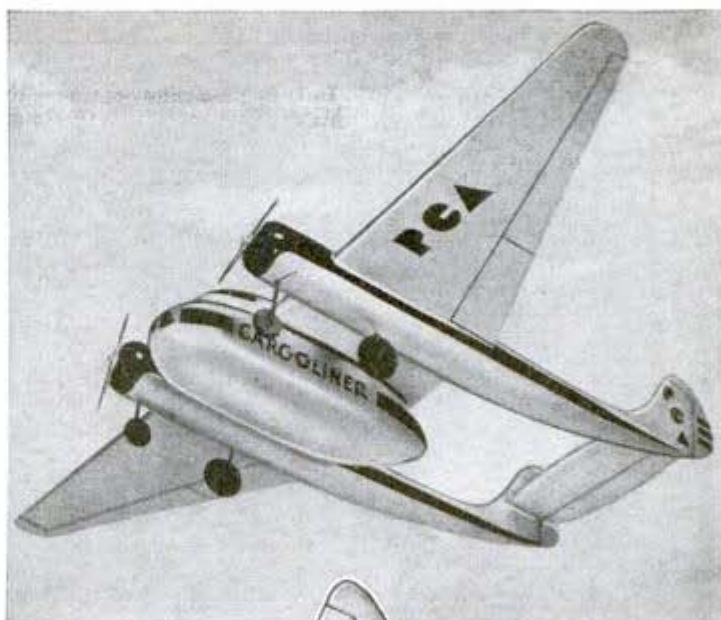


Maritime Service schools give excellent training for marine radio operators. Left, one of 24 automatic code transmitters gets checkup at Hoffman Island Training Station in New York. Below, trainees examine 4-in-1 RCA unit from front and rear. Unit contains emergency transmitter, battery-powered; main transmitter-receiver run by generator; high frequency transceiver; automatic SOS signal alarm

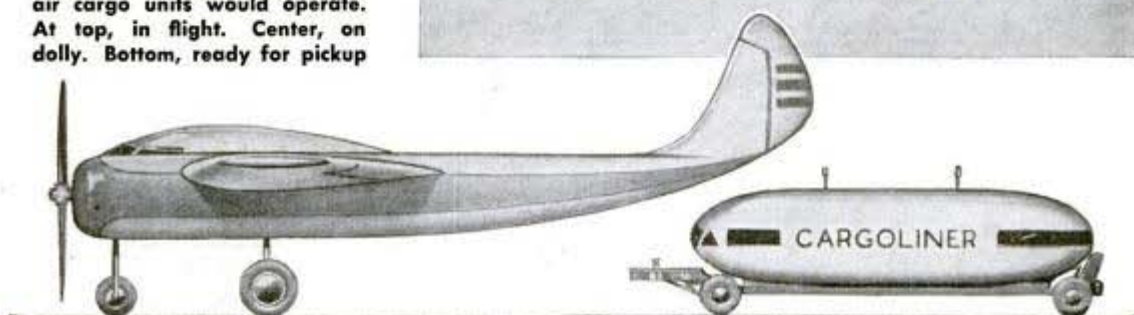


Detachable Fuselage Will Reduce Loading Time

Built to function like highway tractor-trailer units, post-war freighter planes may have detachable fuselages. One plane of this type, suggested by Pennsylvania-Central Airlines, is a twin-boom ship with a demountable cargo unit. Each plane would have two or more of these units to reduce loading time. Arriving at a terminal, the fuselage cargo unit could be quickly detached and replaced with another unit already loaded for the return trip. This would cut substantially the time now required



Sketches reveal how detachable air cargo units would operate. At top, in flight. Center, on dolly. Bottom, ready for pickup



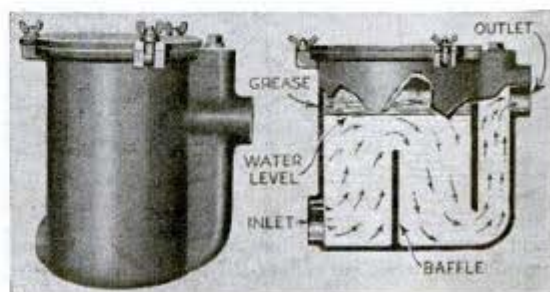
to load cargo planes. Pennsylvania-Central engineers have also designed a tanklike cargo container which would be attached underneath a plane and used for carrying

bulk items such as milk or gasoline. Special terminals designed to accommodate the "aerial trailers" would further speed up postwar air cargo.

Grease Catcher Prevents Clogged Drains, Saves Fat for the War Effort

By installing a compact grease interceptor under the sink, fats which otherwise flow down the drain and clog pipes can be salvaged for war. Made of cast iron, with a gray finish, the cup is inexpensive. Wing nuts on its cover make it easy to clean.

☛ A new du Pont nylon compound that resists heat and solvents can be applied as a coating on wire at 1,000 feet per minute.



Ore., that receives programs from Japan, Russia, Manila and, at times, satellite stations from the South Pacific; and another just outside of San Francisco that receives programs from stations in Japanese-occupied territory. Each station is manned by a staff of monitoring officers and operators. Silver Hill has ten monitoring officers, headed by Frank X. Green, former chief engineer of several leading broadcast stations.

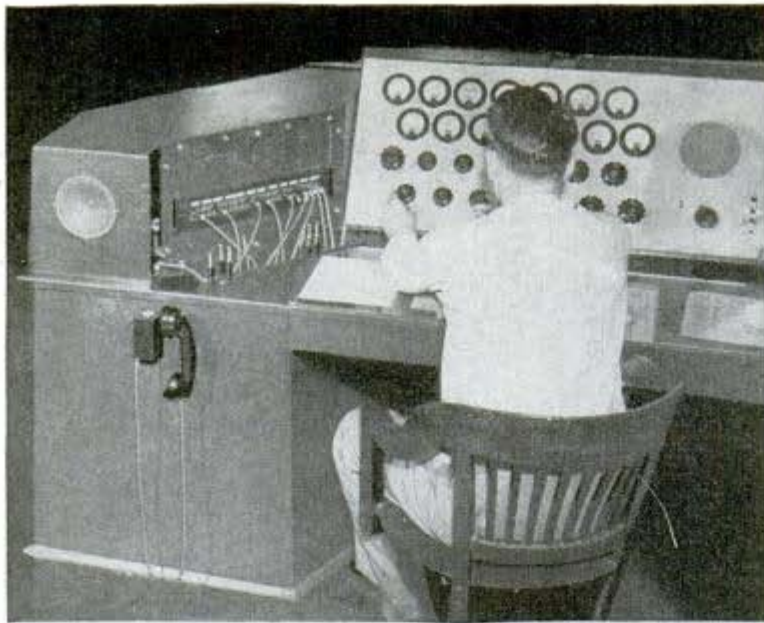
All FBIS receiving stations are several miles from inhabited areas. The elaborate antenna systems must be kept well out in the clear, away from power lines and any other sources of man-made interference. Before setting up the stations, FBIS engineers surveyed the countryside with sensitive instruments to find the best possible reception sites.

Inside the station is an intriguing array of sensitive communications receivers of which there are twenty-nine in operation at the Silver Hill station. Mounted in sub-



Above, data on card guide monitor as he tunes set to hear a scheduled broadcast from Berlin. Right, stepping on switch enables monitors to make instant checks of frequencies and keep dial settings accurate. Below, a supervisor records program on Memovox machine. Lone disk runs two hours. Other console holds a high-fidelity unit





Broadcasts picked up by FBIS receivers are piped through this console, and correct volume levels set for wax cylinder recorders many miles off

stantial steel racks and assembled in "bays," or sections, these sets are in continuous operation 24 hours daily. Each receiver has its own calibration which shows the exact dial setting for any given wavelength. This information must be kept currently accurate so no scheduled program can be missed. There can be no major failures, and all receivers are kept in top-notch condition. Accessible from the rear, the sets are inspected and serviced regularly.

their shape, height and pattern. If several programs are coming from the same direction, one antenna may be used for several receivers. In fact, all 29 may be connected to the same antenna with high efficiency.

Next, the broadcasts being picked up by the receivers are "routed" through a control console, whose operator adjusts the volume of each program to the proper level for recording. The broadcasts then travel over private telephone wires to the FBIS downtown offices in Washington, D. C., seven miles from Silver Hill.

Experienced interpreters, specializing in various languages and dialects, hear the broadcasts with headphones and type a summary in English. At the same time, the entire program is recorded on wax cylinder machines, each with duplicate cylinders so that when one is filled the intelligence may continue on the other without interruption.

These wax cylinders are kept on file in the FBIS office for 48 hours in case some agency needs a complete transcription.

Other types of record-



Pigeonholes contain the wax cylinder recordings made of broadcasts picked up by FBIS

ers are used when high-fidelity transcriptions are required. These include several Memovox recorders employing paper-based disks capable of an hour's recording on each side. In addition, two Presto high-fidelity recorders using acetate professional disks provide quality transcriptions for re-broadcast or for "dubbing" purposes—that is, making copies.

More than 6,000 programs are carried on the daily list of the FBIS. This is kept completely up to date and any changes in station call letters, time of transmissions, and other information are made immediately. An FBIS operator is on duty continuously scanning the ether with four receivers, searching for new stations and other information. He logs frequencies of new transmitters with a special frequency standard, which puts out an accurate signal and is used to check the calibration of the receivers. Similar frequency standards check on the other FBIS receivers. Calibration must be known at all times as sudden changes in temperature sometimes cause the dial readings to vary slightly on different sets. Merely by pushing a switch with his foot, the operator brings in a signal from a frequency standard which discloses any deviations from the normal dial setting of the receiver.

Most of the FBIS interpreters have traveled extensively and their knowledge of foreign tongues has contributed immensely to the successful interpretation of enemy trends or psychological slips. Valuable information which the enemy had no thought of revealing frequently is gathered from simple broadcasts.

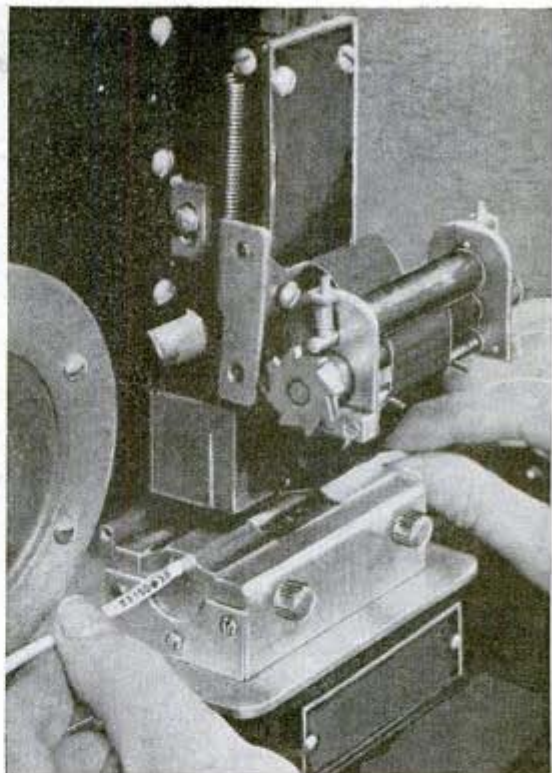
"As recorded by U. S. Monitors" is a term often encountered in this war. It refers to FBIS operations, and important headlines often are made by intelligence picked up by FBIS personnel. For example, FBIS gathered the first information of the 1942 bombing of Tokyo, and the first screaming headlines with the welcome news were based on FBIS reports. Here is the case history of that world "scoop"—journalese for an exclusive story:

At 12:13 a.m., EWT, April 18, 1942, an engineer at the Portland, Ore., station scans his schedule. Tokyo station JWV-3 is on it. At 12:14 a.m. a broadcast monitor dons earphones and prepares to receive the program. Static is heavy and reception will be difficult. A few seconds later he pushes a lever which starts the wax cylinder recording machine. The program comes in promptly at 12:15.

Thinking simultaneously in ideographs (the picture characters which give meanings to Japanese words) he stiffens as an announcement of extreme importance

(Continued to page 150)

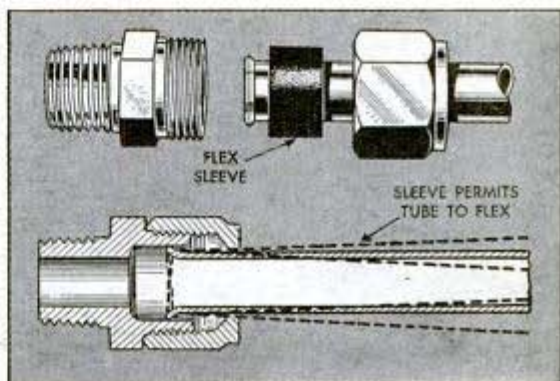
Stamp Numbers Wires for B-29 To Facilitate Repair Jobs



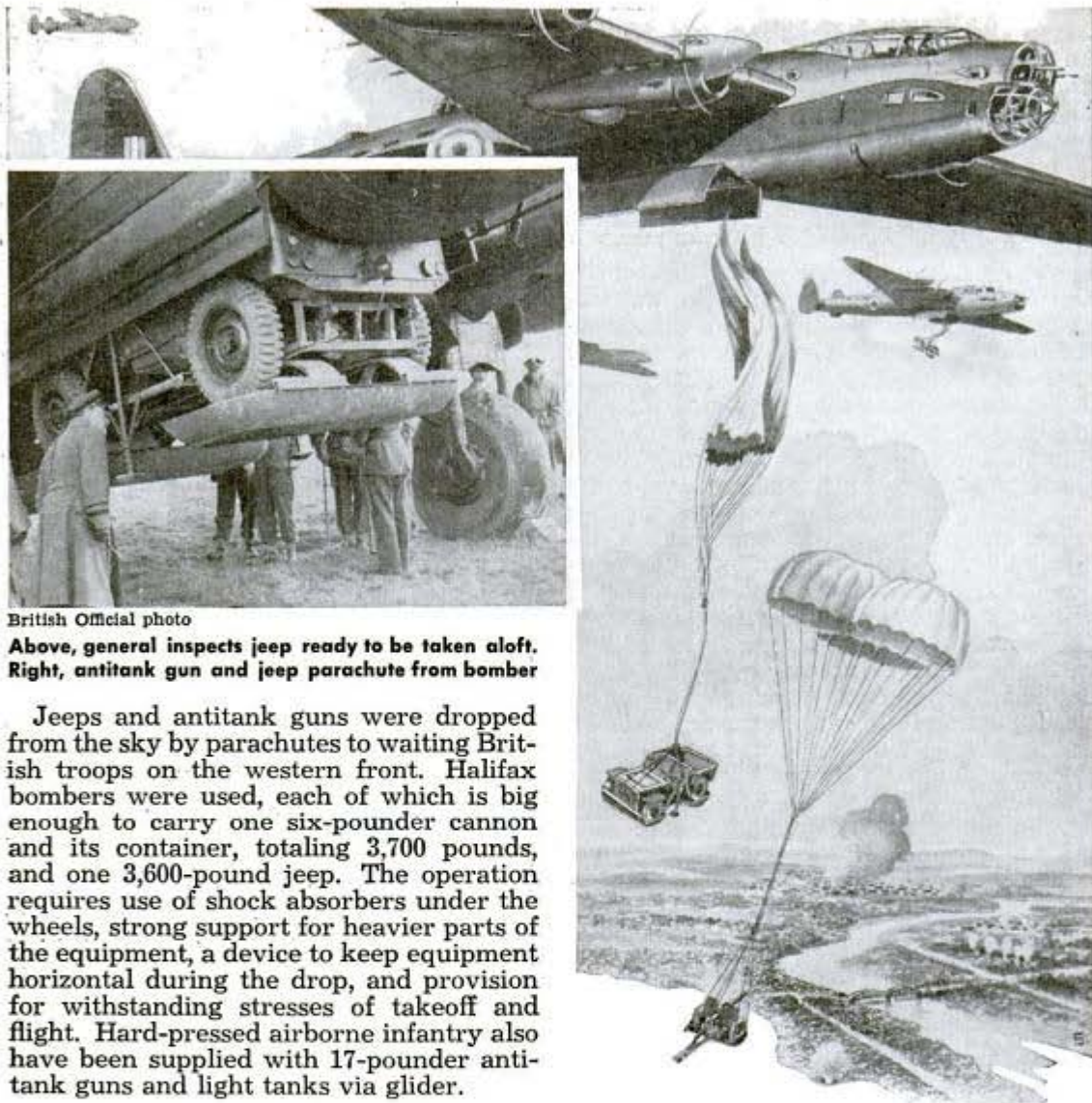
Wires used in the fuselage of the B-29 are numbered every few inches by an elaborate stamping machine at the Hudson Motor Car Company. One number tells the gauge of the wire, while a second number and a letter nearby indicate where the wire will be used. This speeds up the repairing of Superfortresses after battle damage.

Flexible, Leakproof Pipe Fitting Ends Damage by Vibration

Virtually indestructible by vibration, a flexible fitting with a shock absorbing sleeve is available for connecting tubing lines where there is vibration. Easy to install, it can be disconnected and reconnected without any danger of leakage.



Bombers Deliver Jeep and Guns by Parachute

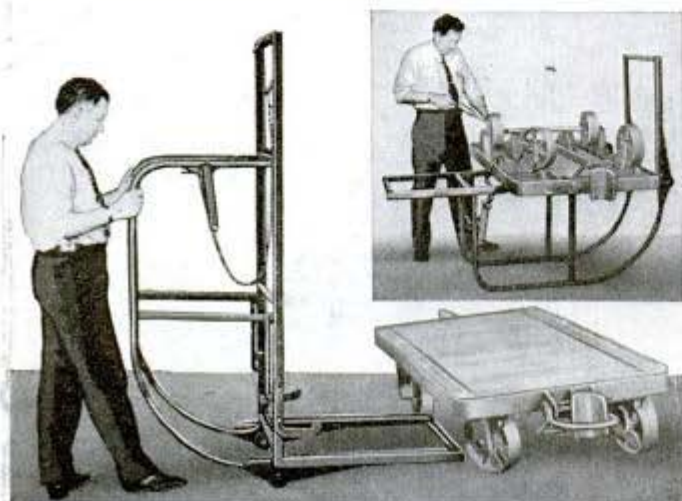


British Official photo

Above, general inspects jeep ready to be taken aloft. Right, antitank gun and jeep parachute from bomber

Jeeps and antitank guns were dropped from the sky by parachutes to waiting British troops on the western front. Halifax bombers were used, each of which is big enough to carry one six-pounder cannon and its container, totaling 3,700 pounds, and one 3,600-pound jeep. The operation requires use of shock absorbers under the wheels, strong support for heavier parts of the equipment, a device to keep equipment horizontal during the drop, and provision for withstanding stresses of takeoff and flight. Hard-pressed airborne infantry also have been supplied with 17-pounder anti-tank guns and light tanks via glider.

Tipper Turns Trailers Upside Down for Speedy Servicing



In just 17 seconds one man using a new tipper can turn a platform truck or trailer upside down and bring it into position for quick servicing of the running gear. A crank-operated chain, which is prevented from slipping by a ratchet and is attached to the truck by a hook, lifts the truck onto the tipper. The unit is then tipped over with the truck to bring the wheels or casters into position for changing, greasing, cleaning or inspecting. In this position the overturned truck deck can be used as a bench for tools and other equipment used in servicing.

MILLION MILE PATROL



Catalina patrol bomber takes aboard gasoline from a seaplane tender in the frigid Aleutian waters. Bamboo poles are snubbed against the propellers to keep the plane from drifting into the ship's stern

EVERY big show has its advance men who travel far ahead to look over the ground before the main performers arrive—and the Navy, in its biggest show of all in the Pacific, is no exception.

What is the exception is the way the Navy does its own advance man job, the efficient and spectacular results that are achieved, and their importance in smoothing and speeding the route to Tokyo.

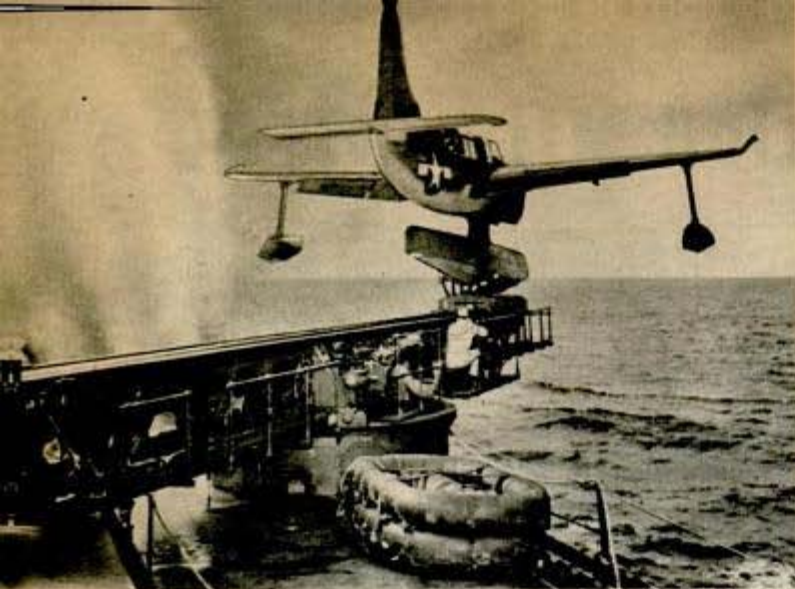
Navy advance men are like no others. They cover, in search, observation and patrol planes and smaller aircraft, approxi-

mately a million square miles every day. Long before a new objective is invaded by the main performers, they not only have looked over the ground but have surveyed vast areas of surrounding ocean as well. They have, in fact, "thousand-mile eyes" that seek, investigate, photograph, rescue, fight, bomb, depth-charge and even shadow when enemy movements must be kept under close observation.

The name of every one of the stepping stones conquered in the advance on Japan can be identified as the base, at one time



Spurred by a jet "take-off engine," massive Martin Mariner flying boat shoots up from the water like a gigantic sky rocket



In a burst of speed a Curtiss Seagull is catapulted from the deck of a warship to search the ocean for signs of the enemy



DANGER—meaning Jap Zeros are nearby—is spelled out on the ground by Chinese to warn a reconnoitering plane. Below, intelligence officer briefs a patrol plane crew before a mission



or another, of the Navy's squadrons of patrol and reconnaissance planes. And before the stepping stones became bases, they were the objectives of these searchers of the seas on their 2,000-mile round-trip missions that mix danger and heroism with the toughest kind of grinding monotony.

Take, for example, the record of Navy Squadron VB 106, composed of fast, far-ranging Liberator search planes. This squadron returned from a seven-month duty tour during which it searched approximately 125,000 square miles a day from bases at Midway, Canton, Baker, Funafuti, Guadalcanal, Munda, Nadzab, the Admiralty Islands and Wakde. Not once during the seven months was a single mission canceled. In all,

1,262 sorties totaling 16,000 hours of flight were made.

Fighting action? Squadron VB 106 had plenty of that, too. What the Navy calls "targets of opportunity," found on search missions, were bombed frequently. Jap ships sunk totaled 43, plus 54 damaged. Victims included 33 cargo vessels and three submarines. At least 15 attacking Jap planes were shot down and 22 more were scored as probables. Five planes were smashed on the ground. Targets were spotted for task forces which shelled Rabaul and Kavieng. The squadron's planes escorted the fleet to Wake and to Palau on carrier strikes.

It was the squadron's reconnaissance flights, however, that were most important in information obtained and operations successfully carried out. Probably the best

example occurred when the fleet was preparing to invade Saipan. It was decided that the island of Biak was needed, too, as an air base for Philippine operations, but surface ships could not participate. Total dependence was placed on aerial search to discover and warn of approaching enemy ships.

Squadron VB 106 was given this task and carried it out well. Every one of the Jap search planes entering the Biak area was shot down before it had sighted the invading forces. Had the Japs known the main American fleet was not in the area, it is believed they would have assembled forces to oppose the landings.

Generally speaking, the term "search" as used by the Navy describes the operations and functions of long-range planes in cov-



Starting fires on Okinawa in the Ryukyu Islands with bombs was one of the "advance jobs" of Navy aircraft in the mighty Pacific fleet

ering sea areas, including islands, rather than land reconnaissance. Flying boats or specially designed land planes are sent out from advanced bases to discover the presence of enemy units and report the size, speed, course and disposition of these units so proper measures can be taken without delay to intercept and destroy them.

These search planes also investigate harbors and islands to discover concentrations

of enemy shipping or other activity. For instance, a Navy patrol squadron under the command of Lieutenant Commander Guy Howard once took the opportunity, near the end of a regularly scheduled search mission, to look over a small and apparently uninhabited island. Close observation disclosed signs of fuel pipe lines, evidently designed to refuel submarines. The next day the squadron came back



L-5 scout plane's glassed-in canopy gives all-around visibility. Right, soldiers contact search plane by radio

and bombed the installations to destruction.

Numerous types of search and observation planes are employed by the Navy and other branches of the armed services. Best known of the Navy's planes are the famous Catalina flying boats, but these are being supplemented in dangerous or difficult operations by Navy Liberators, which are said to meet the rigorous speed, armament and range requirements of modern search better than any other plane in the world.

The difference between the two planes is described by Commander John Tucker Hayward, commander of Squadron VB 106, who quotes the message from the pilot of one "Cat" which read: "Trailing enemy carrier. Notify next of kin." Commander Hayward explains:

"The pilot sent this message back in the

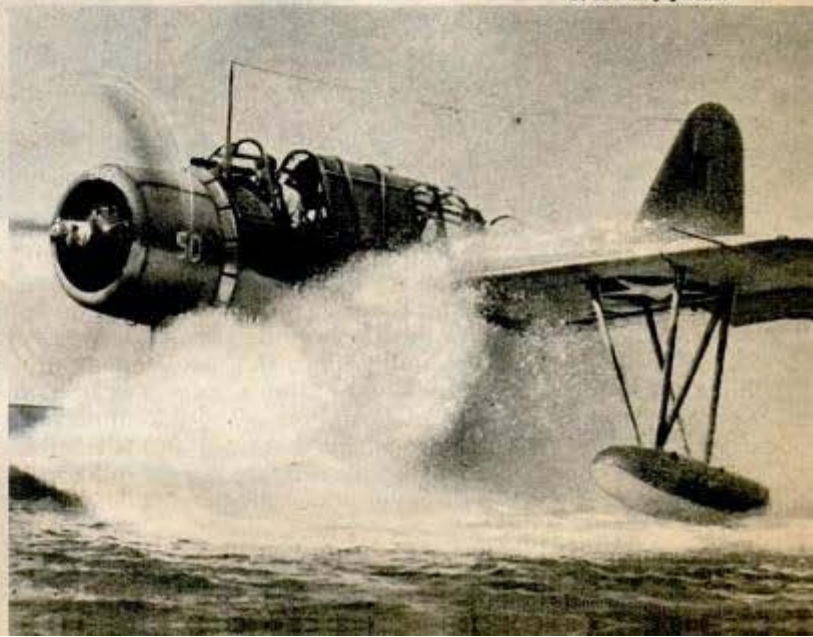
days when all we had were Catalinas to do this search job, in which you have to fight your way in and fight your way out again. Now, in the Liberator, we never intend to notify next of kin. We have the speed and range and hitting power to hang on to any contact we make, and keep getting the dope back to base. This plane on more than one occasion has fought off 10 Japanese fighters. Its ability to take punishment can be attested by the fact that any number of times it has come home over 1,000 miles on three engines, and with as many as 200 bullet holes in it."

The "Cats," however, still have their share of the glory. Many are painted black for night flying, accounting for the name "Black Cats." One such squadron flew 13-hour patrols in the



Top turret gunner (below, left) on a Navy Liberator peers into bright sky, on the lookout for enemy fighters. Below, right, a Kingfisher (OS2U) lands in cloud of spray. It is used as a scout and gunfire spotter

U. S. Navy photos





Navy cameraman sights a giant aerial camera

darkness from Guadalcanal and in six months never lost a pilot. In the Aleutians, the Catalinas don a gray-white coat to become nearly invisible in the fogs and blizzards of the North Pacific.

In addition to the long-range planes, the Navy also uses scout bombers flown from carriers and even the small observation scouts such as the Vought Kingfishers, which are used for shorter and more localized searches and for inshore patrol and convoy protection. Helicopters also have been used for localized rescue work.

Rescuing lost airmen and survivors of torpedoed ships is one of the most spectacular functions of search planes, and patrol bomber pilots have developed miraculous skill in putting their craft down on the sea on many of these occasions. Once, for example, Lieutenant Nathan Gordon landed a "Cat" under direct fire of the heaviest Jap defenses of Kavieng to save 15 airmen from death or capture. Twice he went under the guns into the harbor. His plane overloaded with nine men he had saved from one rubber boat, he flew back to take aboard six more men in another life raft drifting only 600 yards from the enemy shore.

Coordination of search planes with PT boats has provided some of the thrilling chapters in the war. This has been notable in operations around Guadalcanal, where "Black Cats" located the "Tokyo Express" and tracked it for PT boats to hit, and in action at Rendova, Munda, Villa and Bougain-

(Continued to page 152)

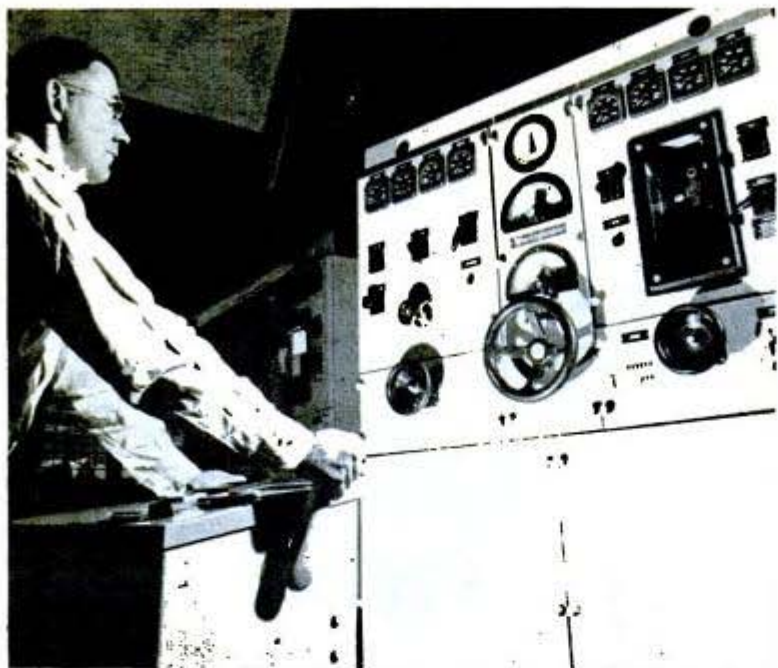


Above, refueling from a seaplane tender is a ticklish job even in calm weather. Below, forced down somewhere in the Pacific, a seaplane is hoisted aboard an assault transport after being towed alongside by a small boat

Official Coast Guard photo



Electric Unit Controls Ship's Engines Directly



Direct control from the bridge over the complex electric motor equipment of turbine-electric driven Navy ships becomes as simple as flicking a light switch with a

through faulty operation of control levers or misinterpretation of orders. Manual operation of the new unit is provided should electrical controls be damaged.

newly developed electric power control. By operating a lever at the side of a small control stand, the officer in the pilot house has direct command over the ship's electric motor, and is able to regulate speed and forward or reverse directions. The main control board is in the engine room. The device eliminates the time lapse involved in sending a command from the bridge to the engine room crew, which confirms it and then carries out the pilot's order. Westinghouse engineers say the automatic control eliminates the possibility of human error in the engine room

Giant Plow Digs Seven-Foot Trench for Telephone Cable



Weighing 30,000 pounds, a giant plow pulled by two Diesel tractors digs a seven-foot trench for laying telephone cables. The machine, combined with a cable layer, was designed to lay a multiple circuit line for the relief of overcrowded West Coast telephone wires. As the unit digs the ditch and lays the cable, a bulldozer follows, covering and leveling off the trench.



Huge rooter pulled by Diesel "Cats," above, left, digs seven-foot trench. Below, in another version two tractors pull a plow and cable layer; third tractor follows with a bulldozer to cover trench

Air Engine Preoiler Prevents Failures

To save man-hours and prevent airplane engine failures due to improper lubrication, the Glenn L. Martin Company, Baltimore, Md., has devised an extremely compact portable preoiler mounted on a small truck. The unit delivers preheated oil under pressure to the engines of B-26 Marauders, thus assuring the removal of all preservative compounds and the perfect lubrication of all parts prior to their initial runup. The preoiler comprises a five-gallon oil drum with a thermostatically controlled heating element for heating the oil and maintaining it at a specified temperature, and an electric pump. A dual purpose frame at one end of the truck serves both as a handle for guiding the truck and a rack for the 75-foot power cable and 15-foot flexible oil line. The cable is plugged into the nearest electric outlet and the oil line is attached to the engine's oil pressure line.

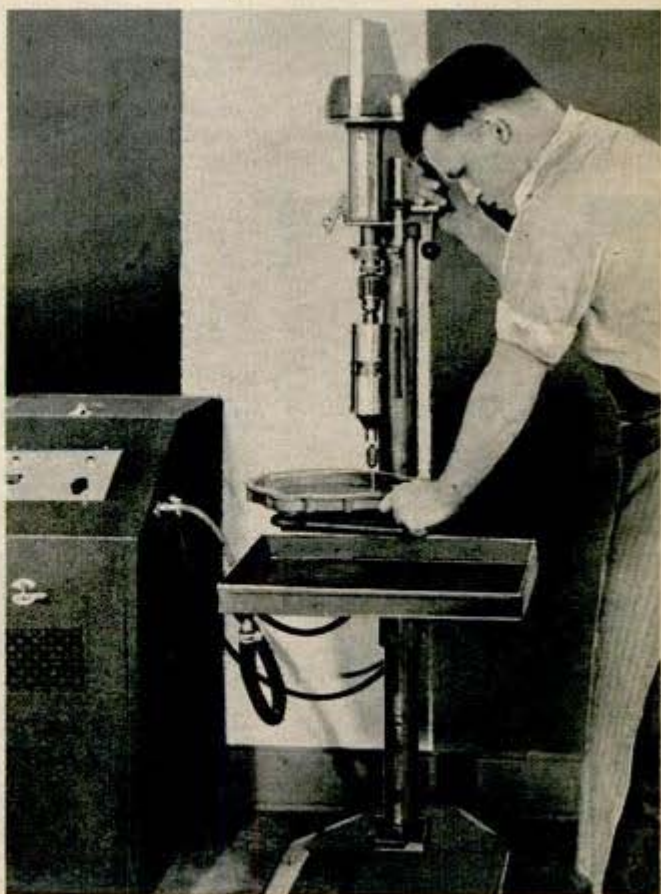


Embedded Drill 'Dissolved' for Easy Removal From Hole

Broken drills, studs or screws which are embedded in metal can be removed easily with a drill-press attachment that causes them to disintegrate. The unit consists of a tubular copper electrode through which water and electricity pass to make contact with the broken part. Disintegration takes place on contact and a core is cut out of the embedded drill or stud. After the core is removed, remnants of the broken part are picked away from the wall of the hole. This unit can be used to remove parts embedded in steel or nonferrous materials without damage because contact is made only with the broken part. It can also be used for cutting odd-shaped holes in metal.

Flooded Cable Kept Open By Compressed Air

Cincinnati telephone service continued to function in the recent Ohio Valley floods when tanks of specially-dried compressed air were used to blow moisture out of short-circuited underground cable.



GI JOE AT HOME



Home is where any Yank happens to hang his iron hat, and frequently the domestic touch appears in some strange places. Since mobile warfare virtually abolished the elaborate trench systems which housed doughboys in World War I, today's soldiers must improvise temporary houses for themselves on short notice. These pictures show typical examples of our fighters' ingenuity and imagination in setting up house-keeping on far-flung battlefronts. Above, left, wine cask provides snug dwelling for private in France. The occupant put his pin-up girl's picture on the wall and moved in. Cartoonists are fond of depicting John Q. Citizen in a barrel, but this time it's not funny

Starting out in a cave dwelling, man struggled for a few thousand years until—at last—he's back in the cave again. Below, left, a soldier fixes stove pipe at ivy-bedecked entrance to his cave home in Italy. At right, two military policemen add finishing touch to "log cabin" fashioned from empty shell containers





Out in the wide open tropical spaces, there's lots of room and plenty of fresh air in outdoor barracks such as those above, left. Soldiers have to be on constant guard against insect blitzes from aloft, however, and sleep in cots shrouded with netting. A genuine log cabin, above, right, hewn of pine logs in German forest, keeps Yanks warm and cozy with stove and everything. Note the camouflaging over canvas cover of structure

One of the coldest days of the year in Iceland didn't relieve the Yank at right from guard duty, but he was more than ready when it came time to return to the warmth of one of the Quonset houses in background. These portable units can be set up quickly and do a good housing job in Yanks' frigid outposts



No, the soldier at left, below, hasn't set up residence in a sewer, even if the lid of his underground dugout does look a lot like a manhole cover. Construction men who must work in open, within sight of enemy spotter posts, sleep in dugouts such as these, and in slit trenches, for housing above ground would be too apt to draw enemy fire. Pipe in right of picture wasn't identified, but may be either periscope or air duct. Soldiers at right make good use of fuselage of a wrecked glider, bunking down for a much-needed rest during advance into Germany. Continually on the move in most battle areas, troops must always be on the lookout for anything that will serve as shelter. Do you still think the housing problem's so tough here at home?



Flyers Escape Sunken Bomber With Air Unit



Mockup of B-24 bomber, above, is lowered into water for "walk-around" air unit test. Left, flyer emerges after several minutes under water and stands erect without showing any ill effects

Portable apparatus which supplies oxygen to flyers at great heights has found a new role—saving lives of airmen submerged when their planes crash into the water. The Air Technical Service Command at Wright Field, Ohio, tackled the problem after receiving reports that flyers, apparently uninjured, were drowning while trying to escape from ditched bombers. Tests showed that standard "walk-

Westinghouse photo

around" oxygen units would serve the purpose without change. Six human guinea pigs fought to free themselves from a submerged B-24 mockup in a final test of the assembly, and found it acted as a buoyant life vest as well as supplying the needed oxygen. The unit provides sufficient oxygen to let a man breathe for six minutes at a depth of 10 feet, five minutes at 20 to 25 feet, and three and a half minutes at 50 feet. Flyers in doomed bombers are instructed to don the portable equipment after bracing themselves for ditching.

Altitude "Lifeguard" for Plane Is Accurate Within 10 Feet

Flying through fog or darkness, a pilot can accurately judge his altitude above ground within 10 feet with the latest type of absolute altimeter. This instrument, based on radio principles, is considered one of the greatest safeguards of "blind" flying.



Hold the Waste Line

Total war takes all kinds of lines, and the waste paper salvage line on the home front is mighty important in the drive toward victory. Keep holding the waste line, but don't hold the waste paper itself too long. It won't do our boys much good in your garage or attic. Phone your local salvage committee or scrap dealer without delay.

Water Jet Sets Off Mines and Clears Them From Beach

High-pressure jets of sea water, pumped at 2,000 gallons a minute, are used by the British to explode mines and thus clear them from beaches. The water is pumped by monitors mounted on wheeled carriages through pipes laid to the sea and is shot out over the mine field at a pressure of 200 pounds to the square inch. Two men in an armored cab direct the stream from a range of 20 to 30 yards. The cab is equipped with a periscope so the stream can be aimed without leaving the men in an exposed position.



Auto Springs Form Hitch For Farm Tractor

Made from two leaves of an automobile spring welded together, a tractor hitch rigid enough to stand severe abuse on farm roads or across fields has been devised by Noel S. Hanson, agronomist at the University of Nebraska College of Agriculture. The hitch is attached to a plate bolted to the rigging of the tractor and is connected with the drawbar of another tractor or the trailer hitch of a car or truck. Spring steel gives it flexibility.

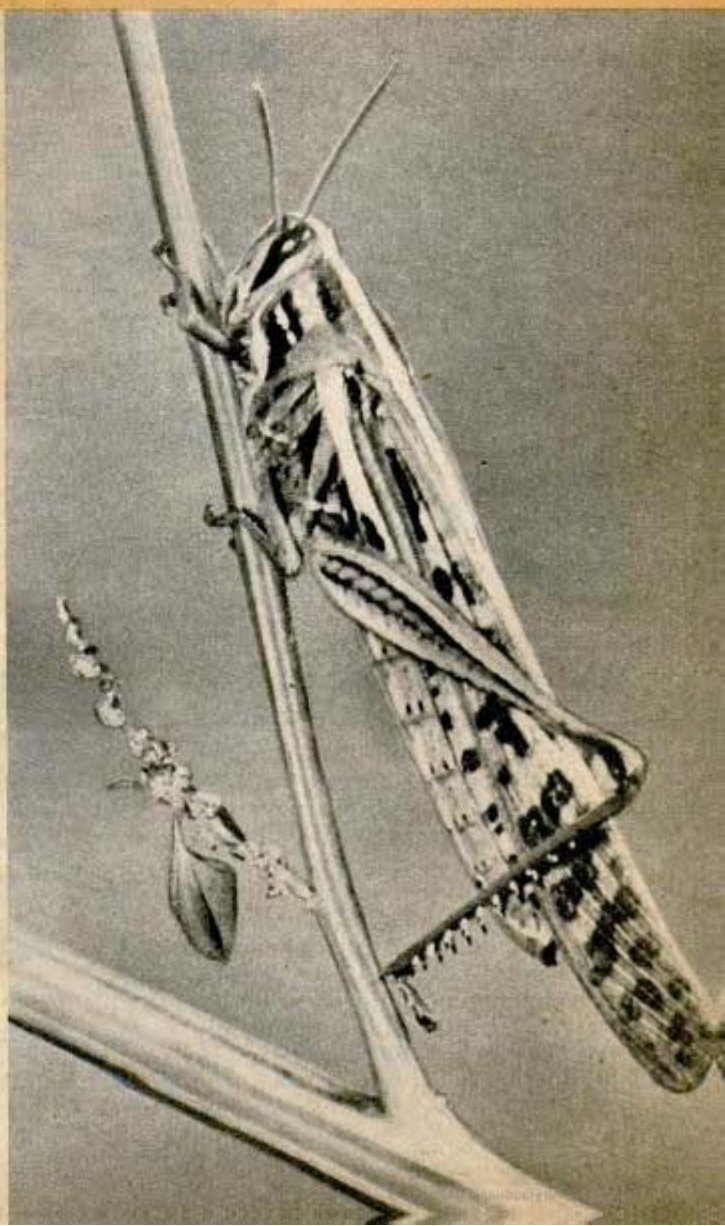
Fluorescent Work Lamp Lights Up Dark Corners

Designed for use in confined areas where permanent fixtures are impractical, a portable fluorescent lamp can be plugged in almost any place you want to work. The lamp is light in weight, cool to touch, and provides illumination of daylight quality with an absence of glare and shadows. Used mostly for inspection of materials where a small aperture affords the only view, the lights withstand jars or vibration without damage.

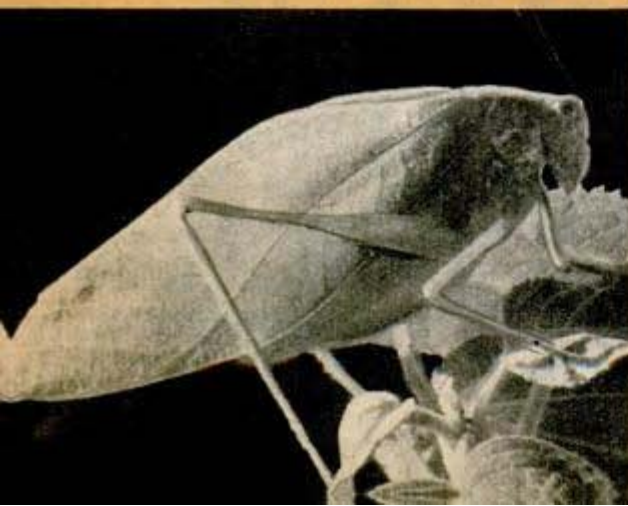




Insect photography can be fun for anyone except hay fever victims. Here the author-photographer places a Monarch butterfly on goldenrod, in nature studio set up in his cellar. Above, right, leaf-house retreat is opened up to get a photograph of Skipper caterpillar, using two No. 2 photoflash, aperture f:22, 3 seconds



Above, a spider spins his web on low bush. Right, grasshopper prepares for kickoff. Below, a katydid shot in natural lighting





Clearwing moth at the left posed on a zinnia. Praying mantis did some mugging for the lens

MR. BUG SITS FOR HIS PICTURE

By George A. Smith

RIGHT IN YOUR own backyard there lies a strange, new world, ready and waiting for you to explore its fascinating customs. You need no passports or cumbersome equipment, for a camera and its accessories are all that is required for an expedition into Insect Land.

Development of camera attachments for close-up shots, and convenient photo flood and flash bulbs for lighting have opened up insect photography as an enthralling new field. The life story of almost any of our common insects presents a whole chain of gripping episodes which seldom have been photographed.

You soon will realize that one of the first requirements for a striking insect photograph is a negative sharp enough to make a good 8 by 10 enlargement. This means that the shot must have speed enough to stop all noticeable movement, yet possess sufficient depth of focus to show the insect in detail.

All of my hundreds of insect photographs were made with a 35-mm. reflex camera (Kine Exakta). Some may like a larger negative, but I prefer this size because most of my insect models are very small to begin with and must be enlarged to fill even a 35-mm. frame. I use extension tubes of several lengths in obtaining an image of the desired size. Remember that the time must be increased accordingly when tubes are used. Through a number of experiments I have discovered the exact addi-

tional time required for each combination.

To help in lighting insects found in unfavorable natural lighting conditions, I have added a four-foot flexible extension to the electrical outlet of my flash gun and a handy clamping device with a universal connection. This makes it easy to direct the flash from any desired angle when preparing for a close-up shot. I always place my flash gun at about the same distance from each subject. In this way, I have a rather constant lighting factor for each shot. Most of my flash shots are made with the flash bulb three feet from the subject, and the lens stopped down to f:22. Then the only variable factor to contend with is the speed of the shot. With film having a "B" speed rating, I get most of my photographs with my lens timed for $\frac{1}{150}$ second. A small amount of experimenting will determine the correct timing for any particular type of flash bulb and film combination. My experience has been that it pays to stick closely to a certain combination after it has once proved satisfactory, especially since wartime needs have limited the supply of films and flash bulbs for amateur use.

In taking inside photographs with artificial lighting, I use two No. 2 photo floods. These floods are arranged on stands, and are kept in readiness in front of a table in an out-of-the-way place in my cellar studio. Hanging at the back of the table I have sheets of white, gray, and black cardboard to be used as desired for backgrounds for my insect photographs. I keep a few table containers in which to place flowers, twigs



Refrigerator cooling makes grasshopper in jar inactive. Insect then is placed in setting, snapped as it revives. Below, close-up of Monarch butterfly hatched in studio



or branches containing specimens to be photographed. I also keep a small vise clamped on the front edge of the table. This is a handy arrangement in which to hold a piece of shrubbery at any desired angle while a specimen attached to the shrubbery is being photographed. If the specimen suddenly decides to move to a new location on a twig, it is easy to refocus quickly by merely readjusting the twig in the vise.

For all of my inside shots I use a stable tripod. And here again I make it a practice to close the lens down to $f:22$ to gain depth of focus in a close-up shot. If the subject is too active for a time exposure, I use flash instead of photofloods. In taking a time exposure, I set my camera for a bulb exposure, and then hold a black card in front of the lens while the cable plunger is pressed in. I then raise the card, and time the exposure by counting out the required seconds. In counting I add the word Philadelphia to the number, as Philadelphia-one, Philadelphia-two, etc. This method of timing becomes very accurate after a check-up or two with the second hand of a watch. At the end of the timing, I lower the card so that it covers the lens, and then release my thumb from the cable plunger. In this way I avoid even the slightest movement of the camera during the time exposure. In an exceedingly close-up photograph even the slightest amount of camera movement generally will produce a fuzzy enlargement from a 35-mm. negative.

In the collecting and handling of insect specimens for this type of photographic work, various techniques can be used. The more or less inactive specimens such as caterpillars present no great difficulty. A twig or a leaf holding a caterpillar usually is brought inside and photographed with photofloods. Advantage can be taken of the rest periods of caterpillars in making time-exposure photographs. In using photofloods care must be taken to avoid overheating a specimen. I usually focus with an ordinary light bulb, and then turn on the photofloods just long enough to make a close check-up on the focus and to snap the picture.

It is easy to rear caterpillars in a screen-covered cage if the specimens are supplied with the proper food. I keep a caterpillar cage in my backyard in which I place specimens collected during my nature hikes. Plants and branches containing specimens are placed in bottles filled with water. As

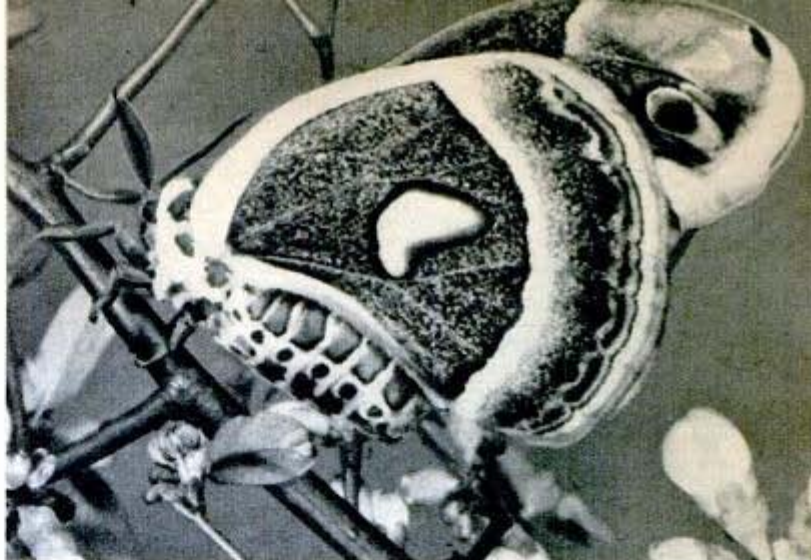
soon as a plant becomes withered or eaten away, a fresh one is added and sprinkled with water. Whenever I happen to notice a caterpillar going through an interesting phase of its development, it is easy to carry the plant containing the specimen into my cellar studio for a photograph. With this arrangement, a whole series of photographs on the life history of a moth or a butterfly can be prepared. When hatched out in captivity, perfect adult specimens may be obtained. Then, too, there is a period of inactivity shortly after the wings of a moth or a butterfly have expanded fully. The photographer can get several well posed shots of the adult at this period.

Advantage also can be taken of the fact that an insect usually becomes thoroughly inactive if chilled sufficiently. I often place an active insect in a refrigerator just long enough to reduce its activity without actually killing it. Then I place it in a suitable environment, and take the shot just as soon as the insect revives sufficiently to assume an alert pose.

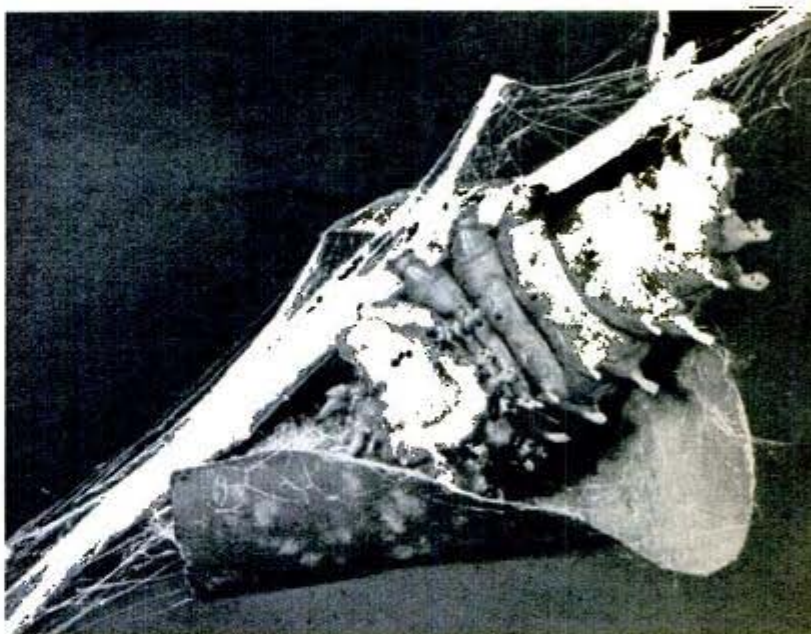
Late in the evening is a good time to get insect photographs afield with the aid of flash bulb lighting. The damp chill of the evening reduces the activity of many insects to the extent that they often can be photographed in a natural environment. When I find an inactive insect in the evening, I set up my camera on the spot and focus with the aid of a hand flashlight. I then make the shot with synchronized flash. I use small flash bulbs (G.E. No. 6) in my flashgun. It is surprising how many insects can be located and photographed by this method.

Before making an enlargement from a 35-mm. negative, I carefully study a contact print, and then mark the section that will make the most interesting insect photograph. Often only a small section of a negative is used in making a striking 8 by 10 enlargement.

All of this may, at first, sound extremely difficult, but once a photographer becomes acquainted with a few of the techniques of taking close-up photographs of insects, he will be carried along by its unending fascination, and his general knowledge of insect life will grow by leaps and bounds.



Cecropia moth above is resting before first flight. Picture was made with two No. 2 photofloods, shutter f:16, in one second



Cecropia caterpillar above is pictured spinning cocoon with leaf as framework. Below, bumblebee on milkweed at twilight, when many insects are easy to find in natural settings



JUST A TWIST OF THE WRIST



Chances are you never realized the complex pattern your hands make as they perform the simple tasks of everyday life. Some of these weird gyrations were traced by a photographer by means of double exposures. Above are the motions made by a man lighting a cigarette. Lines in the picture below show the movements for making a bed. The first exposure is made in darkness while the subject goes through the act with lighted bulbs tied to his wrists. In the second exposure a flash bulb is used to show the completed action



If you think your wife expends waste motion in fussing with her hat, show her what one woman's motions added up to in the top picture, where the lines seem to repeat themselves. The flashlight bulbs on her wrists (above) have wires running directly to two ordinary flashlight batteries taped together and tucked inside her belt

Blind Take Shorthand With Small 'Typewriter'



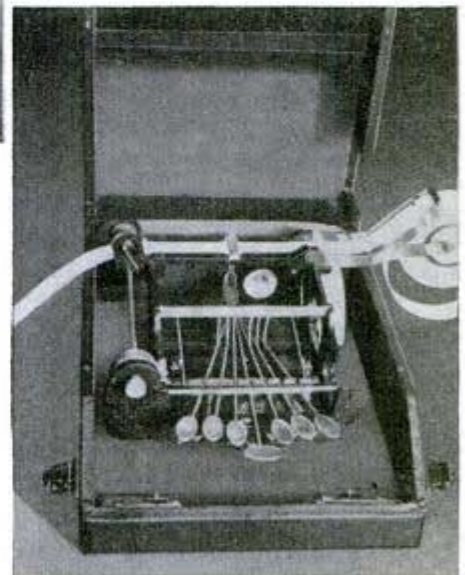
Braille tape slides over a table ledge as sensitive fingers touch it. Below, a closeup of the Braille tape



Above, a blind man taking dictation notes on a machine (below) which punches Braille characters onto tape



World War II has given the blind opportunity to show that they can perform many jobs as well as, if not better than, people with average sight. In England, for example, employers capitalized on the blind's talent for typing by making it possible for them to take shorthand notes on a specially designed machine which resembles a small typewriter. The machine has seven keys, the middle one acting as the space bar, which punch out Braille characters on a tape. To transcribe his notes, the blind typist "reads" the tape with his sensitive fingers and types out the words on an ordinary typewriter. The invention is helping solve the manpower shortage in offices and also enabling many unemployed blind people to "do their bit."



Lightweight Material From Sand Offers Highly Efficient Insulation

Your postwar blankets and hunting jackets and refrigerators may have their origin in a seaside sandpile. Experiments with an organic derivative of sand, or silica, have led to the development of Santocel, a highly efficient and extremely lightweight insulating material, twice as effective as cork in low heat transfer. General Electric research chemists found a method of making the material water-repellent, and Monsanto

Chemical company engineers are developing its textile phases. Millions of dead air pockets in a cupful of Santocel act as insulation. Used in fabrics, it promises blankets and garments weighing but a few ounces yet warmer than heavy furs and woollens. Monsanto predicts its use as wall insulation for postwar refrigerators which would offer 40 percent greater cubic content in the same kitchen space.



I COVER THE BATTLEFRONT

By Bert Brandt

Agne Newspictures War Correspondent

COVERING World War II with a camera is certainly much different from photographing the biggest home front stories—fires, floods and wrecks included. To begin with, the effective range of even a telephoto lens is only about 500 yards, while it seems as if any kind of German machine gun or rifle can shoot accurately at least 2,000 yards. If you're too far away when you snap a battle picture, the images are so small they can't be sufficiently enlarged for newspaper use, and if you're too close you're more worried about saving your neck than about getting a few pictures.

So you're on the move a good deal, trying to be at the right place at the right time.

After all, you can't tell them to fight the battle over

just because you didn't happen to be there when it was going on. I was with the infantry when it went into Cassino, Anzio, Normandy, St. Lo, Paris and Aachen and I know you have to stick right with the doughboys or you don't get any good pictures. Yes, and you have to have a lot of luck, too, to get anything exceptional.

I remember when we were on the Venafro Ridge in Italy I wanted to get a series of pictures showing our shells falling on the little German-held town of Conacasala. Three Rangers with whom I was living at the time volunteered to take me to a place where I would have a good view of the barrage. They led me about half a mile along

This shot of the razing of a town by U. S. shells was taken behind German lines



Photos by Bert Brandt

a ravine and then up through some bushes onto a rocky hill that overlooked Conacasala — a swell spot to shoot pictures. I immediately got out my 12-inch telephoto lens and went to work. But the view of the town was so good I became suspicious and questioned one of my companions. Blandly he told me we were behind the German lines. I gulped and peered around cautiously. From foxholes 60 yards away on the same hill came the unmistakable sound of German voices.

"Why don't they shoot at us?" I asked, shivering quietly.

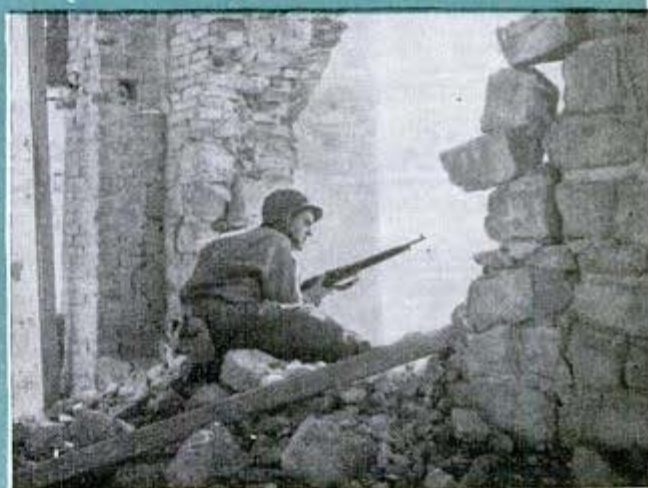
"Oh, sometimes they do and sometimes they don't," came the



Loaded down with invasion pack and with camera ready for quick shooting, Brandt (left) embarks for Anzio beach



The picture above captures the friendly greeting of French family as Yankees troop past their farm. Below, a rifleman of the U. S. Fifth Army hunts Germans in ruined San Vittore





GI and monk eye one another in first picture ever taken inside 13th century monastery. Right, raft ferry shuttles across Volturno River. Below, cameramen emphasize their identity during liberation of Paris



casual reply. Finally I settled down, and the Rangers stayed with me on that hill for almost two hours while I shot a whole series showing the destruction of the town by our artillery.

Even in the middle of a war a news photographer has to worry about getting his "hot" negatives back to the processing point while they are still news. He also likes to beat the official Army cameramen. Probably the greatest competition of that kind occurred during the invasion of Normandy, when each of more than 100 military and civilian photographers was determined to get his pictures back to London first.

The infantry outfit I was assigned to had the job of storming the little stretch of beach that was to have more casualties than any other that day. Be-



fore our LCT had even touched shore I began "shooting," for there were picture possibilities everywhere.

I waded ashore with 72 pounds of equipment hanging about me. This included a Speed Graphic with two lenses and a month's supply of film, 50 flash bulbs, color film, shipping envelopes, a Rolleiflex with 30 rolls of film and assorted filters, two canteens of water and six chocolate bars. For protection, I'd shoved my Rolleiflex and a supply of film inside a slit innertube, put a repair patch over the hole and inflated the tube to wear as a combination camera case and life preserver.

After dodging up and down the shell-riddled beach awhile, making pictures

as fast as I could change film, I became anxious to get the stuff back to London for developing and transmitting. As soon as I could, I hitched a ride on a Higgins boat that was going out to a destroyer. Aboard ship the skipper, who naturally had more important things to worry about, said he couldn't guarantee that he could get my films back to London. But I managed to "thumb a ride" on a small craft full of wounded en route to a troop ship, and I got them to take me across the Channel and put me ashore at Weymouth, England. There a transportation officer lent me his jeep and driver and I raced on to London.

Arriving there early on D-Day plus one, I found that my stuff was the first to get back and the censor labeled two of my pictures No. 1 and No. 2. Thanks to radio, these pictures were being published in papers all over the United States less than four hours later. Although none of the other cameramen, military or civilian, had beaten me, it wasn't really a world "scoop"



Fifth Army soldiers became khaki Santa Clauses on Christmas Eve when they distributed candy from gift packages to hungry Italian children. Below, infantry reinforcements plod into Normandy hills





Purely for comedy, these GIs and an Army nurse posed for Bert Brandt in a royal throne room at Naples. Right, an Allied truck burns fiercely after strafing by German planes "somewhere in Italy"

because the noncompetitive wartime pool agreement makes all war pictures available to everyone.

Under ordinary combat conditions the Army's public relations office takes care of shipping film back. In Belgium, for example, my captions and negatives are delivered to press headquarters, where they are addressed, put into a canvas bag and car-

ried by jeep to a Piper Cub field, then flown to the airport at Brussels. From there they go in a larger plane directly to London, where the news picture agencies have offices. After developing and censoring, the negatives are flown by bomber to the United States. Pictures of exceptional spot news value are transmitted to North America via radiotelephoto.

Usually I carry only about 15 pounds of photographic equipment. I keep the trusty Rolleiflex around my neck, the Speed Graphic in my hand, six film packs and my big 12-inch telephoto lens in a chamois inside my shirt, and roll film and a K ration in my pocket. This is not too heavy but it certainly gets in your way when you dive into a foxhole or try to dig one with your nose during a strafing or bombing.

A combat photographer doesn't have much time to fool around with "trick" shots. However, I did manage to capture what is reported to be the first battle scene ever made by moonlight. When the Germans were holding out in the Lagone, Italy, a British newsreel man and I went to the top of a hill



Assault troops hang 72 pounds of photographic equipment on Brandt as he heads for bloody Normandy beaches on D-Day

overlooking the little moonlit town to try to photograph the shells bursting in the night. I put my camera on a rock and made a 15-minute time exposure at f:5.6 which resulted in a most unusual effect. The moonlight brought out the buildings and the shells made a peculiar glowing effect in the dark. We stayed there until dawn. Then, when our infantry attacked, I made pictures of the sunlight glinting on the bayonets as the troops swept past. Soon afterward the Germans spotted us and sent a barrage of 88s our way. It killed 14 communications men dug in around us.

A month before the Allies took Cassino I decided to try for the first aerial pictures of the town. One of the Army's intrepid flying sergeants took me over the town at low altitude in a Piper Cub and I grabbed 12 shots through the open door of the cabin while a German rifleman drilled a couple of neat, round holes in one wing. As we flew back I was already congratulating myself on a "beat," but when the films were developed I got a shock. Shooting on the back shutter, I'd pulled the prize boner of forgetting to open the compur shutter in the front of the camera. All 12 plates were blank!

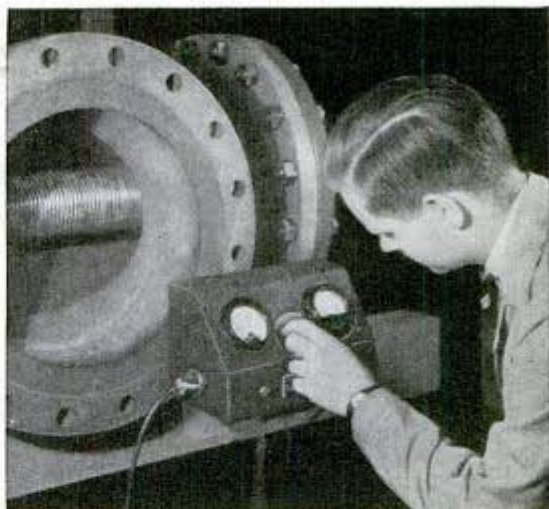
At Anzio my Rolleiflex was a casualty and I had no one but myself to blame. After landing with the first wave at 2 a.m. I stayed near the beach till after dawn to photograph the reinforcements and supplies coming in. German planes kept strafing until it got "under our skin." Once, to escape a low-flying Messerschmitt, I dived under a bulldozer but one of Jerry's .50-caliber shells went through the engine, dousing me with oil. It made me so mad I jumped up and pitched my valuable "Rollie" in the direction of the vanishing plane. Of course I didn't bring it down and I completely ruined the camera.

In GI slang, Anzio was "sticky business." The Germans, settled high in the surrounding hills, lobbed over shells at us on our narrow beachhead whenever they felt like it. The war was right on top of us every minute of the day and night. I could even sit in the bedroom window of the villa where I stayed and shoot pictures of the Jerry dive bombers trying to hit the ships a half mile out in the harbor. I got one shot that way which showed a stick of four bombs falling all around some Liberty ships. When I left the beachhead some time later on an LST a strafing's bullet hit the deck nearby and a piece of it ripped through the back of my camera but luckily did no damage to me.

There have been a number of close calls, each of which scared the devil out of me. Near San Vittore, Italy, I was with attack-

(Continued to page 148)

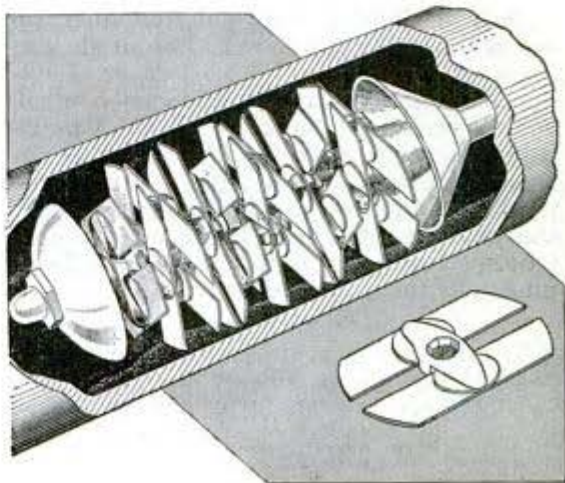
Portable Vacuum Gauge Unit Reveals Leaking Parts



An all-metal thermocouple vacuum gauge unit which is easy to carry about and plugs into any 110-volt a.c. outlet has been developed by the National Research Corporation, Boston, Mass. The gauge is enclosed in metal. Direct pressure readings in microns from 1 to 1,000 may be obtained. Parts in vacuum systems suspected of having leaks are sprayed with acetone or ether and if a leak is present a sudden increase in the apparent pressure reading will occur.

11-Blade Tool Shaves Boiler Flue Of All Carbon Deposit

To remove the tiniest specks of packed soot and scale which usually remain on a boiler flue after it has been cleaned, an 11-blade cutting tool literally shaves all carbon deposit from the inside walls of a flue. The tool is rigid when straight but folds into any position when it is necessary to reach places where the boiler is too close to the wall to use straight cleaner rods.





Jeep Is Welding Shop on Wheels For Battle Line

"Welder-jeeps" provide mobile shops for repairing damaged trucks and tanks right on the battle line, whether it is a muddy field or hilly terrain. The quarter-ton jeep accomplishes what formerly was done by a 5-ton truck towing a 1½-ton trailer. Power to operate the welding unit comes from a V-belt connected to the jeep's engine. When the vehicle stops, the power is turned on. The unit is substituted for the right front seat of the car, allowing it to carry a crew of three comfortably. For airborne operations, the jeep can be loaded into a plane. The Army Air Forces use a mobile metal shop to repair internal ailments or the lacerated "skin" of bombers. Powered with a one-cylinder gasoline engine, this vehicle carries an air compressor for pneumatic riveting and a generator for electric drill motors, in addition to two air storage tanks.

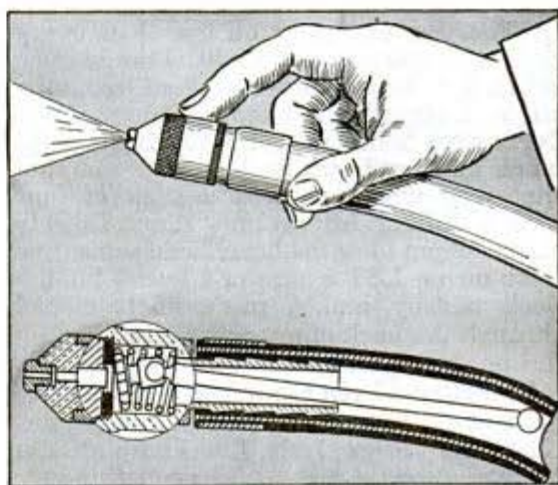


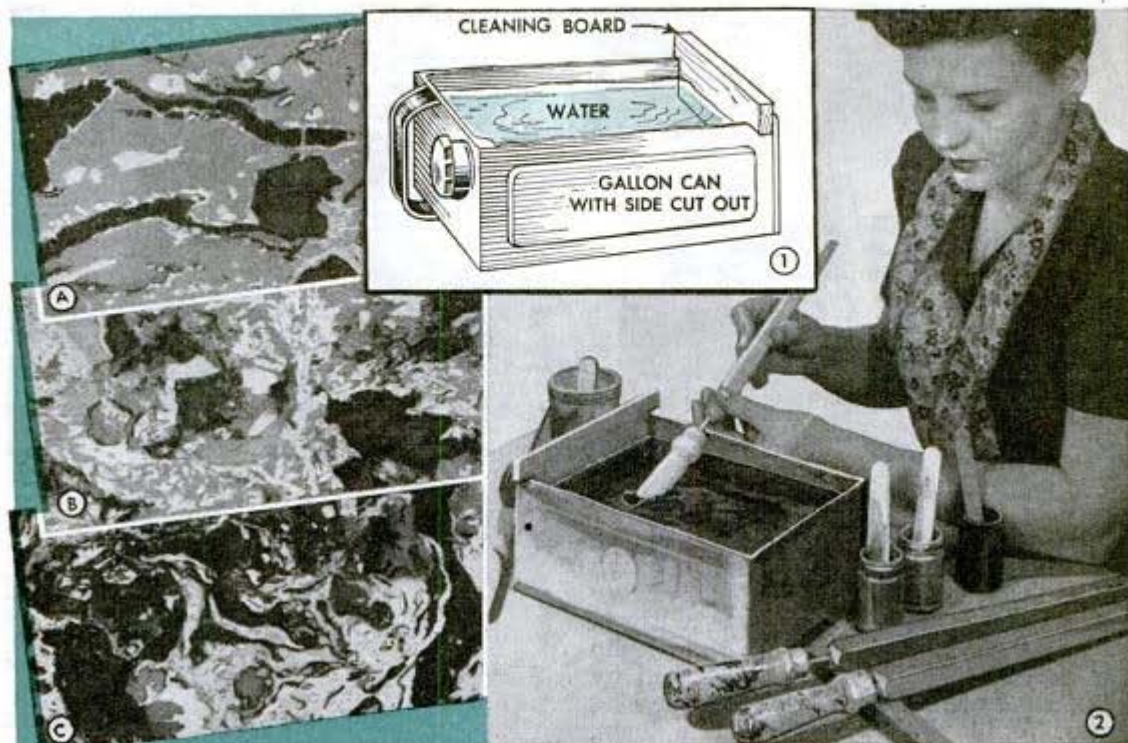
Tank track is welded with unit brought by "welder-jeep," top. GIs repair skin of B-24's nose, left, with mobile metal shop

Fingertip Flex of Air Gun Opens Valve for Small Puff or Full Blast

Only a slight pressure of the fingertip opens the valve of a new leakproof air gun for a small puff or a full blast of air. Flexing the hose gives instant and easy control, and air pressure helps close the valve tightly when the pressure of the finger is released. A special ball and socket valve joint has only two moving parts, reducing the problem of wear. There are no protruding levers or buttons, and the head unscrews for easy cleaning.

☐ The British aircraft industry expanded from 24,000 employees in 17 major factories as of January, 1939, to 1,731,000 employees in more than 15,000 factories at the close of 1944.





Water-Float MARBLE FINISH

PRODUCING imitation marble by means of colors floating on water is a novelty technique used in finishing turnings, handles, small boxes, etc. The work itself is child's play, but the production of a specific design in direct imitation of a certain kind of marble demands considerable experience and practice. You can use this finish on any material—glass, paper, metal or wood. Wood should be coated previously with lacquer of suitable color to obtain a smooth working surface.

On a small scale, the work can be done nicely in a 1-gal. paint can having one side removed as shown in Fig. 1. Fill this nearly to the top with cold water. You will need a film solution made up as indicated in Fig. 3. Also, you will need several colors in japan, which can be obtained in either tubes or cans, the latter being the best since only the pigment is needed and the fluid floating on top can be poured off. Reduce the paste with lacquer thinner, mixing it well, to a consistency a little thinner than you would use for brushwork.

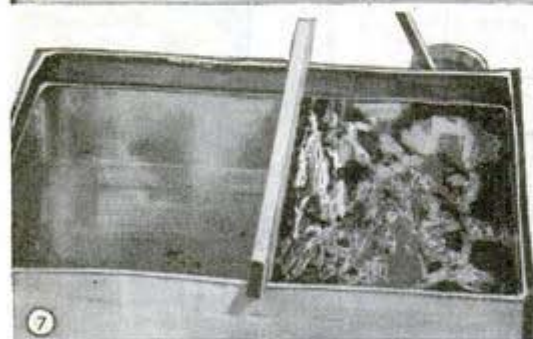
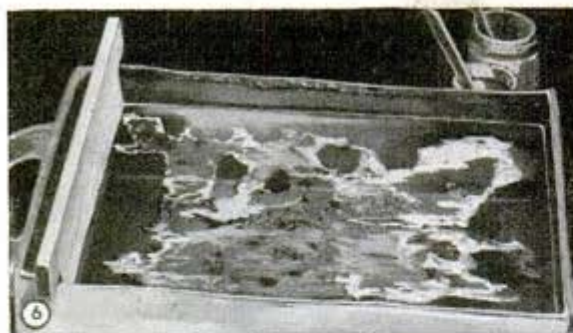
The actual finishing schedule is started by putting a few drops of the film solution on the surface of the water. A lot of solution is not needed; all you want is a thin, almost invisible



FLOAT COLORS ON WATER



DIP WORK FACE DOWN

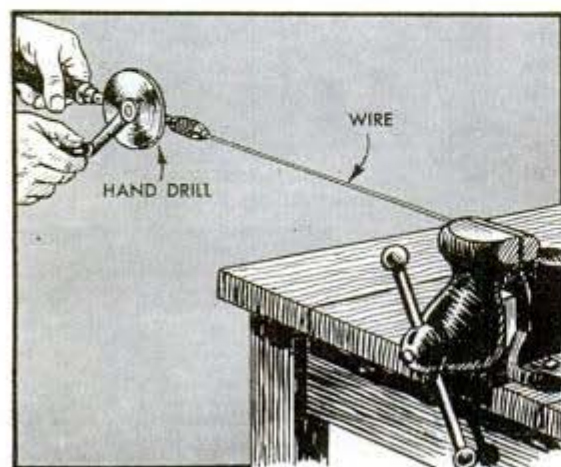


film. Next, pick up any color on a thin piece of wood and draw the paddle through the water as in Fig. 4. Repeat with other colors, mixing the whole pattern gently to get whatever effect you desire. Finally, dip the work. Good practice can be had by using small pieces of white cardboard. Flat work like this is always dipped face down, Fig. 5. The color design floating on water adheres instantly to the underside of the card, which then is withdrawn immediately. Typical designs are shown in illustrations A, B and C. If the work is a turning, it should be placed on the surface of the water and then rotated to pick up the design as in Fig. 2.

Any kind of color combination can be used in this work, ranging all the way from brilliant multicolor effects to soft brown and black tones in imitation of wood grain.

The cleaning board, Fig. 1, is pushed from one end of the tank to the other to skim off any surplus film after each operation. Also, it can be used to compress the design as shown in Figs. 6 and 7. In the dipping process, the paint film will adhere to all surfaces so that suitable protection must be given any area that is not to be treated. This is illustrated in Figs. 8 and 9, where the inside of the box and the inlay on the lid are masked. After dipping, the work should dry overnight.

Kinked Wire Straightened by Twisting It With Hand Drill



It is a simple job to straighten small to medium sizes of wire by using a hand drill as indicated. One end of the wire is held in a vise or other suitable clamp, and the other end is gripped in the chuck of the drill. By rotating the drill and pulling on it at the same time to keep the wire taut, the wire will be straightened. It takes only a little twisting to do the job.

Dampening Clothes for Ironing

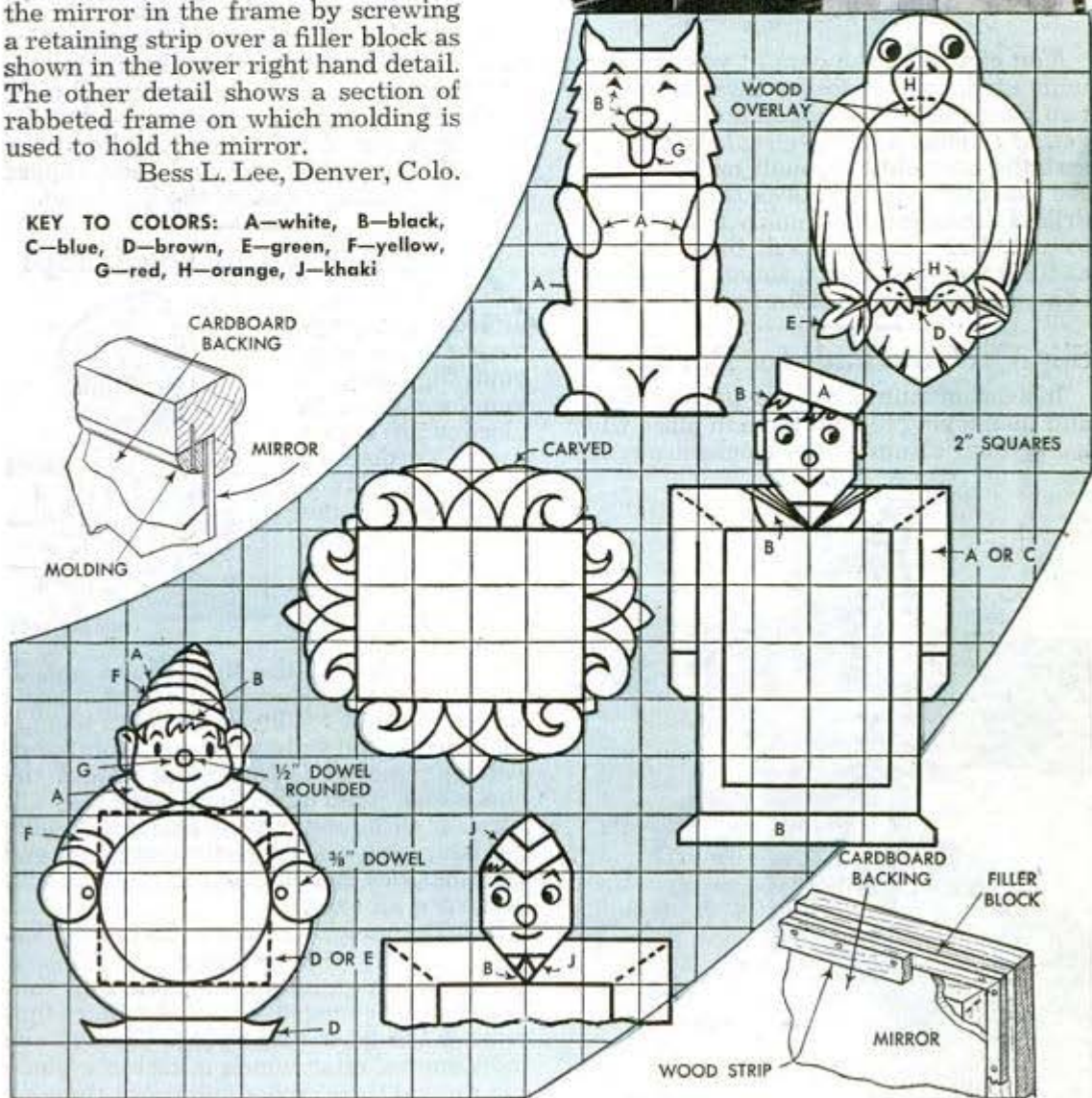
You can save time and work on washday by dampening the laundry to be ironed before removing it from the clothesline. This can be done easily and quickly by means of a fine spray from a garden hose.

NEW FRAMES on Old Mirrors

IF YOU have an old mirror that is still serviceable even though its frame is worn, you can dress it up for a child's room by adding one of these amusing frames. Any size mirror will do, as the frames can be made to the proportions shown in the cross-hatched pattern. Frames with legs can be screwed to a dresser top. Children will like the elf design especially as it has dowel pegs projecting from the hands for holding ties, necklaces and similar articles. White pine or plywood is suitable for most frames, but hardwood is best for carving. If you use plywood, secure the mirror in the frame by screwing a retaining strip over a filler block as shown in the lower right hand detail. The other detail shows a section of rabbeted frame on which molding is used to hold the mirror.

Bess L. Lee, Denver, Colo.

KEY TO COLORS: A—white, B—black, C—blue, D—brown, E—green, F—yellow, G—red, H—orange, J—khaki



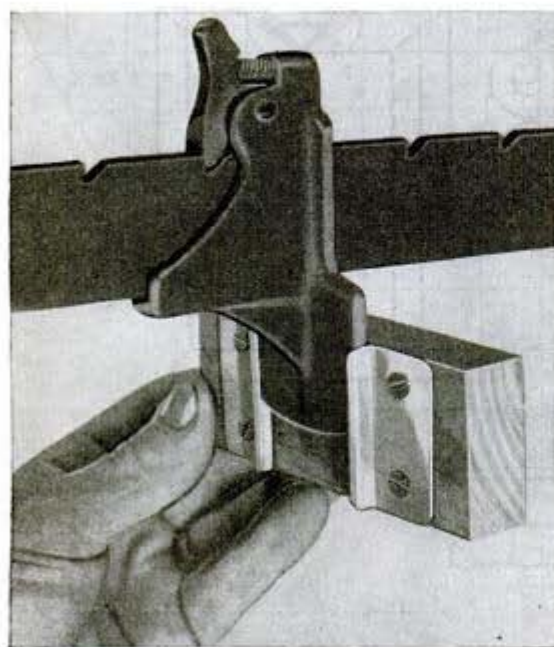
Hooks Locked on Rowboat Seat Prevent Loss of Oars



You can leave the oars in your rowboat without danger of losing them if you use two pieces of metal shaped and riveted together as shown in the circular detail. Insert the assembly through an opening in the seat and snap a padlock through a hole drilled through the assembly near the lower end. Since the hooks fit the oar shanks at their narrowest part, there is no chance of loosening them until the lock is removed.

Slip-On Glue Pads for Bar Clamp

Instead of hunting for a pair of blocks and then trying to hold them in place when using a bar clamp where blocks are neces-

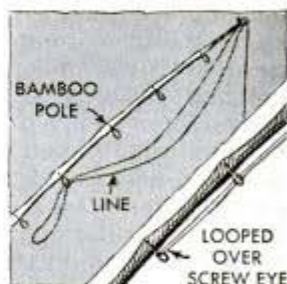


sary to protect the work, why not make a pair of blocks that can be slipped over the clamp jaws as indicated? You can shape pieces of sheet metal and screw them to the blocks so that the latter can be slipped on and off the jaws.

Burl Knutson, Bismarck, N. D.

Screw Eyes in Joints of Fishpole To Shorten or Lengthen Line

To permit quick and easy shortening or lengthening of his fishline, one fisherman drove screw eyes into the joints of his bamboo pole. The line is attached permanently to the eye at the end of the pole through

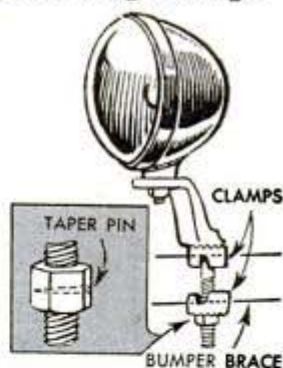


which it is looped and pulled back to slip over one of the eyes in the joints, according to the length required. Simply looping the line over one of the screw eyes will often hold it for all ordinary purposes, but for additional security the loop may be passed through one screw eye and then slipped over the next eye nearer the hand end.

Avoiding Theft of Fog Lamps

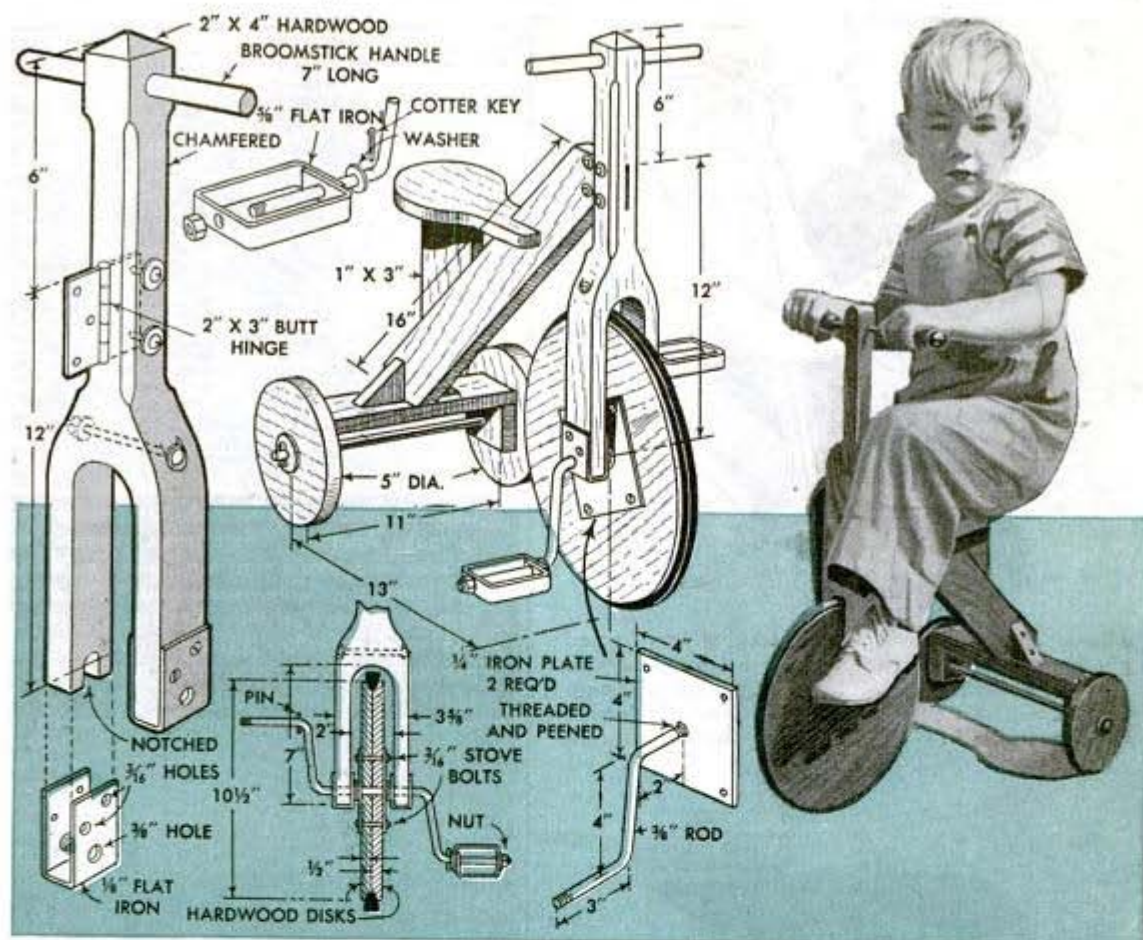
It will be very difficult for anyone to remove your fog lamps if you lock them in place with taper pins. To do this, merely drill a small hole through the nut and bolt that attaches each lamp and drive in a taper pin. Then file both ends of the pin flush with the sides of the nut. If necessary, paint over the ends of the pin so that it is not readily seen. With this arrangement, the only way that the lamps can be removed is to first drive out the pins with a small punch, and since they are not easy to locate, anyone desiring to take the lamps must necessarily work fast and will likely let them alone if the nuts cannot be turned off easily.

Pvt. Bernard Tolk, Camp Claiborne, La.



To remove an old oil-filter element that hasn't been changed for a long time, first remove the filter drain plug. This breaks the vacuum, after which a hacksaw blade run around the element will break the seal.

Wooden Tricycle Has Rubber-Tired Front Wheel



This tricycle will stand a lot of hard use and is easy to pedal because the front wheel has metal bearings. The rear wheels are merely hardwood disks rotating on a rod axle. If desired, however, the wheels can be bushed to provide metal bearings with pipe or tubing that has been reamed to a good fit on the axle. The front wheel consists of two hardwood disks glued together with the grain at right angles and V-grooved in the center to take a V-belt, which serves as the tire. This should project $\frac{1}{8}$ to $\frac{1}{4}$ in. above the edge of the wheel. It is held in place by a waterproof adhesive and finishing nails, the latter being countersunk well below the surface of the belt. Bearings for the front wheel are U-shaped pieces of $\frac{1}{8}$ -in. flat iron. To assemble the axle, which is two lengths of rod, to the front wheel, first, thread both ends of the rods and bend them to form the pedal cranks. Then, drill and tap two metal plates in the center, slip the bearings over the ends of the rods and screw the rods into the plates tightly, peening or riveting the ends. Next, screw the plates to the wheel, being careful to locate them so that the peened ends of the rods are exactly in the

center of the wheel. Now, slip the bearings over the ends of the fork, which are notched to receive the axle, and screw them in place. The pedals can be made of flat iron as indicated, or you can use wooden blocks drilled to slip over the rods, where they are held by washers and nuts. The fork is pivoted to the frame with a strong butt hinge, which is set into slots in the fork and end of the frame member, and is reinforced by a bolt as shown.

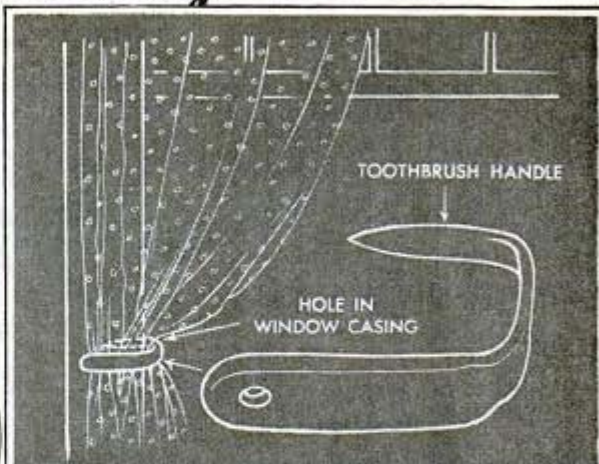
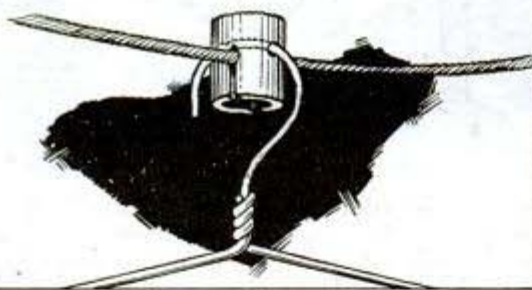
Preserve Roots in Transplanting

To keep the soil on the roots when transplanting, thus assuring minimum losses and sturdier plants, one gardener marks off the soil in his flats into squares, placing only one plant in the center of each square. When they are large enough to be transferred, he moistens the earth well and with a knife cuts through the dirt along both sides of these squares. Then if one side of the flat is removed, the square of soil with the plant in the center can be lifted out with a pancake turner or similar tool and planted intact, considerably lessening the dangers of transplanting.

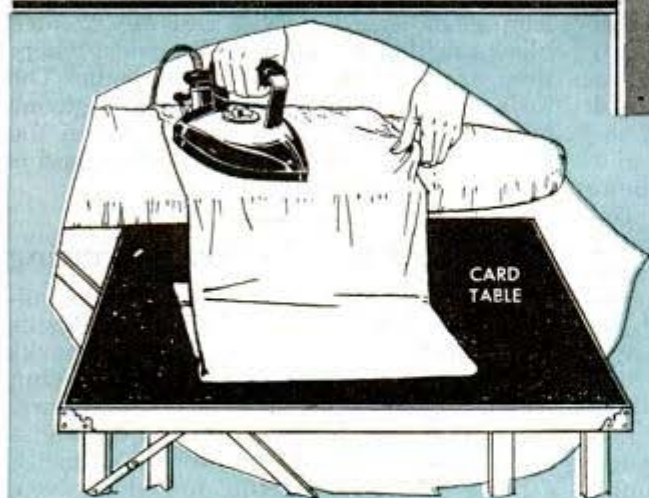
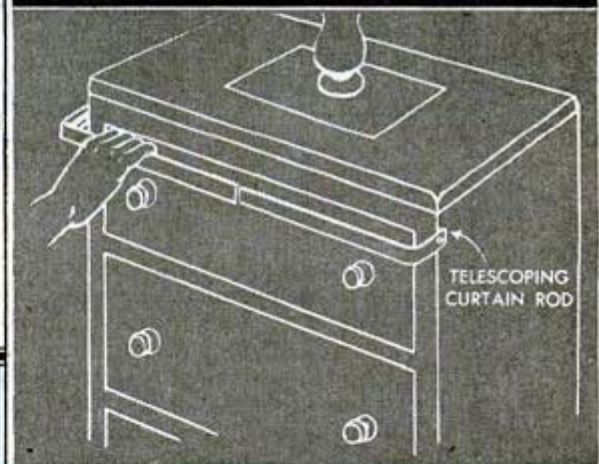
Solving HOME



Above: Dust can be kept from seeping into framed photographs or pictures if the edges are sealed with gummed or adhesive tape. Below: Garments on hangers will not slide on a clothesline if hangers are hooked through a hole in a length of hose slotted as shown



Colorful tiebacks for kitchen curtains are easy to make from old toothbrushes. Remove the bristles and shape the handles as indicated. The pointed ends are inserted into holes drilled into the window casings. A telescoping curtain rod used as below provides an adjustable measuring stick to determine if a piece of furniture will fit into a certain space in a room



Left: To keep curtains and other long pieces from falling to the floor and becoming soiled while ironing, open a card table and place it under the ironing board just beneath the work. Right: The inconvenience of losing or misplacing the spout cover of an oilcan is avoided if a cork is glued to the cap of the can. The cover then is placed on the cork while oil is poured, keeping it readily available

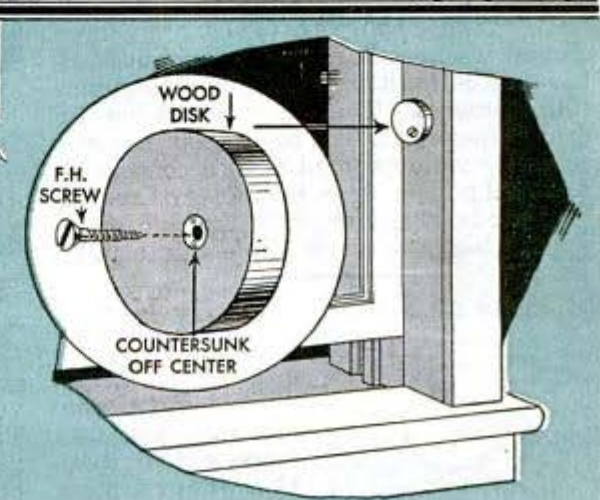
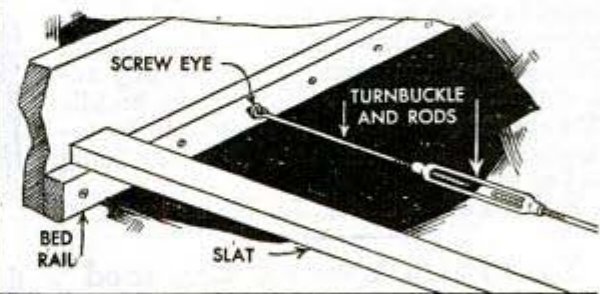
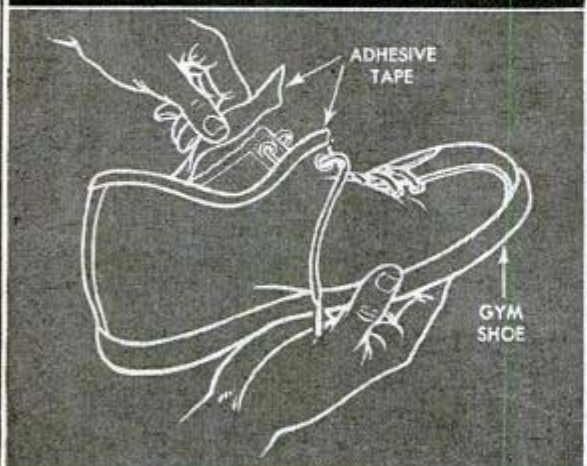
PROBLEMS



Hinged into the lower part of a screen door as above, a smaller door will enable your dog to enter or leave the house at will. Screen-door springs exerting equal tension on opposite sides of the door keep it closed yet allow it to be pushed inward or outward. Below: Worn binding on edges of canvas shoes is easily repaired by covering it with strips of tape



Above: Simple, space-saving hat racks can be formed from heavy wire in a few minutes and stapled to any convenient door. Below: If bed rails are warped and allow the slats to fall, attach a turnbuckle and rods between the rails to pull them back into line



Left: Children cannot lock themselves in a room, making it necessary to remove the door from the hinges, if the lower slot in the lock strike is filled with window putty, which can be chipped out when no longer needed. Right: To hold windows open when not equipped with weights or catches, simply screw a wood disk to the frame off center so that when it is turned toward the window it will wedge against it tightly

Newsboy Removes Papers Easily From Under These Weights



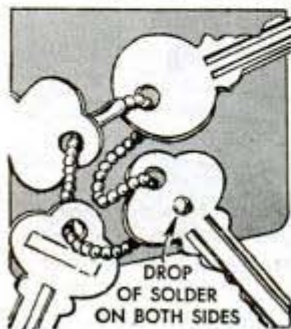
One newsboy who uses his wagon for delivering papers fitted the wagon with a pair of iron-bar weights as indicated. The weights work in channels formed by nailing wooden cleats to the sides of the wagon. In this way, the weights automatically adjust themselves to the height of the bundle of papers, and permit one paper to be removed at a time without the bars sliding out of place.

Norman McCormack, Jr., Kenmore, N. Y.

Two Extra Uses for Gummed Reinforcement Eyelets

Small washers having the toughness of fiber can be built up with gummed-paper reinforcements. These are available in various diameters. The completed washers are easily waterproofed with a coating of fingernail polish. Also, portholes on model ships can be simulated with the reinforcements, which are stuck in place in a jiffy.

Drops of Solder Identify Key



If your key ring or chain contains several keys, one of which you use more often than the others, you can mark this one so that it can be distinguished from the others quickly in the dark—even while

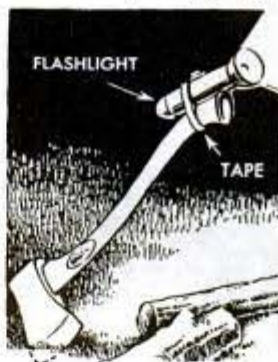
it is in your pocket. Merely drop a small lump of solder on each side of the bow, as shown. Of course, soldering flux should be used to make the solder adhere permanently.—Tony Boharski, Chicago, 1930.

Shipping Tag Used In Loose-Leaf Binder

Especially handy for school children, this page marker can be attached or removed without opening the rings of a loose-leaf binder. It is made by cutting off one side of a shipping tag and then cutting through one side of the reinforcing washer as indicated. The slot, being somewhat narrower than the diameter of the ring, will keep the tag from slipping off.



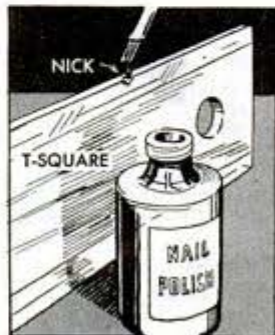
Flashlight Held in Any Position By Taping It to an Ax



When a camp chore requires that a flashlight be held at a certain angle for a time, tape it to the handle of an ax driven into the ground or a stump. This idea is especially handy when dressing game away from the tent or cottage.

Nicks in the Edges of a T-Square Filled in With Nail Polish

When a T-square becomes nicked along the edges, nail polish, which dries to a glass-like finish, can be used to fill in the small depressions. After the polish has dried, the edges of the square are scraped smooth with a razor blade. This treatment also is excellent on triangles and similar drawing instruments that have been nicked.—Cpl. Wallace B. Case, Colorado Springs, Colo.



Place Cards Made With Egg and Nut Shells

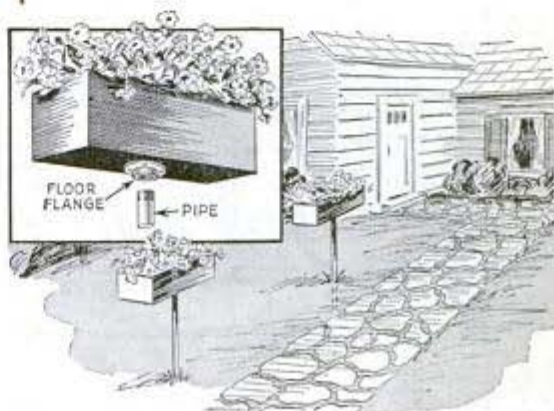


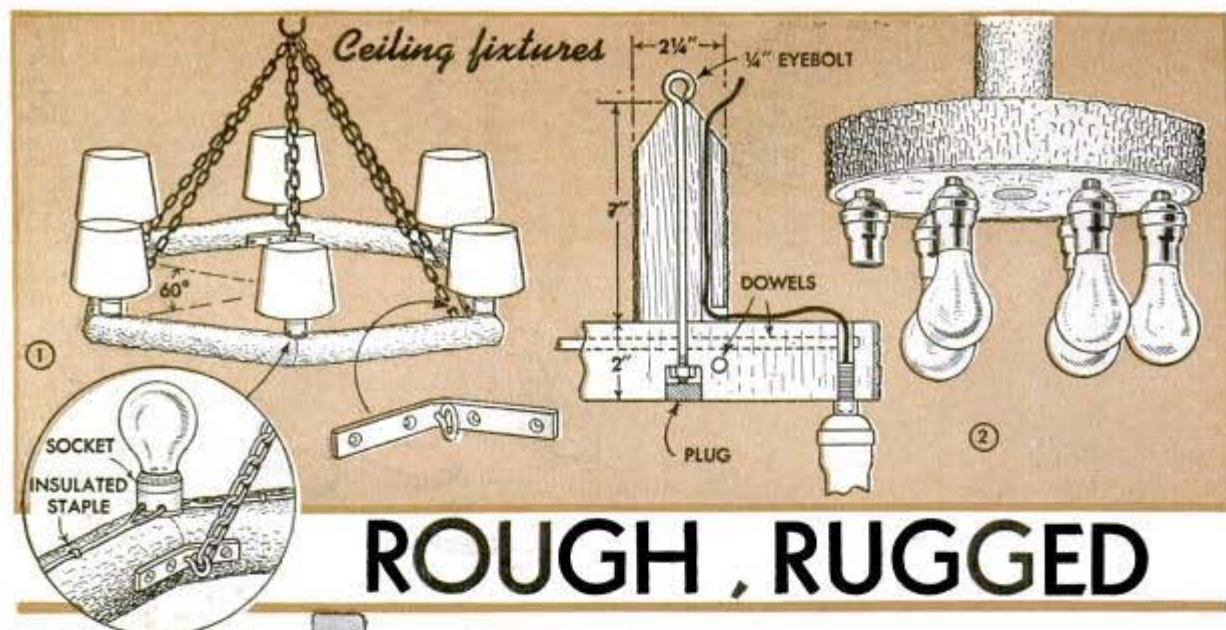
Clever place cards often are remembered longer than any other feature of a young people's party, and are usually taken along by the guests as a souvenir of "a grand time." Three such place cards can be made with the shells of eggs and nuts, a few gum drops and plain white cards. The demure little lady assigned to May is an egg shell, its contents drained out through tiny holes pierced in each end. The empty shell is set on a slice of colored gum drop, which is roughened so that it will cling to the card. Another slice of gum drop forms the hat, which should be set at a jaunty angle. Hair is painted on with water color or you can use a crayon. Eyelashes and nostrils are done with India ink, and the mouth is formed with a small gummed-paper heart. A broken egg shell is used for the boat which decorates Mildred's card. It is attached to

a card with glue or clear nail polish, and a matchstick mast is set into a wad of sealing wax or paraffin. Wavy lines drawn across the card to denote the water, and an appropriate name for the ship, lettered around the rim of the shell, complete this favor. The tortoise, of course, has a shell—in this case, half a walnut shell, which is attached to a card with glue or clear nail polish. It is positioned so that there is room enough to sketch in four legs, a head and a tail, using India ink or poster colors. In the latter case, the body can be painted a dark green, with bright yellow and black markings. This treatment will produce a realistic-looking tortoise.

Removable Flower Boxes on Pipe Stakes Ornament Lawn

One home owner produces beautiful effects around his home by supporting flower boxes on stakes. In this way, he can have both flowers and grass along a walk or any other place desired. The boxes can be arranged individually, in rows or grouped to simulate small flower beds. When the blooming season for the flowers is over, the boxes can be removed, leaving the landscape unmarred. Also, the boxes are interchangeable. You can replace a box of flowers that have finished blooming with some that are just starting. The stakes are made of pipe and screw into floor flanges on the underside of the boxes.





ROUGH, RUGGED

Part 4: Lamps, Tables, Shelves and Book Ends

A DEN, playroom or spare room furnished in rustic style is not only pleasing and unusual in appearance, but it can be done inexpensively. A ceiling fixture, floor lamp and a novel little wall lamp will give you a start, which you can follow with a pair of book ends, tables, wall and bric-a-brac shelves, and even a gun rack if you are sports minded.

The hexagonal ceiling fixture in Fig. 1 is made by mitering six pieces and toenailing them together, using angle plates to reinforce the joints. Screw eyes at each plate take chains by which the fixture is suspended. Lamp sockets are sign receptacles of the type fitted with wood screws for attaching them, and are wired in parallel, the wires running along the top sides of the fixture where they are held by insulated staples. Another form of fixture with six lights is shown in Fig. 2. The wood disk carrying the bulbs is doweled to prevent splitting, and a sturdy eyebolt through a vertical piece or stem holds the assembly together. Notice that bulb sockets are attached by means of nipples screwed into undersize holes in the wood. You can purchase these nipples from most hardware stores or stores handling electrical equipment. Four curved branches of about the same radius and size can be used in making the novel fixture in Fig. 5. This is doweled to an exposed beam.

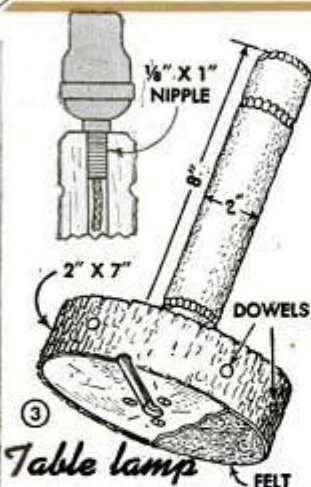
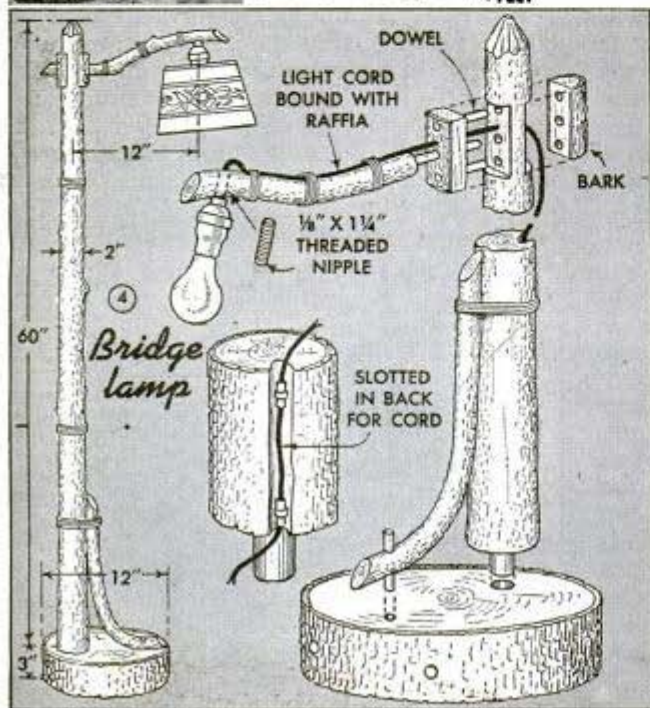
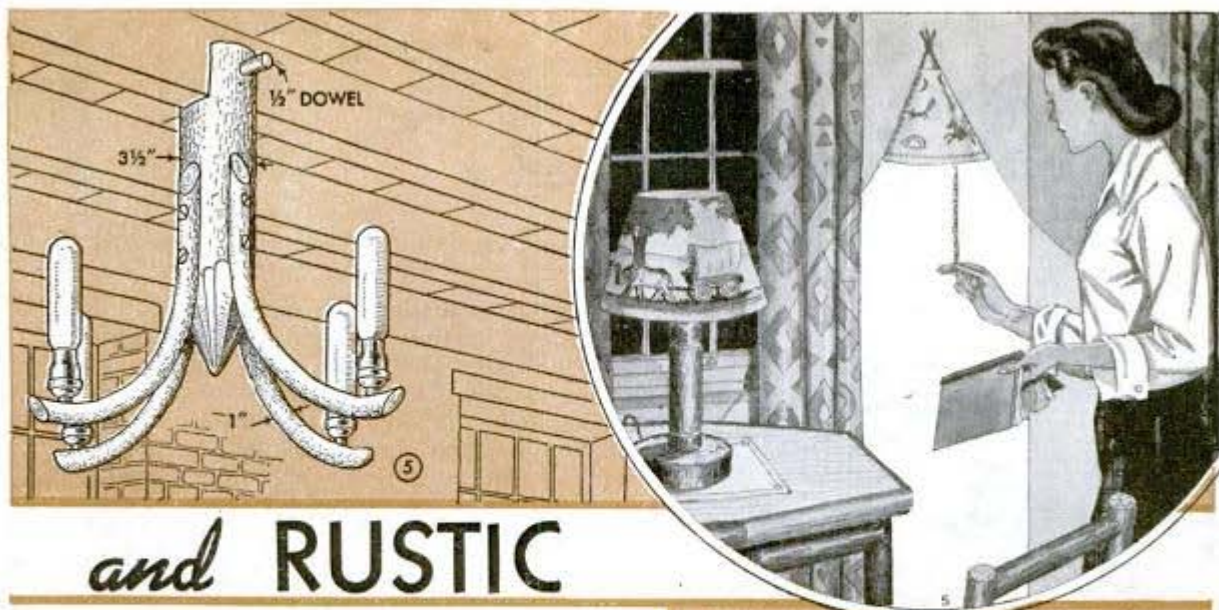


Table lamp



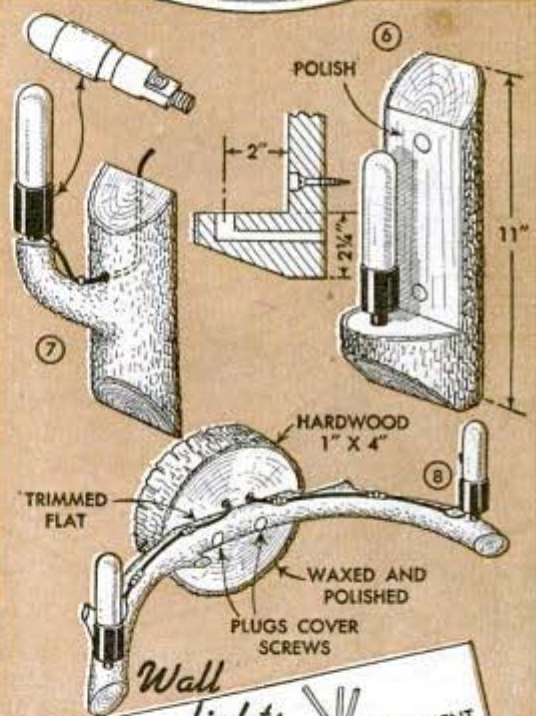
Bridge lamp

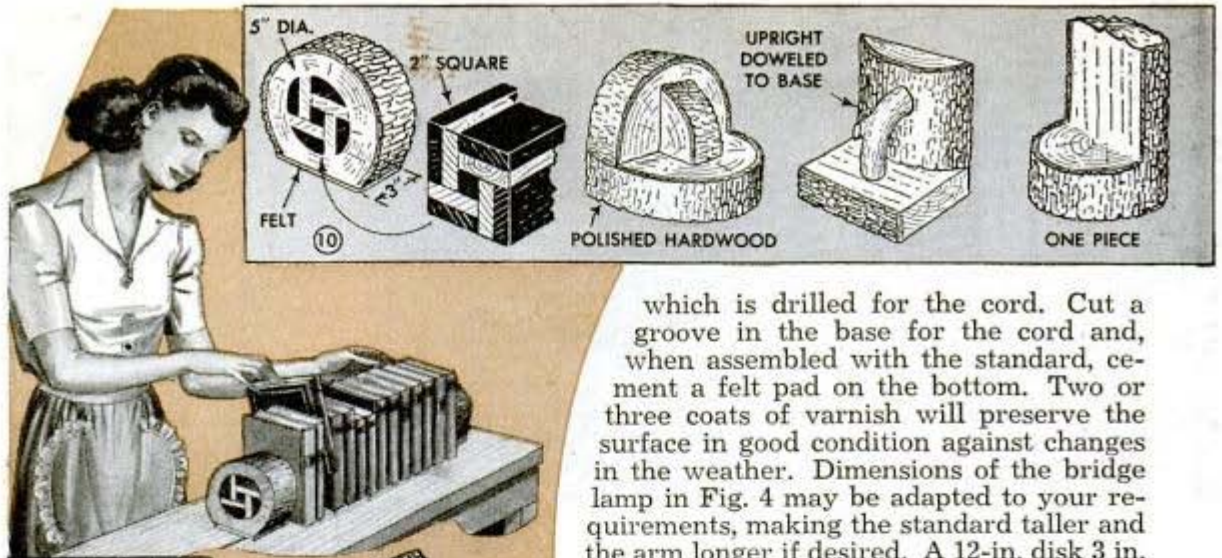


and RUSTIC

Crotched branches can be trimmed to make attractive wall fixtures as in Fig. 7, using candle-type bulbs. A simple sconce is shown in Fig. 6, and a double-bracket type in Fig. 8. The finished surfaces of these fixtures should be waxed and polished. The tepee lamp shade in Fig. 9 is designed to cover a close-in wall bracket. Two semicircular rings are made of heavy wire. These are spaced and held by twig poles bound on with thread and shellacked over. The parchment is sewn on after the figures have been painted on in oil. These should be done in crude silhouette as in the left detail of Fig. 9, each in a solid color.

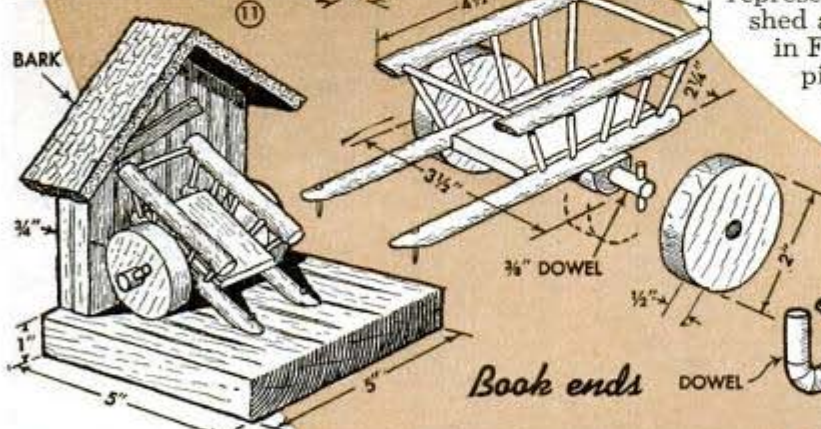
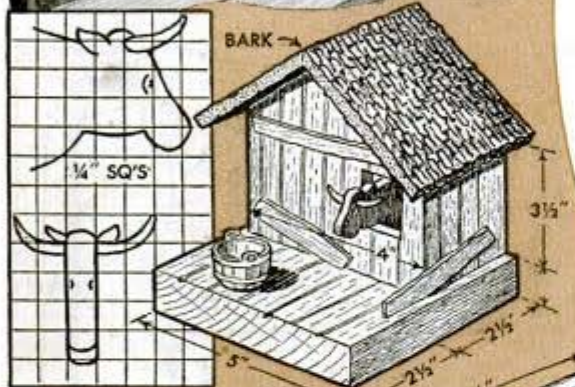
The table lamp in Fig. 3 can be made of practically any wood, but the base piece should be of a wood that does not split readily. In any case, it is well to reinforce it with wooden dowels driven in after glue has been applied to the holes. Drill a hole in the center of the base to take a 1/2-in. metal tube with a force fit. The tube serves as a hollow dowel to fit in the standard,



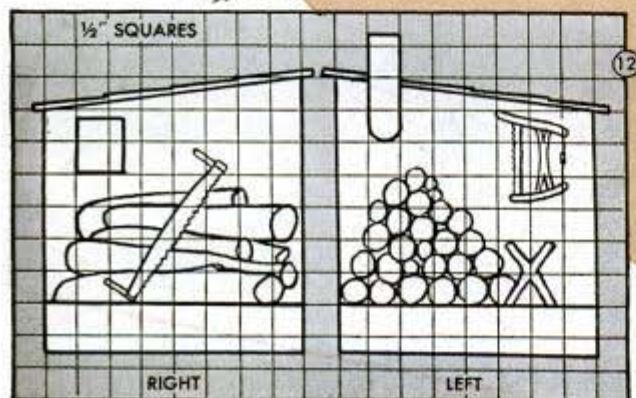
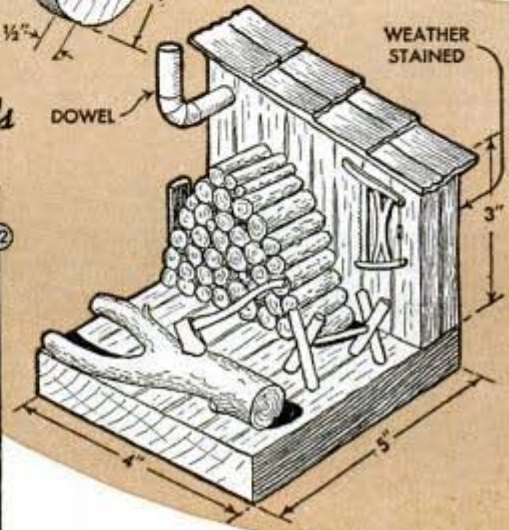


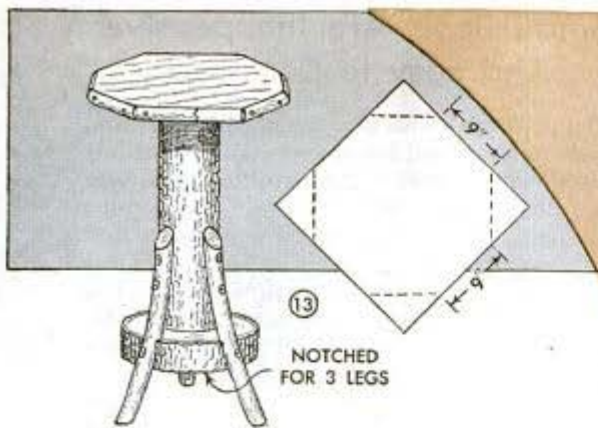
which is drilled for the cord. Cut a groove in the base for the cord and, when assembled with the standard, cement a felt pad on the bottom. Two or three coats of varnish will preserve the surface in good condition against changes in the weather. Dimensions of the bridge lamp in Fig. 4 may be adapted to your requirements, making the standard taller and the arm longer if desired. A 12-in. disk 3 in. thick makes a base heavy enough for stability. This base also is doweled to prevent splitting. Notice that the cord is hidden in a groove at the back of the standard where it is held by insulated staples.

Fig. 10 shows four types of book ends. A solid section of hardwood log is bored for a 2-in. inlay core to make the one at the left. The core is built up of contrasting woods and turned in a lathe for a force fit. Walnut, maple or white pine are suitable for the core. A more elaborate pair of book ends representing the familiar woodshed and cordwood is pictured in Fig. 12. The left one has a pile of wood already cut, with an ax, sawbuck and saw in miniature.



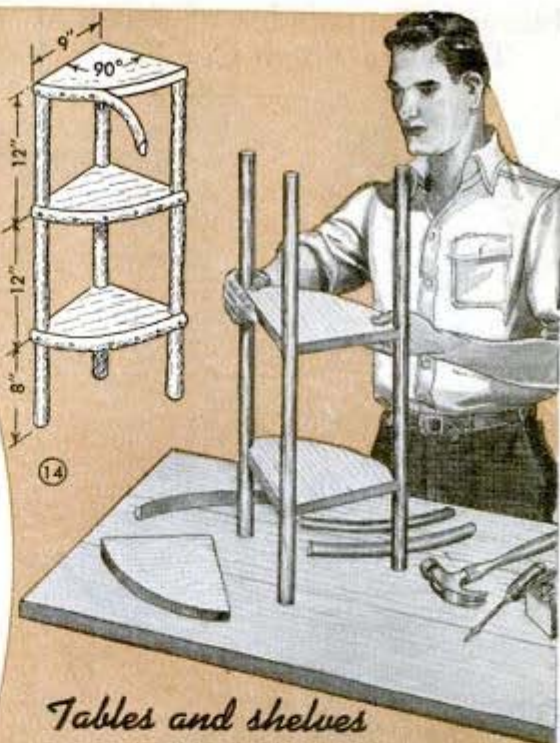
Book ends



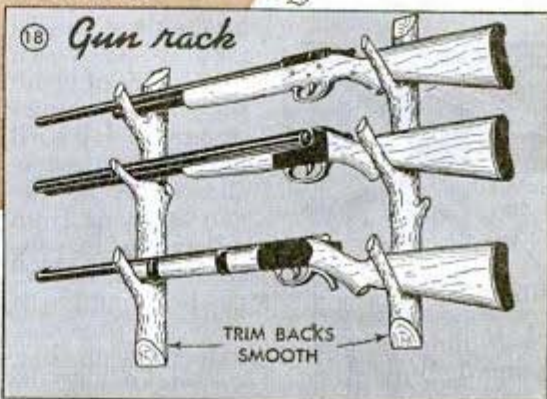
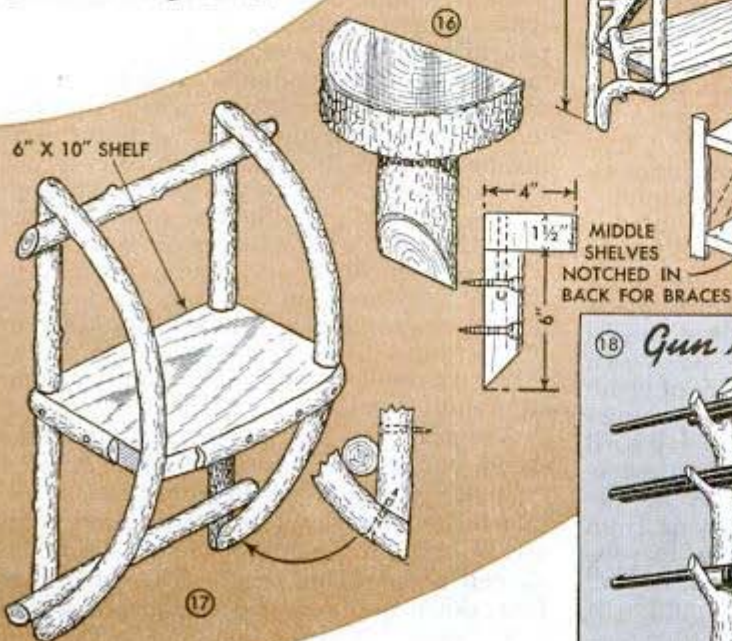
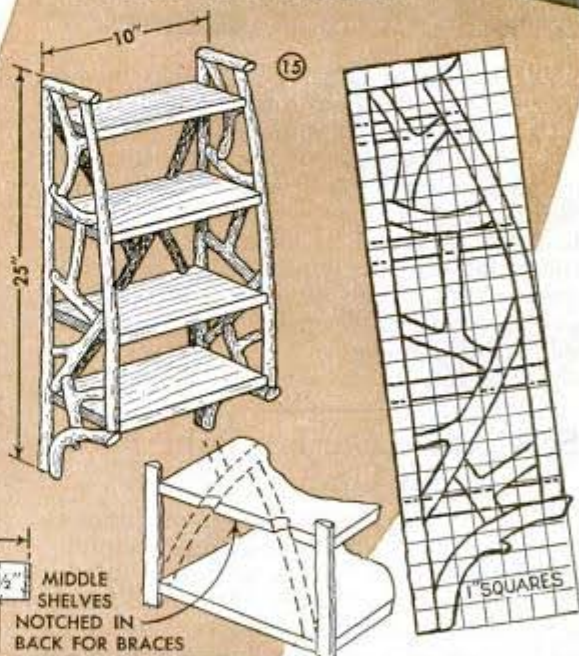


These can be carved from hardwood or balsa and all given a weather stain. A pioneer farm motif is illustrated in the pair of book ends in Fig. 11, on one side the ox cart and on the other an old barn. The cart is built of twigs with wheels cut from a 2-in. stick. The barn is a solid block of white pine, scored to resemble plank joints.

An attractive stand for a potted plant is shown in Fig. 13. It is made of logs, except that the top is an octagon-shaped piece. A neat clock shelf is given in Fig. 16, and a simple wall shelf in Fig. 17. The corner whatnot in Fig. 14 consists of three shelves mounted on rustic legs, the front edges of the shelf being covered with split-willow molding. The hanging whatnot in Fig. 15 has side frames of irregularly shaped sticks. The gun rack in Fig. 18 is made from branches spaced as nearly alike as possible.



Tables and shelves



Filing Saber Blades of Scrollsaw To Make Them Cut Faster

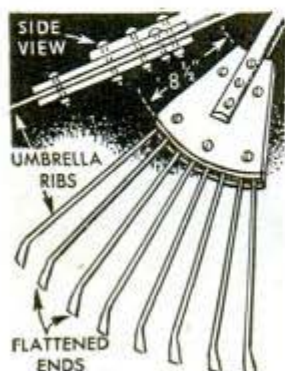


The action of saber blades can be improved by filing them in a manner similar to that of combination blades for a circular saw. First, file the faces of the teeth square across as for rip saws and then bevel the backs about five degrees away from the direction of set. This adds knife points to the teeth and thus considerably speeds up crosscutting. The ripping speed of the scrollsaw will not be affected by filing the teeth in this manner.

Edwin M. Love, Palmdale, Calif.

Serviceable Garden Rake Made From Umbrella Ribs

A serviceable garden rake strong enough to gather fallen leaves and grass clippings, yet flexible enough not to injure tender growing plants if accidentally pulled across them, can be made from a few umbrella ribs flattened at one end and held in place



by being clamped tightly between two pieces of $\frac{1}{4}$ -in. plywood or hard-pressed board bolted together as shown. A handle can be made from a length of broomstick notched at the lower end to fit over the plywood. —Irving Prideaux, Seattle, Wash.

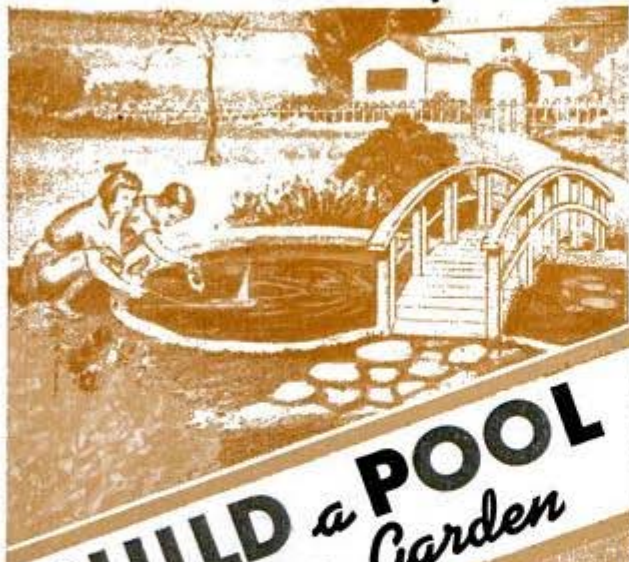
Small Pools Are Inexpensive And Easy to Construct

An informal pool and rock garden is one of the easiest and least expensive methods of improving your home grounds, and you get immediate results—there's no expensive grading, dirt moving or waiting one or more years for grass, trees or shrubs to develop. Just scoop out a shallow depression in the ground and pour some concrete. Then place a few rocks and set out appropriate flowers and plants. You can do all the work yourself, and the pool can be as elaborate as you wish. The pools pictured illustrate the two extremes. The one in the upper right-hand corner is small and plain, yet attractive, while the one in the lower corner is larger and more formal.

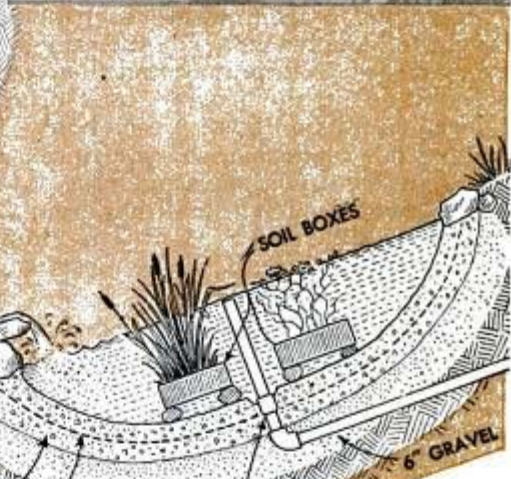
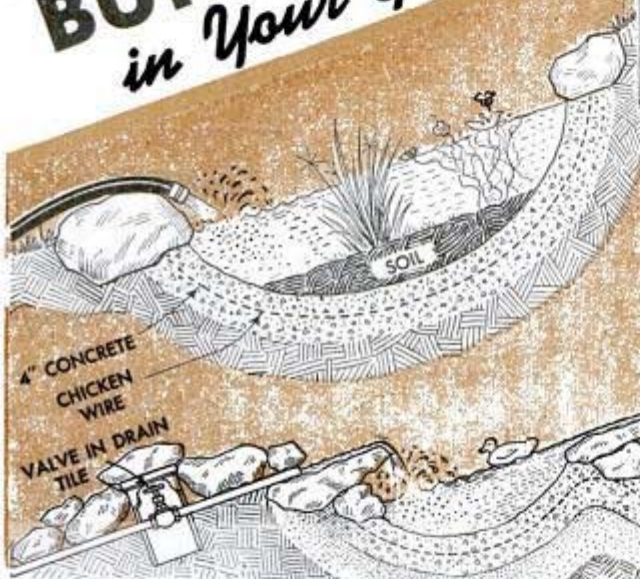
Strong, watertight concrete is made easily. Most important is the amount of water used per sack of cement, ranging from $4\frac{1}{2}$ to 5 gals., depending on the moisture content of the aggregate. The correct mix should be plastic enough to hold its shape well, but not crumbly. Average proportions are cement, 1 part, clean, sharp sand, 2 parts, and gravel, $2\frac{1}{2}$ to 3 parts. Do not permit newly placed concrete to dry out fast. Protect it for a week or ten days. A covering of burlap or canvas, sprinkled often enough to keep it moist, should be used while the concrete is curing.

The lower center detail illustrates a pool with a waterfall. If your backyard slopes, this is an excellent treatment. For convenience in cleaning, soil for the plants should be put in boxes. These should contain a generous amount of stable manure mixed with the soil. A drain pipe is laid before pouring concrete over the bed of cinders or gravel, the latter being used for drainage and also as a cushion in any heaving due to frost. Recommended reinforcement for pools is 40-lb. steel mesh, but if not available, you can use old hog or chicken wire, expanded metal lath or similar material. Concrete in smaller pools is 4 in. instead of 6 in. thick, and is poured directly into the excavation without cinders or gravel underneath. All pools should be on high ground if possible, to facilitate draining and prevent heavy rains from washing litter into them.

A small footbridge can be made as indicated in the lower right corner. Arched stringers are band-sawed from 10-in. stock, and the joints are lapped and bolted, with cleats on the inner sides. Treads should be spaced about $\frac{1}{4}$ in. apart. The top rail is bent down and screwed to the posts, and a batten rail below is also bent. The end posts are creosoted below ground. The bridge can be painted or stained to suit.



BUILD a POOL in Your Garden



Colored Cutouts Over Coat Hooks Identify Children's Wraps



In a kindergarten where each child is taught to hang his wraps on the same hook every day so that he may find them again without delay, the teacher uses brightly colored cutouts to identify each hook. The cutouts are made of paper or tinsel, and represent trees, fish, stars and other objects easily recognized by small children, who often have difficulty in identifying numerals or letters.—John Krill, Youngstown, O.

Waxed Paper Prevents Sticking Of Bathroom Fixtures to Wall

Bathroom fixtures, such as soap dishes, toothbrush holders, etc., often stick to newly painted walls and cause the paint to peel off when they are removed. To avoid this, put a piece of waxed paper between each fixture and the wall. You can cut away the exposed edges of the paper with a safety-razor blade. In some cases, floor wax rubbed on the fixtures will do the trick.

Nonslip Tray for Water Colors Made From Modeling Clay



When small children use water colors contained in a metal tray, they often upset the tray or push it off a table because it slides easily. To avoid stained rugs and clothing resulting from an upset tray, one mother made a

tray from modeling clay by indenting a bar of it with the end of a broom handle. The weight of the clay and its tendency to cling to any smooth surface practically eliminates any possibility of spilling the colors.

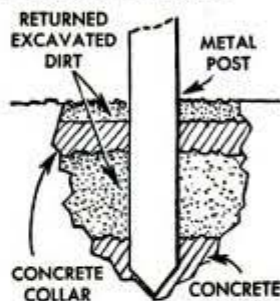
Paint Identifies Padlock and Key

When several padlocks are used around the home, farm or shop, the time usually wasted in searching for the right key for each lock can be saved by painting identifying marks of the same color on the lock and its key, using a different color for each lock and key set. In this way, finding the right key is merely a matter of matching the color of the key with that of the lock.

Howell Scroggins, Houston, Tex.

Saving Concrete When Setting Metal Fence Posts in Place

The next time you set fence posts in concrete, try the following method, which will result in quite a saving of concrete. Dig the hole and place the post in the usual way. But, instead of completely filling



the hole with concrete, fill it to a depth of about 3 in. Then, tamp in dirt to within about 5 in. of the top and pour another 3-in. layer of concrete. Complete the filling with dirt. This gives two 3-in. disks of concrete, providing an "anchor" which is just as effective as a single, solid piece of concrete. As less than one half of the hole is filled with concrete, the saving is considerable when setting a large number of posts. Where the ground freezes deeply, this method may be unsatisfactory because the upper collar might be pushed up by frost.

Edward St. George, Honolulu, Hawaii.

Wire Solder Used as Tie String On Electrical Extension Cord

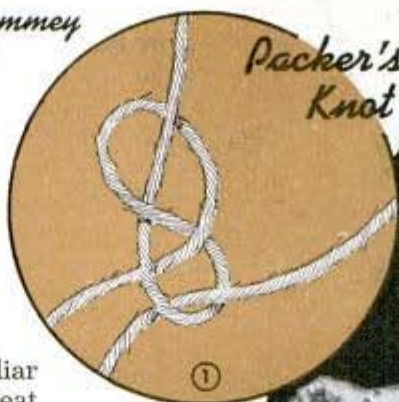


To keep a long extension cord looped when not in use, tie it with a length of wire solder as indicated. The solder will always be at hand if it is given two or three turns around the center of the cord and taped in place.

28 KNOTS YOU SHOULD KNOW

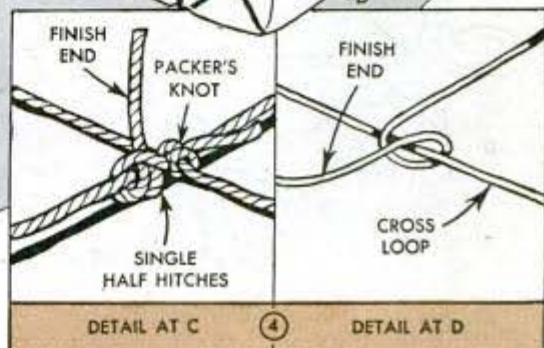
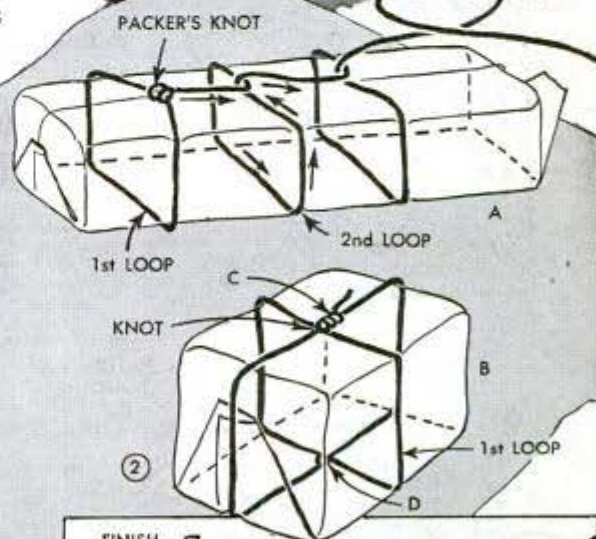
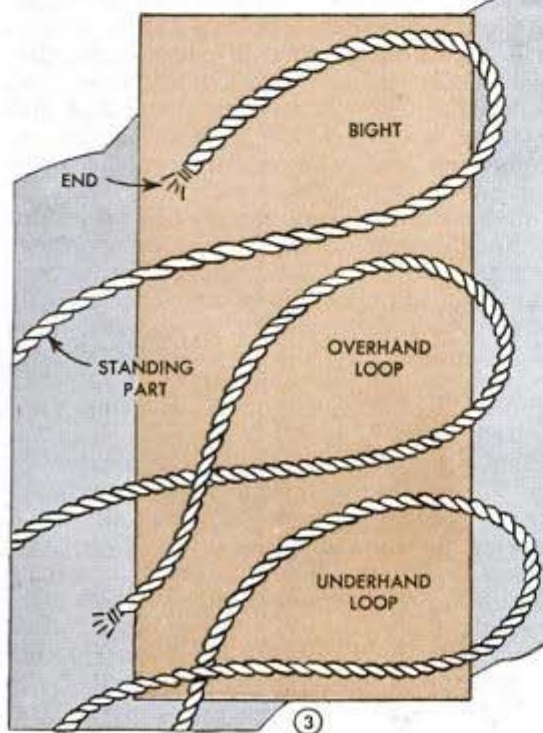
By W. Clyde Lamme

The right knot in the right place! Includes quick and secure parcel tying, end knots, slip knots, slippery half hitch, fixed and adjustable loops, neverslip bowline knots and "boatswain's chair." Also, how to lock knots, join rope ends and "weave" splices

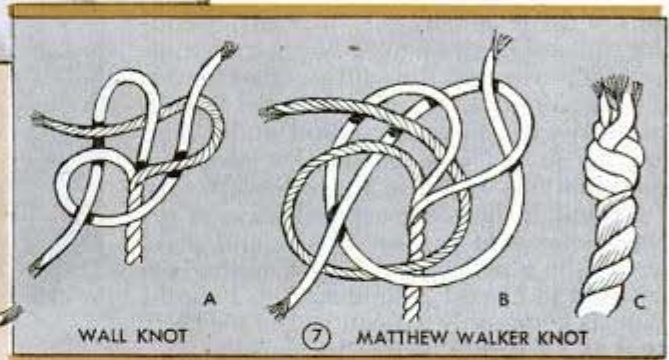
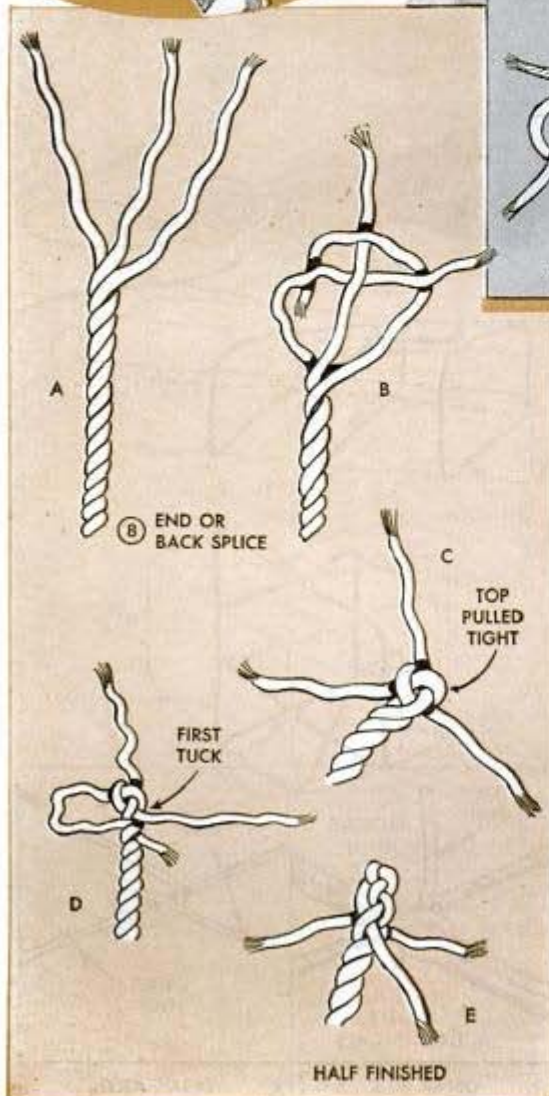
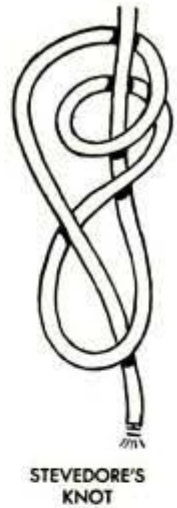
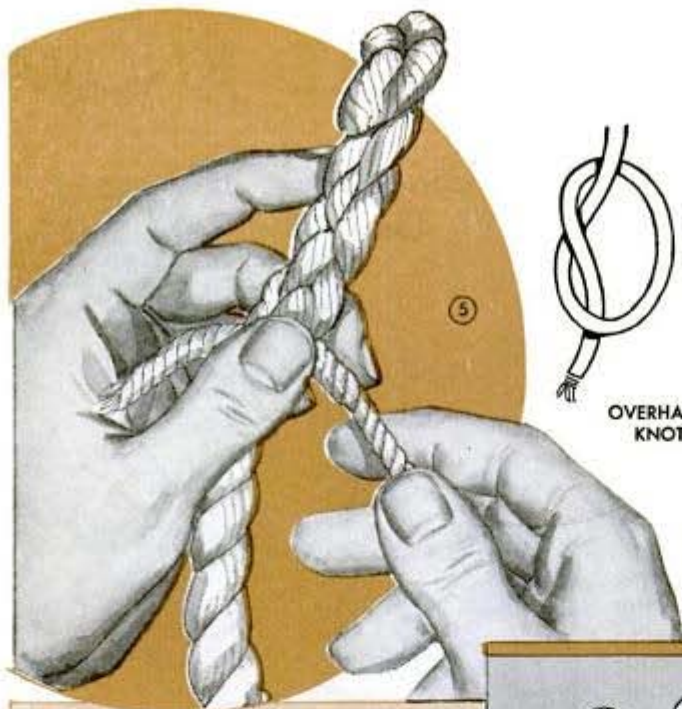


EVERYONE should be familiar with the trick of making a neat and secure package tie. To understand knot tying, one must think of a rope or cord as having two ends and a standing part, the latter term referring to any section of the rope between the ends. Bending the end back forms what is known as a bight; crossing the end over or under the standing part forms what are known respectively as overhand and underhand loops, Fig. 3. The most complex knots are combinations of these three basic turns.

Although there are several ways of tying packages of various shapes and sizes, one of the quickest and surest methods is detailed in Figs. 1, 2, and 4. Fig. 1 shows what is commonly known as the packer's knot and Fig. 2, A, shows its application in tying a rectangular package where several loops or "cross-



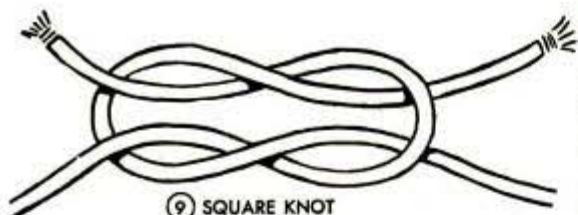
End Knots



ings" are required. Fig. 2, B, details how the same tie is made on a square package, where only one crossing is used. In either case, after completing the crossings, the package is turned over and the free end of the cord is brought up over the end of the package and back to the last crossing. From there on to the opposite end it is carried once around each crossing, Figs. 2 and 4, detail D, then brought up over the end of the package and back to the knot on the first crossing, the package being turned right side up. The end of the cord then is passed around the knot and the tie is finished by throwing a series of half hitches around the standing part, detail C, Fig. 4. A package of almost any size and shape can be tied securely in this manner.

End knots have the double purpose of preventing fraying of the rope strands or "yarns" and serving as "stopper" knots to prevent the rope end from pulling through a loop or sheave. The wall knot, detail A of Fig. 7, and the single Matthew Walker knot, details B and C, are tied with the end strands of the rope. Detail C shows the latter knot completed. The three end knots in Fig. 6 serve the same purpose but are

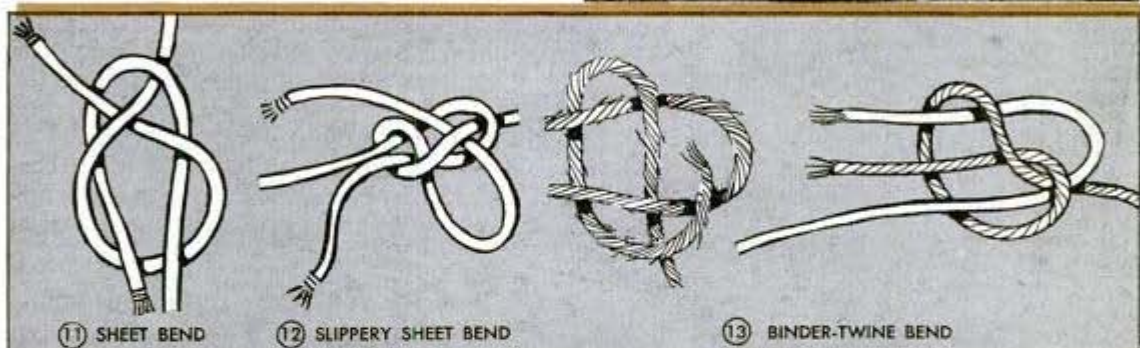
Joining Ends



9 SQUARE KNOT



10 STRAP KNOT



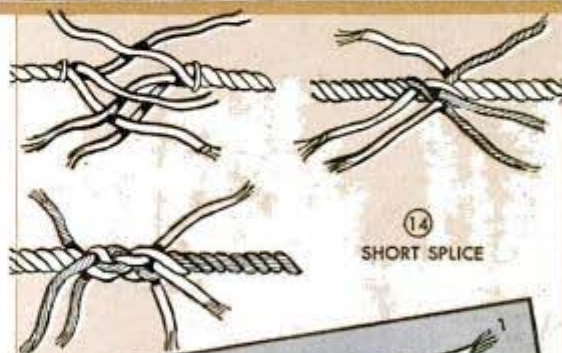
11 SHEET BEND

12 SLIPPERY SHEET BEND

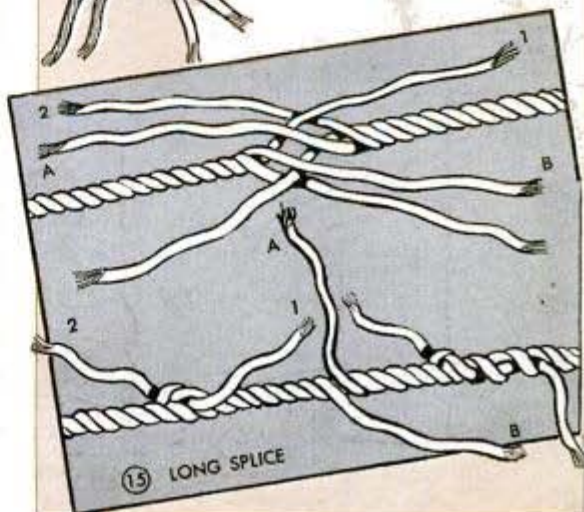
13 BINDER-TWINE BEND

less neat and more bulky. The end or back splice, sometimes called the crown knot, Fig. 5, is the neatest permanent-end knot. Details A to E of Fig. 8 show how to tie it. One trick in finishing any splice where the loose strands are tucked over and under the strands in the standing part of the rope is to separate the yarns when the knot is at the half completed stage and clip away approximately half the fibers of each. When the finishing tucks are made, the knot will taper neatly into the standing part.

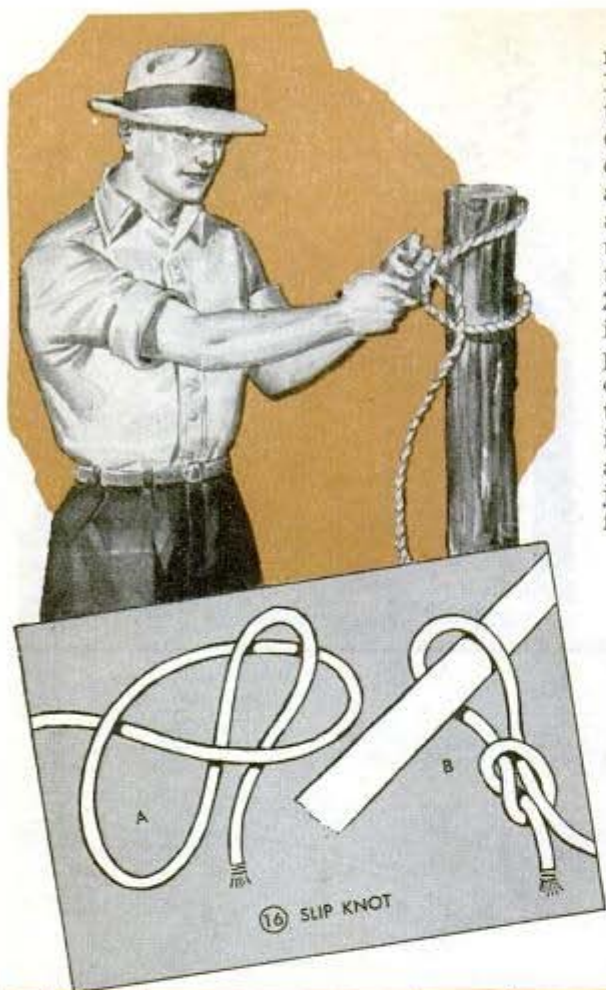
The sheet bend, Fig. 11, and the binder-twine bend, Fig. 13, can be used in joining ends of rope or cord of different diameters. The binder-twine bend was originated for the purpose of joining ends of the sisal twine used in harvesting machinery. The special feature of the knot is that when tied, the free ends point in the same direction, thus assuring that the tie will pass through the knotting mechanism without fouling or jamming. The knots shown in Figs. 9 to 13 inclusive are practical for joining ends of rope or cord of all common sizes, while the strap knot, Fig. 10, is especially effective in joining the ends of leather straps.



14 SHORT SPLICE

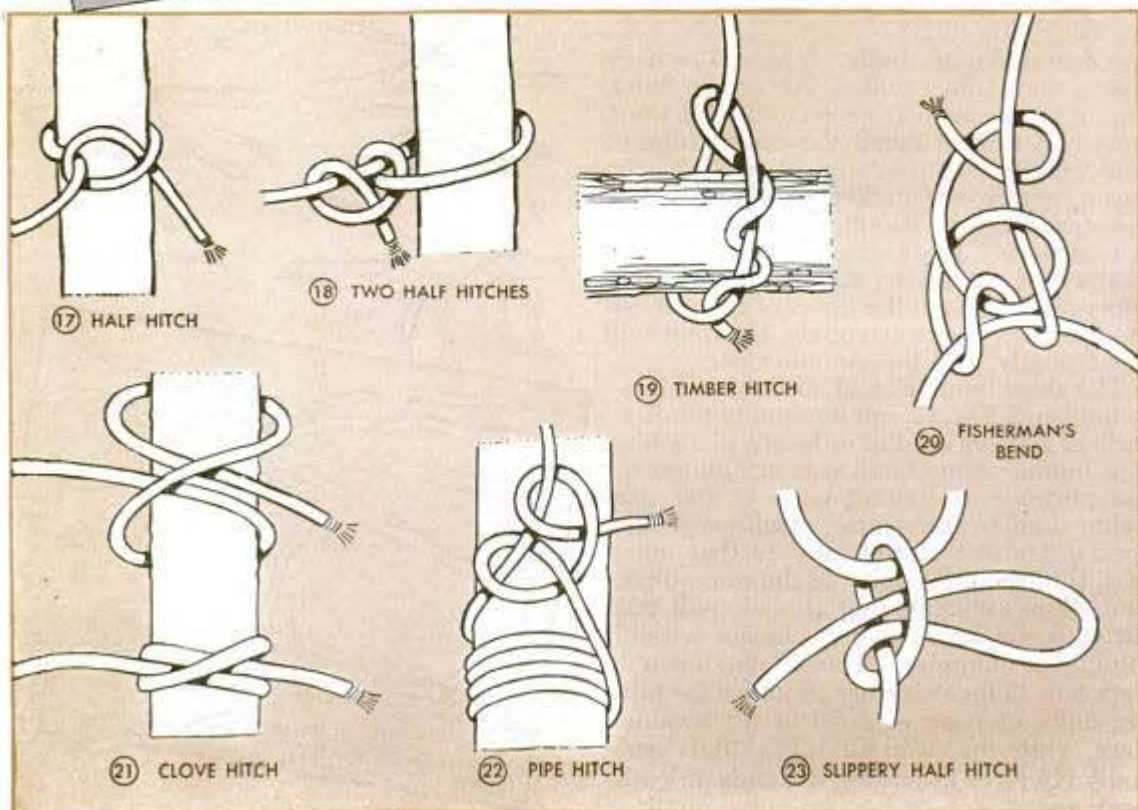


15 LONG SPLICE



The three details in Fig. 14 show how to make a short splice. The long splice, Fig. 15, is somewhat more complicated. Here the strands of both ends are unlay for a distance equal to six or seven times the circumference of the rope. Then the ends are placed together with strands 1 and 2 and A and B in the position shown in the upper detail, Fig. 15. Unlay strand 1 along the standing part and replace with strand 2. Unlay and replace corresponding strands in the opposite direction along the standing part, in both cases leaving enough at each of the ends to make an overhand crossing, the latter being the same as the first crossing in the square knot. Strands A and B at the center and those at the ends then are joined with overhand crossings and the free ends of the strands at the ends of the splice are tucked over and under once as is done in the short splice, Fig. 8. Do the same with strands A and B at the center. Trim away about half of each strand and make at least two more tucks. Then pound the tucks and crossings into the lay of the rope and cut the ends of the strands flush with the lay. In making any splice it is essential to keep the strands pulled tight as successive tucks are made. For reasons of clarity, the strands are shown somewhat

Tying Ropes To Objects

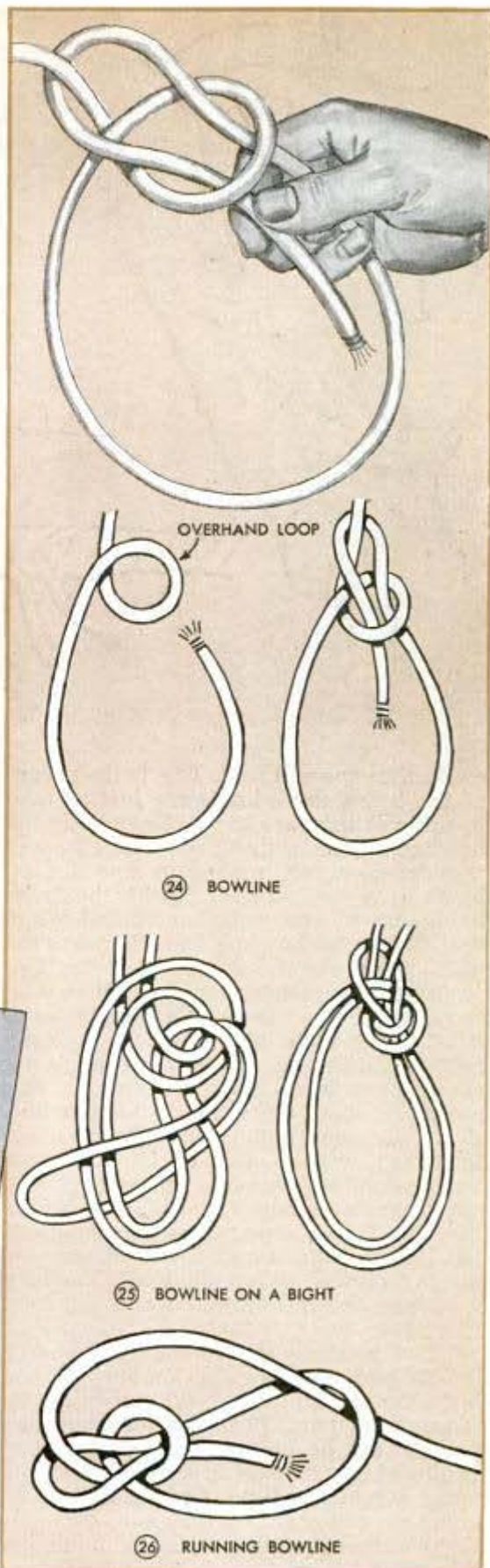
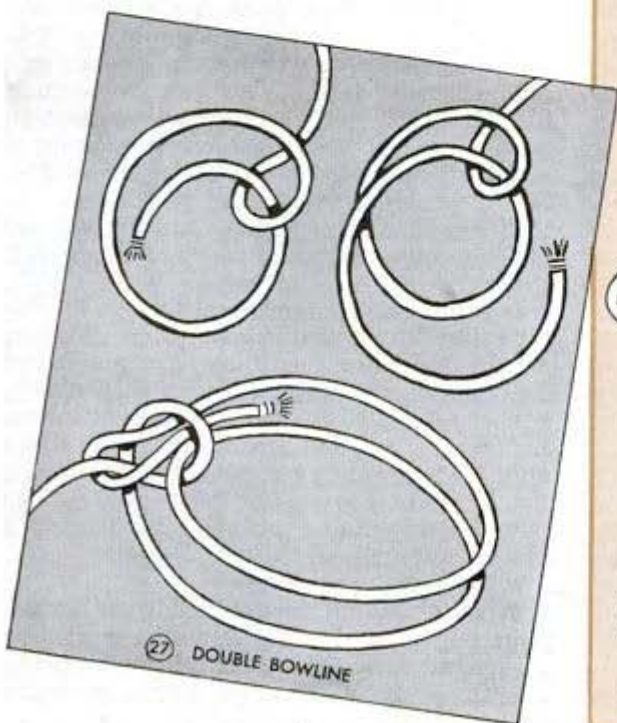


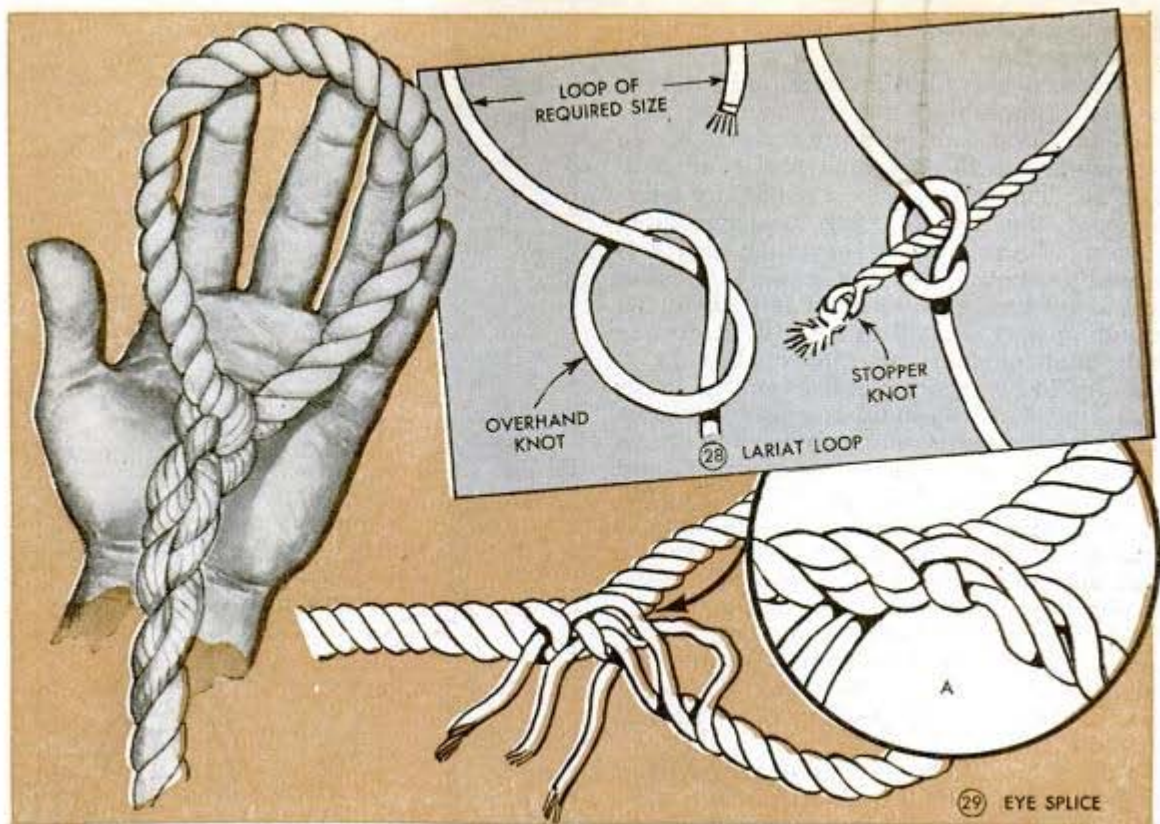
more loose than would be practical in ordinary practice.

Where a slip knot is to be tied over a bar or other object of such size or shape that the loop will pass over it easily, tie the knot with the standing part as at A in Fig. 16. This practice will avoid the tendency of this knot to jam under sudden strain. Where the bar or other object is closed at both ends the rope is carried around it and an overhand is tied on the standing part as at B in Fig. 16. A double half hitch or two half hitches, Fig. 18, is usually to be recommended for this latter tie. Figs. 17 to 23 inclusive detail various hitches which are commonly used to attach ropes to objects. One of the simplest and most effective is the clove hitch, Fig. 21. A most important feature of this hitch is that the rope passes around the object in one direction, hence there is no twisting strain on the strands. The slippery half hitch is so named because one end is slippery; that is, the knot can be untied by simply pulling on the free end. The knot can be "locked" by passing the free end through the eye.

One of the quickest ways of tying a fixed loop in a rope is by use of the bowline knot, Fig. 24. There are many variations of this important knot, some of which are quite complex, but among the simplest forms are those shown in Figs. 24 to 27 inclusive. Properly tied, the various bowline knots will never slip, pull out or jam under any

Knotting Fixed Loops





strain the rope will hold. Due to the nature of the turns, these knots are just as easy to untie as they are to tie. Essentially the bowline begins with an overhand loop in the standing part, spaced to give a fixed loop of the desired size, Fig. 24, the finish being shown in the right-hand detail. When tied, the double bowline, Fig. 27, makes the well-known "boatswain's chair," the two loops being adjustable for size. When used in rescue or other work, one loop serves as a "seat," while the other loop forms a back-rest, leaving the arms free. Although not shown here, there are elaborations of this particular knot. Like the double bowline, the bowline on a bight, Fig. 25, can be made to serve as a chair, the two loops forming a more comfortable seat. However, it does not leave both hands free. The running bowline, Fig. 26, does not form a fixed loop but rather serves much the same purpose as the loop tied with a slip knot. The loop is always freely adjustable and the knot will never twist or jam.

When used as the running knot on a lariat, the lariat loop, Fig. 28, is made just large enough so that it will run freely on the standing part. However, for other purposes it can be used to form a fixed loop of almost any desired size. It will not jam under strain and thus is easily untied. In any case, a stopper knot, such as the Matthew Walker knot, Fig. 7, should be tied in the end of the rope. Although the primary

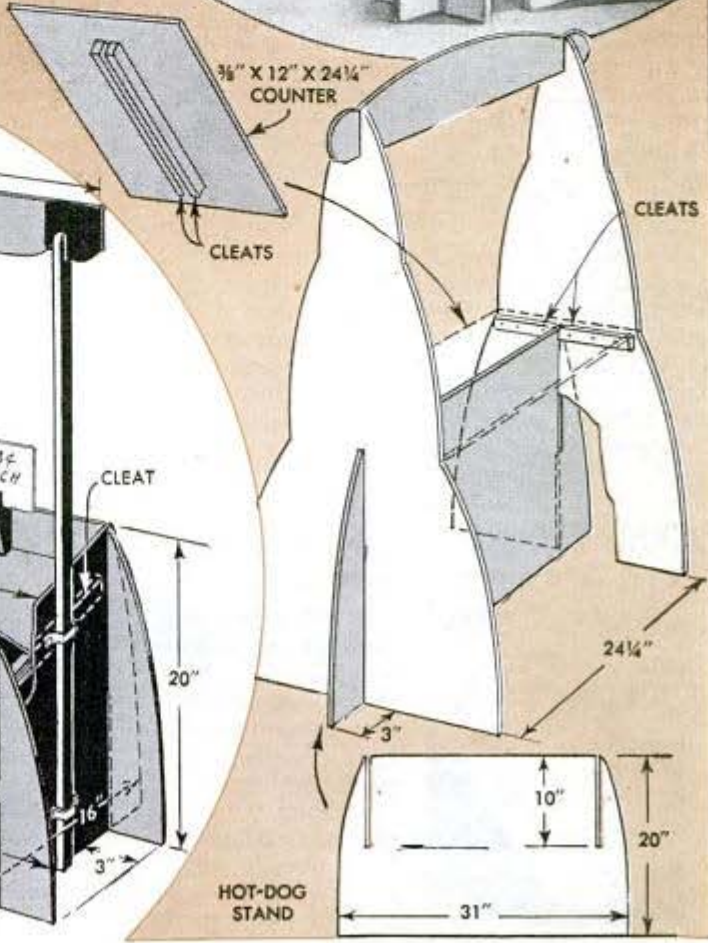
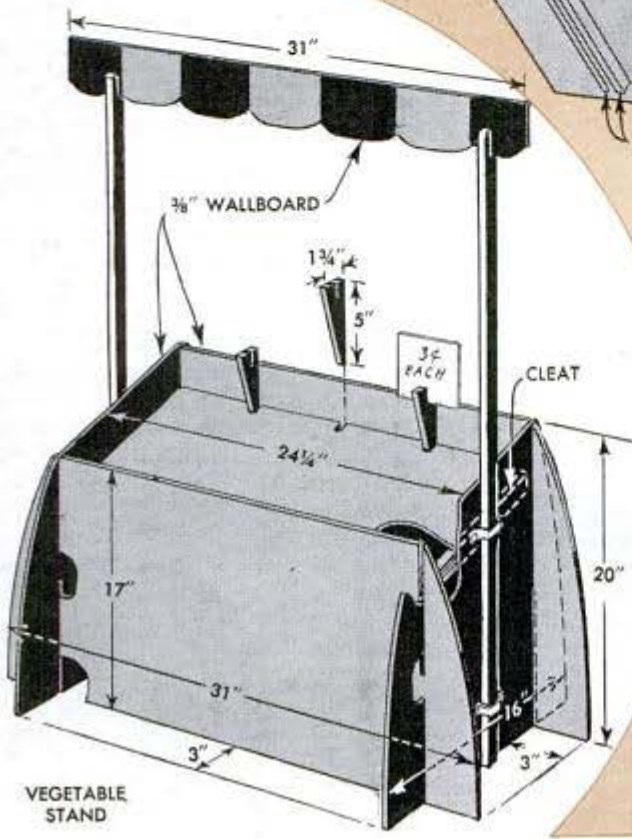
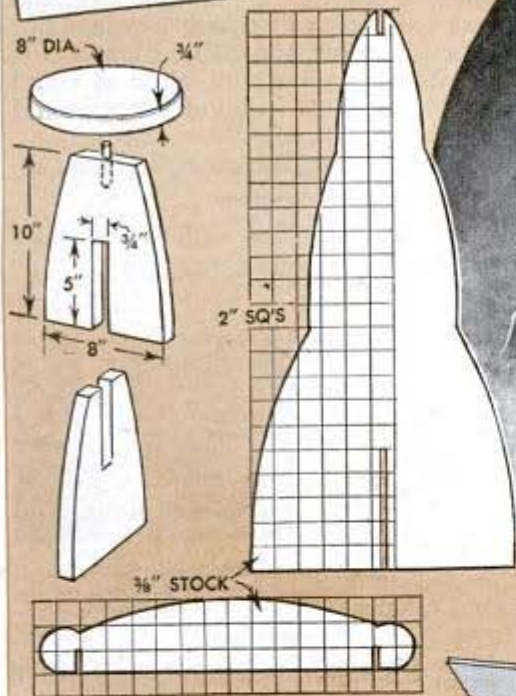
purpose is that of forming a fixed loop or eye in the end of a rope, the eye splice, Fig. 29, and the method of making it can serve other purposes. As an example, using the same method, one rope can be spliced into the side of another to form a lateral. To make it, unlay the strands at the end of the rope four to six turns and bend the end back on the standing part to such a distance as will form a loop or eye of the desired size. Then proceed to tuck the strands one over and one under in much the same way as when making a short splice. After two or three tucks, Fig. 29, A, trim the strands as previously described and finish tucking until the strands are taken up, then trim the ends flush with the lay.

It should be remembered that in all details the knots are shown loose. When drawn tight they will appear somewhat different than detailed. Strictly speaking, splices do not classify as knots, yet in most instances the splice accomplishes the same end, that of joining rope ends, forming a fixed loop, and so on. For this reason splices have been included with the several types of knots described.

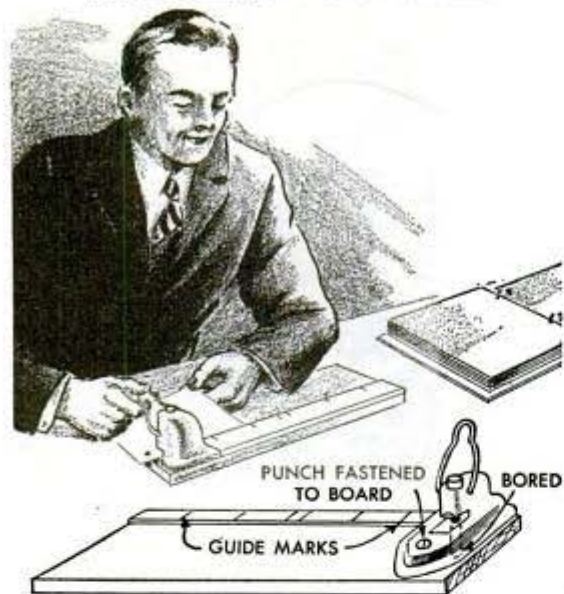
When changing tires or making other repairs on the road at night, a mirror held or supported so that it reflects light from the headlamps provides a good substitute for a trouble lamp or flashlight.

PLAY STORE

Keeps Children Busy



Multiple Punchings Can Be Made With Single-Hole Punch



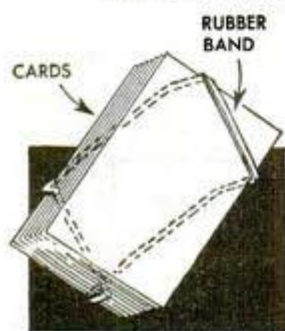
Punching holes in filler paper for two, three, or even four-post loose-leaf binders can be done accurately and easily with a single-hole punch if it is mounted on a board as shown. On a strip of wood nailed along one edge of the board, guide marks are made by which the paper can be spaced for punching holes at the desired distances from the lower edge. A hole bored in the board directly under the punch-pin opening will permit removal of paper punchings.

Repairing Leaky Gas Cocks

When a leak develops at a gas cock, often a coating of petroleum jelly applied to the core will stop the trouble. Before doing this, however, shut off the gas at the meter, and before turning on the gas again, be sure that all appliances are shut off. And don't forget to light immediately the pilot lights on stoves, heaters, etc.

R. B. Devault, Santa Monica, Calif.

Cards Gripped by Rubber Band Are Easy to Remove



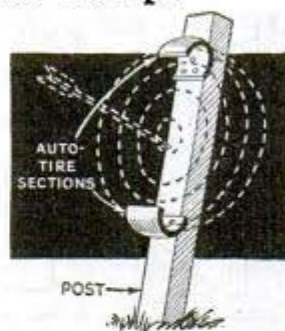
When using cards or other small, single sheets of stationery from a stack or desk-size supply grip them with a rubber band as shown. Slip the band over one corner, bring it down under the stack

and up over the opposite corner, slipping the band over only a portion of the cards. This will hold the cards together if the stack is tipped over or accidentally knocked off the desk. If a predetermined number of the cards are to be used on a certain job, slip the rubber band under the last card of the number to be used. In this way, the band not only holds the stack together but serves as a marker, too. This idea also is handy when carrying a number of small cards in the pocket if they are not bound or glued into a pad.

Jean Brickman, Urbana, Ill.

Archer's Target Kept on Post By Flexible Clamps

A good way of keeping an archer's target on the supporting post is to use sections of an old auto tire as clamps. Nailed to the post, they are slipped over the target, which thus can be mounted or removed quickly.



Dulling Sharp Typewriter Letters For Better Mimeograph Stencils

When difficulty is encountered in cutting a mimeograph stencil because some of the typewriter keys are too sharp and cut too deeply, the trouble can be remedied by holding a piece of fine emery cloth on the platen while the faulty letters are stroked lightly against it, thus dulling the letters. Care must be taken to avoid overdoing this, since the abrasive cuts very rapidly.

Bruce MacIntosh, Galveston, Tex.

Hacksaw Blade Screwed to Block Is Used to Tear Sandpaper

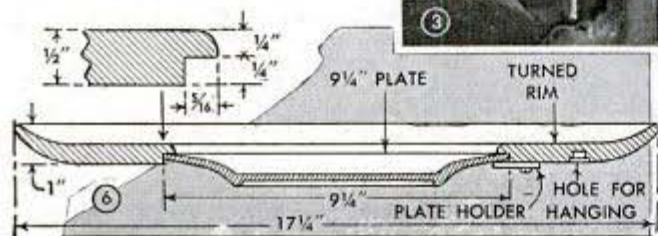
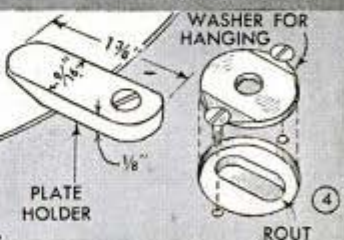
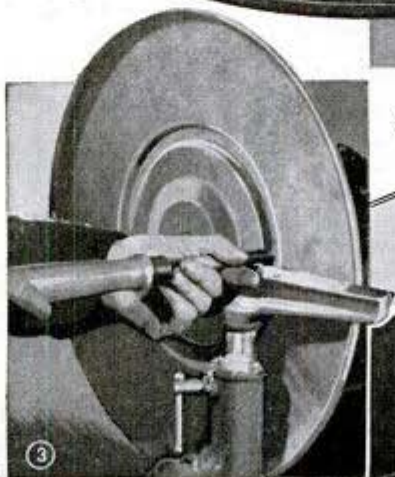
Instead of cutting sandpaper with a knife, pair of scissors or tin snips, a practice which dulls them quickly, tear it with a hacksaw blade. Screw the blade to a block with one or two washers under the blade so that the paper can be inserted, or screw the blade to a bench top in some out-of-the-way place where it will be handy when needed.—D. P. Manuel, Minneapolis, Minn.



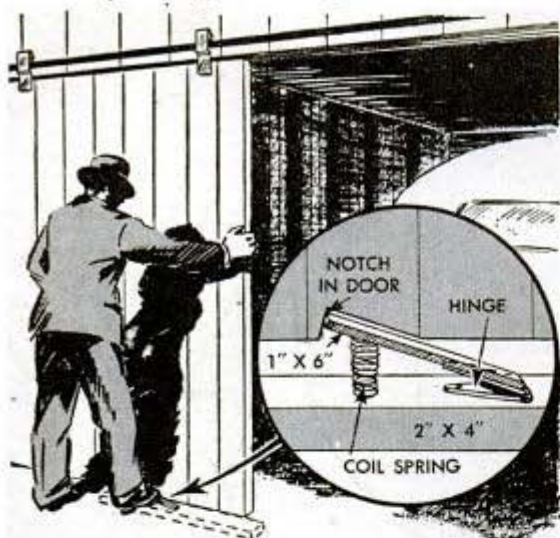
PLATE PLAQUE

Doubles as Serving Tray

AN ATTRACTIVE ornament for a wall in the kitchen or dining room, the plate plaque shown in Fig. 1 also is highly practical as a serving tray as indicated in Fig. 2. Essentially, the plaque is merely a round wooden tray having the center cut out and a decorative dinner plate inserted. Stock 1 in. thick is required for the tray and can be a solid piece, or it can be glued up. Walnut or other cabinet wood should be used. In either case, saw out a disk about 17½ in. in diameter, mount this on the outboard end of a lathe on a 6-in. faceplate and turn it to the shape and size indicated in Fig. 6. Sand the tray while it is still on the lathe as this is easy to do while the work is rotating. Then remove it and cut out the plate opening on the jig-saw, and run in the plate rabbet. This is best done on a shaper, but can be done with a router, or even by hand if suitable tools are not available. A standard size plate was used on the original, but any size could be used, altering the tray size in proportion. The plate is held by wooden holders as in Fig. 5. The holders are made from hardwood blocks and are dimensioned in Fig. 4, which also shows how a washer is beveled on opposite edges and recessed into a blind opening made in the back side of the tray for hanging the plaque. The opening should be shaped like a slot as indicated.



Sliding Garage Door Held Open By Simple Hinged Catch

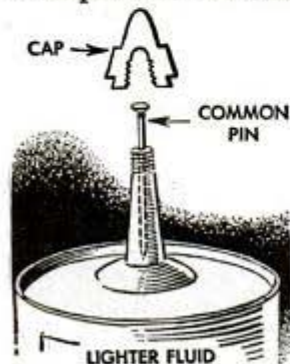


After standing for a few years, my garage settled slightly, so that one of the sliding doors, which were hung on rollers, would not stay open. To keep it open, I made a catch like the one shown in the circular detail. The catch is a treadle hinged to the garage sill and has a spring under the free end to force it into a notch cut in the lower edge of the door. The catch is released by pressing on it with the foot.

Melvin H. Grimm, Maxwell, Tex.

Pin Helps Provide Seal in Cap Of Lighter-Fluid Can

When fluid for cigarette lighters comes in a can of the type shown and evaporation is excessive due to loose fit of the cap after the seal has been broken, drop a common pin into the can spout after refilling your lighter and screw the cap on tightly. In this way, the slightly beveled edge of the pin head is pressed firmly against the spout when the cap is replaced, thus effecting a better seal. — D. Brooks, Chicago.



Paste "Hypodermic" Smooths Bubbles in Wallpaper

When bubbles appear after wallpaper or canvas has been hung, they can be eliminated by inserting a hypodermic needle into them and forcing paste through the needle, after which the rough spots are

smoothed down with a smoothing brush. This makes it unnecessary to cut slits in the bubbles in order to paste them down, or to remove the wallpaper entirely.

Charles B. Fahn, Norfolk, Va.

Wire Wrench Loosens Bottle Cap

Loosening tight-fitting bottle caps will be no problem if you use a simple wrench shaped from a piece of wire as shown. The looped portion of the wire is slipped over the cap and the harder the handles of the wrench are gripped to turn the cap the tighter it is squeezed by the looped wire.



Ken Murray, Baltimore, Md.

Small Cape Protects Shoulders Of Hunter's Coat

On long hunting trips, one sportsman always carries a small rubber cape of the type shown to prevent the shoulders of his



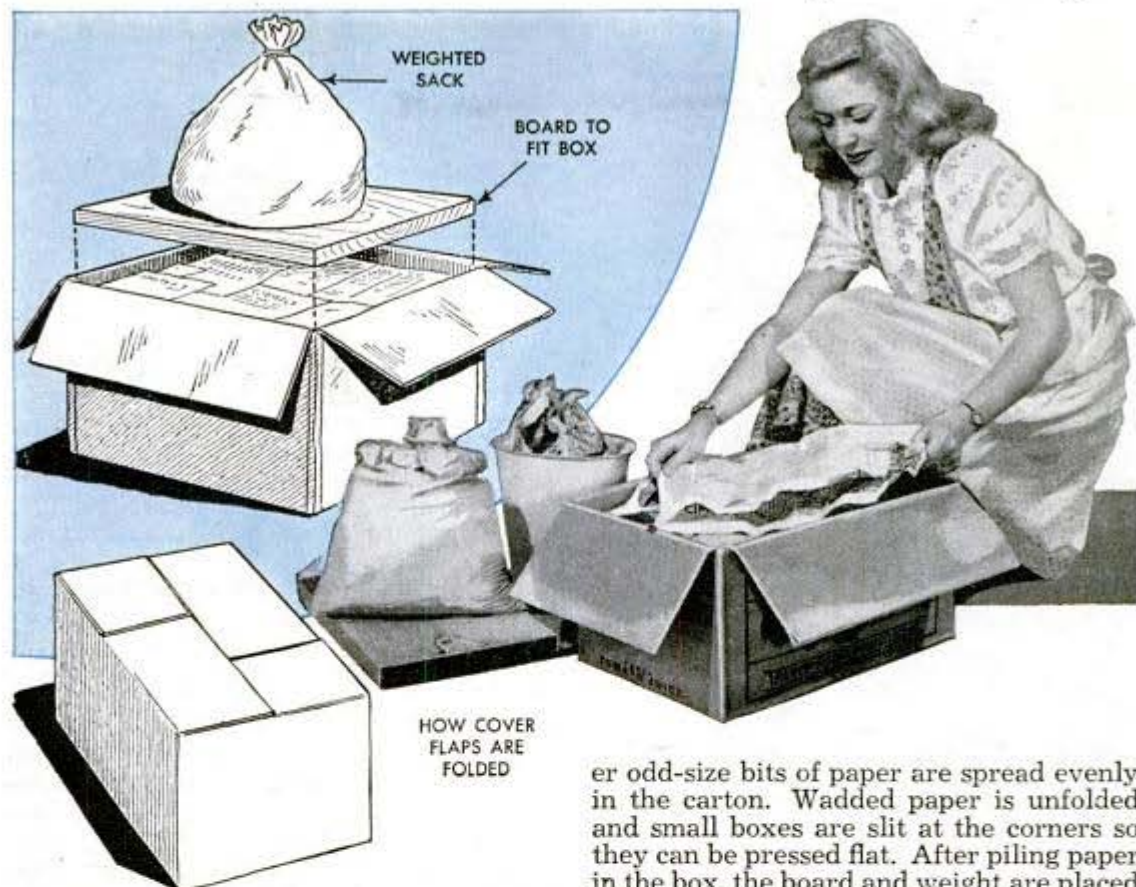
hunting coat from becoming soaked during light showers. The cape is merely a piece of rubber cut from an old inner tube, or fabric cut from an old raincoat or other waterproof material. It can be rolled up and carried in a coat pocket when not in use.

☞ To aid in writing straight and spacing uniformly on a blackboard, guide lines may be ruled on the board with an indelible pencil. The lines will be invisible a short distance from the blackboard and will remain when the chalk writing is erased.

EVERYBODY IS AN INVENTOR

Nearly everybody has discovered some kink or shortcut to solve one of those seemingly trivial problems encountered in every home or in a person's work, hobby and play. But the solution may have saved time, money and energy. We pay readers for such ideas. Just submit a sketch or photo and a brief description to our Homecraft Editor. If acceptable for publication, we will send you a check promptly.

Cardboard Carton Used for Baling Waste Paper



Baling scrap paper is reduced to a simple method by a Los Angeles housewife who uses nothing more than a cardboard carton, a board that fits inside, and a weight of about 25 lbs., such as a sack of sand. When filling the baler, waxed or greasy paper is not used. Cards, envelopes, letters and oth-

er odd-size bits of paper are spread evenly in the carton. Wadded paper is unfolded and small boxes are slit at the corners so they can be pressed flat. After piling paper in the box, the board and weight are placed on top. In a few days the paper is packed down solidly. Then more paper is added and pressed down in the same way. When the carton is full, the cover flaps are interlocked and the bundle is ready for the salvage collector.

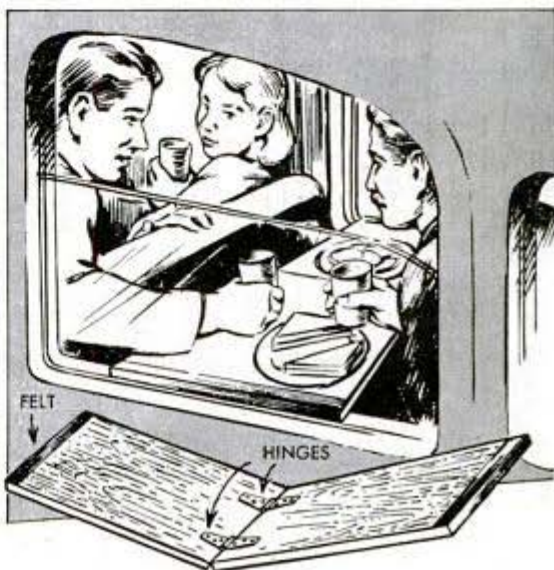
Charles Kimball, Los Angeles, Calif.

Folding Table for Enjoying Your Picnic Lunch Inside Car

A rainy day need be no obstacle to your enjoyment of a picnic dinner if you have a folding table like the one shown to use inside your car. Also, such a table is handy for those who like to have a picnic lunch in scenic spots where there are no suitable grounds. The table is nothing more than a wide board long enough to reach between the window sills in front of the rear-seat passengers. The board is hinged to fold in the center and is padded at both ends to prevent scratching the window glass or sills. In use, place the board between the sills with the hinges on the underside so that it will not collapse.

Allen L. Freas, Woodhaven, N. Y.

☐ After starching scarfs and doilies, pin them to a piece of corrugated cardboard to keep them in shape while drying.

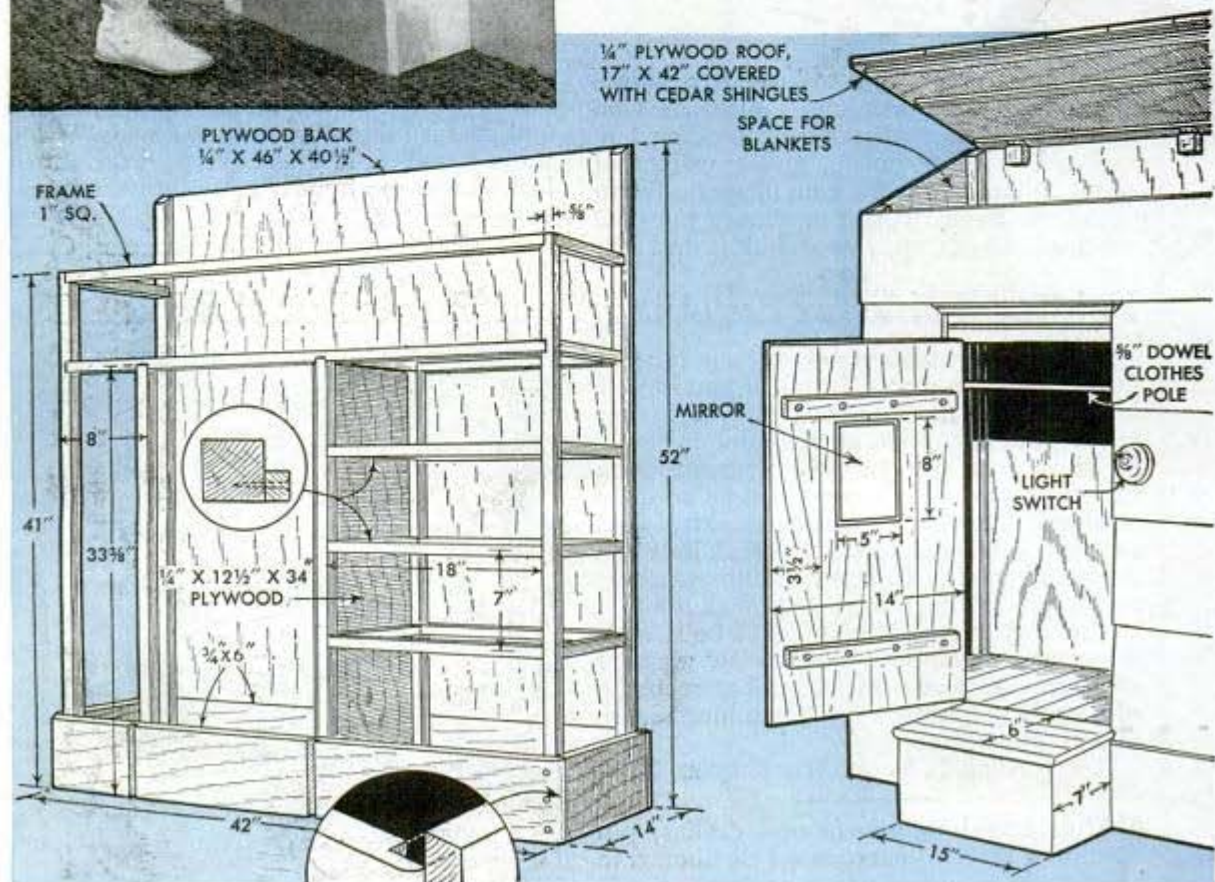


A House All

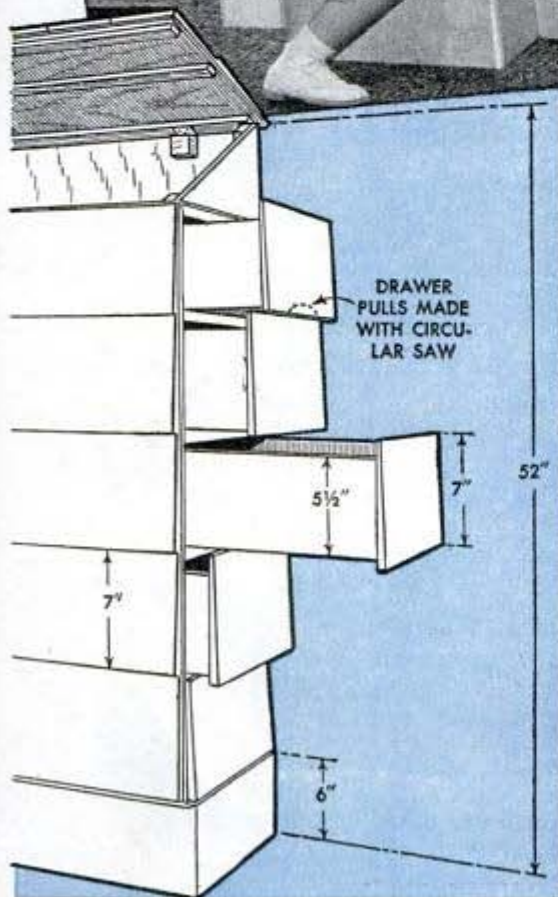
By A. T. Eyman



YOU won't have to coax your children to hang up their clothes if they have a wardrobe house like this one. Complete with cedar-shingled roof and lapped siding, it can be placed anywhere against a wall. Besides the space inside the house for hanging clothes there's an "attic" for storing blankets and other extras. Drawers fitted into the side of the house take the place of a dresser or chest for slippers, sweaters and other small garments. Notice that the house is floored. This detail can be omitted and a threshold substituted for the doorstep if the house is made as an extension to an already existing closet. A small mirror attached to the outside surface of the door will give the entrance a realistic appearance as well as reflect the little owner's features. Or you can hang a mirror on the inside of the door, reserving the outside for a miniature knocker, house number or name plate. A toggle switch that controls interior lighting occupies the place of a bell button beside the door.



Their Own



Sharpened Tooth of Cultivator Cuts Garden Weeds

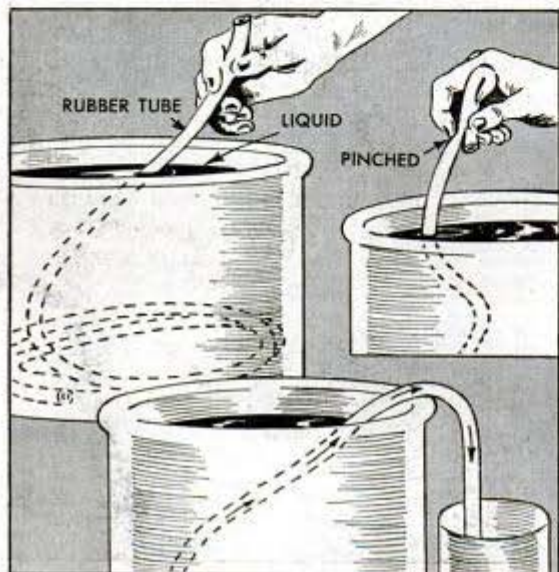


To avoid changing over from a cultivator to a hoe to cut an occasional deep-rooted weed along your rows of vegetables, sharpen the edge of an outer tooth of the cultivator to make a good weed-cutter. You can do this easily with a file or an emery wheel.

P. B. Reed, Chicago.

Easy Way to Start a Syphon

A simple and safe way of starting a syphon, especially when handling caustic, poisonous and other dangerous liquids, is shown in these three steps. First, insert the syphon tube in the liquid almost to the end to fill it with the liquid. Fold over the end and pinch it tightly together to prevent entrance of air. Then, still keeping the tube



pinched tightly, lower the end outside the container below the level of the liquid inside, release the pinched end and the syphon will start.

Jack Bronte, Nevada City, Calif.

Container for Storing Brushes In Paint Solvent

Anyone who does not wish to clean paint-brushes that are laid away overnight or for a few days between jobs will find this method of storing them very convenient. Use a wide-mouth container such as a 1/2-gal. fruit jar, one that can be sealed to prevent evaporation of the solvent, and fit the lid with a block of wood about 1 in. square. Drive nails in all four sides of the block so that four brushes can be hung on them, and attach a knob to the top of the lid. In this way, the brushes can be suspended in solvent without being pressed out of shape, yet can be removed by merely unscrewing the cover and lifting it as indicated.

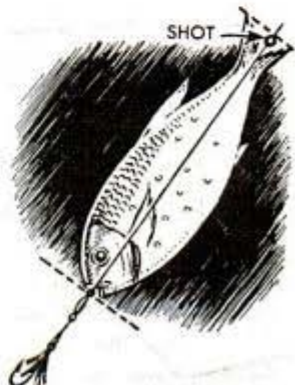


Minnows Kept Alive With Iodine

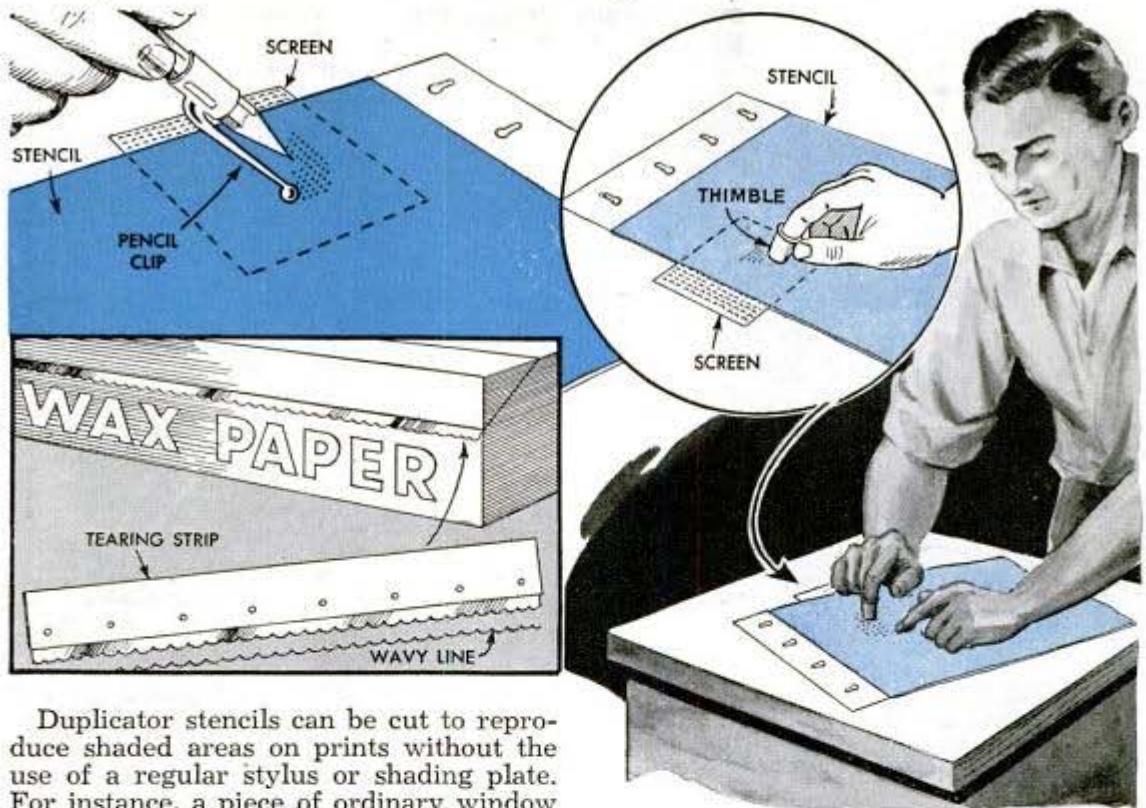
One fisherman found that he could keep minnows alive much longer when transporting them if he placed six or eight drops of iodine in the water as soon as the fish began to show signs of distress due to lack of oxygen.—R. H. Dalton, Fremont, Ohio.

Split-Shot Sinker on Fishline Checks Length of Fish

If it is inconvenient to carry a rule for measuring the fish you catch to see if they are of legal size, just attach an extra split-shot sinker to the line. Space it a distance from the regular sinker equal to the length of fish that you can legally keep. Then it is just a matter of measuring the length of a fish between the two sinkers to determine whether or not it can legally be kept.



Easy Methods of Shading Duplicator Stencils



Duplicator stencils can be cut to reproduce shaded areas on prints without the use of a regular stylus or shading plate. For instance, a piece of ordinary window screen and a common thimble may be used, as shown in the circular detail. The screen is placed under the stencil and the thimble is rubbed over the portions to be shaded. A piece of coarse sandpaper may be substituted for the screen to produce a slightly different effect; and, instead of a thimble, the ball end of a pencil clip can be used for rubbing over the stencil, as shown in the upper left-hand drawing. For drawing wavy lines that make neat borders or dividing lines, an inexpensive and easily-made ruler can be improvised by cutting the metal tearing strip from a wax-paper carton and using it as shown in the lower left-hand drawing. As the metal strip usually is quite narrow, the cardboard flap to which it is attached should be cut to leave a strip about an inch wide, so that the ruler can be held on the stencil while the wavy lines are being drawn.

G. E. Hendrickson. Argyle, Wis.

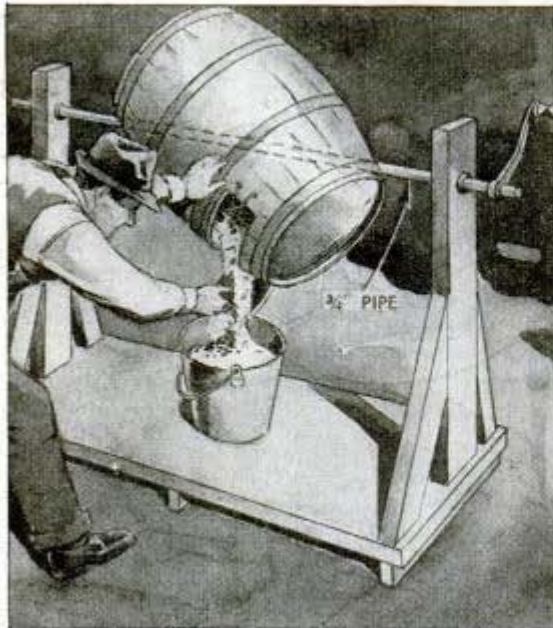
Broken Concrete From Sidewalk Has Many Uses About the Home

If you have to break up one of your sidewalks, or one in your neighborhood is replaced, save the broken pieces. You can make a strong, durable retaining wall from pieces about 2 ft. long and as wide as the wall. Lay the pieces in cement mortar smooth side up, placing them so that the

smooth edges are exposed. Or if you desire a rustic effect, lay the pieces with the rough edges exposed. Pieces of concrete about 9 by 18 in. in size make good pillars, and you can even make an attractive drinking fountain with them. When building a wall, pillar or fountain, it is best to set them on good concrete footings below the ground surface.—Ben L. Byer, Pasadena, Calif.



This Small-Job Cement Mixer Is Assembled at Little Cost

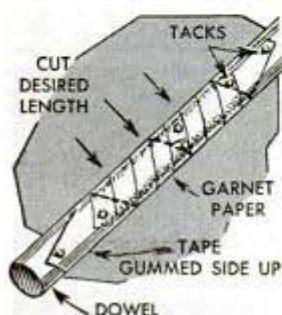


Farmers, home owners and others who have an occasional job of mixing small amounts of concrete can save a lot of work by using a simple mixer like the one shown. It is made from a small barrel, keg or drum, which has a pipe axle running through it as indicated, and is fitted with a crank. The method of attaching the barrel to the axle will depend on what you have at hand. A simple way would be to weld a couple of plates to the axle and screw them to the barrel. Or you could use two malleable-iron pipe flanges, which could be screwed onto the pipe and bent to fit against the barrel sides.

G. J. Issakoff, Sioux City, Ia.

Sanding Sleeves Are Easy to Make

If you are unable to obtain abrasive sleeves for small sanding drums, you can make them easily as shown. First, obtain a roll of gummed canvas tape of the type sold by paint stores for covering plaster cracks before painting or papering. Wrap this spirally, gummed side out, on a dowel of the same diameter as the sanding drum



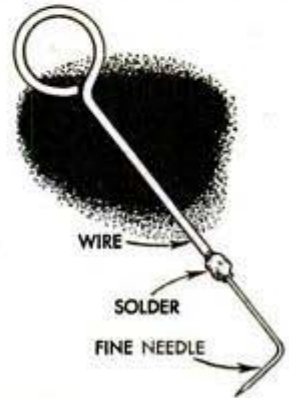
and tack the ends. Then cut the abrasive paper or cloth into strips about $\frac{1}{2}$ in. wide, moisten the gummed surface of the tape and wrap the abrasive spirally over the tacky surface, wrapping it in the direction

opposite to that of the tape. Tack the ends until the adhesive hardens, after which remove all of the tacks, cut through both the paper and tape with an old knife and slip off the sleeves thus formed.

Harold F. Grunert, Rochester, N. Y.

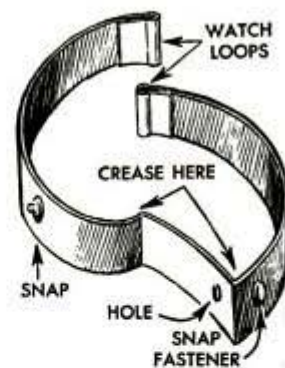
Burner Cleaner for Blowtorch

If you have a blowtorch or other type of heater that uses gasoline as a fuel, and have no instrument for cleaning carbon from the generator or burner, a simple way to make such a tool is by merely soldering a needle to a handle made of wire. The needle should be very small so that it will not enlarge the jet orifice when inserted in it. In some cases, it may be found desirable to bend the needle near the end, after removing the temper, while in other cases it can best be used straight.—Chas. S. Marshall, Baptistown, N. J.



Expanding Wrist-Watch Strap

A watch strap that expands instantly can be made from a piece of soft leather. First, cut the strap to width, fold over the ends to form watch loops and secure them with cellulose cement. Then wet the leather and crease it as indicated. Stiffen the short



section between the folds with an application of cellulose cement or several coats of clear nail polish. The strap is completed by attaching a snap and fastener as shown, and punching a hole in the stiffened section to fit over the snap.

Fleas Kept Out of Doghouse By Cedar-Filled Mattress

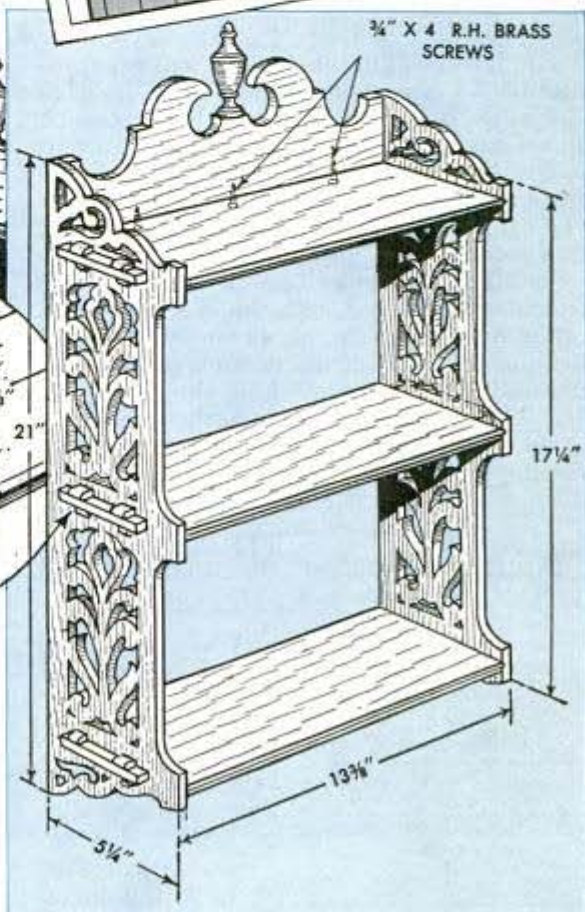
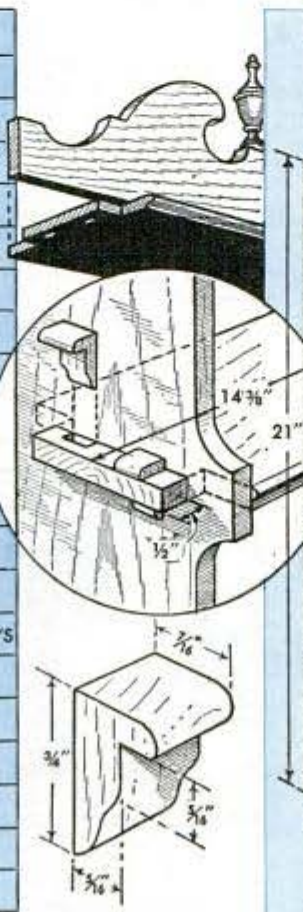
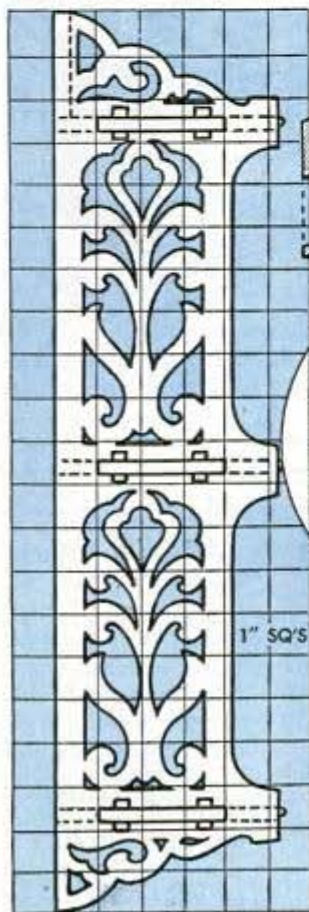
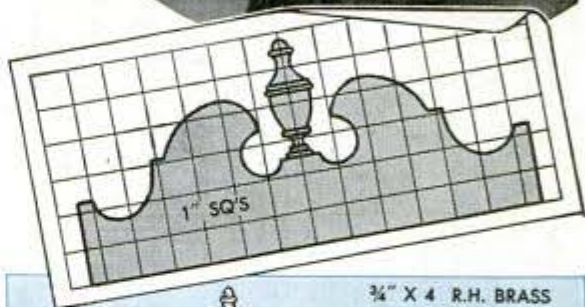
To keep fleas from infesting a doghouse, make a mattress by stuffing a canvas or muslin pad with cedar shavings, and place this in the doghouse. It provides a comfortable bed for the dog, and the fleas are repelled by the odor of cedar. These shavings are available at almost any lumber mill, or can be bought at most pet shops.

E. P. Barnhart, Whittier, Calif.

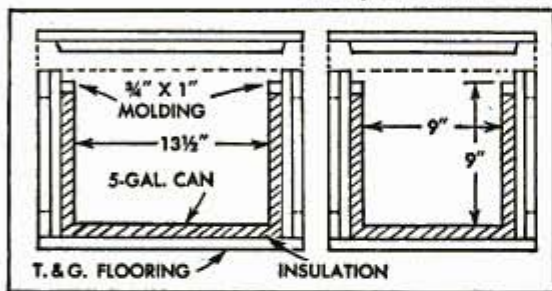
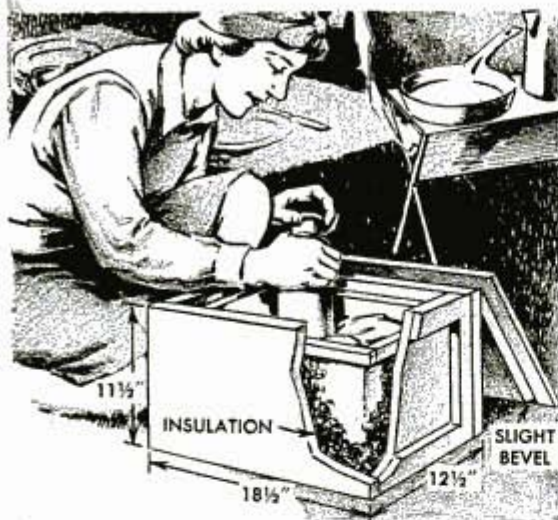
Scrollsawed WALL SHELF

GRACEFUL and serviceable, this wall shelf is just the right size for bric-a-brac, yet is large enough to hold several books. It is scrollsawed from $\frac{1}{4}$ -in. plywood, and the shelves and sides are joined by wooden pegs. These are fitted snugly in slots cut in projecting ends of the shelves and are glued in place as shown in the circular detail. The pediment, of heavier stock, is cut to shape according to the cross-hatched pattern and is held by screws driven through the upper shelf from the underside. To hold the pediment rigid, brads can be driven into it through the sides. A turned finial then is split, one half being used as an ornament. This is held by a tenon or a short length of dowel.

Thos. J. Moffat, Listowel, Ont., Can.



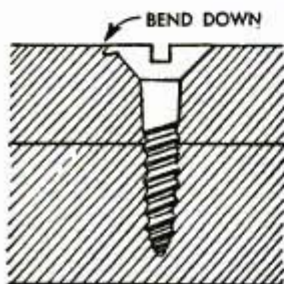
Insulated Can in Wood Cabinet Serves as Portable Icebox



An icebox suitable for picnics or automobile trips, and large enough to hold 25 lbs. of ice besides bottles and dishes, can be made inexpensively from a large can and a few lengths of tongue-and-groove flooring or other wood. One side is cut out of the can, which then is placed, open side up, in a wooden cabinet made about 1 in. larger in all dimensions so that the intervening space can be filled with wood shavings or other insulation. Strips of molding nailed around the sides of the cabinet enclose the insulating material and hold the can rigidly. A two-ply lid is added, the inner ply crossing the outer for strength, the former having beveled edges for an airtight fit.

R. K. Fowler, Redding, Cal.

Nick in Head of Wood Screw Locks It in Place



Whenever a wood screw is used where it may be loosened by vibration, it can be locked securely by this simple method. After driving the screw in tightly, nick the head

with a cold chisel so that the metal is bent downward as indicated. Do this where the nick will be parallel with the grain of the wood. Take care not to depress the metal so far into the wood that the screw cannot be removed with a screwdriver. Usually just a shallow nick is sufficient.

W. F. Schaphorst, Newark, N. J.

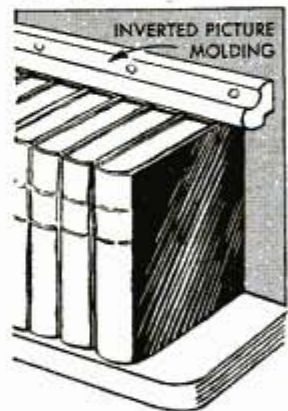
Blue Dye Formula for Flash Bulbs

Use of special blue-tinted flash bulbs often is required when it is necessary to filter out the yellows of the flash and leave a perfectly white light. Since these bulbs sometimes are difficult to obtain or too expensive, the regular bulbs may be dyed, using the following solution: clear lacquer, 75 percent, lacquer thinner, 22 percent, mechanics' layout bluing, 3 percent. The mixture should have a deep purple hue, and a little preliminary experimenting may be required before the proper consistency is achieved. The bulbs are dipped into this dye, then hung base up to dry.

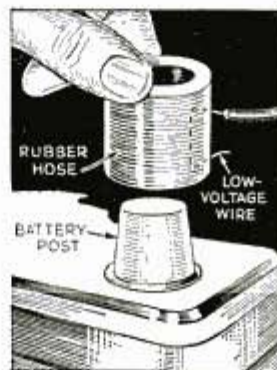
Sgt. W. Mead Stapler, Wright Field, O.

Keeping Books Upright on Shelf

To prevent large books from falling to one side when supporting volumes were removed, one law clerk nailed a strip of picture molding to the wall above the books as indicated. The molding was inverted and placed so that it just touched the tops of the largest books. In this way it permitted books to be inserted or removed easily, but kept them from falling to one side.



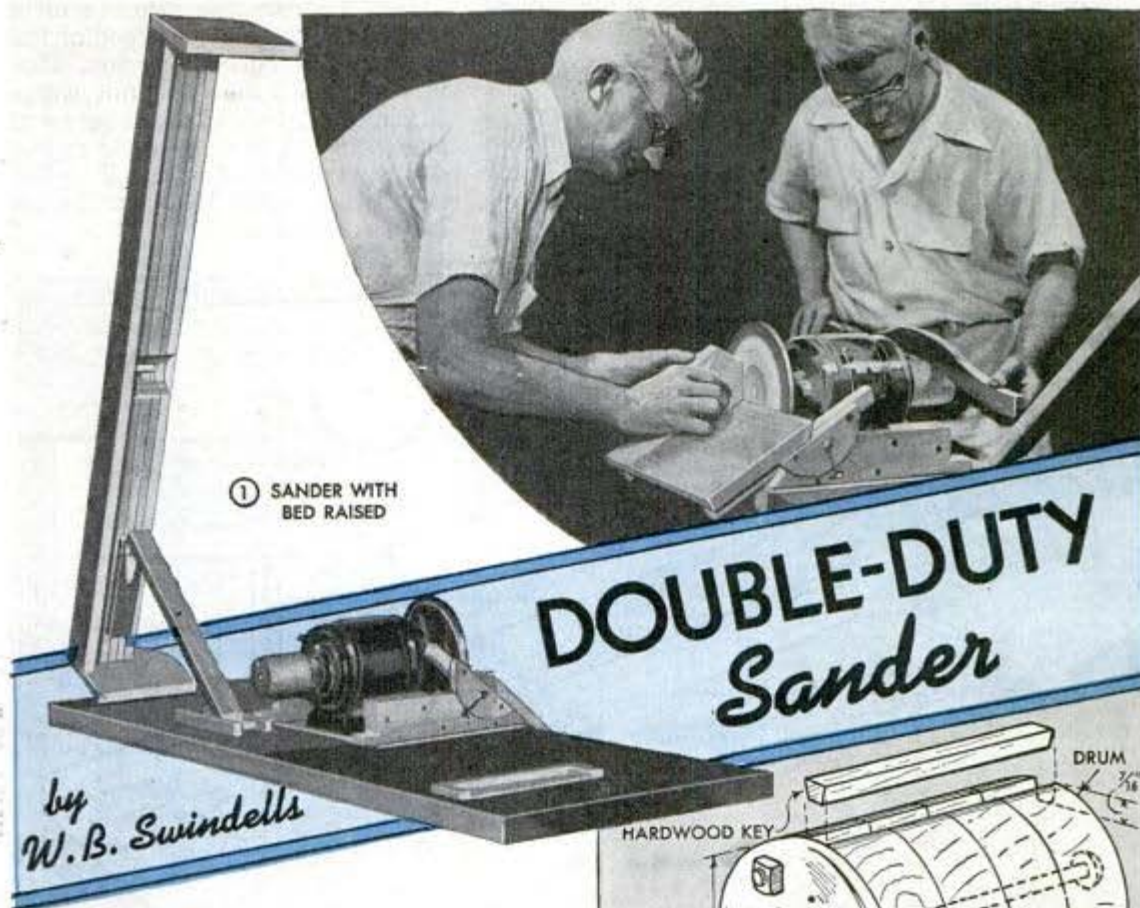
Simple Way to Connect Wires To a Storage Battery



When a storage battery is used for testing purposes on low-voltage lines, an easy way of connecting the wires is to use short pieces of hose. The bared ends of the wires are run through the hose as indicated.



SHOP NOTES



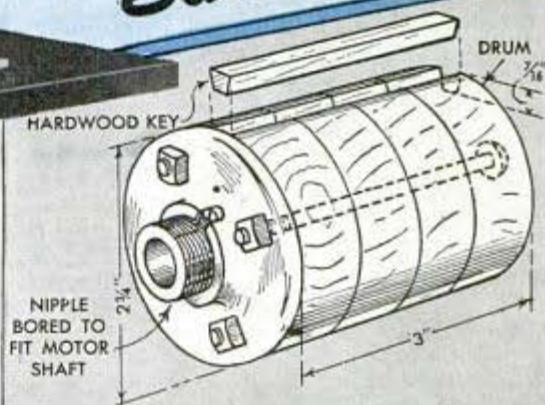
① SANDER WITH
BED RAISED

DOUBLE-DUTY Sander

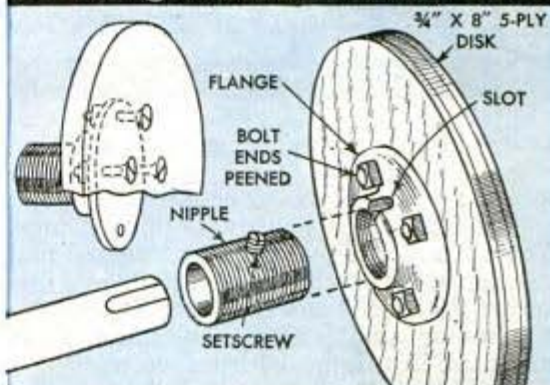
by
W. B. Swindells

WITH a $\frac{1}{4}$ -hp. or larger electric motor having a double-end shaft, and some scrap wood, you can make this combination drum-and-disk sander, which will serve for almost all ordinary sanding operations in the small woodworking shop. The motor is mounted on a sturdy bench or table. A horizontal bed is used to feed the work over the drum sander in the manner of a jointer, as in Fig. 4. The bed is hinged at one end so that it can be raised out of the way as in Fig. 1, when sanding inside curves and work of irregular shape. Also, there is an adjustable disk-sanding table that can be tilted for sanding work at various angles, Fig. 8, or it can be set horizontally for accurate, 90-deg. corners, as in Fig. 7.

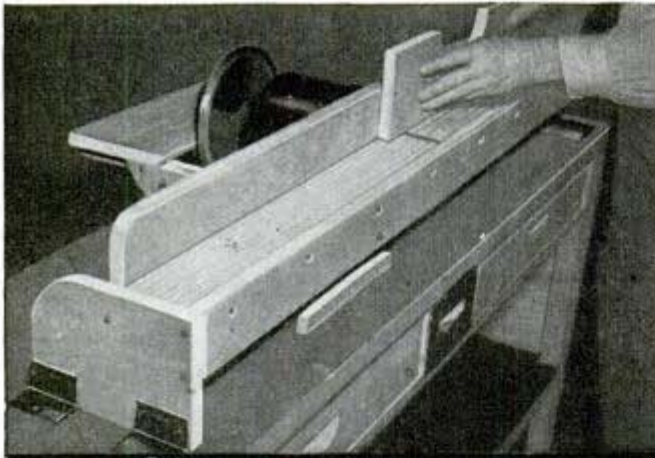
The drum is made by assembling four pieces of $\frac{3}{4}$ -in. hardwood of suitable size on a floor flange, gluing the pieces of wood and clamping them tightly with stove bolts, Fig. 2, which hold the assembly together. When the glue is dry, a pipe nipple is screwed into the flange. The nipple should



② FOUR-PLY DRUM AND KEY



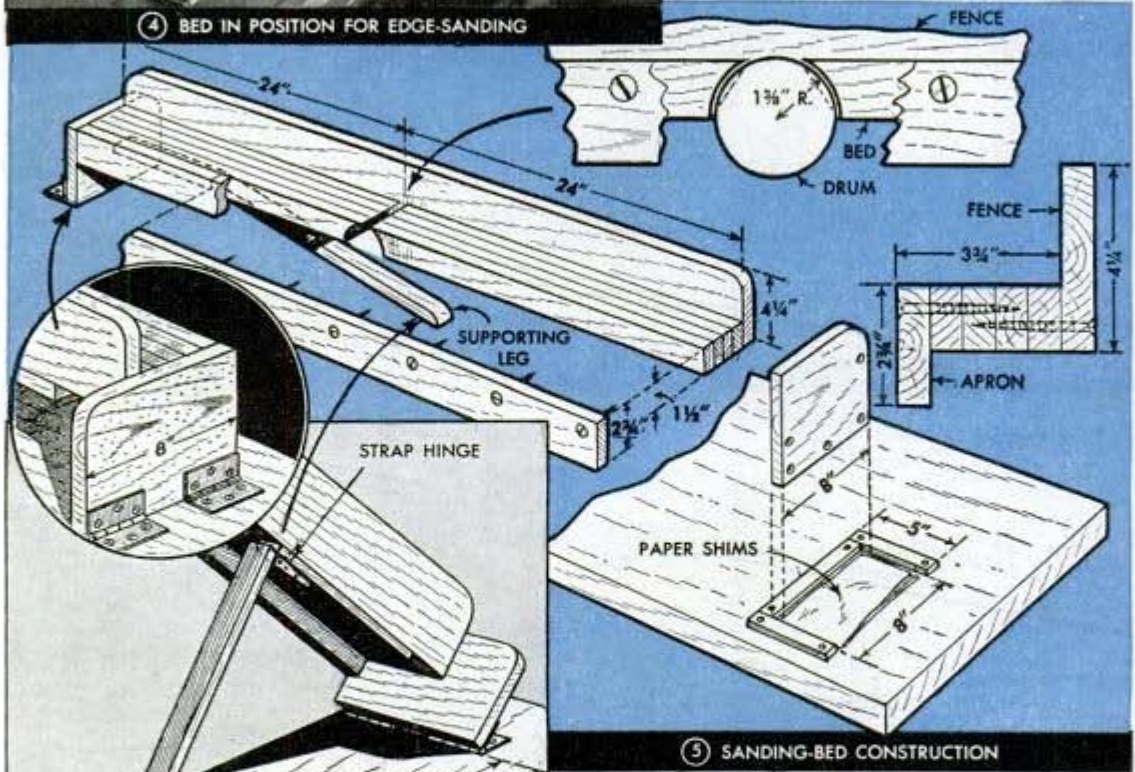
③ HOW DISK IS ASSEMBLED



4 BED IN POSITION FOR EDGE-SANDING

wood and flange are turned to a diameter of $2\frac{3}{4}$ in. Then the work is removed and a slot is cut lengthwise for a hardwood key that holds sheets of abrasive paper tightly around the drum.

Fig. 3 shows the sanding disk, which is a piece of plywood of the kind used in concrete forms. This is waterproof and will not warp. It is mounted on a floor flange and sleeve in the same manner as the drum, except that in this case the bolt heads must be countersunk in the face of the disk.



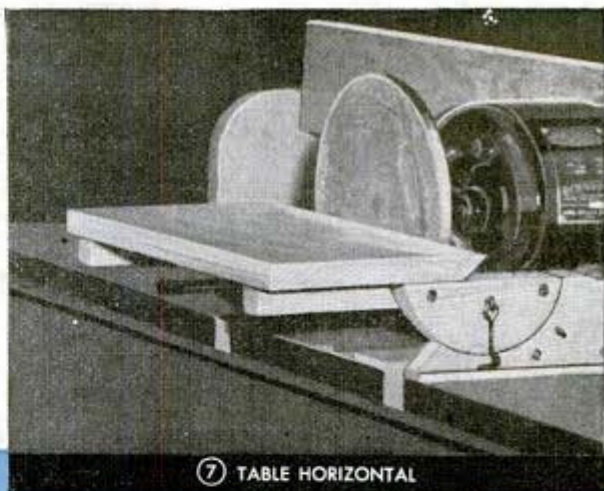
5 SANDING-BED CONSTRUCTION

fit on the motor shaft snugly and reaming may be necessary. Or you can make up a sleeve from solid stock, drilling it to shaft size and threading one end to fit the flange. Then the nipple is drilled and tapped and the flange is slotted as shown to take a set-screw that locks the nipple and flange to the motor shaft. Now, the assembly is mounted in a lathe with a face plate and dog, so that the center line through the nipple is in line with the lathe center. Both

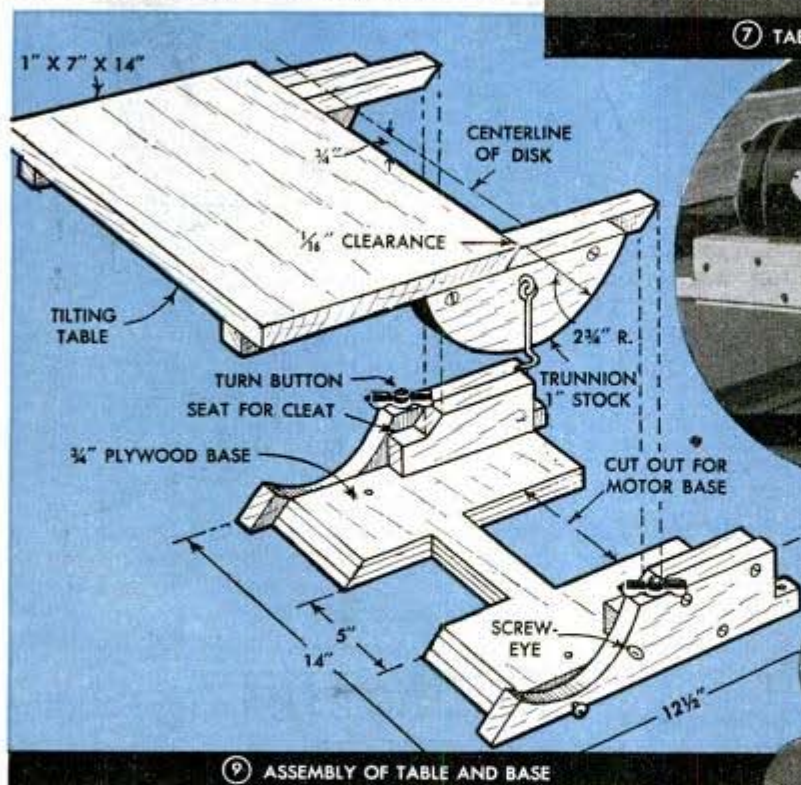
The bed for the drum sander consists of a floor, an apron and fence, and two end-pieces, Fig. 5. The floor is made in two sections, each of which is assembled by gluing together four pieces of $\frac{3}{4}$ -in. hardwood. One end of each section is cut away at an angle and then is sanded on the drum so that when the sections are assembled there will be a concave cutout of $1\frac{3}{8}$ -in. radius over the drum as shown in the upper detail of Fig. 5. The apron and fence are screwed to the floor sections as in the right-hand detail, the screws also serving to supplement the glue in holding the floor strips together. The floor of the bed must be flush with the top of the drum without a covering of abrasive paper. Next, the endpieces of the bed are screwed in place, with their upper edge flush with the bed floor. One

of the endpieces is hinged to the work table; the other is held in a stabilizing frame consisting of three cleats. Paper shims are placed in the frame to regulate the height of the bed above the drum to accommodate varying thicknesses of abrasive and to permit sanding work to desired depths. When the bed is raised, it is supported by a leg set in a rack as in Fig. 6.

The disk-sanding unit, consisting of table and base, is shown in Fig. 9. The base can be made of $\frac{3}{4}$ -in. plywood or other suitable stock, cut in the form of the letter H, so that the motor base will



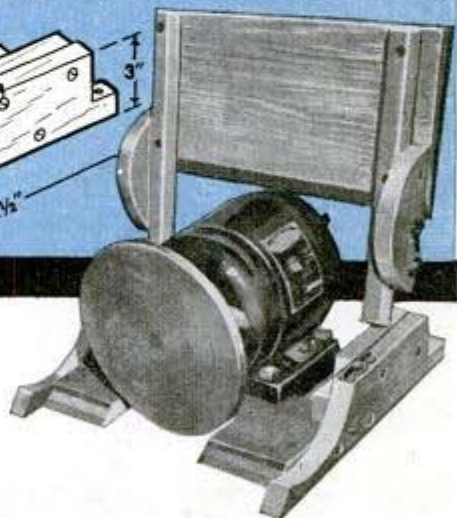
7 TABLE HORIZONTAL



9 ASSEMBLY OF TABLE AND BASE



8 TABLE-TILTED

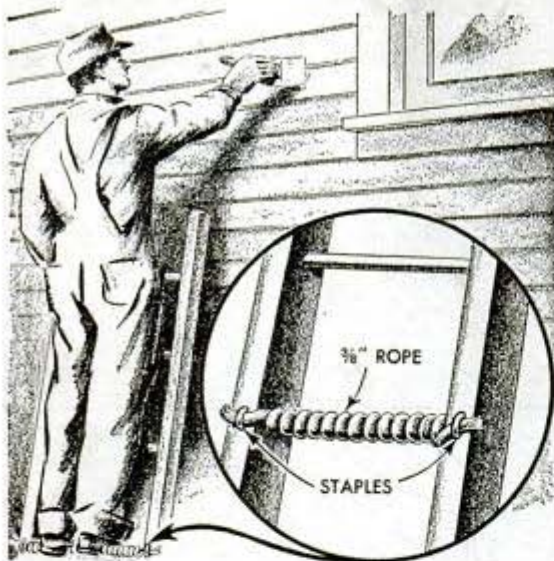


fit into the rear cutout and the edge of the disk can turn freely in the other. Sides are added to the base as supports for trunnions, on which the table rides. The trunnions are screwed to cleats attached to the underside of the table as shown. Each trunnion is half of a $5\frac{1}{2}$ -in. disk less the thickness of the table. The upper surface of the table, when horizontal, should be $\frac{3}{4}$ in. below the center of the sanding disk, and there should be a clearance of $\frac{1}{16}$ in. between the table edge and the sanding disk when abrasive paper is attached. With the table in the horizontal position, the cleats rest on supporting pieces screwed to the sides of the base, and are held by turn buttons. A screen-door hook on each trunnion is slipped over screws driven part way into the sides. These also help to hold the table firmly in the horizontal position. To hold

the table in a 45-deg. position, as in Fig. 8, the hooks engage screw eyes located in the base. Screws and screw eyes should be positioned so that considerable pressure is required to release the hooks in order to prevent play, which otherwise may be considerable.

With a drum and disk of the sizes given here, you can use one 9 by 11-in. sheet of abrasive to cover both; an 8-in. disk and a 3 by 9-in. piece to fit the drum, leaving a 1 by 8-in. strip.

Rope-Wrapped Ladder Round Is Comfortable to Feet



To provide a comfortable rest for his feet when standing on a ladder for long periods of time, a Wisconsin painter wraps rope around the most commonly used rounds as shown. The rope is fastened at the ladder sides with large staples.

Hog Waterer Maintains Supply At Constant Level

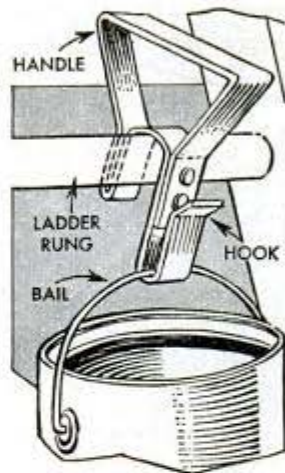
Here's a good way to reduce the time spent each day in watering hogs. With one filling, the device shown here will supply enough water for 50 head of hogs for a period of about two days. It consists of a metal barrel or drum, a 1-in. faucet and some pipe fittings. The drum should have a tightly-fitting screw cap with a gasket to make it airtight. To install the waterer,



mount the drum with the side cap on top to facilitate filling. Then screw a nipple of suitable size into the vent, and attach an elbow and faucet. With the drum set in place over a watering trough, close the faucet, remove the cap and pour in water. Then replace the cap so that it is airtight and open the faucet. Water will flow until the level in the trough reaches the faucet and shuts off the air intake into the drum, thus maintaining a constant level in the trough.—W. Thomas, Barneveld, Wis.

Handle on Paint-Bucket Hanger Permits Easy Moving on Ladder

An improved hanger for supporting a bucket of paint from a ladder rung can be made from a strip of flat iron bent and riveted as shown in the drawing. The iron should be bent to fit snugly over a rung, with an extension above for a handle by which the device can be lifted easily for removing. As the weight of the bucket naturally will incline the hanger forward, the handle can be formed at an angle so that in use it will remain horizontal.



Russell Smith, Buchanan, Va.

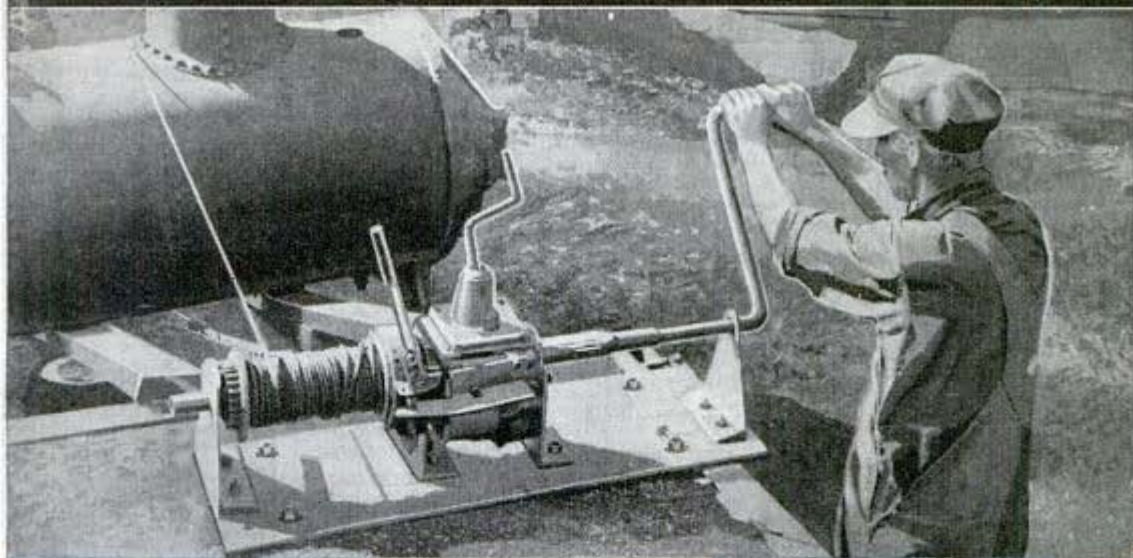
Funnel Holds Pigeon for Banding

One pigeon breeder who raises the birds for commercial purposes keeps records of the various pairs. This necessitates banding each bird for easy identification. To attach the leg bands easily and without injuring the birds, a funnel is placed in a fruit jar, which is weighted with sand, and the pigeon is placed head down in the funnel. The bird's legs project and flapping of its wings is restricted.

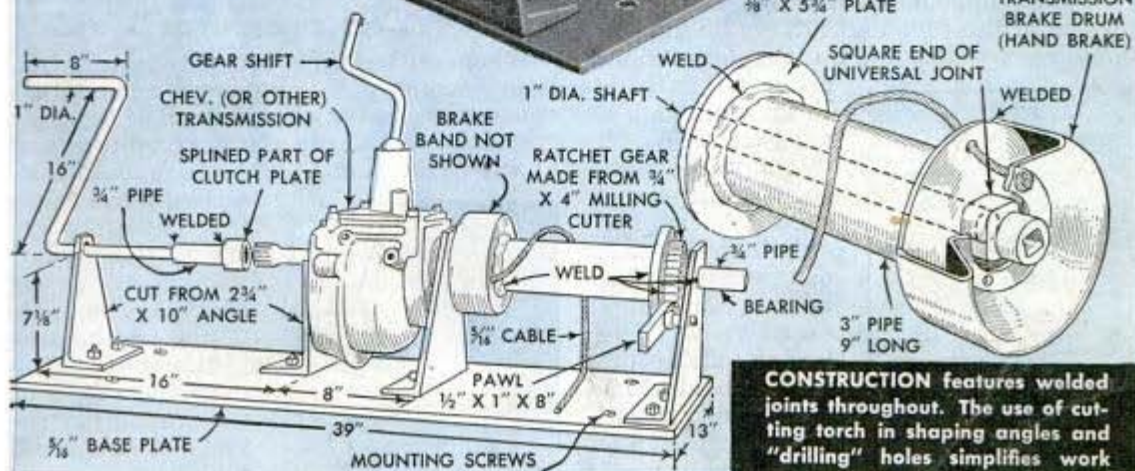
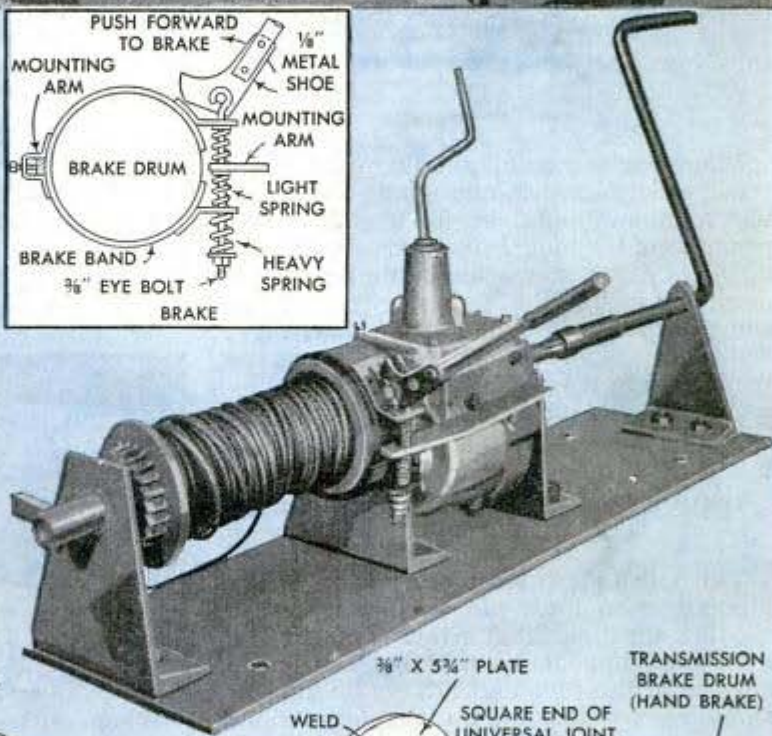
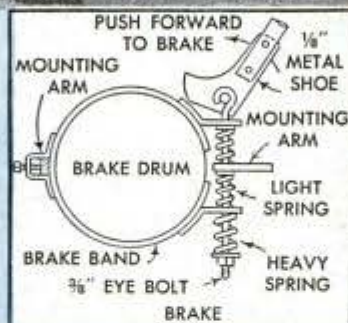


☐ A clicking sound sometimes apparent when a car motor is idling often can be traced to a fan hub that is loose on the shaft.

Powerful DRUM HOIST Made from Scrap



With this homemade hoist, you can lift loads weighing more than a ton. For each pound of pressure exerted on the handle, there is an upward pull of 30 lbs. on the load. Construction is largely torch cutting and welding. The base plate has holes for mounting, preferably on the bed of a truck, permitting full sweep of the handle. However, the hoist can be used on the ground if the handle is disengaged after each half swing. Although the brake mechanism is not essential, it is useful for dropping a load. An old auto transmission gives a free neutral position as well as a selection of gear ratios



28.05.11 (ch.) removed work

Progress of Lathe Tool Watched In Mirror Behind Work

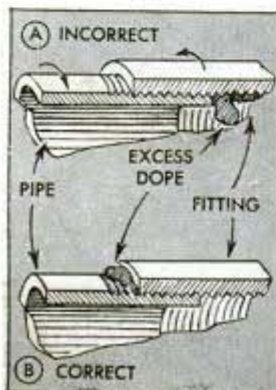


When turning small shoulders, or doing other exacting work, many lathe operators use a magnifying lens for watching the progress of the tool. However, a large magnifying mirror, supported behind the work as shown in the illustration, will serve the same purpose, yet be out of the way. Also, the operator can either look directly at the work, or see it reflected in the mirror, by merely raising his eyes.

A. J. Lockrey, Douglaston, L. I., N. Y.

Applying Pipe-Joint Compound To Prevent Obstruction

When fitting water pipe, especially for pump suction lines where friction loss in the flow through the line must be kept at a minimum, it is important that the inside surface of the pipe and fittings be kept as smooth as possible and that no obstructions



occur to reduce the size of the passageway. With this in mind, pipe-joint compound should be applied only to the threads of the male fitting as at B so that any excess will be forced outside the pipe instead of inside it as would be the case if the compound were

applied to the threads of the female part A of the fitting. Reaming the ends of the pipe before assembly also helps to reduce friction.—J. Modrock, Danbury, Conn.

Funnel Soldered to Paint-Jar Cap Points and Holds Brushes

Soldered to the screw cap of a show-card color jar, a section of an ordinary funnel provides a broad surface on which to point brushes and test colors before applying them. Also, if a length of wire is soldered across the top of the funnel, it will serve as a rack on which cleaned brushes can be laid ready to be used. As the screw caps are interchangeable on all jars of the same kind, only one cap-and-funnel unit is needed. This may be used on jars of different colors.—Opie Read, Jr., Chicago.



Wire Coil Under Filter Disk Speeds Straining of Milk

Dairymen who strain milk through filter pads often find that the pads cling so tightly to the screen in the strainer that the flow of milk is impeded. To overcome this, one



farmer found that a flat coil of wire placed between the screen and filter pad would keep them separated. The coil is wound loosely and lies on top of the strainer screen.

Safety-Razor Comb on Hammer Cleans Concrete-Form Boards

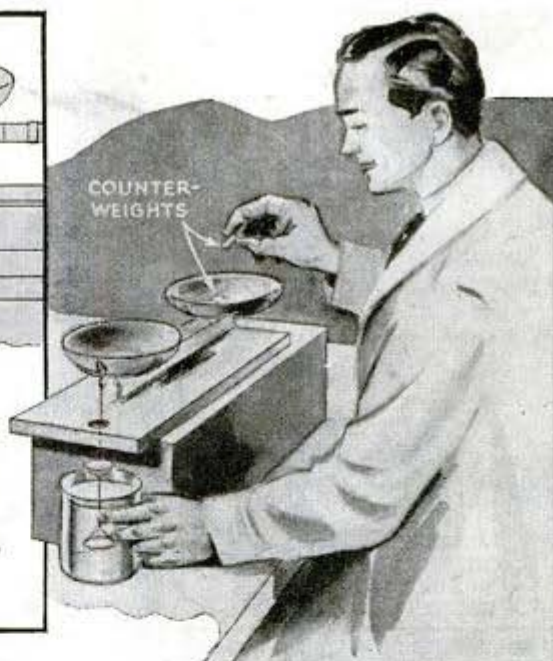
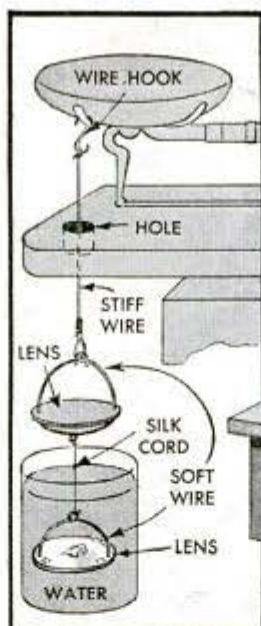
When setting up a concrete form, often it is necessary to scrape off some dried concrete so that the boards will fit together correctly. To assure always having a tool at hand for this purpose, one workman



screwed the comb from a safety-razor to the end of his hammer as indicated. The teeth of the comb, projecting slightly over the edges of the hammer, remove the concrete with ease.

Easy Way to Find Specific Gravity of Minerals

It's a simple matter to convert small balance scales of the type used in weighing photographic chemicals so they can be used to determine the specific gravity of minerals, etc. Just suspend a couple of small weighing pans from one end of the scales as indicated. Rimless spectacle lenses make ideal pans as they are already drilled at opposite sides for attachment of soft wire bails. A straight piece of fine, stiff wire may be used to suspend the upper pan. The lower one is hung from the upper one by means of a piece of fine silk thread, which weighs practically nothing. In suspending the pan assembly use a small wire hook and slip it over one of the fingers on the scale, getting it as near the center of the scale pan as possible. Do not hook it over the edge of the pan as this will produce a slight stress in the lower horizontal rod of the scale and make weighing inaccurate. Immerse the lower pan in a glass of water to a depth of about half the

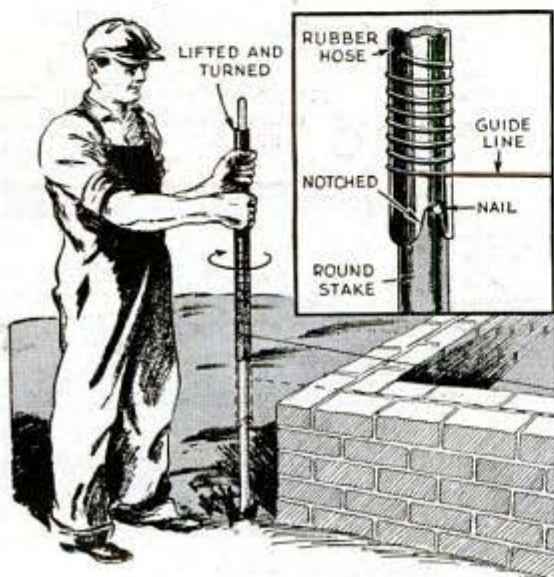


length of the silk thread. Wad a piece of tin foil, or use other weights to balance the scale exactly. Weigh the specimen in the upper glass pan (dry) and then in the lower one (wet). The difference in weight then is divided into the dry weight to give the specific gravity.

Philip H. Grant, Wilmington, Del.

Notched Rubber Hose on Stake Tightens Mason's Line

To simplify the work of taking up the slack in a mason's line from time to time, one workman improvised the tightener shown. The line is attached permanently to a short piece of rubber hose, which is

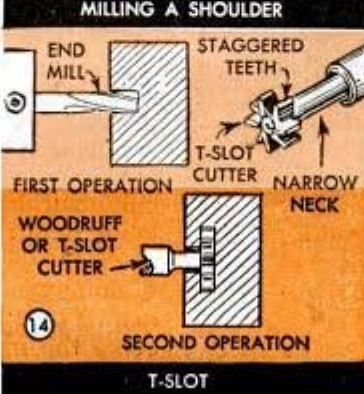
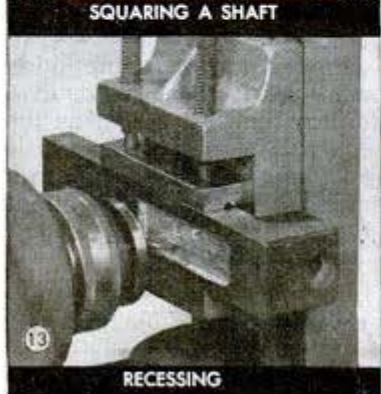
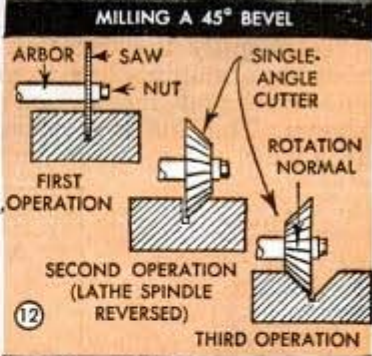
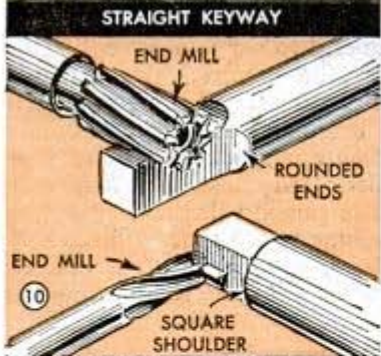
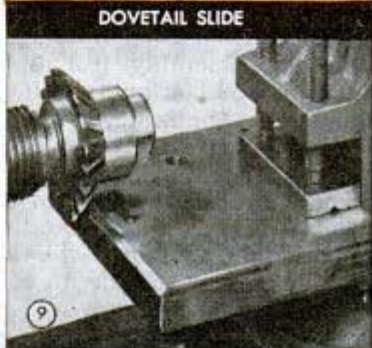
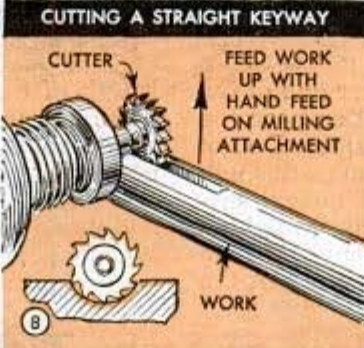
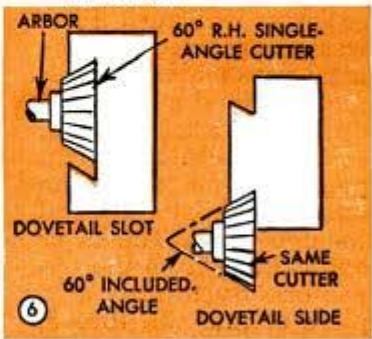
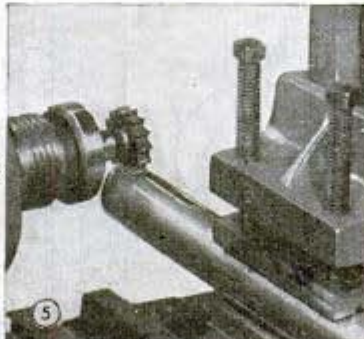
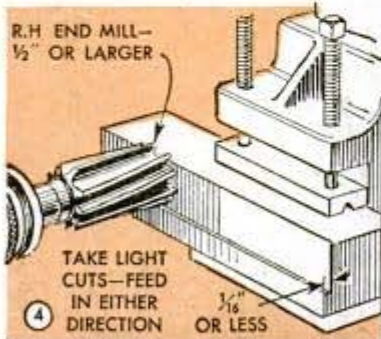
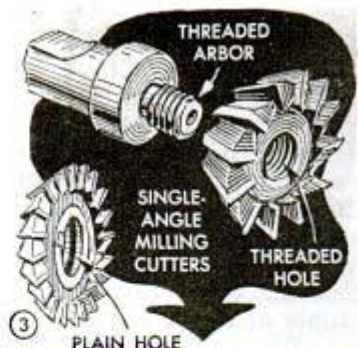
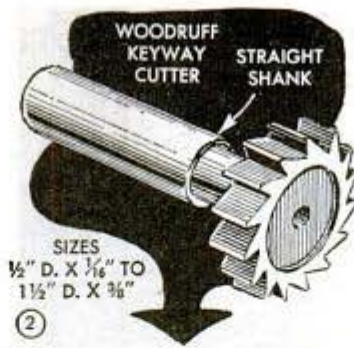
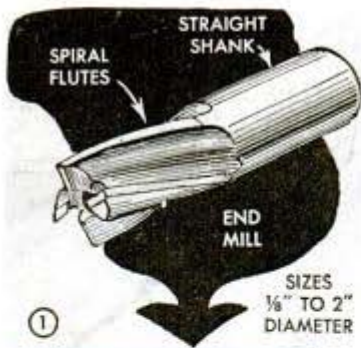


notched at one end to serve as a reel. This is slipped over the round stake through which a nail or cotter key has been inserted. After the line has been stretched, any sag that may occur can be taken up instantly by merely lifting the hose and turning it, after which it is pushed down so that the notched end engages the nail to hold it in place. If desired, several notches can be cut in the lower end of the hose to permit finer adjustments.

Cutting Oil Applied by Dropper

A medicine dropper is ideal for applying cutting oil to small work in a lathe or drill press. It is handier than an oilcan as the application is controlled better. The bottle of oil and dropper are fastened to the machine within convenient reach, the dropper being kept in the bottle as a stopper.

☞ Your work gloves will last longer if adhesive tape is applied to the parts that receive the most wear, especially along the palm sides of the fingers and at the tips.



Standard operations

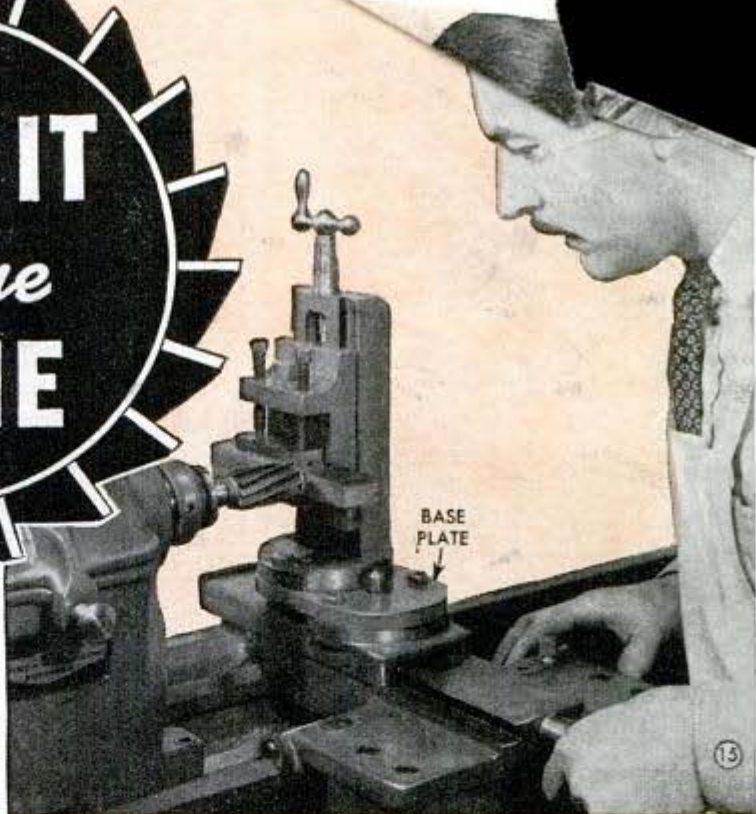
cover a wide variety of jobs, all easy to do with milling attachment. Most useful cutters are end mills and keyway cutters with $\frac{1}{2}$ -in. shanks to fit $\frac{1}{2}$ -in. hole arbor. All cutters should be right hand to suit lathe rotation

MILL IT *in the* LATHE

By Sam Brown

SMALL shops that are not equipped with a milling machine can get along very nicely by milling in a lathe. Extra equipment needed includes a milling attachment, which is a standard lathe accessory, plus a few cutters, most popular being end mills, Fig. 1, and Woodruff keyway cutters, Fig. 2. The milling attachment is fitted to the lathe carriage in place of the compound, Fig. 15. It holds and feeds the work to the cutter, which is mounted in the lathe spindle.

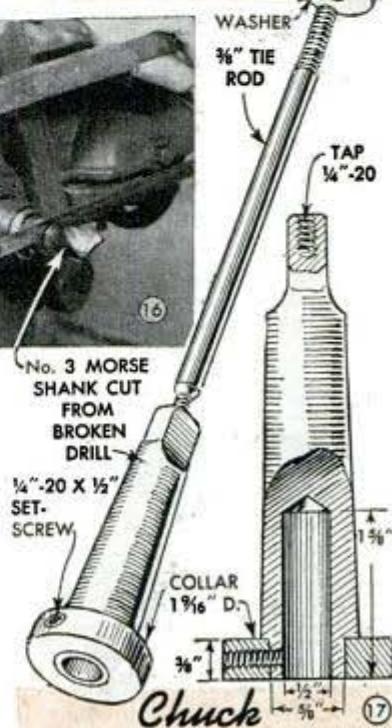
Examples of standard operations shown in Figs. 4 to 14 inclusive need little explanation. As far as possible, lathe power feeds should be used, chiefly the power crossfeed. However, if the lathe is not fitted with power crossfeed, good work can be done by hand feeding. The feed on the attachment itself is sometimes used, an example being the milling of a Woodruff key slot, as shown in Fig. 8. In the recessing operation, Fig. 13, it is necessary to drill a starting hole since the conventional end mill cannot be sunk directly into the metal. Work of this kind is most conveniently done with a two-lip slotting end mill, this style being especially designed for direct sinking into the metal. Fig. 6 shows the milling of dovetail slides. The same cutter, a single-angle milling cutter, is used for both parts of the slide. This style of cutter usually has a threaded hole, and is fitted on a threaded arbor, as shown in Fig. 3. Fig. 9 shows a 45-degree angle cutter with plain hole being used to cut a bevel. In this particular operation, the cutter is turned over on the spindle and the direction of lathe operation is reversed. Another example of reversing an angle



Milling attachment

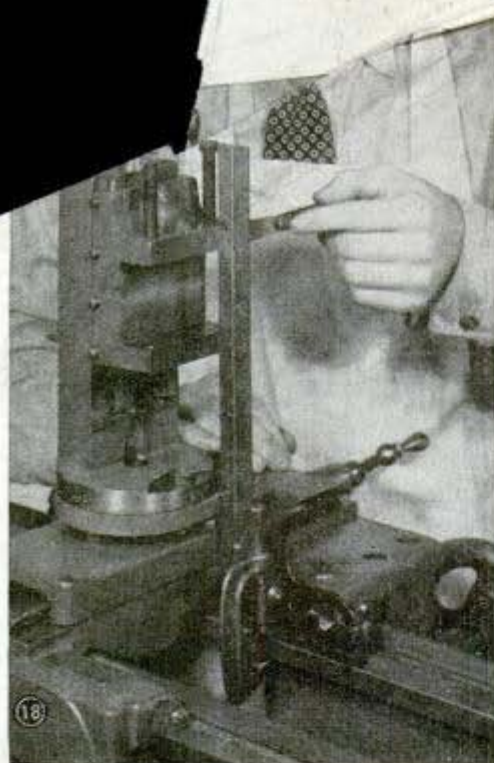
bolts to lathe carriage in place of compound. Crossfeed is increased by using base plate

NUT



Chuck

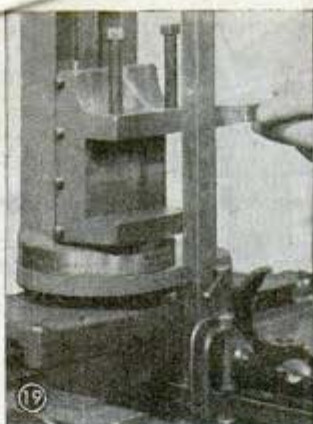
for straight-shank cutters can be made from discarded drill, annealed and turned to take collar, driving fit



18

Checking accuracy

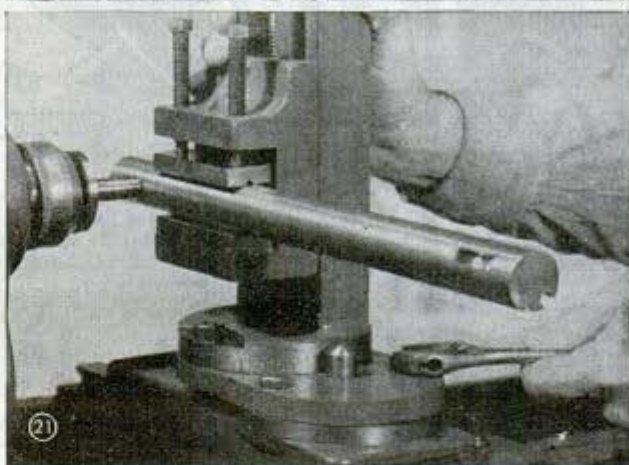
shows if milling attachment is true vertically and horizontally. Accurate work is impossible unless the attachment itself is accurate



19



20



21

cutter is shown in the V-groove diagrams, Fig. 12, where the angle cutter is reversed to cut both sides of the vee. The same job could be done also by turning the work end-for-end, leaving the cutter in the same position for both cuts.

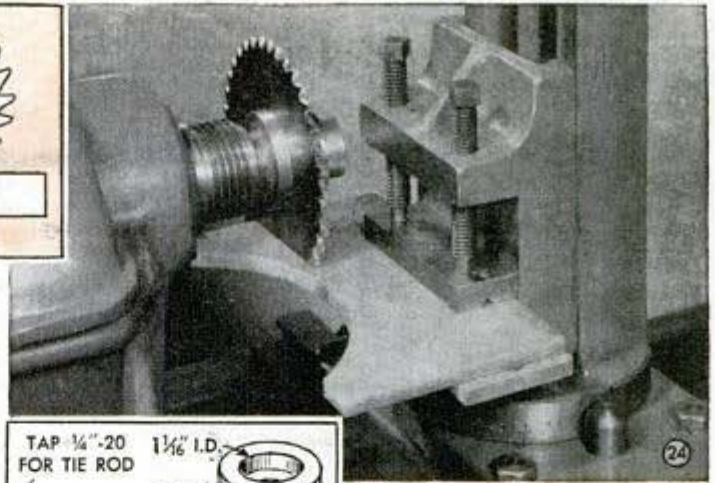
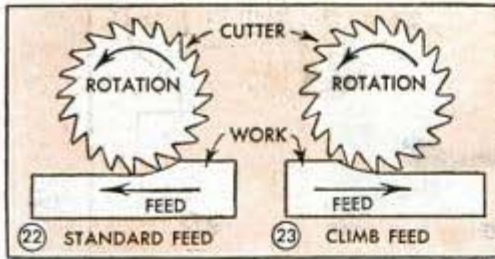
The range of milling operations is greatly increased if the attachment is fitted with an offset base plate, Fig. 15. This plate, about $\frac{1}{2}$ in. thick, increases the amount of crossfeed. Another way of increasing the crossfeed is to use a longer lead screw in the cross slide. Fig. 17 pictures the standard $\frac{1}{2}$ -in. hole chuck, used for end mills, keyway cutters and other tools with straight shanks. It can be made from a discarded No. 3 Morse-shank drill by cutting off the broken end as in Fig. 16, then drilling the end as in Fig. 17, and turning it down to provide a shoulder and take a collar with a drive fit. Both collar and shank are drilled and tapped for a setscrew, which locks the tool in place. You will have to anneal the drill by heating it to a cherry red and then allowing it to cool slowly in the air before it can be turned or sawed.

Before any attempt is made at milling, the attachment should be checked carefully for accuracy. Clamp a try square to the lathe bed and check with a thin feeler blade, with vise jaws at uppermost point

of travel, Fig. 18; then recheck with vise at lowermost position, Fig. 19. If any appreciable error is found, remedy it by sanding the bottom of the base plate. In a somewhat similar manner, check crosswise at the vise jaws, as shown in Fig. 20. With the vise true in these two planes, it is only necessary to set the work square with the cutter to assure perfectly accurate work. Setting the work square is simply a matter of rotating the milling attachment until the work shows an equal distance from the cutter at both ends of the crossfeed travel, Fig. 21.

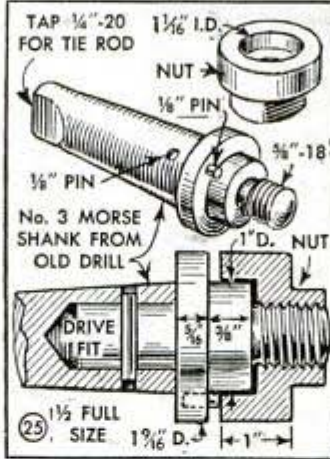
Climb feed is recommended for most jobs, provided the lathe has power crossfeed. When climb feed is used, the work moves in the same direction as the rotation of cutter, Fig. 23. When standard feed is used, the work moves against cutter rotation, Fig. 22. Principal advantage of climb feed is that it tends to push the work down with strong, even pressure, eliminating chatter to a considerable extent. Climb feed, however, is a little difficult to control when the feed is operated by hand. In this case, it may be best to use the standard feed. A little experimenting will enable you to determine which one to use.

Fig. 25 shows a stub milling arbor for holding saws and other plain-hole cutters. It is diagrammed for 1-in.-hole cutters, but



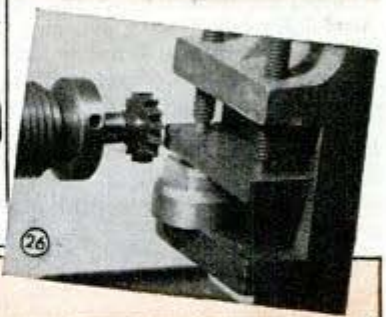
can be modified to suit any other hole size. Fig. 24 shows this arbor in use. Fig. 26 shows the milling setup for cutting a wrench flat on a nut.

Speeds and feeds given in Fig. 27 were compiled from actual shop tests. Generally, the cutter should run at a good rate of speed, while the feed should be kept fairly fine. The column giving feed per minute can be used as a guide if the lathe does not have power crossfeed. Depth of cut will normally be $\frac{3}{16}$ in., depending on hardness of material being cut, width of cut, nature of set-up, etc. Feed for saws is given for a full-capacity cut and can



Stub milling arbor

takes saws and side milling cutters with plain or keyed hole. Shank is discarded drill

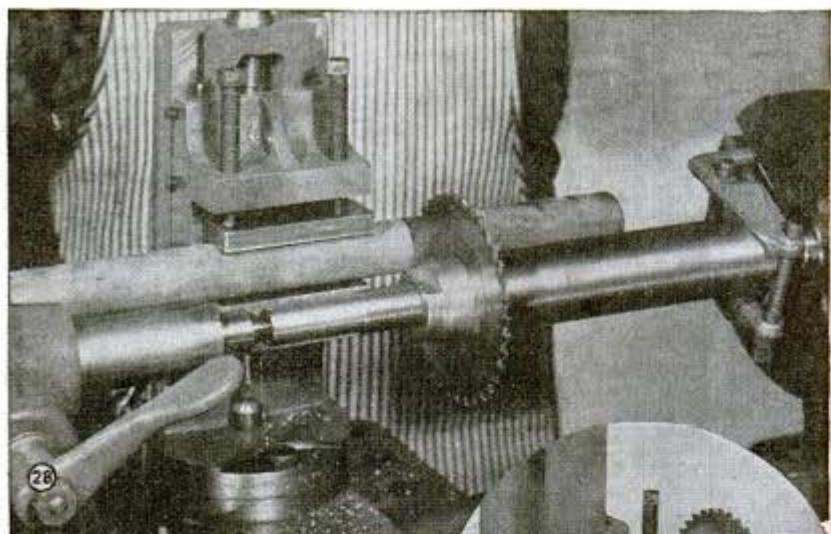


(27) Speeds (1) and feeds

CUTTER (2)	HARD STEEL				MED. STEEL—CAST IRON				MILD STEEL				SOFT METALS			
	Cutter speed r.p.m.	Depth of (2) cut	Feed (2)		Cutter speed r.p.m.	Depth of (2) cut	Feed (2)		Cutter speed r.p.m.	Depth of (2) cut	Feed (2)		Cutter speed r.p.m.	Depth of (2) cut	Feed (2)	
			Per rev.	Per min.			Per rev.	Per min.			Per rev.	Per min.			Per rev.	Per min.
1/4 End mill	458	1/16	.0015	3/4	917	1/16	.002	1 3/4	1222	1/16	.0015	1 3/4	2292	1/16	.001	2 1/4
3/8 End mill	306	1/16	.002	5/8	611	1/16	.002	1 1/4	815	1/16	.002	1 1/2	1527	1/16	.001	1 1/2
1/2 End mill	229	1/16	.003	5/8	459	1/16	.003	1	611	1/16	.003	1 1/2	1146	1/16	.0015	1 1/2
1 End mill	115	1/32	.004	1/2	229	1/16	.003	1/2	306	1/16	.003	1	573	1/16	.002	1 1/4
Woodruff 1/2 x 1/8	229	1/16	.002	1/2	459	1/16	.002	1	611	1/16	.002	1 1/4	1146	1/16	.004	4 1/2
Woodruff 1 x 1/4	115	1/8	.003	3/8	229	1/8	.003	3/4	306	1/8	.003	1	573	1/8	.004	2 1/4
Woodruff 1 1/4 x 3/8	92	3/16	.003	3/8	183	3/16	.003	1/2	245	3/16	.003	3/4	459	3/16	.003	1 3/4
Angle cutter 1 1/4 x 3/16	92	1/16	.003	3/8	183	3/16	.003	1/2	245	3/16	.003	3/4	459	1/16	.003	1 3/4
Angle cutter 1 3/8 x 3/16	70	1/16	.003	1/4	141	1/8	.003	1/2	188	1/16	.003	1/2	351	1/16	.003	1
Saw 2 1/2 x 1/16	69	Any	.003	1/4	184	Any	.002	3/8	230	Any	.002	1/2	306	Any	.002	3/8
Saw 3 x 1/16	57	Any	.004	1/4	152	Any	.003	1/2	191	Any	.003	1/2	254	Any	.003	3/8
Saw 4 x 1/32	43	Any	.004	1/4	115	Any	.003	1/2	143	Any	.003	1/2	191	Any	.004	3/8
Side mill 2 x 1/4	57	1/16	.006	3/8	115	1/8	.004	1/2	153	1/8	.004	3/8	287	1/8	.006	1 3/4
Side mill 3 x 3/8	38	1/16	.006	1/4	76	1/8	.004	3/8	102	1/8	.005	1/2	191	1/8	.010	1 3/4

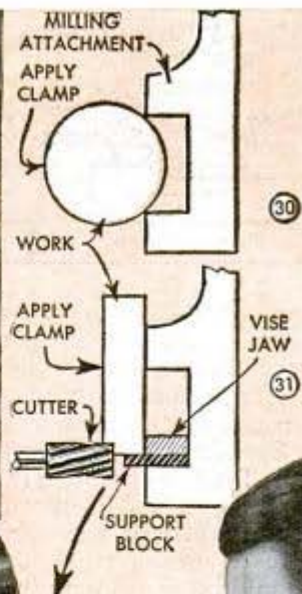
(1) For high-speed steel cutters. If carbon-steel cutters are used, run lathe about two-thirds of speed given

(2) All figures are in inches



Long milling arbor

is similar to stub type except it is straight bar mounted between centers. Useful for cut-off work and any operation that requires clearance between the cutter and the headstock

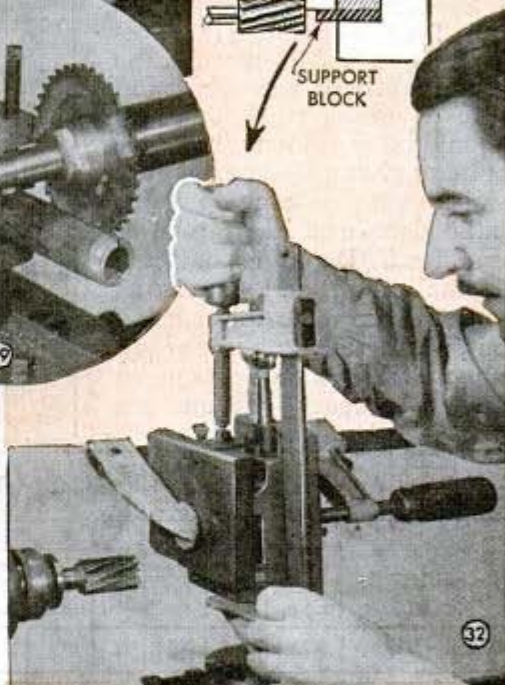


be increased somewhat when thin stock is being cut.

Fig. 28 shows a long milling arbor in use. This is made like the stub arbor, except that it is a straight bar driven between centers. It is useful for cut-off work and other operations that require clearance between the cutter and the headstock. Another job with saw mounted on this arbor is shown in Fig. 29. Likely you will come across numerous jobs that are ideally suited to this particular setup.

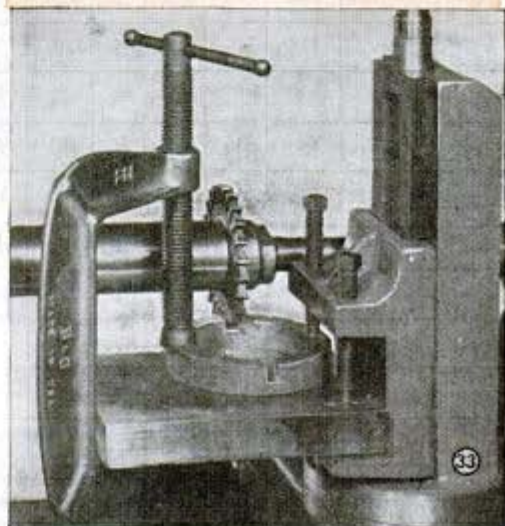
The work opening of most milling attachments measures about 1 in. deep by 2 in. high by 3 in. wide. Although this is sufficient capacity for most work, occasionally the worker will have a job which cannot be accommodated. The solution to this problem is the familiar C-clamp. Fig. 30 shows how large rounds can be clamped directly over vise opening; Figs. 31 and 32 show a simple setup for large, flat work. Usually, this can be handled by clamping it over the vise jaws. The work must be mounted as rigidly as possible to prevent chatter. A heavy block of metal at least $\frac{3}{4}$ in. thick is a useful base for jobs that overhang the vise jaws, such as the ring shown in Fig. 33. With these and other makeshifts, fairly large work can be milled in the lathe, but cuts must always be light, particularly when the setup has long overhangs.

Precision work in wood and plastic can be done with the same general setups shown for metal. If desired, regular three-wing shaper cutters can be used. Obviously, the speed of the lathe can be greatly increased for working these comparatively soft materials. With a little experimenting you can find the best speed.

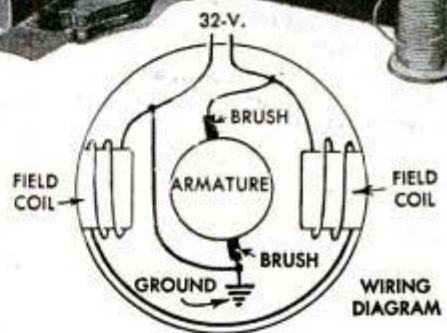
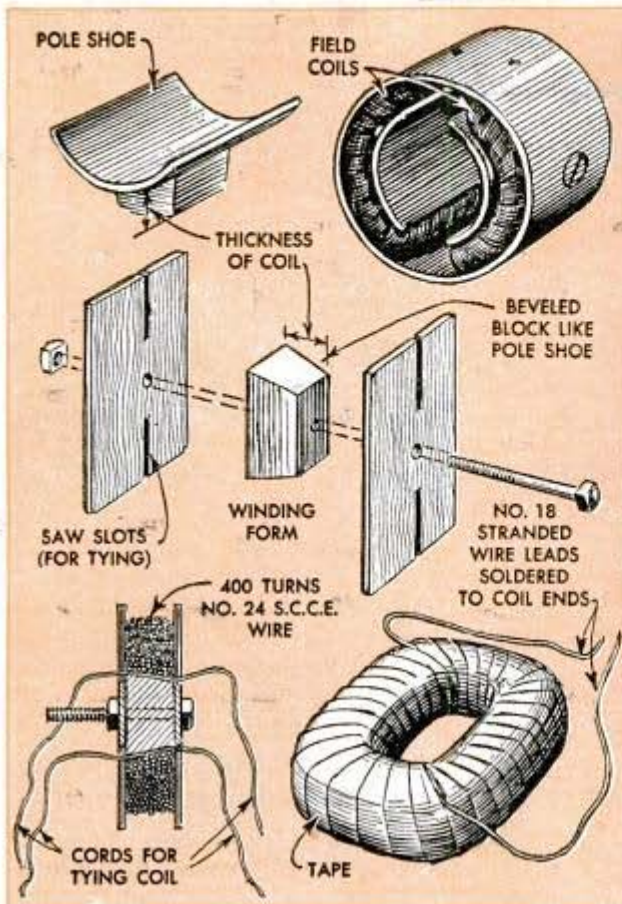


Large work

usually can be handled by using simple C-clamp setups. Work must be mounted as rigidly as possible to prevent chatter



Old Car Generator Rewound to Produce 32 Volts

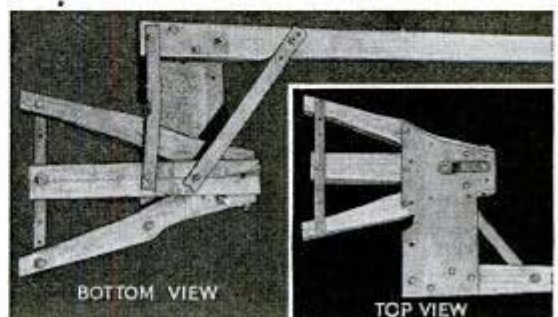


By simply rewinding the field coils of most auto generators they can be made to produce 36 to 40 volts when driven at a speed of 1,800 to 2,000 r.p.m. Also, by supplying current at this voltage a generator of this type will operate as a shunt motor, delivering $\frac{1}{4}$ to $\frac{1}{3}$ hp. at a speed of approximately 1,800 r.p.m. To convert the generator, remove the original field coils and the electrical cutout, which is not used, and then make a winding form of wood similar to the one shown in the center detail. Each coil consists of 400 turns of No. 24 single-cotton-covered-enameled wire, and is covered with two layers of cotton tape and impregnated with insulating varnish. After installing the coils in the generator housing, stranded lead wires are soldered to the ends of the coils, which then are tested for polarity. This can be done with two pieces of soft iron held against both pole faces at the same time while current is flowing through the coils. If the iron pieces attract one another, the polarity is correct. But if they repel each other, which indicates incorrect polarity, just reverse the connections to one coil.

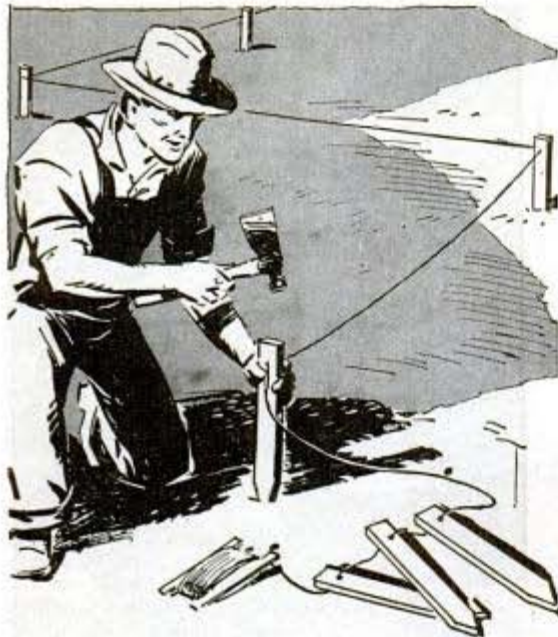
Geo. E. Clentimack, Plainville, Mass.

Offset Wagon Tongue Simplifies Use of Three-Horse Hitch

One farmer who used three horses to pull a wagon on the road offset the tongue. This centered the hitch behind the horses and simplified the use of a three-horse double-tree on the tongue, which was set to one side just enough to bring the stub-end directly behind the center horse. An iron plate bolted on top and two iron braces bolted to the underside of the tongue and stub end provide a rigid assembly.



Small Stakes Strung on Chalkline Aid in Laying Out Work

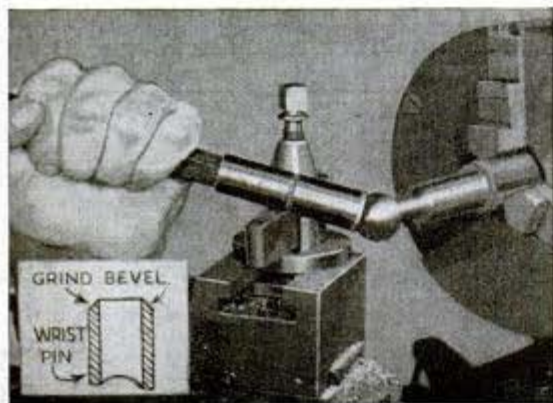


When laying out grading or construction work where batten boards or marking stakes are not required, you can use stakes strung on a chalkline as a portable device for stretching a line from point to point over various distances. With this arrangement, the stakes and line are always together, and the line is strung as the stakes are driven into the ground.

Michael Ligocki, Gary, Ind.

Ball Shape Is Turned in Lathe With Hollow Cutting Tool

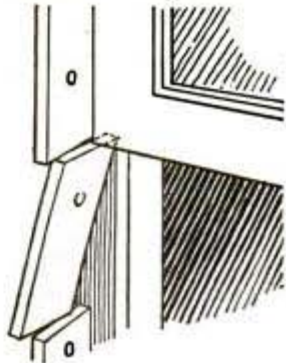
If you have trouble turning a ball in a lathe, try the method shown. The cutting tool is a wrist pin from a gasoline motor. Various sizes can be obtained at a car wrecking yard. The end of the pin should be ground to a bevel, and the pin should be mounted on the end of a file or other suitable handle. The ball shape first is rough-turned with the regular lathe tool, after



which the wrist-pin tool is used freehand as shown. By swinging the tool back and forth, a perfect ball shape is obtained. Best results are had if the inner diameter of the pin is about two thirds the diameter of the work.

Section of Window Stop Pivoted To Hold Barn Sash Open

If your barn windows do not have weights or pins to keep the lower sash open for ventilation, cut out a section of the stop on one side of each window and pivot it as shown. The pivoted section then can be turned to engage the lower edge of the sash and keep it in a raised position. Before pivoting the stops, determine the height at which you want the sash raised and then cut out the sections accordingly.



Legible Marks on Rough Lumber Made With Horseshoe Nail



Finding pencil marks difficult to follow when sawing rough or weathered lumber, one carpenter scored it with a horseshoe nail. This was formed into a finger ring so that the pointed end of the nail projected enough to provide a scoring point.

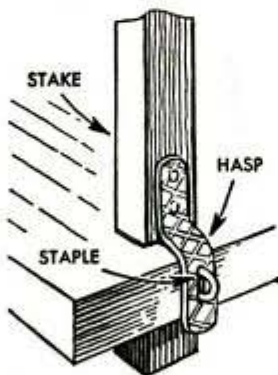
How to Store Portland Cement

For occasional use in mixing small batches of concrete or plaster about the home, portland cement can be bought in full-sack lots and kept in perfect condition for several years if it is stored in metal cans that have tight-fitting lids. Line the can with sheets of paper or with a paper bag of a diameter slightly larger than the diameter of the container. Pour in the cement while it is fresh and dry, and pack it down well by joggling the container against the floor. Fill the can until there is just enough room to fold down the paper liner, then press the lid in place. Paint cans of the 1-gal. size provide good containers. If

these are not available, malted-milk containers or popcorn cans will serve as well. Cement stored in a number of small containers will keep longer than when stored in a large container that is opened frequently. When using only part of the cement from a can, fold or twist the paper lining to cover the remaining cement before putting the lid in place. When several sacks of cement are purchased and are not used immediately, they should be stored in a dry place, preferably indoors. Where it is necessary to store the sacks in a damp place, stack them on a temporary platform elevated a foot or more above the floor. If stored outdoors, pile the sacks in the shape of an inverted V and cover with waterproof building paper laid to shed rainwater. Cement stored in the sack even in a relatively dry place will harden next to the sack and ultimately throughout. If hardening has not progressed too far, some of the cement can be salvaged by breaking up the hard outer shell and sifting out the fine cement. First shake this through a 1/4-in. mesh sieve and finally through one of 14-mesh fly-screen.—Chas. Kimball, Los Angeles, Cal.

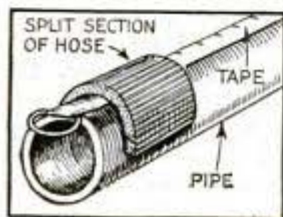
Truck-Body Stakes Kept in Place By Simple Rubber Hasps

To keep stakes in the body of his truck from bouncing out, one driver cut hasps from an old auto tire and nailed them to the stakes. When slipped over staples projecting from the truck floor, the hasps hold securely but may be lifted for removal without bothering with keys or pins. Slots in the hasps must be short enough to provide a tight fit on the staples.

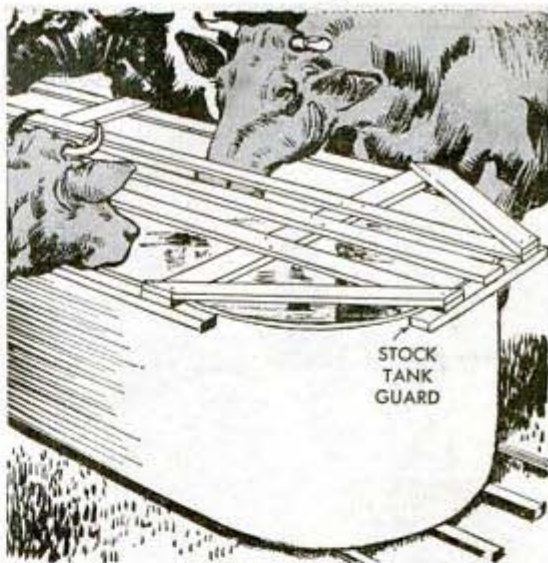


Plumber's Tape Secured by Hose For Measuring Pipe

The problem of holding the end of a tape measure while measuring lengths of pipe was solved by one plumber who used a short piece of split garden hose. The tape was placed at one end of the pipe and the hose slipped over it to act as a clamp. This method will work effectively on pipe of various diameters.



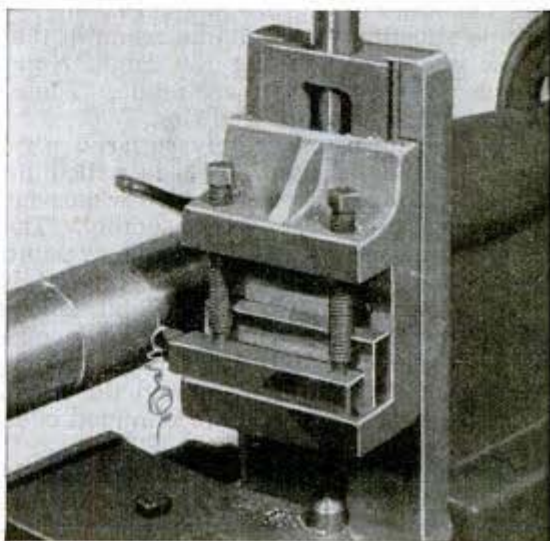
Guard on Stock Watering Tank Reduces Crowding of Animals



To keep cattle from crowding each other at the watering tank, one farmer uses a guard which forces the animals to drink at each side of the tank. The guard also is used as a support for covering the tank to prevent freezing. Cleats fit along the sides and ends of the tank to hold the guard in place.—A. M. Wettach, Mt. Pleasant, Iowa.

Large Tool Bit Is Held Securely In Lathe Milling Attachment

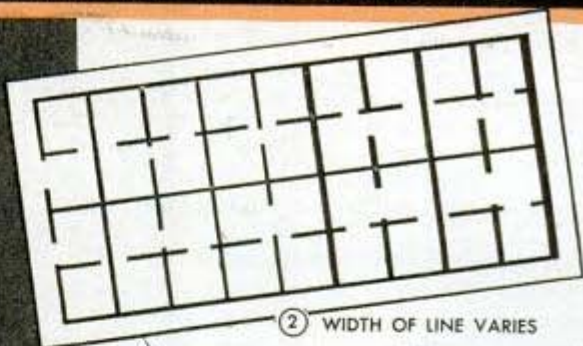
Large tool bits of almost any shape can be used in a small lathe by mounting the tool in a milling attachment. Clamping is solid and positive, and raising the mechanism of the attachment permits placing the point of the bit on center or above as desired. Boring tools can be held in the same manner. The milling attachment also makes a good mounting for other tools.



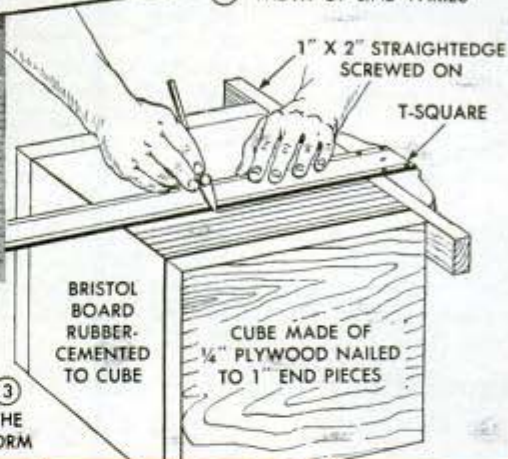
PHOTOGRAPHIC GRIDS



① PHOTOGRAPHING THE FORM



② WIDTH OF LINE VARIES



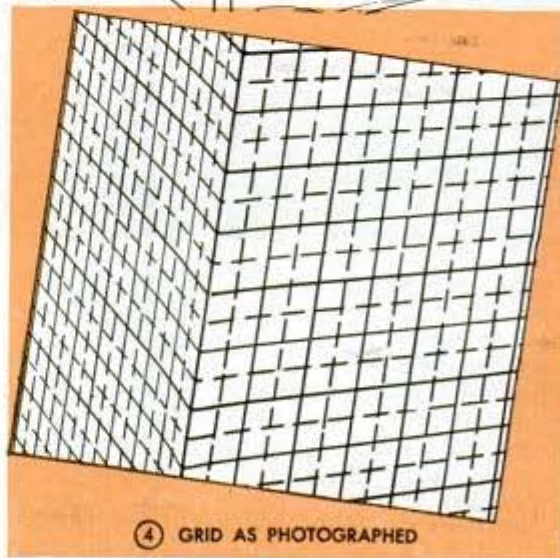
③ THE FORM

By E. M. Love

ONE of the easiest ways of drawing perspective views is by using a "grid"—an arrangement of accurately spaced and scaled lines that lead to vanishing points. If tracing paper is laid over one of these grids on a drawing board as in Fig. 9, a perspective drawing can be made directly with straightedge and pencil and without the use of extensions on the drawing board or any other special equipment. Two examples of such grids are shown in Figs. 4 and 7. The grids are made by photographing two adjacent surfaces of a specially made form, Fig. 1. On this, bristol board is cemented, and accurately spaced lines are drawn in ink to establish the lines of perspective, Fig. 3. Any number of different perspective views can be made in the same way by changing the angle from which the photographs are made. These can be enlarged to desired size.

For the form, accurately squared plywood should be used. This is nailed to 1-in. stock, and braces are added wherever necessary to square the assembly. The form then is coated with thin glue or paint, and, when this is dry, rubber cement is applied evenly to two sides. Next, sheets of two-ply bristol board are similarly coated with the cement and allowed to dry, after which they are placed on the form. Any projecting portions are trimmed even with the edges of the form.

Size of the form depends to some extent upon the area of the film and the kind of lens used. With a large film and a wide-



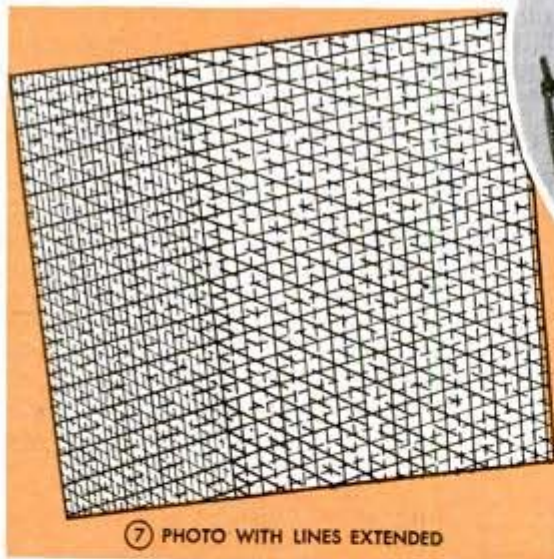
④ GRID AS PHOTOGRAPHED

angle lens, correspondingly greater areas can be photographed at any given distance than with a regular lens and miniature-size film. However, in this case the lower edges of the form as well as the parallel lines drawn on the attached bristol board will appear in a more abrupt perspective. On the form shown, solid inked lines were spaced $\frac{1}{2}$ in. apart, with alternating dashed lines between them, Fig. 2. These, also, were spaced $\frac{1}{2}$ in. apart, so that the solid and dashed lines were $\frac{1}{4}$ in. apart. As an

Simplify Perspective Drawing

aid in drawing the lines, a straightedge should be screwed to the form to guide a T-square. The straightedge can be a length of 1 by 2-in. wood, and should be secured flush with the surface on which the lines are to be drawn. As the form is photographed at an angle, the lines drawn across its surfaces will appear foreshortened, those farthest from the camera tending to become fainter than those in front. To avoid this dimming, the width of the lines should be increased toward the far end, as indicated in Fig. 2.

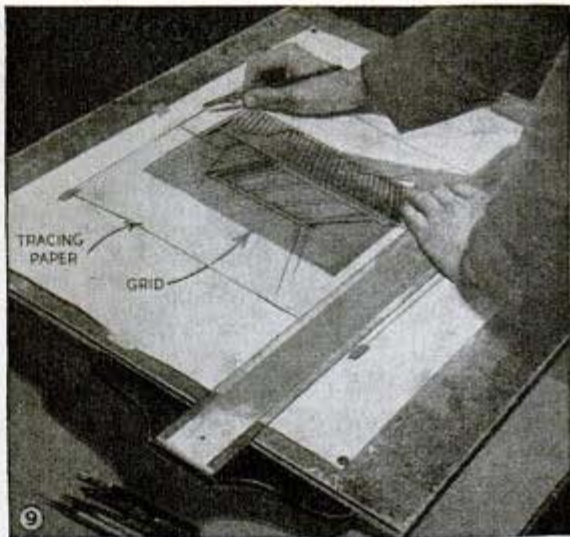
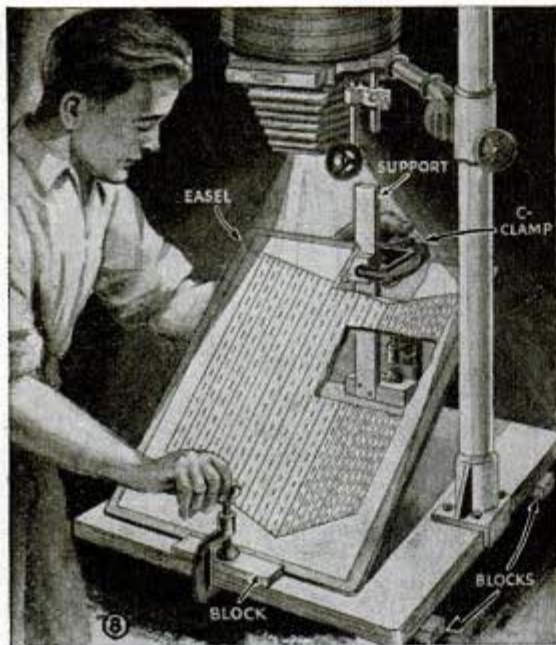
In order to obtain a photograph at a desired angle or with a particular pitch of line, a view camera, as shown in Fig. 1, is best. Many view cameras are equipped with adjustable lens boards or backs, en-



abling the operator to avoid the three-dimensional effect caused by lines receding from the portion of the object nearest the focal point. The image is focused about halfway on the side farthest from the camera and the lens is stopped down as far as possible to gain overall sharpness. The aperture can be reduced beyond its normal range by the use of a special diaphragm. This can be a disk cut from a discarded, dense negative, or any similarly rigid and opaque material, in the center of which a

pinhole is made, and the area is sanded to remove any burrs resulting from such piercing. The disk is fitted into the lens mount behind the lens, as in Fig. 6. Of course, the disk must not be used for focusing, but is put in place only when the exposure is to be made. Also, exposure time with a pinhole must be much longer than that with the smallest regular stop.

A print from a negative made in this way will resemble that shown in Fig. 4. To increase the usefulness of the grid, however, the lines can be extended on the negative to produce a print like that shown in Fig. 7. This can be done best on a retouching desk or board fitted with a piece of ground glass. The lines are scratched into the emulsion on the negative with a scribe made by inserting the head of a fine needle into a



length of narrow dowel or another suitable holder. It is best, when extending the lines, to use an extension held under the desk by a C-clamp as in Fig. 5, inserting into it a pin on which a T-square can pivot.

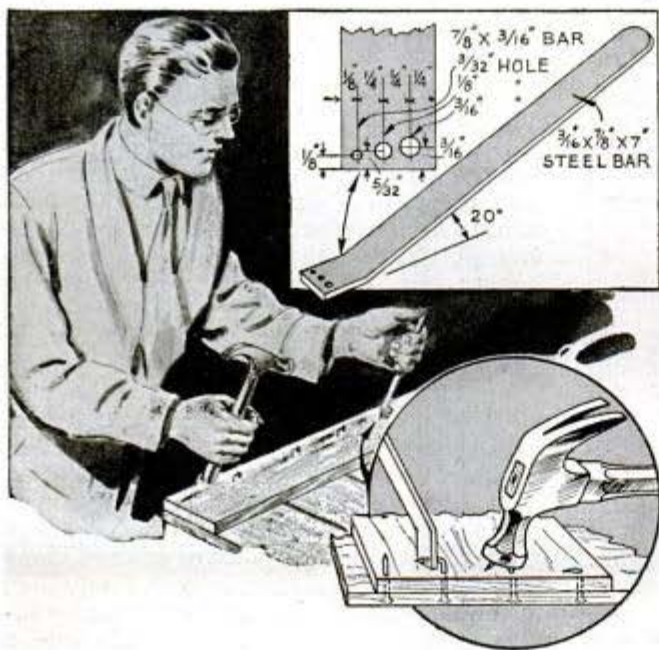
Enlargements of the grid negative now are made. However, as paper will not last very long in ordinary use, process or litho film should be used for the prints. If a print larger than any size film you have is wanted, the image can be focused to the desired

size on the easel, and small films placed side by side so that, when printed, they can be taped together to make one large print. To protect the emulsion from wear in handling, a coat of clear lacquer or varnish should be brushed or sprayed on the film enlargements. If the negative was made with a fixed-back camera, with the lens pointed directly at the form, there will likely be some distortion in the image. To overcome this defect, the easel is tilted when the enlargement is made, as shown in Fig. 8, so that there will be no converging of lines that should be parallel.

Nail-Bending Tool Speeds Work of Crating or Packing

Craters and others whose job includes nailing wooden cases for transit usually are required to clinch the nails so that the

points do not project. For this work the tool shown will be a time and labor saver. Also, the nails are bent so that the points are directed back into the wood. The tool is a length of flat iron bent upward slightly at one end for easy use. Three holes are drilled in this end to take nails of the size most commonly used. After the nails have been bent, a hammer is used to drive the points down, as shown in the circular detail.—Axel Ogren, Chicago.



Protect Your Eyeglasses

It is a good idea to rinse your eyeglasses in water before wiping them with a cloth, especially if you work in a factory where metallic dust or other abrasives are prevalent. Rinsing removes fine particles that might have collected on the glasses. By taking this precaution, the lenses will not be scratched when the wiping cloth is applied.

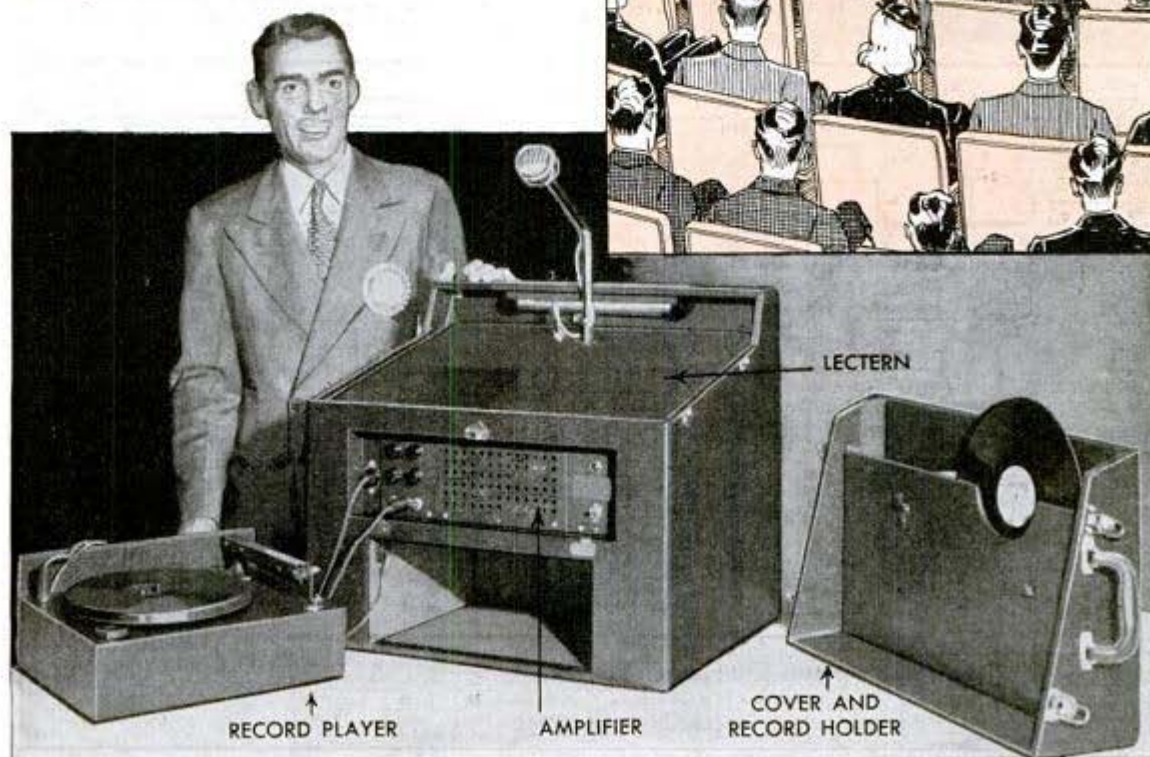
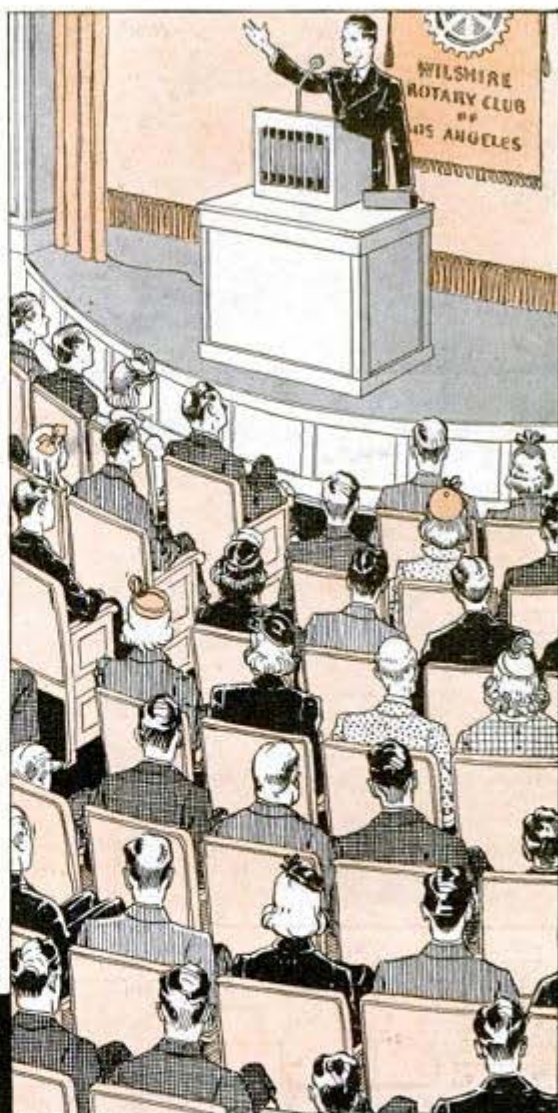


Public Address System Is Built Into a Portable Lectern

DESIGNED and assembled by a sound engineer to meet an immediate need for a flexible public address system, this unusual combination of a speaker's lectern and an audio amplifier provides channels for a record player, an adjustable lectern microphone and two extension microphones that may be used on either side of the lectern for debates. Extension cords permit these "mikes" to be carried around the room, if desired.

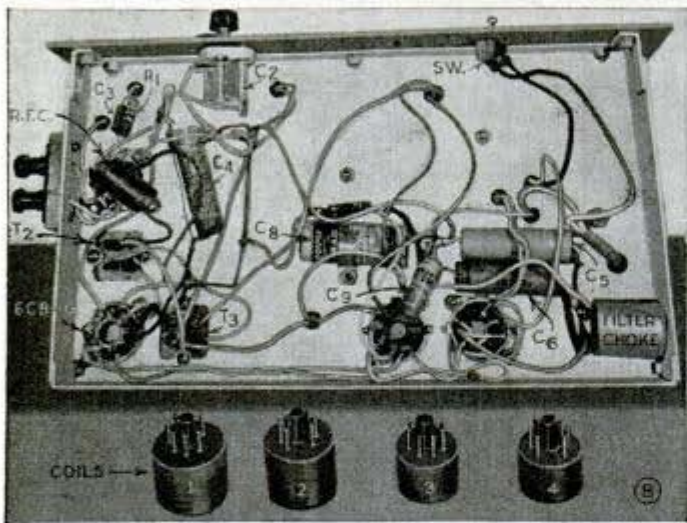
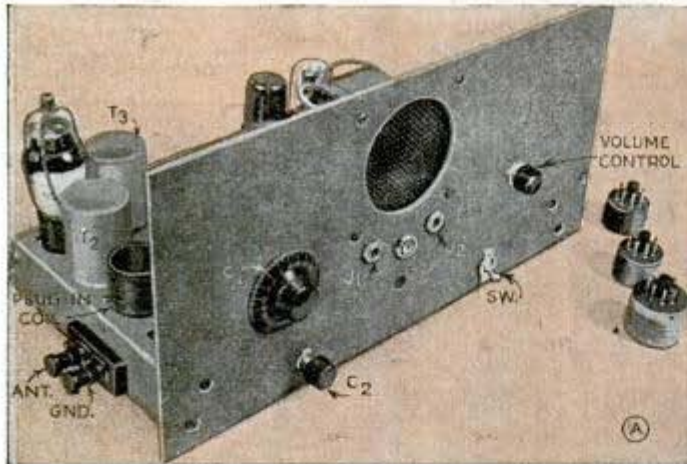
The plywood lectern cabinet is designed for correct height and proper contour for visibility; a built-in lamp illuminates the speaker's papers. Two 10-in. loud speakers are employed and these are mounted inside the cabinet at a 25-degree angle for wide range coverage. A 1½-in.-thick Celotex partition absorbs possible rumbles within the lectern. The record player is a slide drawer unit that can be placed beside the cabinet for convenient operation.

Two spaces are provided in the lectern cover, one to hold 12 records and the other for small parts and cords. The total weight of the portable unit is 65 pounds; it can be set up in about 2 minutes.



SHORT-WAVE LOUDSPEAKER

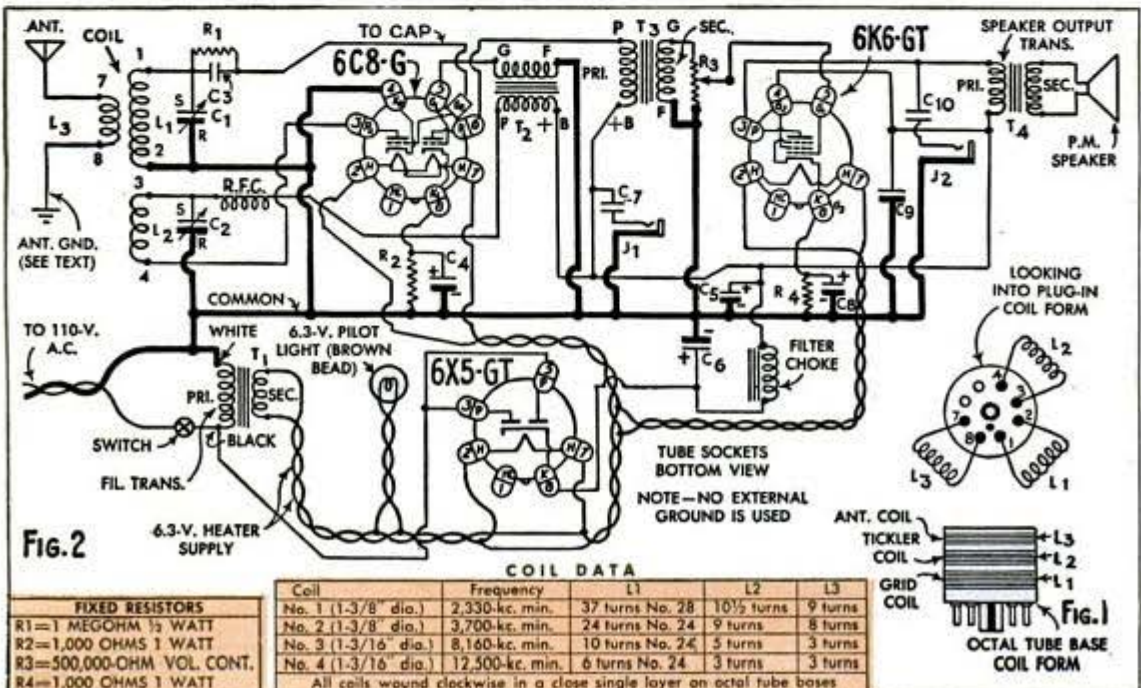
By Stuart D. Distelhorst



ASSEMBLED from odds and ends of salvaged materials in connection with radio training activities, this three-tube communications-type receiver offers the student an example of what can be done with scrap materials. Satisfactory loudspeaker results are obtained with only three tubes and the set operates directly from a 110-volt 60-cycle a.c. power line.

Four plug-in coils, wound on old octal-type tube bases, overlap to tune from approximately 160 to 19 meters; minimum frequencies only are given in the coil chart. Coil winding details are given in Fig. 1. As this particular set is designed for the short-wave bands specified the builder is not advised to try to alter it for broadcast band reception. The schematic circuit diagram appears in Fig. 2; it consists of a regenerative detector and one stage of audio amplification, obtained by the use of the dual-purpose type 6C8-G tube; this is followed by a 6K6-GT for a second audio amplifier stage.

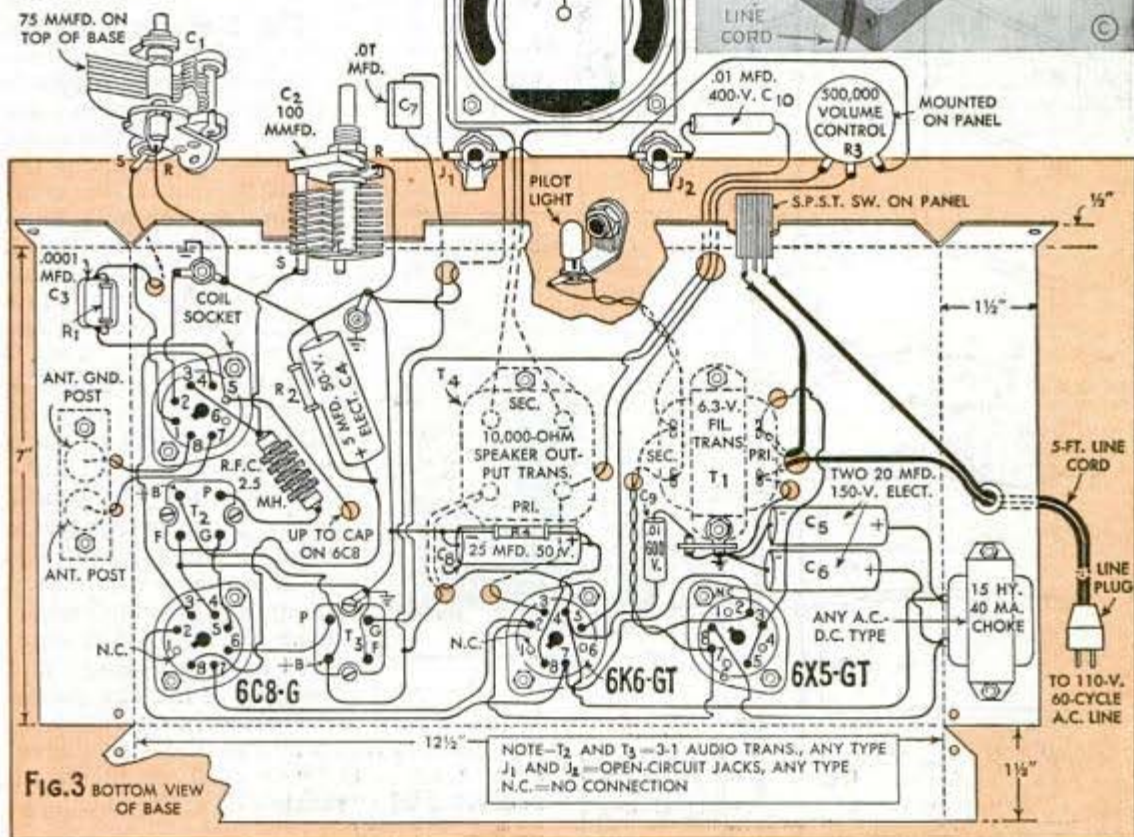
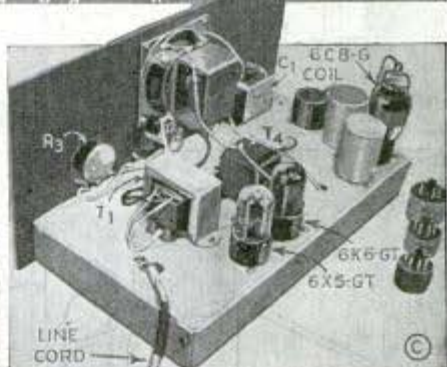
The 6X5-GT double-diode rec-



SET BUILT WITH USED PARTS

tifier tube plates are connected together to work as a half-wave rectifier utilizing the 110-volt 60-cycle line current to supply the plate and screen voltages. A 6.3-volt filament transformer is employed for the tube heater supply. All chassis-ground connections within the set are indicated by the heavy lines in Fig. 2. The chassis base of the set must not be connected to an additional external ground. However, the antenna coil may be grounded externally on one end without conflicting with the power ground.

Bottom views of the chassis base are shown in photo B and the pictorial wiring diagram, with parts values, in Fig. 3; photos A and C show the completed set. Base dimensions are given in Fig. 3; any salvaged metal base of similar dimensions may be used. The 1/8-in. hard-pressed wood front panel is 6 3/4 in. by 13 1/2 in. Variable condenser C₁ is mounted directly on the metal base. To tune the set turn C₂, starting with plates all out, until a thud or hissing sound is heard; if it refuses to oscillate rewind and add more turns to tickler coil L₂. Stations are tuned in with condenser C₁. Detailed list R-334 is available from Popular Mechanics radio department upon receipt of ordinary letter postage, if desired for student use.



Television in Department Store Merchandising

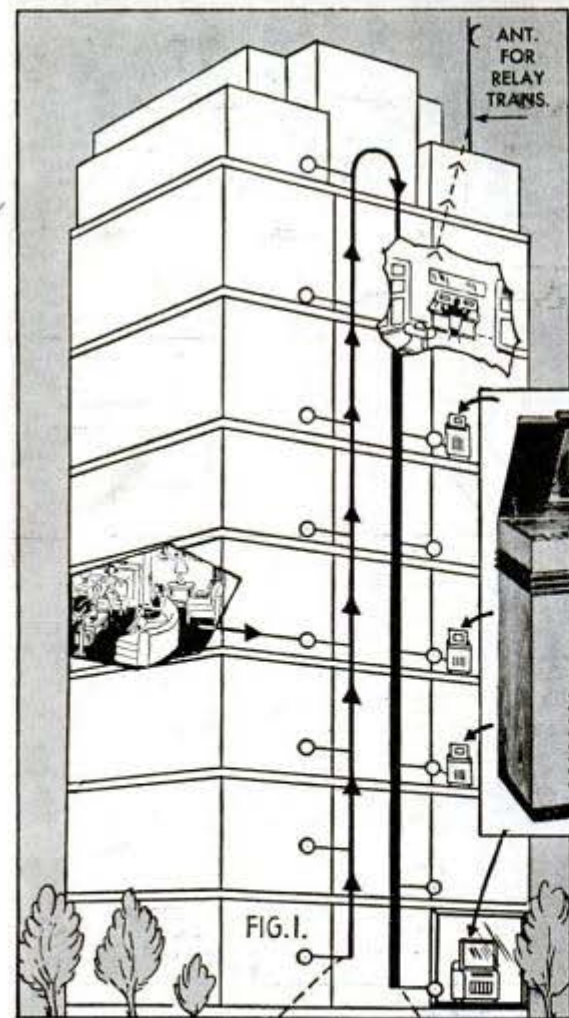


"PERHAPS one of the most important applications of industrial television after the war will be its use as a powerful merchandising medium by department stores," explains J. D. McLean, General Electric commercial engineer. "Large stores will have many display points carefully chosen to catch and direct attention to fashion shows, demonstrations and specific products. The animation of certain of the primary display points, and the addition of sound bringing an advertising message or an explanation, will provide a new service."

Where industrial systems transmit pictures and sound from one point to another for private commercial uses by means of wires or coaxial cable only, no transmitting license will be required. Thus a department store can produce and televise its own programs throughout its store. It will

also be able to originate programs and relay them by the use of ultra-high frequency radio transmitters for transmission from local television stations, such radio relays, of course, being made by the licensed station.

Block diagram Fig. 1 shows a typical installation and the basic equipment required. Outlets for both portable television cameras and sound microphones are distributed on various floors of the store. Picture and sound are picked up at the display location by camera and microphone, illustrated in Fig. 1 and sketch A, and are fed through cables to the control and monitoring console at upper right, Fig. 1. Associated with the monitoring console is a camera amplifier channel for each portable camera, an audio amplifier for the sound, and a pulse generator to provide the timing signals. Mercury vapor flood lamps are provided wherever the television cameras are used. Sight and



sound receivers, similar to the one shown in photo B, will be placed in operation on the various floors and in the street level show windows. Many of these television receivers will probably be of the new large screen projection type.

Tough *but oh so gentle*



● Your automobile engine is only as old as its parts. Watch for signs of wear, have worn parts replaced promptly, and it will last . . . and last . . . and LAST!

One of the most important things to watch is the piston rings. Worn-out rings must be replaced promptly, to protect the cylinder

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When your engine shows symptoms of ring wear — smoke, oil-pumping, or loss of power—it will pay you to install Hastings Steel-Vent piston rings. They stop oil-pumping, check cylinder wear, restore performance. Ask your motor specialist.

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"NOTHING CAN STOP THOSE HARLEY-DAVIDSONS"

FROM "Somewhere in the Pacific" comes this dramatic letter from Sgt. John V. W.

"Have been in the Army for two years. Cannot tell you much, but I have put in a good many hours on the Harley-Davidson 45 and have been through mud and all kinds of weather. It rains most of the time over here, but nothing can stop those Harley-Davidsons—not even bullets. I know for I have been shot off of them! My name for my Harley-Davidson is "Commando" and that's just what it is."

Thanks to you, Sgt. John V. W., and to thousands of combat riders like you, the days will come again when red-blooded motorcycle fans can take in race meets, hillclimbs, endurance runs, pleasure trips and all the other joys of motorcycling. Plan to be riding with the rest of the gang on a brand new Harley-Davidson of your own!



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Beyond the front lines high-explosive land mines lie hidden in the earth — waiting for the unwary foot soldier! Portable, battery-powered Mine Detectors locate danger and help clear the way for tanks and infantry. War-winning weapons and instruments use thousands of dry batteries every day — that's why we're short of them on the homefront. Burgess Battery Company, Freeport, Illinois.

Food Is A War Weapon—Use It Wisely!



**BURGESS
BATTERIES**
IN THE NATION'S SERVICE



I Cover the Battlefront

(Continued from page 87)

ing infantry when we ran into a Nazi barrage. I dived into the nearest trench, landing on top of two Jerries. They were apparently even more frightened than I, for they held their hands above their heads and cried "Kamerad!" I like to think I captured them.

At Aachen I was with 10 doughboys who were moving an antitank gun into position on one of the bitterly contested streets. The Nazis spotted our movement and immediately showered us with mortars. As I ducked for the protection of a doorway one of the mortars hit the street not five feet away. I'm glad to say it was a dud. But some of the others were real—and they got seven of the men in our group.

Editors like unusual human interest pictures, which vary the familiar pattern of routine war photography. You're always sure a humorous picture will get a good "ride" in the papers. For example, one of my most widely published pictures shows a bearded little gnome of a Trappist monk and a jeep driver staring curiously at each other in a 700-year-old Belgian monastery never before photographed. Another is a "gag shot" of three GIs standing at exaggerated attention behind an infantryman and an Army nurse who are sitting in the throne room of the Royal Palace of Caserta, near Naples. It was good for a laugh.

Sometimes people get the impression that cameramen are taking more risks than anyone else and therefore are heroes. The real heroes are the slogging infantrymen, who take risks day in and day out as a matter of course and keep right on going.

What really makes my job worthwhile is to see a gaunt, unshaved GI proudly dig a clipping from his pocket and say, "Remember when you took this picture of me? Mom cut it out of the hometown paper. She thought it came out pretty good."



**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

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NEW PRESTIGE TO

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performance, and dependability. Out of these studies and records emerged conclusive and dramatic evidence of superior performance, longer life, lower costs, lower maintenance and servicing time with Champion Ceramic Aircraft Spark Plugs.

The Champion Spark Plugs you buy for your car today are blood brothers to those used in Pan American's far-flying clippers. They are products of the same research and engineering, exclusive materials and processes; and, as a result, they bring an extra measure of performance and dependability to every engine.



To Save Gasoline—
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LATHE FILING embodies a distinct filing technique, and is employed to smooth-finish or true-up a shaft, spindle, hub, gear or other rounded part—usually to make it fit or rotate properly.

Lathe File vs. Mill File. Because of the 45° angle of its teeth, the Nicholson Long Angle Lathe File overcomes filling up and consequently scratching surface of work—a tendency common in the shorter-angle Mill file when used as a "lathe" file. The chips slide down the gullets and are forced out at the edge. Makes file self-clearing; provides cleaner shearing; prevents "chatter" and "drag"; assures faster cutting.

Further information — on proper use, and range of surface speeds for various metals — is available to machine-shop operators, master mechanics, home-shop "hobbyists." Ask also for handbook, "File Philosophy," on kinds, use and care of files in general.

NICHOLSON FILE CO., 22 Acorn St., Providence 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON
FILES FOR EVERY PURPOSE

NICHOLSON
U.S.A.
MADE IN U.S.A.

Listen—the Enemy!

(Continued from page 63)

comes crackling through the ether. He strains every nerve. Did the announcer say "Juku," which means 19, or did he say "Jusu" which means 10 plus several? Did he say "Kishu" or did he say "Kushu"? "Kushu" it is. Tokyo has been bombed (Kushu) by a number of planes of undetermined nationality.

Tearing the page from his typewriter, he calls to the editor and translator on duty. Glancing quickly at the summary, the editor rushes to a teletype machine. Editing the summary, he sends the following flash to Washington: "Enemy bombers raided Tokyo shortly past noon on Saturday, inflicting damage on schools and hospitals, none on military establishments. The attack is causing widespread indignation among the people." Meanwhile in Washington the FBIS editor receives the Portland flash. Realizing its importance, he immediately asks Portland to check the copy. The Portland office replies: "Copy is correct." The information is sent out at once over the "A" wire which goes to a dozen government agencies and also on the "D" wire going direct to England.

The phones begin to ring. Navy, War Department, the OWI all want assurances that this story has been checked.

It's been only nine minutes from receipt of the first broadcast in Portland to its transmittal on the wires out of Washington. By morning, newspapers spread over the United States the glad tidings that Tokyo has been bombed. And the words, "As recorded by U. S. Monitors," take on a new meaning as you visualize that Portland monitor catching the word "Kushu" at 12:15 a.m.

Versions of the raid are pouring in meanwhile from Tokyo and Japanese satellite stations. Shortly before noon the FBIS knows that Kobe and Nagoya also have been bombed. About 3 o'clock, daily reports have been delivered to 360 offices in 58 war units of the Government. Included is the complete story of the raid on Japan.

Expert analysts, well versed in Japanese propaganda technique, determine that in spite of what Tokyo had said, the American raid had reached military objectives and incendiary bombs had damaged Tokyo's transport system. All of these conclusions were confirmed later by the Doolittle flyers and by neutral informants.

Inspired by such accomplishments, the former amateur radio operators and other skilled personnel of FBIS go quietly ahead today with operation of one of the world's finest receiving systems.



"Watch Jim get his double..."

"In a second the birds will flush and you'll see Jim go into action. He was high gun that day... surprised all of us with his great shooting... Just couldn't seem to miss.

"When the boys got back to the car that evening they all wanted to know Jim's secret. He just smiled and patted his Savage Model 720 Automatic Shotgun."

.....

Of course, it's the man behind the gun that counts, too, but the split-second speed, perfect balance and dependability of Savage shotguns and rifles go a long way toward giving any shooter the confidence he needs to turn "near misses" into direct hits.

Savage Arms Corporation, Utica, N.Y.
Plants in Utica, N.Y. and Chicopee Falls, Mass.

WAR PRODUCTION COMES FIRST . . .

Savage has produced more than 2,000,000 military arms, including Browning caliber 50 aircraft machine guns, Thompson sub-machine guns and rifles. Of course, the requirements of our armed forces come first but your Savage is worth waiting for.

Savage Model 99 Hi-Power Rifle. The lightning-fast lever action, streamlined design and paralyzing power of this famous rifle long have made it a favorite with big game hunters.



Savage Model 6 — .22 caliber automatic rifle. Three rifles in one—automatic, bolt action repeater or single shot. One of a great line of Savage 22's and medium power rifles.



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DEPENDABILITY AND
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HOLES IN CONCRETE

Repair breaks in cement floors, walks, etc., with Rutland Concrete Patcher. Quick. Easy. Just mix with water and apply with trowel. To be sure of having enough, ask for the 25-pound bag.

RUTLAND

REPAIR PRODUCTS

Rutland Fire Clay Company, Rutland, Vt.

Make Your Old Tackle Do

(Continued from page 31)

Jerking the rod would only fasten the sinker tighter into the rocks and our only out was to break the line. Then came the "light," as carried by Charlie Anderson, old-time local commercial fisherman.

"Never fished here before, have you?" he asked. And without waiting for an answer he showed us his own way of solving the problem of how to keep the weight from snagging on the rock bottom.

He took an ordinary screen door spring and cut it in three parts. "Here are your sinkers," he said, holding up the sections.

He tied one on the end of his line and cast out in a spot we had found to be the rockiest of all. Sure enough, he snagged. But he ran an extra yard of line off his reel and then pulled hard on the section tied to the door spring. When the line was taut he let go and the bait snapped free.

"It's simple," he explained. "When the spring catches on the rocks you pull the line tight enough to stretch out the spring. Then by letting go in a hurry the spring snaps back and its rebound carries it out of the crevice. It seldom fails."

Million Mile Patrol

(Continued from page 69)

ville. Besides the "Cats," the inshore patrol of SOCs, the Navy's faithful old biplanes, were important in the night operations, dropping flares on enemy vessels to make them vivid targets for PT attack.

The team of "Cats," SOCs and PTs, in fact, made barge supply routes almost impossible for the Japs in the upper Solomons—the "Cats" with 500-pound bombs and .50-caliber machine guns, the PTs with torpedoes, and the SOCs with 100-pound bombs and flares.

The photographic reconnaissance of the search planes became even more important as the Navy approached areas that were more heavily fortified.

Of all the achievements of Navy search planes, perhaps the most noteworthy are the operations of pilots who have been responsible for the success of bombing missions over Japanese Paramushiru. Some of the Pacific's worst weather made the fog-shrouded Kuriles extremely difficult to observe, yet photos of enemy installations were necessary to the success of bombing missions. The bombings, however, were highly effective despite the fact that many of the pictures were taken at night in the light of flares dropped on airfields and gun emplacements.

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"Cain't hide dirt under Lightnin', Willie . . . he gits up most every day."

FIX DIRTY SPARK PLUGS THE "PLUG-CHEK" WAY

Cleaning a spark plug often isn't enough. The plugs may be faulty, the wrong type or improperly gapped. Auto-Lite "Plug-Chek" inspection service is the quick and accurate way to find what corrections should be made to improve gas mileage up to 12%, according to tests made by the American Automobile Association.

Have your spark plugs inspected the "Plug-Chek" way by your friendly Auto-Lite dealer. But if new plugs are needed, ask for Auto-Lite spark plugs—they're ignition engineered.

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Radio Show

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ORCHESTRA

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It's easy now to Simoniz a car. You'll enjoy doing it yourself. All you need is Simoniz and Simoniz Kleener. In no time at all they'll have your car glistening beautifully. And it's lasting beauty! More important still . . . Simoniz protects and preserves the finish. Yes, it assures you a lot better trade-in allowance when victory comes. In the meantime, you'll get more pride out of driving because your car stays bright and beautiful. So Simoniz now. The sooner you do it the better.

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Recognized for over thirty years as authorities
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SIMONIZ
HOUSEWIVES DO LIKEWISE**

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and department stores, filling stations and garages

The Road That Couldn't Be Built

(Continued from page 5)

new road that climbed, dipped and zig-zagged through the mountains.

This was the opening wedge that was to drive the Japs out of North Burma, and it was to be a combined operation between road-building engineers and Chinese-American combat troops. Neither could have advanced without the other. In many places combat engineers with mine detectors had to go ahead of the bulldozers. Jap strafing planes and snipers were a constant menace, but the troops and road crews maintained a steady advance.

General Pick's men had to build not only the main Ledo trace, but dozens of combat roads leading off into the jungle to clean out pockets of Japs. They cut roads to battlefields all the way from Ningam Sakan to Shaduzup and Warazup. They built air strips and paved the way for Brigadier General Frank Merrill's famed Marauders. One officer remarked that the tombstones of the men who gave their lives formed the milestones of the Ledo Road.

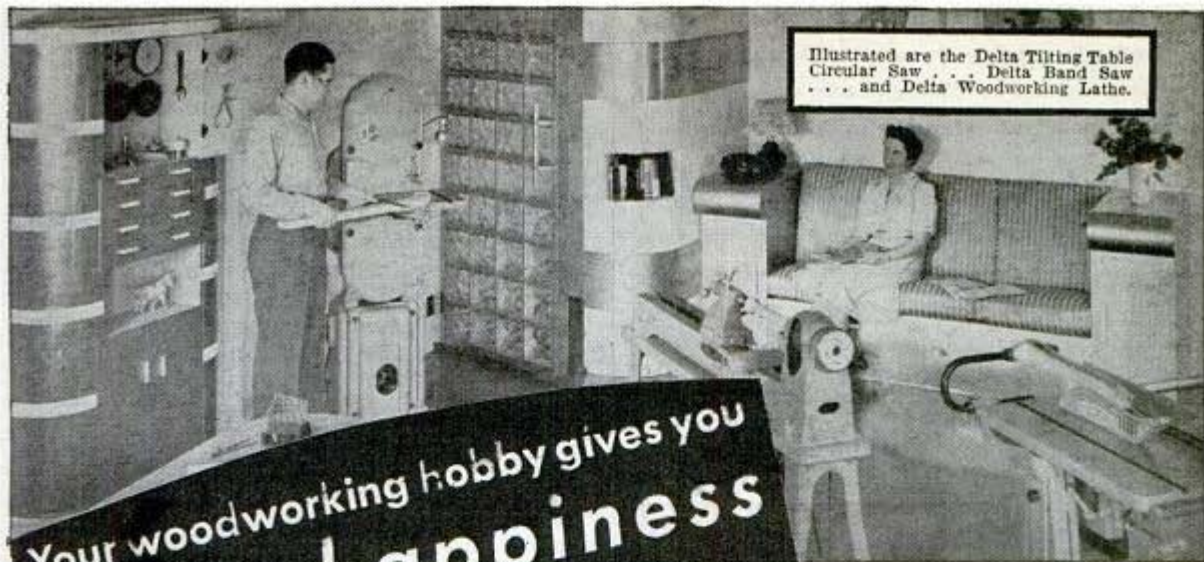
When the 1944 monsoon struck, the road had advanced to Warazup, which is about 190 miles from Ledo. While the road engineers fought the weather during the summer months to keep the highway open, the combat troops pushed the Japs out of North Burma. The fiercest battle was the 74-day siege of Myitkyina, the Jap stronghold on the Irrawaddy River. Two battalions of Ledo Road combat engineers were flown into Myitkyina to help the infantry.

Meanwhile, General Pick had been gathering a vast backlog of equipment at Warazup for the final push to Wanting on the China border. During the monsoon, a vital section of the road in the Hukawng Valley was inundated. For a time it seemed to be the final "impossible" obstacle.

But, by this time, General Pick and his staff were used to riding roughshod over "impossible" barriers. Two GI lumber mills were quickly set up in the valley. In 30 days these mills turned out 2,400 pilings and more than a million board feet of lumber to build a causeway over the flooded area so that supplies could keep rolling.

With the end of the monsoon in October, the road was pushed along at a fast pace until another "impossible" obstacle was encountered. A huge floating bridge had to be anchored across the Irrawaddy near Myitkyina. The method by which this bridge was anchored was so successful and so ingenious that it is regarded as a military secret. This bridge is one of 165 main

(Continued to page 156)



Illustrated are the Delta Tilting Table Circular Saw . . . Delta Band Saw . . . and Delta Woodworking Lathe.

Your woodworking hobby gives you
more happiness

...when you enjoy the deep satisfaction
of using **quality** power tools —

Delta Homecraft* Power Tools

Here are tools you can count on to give you dependable performance

Any woodworking enthusiast can tell you that using your hands to make good-looking things pays off in pride and pleasure and mental alertness. It's a happy hobby!

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Yes, your tools — both hand tools and power tools — can make a difference.

It's because *quality* is so important that Delta Homecraft Power Tools are used by woodworkers everywhere. Delta's "hidden values" in construction — quality engineering features that mean a lot to your contentment — help you obtain accuracy, economy, dependability, safety.

Take Delta's *double-sealed ball bearings*, for instance. These are bearings that are fully protected against harmful dust, assuring you of longer bearing life. You don't have to bother about oiling them, because they stay lubricated for life, when they leave the factory.

The bearings are also *pre-loaded*. This is an extra manufacturing operation that eliminates the "play" in the bearings, to help you enjoy long-time operating efficiency and accuracy.

These bearings fit snugly into *precision-bored bearing seats*. This helps to keep the bearings lined up properly, so that you have greater assurance of finishing pieces to exact dimensions.

Precision-ground shafts are another example of Delta's quality workmanship. These are shafts which run without any "wobbling" which might throw off your measurements.

To help eliminate annoying, damaging vibration, the pulleys which transmit the power from your motor to your power tool are *dynamically balanced*.

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UP TO ONE GALLON
OF GASOLINE IN TEN

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SPARK PLUGS

SPEED FINAL VICTORY—BUY WAR BONDS

bridges on the Ledo Road, which crosses 10 major rivers and 155 secondary streams.

After the fall of Bhamo last December, the road builders moved on toward the China border, and in January junction was made with the Burma Road at "Mile 478" in Wanting. Under the command of General Pick, some 436 miles of the road were constructed in a 15-month period. It was officially declared open January 22, 1945.

For each mile of mountain road constructed, 100,000 cubic yards of dirt had to be moved. The total amount of earth moved for the entire project was about 13,500,000 cubic yards—enough to form a dirt wall three feet wide and 10 feet high from New York to San Francisco. The culvert pipe used in the road's drainage system averaged 1,200 feet a mile, and if placed end to end the pipe would extend 105 miles.

As the Ledo Road was being built, a four-inch oil pipe line was extended from Calcutta up across northeastern India. Thence it follows the same general course as the Ledo Road to Myitkyina, then crosses the Irrawaddy River.

The highway from Ledo to Kunming, China, incorporating the Ledo and part of the Burma Road, has been named the Stilwell Road by Chiang Kai-shek. This road is 1,044 miles long.

It was an historic occasion when the first convoy of nearly a hundred trucks, jeeps, ambulances and light artillery pieces set out from Ledo. There was a special Chinese guard, and General Pick rode in the lead jeep. Army engineers, Negro truck drivers, and native laborers were accorded places of honor for this epic journey. Photographers and newspaper correspondents in jeeps raced from one end of the convoy to the other. Photo planes cruised low overhead. The Engineers were tossing their hats in the air and telling the world:

"We built the road that couldn't be built!"

The "Cat" Beats the Dog Team

(Continued from page 16)

with much other equipment. Food supplies were to be dropped from planes to the members of the party along their chilly journey. Several portable radios were tested so contacts with the National Park Service transmitter could be maintained.

The tractors encountered little snow for the first 40 miles through the park. However, the front wheels had to be replaced with skis before the base camp was reached. Then came the real test for the tractors. Through mud and across rivers they forged ahead, dragging heavily loaded trailers.

(Continued to page 158)

Best Bait for Pads and Weeds

The No. 3 Hawaiian Wiggler is made for just such conditions. Don't be afraid to throw it right into the pads. Then work it slowly thru the openings, even letting it stop and flutter down thru the pockets. In thick cover, bass need more time to get to the bait than in open water—so don't reel too fast.



Hawaiian Wiggler No. 3

\$1.10 (Weedless)



(Left) Dr. Jos. Schmid, Salem, Ohio, (now in the army) with this two-man limit caught with the No. 3 Hawaiian Wiggler right out of the weeds and lily pads from Mud Lake, Mich., where other baits couldn't go.

Write for Free Catalog

It will give you all the latest dope on my family of Hawaiian Wigglers and also Jitterbug, the famous surface bait that runs fish crazy.

FRED ARBOGAST, 1615 North St., Akron 3, Ohio

three machines in one...

This low-cost DURO Router-Shaper-Carver can be converted from one use to another in a few seconds

An ideal machine for these quick-changing times—when the ability to shift rapidly and economically from one set-up to another is vital.

Here is an unusually flexible machine that can be used for routing, shaping and carving wood, metal or plastics. Combines high speed (20,000 R.P.M.) power (1200 watts at the spindle) and solid, heavy construction that gives smooth, vibrationless cutting. Is extremely flexible—can be transformed quickly into a Shaper or Carver. Standard equipment handles 1/4", 5/16 and 3/8" bits for routing—5/16" and 1/2" bore shaper cutters—and all standard cutters for carving. Has many special features including: Specially designed G. E. Universal Motors, New Departure Precision ball bearings, precision machining throughout; Table can be instantly adjusted to any height without holding foot pedal. Chuck is part of spindle and holds adaptor and cutter close to work, thus preventing whip. Many other exclusive features. Unusually low priced.

Send for Catalog—giving full specifications and prices on the DURO Shaper-Router-Carver—and other DURO quality Machines including Drill Presses, Circular Saws, Band Saws, Flexible Shafts, Lathes, Sanders and Electric Drills.



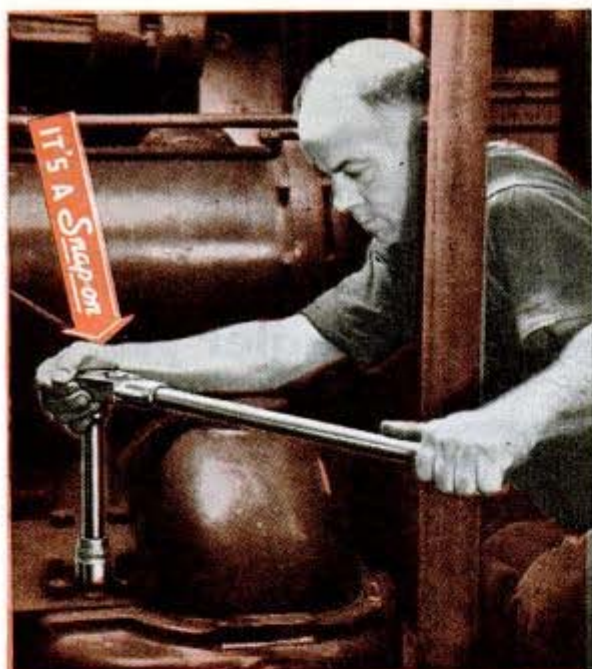
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MACHINE TOOL DIVISION

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ALSO MAKERS OF DURO HAND TOOLS

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Snap-on Wrenches For Efficient Maintenance

Time and manpower saved on every maintenance operation counts today as never before! For hundreds of routine maintenance jobs such as this, modern Snap-on wrench equipment provides speed, flexibility and accessibility, with safe, powerful leverage to turn the biggest, tightest nuts.

In Snap-on's heavy duty Loxocket wrenches the automatic locking device makes any combination of handles and sockets *safe as a one-piece wrench* . . . and the thumb button release permits quick change of hookup to clear obstructions. The ratchet action operates within a 20-degree handle swing.

Standard Snap-on socket wrenches for industrial nut turning are available in complete series of handles and sockets in $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" and $1\frac{1}{2}$ " square drives, with wrench sizes ranging from $\frac{3}{16}$ " up to $3\frac{1}{2}$ ". Write for 1945 catalog of 3,000 Snap-on tools for production, assembly and maintenance.

SNAP-ON TOOLS CORPORATION, 8062-E 28th Ave., Kenosha, Wis.



After a steep climb they landed on huge Muldrow Glacier, where they had to detour around yawning crevasses. Deep valleys, carved in the glacier by the high winds, were crossed and recrossed without difficulty. Airplanes dropped fuel and oil to the men as they climbed into the highest mountains of the Alaska Range.

Finally the last camp site was established at an altitude of 7,000 feet and the tractors were given a well deserved rest. From that point to the wrecked plane, no machine could navigate the sheer slopes of hard blue ice. Only afoot and by hanging to ropes could the expedition continue on. It often became necessary to cut steps in the ice in order to reach the wind-swept ridge above them and over which they must pass. The ridge was topped only after many hours of arduous labor. Far below they could see portions of the wrecked plane. Down the treacherous sheets of ice Pearson led his crew. Hanging to nylon ropes, tied to ice picks sunk in the ice, they slowly worked downward until the plane was reached. Tents and supplies were dropped from planes and excavation work on the snow covered fuselage was begun. Not a body was found in or within hundreds of feet of the wreck. The plane had struck the hard ice with a terrific impact and tumbled hundreds of feet down the mountain, breaking into pieces as it hit the great chunks of jagged ice. It was evident that the bodies of the victims had been mangled beyond belief. The expedition was a successful failure.

But the old sourdough Alaskans, who kept in touch with the progress of the expedition via their short-wave radios, overheard nothing but praise for the little snow tractors. The gruelling test given them by members of the expedition was conclusive evidence that the little "Cats" could do about everything expected of a dog team except consume dried fish as fuel.

Even the cold-blooded businessman of Alaska says the dog team is about due for the doghouse. A snow tractor left with the National Park Service at Mt. McKinley Park during the rescue operations was given every conceivable test by Louis Maupin, fiscal agent for the Interior Department. He says operation costs are far lower than maintaining sled dogs and that if given two snow tractors the National Park Service can chase poachers, hunters and trappers out of the park with more efficiency. Then, too, expert dog team drivers are not easy to find in these days of labor shortages.

So, when the war ends and visitors travel to Alaska, they may see the last of that hardy, hard-working breed—the sled dog.


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There's lots of *experience* wrapped up in these fine motors. It shows up in **DEPENDable** performance through the years.

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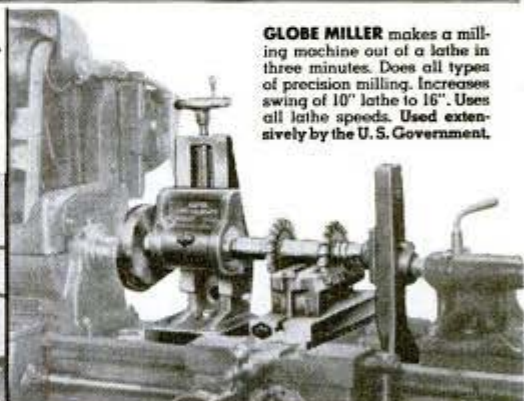
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Adaptable to any lathe. 4 1/4" travel. Precision built. Rugged construction.

GLOBE CROSS SLIDE. Adaptable to any lathe. 3 1/2" travel. Rugged construction.



GLOBE MILLER makes a milling machine out of a lathe in three minutes. Does all types of precision milling. Increases swing of 10" lathe to 16". Uses all lathe speeds. Used extensively by the U.S. Government.

IMPORTANT: When ordering or requesting prices on above items, be sure to give: 1. Make and model of lathe. 2. Lathe swing. 3. Power or hand cross feed. 4. State if lathe is equipped with telescoping taper attachment.



GLOBE HAND SCREW MACHINE produces precision parts at high speeds, low cost. Ball Bearing Headstock. 10" swing. 1" capacity. 12 speeds up to 3125 RPM. Exceptionally rugged construction.



DIVIDING HEADS. Precision built. Various sizes available.

MILLING VISE (below) with replaceable jaw plates. Jaws 3 1/4" wide, 3" opening. 1 1/2" deep. Larger sizes available.

Milling arbors. 4", 8", and 12"



WORK HOLDING FIXTURES, hold work of various shapes for milling, drilling, shaping or grinding.

End Mill Holders. Various sizes.

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X-ACTO... KNIFE OF A THOUSAND USES

X-ACTO knives are always sharp... for at the first sign of dullness, you instantly re-blade to re-sharpen! That is why, in all cutting work and in all arts and crafts, whenever it is important to have a knife with a keen, precision cutting edge, X-ACTO'S prove best by test. They are always factory-fresh... always sharp!

New! No. 83 X-ACTO deluxe all metal knife chest. The finest in knife sets complete with 3 solid aluminum handles and 12 interchangeable blades, in handy wooden chest. Price \$5.00 complete. Other knives and sets from 50c to \$3.50.

RE-BLADE IN
RE-SHARPER

The new deluxe all-metal Knife Chest will give you an ease and skill in cutting you've never known before.

Get this new X-ACTO Knife Chest today. Discover the joy of working with knives that have better, sharper, surgically keen blades... with knives of a thousand uses, X-ACTO!

Write for 32
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—10 cents



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Stores or order direct from
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440 Fourth Ave., New York 14, N. Y.



The Fighting Lady Will Be Back

(Continued from page 11)

The targets had been selected with care. The officers who planned the operation figured that if aircraft engine and assembly plants could be wrecked, we would hit Japanese aviation in a vital spot. So these were marked for destruction: the Nakajima-Musashino plant and the Nakajima-Tame plant, side by side in the western suburbs of Tokyo; the great Ota assembly factory in the northern suburbs, the Tachigawa engine plant a few miles north and east of Tokyo; and the Koizumi engine factory northwest of Tokyo.

The engine plants and assembly factories, some of which were new, modern buildings, pleased the bomber pilots no end. One told me enthusiastically later:

"Boy, what a pleasure it was to go in on that big, fat target. It looked as wide as a mountain. What a whale of a difference between that and a twisting, turning little ship. You didn't even have to look back to see if you'd hit the damn thing!"

Because of the excellent visibility our bombers made few misses. Reconnaissance photographs showed later that 50 to 75 percent of the targets hit had been wrecked. There were black plumes of smoke all over Tokyo—factories, docks, warehouses and buildings were afire.

The box score for the two days added up to something like this:

- 322 planes shot out of the air.
- 177 planes destroyed on the ground.
- 150-200 planes probably destroyed.
- 14 ships sunk and 22 damaged.

Aircraft factories, shops, warehouses, factories, docks and buildings damaged.

In the light of our uncertainty before the operation, it was a most satisfactory strike. We'd lost 49 planes and perhaps 30-40 brave pilots. The Japs hadn't thrown any of their land-based bombers against our ships. Carrier-based aircraft had scored a knock-out punch against land-based aircraft.

We went back to Tokyo again on February 25. The weather was bad, we caught the Japs by surprise and we hurt them. This time there was snow in the air.

There were approximately 100 Jap planes in the sky that day—we call them "meatballs" because of the red spot on each wing—skillful but not aggressive. Few of them tangled with our planes and when they did, they went plummeting down in smoke. I saw a couple of Jap pilots parachute out even before they had been hit.

One of our torpedo pilots had the unique experience of downing a Zero without firing a shot. The Jap zoomed in front of the

(Continued to page 162)



When it's
an **EXIDE**
...you start

Judge a dealer by the brands he sells.
You can generally depend upon the
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that are of **KNOWN** high quality.

THE ELECTRIC STORAGE BATTERY COMPANY,
Philadelphia 32

Exide Batteries of Canada, Limited, Toronto

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Our fighting forces need more batteries. Therefore, it is a patriotic duty to make your battery last—to put off buying a new one as long as possible. Regular inspections by your Exide dealer and periodic recharges when necessary will help keep your battery in service.

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Discovery!*

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Tropical*
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Originally developed by
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When peace arrives, this radi-
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have great advantages for ci-
vilian use. Now, output is con-
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MALLORY

TBF, whose propeller chewed the Jap's tail right off. The TBF pilot asked for—and got—credit for a shoot-down.

Score for the day, cut short by the snow-storm, also was impressive:

47 planes shot down.

111 planes destroyed on the ground.

150 planes damaged.

5 small ships sunk, 5 probables.

14 vessels damaged.

Trains, airfield hangars and aircraft plants bombed.

So it all adds up to this: The Tokyo strike was one of the easiest major strikes by a United States carrier task force. Why the Japs didn't give us more opposition I don't know. Several theories have been advanced. Which is correct I don't presume to say. Perhaps a combination of all:

1. We caught the Japs entirely by surprise. They didn't think we had the ships or the daring to come that close to the empire. (Perhaps they believed some of their own propaganda.) The weather helped us, of course, but even on February 17 and 25 we didn't get the opposition we expected.

2. The Japs may be short of pilots. We've shot down a lot of pilots in three years and maybe they just didn't have the men to send up. Perhaps that's why so many planes were caught on the ground.

3. The Japs didn't have the engines. Some think that Japan's most serious bottleneck right now is airplane engines. We saw a lot of planes setting near engine factories, obviously waiting for engines.

4. The Japs may be short of aviation gasoline. Since we have destroyed so much of their shipping—and especially ocean-going tankers—they have had increasing difficulties in getting oil from their conquered petroleum-producing areas in the Dutch East Indies and Burma.

Whatever the reason, the Japs are going to have plenty of trouble protecting their cities, their factories, their empire.

In his first communique on the Tokyo operation, Admiral Nimitz concluded with these words:

"Congratulations to all hands on a superlatively well done job. Only courage, skill and intelligent teamwork by every member of the task force could have produced these historic results in spite of opposition by both enemy and weather. I know our future operations will hurt the enemy even more."

Yes, the Fighting Lady and her sister ships are coming back to Tokyo again and again. They will have an ever-increasing armada of warships and planes to bring death and destruction to Japan. The Japs will be sorry they ever unleashed the tiger of American sea and air power.

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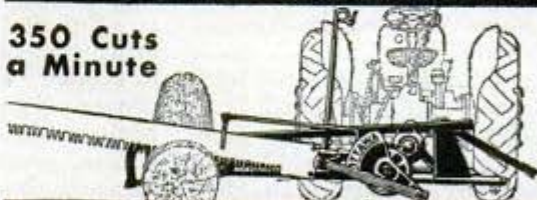
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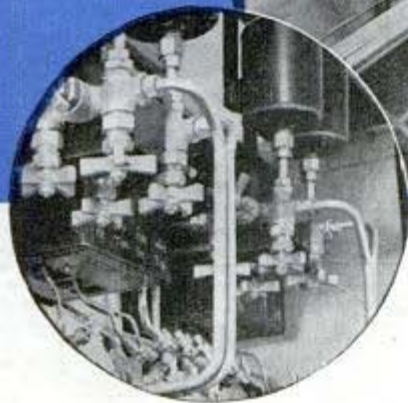
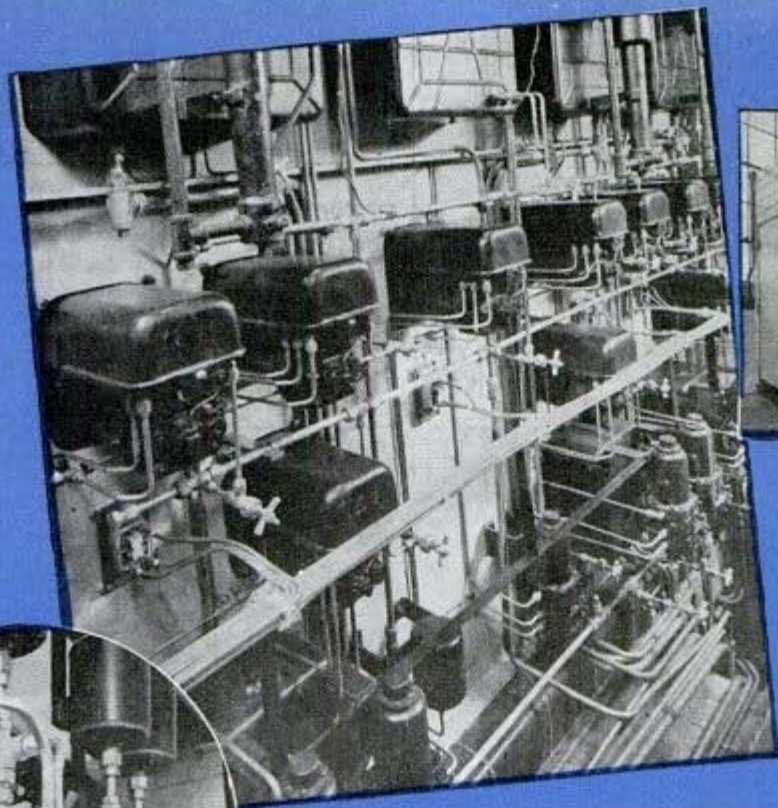


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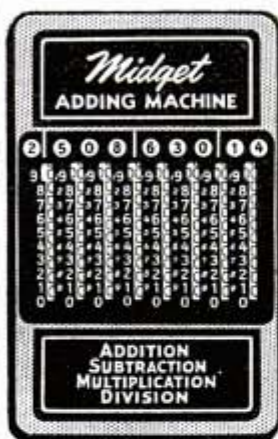
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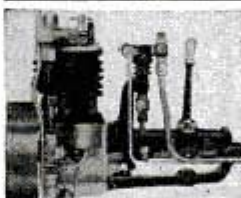


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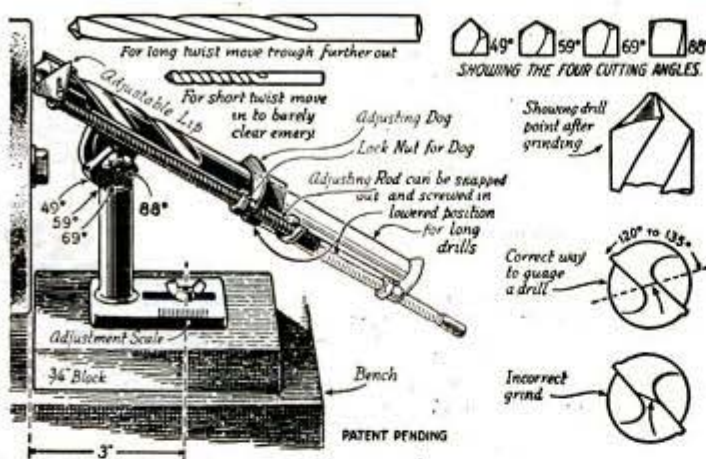
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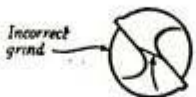
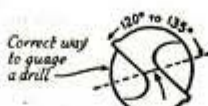
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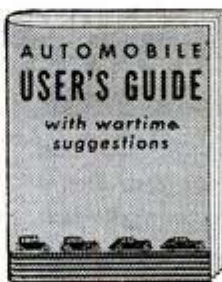
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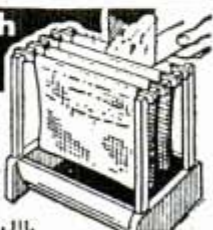
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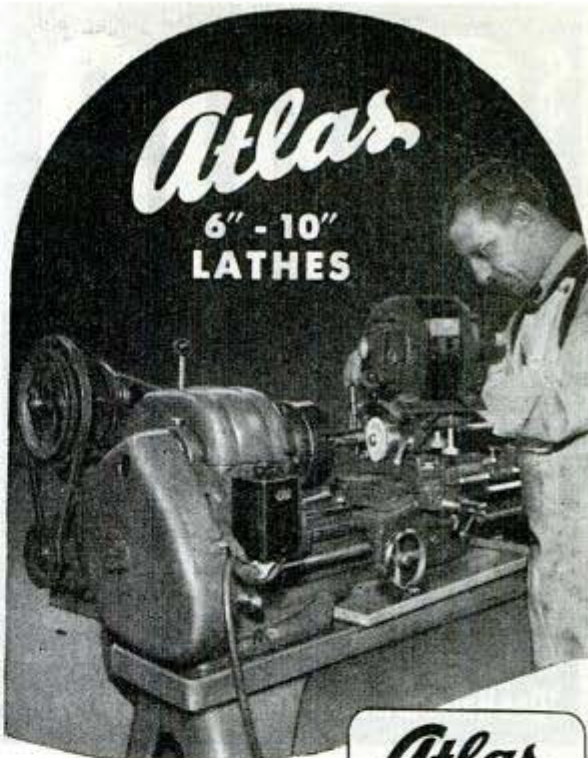
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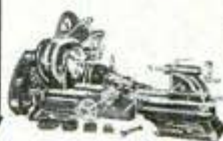
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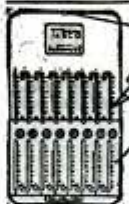


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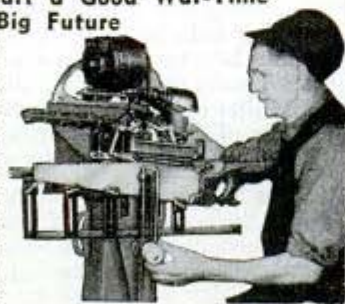
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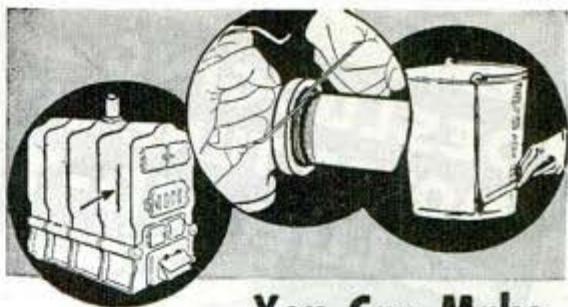
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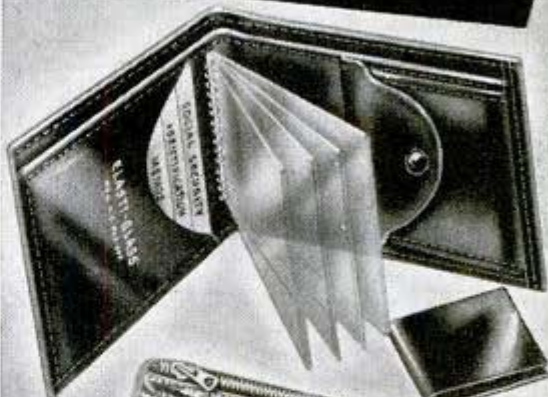
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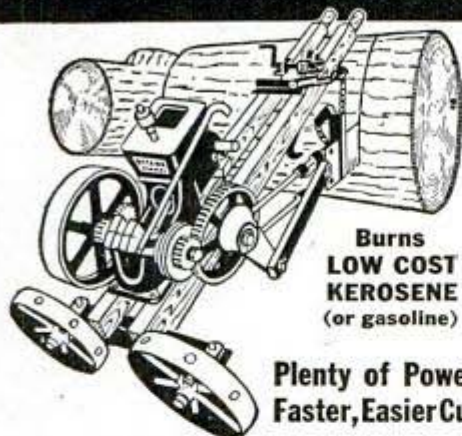
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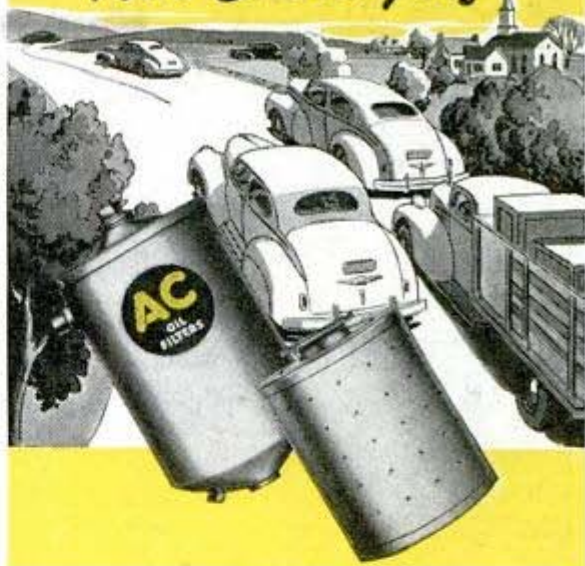
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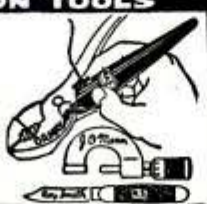
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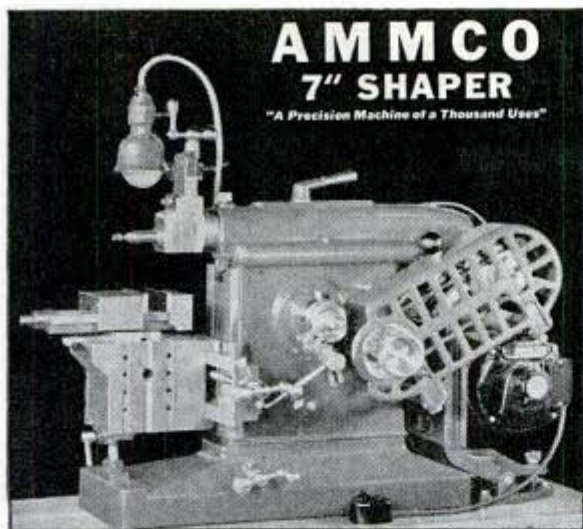


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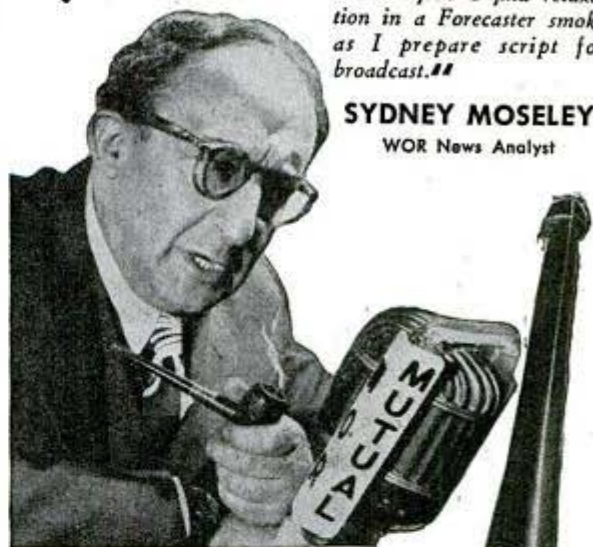


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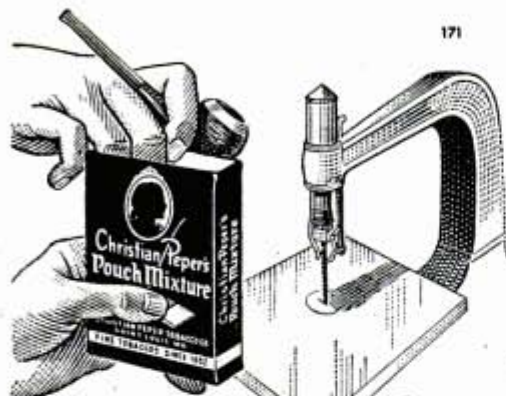
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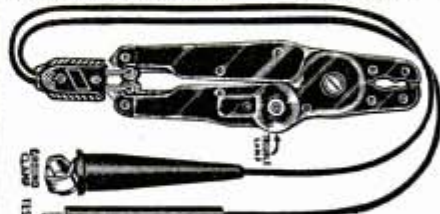


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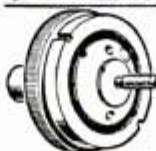


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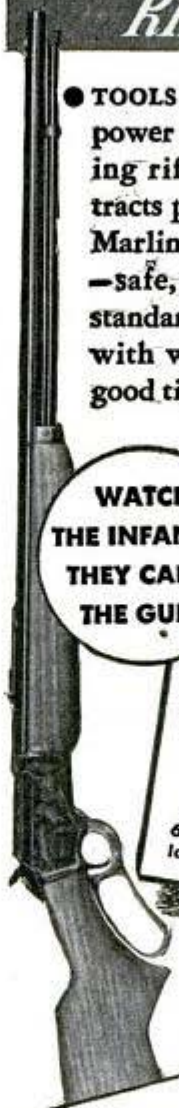
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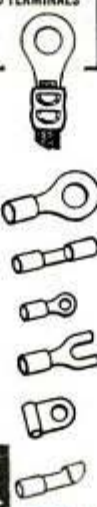
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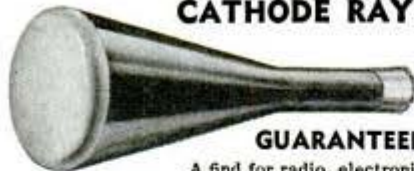
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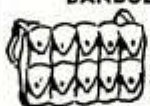
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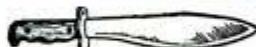
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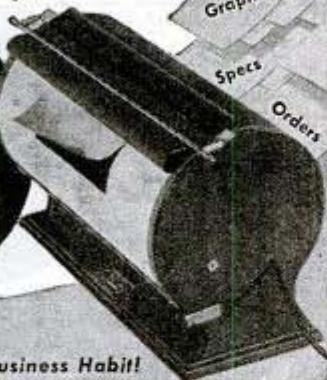
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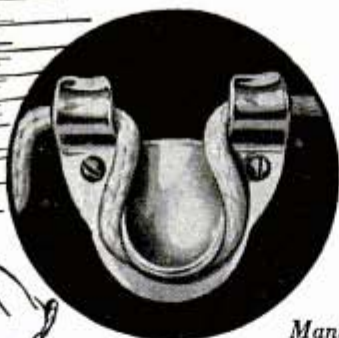
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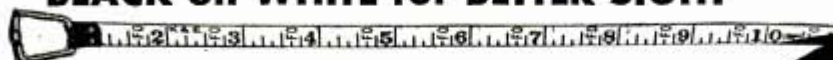
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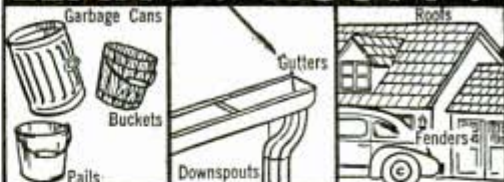
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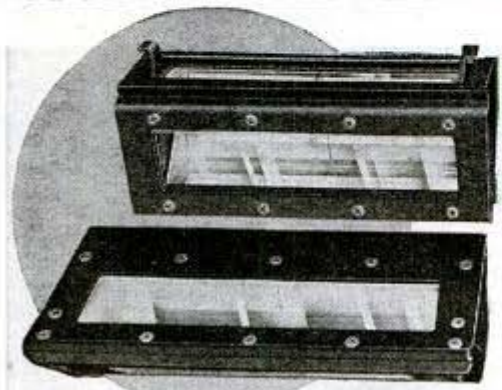


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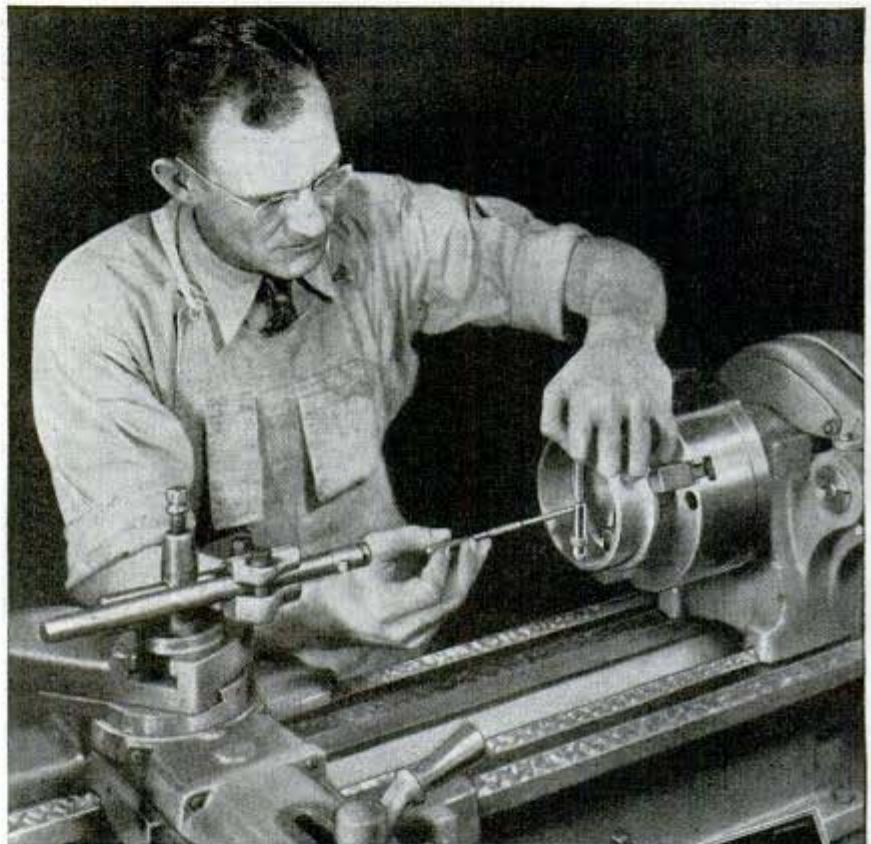
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