

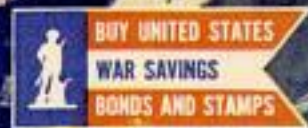
Picking the Target

POPULAR MECHANICS

MAGAZINE

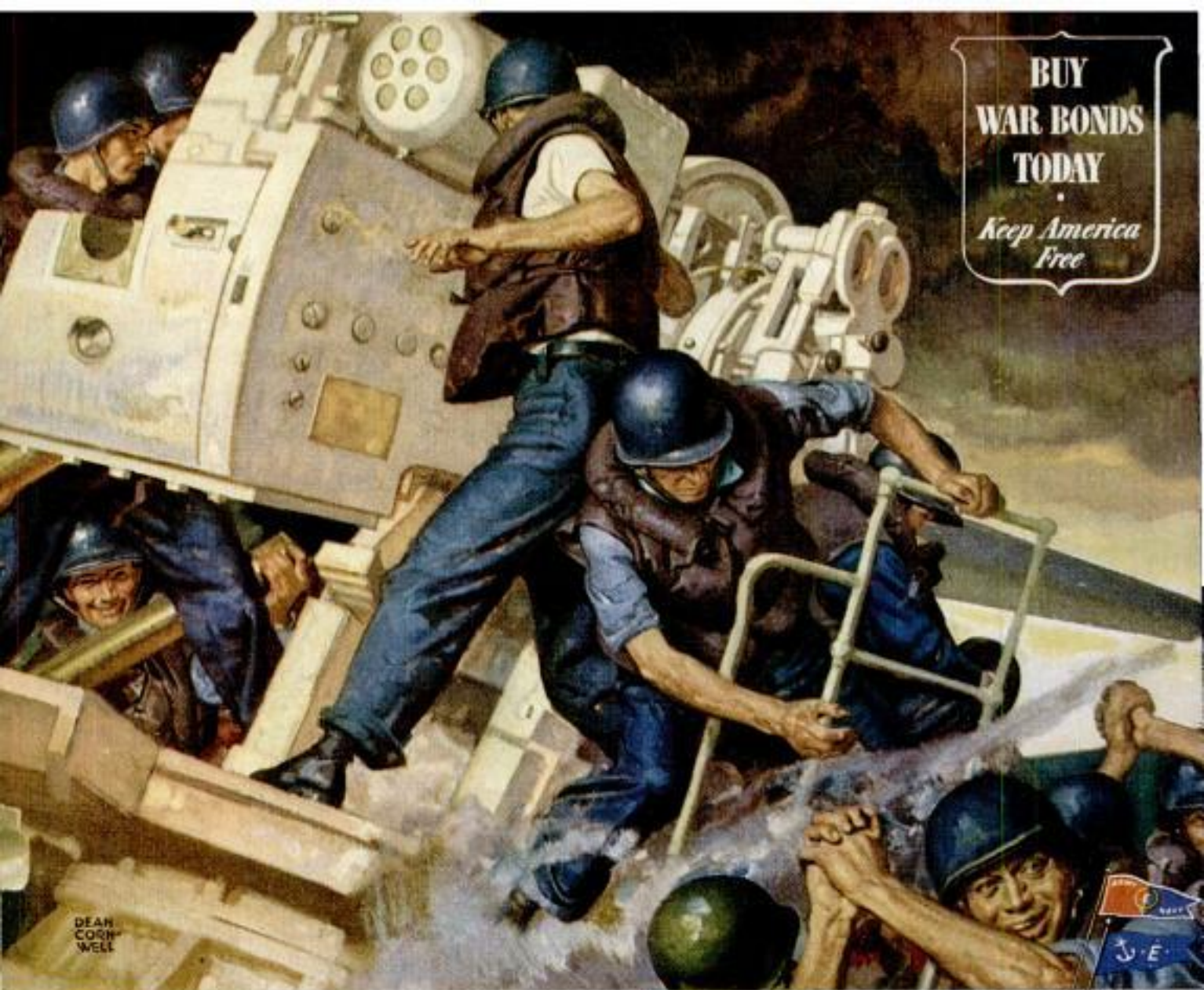
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SEE PAGE 14

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Finish Fight *by Fisher*

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

IT'S a hard-hitting brute—this dual-purpose 5-inch gun. It's the kind of fighting tool needed to smother enemy fire power, to give our men a life-saving advantage when the going gets tough.

We cannot take credit for *all* of it. This big 5-incher was designed by the U. S. Navy, and its production is a tribute to the cooperation of thousands of workers and several companies.

But as we see it come down the Fisher assembly lines, we get a thrill of pride out of the work we have done on it. It's proof that Fisher craftsmanship has once more been pointed right, has once more registered a hit on the production target.

Whether it's bombers, fighting planes, tanks,

anti-aircraft guns, delicate flight instruments or other armament to be built—Fisher craftsmen are on the job till they get it ironed out. That goes for some very rugged problems put up to us by the men who do the shooting. And in this fight to the finish, we intend to stay right in the middle of such things until the final bell rings.

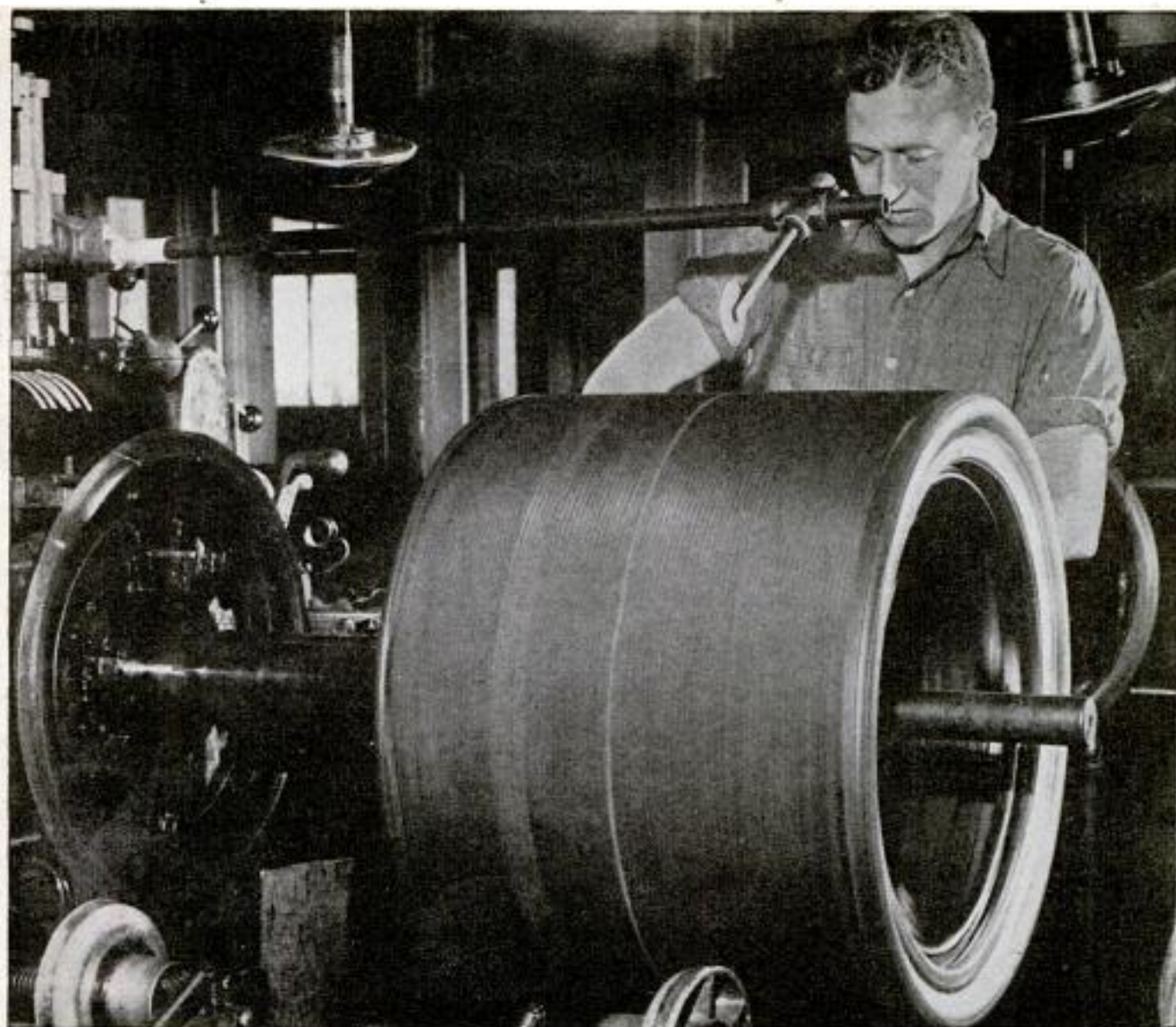
Every Sunday Afternoon
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armament
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The tack we put in every tire

Synthetic rubber used to rub itself the wrong way, until the chemists found the answer

A TIRE IS BUILT like a layer cake. First, one layer of rubber-coated cord, then another on top of it. The picture above shows a man building up the layers. That's an actual tire he's working on, before it's shaped and molded.

If the layers didn't stick together tight, the tire-builder would have a bad time of it. Production would slow down. Tire failures would increase.

Natural rubber has plenty of adhesiveness, or "tack." Synthetic rubber hasn't. So B. F. Goodrich engineers began to search for something that would give synthetic rubber more "tack."

The answer was found in a cement made from natural rubber. It is

applied to both sides of each layer and the underside of the tread.

But this *natural* rubber (2% or less) in the new synthetic Silvertowns insures against lagging production, frequent failure.

By making and selling thousands of tires made with more than 50% synthetic long before the war, B. F. Goodrich engineers were able to get a three-year head start in compounding synthetic rubber—knowledge that today is invaluable to American car owners.

These tires totaled more than 80,000,000 miles. They were the first containing any synthetic rubber ever sold to American car owners. Many are still in use. Today's B. F. Goodrich tires for pas-

senger cars are all-synthetic (98%) and are almost as good as pre-war tires. Truck tires aren't as good, especially in intercity service with overloads, but are improving daily.

Few can buy right now, but if you're one of those who *can* buy tires today, go to a B. F. Goodrich dealer or Silvertown store. You'll get tires backed by years of experience with synthetic rubber in all kinds of products—tires backed by this 80,000,000-mile road test. *The B. F. Goodrich Company, Akron, O.*

In war or peace
B.F. Goodrich
FIRST IN RUBBER

SEPTEMBER, 1944

J1RQ-4S7-8UFN

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A Camera Fan is MADE . . . not born!



Most beautiful picture ever made? Bob's mother insists it is because it's the first snapshot he ever made. . . . and he made it of her! It was taken with a Universal, one that Bob bought out of his allowance.



Mother was embarrassed when Bob graduated to candid shots like this. Made with a Universal, of course. For even then Universal called the field with a candid-type camera priced so low even youngsters could afford it.



Here's the last one he took of his mother before entering the Navy. Also made with a Universal, the Mercury he got when he graduated from college. Bob carries this picture with him everywhere.



Bob's using Universal Navy binoculars now—for Universal's at war too, making military optical instruments instead of cameras. But Bob took his Mercury with him. He's made some great shots in his spare time.



The war will end . . . and a home and family of his own will redouble Bob's interest in photography. And what photography! Universal's wartime achievements will result in a great new series of cameras.



He'll get fast action shots yet his camera will be simple . . . thanks to Universal's pioneering of new methods in mass-producing precision optical instruments. *Expect YOUR next camera to be a Universal!*

Remember: One picture from home is worth a thousand words to a Serviceman



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H. H. WINDSOR, Founder

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

September, 1944

Vol. 82, No. 3

Next Month

REAR Admiral Clark H. Woodward says our conquest of Saipan was the greatest victory the Allies have won in the Pacific. Those are big words if you think back to the battles of Midway, the Coral Sea, Guadalcanal, Tarawa—to mention a few. In an authoritative article next month, Admiral Woodward tells why the possession of Saipan and neutralization of the Marianas is the "Springboard for Victory" over Japan. He also traces the advance of our fleet at blitz tempo to the Jap's inner defense area 4,000 miles west of Pearl Harbor. The article tells how the Japs might have staved off invasion of strategic outposts.

Twin-Threat Man

AFTER the pilot of a Navy dive bomber or torpedo plane has hit a Jap target, the Zeros attack in swarms as he heads for home. The pilot's fixed guns in the wings fire only straight ahead, and his chances for getting back would be slim without his twin-threat man in the rear turret. An October feature, "Twin-Threat Man in a Dive Bomber," tells the dramatic role of the Navy's radio-gunners in bringing the planes safe home.

Aerial Detectives

IF YOU think the air you breathe is ordinary stuff, you should talk to the men who are solving the mysteries of high speed flying. One problem is to find a way to keep a high altitude pilot from becoming overheated by cold air coming into the cockpit for ventilation. Slowing of air causes compression and heat. Don't miss "Secrets of Super Speed" next month.

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Cameramen Under Enemy Fire

REMEMBER the Tarawa picture of marines examining a captured Jap stronghold in the midst of battle with dead Japs strewn grotesquely about? And the pictures of our men moving onto the beaches of Normandy under machine gun fire? Those invasion photos were received in the U. S. just 36 hours after the battle started. Cameramen, in uniform and out, are risking their lives every day in combat. They ride in the first waves of landing craft onto enemy beaches. Meet these heroic front line photographers in the first installment of a two-part feature in the October issue.

Television After V-Day

AN OFFICIAL of one of the largest radio companies in America predicts that in the decade after the war some 25 million television sets will be sold in this country. It may take a few years for the industry to get up steam, but when it does you will have televised movies on a 15 by 20-foot screen in your theater or home. Engineers also predict pictures in color 10 years after victory. For a glimpse into the future read "Television After V-Day" next month.

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A ship is a world

To her crew a warship means everything—home, food, protection, life. She's a world in herself, wherever she sails on the seven seas. She must stand alone—she must meet the strains and stresses of the sea, the weather and the war. The safety of the ship—the lives of men—depend upon the enduring qualities built in by skill, experience and integrity. That is why, here at Defoe, men and women put heart and pride into the construction of every Destroyer Escort and LCI (L) Landing Craft launched. The vital responsibilities of the shipbuilder's art will tolerate only craftsmen who build well. For these reasons whatever Defoe produces after the war will have the advantages of staunch dependability . . . of better quality and value for peacetime America.

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You would enjoy a visit to Greenland. . . A land of unusual beauty and the midnight sun. The people there are friendly, pleasant and honest, awakening with ever-increasing speed to the features of the civilization we enjoy. . . Greenland is a World Neighbor and the incidents that were once of only local importance are now of international concern. The best and easiest way to have a ringside seat to the history making events of *any* country is with shortwave radio, because with it you can tune anywhere in the world almost instantaneously. . . Your postwar Hallicrafters Radio will be a superb instrument—the world's best shortwave receiver. The result of over eighty million dollars of war research and manufacturing development, you will be able to tune in on any World Neighbor simply by turning a dial.

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The "Rambler" Roars into Rangoon

This morning you're flying with the crew of the famous "Rangoon Rambler" . . .

Crouched in the glassed-in nose beside you, Lt. Guy Spotts, the navigator, studies a map spread across his knees, checks off landmarks as they slide past underneath. Suddenly he peers ahead . . . speaks into his throat-microphone: "Pilot from navigator. There she is, Rote. We can see the target now. Alter course to three-three-zero."

"Roger!" Capt. Raymond Rote, the pilot, eases the big B-24 around and straightens out on his new course.

Then you see it . . . a splash of flame against the green horizon . . . the great, gold-domed Shwe Dagon Pagoda that towers over Rangoon. You're getting close . . . and the crew gets set. Lt. Robert Currie, the bombardier, fiddles with the knobs on his bombsight. Capt. Gordon Wilson, co-pilot, gives the instruments a last-minute check.

Now you're over the target . . . a flock of pot-bellied Jap cargo ships squatting there in the river's bend. The "Rambler" lurches and bucks as she ducks through bursts of ack-ack and goes into her bombing run.

Your heart pounds hard. Then Currie comes in on the intercom . . . cool as if he were ordering cokes at the Assam Officers Club: "Pilot from bombardier. Bombs away! Let's get out of here, pal!"

Looking back and below, you watch the formation's bombs bullseye the target. A freighter goes up in a blast of fire and black smoke. The ship beside it explodes.

Flames break out from a third. And a fourth. Currie and the other bombardiers were "on the beam" today.

Rote banks the Lib around steep, and you high-tail for home. You're congratulating yourself when . . . "Fighters at four o'clock—high!" somebody yells. You look up and see a formation of Japs sweeping out of the sun.

Now it's the gunners' turn. And between squirts of their big, twin-50's they keep up a running pep-talk:

"There goes his wing down! He's coming in! This one's my meat, Salley!"

"Hey, skipper—kick her over a little. I want a good shot at this guy."

And two Japs spiral down in flames, and the rest decide to quit. That's all for today. You look around at the crew, relaxing now, shooting the breeze, adding up the score. You think of the ribbons each man has won for flights like this.

And it makes your chest puff out with pride to be flying with guys like these . . . to be wearing the wings of the AAF—the "greatest team in the world!"

U. S. ARMY RECRUITING SERVICE



THE "RANGOON RAMBLERS": Standing: Sgt. Ferdinand Knechtel, gunner; Capt. Raymond Rote; Capt. Gordon Wilson; Lt. Guy Spotts; Lt. Robert Currie; Sgt. Joseph Willis, gunner. Seated: Sgt. John Craigie, Sgt. Carl Paak, Sgt. Adolph Scolavino, Sgt. Edward Salley, gunners.

MEN OF 17...



If you want to fly on the "greatest team in the world," an AAF air combat crew . . . go to your nearest AAF Examining Board . . . see if you can qualify for the Air Corps Enlisted Reserve. If you qualify, you will receive this insignia . . . but will not be called for training until you are 18 or over.

When called, you will be given further tests to determine the type of training you will receive. If you are trained as a gunner or technician gunner, you will go into actual combat as a non-commissioned officer. If your aptitudes are

outstandingly high, you may be trained as a bombardier, navigator or pilot; and graduate from training as a Flight Officer or Second Lieutenant.

But whatever your job on an AAF air combat crew, you will be the best-trained flier in any army on earth.

For pre-aviation training, see your local Civil Air Patrol officers. Also see your High School principal or adviser about recommended courses in the Air Service Division of the High School Victory Corps. Ask about the opportunities for college training through the Army Specialized Training Reserve Program.

For information on Naval Aviation Cadet Training, apply at nearest Office of Naval Officer Procurement. This advertisement has the approval of the Joint Army Navy Personnel Board.



FLY AND FIGHT WITH THE

GREATEST TEAM IN THE WORLD



WHITE COLLAR or OVERALLS—



Which will YOU wear after the war?

HUNDREDS of thousands of white collar workers have put on war overalls for the duration. Millions of both white collar and overall workers have put on uniforms. Hosts of home women are patriotically taking jobs.

After the war, millions will be coming back from army, navy and air force to civilian jobs; great war materials factories will be re-converting to civilian production; old peace-time functions of business will be springing up—where will you fit in the situation?

If you are wise, you will look ahead and prepare. You will not wait on chance. You will analyze the probable conditions in peace employment, decide where your likes and aptitudes fit best, and get ready. You will decide whether your best opportunities lie in production or office or store. You will determine whether you wish to work for someone else or develop a business of your own. You will train now to be above the average and, therefore, surer to get the opportunity you want after the armistice.

Nor will you wait very long. Nobody knows when this war will end or how soon this problem will hit you in the face.

major fields of commerce and industry, and we have gathered a wealth of information about job opportunities and requirements. That information is at your service.

We Can Help You Prepare

And when you have decided what field of work offers most to you for a life career, we can help you prepare for it—quickly, economically, thoroughly, in your spare time and without any interference with your present work—if it is in the list below. A 48-page booklet on the field of your choice, discussing the field and our training for it, has been prepared to help answer your questions. The coupon below or your letter will bring it to you, without cost or obligation.

Do not delay. Whether the war lasts six months or three years, now is the time to make sure your preparation for postwar success shall not be “too little and too late.”

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I want to pick my career for after the war and get ready for it now. Send me your free booklet on the field I have checked below and full information about your training in that field.

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Name.....Age.....

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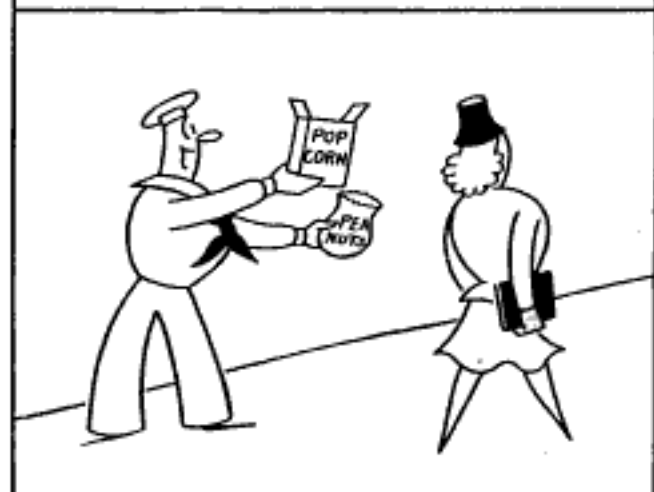
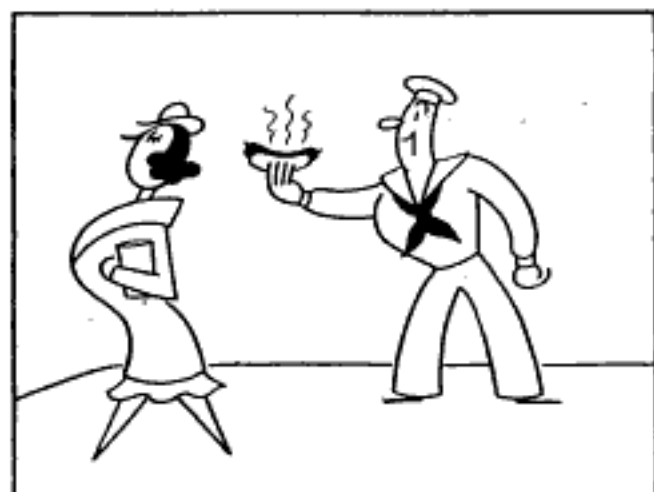
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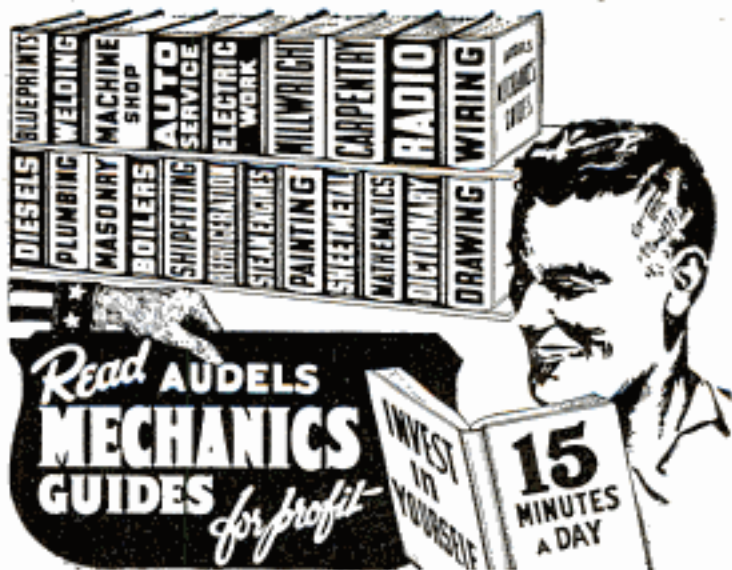
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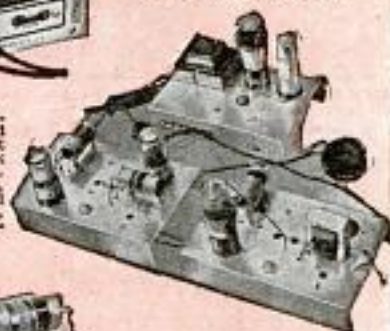
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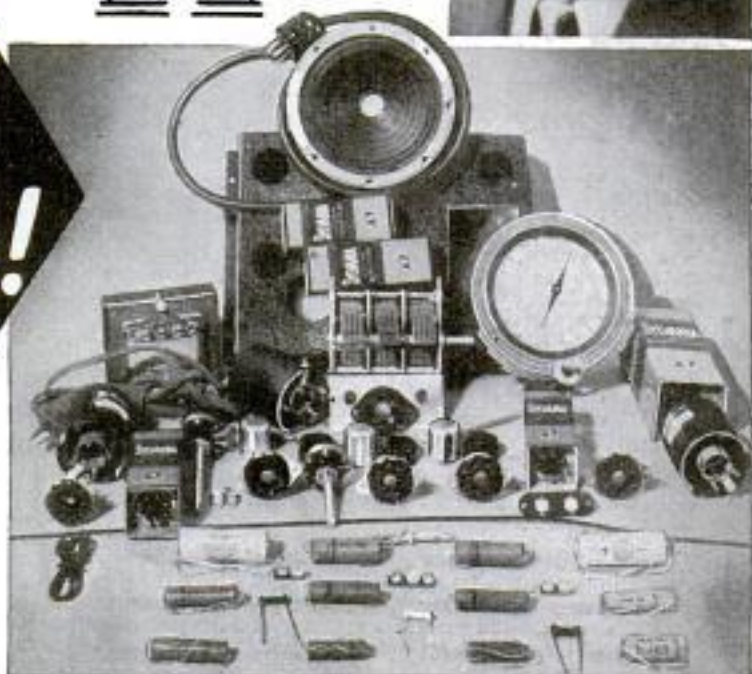
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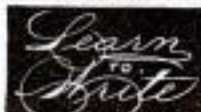


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electric, shows position of every train in the area	35 Sep
of the "Little Burma Road"	62-63 Sep
Mechanical brain enables operator to dial direct connection from city to city	9 Sep
Medical rolls to be dropped to Yanks	86 Sep
Meter electrical, takes multiple reading	16 Sep
Micrometer with magnifier speeds reading of numbers	61 Sep
Mobile power station to serve bombed cities	26 Sep
Mold-and-Ladle unit melts lead to form hammer	16 Sep
Money holder made of plexiglas	88 Sep
Motor-driven saw cuts big logs in five seconds	55 Sep
Movies "Sound Tricks of the Movies"	56 Sep
Nails picked up by sweeper with magnetized drum	61 Sep
Navigators in pre-flight training study model of Japanese city	31 Sep
Nozzle all-purpose, permits the water either as stream or fog	53 Sep
"Nurses' Training---And How"	80 Sep
Obstacle course part of nurses' training	80 Sep
Orange trees flourish best when provided with zinc	46 Sep
Oxygen bottles wrapped in wire don't shrapnel when hit	13 Sep
Parachutes drop food and supplies to reconnaissance units	85 Sep
Paratroopers	
protected by smoke screen	74 Sep
"Rescue from the Sky"	82 Sep

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SO IT NEEDS FIXING

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

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

What to Charge?

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

For a while, repair parts (needed on some

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

The Future Offers

Friends ask me about my future. And, I think I've got a grand one. Age is no handicap in repairing. I have in my files enthusiastic letters from repairmen ranging in age from 18 to 79 years. After the war, we're bound to see hundreds of new products on the market . . . products that the average person never dreamt of. These new products and our old appliances are all going to need at some time or other "fixing." Well, I'll still be the fellow to do it. The field open for appliance repairmen is unlimited. I don't worry at all about too much competition.

If You Are Ambitious

To the contrary, I've prepared a complete course, chuck full of simple, easy to understand photos and drawings and written in the same non-technical language as this article. I know the course is good, because I have hundreds of men all over the country writing to me telling me how the course has helped swell their pockets with cash. If you too want to prepare now for your future, I suggest you read the next page and send me the handy coupon."

Parker Dam is typical of smaller irrigation projects	23 Sep.
Penicillin purity of tested with aid of rabbits	55 Sep.
Pennsylvania railroad busiest straightaway on any railroad	33 Sep.
Phone booth outdoor, serves war housing unit	10 Sep.
Phosphorous bombs when exploded make smoke screen	75 Sep.
Photography	
"Picking the Target"	28 Sep.
rapid-fire portable speedlamp shoots at 1/5000 of a second	13 Sep.
Photo-holder made of plexiglas	88 Sep.
Photo-reconnaissance played major role in invasion site	29 Sep.
Pilots fighter, trained with help of mobile control tower	49 Sep.
Pipe miles of carry captured flood waters	22 Sep.
Plant hormone enables apple and pear trees to get full crop	46 Sep.
Plastic	
molds pop out after pre-heating to order	61 Sep.
same as used in gun turrets makes gifts items	88 Sep.
Plexiglas	
used in making gift items	88 Sep.
used in making simplified celestial navigation instrument	87 Sep.
Plow subsoil, leaves protective stubble to prevent erosion	38 Sep.
Poison ivy eliminated by use of chemical	45 Sep.
Portable telephone designed for wounded veterans	9 Sep.



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I have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some years ago. I have learned so much more through this course I would not part with it.—*Charles Schwarz, Hamilton, Ohio.*

The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for.—*P. J. Brett, Sebring, Ohio.*

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—*Henry S. Lee, Washington, D. C.*

PREPARE FOR THE FUTURE

If now in war work, start your home appliance repair business in your spare time and be set with a business of your own when the war is over. You don't need elaborate fixtures or expensive equipment to be a successful repairman. Operate from your garage, basement, vacant store, etc. Work as many hours as you wish . . . the home appliance repairman is his own boss. It's a profitable occupation for on many types of repairs it is usual for a repairman to charge on the basis of \$5.00 to \$6.00 an hour! *Prepare today and make sure of tomorrow's future.*

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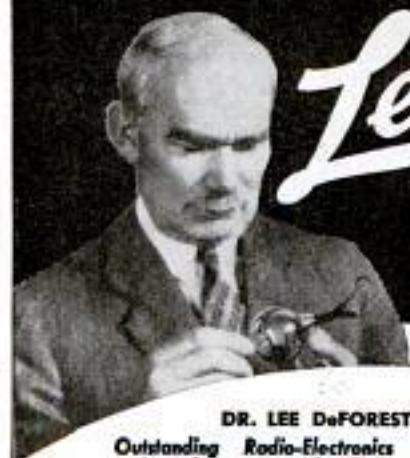


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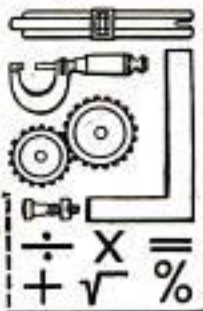
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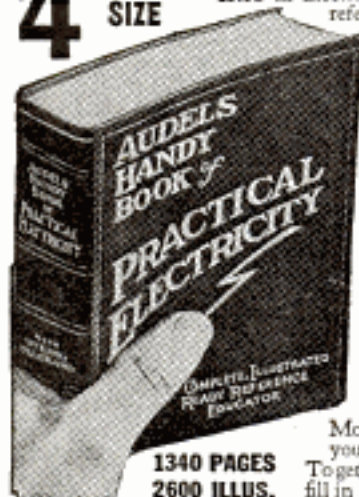
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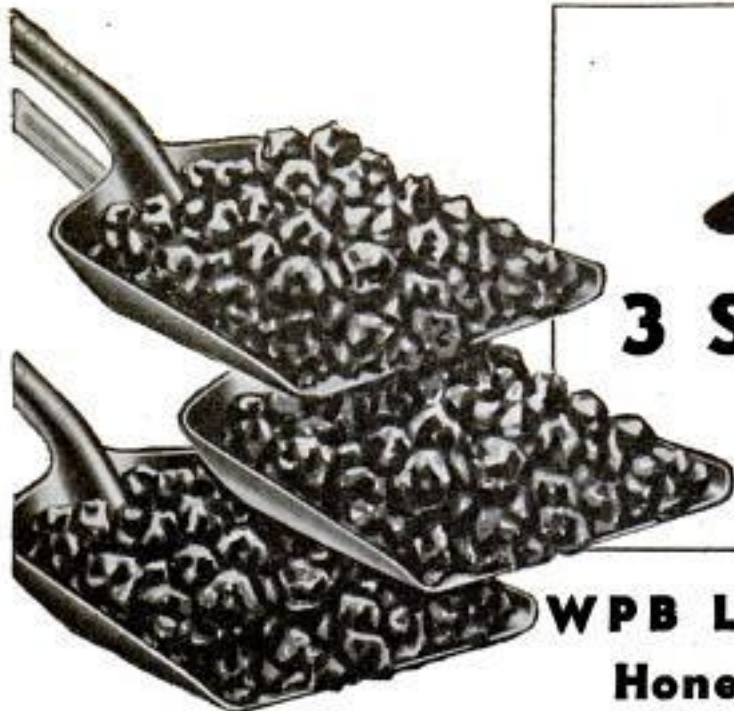
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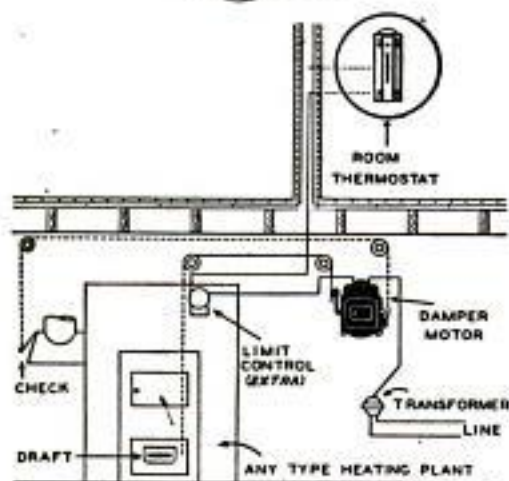
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Vol. 82

M. S. S. SEPTEMBER, 1944

0339

No. 3



"The ROCKET'S
RED GLARE"

British Official photo

Loading rocket projectiles under wing of an R.A.F. Typhoon on an air field in Normandy, shortly after D-Day

THE war of the rockets burst into full flame with the invasion of Nazi Europe.

In the last days of the "softening up," fleets of rocket-toting planes swarmed over the Norman coast and wiped out all enemy radio installations. Thus deprived of listening posts, the Germans failed to detect the approach of airborne troops.

On D-Day unlovely little barges bobbed in the sea just off the invasion beach, and from their decks erupted lovely orange shafts that arched into the shore defenses with devastating effect. These were the LCR's—landing craft, rockets—one of the newest of the new breed of landing vessels, their decks bristling with row on row of rocket projectors.

Through the surf and up the beaches waddled rugged amphibious "Ducks" spouting rockets from multibarreled guns. Bazookas made the Yankee infantryman a walking tankbuster. British and American fighter planes carrying four rockets under each wing went hunting for tank formations or singled out Nazi command posts for heat treatment, and within a week after D-Day Typhoons and Beaufighters, Swordfish and Hurricanes and rocket-mounting Mustangs and Thunderbolts were working over the enemy from fields on French soil.

And it was about that moment that the German rockets began soaring across the Channel to bury their 2,200-pound explo-

SEPTEMBER, 1944

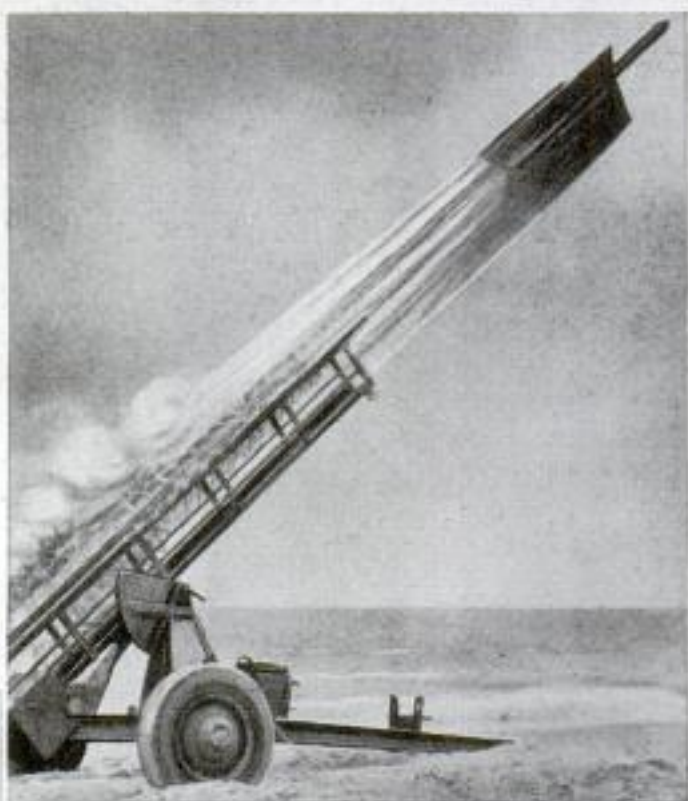
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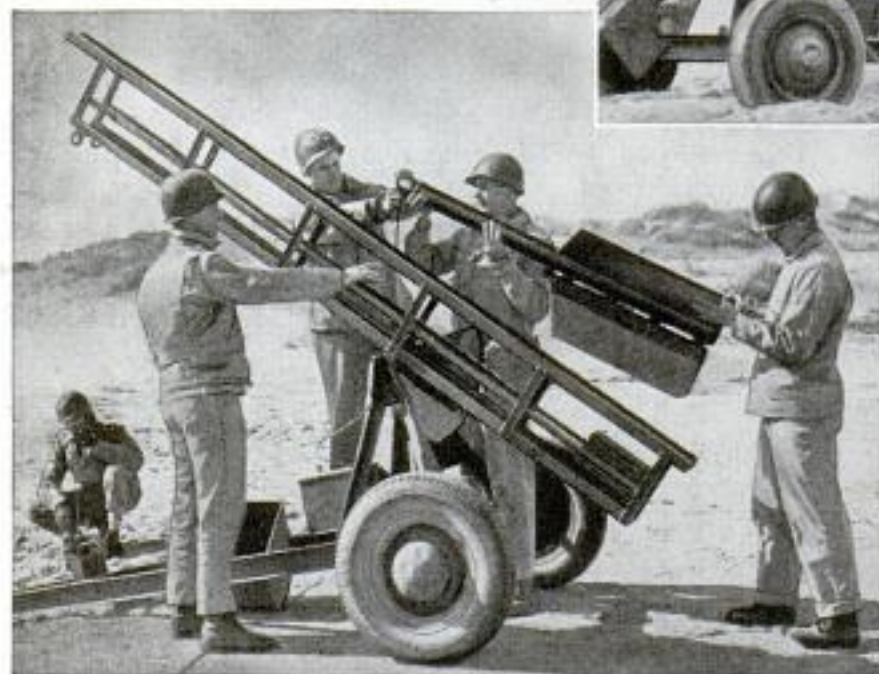
The carrier-borne Grumman Avenger above carries racks for four rockets under each wing

sive noses in London and the ports of southern England. They are not really rockets; rather flying torpedoes, or jet-propelled miniature planes carrying a terrific wallop and traveling as far as 150 miles. Their distance of travel can be controlled by the amount of fuel or the rate of its expenditure; their general direction by takeoff from fixed ramps aimed toward the target, plus an automatic gyropilot pre-set to continue the robot in its initial direction. This does not, however, prevent deflection by the wind.

However, the flying bomb is quite incapable of hitting a specific military target at any distance. At first it was thought to be radio-controlled, like the



Antiaircraft gunners practice by firing at rockets, launched from wheeled projectors (left and above) at a seaside range



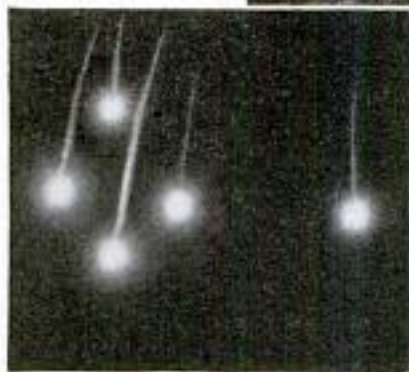
glider bombs used by the Nazis against Mediterranean shipping last year. These were launched from parent planes and guided by radio to their targets. When the Allies discovered how to "jam" their controls and sometimes sent the gliders chasing their own parents back across the sky, the Ger-

mans dropped that idea like a hot plate.

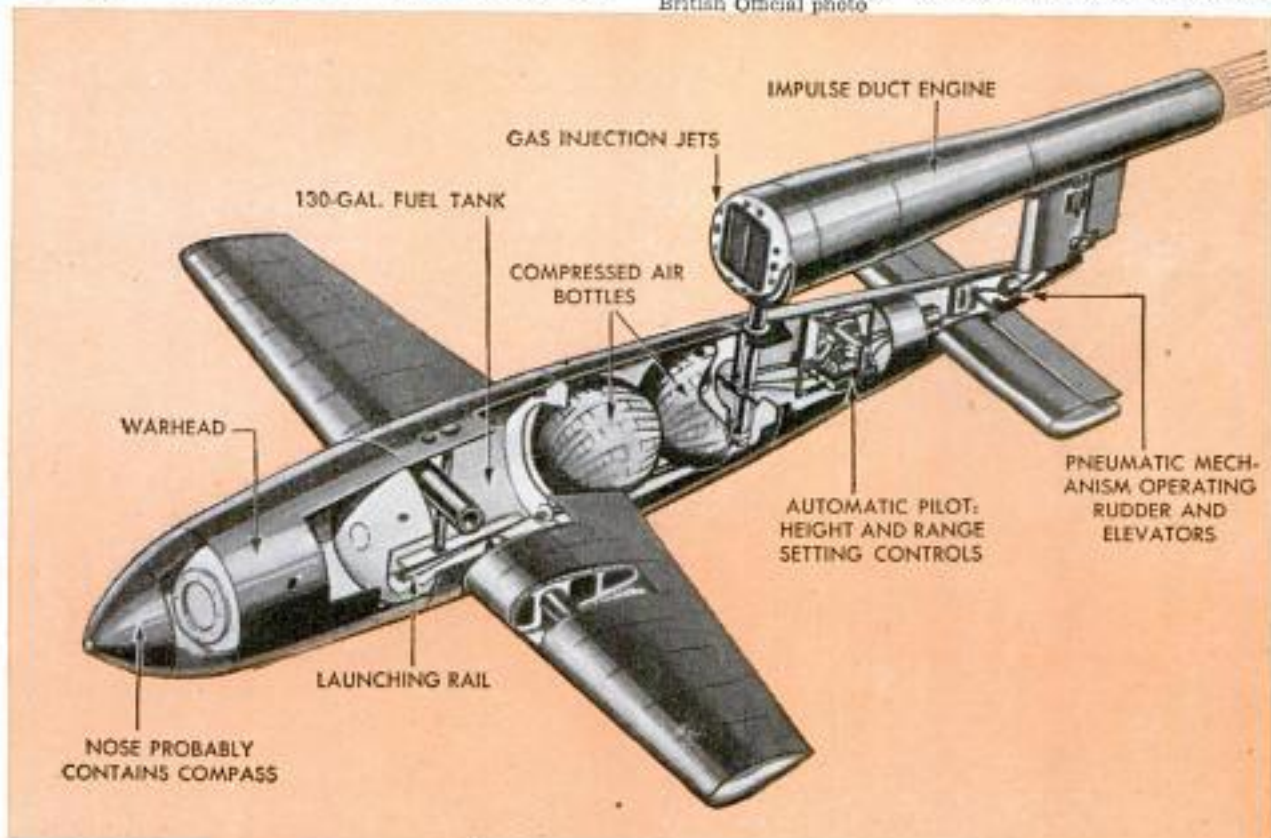
Two gyroscopes control the course of the robot, one governing its altitude and the other lateral guidance. Horribly effective in an indiscriminate way—against a large city target such as London—the flying torpedo probably has no effect on the war's outcome. Its local destructive blast is immense, and in its first 21 days of employment it killed on the average one person per 2,200-pound bomb: 2,750 bombs took 2,752 lives, and injured some 8,000 persons. Compared with the pinpointing of military objectives by Allied bomber and rocket planes, the robot is a nuisance of small strategic value. It has caused multiple tragedies and property loss, and has diverted numbers of anti-aircraft guns and fighter planes to defense. And it has served as a pilotless pinch-hitter for the German Luftwaffe at a moment when German bombers are virtually nonexistent and German fighters a vanishing race.

The fuselage of the flying torpedo is 21 feet 10 inches long and 2 feet 8 inches wide; its overall length including the jet propeller mounted above the tail is 25 feet 4.25 inches, and its wing span 16 feet. A larger robot is on the rumor list.

The Germans have also introduced recently their copy of the American ba-



Grenade launcher above is sending up a rocket signal used for communications at front; note the five-starred signal. Below, an artist's conception of the winged bomb launched by the Germans against England
British Official photo





British Official photo

Erecting multiple-barreled rocket guns to fight off planes over England

zooka. First reports indicate it is a one-man "waterpipe" gun firing an 88-millimeter shell that has a terrific wallop at 50-yards range, but lacks accuracy and loses impetus beyond that.

Our own bazooka has been dubbed the "shoulder 75" by Nazis who scrambled out of tanks and pillboxes hands first when the rocket burst through their armor. It will

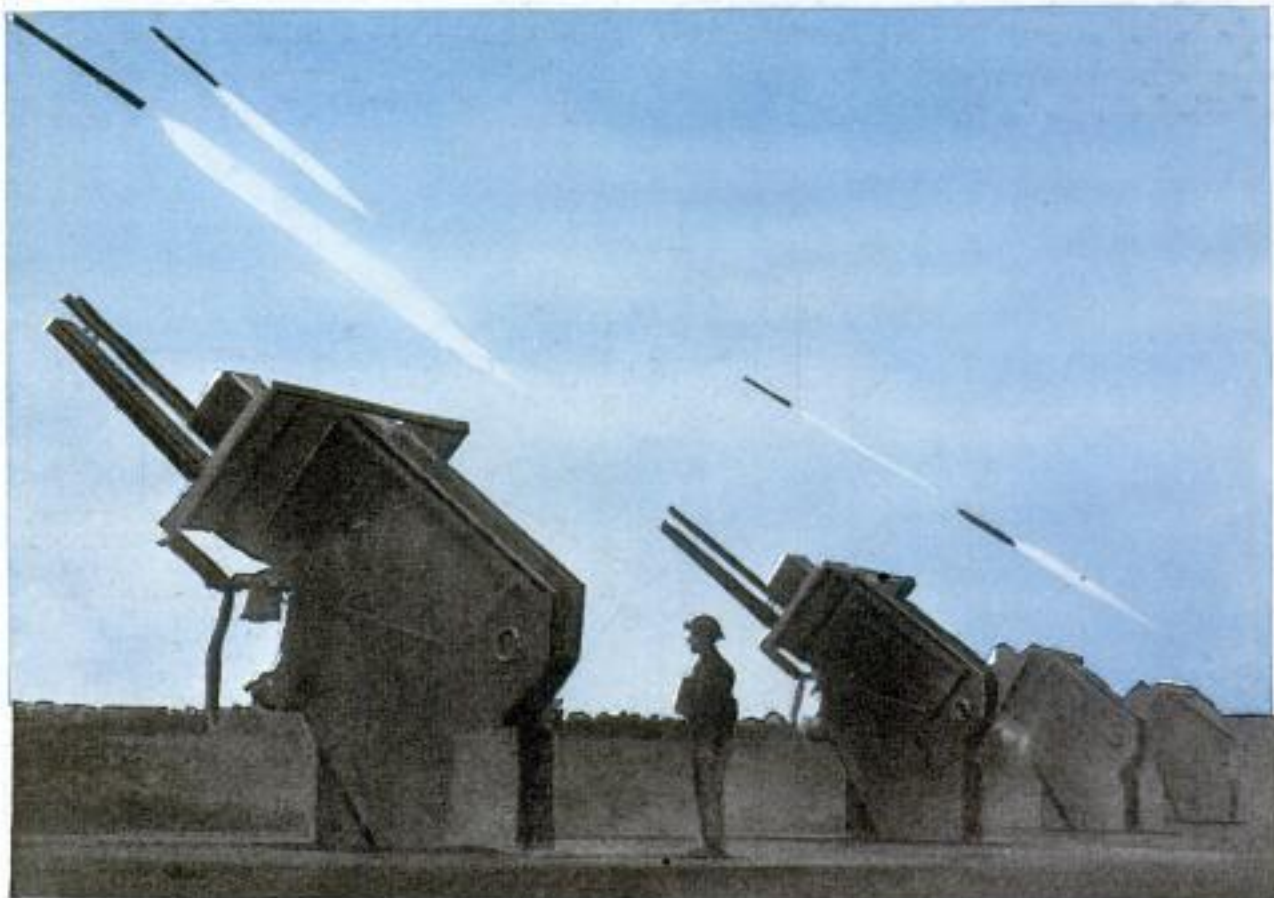
from Russian warplanes.

This famous pair, the Katusha and the bazooka, became the parents of a sky rocket—the flying bazooka. A lightweight weapon like the Yankee bazooka, that has such a powerful blast effect coupled with light weight and absence of recoil, would be an ideal air weapon, and the U. S. Army Air Force and Navy both began develop-

penetrate brick walls and shatter rock, smash through the toughest enemy tank the Allies have encountered, and on one occasion a Yankee colonel saw a doughboy blast the turret right off a German tank with a single bazooka rocket from 75 yards away, and the turret sailed 40 feet through the air.

The Russians were probably the first to splash the rocket's red glare in the face of the Nazis at Stalingrad. There the now famous "Katusha" sent a shower of rockets at a single target in a withering salvo. It was very quickly adapted for launching

Antiaircraft rockets flash up from a battery of projectors to meet the Luftwaffe during a Nazi bomb raid



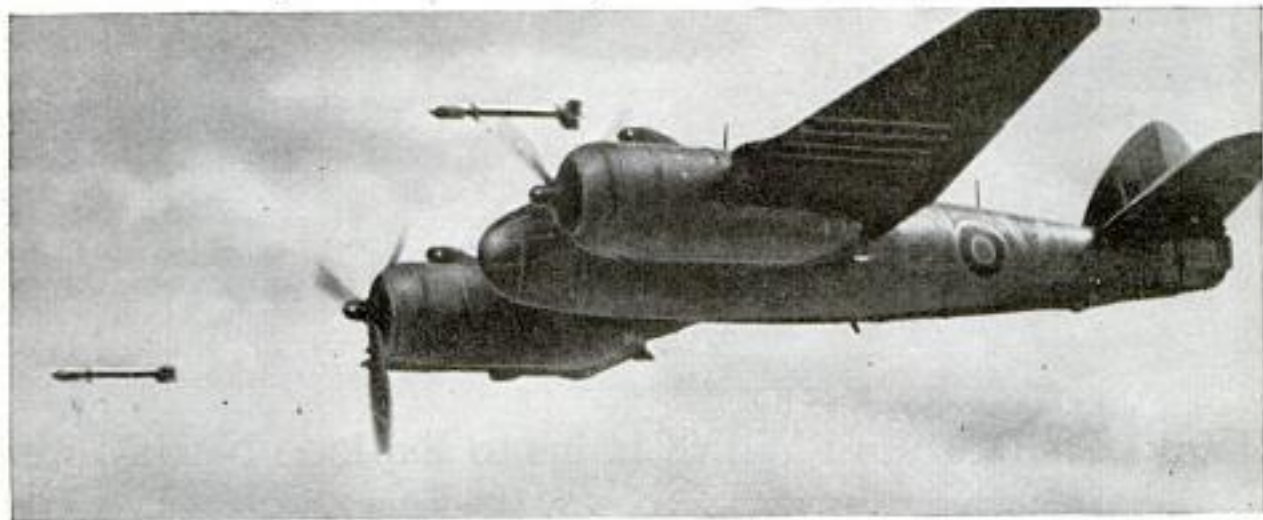
ing rockets for their own purposes.

The flying bazooka made one of its first appearances when a fleet of P-39 Airacobras swept down from the clouds over Rabaul and sank 40 Jap barges with their high-explosive rockets. After that successful mission the Air Force announced that rocket racks had been installed under the wings of all five of our Army fighters—the P-38 Lightning, the Airacobra, the P-40 Warhawk, P-47 Thunderbolt and Mustang.

The rocket lacks something of the accuracy of



Gen. Sir Oliver Leese, British Eighth Army commander, sights a captured rocket antitank gun—German version of the bazooka—on the Italian front



the machine gun and rifle, but that discrepancy is made up by increasing skill of the fighter plane pilot in sighting his plane on the target. On the credit side is the rocket's terrific power, which has the effect of a 105-millimeter shell without entailing the immense weight of the 105 gun and its mount. The simple rocket tubes are mounted under the airplane's wing in pairs, four projectors on each wing; they can be fired singly, in pairs or in a simultaneous salvo of eight. A particular advantage of the flying bazooka is its lack of recoil. It is a rath-

Continued to page 160

Above, a Beaufighter of the R.A.F. Coastal Command lets go two rockets in an attack on a German convoy at sea. Below, U. S. Ordnance officers examine abandoned German rocket gun in which booby traps were planted



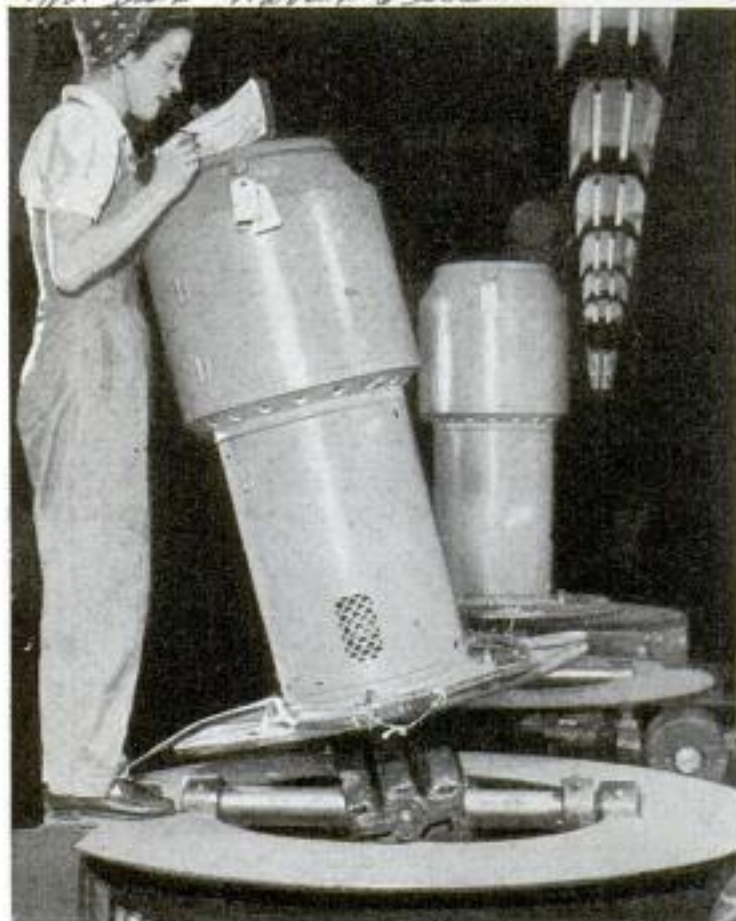
*Sperry Gyro Comp., U.S.A. Bldg.
30 Rockefeller Plaza
N.Y.C.*

0321

Gyro-Compass Guided Assault Boats to France

Hundreds of non-magnetic, lightweight gyro-compasses which make use of elec-

Mr. John Warren & Mitt



tronics were produced by the Sperry Gyro-compass Company as a preparation for the invasion of France. The Navy asked for a gyro-compass light in weight and yet rugged enough to operate on small boats during amphibious warfare, which must proceed on a fixed timetable despite hazardous coastlines, heavy surf and impaired visibility. It also had to be non-magnetic so it wouldn't be affected by electrical machinery or by cargoes of tanks, guns, trucks, and jeeps. To meet these requirements Sperry engineers designed a compass which stands at normal height but is only 19 inches in diameter. Except for the voltage regulator and the repeaters, all items of equipment are contained within the binnacle. To cope with space limitations on small vessels, the binnacle can be split into upper and lower halves and placed in different locations on the ship. The top half, which has the rotor and mechanism that actually does the job, may be installed at the steering station and the bottom half, with the control panel, amplifier panel, filter and motor generator, can be located where more space is available.

0380

Tanks Flail Ground With Chains to Explode Nazi Mines

"Flail tanks" which explode enemy mines by beating the ground with chains are being used by the British Army. Across the front of the tank is fitted a steel cylinder

to which are attached a number of lengths of chain several feet long. As the tank moves forward the cylinder revolves rapidly and the chains are whirled around, lashing the ground to set off anti-personnel or antitank mines and clear a path the width of the tank. A late model of the "flail tank"—called the "Crab"—drives its chains by the engine itself instead of by an independent motor as on the "Scorpion," an earlier model which destroyed 100 percent of the mines in its path in North Africa.



Above, "flail tank" beating the ground in search of mines. Right, British tank showing revolving drum for whirling chains mounted in front. One of these tanks destroyed 47 Nazi mines without damaging itself



*Lilbo, Neal & Battle (Adm.)
 Chamber of Commerce Bldg.
 Atlanta 9, Ga.*

0349

"Sea Mules" Herd Landing Craft and Big Ships



U.S. Navy

Hailed as "virtually unsinkable" in its operations in the English channel during the invasion, the Ingalls Sea Mule is a small but powerful marine tug which is expected to revolutionize the handling of vessels in harbors and inland waterways. The Sea Mule, which was shipped across in a "knocked down" condition and reassembled at invasion ports, was used to tow or push barges across the channel. The craft is so maneuverable it has been dubbed the "harbor jeep." Since the invasion, a larger type of Sea Mule, the strongest tug of its size, has been launched at the Ingalls Iron Works Company, Birmingham, Ala. The tug is 42 feet long and 15 feet wide with a draft of 7½ feet. Each of her two propellers receives 250 horsepower from twin Chrysler marine engines. Although the Mule usually takes a crew of three, one man can handle her in light traffic.

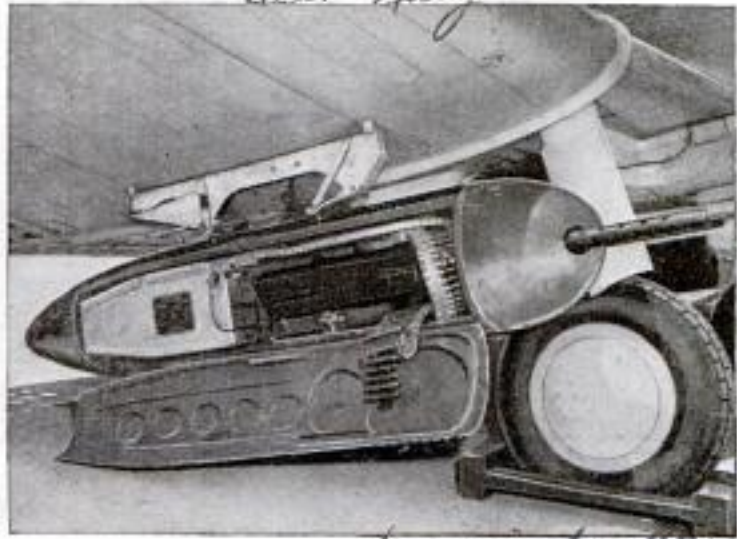


Photos from: *Ingalls Iron Works, Inc.
 50 Parkville Plaza
 N. W. 77, N. Y.*

Gun 'Packages' Under Wings Add Punch to Navy Planes

0330

U.S. Navy



"Gun packages" are hung under the wings of certain Navy planes, increasing the firepower of some craft 100 percent. The guns are placed in self-contained cases which are attached to the wings by sway braces, the same as those used for bombs, so that the plane may carry bombs, auxiliary gasoline tanks or guns without substantial alterations. Although the gun packages are not intended to be dropped after the ammunition is exhausted, they may be jettisoned when a quick get-away is necessary. Each package weighs over 350 pounds and is longer than a 2,000-pound block buster.

SEPTEMBER, 1944

*Designed by:
 Capt. John W. Luyck, Civil En-7
 Training Corp., U.S.N., Washington, D.C.*

Copyrighted material

Mr. Allen Warren G. Mease
7 Park Ave.
N. Y. 16, N. Y.

0418

THE LINE IS BUSY



Telephone workers are being recognized as the Signal Corps of the home front army, maintaining production and morale. It takes some 500,000 of these workers—440,000 in the Bell System alone—toiling in shifts around the clock to keep our 26,000,000 or more telephone bells ringing out with sad music for our enemies. About 225,000 of the total are operators, and 68 percent are women.

Their production job is indicated by the 12,000 phone calls required to make a big bomber, 60,000 to build a cargo ship, and 87,000 "hello's" to complete a destroyer.

What the telephone means to the morale of homesick servicemen, or wounded veterans, is shown by the fact that the peak days for phone use are Christmas, Thanksgiving, and Mother's Day. Traffic on these days—

Telephone "minute man" making emergency repairs after storm. Below, workers on B-29 bomber use world's shortest phone line

THE next time you reach for the telephone just remember that Americans are doing the same thing at the outstanding rate of 106,000,000 times per business day. This adds up around 35,000,000,000 calls a year.

Never in the history of this nation or any other have the wires hummed with so much conversation, a great part of it connected with the war. It appears that the harder we fight and the more we produce, the more we use the telephone. So the present incredible rate of telephone use might be taken as a sure indication that Victory's on the wire.

Telephone conversations for the year will show an increase of 2,500,000,000 over the last year before our entry into the war. And the boost would be higher, except for people who are beginning to understand that the telephone, like a gun or a tank, is an instrument of war—slugging it out 24 hours a day.



particularly long distance—is now greater than the former record set on Dec. 7, 1941.

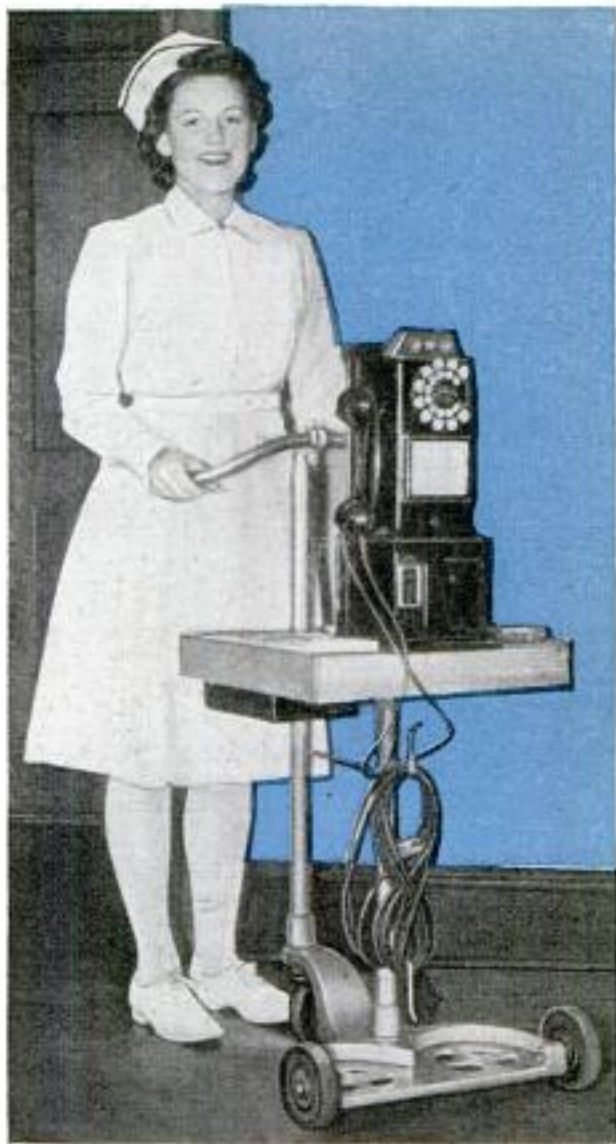
The greatest pinch has come in long distance. Toll and long distance calls are up about 300,000,000 a year since we entered the war. Long distance calls have multiplied as much in the last three years as in the previous 36 over the Bell System.

One reason this company has been able to carry the increased load despite shortages in equipment and labor is the increased use of the modern carrier telephone system. This makes a dozen telephone conversations grow where one sprouted before. Complicated terminal apparatus separates the various messages and sends them speeding by different frequencies over a single pair of wires to a distant point where other equipment changes them back to their original voice frequency.

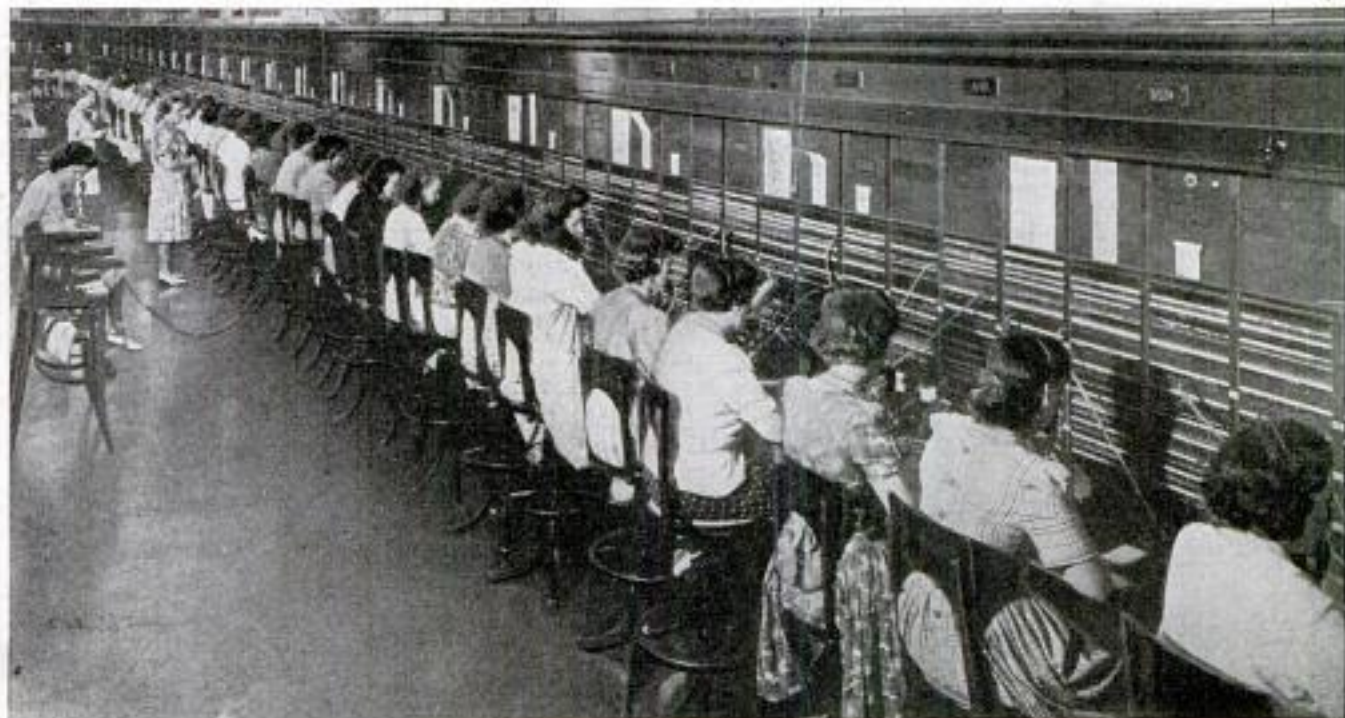
Another device engineered by the Bell Telephone Laboratories is a mechanical brain which enables an operator to dial a direct connection from city to city. Called "the Number Four Toll Switching System," it was inaugurated in Philadelphia, where switchboards, which look like adding machines, are in use. By this system an operator can employ mechanical devices to find an idle long distance circuit, hold the circuit, signal the central office in a distant town and finally ring the telephone of the called party without the help of the operator in the called party's town.

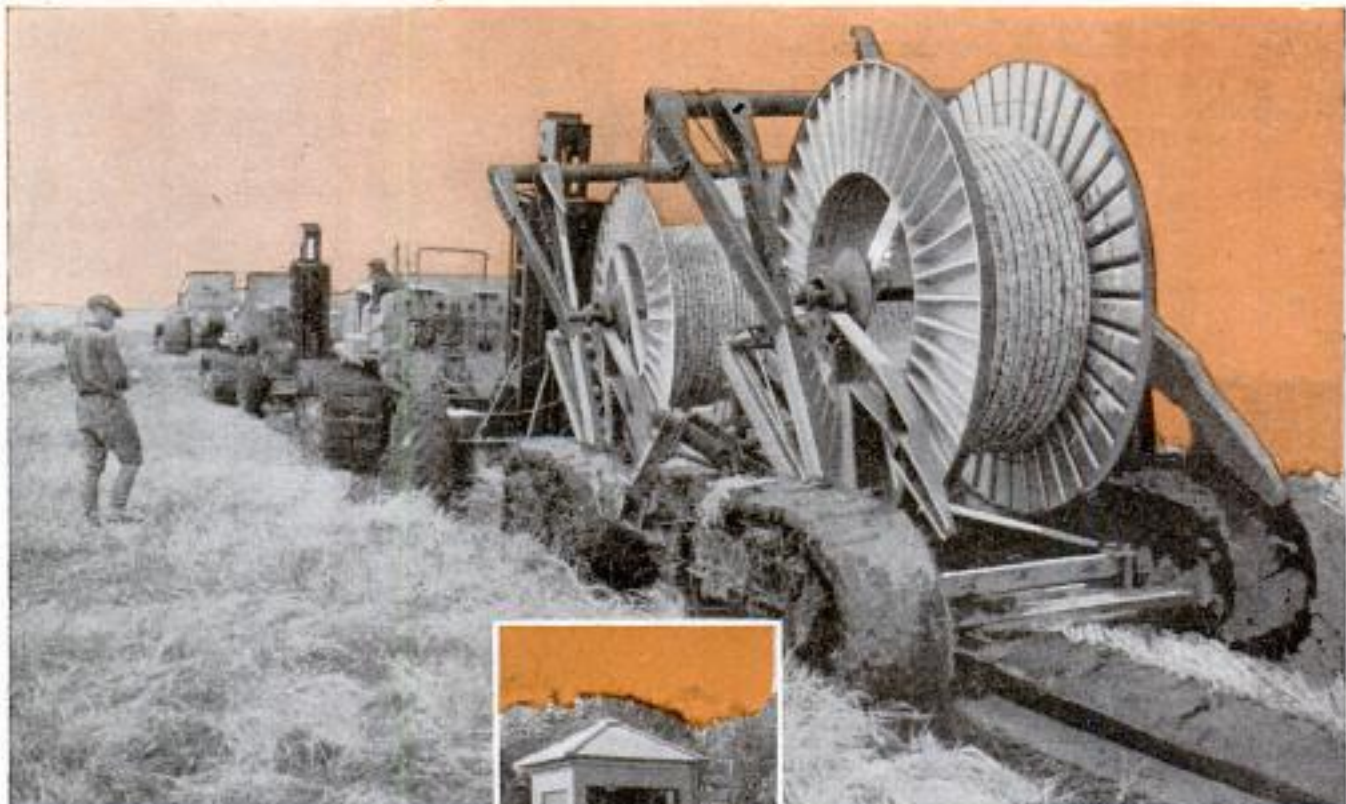
Another mechanical robot went to work in the Los Angeles area. Subscribers dial nearby toll calls and the machine prepares a printed ticket, fixing the cost and charging it to the proper number.

Extremely important, too, was the war-

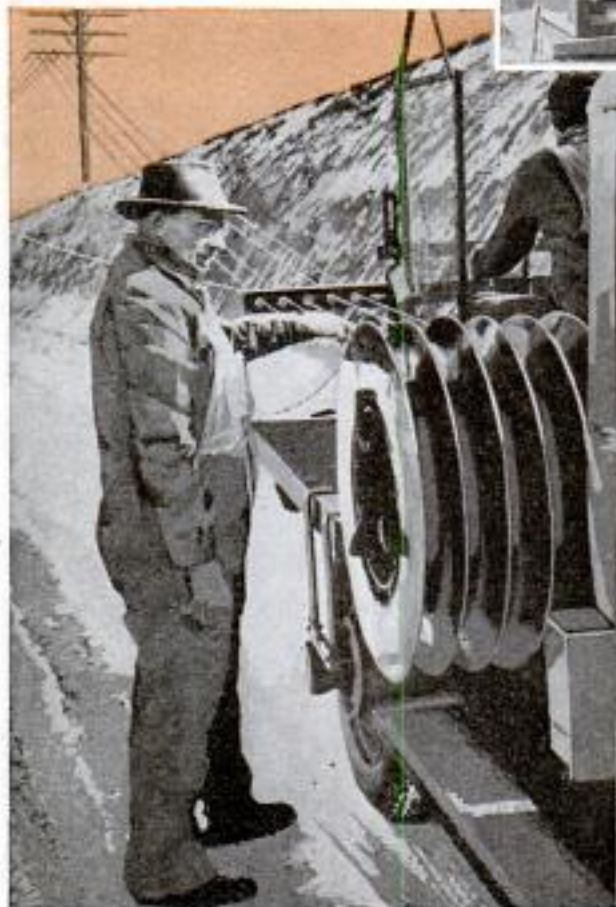


Designed for wounded veterans, portable telephone with long cord is rolled to bedside. Below, a long distance toll board—calls have jumped 300 million





Home front war machine (above) plowing under a section of transcontinental cable which carries several messages over one pair of wires. Right, outdoor phone booth serves war housing unit. Below, motor-driven reel takes down copper wires so they can be used again



time completion of cable connections between Omaha and Sacramento, Atlanta and Terre Haute and between Dallas and San Antonio.

Just as vital, perhaps, is the high-spirited morale of telephone employees who have scored by hard work, economies, short cuts and new ideas.

When the sudden burst of war activity, particularly at night, upset traffic on basic long distance lines, traffic control bureaus became more vital than ever.

A large part of this night volume originated at military establishments where G. I. Joes were calling the folks at home. Thus, a special night layout was devised to provide more circuits needed at certain places. Its job is controlling these night circuits and regular circuits, too, and providing a quick picture of the shifting situation at any time.

In a typical bureau, a girl posts a colored code symbol beside the name of a city. The codes indicate the load on the circuits, how calls are being routed and other pertinent information.

Most remarkable is the manner in which service has been maintained without large, new supplies of copper wire and telephone instruments, both of which are now serving the men in uniform in far-off places.

Wire is an item, indeed. About 100,000,000 miles of it connects the more than 70,000 cities and towns in the United States. Yet, new copper requirements of the Bell Sys-



tem were reduced from a peak rate of 92,000 tons a year to an estimated 6,000 tons in 1943. About 10,000 tons of Bell System copper were salvaged and returned to the national copper pool, more than offsetting the new copper used. The entire system's requirements for bare copper line wire were being met by reusing wire removed from poles.

By employment of a special type of truck with a motor-driven reel, wire is being carefully taken down from a telephone line no longer needed, so that it can be saved and used again.

Another ingenious device fixed on a hand pole permits aerial drop wires to be coated with asphalt by one man without lowering them from their supports. The painting treatment is a means of retarding deterioration of these wires which connect the subscriber's premises, and of reducing the peaks of trouble during prolonged periods of wet weather.

Exposed aerial lead-covered cables are removed by a machine which lowers them carefully to prevent breaking, coats them with asphalt, wraps them in felt and then buries them in a trench.

A metal-saving "victory" joint is used in splicing lead-covered telephone cables.



Cable-wrapping and burying technique is speeded with a two-wheel guide which prevents sharp bends. Left, the lineman tying wire to glass insulator is symbol of 24-hour maintenance service—only five percent of the Bell System's outside wires are open like these. Below, adding-machine type of switchboard locates idle circuits.

Bell System photos





From this telephone center for the armed forces in Times Square, New York, calls go to every state in nation

Compared with the old-style joint, it requires 40 percent less solder. Since the solder used for wiping joints consists of nearly one-third tin, the new technique saves about 110,000 pounds yearly in the amount of tin used for repair and maintenance.



Dummy switchboards, made principally of a photograph, save strategic materials and permit regular switchboard positions to be used for providing telephone service. These simulated switchboards are made of heavy cardboard over which a photograph of an actual switchboard has been pasted.

New, also, are outdoor telephone booths, first installed in wartime housing developments where telephone facilities are unavailable to serve ordinary needs. They are used in other spots where special demands had to be met, such as in trailer camps, public parks, gasoline stations and military posts.

The Bell System companies have done everything possible to provide special service for men in uniform, especially to wounded veterans. A variety of hospital bedside, plug-in telephone hook-ups have been provided. Even telephone booths big enough for wheel chairs have been installed.

According to a telephone official, some of the men back from the battle zones were almost in dread of calling their mothers. "How do

Posting colored code symbol beside name of city aids routing long distance calls

I tell her I only have one leg?" was one anxious question. And others had heard of the experience of a buddy in the next bed. A call home. A mother's answer. A "Hello, mom." A click, then a thud. "It's better," they advised, "to call your father or your sister

first; they can take it better." In war-time government projects alone, the Bell System has placed 20,000,000,000 feet of wire. The biggest private switchboard in the world is where you might expect it to be—in the War Department. The shortest telephone line in the world is



in the busy, noisy Boeing B-29 airplane plant where workmen talk over the telephone although only a foot apart. They are separated by a wall of metal.

Flood, fire and storm have made preparedness a telephone habit. Safeguarding war telephone communications has heightened this function. Lines are patrolled. Stand-by engines are kept on hand to provide emergency power. Nearly two-thirds of the wire network is underground. In fact, 95 percent of all outside wire is either underground or in overhead cable. Long distance cables are under gas pressure which sets off automatic alarms when trouble develops. If lines are broken, essential calls can be switched over alternate routes. Emergency switchboards move by plane.

Some of the adventures of the telephone men in the field are thrilling.

A wire chief near a northeastern Air Transport Command base got a hurry up call. A crew laying steel landing mats had driven three-foot spikes through a cable, knocking out the control tower radio transmitter by which planes were brought in.

"There are eight planes in the air," the telephone man was informed. "The ceiling is 100 feet. It's pouring rain. Either you get us two circuits in a hurry or there will be a lot of blood spilled when the planes run out of gas!"

While the planes droned above in the murky sky, the wire-chief started two men with wire, one from the control tower and another from a connection three-quarters of a mile away. They met the wire chief in the middle of a swamp. Stripping off their raincoats, they made a tent, completed a dry splice and restored service in time to permit the control tower to land the planes.

One telephone man achieved a lot of attention while installing a phone in a War Department office in Washington. He had been working 40 hours and, lured by the soft rug under an ornate desk, he had fallen asleep.

A guard who found him snoozing there hours later was positive he had captured a spy. It happened that he had picked one of the most important spots in the world—the office of General Marshall.

Oxygen Bottles Wrapped in Wire Don't "Shrapnel" When Hit

To prevent them from "shrapneling" when hit by flak, oxygen and carbon-dioxide cylinders used for breathing and fire-fighting purposes on Allied planes are wrapped with steel wire. A bullet striking a wrapped cylinder leaves only a clean hole, while an untreated cylinder would explode. The process was developed by Walter Kidde and Company.

SEPTEMBER, 1944

88 West St.
Syracuse, N. Y.

Rapid-Fire Portable Speedlamp Shoots at 1/5000 of a Second



Something a press photographer dreams about—a portable speed-lamp unit capable of taking pictures at a speed of 1/5,000th of a second—has been released to the armed forces by Eastman Kodak Company. The unit is ideal for covering indoor sports events where extremely fast and dramatic action must be caught. The speedlamp can make 200 consecutive flashes when the battery is employed, or an indefinite number when operating with alternating current. The light output is good enough to produce a fully timed negative of an average subject at 15 feet with high speed film exposed at f/11. The flash length of 1/5,000th of a second is far above that of any mechanical shutter. The 18-pound power unit is supplied with a shoulder strap. The company announced that delivery to persons with high priorities may be made after all government requirements are filled.

Photographer, N. Y.

Flexible Putty Fills Wing Dents To Reduce "Skin Friction"

Hailed as an important step toward the absolute minimum of "skin friction," or perfect wing-surface smoothness, a flexible, high-adhesion aircraft putty has been developed to fill dents and cracks between riveted aluminum sheets forming airplane wings. So important is wing-surface smoothness in fast fighter planes that it has been seriously suggested they be wiped free of dust and other small particles before each takeoff. The new putty has a buttery consistency and stays in place, maintains the desired surface contour because it has no tendency to flow, and does not sag.

Report of 2-28-44 aircraft putty

G. I. du Pont & Company
Wilmington, Delaware

0145

0389

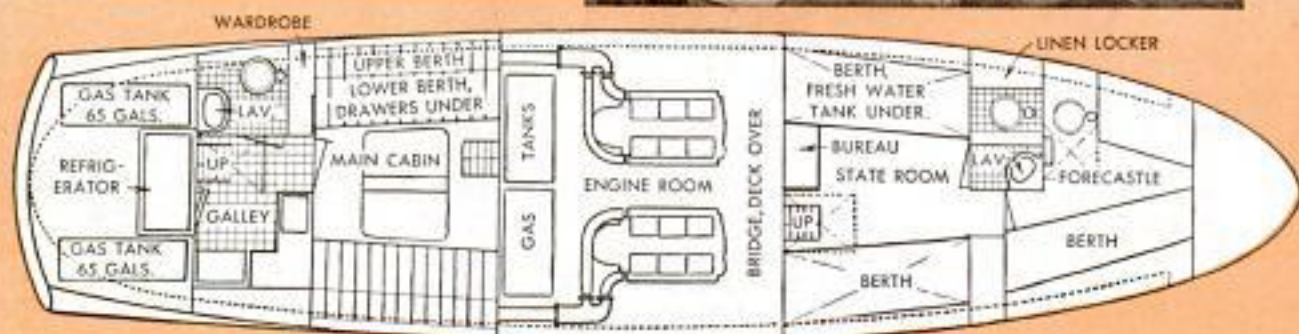
"LIFETIME" COPPER CRUISER



Almost as thin-skinned as cardboard, a swanky, rakish cabin cruiser, the "Revere," has survived 30 months of rugged Coast Guard patrol work and may revolutionize the design of pleasure boats. Its 45-foot hull (below, under construction) consists of an alloy which is 70 percent copper and 30 percent nickel and is only 80/1,000 of an inch thick. Erected as a buoyant shell and lacking most of the conventional inner supports, the boat has resisted the ravages of salt water



Above, two-way radio designed to use 10 crystal-controlled waves, is one of the many luxuries on the \$50,000 boat, built by Revere Copper and Brass, Incorporated, for tests by the Coast Guard. Below, plan of interior arrangement

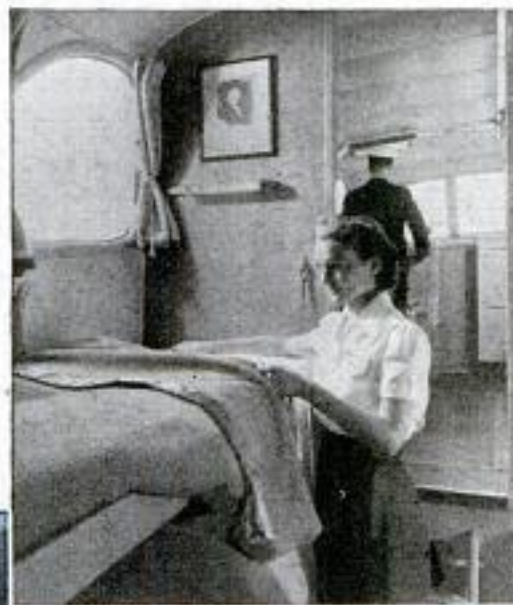




Above, part of the forward deck section of the craft, which is fireproof, worm-proof, leakproof and resists corrosion



Above, unusual galley layout showing its many corrosion-resistant fixtures. The shell design gives the boat roominess and facilities ordinarily found only in a large yacht

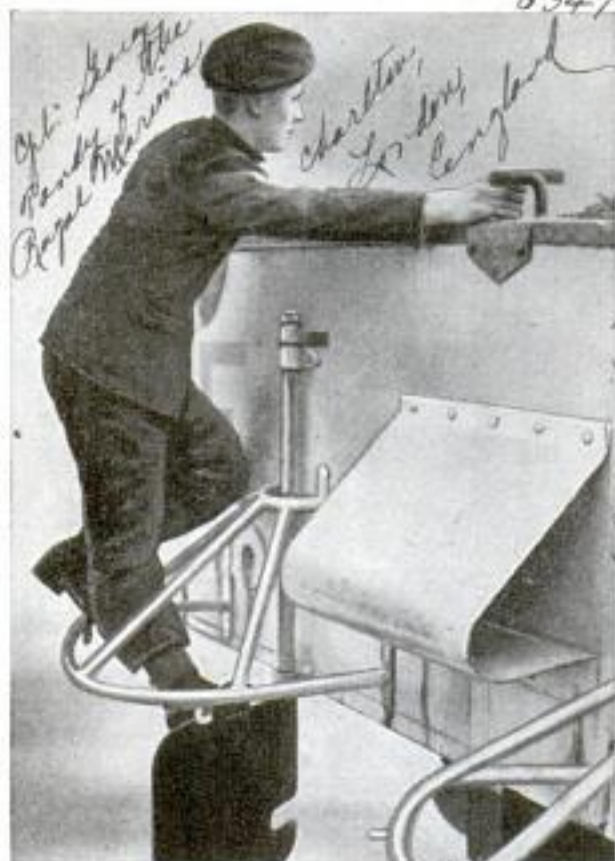


Left, double stateroom with drawer space under bunks and fluorescent lighting. Note the head room and the volume of daylight possible in the cabin. Insulation insures quiet

Below, the "Revere" purrs up the Hudson River. Manufacturing of cupro-nickel cabin cruisers will be started on a mass scale for civilians as soon as priorities are lifted



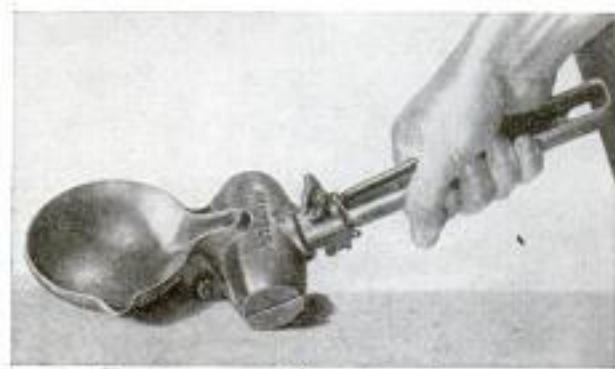
Marine Standing on Rudder Steers Helm-less Ship



On D-Day Corp. George Tandy of the Royal Marines found himself running a landing craft assault boat in the English channel with no steering wheel and a shattered engine room telegraph. They had been torn away when the boat ran afoul of the hook which lowered it into the water from its parent craft. So he slipped over the square stern, placed one foot on the rudder guard rail, and controlled the rudder with the other. In this precarious position he steered the craft seven miles to the Normandy shore and seven miles back again to her parent ship.

Mold-and-Ladle Unit Melts Lead To Form a Soft Hammer

By means of a combination mold and ladle, it is easy to make soft lead hammers



which are used to work on material without marring. The lead is placed in the ladle, which is then closed and held over the fire until the lead melts. By depressing the handle to a horizontal position, the molten lead flows into the mold and around the hammer handle to form the head.

Pocket-Sized Electrical Meter Takes Multiple Reading

Electrical tests of many types can be made with a multiple-purpose meter which is so small and compact it slips into the pocket easily. The tiny unit answers all volt, ohm and milliammeter requirements and includes additional features of larger and more costly equipment. The meter is equipped with self-contained batteries which slide out for replacement.



Barbless Spring Hooks Fish So They Don't Get Away



To keep both the little and big ones from getting away, a barbless fish hook has been made of fine steel wire with a spring in the center. The hook has two prongs. The larger one is baited by the angler and the two ends are clasped together. When the fish grabs the hook, the spring is released and the hooks catch the fish on both sides of its mouth. Fish are not harmed by the barbless hook and undersized ones can be removed and thrown back into the water.

To learn where to buy commercial products described in these pages, see the index.

*Surv Oak Freight Yards.
Surv Oak, Ill.*

Train's Two-Way Radio Links Crew to Yards

0.308



Above, engineer and fireman in locomotive receive orders from yardmaster (right) via a radio telephone instrument to switch some more freight cars

Two-way radio communication in high frequencies between locomotive engineer and dispatcher has been inaugurated in the Rock Island railroad's freight yards near Chicago. The installation of transmitters and receivers, which operate at 10 watts in the 40 megacycle band of frequencies,

permits conversation between switch engine crews and yard masters. The station has an operating radius of 25 miles. The railroad plans to install additional high-frequency systems for communication between engines and cabooses of trains, and yards and dispatcher.

0153

"Jack-in-the-Box" Telescope Lift Raises Platform 95 Feet

For reaching high ceilings and walls in cleaning and service work, an electric "jack-in-the-box" lift telescopes up to 95 feet. In some models the platform can be lowered to six feet so that the lift can be moved through doorways and transported in elevators. Capacities of the lifts range up to 500 pounds, which makes it possible for two men and much equipment to be carried. The men on the platform have full travel control by means of an electric pushbutton system. Dual controls are located on the frame near the ground and include a safety stop button. The lift is portable, the platform railing being folded down when it is not in use.



Platform lift at maximum extended height of 95 ft. is shown at far right, in comparison to lift as it is before being elevated. When lift at Rockefeller Center is not being used it can be stored in the basement. Unextended, it may be carried through a doorway 5 feet wide, 6 feet, 10 inches high



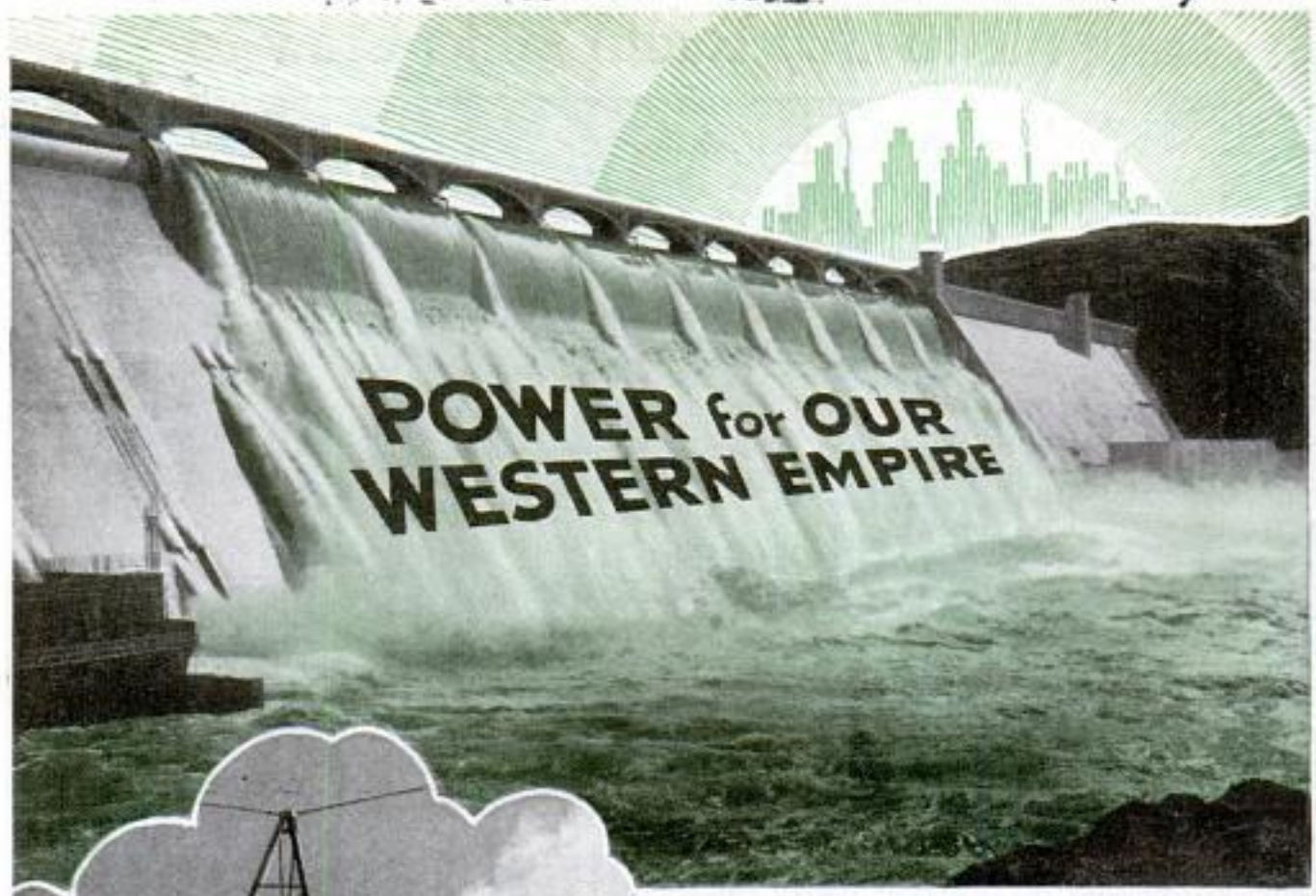
SEPTEMBER, 1944

*Ceroney Engineering Co.
2643 W. Van Buren St.
Chicago 12, Ill.*

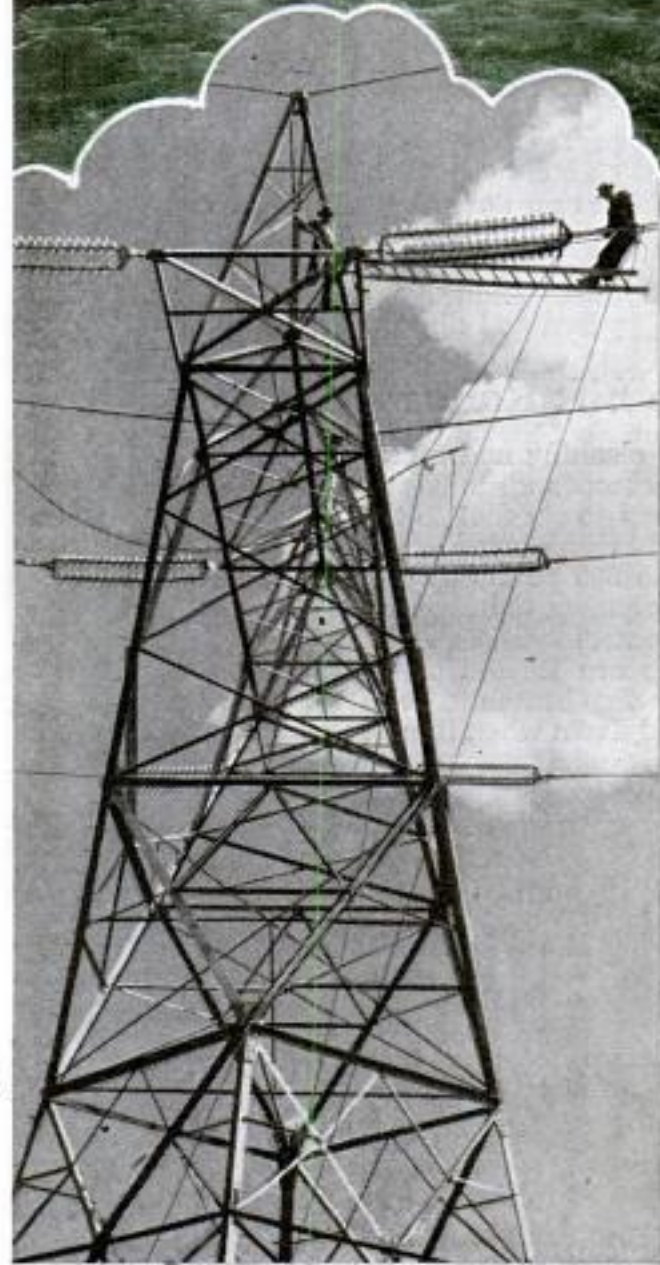
Copyrighted material

Mr. Wayne Whittaker

0107



POWER for OUR WESTERN EMPIRE



Grand Coulee—potent source of power for war or peace. Left, symbol of a new empire

By Wayne Whittaker

WHEN the whistles blow and the bells ring and G. I. Joe comes marching home, he's going to look Uncle Sam straight in the eye and say:

"Well, I won the biggest war in history for you. Now what have you got for me?"

If you think Uncle Sam is going to be caught napping and have to mumble something under his whiskers about a dole ticket or an apple stand, just guess again. His answer, right from the shoulder, will be:

"Roll up your sleeves, Joe. We've got a vast western empire that is yours for the taking."

Big talk? Sure it is. Biggest in the history of the U.S.A. It concerns a new empire of 20 million acres that would permit the West to double its present population. This big talk is backed up by facts, scale models, blueprints and something far more tangible—four million acres of rich reclaimed land that once supported a sickly growth of sagebrush and cactus.

Much of the credit for transforming dry but fertile areas into garden spots lush with grain, fruit and vegetables,

goes to the Bureau of Reclamation of the Interior Department. If you think that bureau shies away from a big job all you have to do is take a look at Boulder dam, called the greatest engineering feat in history, or Grand Coulee, giant of them all, or recently-completed Shasta, or any one of a score of projects that have been harnessing runaway rivers for irrigation, power, flood control and municipal water.

The immediate postwar program of the bureau, as outlined by Harold L. Ickes, Secretary of the Interior, would provide irrigation service for 16 million acres within three years. It will take more than half a million men at construction sites and in factories to do the job and supply the materials. This new service will add

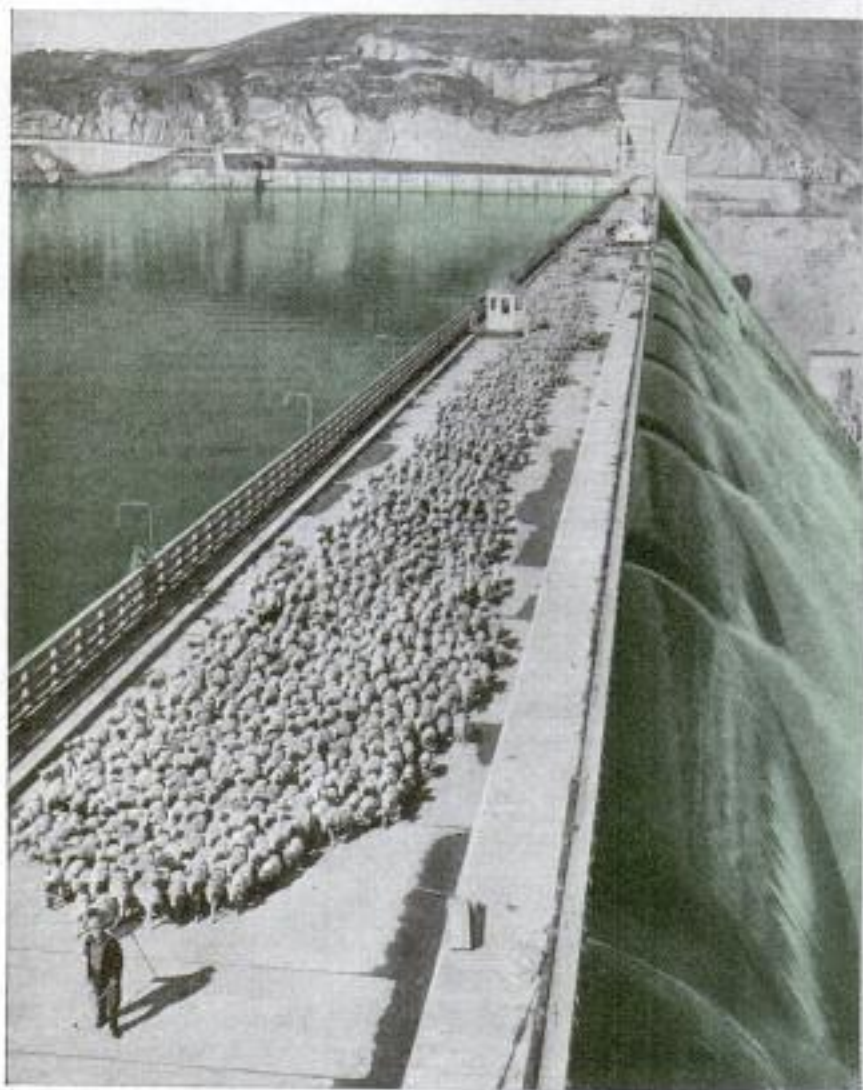


Concrete tube with steel ribs will carry waters to reclaim arid tract in San Joaquin Valley, part of a project to create 2,000,000-acre garden spot. Below, Boulder dam holds record for million-kilowatt capacity





Huge penstock on Shasta dam is prepared for painting. At left, sheep on Grand Coulee

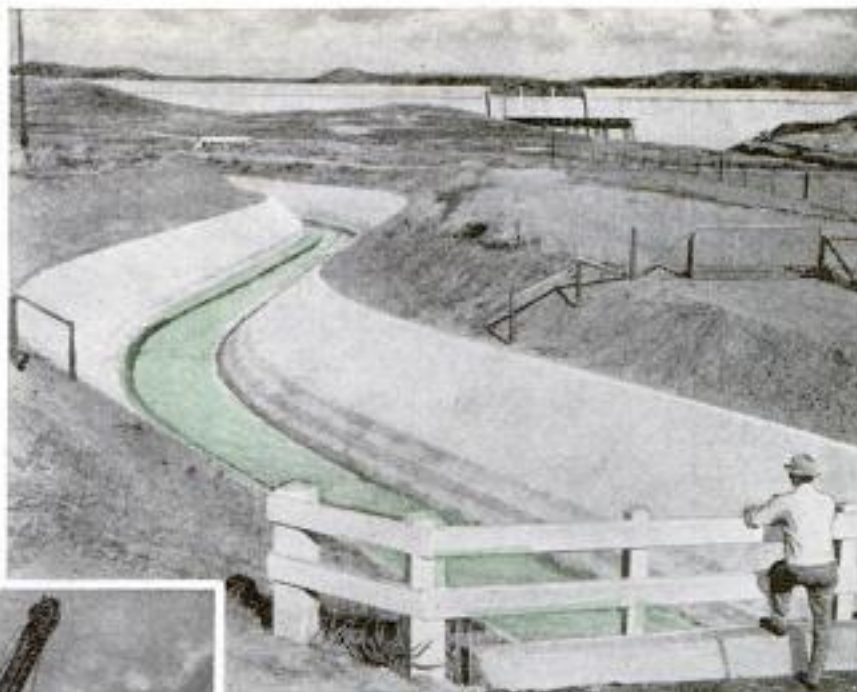


150,000 highly productive farms to the wealth of the nation and give security to as many more farms now harassed by drought or flood. New cities and industries will spring up across the lands dotted by dams, reservoirs and power plants, and criss-crossed with canals and irrigation ditches.

The new empire is scattered over the western third of the United States. Its development will see the completion of great projects interrupted by the war in the Pacific Northwest, central California, and in the Southwest. Additional projects now in the planning stage will get under way, if Congress approves, on both sides of the Continental Divide and in the Great Plains region where rivers go on a rampage in spring and dry up in midsummer.

No crystal ball is need-

ed to reveal what the bureau's irrigation and hydro-electric power program means to the nation in time of war or peace. All you have to do is glance at the record of three great projects in various stages of development. They are the Columbia River Basin project in Washington to be irrigated from Grand Coulee dam, Central Valley project in California, and the Colorado-Big Thompson project. These developments, part of a



Concrete canal is fed from reservoir of Friant dam in background. Left, digging part of 37-mile canal



went into service two months before Pearl Harbor.

With war plants bobbing up like mushrooms, a power shortage appeared imminent in the summer of 1942 despite the three big generators then in operation. To fill the gap, two 75,000-kilowatt generators were transferred to Grand Coulee from Shasta dam in California where the powerhouse had not been completed. These generators were rushed into operation in eight months instead of the usual 30 months required for the construction and installation of regular Grand Coulee units.

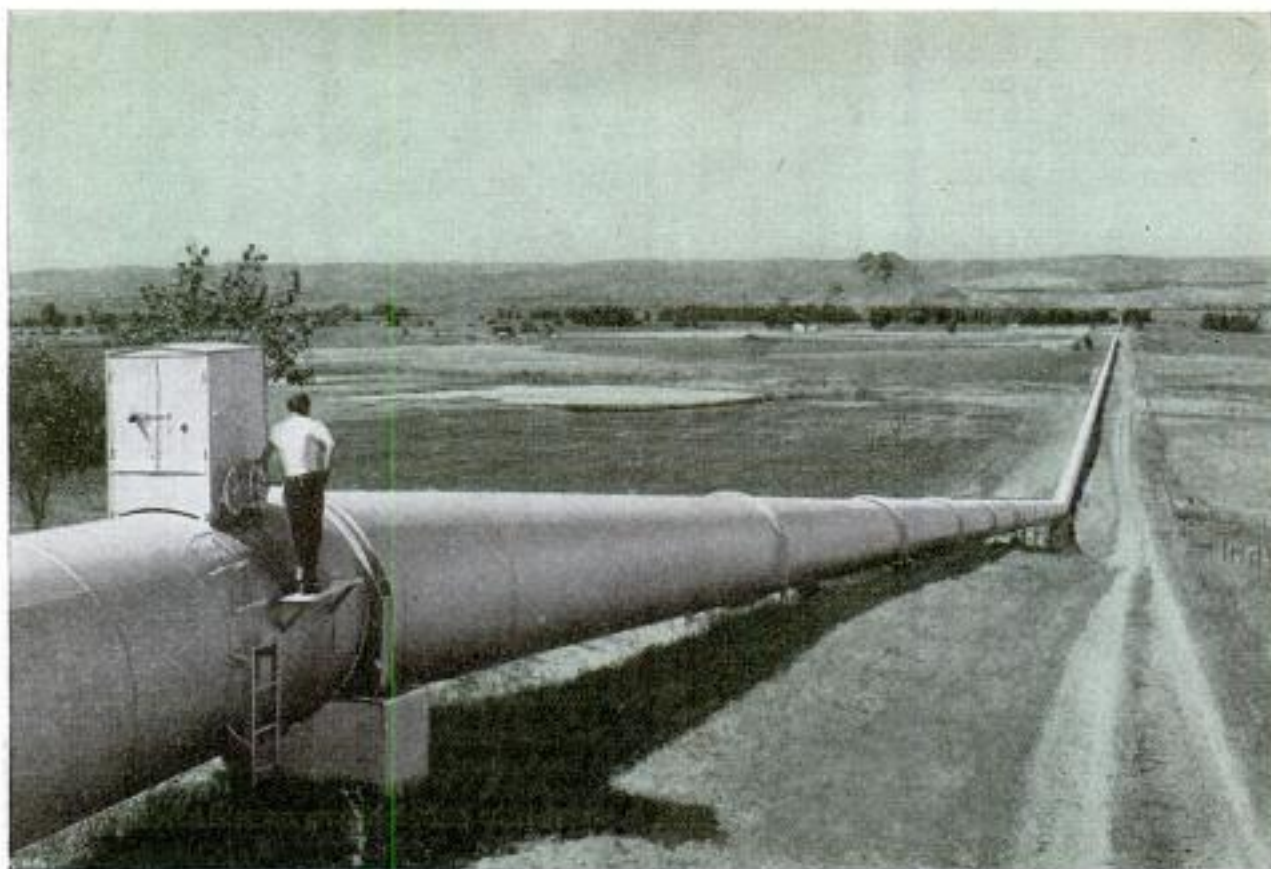
Recently, Grand Coulee's record-breaking expansion was climaxed with the in-

long-time plan to insure peacetime prosperity, are vital cogs in America's war machine today.

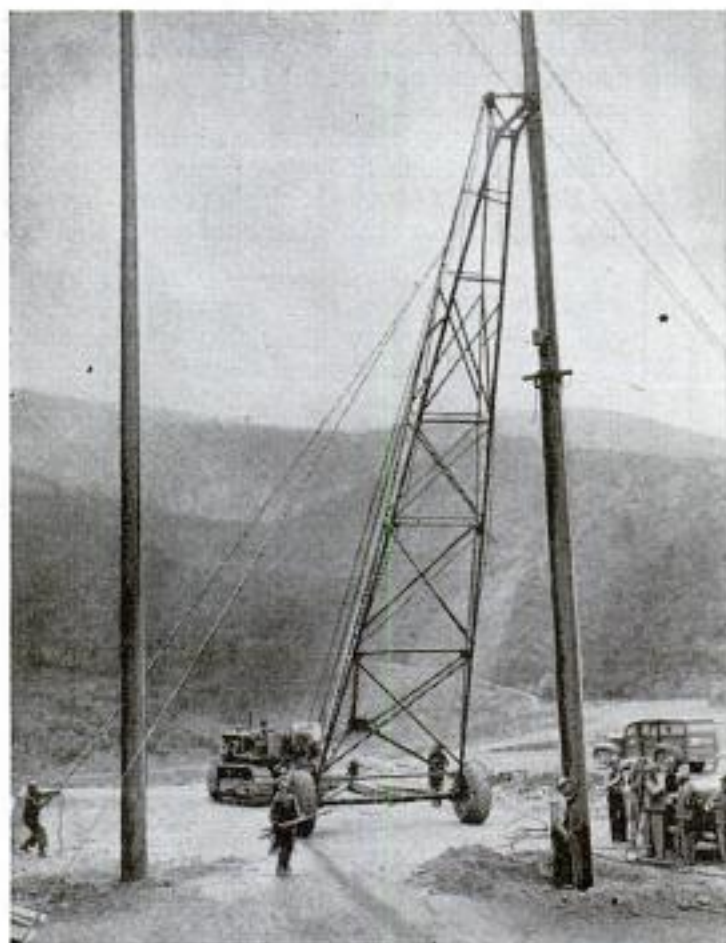
When new war industries in the Pacific Northwest were threatened with a power famine, the government ordered full speed ahead on the completion of Grand Coulee dam on the Columbia River. The first of the six 108,000-kilowatt generators now in operation



Row crop irrigation in Arizona field makes crops boom



Miles of pipe like this will carry captured flood waters to help reclaim 16,000,000 acres in the Bureau of Reclamation's postwar program. Below, erecting link in 100-mile transmission line to carry Shasta dam power to industries



stallation of the 10th generator. This increased the plant's capacity to more than 800,000 kilowatts—third largest in the world. Ninety-eight percent of the power produced at Grand Coulee goes to war industries and military establishments, according to Harry W. Bashore, commissioner of reclamation.

"No other power system in the United States, public or private, is contributing so much of its output to winning the war," Bashore said.

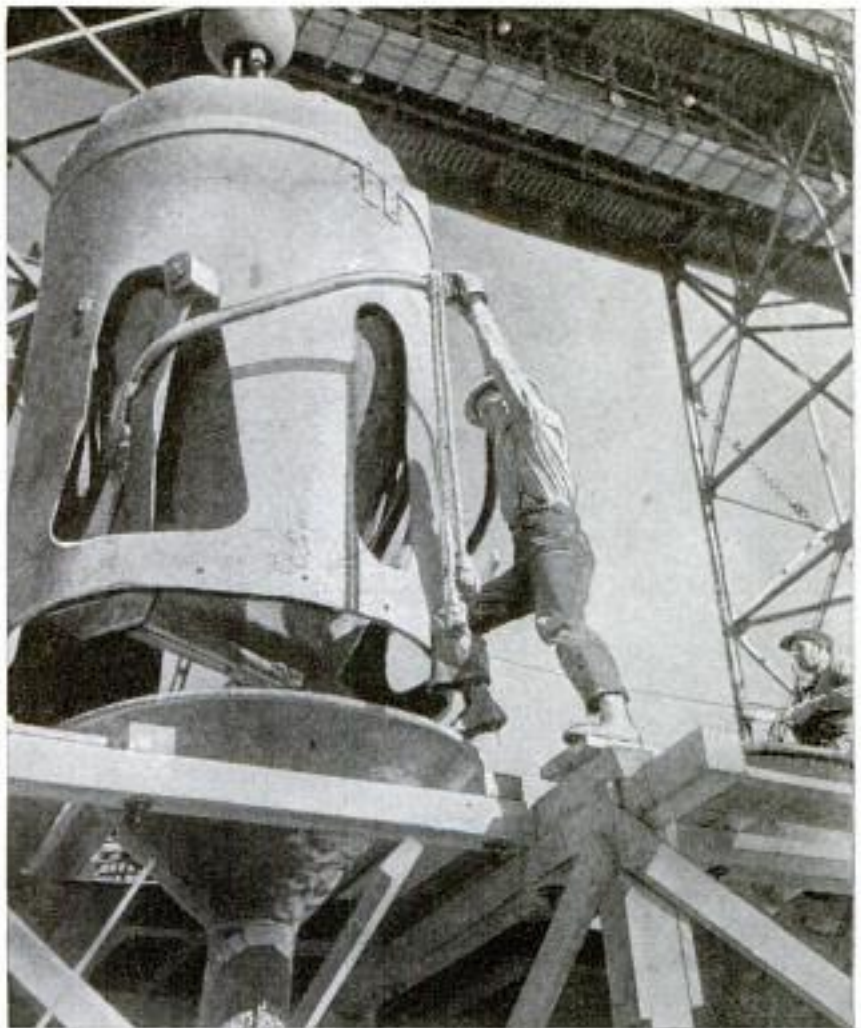
In the Grand Coulee plant is the most modern speed regulating equipment in the world. Its generators operate literally like clockwork, for they are synchronized with a high-gear master clock. Four times a day, this master clock is checked with the naval observatory's time signal by radio.

Downstream from Grand Coulee is the Bonneville dam, built by the U. S. Army Corps of Engineers. The Grand Coulee-Bonneville power pool keeps northwest war industries humming at peak production. Among these industries are five important aluminum plants producing 6,000,000 pounds of that precious metal a year, or about one-third of the national total. The aluminum from these plants in 1944 would build 30,000 bombers.

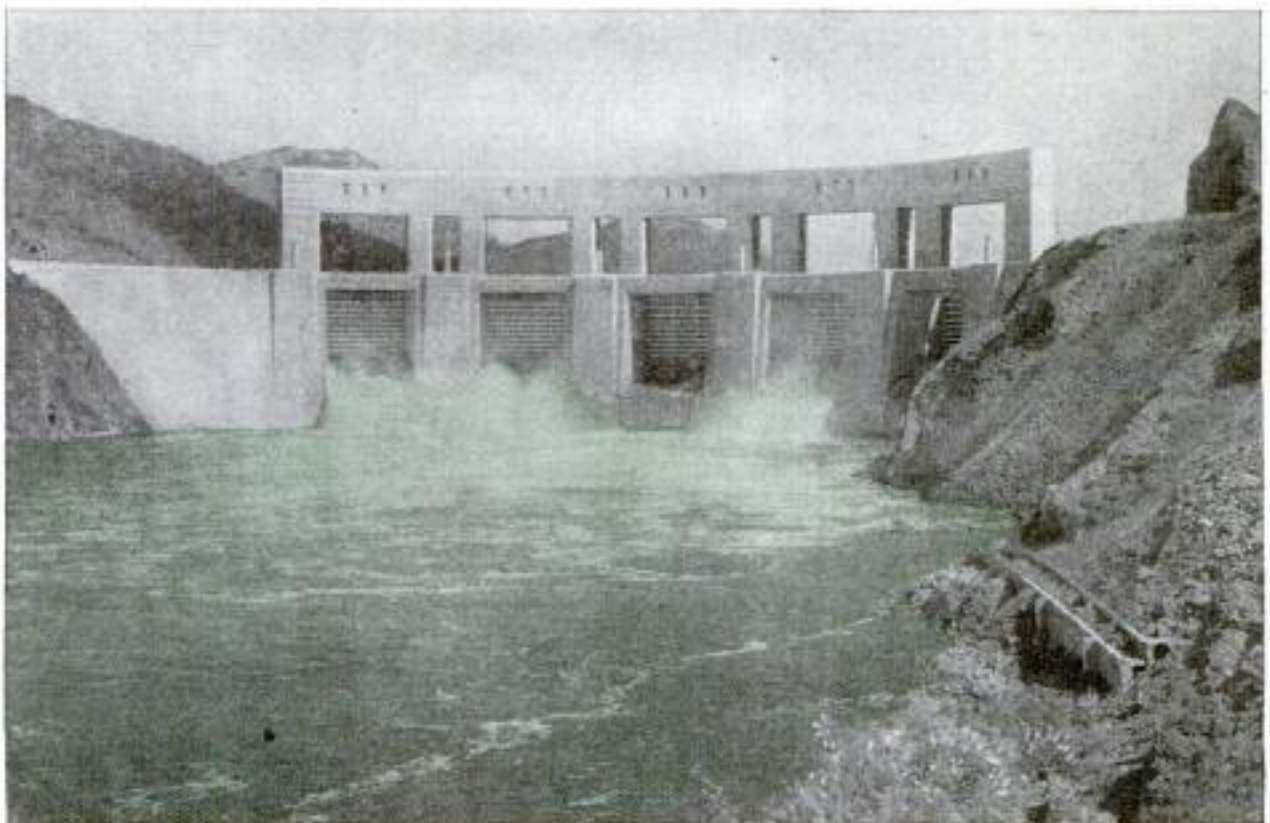
Hydro-electric power now pouring into war plants will be just as potent in postwar factories which will create a balanced economy in a rich agricultural district.

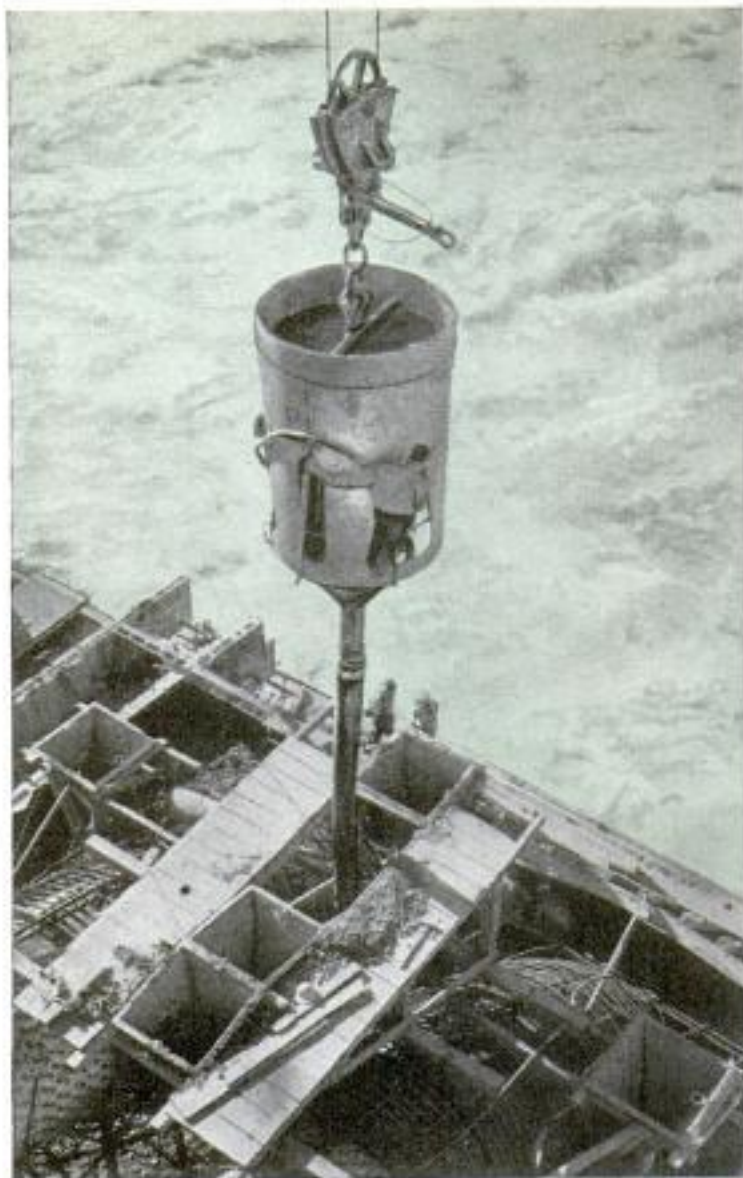
Another section of the new empire, farther down the coast, is the 500-mile arid valley of central California. When the Bureau of Reclamation Central Valley project is completed, the famed California Chamber of Commerce will really have something to sing about — irrigation water for a 2,000,000-acre garden spot available for intensive cultivation the year around.

Guardians of this area are giant Shasta dam, second in size only to Grand Coulee, and Friant dam. Shasta, two-thirds of a mile long and higher than the Washington Monument, rises to the north of the valley and controls the waters of the Sacramento River. Friant acts as monitor of the San Joaquin River which flows from the south. Di-



Dam builders perform the "impossible" by using chute to place concrete in areas out of reach of regular bucket. Below, Parker dam, looking up stream from the Arizona side, is typical of smaller irrigation projects





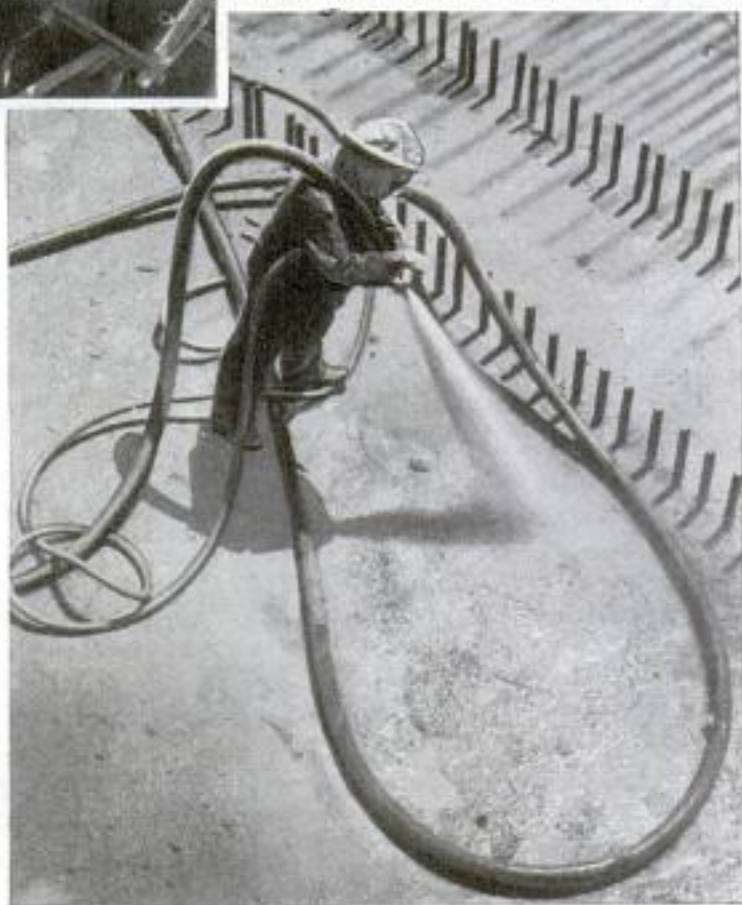
Aside from the bread-and-butter features of the reclamation projects, they are providing new playgrounds for postwar vacationers. The big reservoirs form beautiful inland lakes, paradise for fishermen and inland sailors.

Another pillar of the new empire is Boulder dam which spans that portion of the once-rampant Colorado River forming the boundary between Arizona and Nevada. Lake Mead, the tremendous reservoir backed up by the dam, holds enough water to supply every man, woman and child in the U. S. with 80,000 gallons each. The captured flood water, which once played havoc with the lives and property of 100,000 persons, will be used to irrigate 2,000,000 acres. It solves the water problem of 13 cities, including Los Angeles. It also creates more than 500 million kilowatt-hours of electric energy a month. This power has helped produce tons of metal in the world's largest magnesium plant, and enabled airplane factories and other war industries to break production rec-

Placing concrete in the dam structure with "elephant trunk" bucket. Below, water and sandblast are used between "pours"

version of water into the Madera and Friant-Kern canals will reclaim a great tract in the southern San Joaquin Valley.

The era of the simple project that merely turned some water out on arid land and did nothing more is finished, according to Michael W. Straus, First Assistant Secretary of the Interior. He points to the multiple benefits of the various projects, of which Shasta dam is a shining example. Its great reservoir, backing up 35 miles, not only provides water for irrigation and power plants, but creates a mountain lake within Shasta National Forest. It also provides year-around navigation on the Sacramento River, helps to eliminate floods, and provides water for homes and industries. One phase of the Central Valley project is devoted to the control of salinity around San Francisco Bay.



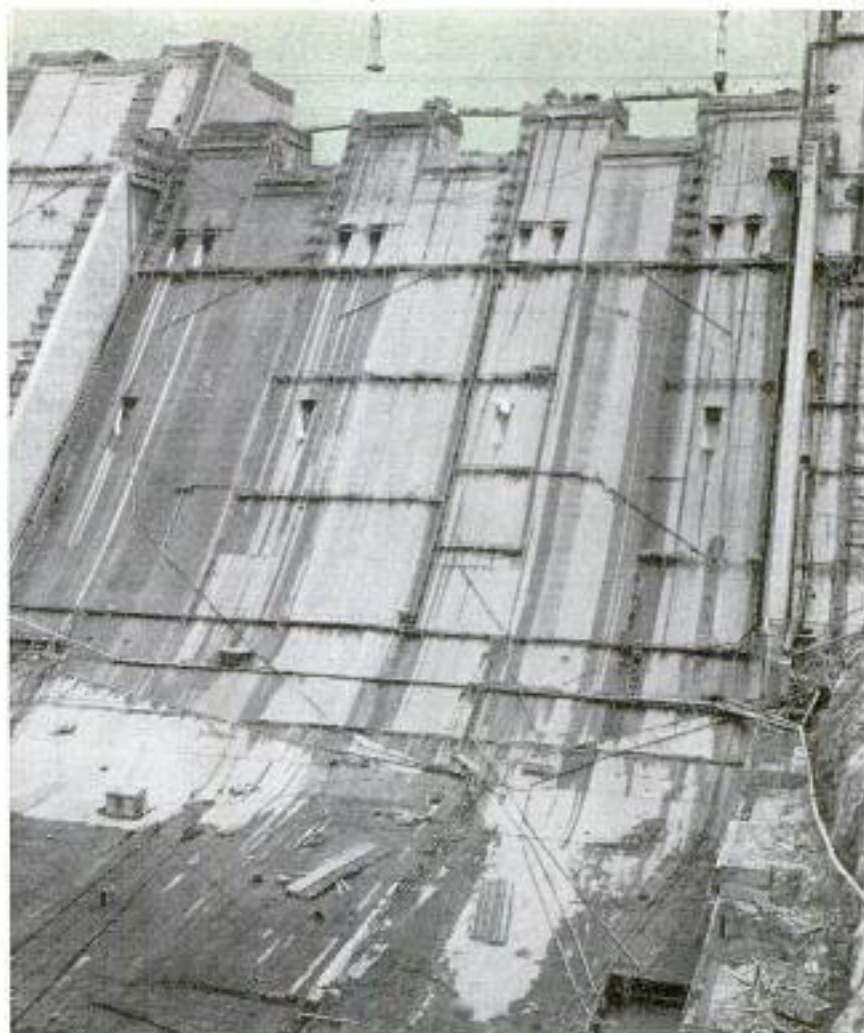
ords. Boulder dam's generators recently operated at a capacity of more than a million kilowatts, the first power plant in the world to have that distinction.

Since we entered the war, the power output of the 30 plants constructed and operated by the Bureau of Reclamation has been more than doubled. Capacity of the plants this year is expected to exceed 2,400,000 kilowatts. With a 1943 capacity of 2,000,000 kilowatts, the output was nearly 12 billion kilowatt-hours. This was about as much electrical energy as was produced by all the power plants in the U. S. when we entered the first World War. To produce 12 billion kilowatt-hours by steam, would have required 7,860,000 tons of coal or 1,350,000,000 gallons of fuel oil!

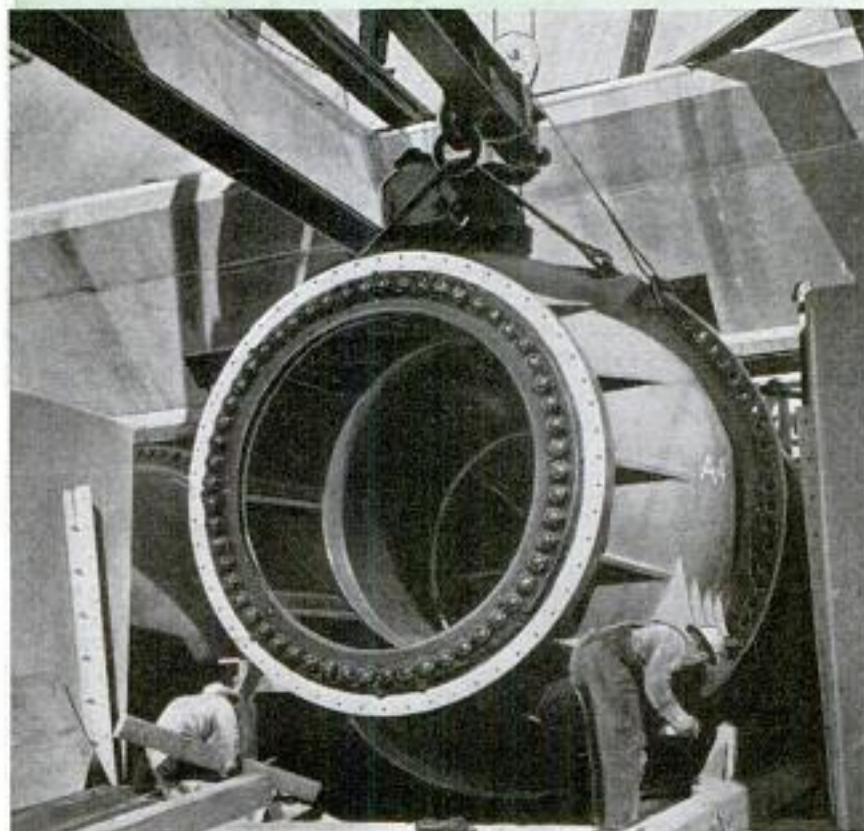
Supplying war plants with hydro-electric power is only part of the picture. Lands reclaimed by the Bureau of Reclamation are helping feed a fighting nation and its allies. Crops valued above \$350,000,000 were grown on these lands last year, and the amount will be greater in 1944.

If the bureau's record during the last decade is any indication of what the future holds, there is little doubt where the power is coming from to build additions to our western empire. Rivers like the Missouri, Arkansas, Rio Grande and others, wait to be chained and converted into empire builders.

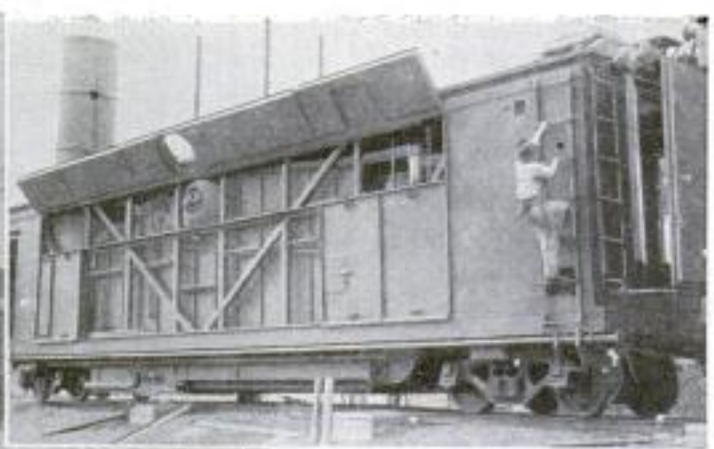
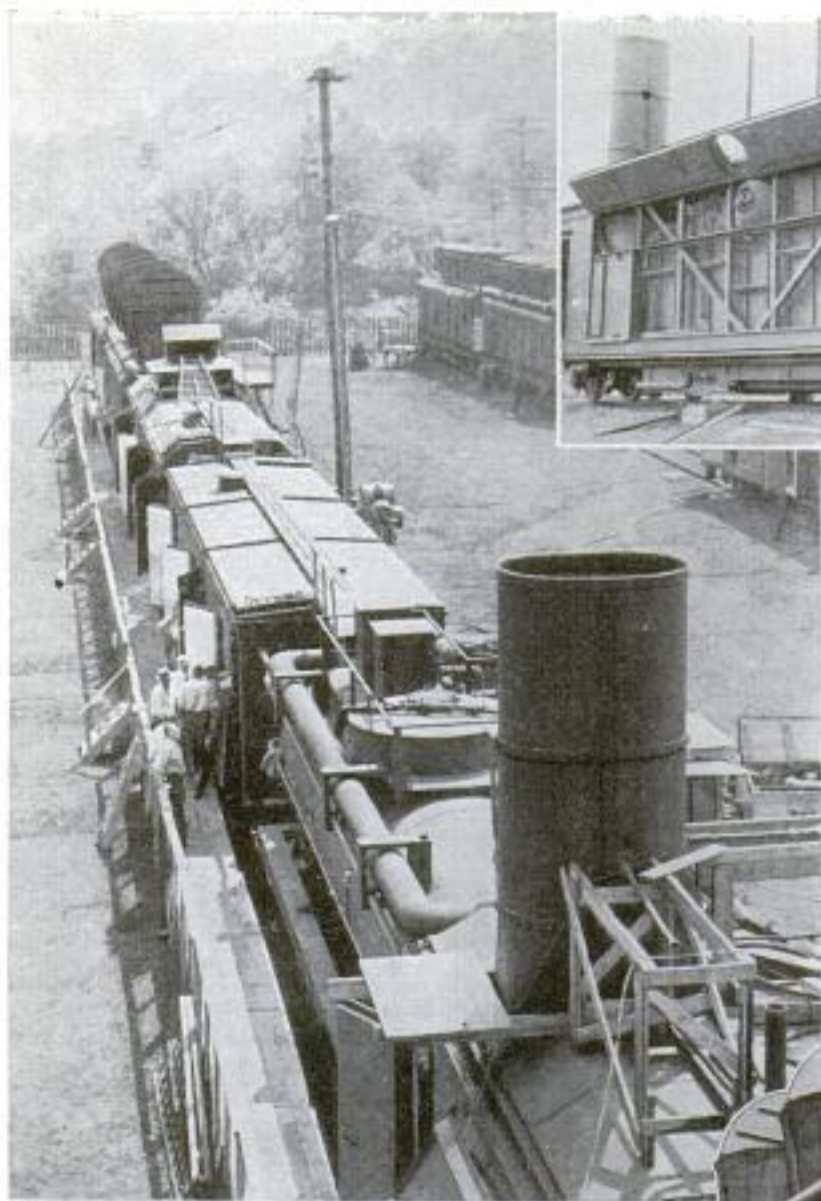
Six regional offices of the Bureau of Reclamation are ready to start the program rolling when our victorious G. I. Joes come marching home shouting: "Where do we go from here?"



Higher than the Washington Monument is the spillway of Shasta dam on Sacramento river. Below, giant 84-inch needle valve in Friant dam controls flow of San Joaquin waters into new Madera irrigation canal



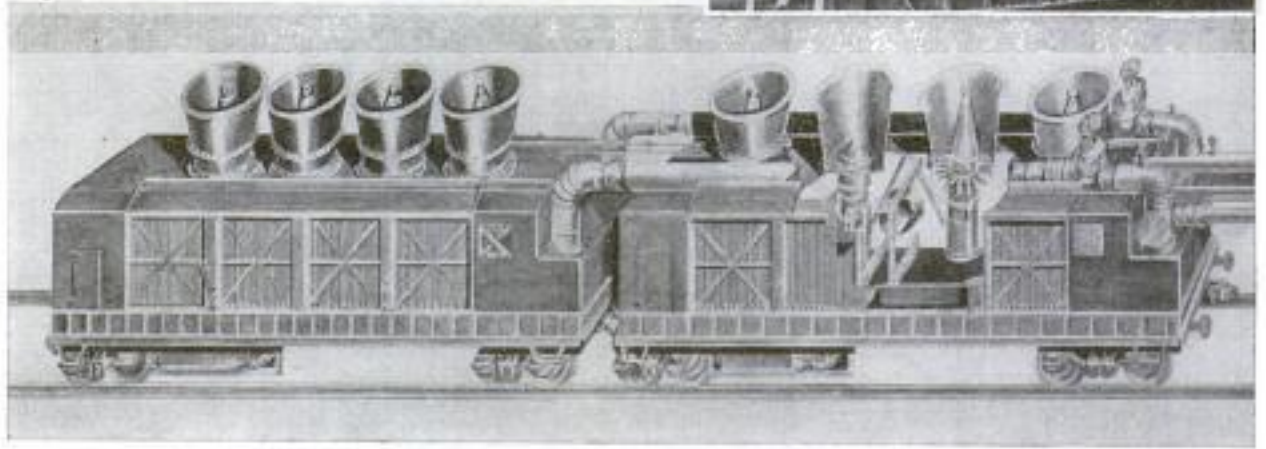
Mobile Power Station to Serve Bombed Cities



Above, final assembly work on the boiler car of one of the 5,000 kilowatt trains. Each train, consisting of eight cars, is ready to follow on heels of an advancing army, stop at the coal stockpile of a wrecked power station and feed current to factories and homes. All the trains can operate in temperatures from 40 degrees below zero to 95 above. After the war they will be available for disaster emergencies



To restore current to bombed cities re-taken from the Axis, the Allies are using 10 Westinghouse trains, each carrying a complete electric power station. The stack in the foreground (above) is on one of two boiler cars which generate enough steam to run a Liberty ship. Right, condenser car about to be tested. Below, sketch of two condenser cars which shoot out 800,000 cubic feet of air a minute. Cutaway of car at right shows position of fans



Westinghouse Electric & Mfg. Co. Pittsburgh, Pa.

"Suicide Pilot" of Tiny Nazi Sub Fires Torpedo

That the Nazis have used one-man submarines to launch suicidal torpedo attacks was disclosed when a 12-foot submarine containing a 17 year old sailor was washed ashore on the Anzio beachhead. These craft, which are driven by electric batteries,



Above, radio-controlled tank captured from the Nazis is loaded on trailer. Left, a German "human torpedo" manned by a 17-year-old sailor is washed up on the shore



of the German midget submarines have been failures, several exploding within sight of their objective. Apparently the Germans have had more success with their radio-controlled tank, also 12 feet long, whose driver takes it as far as he dares, then gets out and directs the tank and its 1,000 pounds of explosives to the target by radio. The tank was first used against the Allies at Anzio.

approach their targets silently at slow speeds and release a propeller-driven torpedo. Unlike the two-man British "human torpedoes," which have had success, most

as he dares, then gets out and directs the tank and its 1,000 pounds of explosives to the target by radio. The tank was first used against the Allies at Anzio.

Electronic Set Measures Hides And Textile Pattern Layouts

Industrial plants are using an electronic machine which measures the areas of flat sections of material, such as the size of leather hides in the leather industry and pattern layouts in the textile business. Other possibilities are the measuring of the area of ink on printed matter and the surface enclosed by pin pricks of perforated layouts and outlines. The machine is a two-part cabinet. The bottom cabinet contains photoelectric equipment that scans the pieces of hide traveling on rollers through a long narrow slot. As the light beam travels along the slot, it moves part of the distance before it strikes the skin, then crosses the skin and finishes the stroke out of contact with the leather. These operations are repeated on the return stroke. Since the rate of movements of the beam and the rate of feed of the skin are known, the area of the skin can be quickly calculated by finding the total time interval that the beam is on the skin.

Paper Also Fights—Save It!



Signal Corps photo

Here's another cogent reason for saving paper. Last year the U. S. Army bought \$70,000,000 worth of paper, and one fighting item on the list was paper cases for artillery shells. Some idea of the expenditure of shells in an area of concentrated artillery fire is gained from this picture of a dump in Italy where containers are salvaged from a Fifth Army battleground. You can help ease the shortage of a vital material by saving all your waste paper for your salvage committee

0258
0-344
"Submarine" May-1944

Stockton Profile George Lang 27
Lowell, Mass.

Mr. Wayne
W. Miller

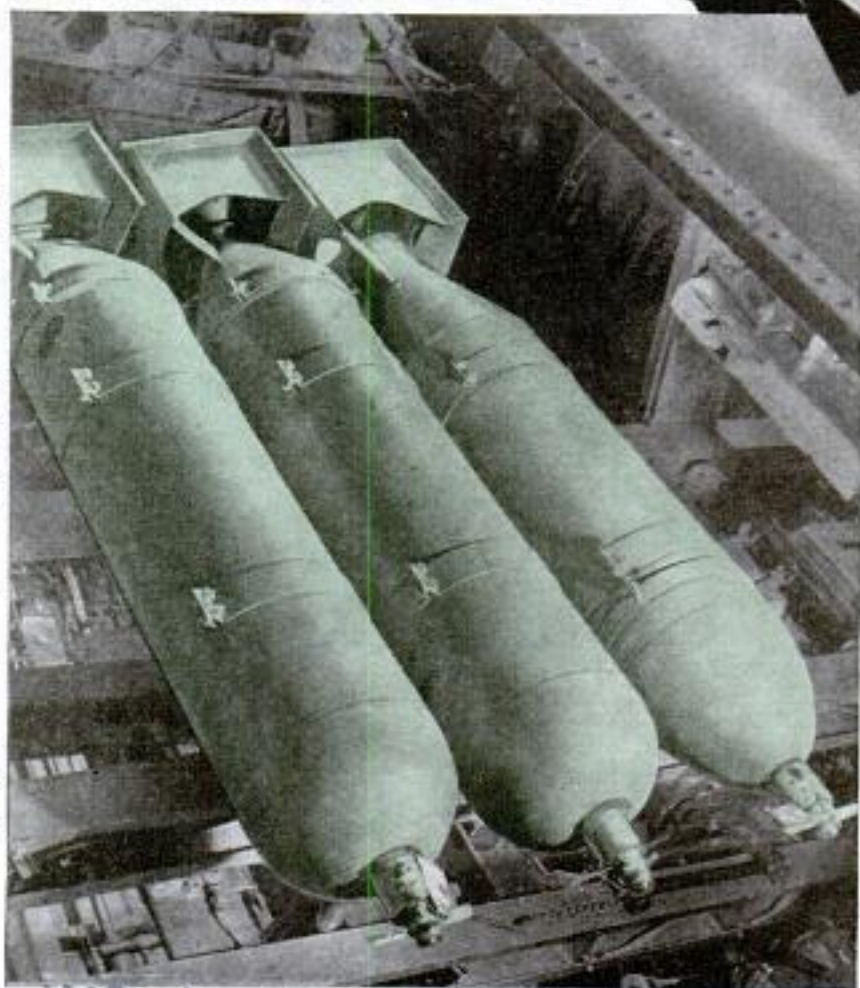
PICKING *the* TARGET



An Air Force officer picks a target on the English Channel coast as plans for bombing mission are laid

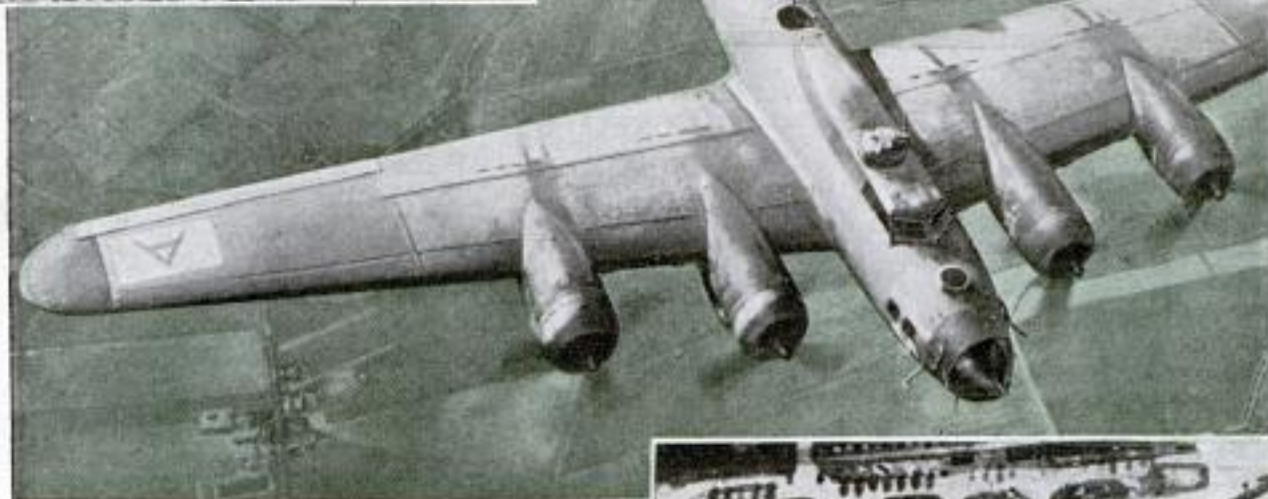


Looking up through camera doors (right) of an O-47 plane you face the big camera of an aerial observer. Below, 52-pound flash bombs for night photography



"BUT HOW did they know it was there?" Millions of Americans ask the question after reading some exciting account of a successful mission by Allied bombers against some highly strategic target.

How did they know the Germans were making radar equipment in the old Zeppelin works at Friedrichshafen? How did they know the camouflaged plant at Huls was producing synthetic rubber? Who told them the battleship Tirpitz was at anchor in the Alten Fjord? How did they happen to catch 200 Jap planes on the ground at Wewak and 19 ships in the harbor at Truk? How did they know when the German submarine pens at Vegesak had been re-



Reconnaissance photos at upper left and below show Nazi signal corps depot at St. Cyr before and after a bomb raid. Upper right, a B-17 blasts Marienburg

built to a point where they were worth plastering again?

The answer is photo-reconnaissance. It is also the source of about 80 percent of the information we have about what the enemy is doing, where he is doing it, and how we are going to stop him. Reconnaissance pilots fly alone in unarmed planes to get the photographs. They steal the enemy's secrets at 300 miles an hour, at altitudes from 300 to 30,000 feet.

In planning the invasion of Europe, millions of aerial photographs were taken, including more than half a million pictures of German coastal fortifications alone. These photographs, taken over a six-month period, revealed amazing details of defenses and terrain. Expert aerial photo-interpreters can estimate ground elevation of only a few feet from pictures taken at 30,000 feet. Color photography makes camouflage stand out like a beacon.

Photo-reconnaissance played a major role in the selection of the invasion site between Le Havre and Cherbourg. Thousands of photographs of northern France revealed the location of important military



U. S. Army Air Force photo
Loading photoflash bombs, with which night pictures from four miles up can be made. They light the earth on darkest night with noon brilliance

highways, railroad yards, bridges, hidden hangars and camouflaged airstrips, gun installations, mine fields, ammunition dumps, and likely places for the concentration of troops. On these targets, 13,000 tons of bombs were dropped in the four days preceding the invasion.

Although the men who take 99 percent of the pictures of enemy positions carry cameras instead of guns, and must act as their own navigators and radio operators, no one ever called them "suicide" pilots. They are experts at faking and must be the despair of German radar operators, for they never seem to arrive where they are headed. This frequent changing of course, all carefully planned, baffles the methodical German who cannot figure out whether the target is to be Berlin or Hamburg. Consequently, Messerschmitts and Focke-Wulfs are forever trying to intercept our reconnaissance pilots "where they ain't."

But there is flak to dodge at 30,000 and even 40,000 feet, and when the pilots "dice" an area at 300 feet

Camemen rig up an electrically heated camera for high altitude
AAF Materiel Command photo



there is the danger of small arms fire. For day missions, U. S. reconnaissance units fly stripped-down Lightning P-38's which can outrun enemy fighters. The stripping consists of replacing 900 pounds of guns and firing mechanism with 500 pounds of photographic equipment, saves weight and increases speed and range.

Two-camera and three-camera installations are used on the P-38's. The former takes overlapping pictures by shooting straight down, and the tri-metrogon method provides three different views, taken simultaneously, which give a horizon-to-horizon picture.

At 20,000 feet, tri-metrogon cameras photograph a 40-mile area, and planes traveling 200 miles an hour can "shoot" 8,000 square miles per hour. At 30,000 feet,

telephoto cameras can record areas six miles square with prints so sharp it is possible to tell the difference between light and medium tanks and detect barbed wire. The accuracy of the telephoto cameras is so fabulous that the pilots jokingly insist a second-day beard is visible in a picture taken from six miles up.

The cameras work automatically, and after the pilot has determined the proper position all he has to do is press a button. If he wants a series of shots he holds the button down and the cameras take several pictures a second.

Photographs are taken at night with magnesium flash bombs, which provide a billion candle power at the peak of the flash, illuminating the target area for miles.

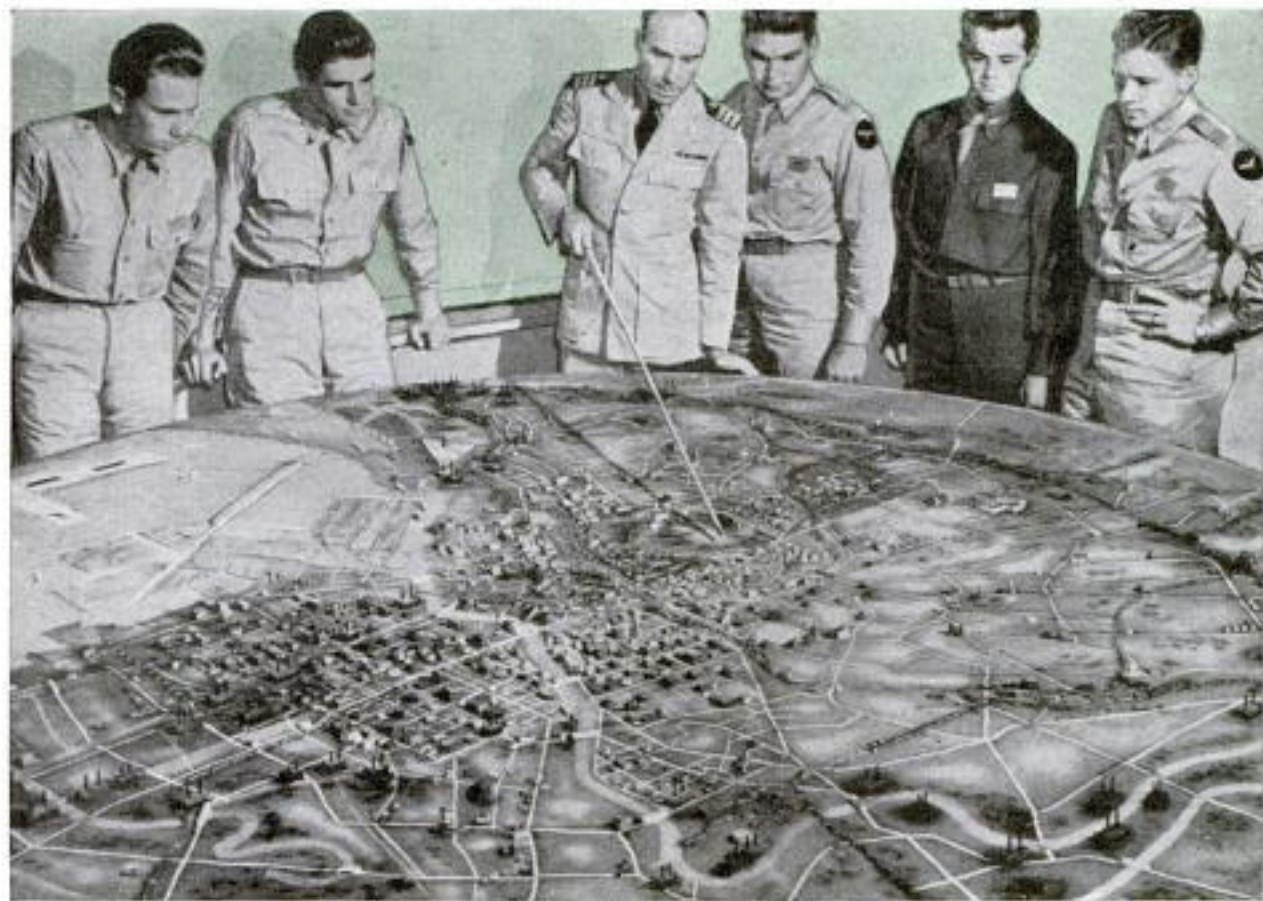
Four-engined bombers are sometimes equipped for photographic missions. Liberators, carrying six cameras instead of bombs, have been used over Europe and the South Pacific. Photos taken from Liberators helped trap the Jap ships at Truk. These planes carry standard armor and ten .50 caliber machine guns.

Often, when a pilot has complet-

Continued to page 148



From his flying "greenhouse" a student at Aerial Observation School trains his camera on a target. Below, bombardiers and navigators in pre-flight training study model of Japanese city; they must learn to identify enemy cities, planes and ships



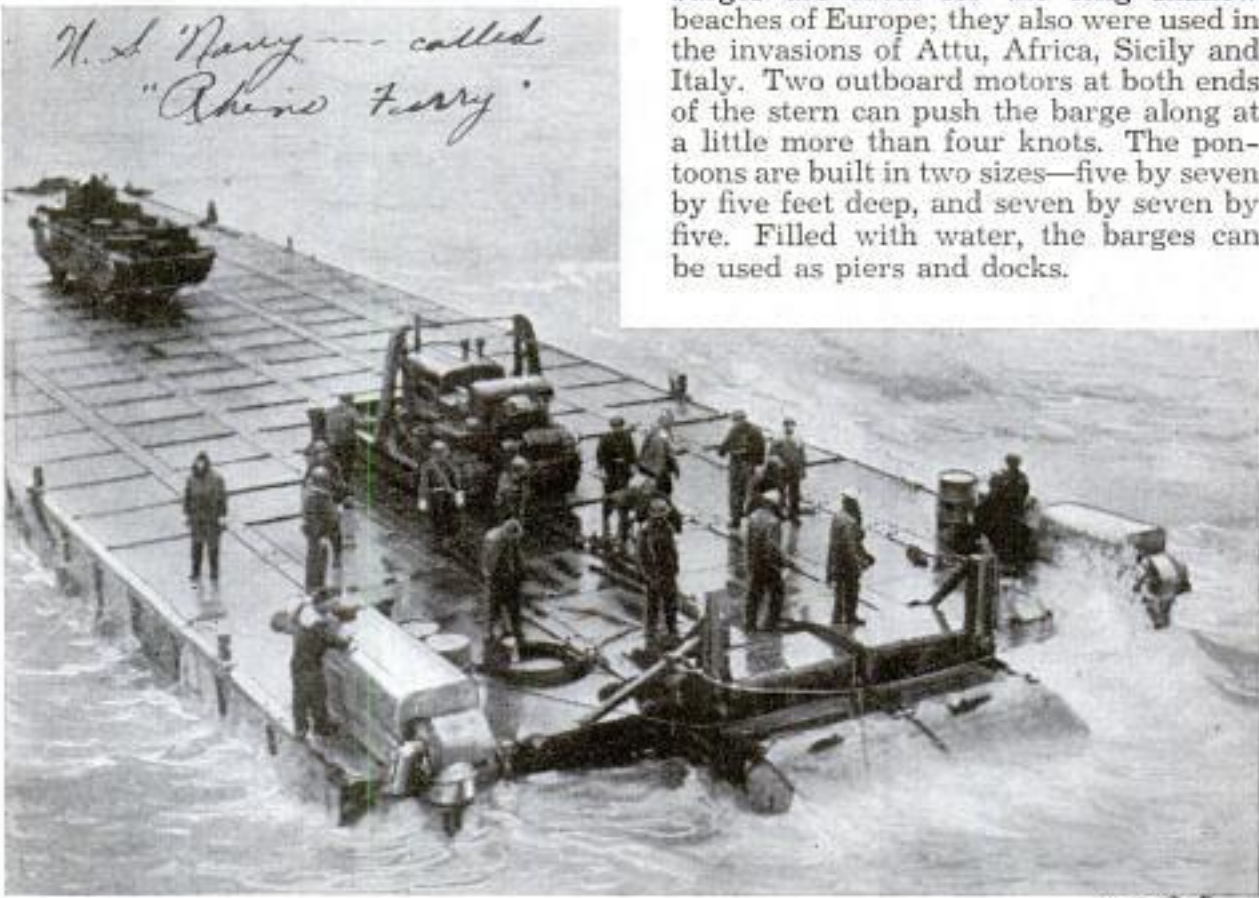
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Boxes Joined as Barge Float Allies to Beaches

Hollow boxes of welded metal joined together to make self-propelled barges bridged the last few hundred yards between ships and beaches when Allied troops stormed the Normandy coastline.

The pontoon gear, known as the "Rhino Ferry," can be put together aboard ship and loaded with men, vehicles and supplies as soon as it is lowered into the water. Having less draft than landing craft, the barges are ideal for the long shallow beaches of Europe; they also were used in the invasions of Attu, Africa, Sicily and Italy. Two outboard motors at both ends of the stern can push the barge along at a little more than four knots. The pontoons are built in two sizes—five by seven by five feet deep, and seven by seven by five. Filled with water, the barges can be used as piers and docks.

U. S. Navy --- called "Rhino Ferry"



0283

Icy Electrodes to Speed Welding Put Frost on Machine

By pumping a stream of "super-cooled" liquid into and then out of copper electrodes in a welding machine, spot welding of thin sections is speeded up and the quality of the work is improved. Refrigerating

of the electrodes, which are specially designed for the purpose, keeps them from heating up to such an extent that they alloy with the aluminum being welded, thus preventing a clean strong weld and requiring a halt in production until they are cleaned. The liquid is maintained at any desired temperature in a special refrigerating unit. A replaceable cap, cold forged from electrolytically pure copper and fitted to the end of an electrode, makes it possible to bring the cooled liquid down to within a fraction of an inch of the point where the welding is actually taking place, which is where the heat can do the most damage. Use of these caps makes it unnecessary to replace the entire electrode. As a result, even when welding at high speeds, welding machines now are often covered with frost.

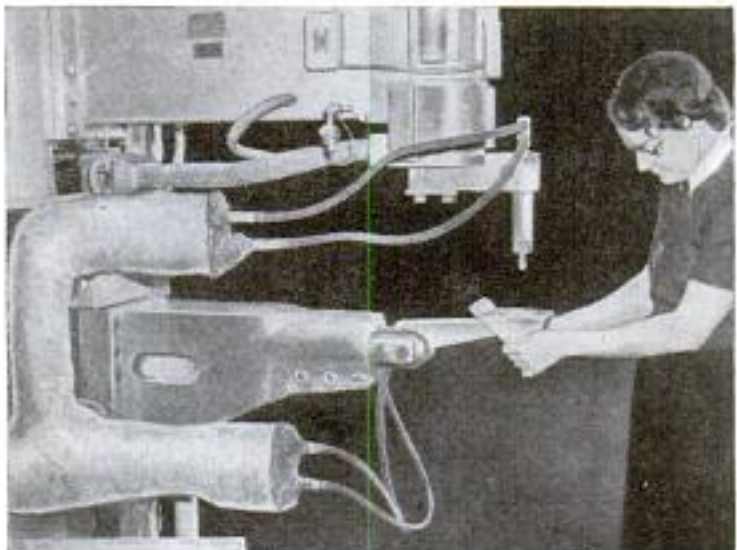


Photo courtesy of Frostrade Products

Cont: Deane & Co. Bond Bldg. Detroit, Mich.

*7/4/48: Frostrade Products
19929 C. Peter
Detroit 3, Mich.*

HIGH BALLING 500 TRAINS *a* DAY

By
Roderick M. Grant

FROM their gallery seats in Union Tower at Rahway, N. J., the Pennsylvania Railroad's block operator and leverman watch over an endless passing parade through the bottleneck that is no bottleneck.

Beneath their windows lies probably the busiest straightaway on any railroad. Just west of Union Tower the rails from New Jersey seaside towns merge into the main line that leads into New York from Philadelphia, Washington, Harrisburg and the west and south. A few miles east of Rahway the freight lines diverge to fan out in sprawling yards along the waterfront; farther on, at Newark, the main trunk heads eastward to the Pennsylvania



One of 88 Pennsylvania passenger trains a day between the two cities leaves the Broad Street Station in Philadelphia for New York. Below, the power director in New York City routes 11,000-volt current to wires





The engineer overlooks the streamlined nose of GG-1 passenger locomotive

Station in Manhattan while another offshoot forks down to Jersey City.

But here at Union Tower traffic is at its thickest. All told, the Pennsylvania carries roughly 11 percent of all America's railway freight tonnage and 18 percent of all the passengers. And a large and solid

chunk of this filters through the high-speed bottleneck at Rahway.

It is no rarity to find all the lamps lit on the frosted-glass panel before the block operator, indicating a "full house"—a train on each of the six tracks within the ten-mile section governed by Union Tower. In morning and evening rush hours there are even moments when all six tracks beneath the window are loaded, and the block operator has a busy few seconds to jot down on his log the engine number, train number, the time and track of each passing train.

The two men in the tower have full responsibility over trains in their section. Behind the block operator stands the leverman at the long bank of levers controlling the interlocked switches and signals governing the route of each train. Movements on the middle pair of the six tracks can be made in either direction, so that at peak hours three tracks west of

Train directors, yardmasters, block operators and levermen supervise and operate this interlocking machine, one of the biggest, governing movements of trains in New York's Pennsylvania Station

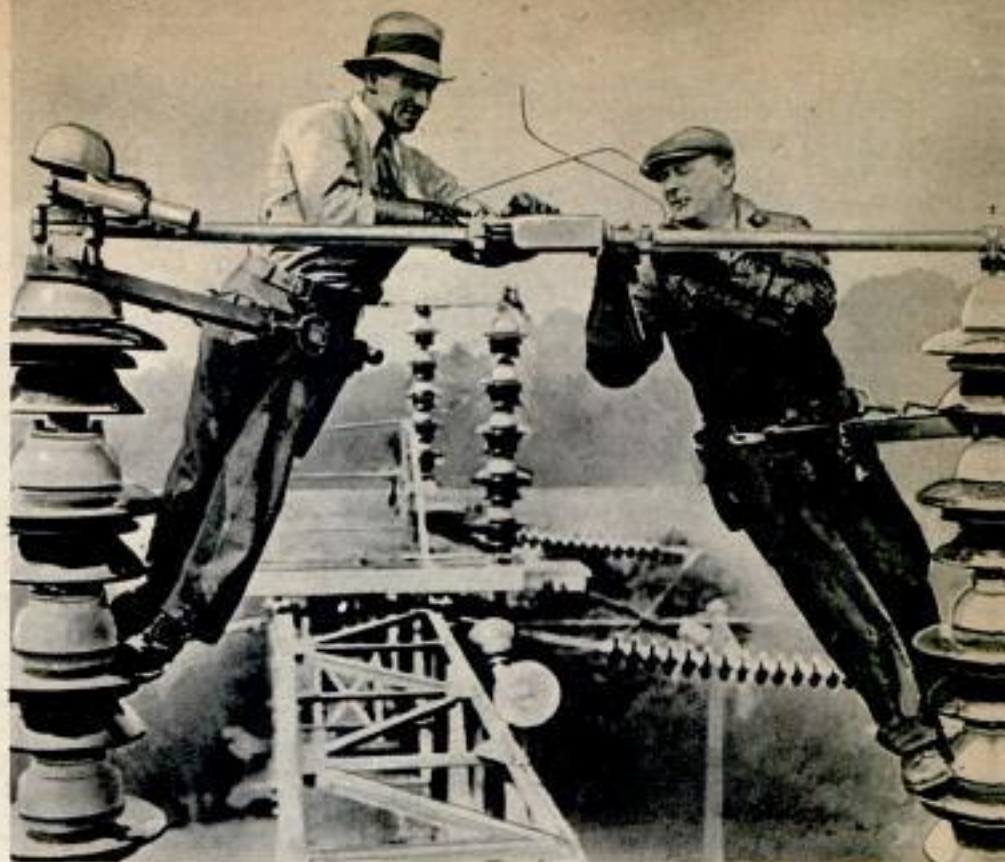


Union and four tracks east are available for traffic in one direction, either east or west. Colored arrows on the electric track map above the interlocker indicate direction of traffic flow on the inner tracks at the moment. Dots of light across the animated map show the position of every train in the area.

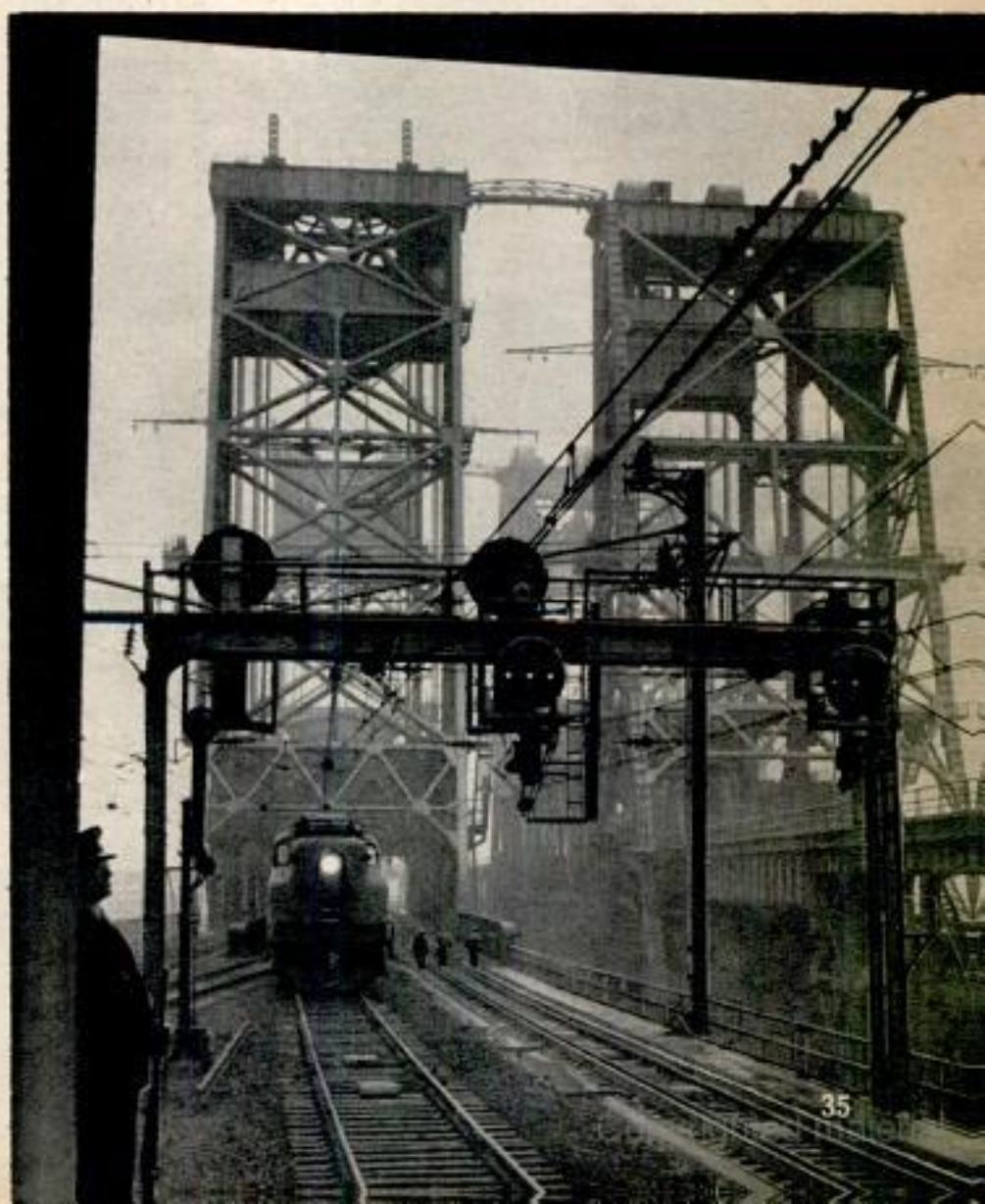
Railroading is a forward passing game. Union Tower has no dispatcher, but is in touch with division dispatchers by telephone. The Union block operator receives a New York-bound train from the tower at Metuchen, six miles west; clears the train to Elmora Tower, and so on until it is delivered to the big interlocking which controls movements in Pennsylvania Station.

Hours before an overnight sleeper filters past Union Tower to the threshold of New York, the Pennsylvania Station dispatcher reads a train consist coming by Teletype. It reports train No. 60, with engine 4877, left Harrisburg at 5:35 a.m. The consist lists baggage car 6139, five Pullman cars by name—"Night Mantle, Imperial Pass, City of Johnstown," etc.—diner 4423, nine more sleepers; then the train crew listed by name. From this consist the Pennsylvania Station block operator knows the length of the train and routes it to the station platform of proper length. Every tower from Harrisburg to New York relays train and engine numbers and passing time.

Five hundred trains a day highball past Union Tower. Four hundred passenger trains carrying suburbanites and transcontinental travelers, troops, and thousands commuting on hourly



Electricians adjust a 132,000-volt transmission line switch at a power sub-station. Below, an armed guard stands by during wartime at the approaches to a five-track lift bridge at a busy gateway to New York City





Operating the remote-control circuit breaker on control panel in Union Tower at Rahway, N. J., for nearby power station

trains between the nation's capital and the largest city. Fifty freight trains westbound, and 50 more headed eastward with war materiel for army docks, with coal and oil and merchandise, with perishables to be put aboard car floats and ferried across the river to the markets of lower Manhattan.

A train every three minutes all day, on

the average. More dense than that in rush hours. And among the fleet of streamlined electric locomotives the towermen notice a sprinkling of steam engines, some pulling freights, others troop trains headed for the port of embarkation. They look a bit anachronistic steaming along beneath the network of 11,000-volt wires that stretch from Long Island City to Harrisburg, Pa., and Washington, D. C.—2,677 miles of track representing 41 per cent of the electrically operated standard railroad trackage in America. The transmission lines carry 132,000 volts, stepped down to 11,000 volts a.c. at the pantograph. So heavy has wartime traffic become that at the last peak, in November, 1943, 88 steam locomotives supplemented the fleet of electric "horses."

By the end of 1943 the Pennsylvania had a pool of electric engines with a total of 1,100,000 kilowatt capacity, ranging from half-pint switch locomotives and suburban motor cars to the mile-a-minute freighters and 4,620-horsepower "GG-1" passenger streamliners whose twelve drive wheels can pull a steel train at better than 100 miles an hour. Last November the electric fleet drew out of the wires a record peak load of 235,000 kilowatts through its heavi-

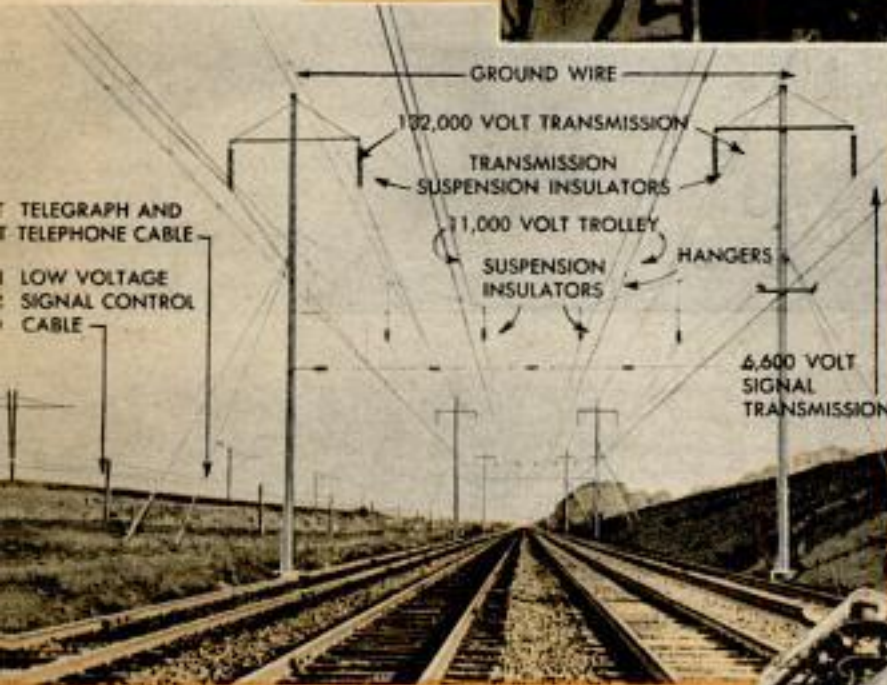
Block operator and leverman in Union Tower are perpetually busy. There's a train every three minutes here



est hour. The flow of power mounts astronomically. Last January the Pennsylvania used 70,188,000 kilowatt hours in the New York area, 69,416,000 more in the Philadelphia - Washington-Harrisburg zones. In a year the figure would add up to 1,675,000,000 kilowatt hours.

Philadelphia being the capital of the line, the railroad's load dispatcher officiates from there over the entire electric system.

If a GG-1 develops a



Wayside signals are duplicated in cab of fast passenger locomotives

short circuit near Rahway, high speed breakers instantly kill the trolley feeding the engine. The block operator at Union Tower who controls the sub-station at Rahway, gets the New Jersey area power director on the telephone, advising him of the trouble. The power director is in complete charge of trol-

Continued to page 156

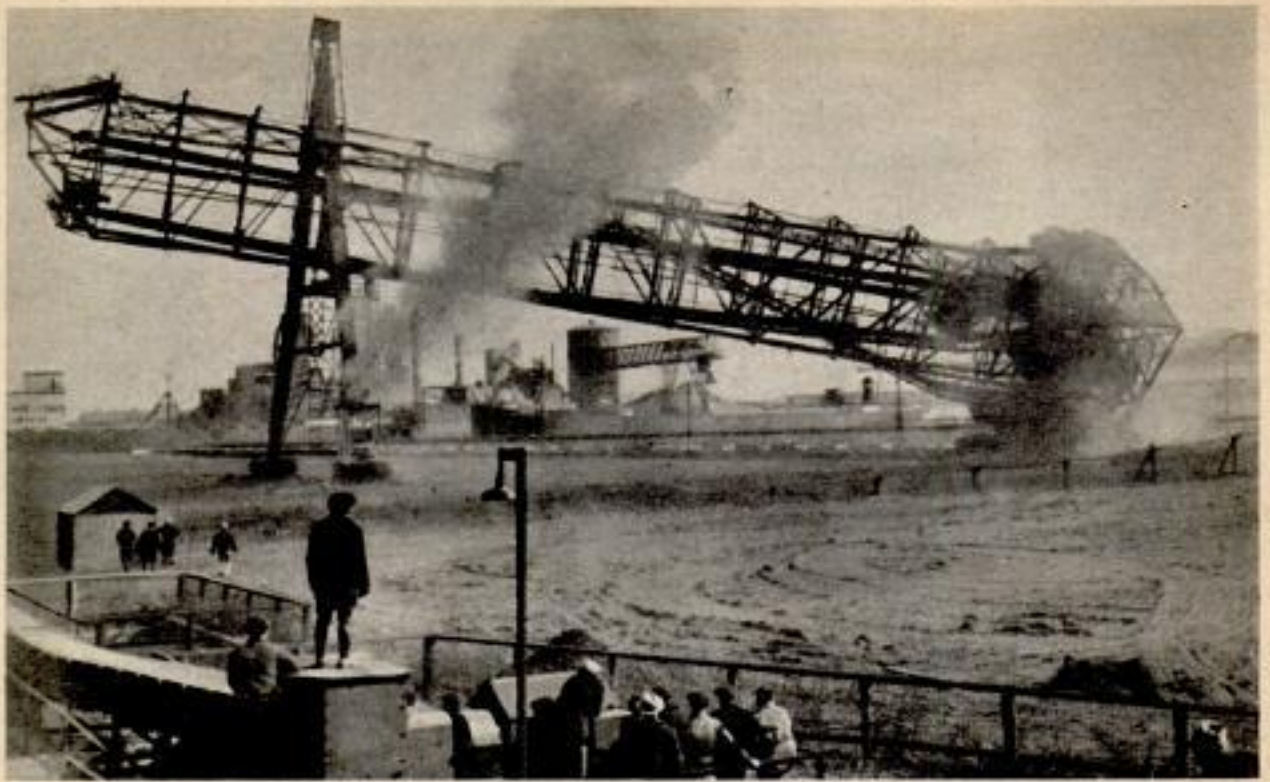
Above, the Pennsylvania's catenary trolley system. Below, a 100-miles-an-hour locomotive on the New York-Washington route



bridge at place of Interlake Snow Cap.
in So. Chicago.

0105

Thermit Topples Bridge by Melting Its Supports



To wreck a huge traveling coal and ore bridge in Chicago recently, a thermit furnace was built around four of its eight supports. Ignited by electricity, the burning metal compound reached 6,000 degrees in

10 seconds and the piers melted, toppling the 20-year-old structure which was 300 feet long, 80 feet high, and 30 feet wide. It was one of the swiftest demolition jobs Chicago has ever known.

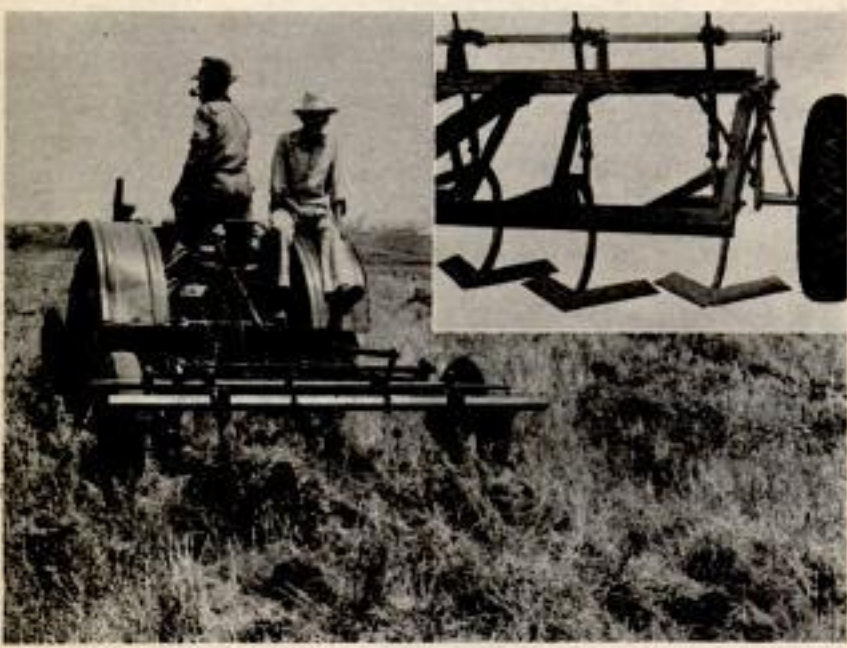
079

Subsoil Plow Leaves Protective Stubble to Prevent Erosion

To guard against the eroding effects of wind and rain, a new subsurface plow loosens the soil and at the same time leaves a protective blanket of stubble on top. Instead of turning over a barren furrow,

blades of this plow merely loosen the soil a few inches below the surface. Implements adapted to the work, which are manufactured by several companies, range from one or two blades to an eight-foot,

five-blade machine. Sub-surface plowing, developed from experiments conducted at the University of Nebraska in cooperation with the U. S. Soil Conservation Service, boosts crop yields in dry regions by increasing the seepage of rain water through the stubble into the soil. This type of tillage, also known as stubble mulch farming, has proved effective in many grain and orchard regions.



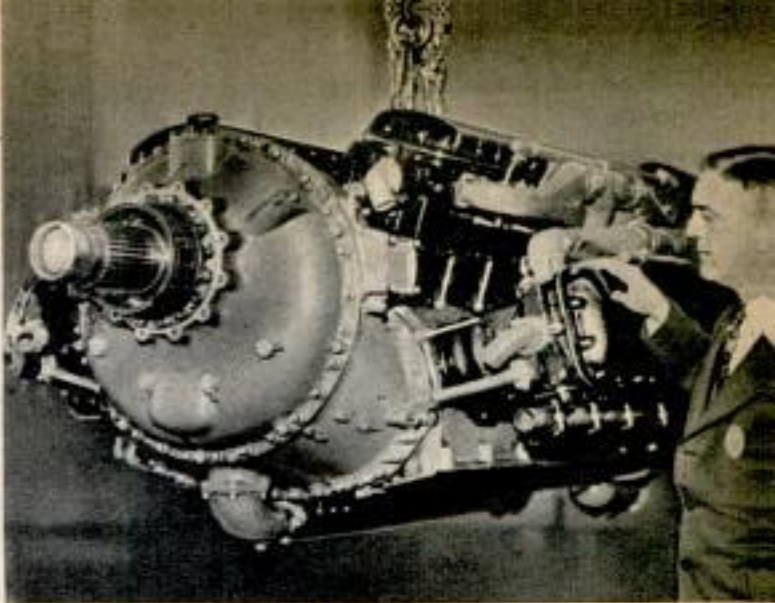
Orchard trees planted in clay soils loosened by small dynamite charges sometimes bear fruit a year or two earlier.

Mr. J. C. Dwyer, Acting Chief
U. S. Dept. of Agriculture
Soil Conservation Service
Washington 25, D. C.

Allison Division 0302
General Motors Corp.
Indianapolis, Indiana

3,000-Horsepower Engine Is Tops for Planes

American fighter planes will attain even greater speeds and climb more rapidly with the new Allison 3,000-horsepower engine. This 24-cylinder, liquid-cooled power plant is the most powerful aircraft engine in the world. It has twice the piston displacement of the present standard Allison 12-cylinder engine used in the Lockheed Lightning, Mustang P-51, the Invader A-36, Warhawk and Airacobra. Although the weight of the standard engine was already less than one pound per horsepower, the new model has further decreased the weight per horsepower. The cylinders are arranged in four banks of six each, giving the engine an over-all design of a "W" compared to the "V" design of the 12-cylinder engine. Simplified design of the new



engine makes it possible to rush mass production, for 97 percent of the parts are interchangeable with those of the standard model. The engine is designed for installation on multi-engine aircraft as well as fighters, according to Allison engineers.

"Mars" Flies Biggest Mail From Hawaii to California



Twenty-five thousand pounds of letters—a record airmail load—recently was flown from Hawaii to Alameda, Calif., in the Martin "Mars" flying boat. At an average of 1/2 ounce per letter, the load amounted to 800,000 pieces of mail which, at prevailing rates, would carry \$160,000 in postage. While the load set a new record for airmail, it was 10,000 pounds short of the all-time record payload of 35,000 pounds carried by the "Mars" on its first war mission.

0270
The Standard Mailing Co.
Baltimore 3, Md.

Army's Plywood Storm Boat Hits Beach Like Toboggan

Designed to spearhead a river crossing by assault troops, a "storm boat" used by the army engineers is made entirely of plywood and powered by a 50 horsepower motor capable of 20 to 23 miles per hour. The craft carries eight fully equipped riflemen and a crew of two. It makes a difficult target for the enemy because of its low lines and great maneuverability. If the shore is low and shelving, the boat may be beached head-on at full speed, which often toboggans it high and dry. Once it hits the beach, its passengers, who have been lying prone, leap out, rifle in hand, ready for action, and the boat scoots back to its embarkation point to ferry supplies. The "storm boat" is 16 feet, nine inches long, by six feet, six inches wide.



HIGH CHAIR BOMBARDIERS



Bombardier cadets at Midland Army Air Field in Texas begin a bombing run on fixed targets. Below, a low seat in "highchair" trainer teaches bombing from low altitude

By Lt. Col. Howard E. Watkins

Director of Training, Army Air Forces Bombardier School, Midland Army Air Field, Midland, Texas



THE bombardier in the greenhouse is crouching over his bombsight. As he peers through the eyepiece, he sees the target, a gasoline refinery, below and ahead. His fingers deftly adjust the delicate controls. He centers the target on the cross hairs. He makes a final check on level, range, course, drift.

"Bombs away," he says over the interphone. "OK to turn." Seconds later, a series of flashes on the target shows his aim has been good.

The bombardier walks away. He hasn't even left the training hangar.

That's one phase of "synthetic bombing." The apparatus on which he "flew" his mission is a "projection trainer," one of a number of devices, many of them developed by members of our own staff at Midland Army Air Field, which are saving millions of dollars throughout the Army Air Forces Training Command. What is more important, they make it possible to give a cadet a more thorough foundation in both theory and practice of bombing.

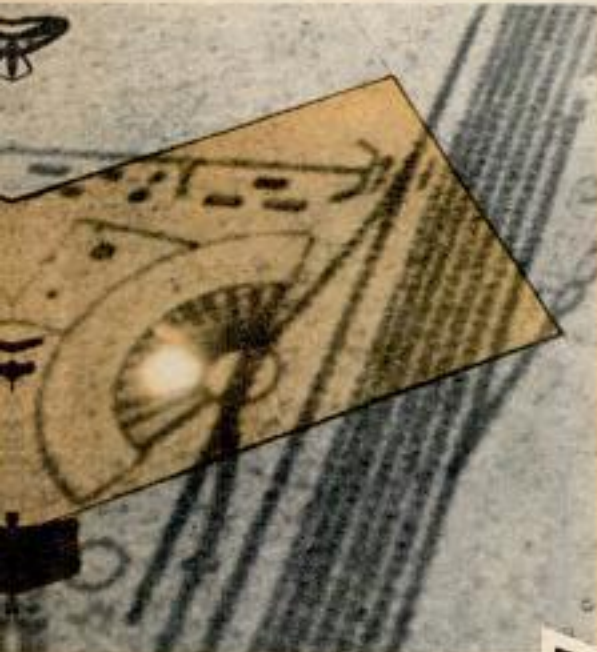
Synthetic bombing is not a substitution for the real thing. Student bombardiers still drop hundreds of practice bombs on targets, from fifteen-foot

square pyramids of clay to an 817-foot full-scale model of the Nazi battleship "Von Tirpitz."

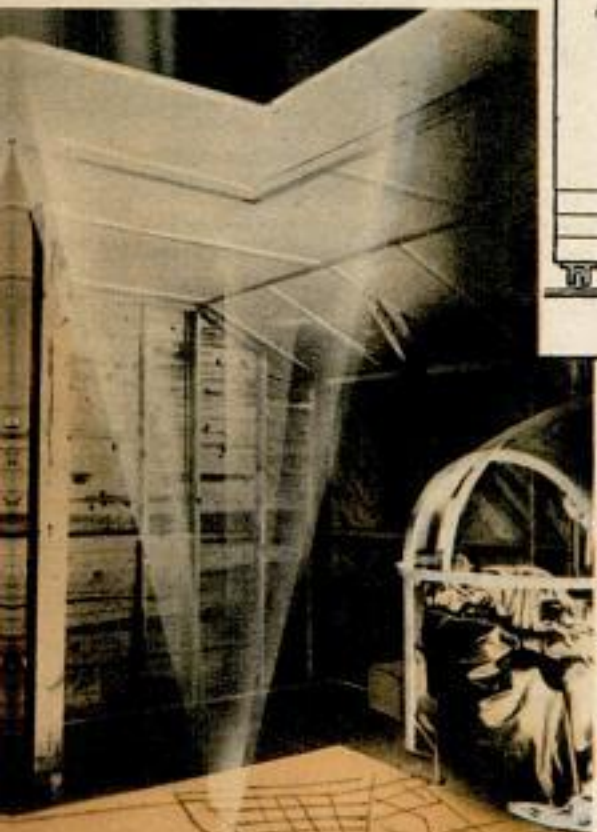
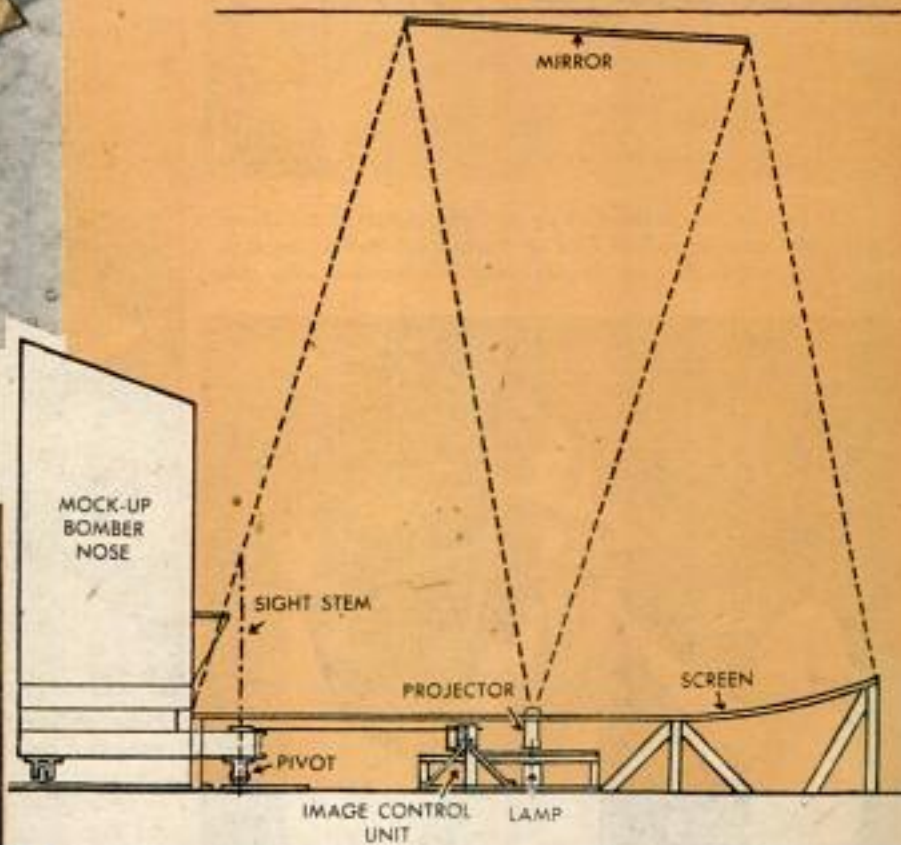
But now, in addition to actual flying missions, the tyro bombardiers spend hours on mechanical training aids which simulate everything encountered in the air except flak and enemy fighters. These training aids are particularly valuable in the preliminary stages. A student can drop several times as many "synthetic bombs"



Hunched over bombsight, the cadet follows target on film until he has it on crosshairs of sight. Flashes on target tell whether he has hit it. Below, diagram of projection trainer



Above, target (railway yard) as it moves toward bombsight of trainer. Below, image projected through hole to ceiling is mirrored to screen



as actual missiles in a given time. His instructor can demonstrate procedure and results, and each mistake can be analyzed. When an error is discovered, the student can concentrate on correcting that error.

In those first difficult weeks, when a student couldn't drop a bomb close enough to scare the crows off the target anyhow, he acquires the fundamentals right in the hangar. Synthetic bombing requires no pilot, no aerial crew or ground crew. It doesn't even require bombs.

The projection trainer was perfected by our special projects section. Major Edward McKaba,



On the Navitrainer's bug or "wintruder" is charted the course student flies on "mission." Below, mockup of bomber's nose familiarizes bombardier with post

in charge, conceived and developed the trainer with the assistance of his staff. Its principal feature is the projection of a moving slide, showing a section of terrain, onto a horizontal screen in front of the bombardier. The movement makes it appear as if the bombardier were flying over the target.

The cadet sits in a mock-up of a bombardier's compartment and sights an actual bombsight. The controls of the sight are connected with the projector so that movement of the slide will change accordingly. For instance, if the cadet sees the target to the left and sets his controls for the proper course, the slide will move in a direction to bring the target toward the



Motor-driven mockups of navigation instruments are operated by instructor as students work out problems

bombsight. Effect of wind drift can be added by a simple adjustment. The bomber nose mock-up is set on a pivot so that it will point in the proper direction as course is changed. A light flashes on the target to indicate the location of bomb hits.

The standby of synthetic bombing training is the "high chair" trainer, a self-propelled scaffold ten feet high, on wheels. The cadet sits on a platform atop the scaffold and, with a real bombsight, sights at a moving target "bug" on the hangar floor. The bomb release trips a clock which causes a plumb bob to drop onto the target after the proper interval has elapsed to



allow for assumed altitude. A sheet of paper, with the bull's-eye marked by an X, is placed on the target "bug." Carbon paper falls across the target as the plumb bob drops, making a record of hits. Containing a small electric motor, the target bug can be propelled at varying speeds and angles to simulate a moving target, wind drift, or both.

Cadets start with runs of about 75 seconds. After they have started flying, they continue workouts on the trainer, but solve more difficult problems. Time of the runs is shortened to 20 or 30 seconds.

A lower seat, two feet above floor level, is used for instruction in low-altitude bombing. As a further improvement on the high chair trainer, there has been installed in each trainer a modification of the Automatic Pilot, which permits the bombardier to take over control of his "ship," in so far as course runs and drift are concerned, exactly as on a real mission.

With the introduction of a course in dead-reckoning navigation, there arose the necessity for training devices. One is the Navitrainer, used in teaching bombardier-navigators the use of navigation instruments before they make actual flights. The Navitrainer simulates the exact conditions of flight, but a mission takes 40 minutes to an hour and a half, instead of three to five hours for an actual flight. It is in two units, one a movable "bug," about four feet in diameter, the other the cab that houses the navigator's "office."

The bug is called the "wintroducer," short for "wind introducer," because adjustments in the bug will vary the direction of the wind in the problem. Mounted on the wintroducer is a huge reproduction of the mercator, on which the take-off point and destination are marked before the student enters the cab. An over-sized pencil plots on the mercator the actual course the student works out as he "flies" his mission. When he has finished he may see just how far he may have varied from the course set.

The cab is driven by a motor that moves it 30 to 36 inches an hour, to correspond to the speed of the plane. On the control panel are an air speed indicator, altimeter and temperature gauge. Also mounted in the cab are a drift meter and an aperiodic compass. The navigation student must also have with him in the Navitrainer a Weems aircraft plotter, an E6B computer, dividers, mercator plotting sheet, a log, a handful of pencils—and a clear head.

Another navigation training aid recently developed is the Classroom Instrument Board, a mock-up of the instruments actually used in navigation. Each instrument is motor-driven and controlled from a port-

Continued to page 158



Helicopter Flies Inside Building To Show Precision Control

Aviation made its bow as an indoor sport recently at an armory in Buffalo, N. Y., when a test pilot demonstrated the Bell helicopter before representatives of the Army and Civil Air Patrol. The craft took off, performed maneuvers in a restricted space and landed. The stunt was staged to show the stability and precision control of the Bell helicopter. *Test pilot: Ralph W. Carlson*

*0264
August 12
Army*

Workshop Dial Solves Problems On Woodworking and Tools

To aid the home craftsman in a variety of problems, a varnished cardboard calculator offers charts of closely related woodworking data. By merely adjusting the dial, a craftsman can convert linear to board feet, determine slope per foot in degrees, and find comparative hardness, weights, shrinkage, warping and ease of working of the various woods. Bit sizes for head, body and thread of standard screws, nail specifications, and tips on tool sharpening are included on the calculator, which is an accurate protractor as well. The chart is six inches in diameter.

*0247
Kumbe Tool Co.
2136 12th St. S.E.
Brookfield, Ill.*

COMPARATIVE EASE OF WORKING WITH HAND TOOLS	
BEAR	White - Ash - Oak
YELLOW BIRCH	Oak - Elm - Mahogany
CHERRY	Maple - Walnut - Pine
WALNUT	White Pine - Fir
DO, SPRUCE	Red Pine - Cedar
SOFTWOOD	White Pine - Fir
GREENISH PINE	White Pine - Fir
BILLAR PINE	White Pine - Fir
WHITE PINE	White Pine - Fir
RED PINE	White Pine - Fir
REDWOOD	White Pine - Fir
SANDWOOD	White Pine - Fir
WEST LARCH	White Pine - Fir
YELLOW PINE	White Pine - Fir
EAST SPRUCE	White Pine - Fir
ENGLISH SPIN	White Pine - Fir
ITALY SPIN	White Pine - Fir
BARCELONA	White Pine - Fir
DO, YELLOW PINE	White Pine - Fir
STRONG	White Pine - Fir
TUPLO	White Pine - Fir
WALNUT	White Pine - Fir

H—High M—Medium L—Low

CHARACTERISTICS OF WOODS

CHEMICAL MAGIC *on the* FARM

*Mr. Thomas C.
Hawson, Jr.
3872 Franklin
Ave. Los
Angeles 27, Calif.*



Top, spraying citrus grove with a multiple-nozzle boom. Left, dusting truck in action. Chemical dust is blown into trees through narrow openings at rear (see below) at 70-miles-an-hour initial speed



IF AN actor should be asked to represent agricultural chemistry in a play he might very properly dress himself in the costume of a magician. His magic wand could be the applicator of a power spray.

He would have to perform some amazing tricks to astonish an audience of farmers, for the things that he has been up to lately have already taken their breath away.

Agricultural chemistry has been going into their fields and weeding their crops. It has been making fruit stick to the trees until ripe. It has been preventing plant diseases, removing pests, and supplying mineral foods to plants and trees that need them. It has been putting trees to sleep during warm winters, insuring good crops the next season. It even has the promise of making more blossoms per plant grow to maturity. Some of this magic is done with colored

POPULAR MECHANICS

Copyrighted material

dusts, but more often with liquid sprays.

Weeding a crop by means of a chemical spray sounds ridiculous, for how could a chemical recognize the weeds and kill them, yet not harm the crop? Research men reasoned that a plant with broad leaves would absorb more spray than would a plant with narrow leaves, hence it might be possible to kill broadleaved weeds in a crop of narrowleaved plants.

They were right. One of the first crops on which they worked was onions. Leafy weeds absorbed the poison and died while the same spray rolled harmlessly off the onion shoots. Light petroleum oils are the basis of several such weed-killing sprays. Stove oil spray is an effective weed killer in carrots. Heavier oils kill both weeds and crop, lighter oils are not effective. The oil spray is applied when the feathery carrot plants are about an inch tall. Broadleaved weeds are killed by it; the young carrots continue to grow. Similar sprays are used for eliminating weeds in grain crops. Mustard plants in a field of barley die out when sprayed, morning glories in grain are killed without harming the crop.



A high-spray outfit working through a walnut orchard, spraying against codling moth

Driver of chemical dusting truck wears a respirator as he starts the dust blower

A spray treatment with DuPont "Ammate" weed killer eliminates poison ivy quickly



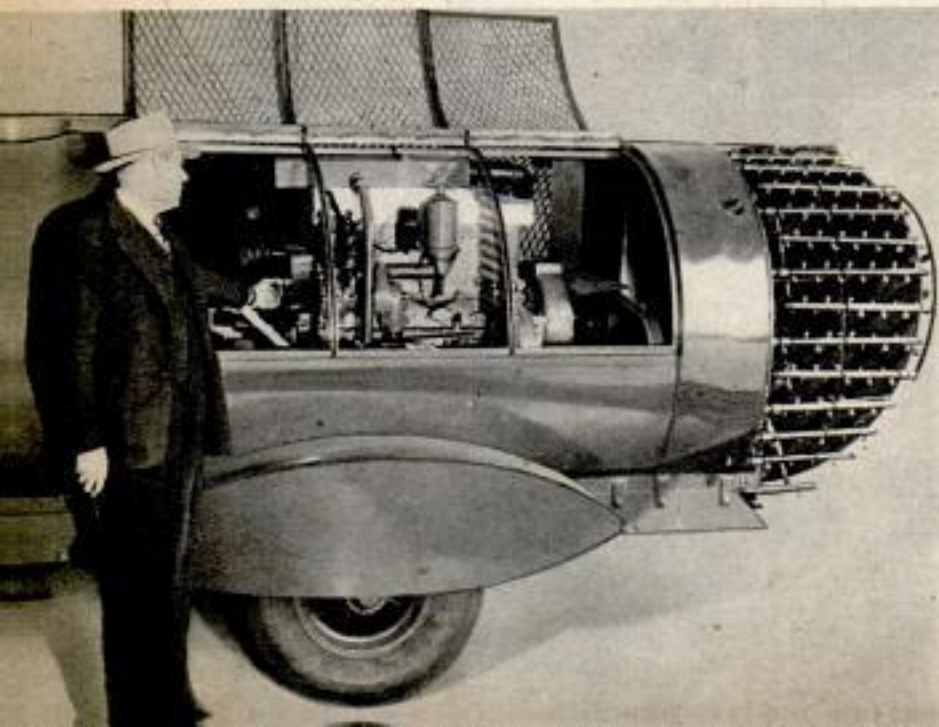
Research on selective weed killers has hardly started. Eventually it may be possible to get rid of weeds in any crop by means of sprays. There is some indication that the leaves of some vegetables are most receptive to moisture at a certain time of day; possibly it will be found that weeds can be singled out and killed by spraying the fields at the time of day when the crop itself is relatively immune.

Ammonium sulfamate, developed by Du Pont, is one new herbicide that has some selectivity against weeds in lawns and that





High-pressure jet protects shade trees in a Benton Harbor, Mich., park. Below, this spray rig forces vapor through nozzles at right, then propeller blows the spray into the trees



is outstandingly lethal against certain woody perennials including poison oak, ivy, and sumac. These scourges as well as goldenrod, chokeberry, and ragweed are easily eradicated by spraying them with ammonium sulfamate. Its residue is not poisonous to animals, or humans. "Ammate" is a salt and does its work by absorption by the plant's leaves. It kills woody perennials without the need of grubbing them out.

Orchards would yield bigger crops if it were not for the percentage of fruit that falls before maturity. Today apple and pear orchardists are getting full crops by spraying with a Du Pont synthetic plant hormone which retards dissolution of the abscission zone in the stem. Instead of dropping, the fruit remains on the tree and develops desirable size and color. Elimination of premature drop in cherries, plums, peaches, grapes, and certain vegetables by means of similar sprays is also being investigated.

Research, too, is being directed toward making more blossoms "stick" to their branches. Tomatoes, for instance, bloom profusely and yet many blossoms drop off instead of maturing into fruit. Development of a hormone spray that would reduce the percentage of blossom drop seems promising.

In southern areas, peach trees refuse to go to sleep during unduly warm winters, then fail to produce fruit the next season. On some occasions such warm weather has been fought by planting cakes of ice around the bases of the trees to help keep the sap from rising. Today peach orchardists use a spray that brings on dormancy, helping the trees to bloom the next spring.

Spraying, too, is the method by which some crops are provided with minerals not obtained from the soil. California orange trees flourish best when provided with traces of zinc; accordingly, small amounts of zinc are sprayed on the trees, to be absorbed by the leaves.

Chemical sprays and dusts perform their most important work as pest killers and disease inhibitors. Chewing insects such as codling moths, cabbage worms, potato beetles, and boll weevils are controlled by arsenical and fluorine

compounds, nicotine, or rotenone. Sucking insects and mites including various scales, aphids, flea and leaf hoppers, and plant bugs, are fought with contact insecticides that include various oils and rotenone or pyrethrum dusts and sprays. Plant diseases, caused by fungi, consist of blights, spots, mildews, and canker afflictions. The best way to fight these is by spraying with a fungicide.

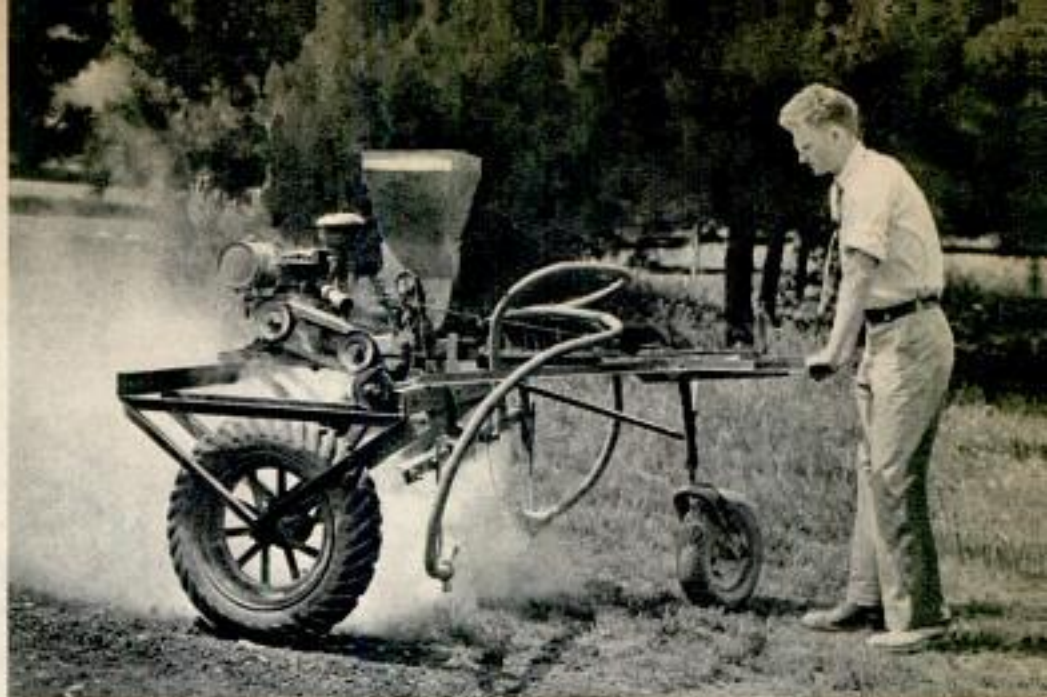
A spray rig for an orchard may consist of a heavy-duty truck that carries a tank holding several hundred gallons of liquid, a pump that has a capacity of 60 gallons per minute at up to 600 pounds pressure per square inch, plus a hydraulically operated tower that can be raised 30 feet, from which spray is applied to the treetops.

Apples and pears may require as many as eight sprays in a year; the cost of pest control spraying in citrus runs about \$50 per acre per year. Without such sprays few crops could be grown to maturity. Many orchards would be killed in two seasons if the insects had a free hand. Still, oils and pest poisons in the long run affect the fertility of soil and are non-beneficial to the plants and trees.

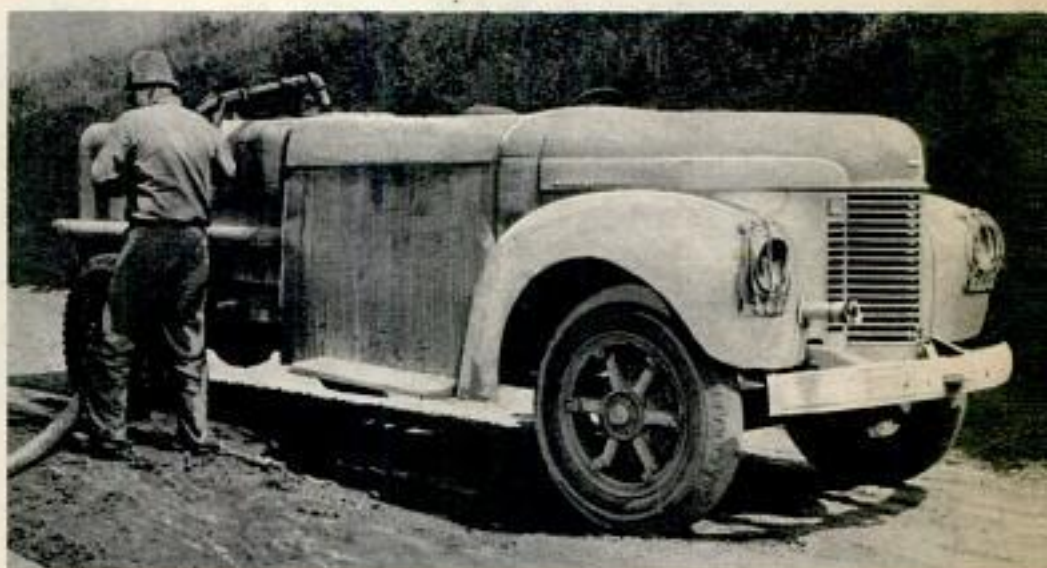
Today spray men are excited over the possibilities of the new insecticide known as DDT, used by the armed forces to combat lice, fleas, flies, mosquitoes, and practically all harmful insect life. This insecticide apparently has no bad effect on soils and plant life.

Agricultural pest control men are experimenting with it in the hope that one or two applications per year will act against practically all the pests that now attack valuable crops.

SEPTEMBER, 1944



This small power-operated duster sprays the ground with dithane, insect and fungus killer. Plants absorbing dithane become deadly to insects



Supply truck (above) takes on water to be pumped into tanks of spray rigs working through adjacent orchard. Below, sprays carrying traces of zinc help supply that mineral to orange trees showing zinc deficiency



0309

From model planes for hobbyists the American Junior Aircraft Co. of Portland, Ore., turned to target planes for the Army, and delivers as many as 5,000 models a week—a lot for any factory! Left, a radio-controlled model. Below, whip-control plane hits 90 miles an hour in two seconds

1166 N.E. 31st Ave.

MODEL PLANES STUNT for GUNNERS



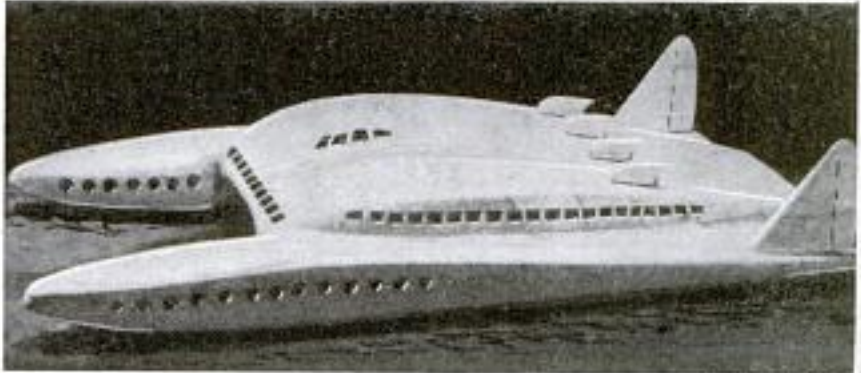
Jim Walker, company president, flies two "fireballs" with trigger-operated speed control and elevator control

Besides radio and sonic-controlled craft and manually flown scale models of fighters, catapult planes are built for aerial gunnery targets; their wings unfold at top of 300-foot rise, then the bullets fly



100-Ton Aeroboat Will Skim Water at 60 Knots

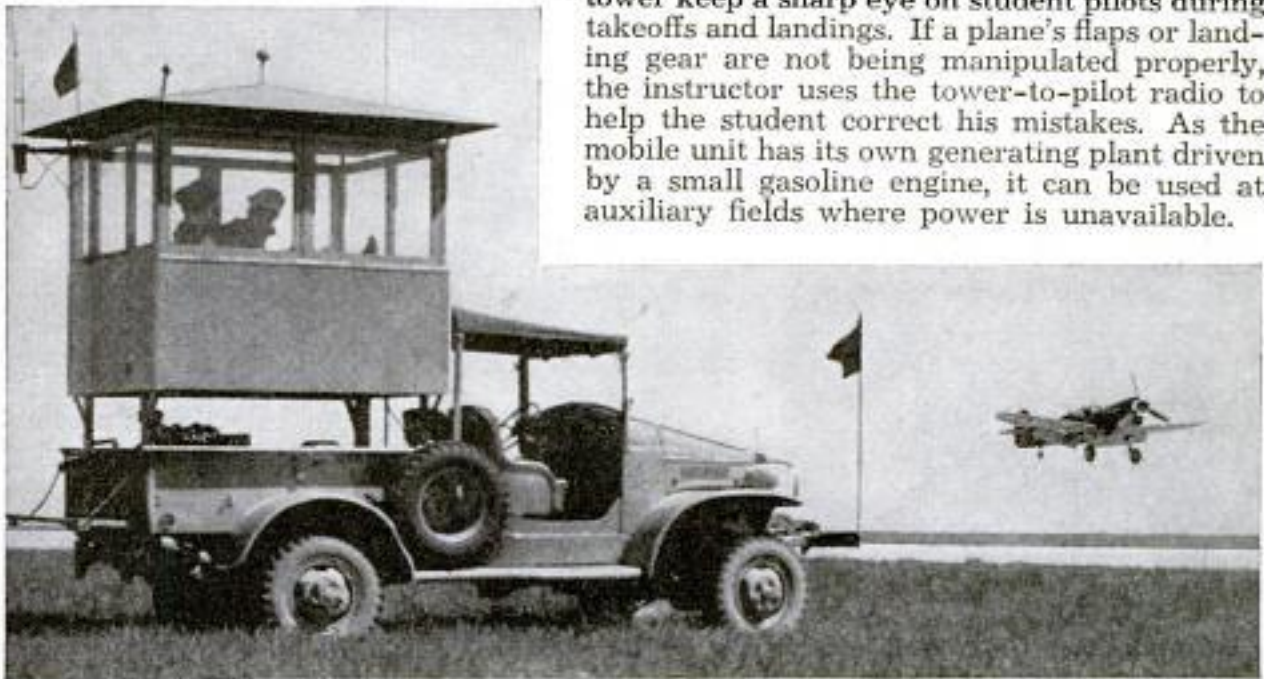
Plans for building a giant aeroboat which would skim the waves at 60 knots have been drawn by Ivan Troeng, engineer of Stockholm, Sweden. According to the design, only one-tenth of the ship rests on water, while the remainder is supported by air. The giant will weigh 100 tons and its two 3,500-horsepower engines will drive air propellers. Troeng has successfully tested a 16-foot model, which reached a speed of 50 knots with a 60 horsepower engine driving a water propeller.



Above, right, the designer in his 16-foot aeroboat. Lower right, model of the 100-ton ship which he plans to build

Instructor in Mobile Glass Tower Advises Fighter Pilots

Transition from slow training ships to speedy fighter planes is made easier for pilots at Foster Field, Texas, with a mobile control tower. This glass-enclosed cupola mounted on an army truck chassis is as complete as a stationary tower. Instructors in the tower keep a sharp eye on student pilots during takeoffs and landings. If a plane's flaps or landing gear are not being manipulated properly, the instructor uses the tower-to-pilot radio to help the student correct his mistakes. As the mobile unit has its own generating plant driven by a small gasoline engine, it can be used at auxiliary fields where power is unavailable.



Pest Weed Finally Makes Itself Useful by Holding Down Airfield Turf

Quack grass, a coarse weed whose complicated root system is a pest to fancy lawn owners, will be used extensively in areas where a tenacious turf is required, agricultural authorities predict. Recently two practical uses have been found for it:

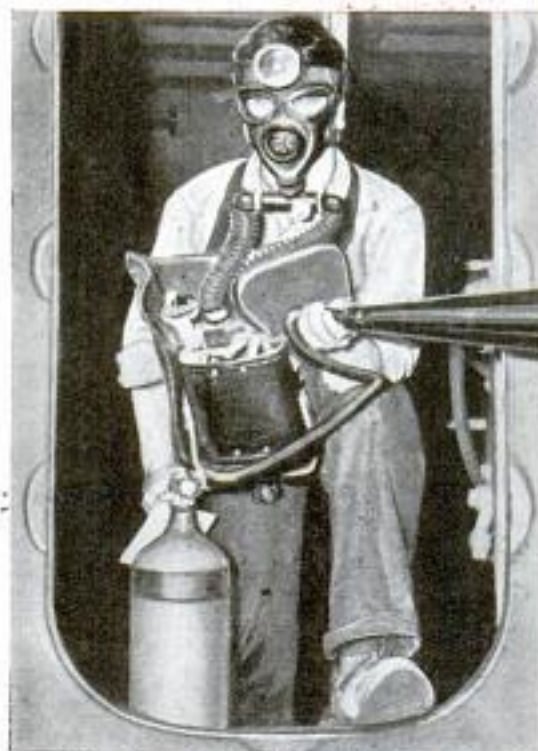
keeping down the dust on airfields and holding down railroad embankments. In addition, increased study of its qualities indicate that it probably will be used at army camps, on athletic fields, on the banks of streams and on uncultivated hillsides.

*The Jay L. March Co. (Incl.)
Cooper Hill
Marion, Ohio.*



FIRST AID *for* WOUNDED WARSHIPS

Its bow blown off in battle, the cruiser New Orleans reached port with a temporary bow. Below, damage control men fight electrical fires with carbon dioxide



AN AMERICAN warship in action is manned by two crews of fighters. One crew fires the guns and runs the ship. The task of the other crew is to minimize and repair battle damage, helping the ship to stay in the fight. Damage control men work right alongside the gun crews, putting out fires that enemy shells have started, repairing damaged piping and machinery, and keeping the ship afloat if she is badly hit.

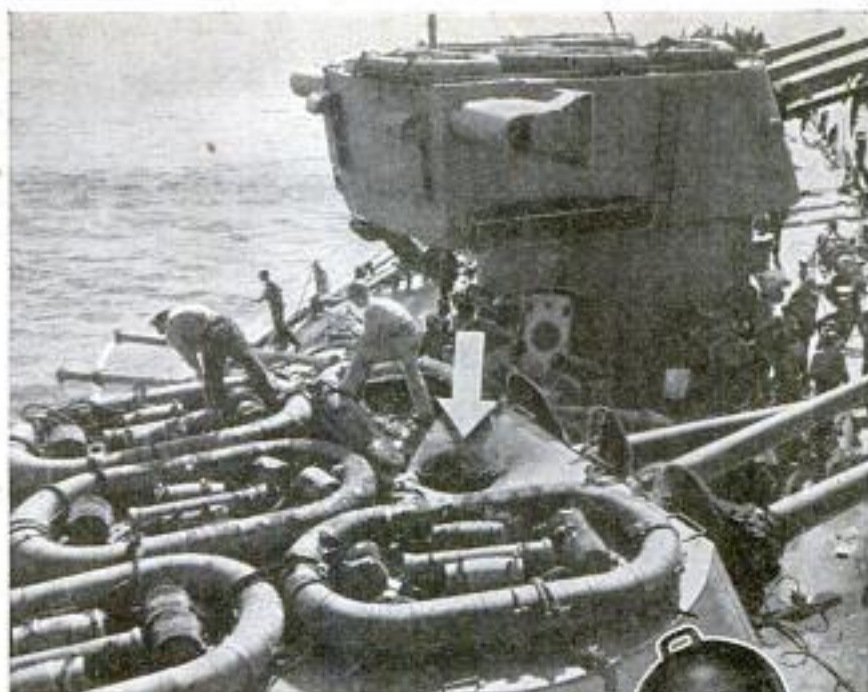
A bomb that plunges through the armor of a turret and explodes inside not only kills the gun crew, it may touch off a chain of events that destroys the ship. Flaming powder and ammunition in the turret may break through to an ammunition hoist, starting a fire in a main magazine that blows up the ship.

Such a bomb plunged through the top of a

turret on the U.S.S. "Savannah" during an engagement off Italy. Flames were leaping from the hole a couple of seconds after the explosion but the fire didn't get a chance to spread. A damage control party made its way to the turret top at once and poured heavy streams of water into the flames. The "Savannah" continued to fight, with one turret out of action.

The destructive power of modern naval weapons is terrific. In a quarter of an hour during the Battle of Guadalcanal, for instance, one American destroyer was sunk, one was blown up, another was dead in the water, and two were damaged. An American cruiser was in flames, two others had been badly holed, and a fourth cruiser was damaged so badly she had to leave the action. All of this happened in the length of time you may take to glance over a newspaper.

In spite of this wholesale destruction it was an American victory, for our side sank 18 Jap ships and forced the rest to flee. Our losses might have



Arrow points to hole where German bomb pierced cruiser's turret. Right, this tool cuts hole in steel bulkhead or cuts cable with exploding cartridge



Damage control men quelling petroleum fire with water spray
U. S. Navy photos

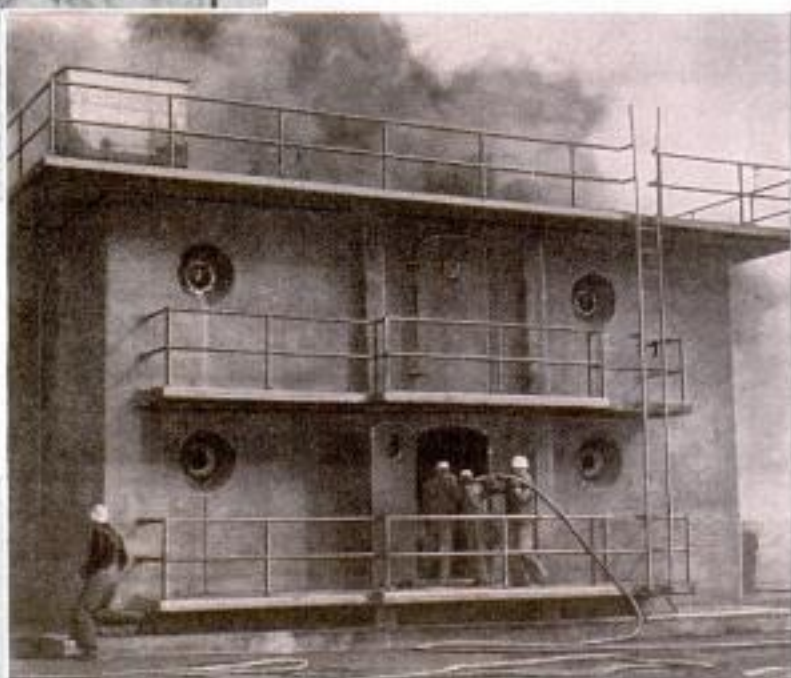




Top, Navy school teaches technique of plugging a small hole in ship's side

Replica of a section of warship is used to train men for fire fighting

Below, sailors mop up water below-decks with pumps and canvas bags



been greater and the damage to the Japs much less except for our damage control technique that kept "as many men at as many guns for as long as possible."

The essence of damage control is speed in combatting each emergency. A bomb or shell that bursts open a tank of high test gasoline and sets it afire can start a conflagration that destroys the ship if the fire isn't attacked at once and successfully extinguished. A torpedo that blows open a ship's side can start a series of events that ends in the ship's destruction five minutes or five hours later unless effective measures are started at once. This doesn't mean, of course,

that damage control parties can overcome every wound the ship suffers; it simply means that some ships that might have been lost are still in action because damage control parties saved them.

The quantities of gasoline, fuel oil, powder and ammunition, as well as clothing, bedding, and personal effects make practically every part of a warship vulnerable to fire. Damage control men are warned to expect a fire from every hit. During one battle an American cruiser had 25 fires raging during a half hour. Each fire was separately confined and quelled and the ship continued in action.

The Navy fire fighter has at hand for extinguishing fires, water, steam, fog, foam and carbon di-

oxide equipment. The water is provided by a fire main which is a piping system that delivers water pumped from the sea to fire plugs and sprinkler systems. A secondary water supply is provided by portable handybilly pumps, in the event of failure of the principal supply or the need of additional water. The special Navy all-purpose nozzle permits the application of water either as a solid stream or fog. As fog, water possesses its greatest heat-absorbing ability. It dilutes combustible vapors, reduces temperatures and as it turns to steam, extinguishes the fire. The screen of fog, produced at the nozzle, protects the fire fighter and enables him to approach the fire safely.

In extinguishing gasoline and oil fires, foam is the principal agent, with water fog as a coolant and a protective screen for the operating personnel.

In fires involving electrical equipment CO_2 is used as the principal medium of extinguishment, as it is not injurious to electrical equipment and is not a conductor of electricity. Water fog is also used as a protective screen where necessary to make entry. Electrical equipment is de-energized as soon as possible to remove the primary cause of the fire. Water fog is a non-conductor of electricity up to 5,000 volts.

War vessels are compartmented so that only a portion of the hull is flooded when a torpedo blows a hole in the side below the water level. Damage control men aren't satisfied with simply strengthening the bulkheads of a flooded compartment when the compartment is holed. They do this with fire-resistant timbers, cutting them to size and shoring up the bulkheads, then they try to patch up the hole itself. The tons of water in the compartment not only slow the ship's speed but decrease her buoyancy, giving her less margin of safety in

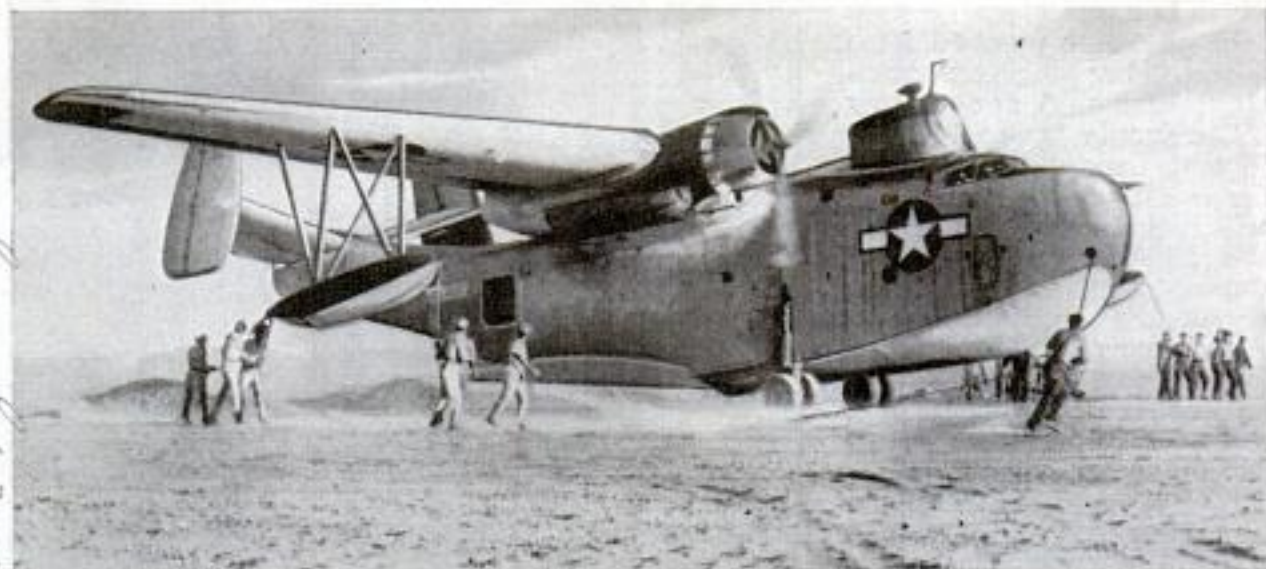
Continued to page 150



Seamen at a Navy damage-control school wear self-contained oxygen breathing apparatus while rehearsing their work. Below, recruits learn to close small holes in a ship's hull by means of a mattress, held in place with wooden planks and shoring



Flying Boat Takes Off From Desert on Wheels



What is believed to be the first take-off ever made by a giant flying boat from a dry field was accomplished recently by a Martin Mariner in southern Arizona. The 26-ton Navy craft had been forced to land

on an arid lake when a motor failed. To get it back in the air, a ground crew attached double-tired wheels to the sides of the airship, which permitted the pilot to handle it like a land plane.

0272

Trailers Set on Track Treads Haul Bombs Over Mud



Better than rubber tires, or even sure-footed pack animals, trailers equipped with track treads are able to forge a path through the deep mud and rough terrain surrounding Aleutian bases. Pulled by

Caterpillar tractors, they are hitched in pairs, tandem fashion, to haul bombs for convenient transfer to the bays of long range bombers. They also carry material for airport runway construction.

0259

Radio System Signals Depth of River at Robot Gauge Stations in Water

By means of a robot radio system, increases in the levels of the Salt and Verde Rivers are recorded automatically in the office of the chief hydrographer of the Salt River Valley Water Users' Association in Phoenix, Ariz. The radio signals are sent by gauges installed in both streams, via 25-watt transmitters. When the "telemark" coder, a combination coding device and

time switch, is in operation, a motor-driven contact arm sweeps across it to produce signals which represent the gauge height of the river at the moment, together with the station's call letters. Before the radio was installed the Phoenix office had to depend on telephone calls, which frequently were not possible during stormy seasons, when the river level data was most needed.

54 by Leopold & Stevens Co. Phoenix, Arizona

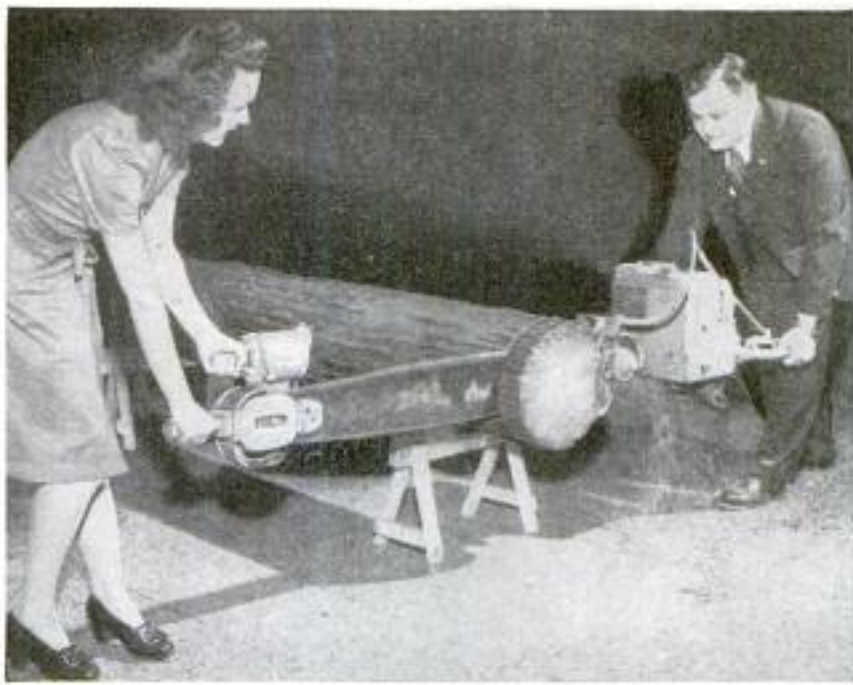
flown by: Lt. A. W. Pittsford
USNR, of High Desert, N.C.

Caterpillar Tractor Co
Phoenix, Ill.

Henry Deaton + Sons, Inc.
4435 Pennsylvania Ave.
Philadelphia, Pa. 0220

Motor-Driven Saw Cuts Big Log in Five Seconds

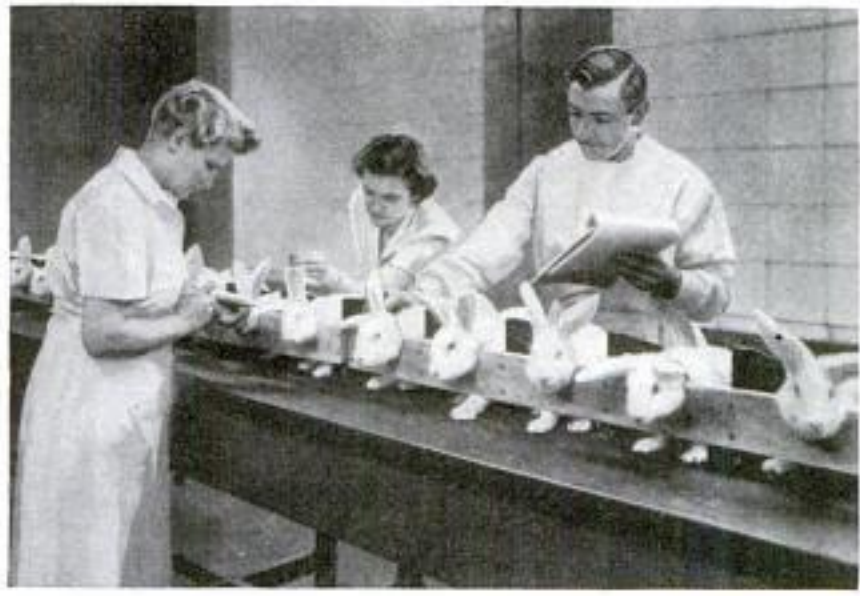
Powered by a two-cylinder engine built on the same principles as an outboard motor, a chain-type saw can cut through a 15-inch log in five seconds. The motor, which has 10 horsepower and runs on a mixture of gasoline and oil, is the first air-cooled, alternate two cycle ever built. The cutting chain rides on a rotating sprocket and an automatic device keeps it at the correct tension. The saw, which weighs 100 pounds and can be carried anywhere a man can walk, is used extensively by army construction workers overseas.



"Stable" of Rabbits in Stanchions Test Purity of Penicillin

Lined up in stanchions in a new chemical laboratory at Terre Haute, Ind., some 750

New Zealand white rabbits are doing an important bit of work for the good health of the human race.



They are used to test the purity of the new drug, penicillin, now in mass production at this plant of the Commercial Solvents Corporation as well as many other drug manufacturers. The pyrogen test is one of the last operations before shipment of penicillin. A measured quantity of the drug is injected into a vein in the rabbit's ear. If the animal's temperature rises abnormally within four hours, some fever-producing agent is present and the lot is rejected.

0240
Pure White
Indians

High "Whistle" of Steel Bar Measures Yarn to Test Elasticity of Hose

Sound waves, which are performing many odd jobs in industry, are now used to measure the elasticity in women's hosiery yarns. The exact degree of elasticity must be known for the proper adjustment of looms or knitting machines. Two scientists in the rayon technical division of the Du Pont Company developed a method for gauging the elasticity of fiber or film by determining how fast sound passes through the material. The test fiber is attached to one end of a bar of steel. When a radio tube

oscillator is turned on, the steel bar vibrates, emitting a note which is higher than the whistle range of man or piccolo. The test material vibrates like a violin string, and the wave length of these vibrations is measured to calculate the velocity of sound through the material. This gives a more accurate measurement of the elasticity than the old method of hanging a weight on the yarn. This test has been used on linen, rayon, nylon, wool and various types of Cellophane.

W. Livingston 98, Del.

SOUND TRICKS of the MOVIES

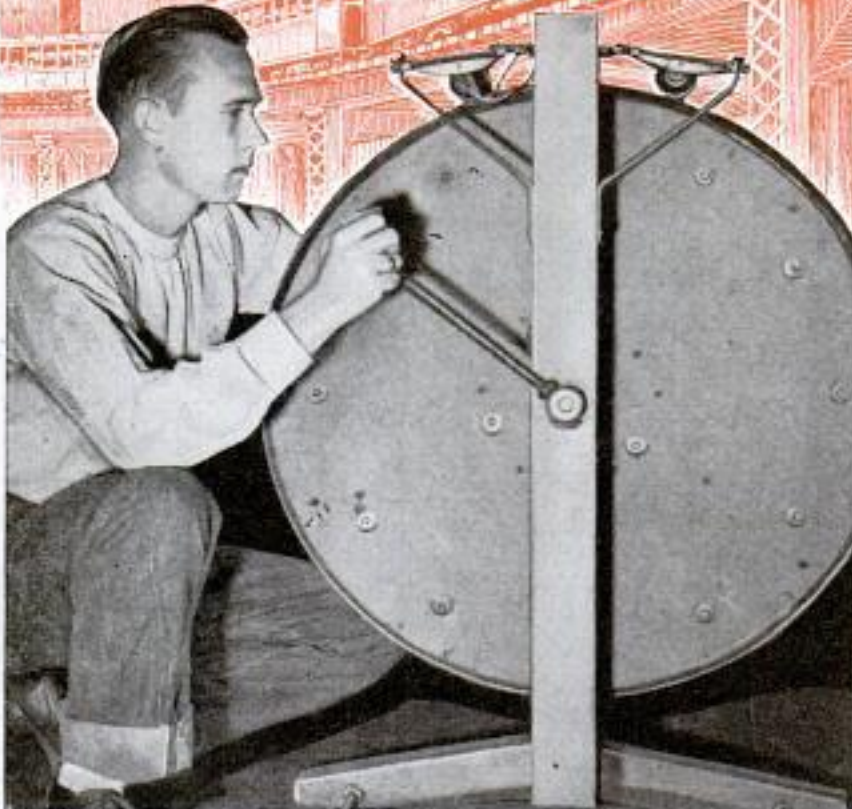
TTRUE to life and death in other respects, the battle movie that you may see at the theater tonight deliberately soft-pedals the noises of war.

Medium-caliber gunfire is reproduced at a tenth or a twentieth of its actual intensity. The nearby explosion of a heavy bomb may be only a thousandth as loud in the theater as in reality.

It's a good thing that this is so. Sound technicians could rebuild theater equipment to reproduce explosions and gunfire at closer to their actual volumes but the result would be a theaterful of shell-shocked spectators. The difference between sound and concussion is simply a matter of degree.

Not long ago some sound experts were using a recording of artillery fire to test a new high-powered amplifier in an empty auditorium. The first shot that was "fired"

Skate wheels rolling on an iron strap simulate sound of elevated railway. Below, exterior stage representing a carrier's deck



Mr. Levinson

Sound effects

by the amplifier brought an end to the test, for the echo or concussion wave that bounced back from the rear wall was so strong that it smashed the speaker.

Preparing battle noises for the movies is a lot more complicated than just holding up a microphone to catch the sounds that are desired. In assembling the sound track for "A Wing and a Prayer," Ed Hanson of Twentieth Century-Fox put a sound crew on board an aircraft carrier to pick up the noises of take-offs and landings, the bellowing of the bull horn, and the other carrier noises. Then, when the sound track was developed and previewed, Hanson found as usual that some of the



The sharp clap of two wooden bars sounds like a slap in the face on sound film. Realistic woodpecker (left) makes his own noise for film when the cord is pulled

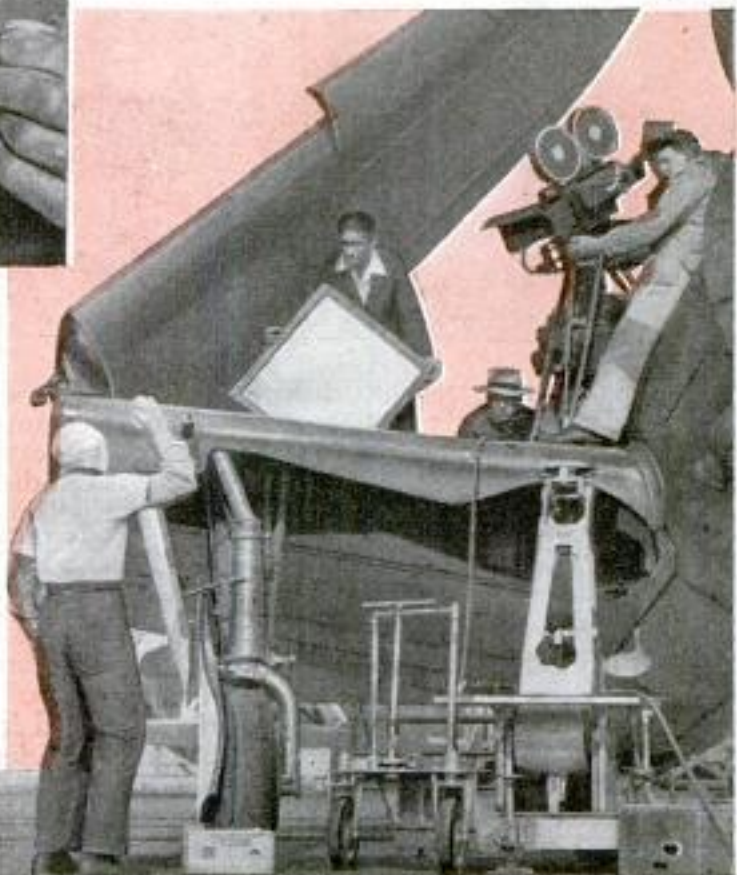


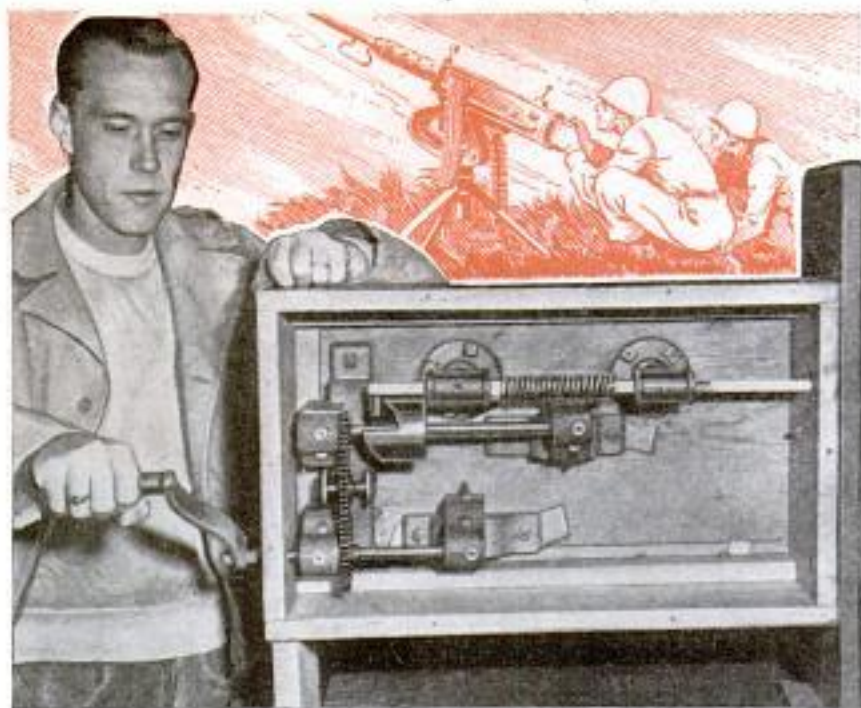
sounds reproduced perfectly while others would need to be doctored before they would be recognizable in a theater.

Conversation on an airplane's intercommunication system, for instance, is not very intelligible to people who are not used to listening to this flat mechanical talk. Such conversations, as well as speeches that are transmitted by a pilot's throat microphone, must be improved in the sound laboratory so that audiences can understand them.

Synthetic wind and synthetic

Shooting action and sound on "flight deck" built for the film "A Wing and a Prayer"





Turning the crank (above) slams the metal rod against a sounding board at right end of box. The result, to the movie audience, is the chatter of a machine gun. Below, the truck in which sound is recorded on film



thunder are two good examples of how Hollywood manufactures sounds that the microphone has trouble in picking up. The difficulty in recording wind is that wind pressure merely pushes against the diaphragm of a microphone, making a sound that goes "blub blub blub." It's much better to record the whines and screams of compressed air that escapes through small orifices in a tin can. A machine that whirls wooden rods around until they whistle in the air can also be used to produce sounds that imitate anything from a gentle zephyr to a full gale.

In the pioneer days of sound Ed Hanson tried for months to get a realistic recording of heavy thunder. The results were pretty thin until he encountered a storm in Arizona. Hanson's equipment was in the bottom of a canyon

Wooden posts slapping floor of box produce sound of marching men

and it picked up a good reproduction of the thunder claps that roared and echoed back and forth between the canyon walls. The studio used portions of that sound track for years, whenever thunder sounds were needed. It was good, but not as good as modern movie thunder that is created by bending and shaking large panels of sheet metal. These crack and roar perfectly for the microphone.

Most kinds of gunfire reproduce quite well on the sound tracks. But the sharp tap-tap-tap of machine gun fire and the thundering roar of naval guns that you hear while watching such action on the screen are not always recorded at the time the camera films the scenes. It is often simpler and technically better for the sound men to obtain these



effects elsewhere or to manufacture them as needed.

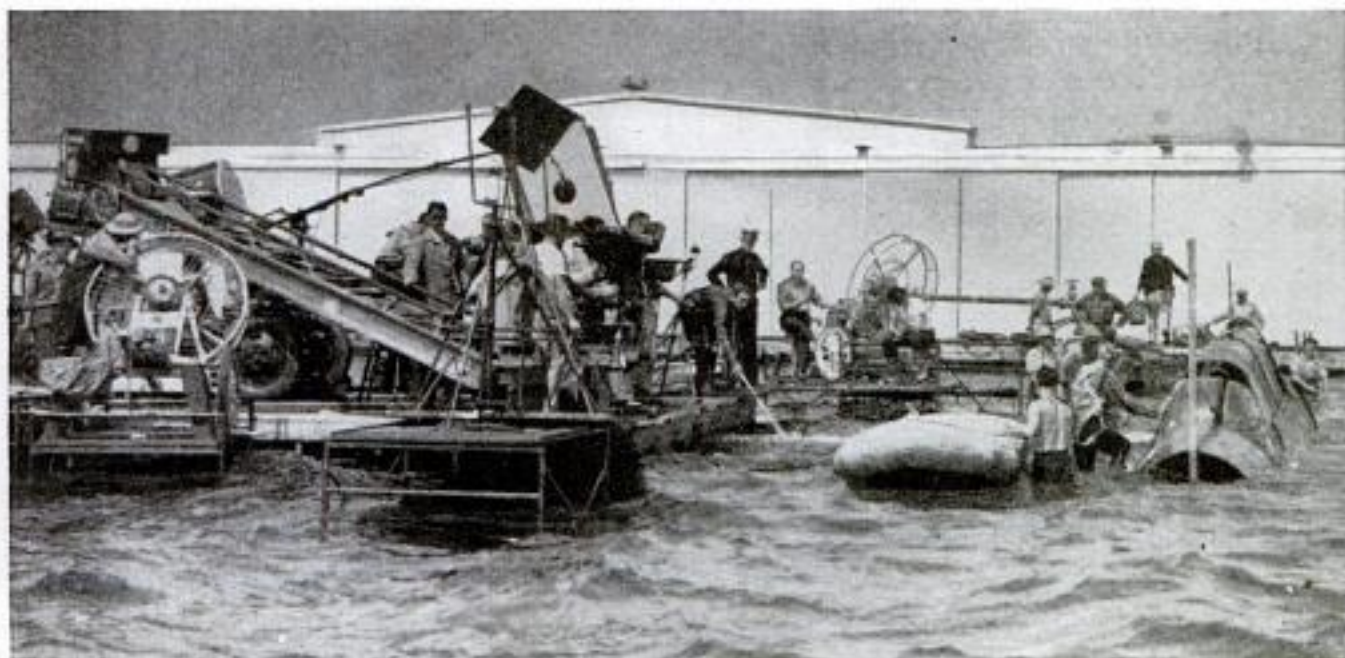
When a sound crew is on location, possibly at an air base where it has been sent to record the characteristic noises of a P-38 in flight, the men also pick up any other sounds that might be needed in the future. They tune in as a B-17 starts its engines, or they catch the heavy drone of a big bomber formation overhead. All such sounds are added to the studio's sound library. This consists of thousands of feet of recordings of thousands of different sounds.

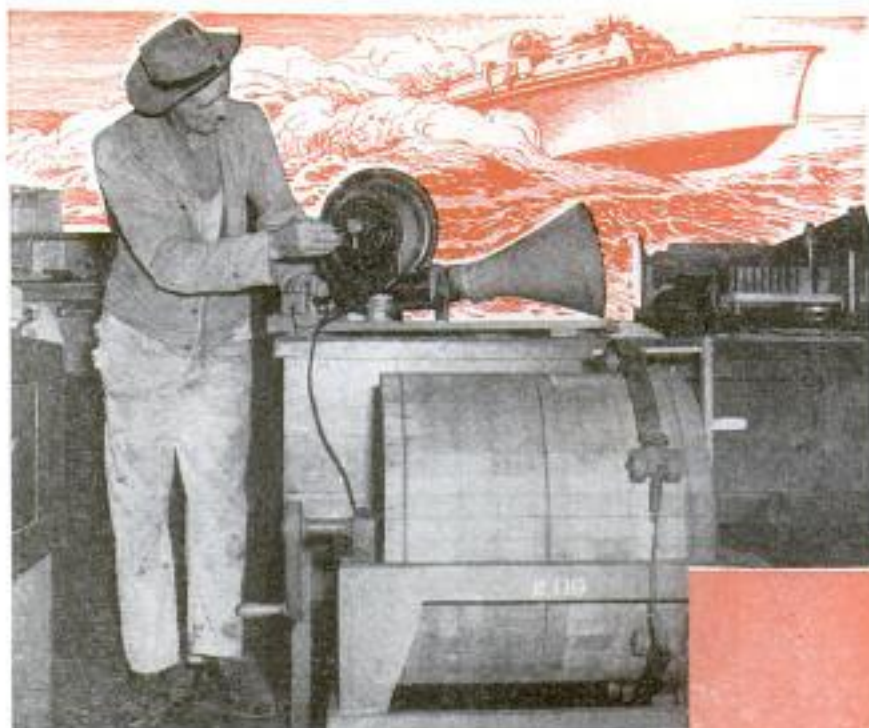
Thus when specific battle noises are needed the first place to look for them is in the sound library. But just the right kind of machine gun fire, for example, may not be on file. Then it's up to J. D. Delfino, the studio's sound effects man, to produce it. Delfino builds a wooden box with a hardwood sounding board at one end. A metal rod slams against this board when a crank is turned, imitating perfectly the heavy explosions of a machine gun. Turn the handle once and you get a single shot; keep turning it and you produce a burst of firing noise. To produce the effect of a Jap automatic weapon, a thinner sounding board is used. This gives a higher pitched note.

Recently the studio men were turning out the battle noises of two different wars at the same time. One group was busy on "A Wing and a Prayer" while another



Sets of steam whistles and electric bells are mounted in studio
Preparing to film scene as pilot leaves sinking plane for raft





Adjusting blower for sound effect. Barrel simulates the rumble of torpedo boat's exhaust when crank is turned

was living in the past, putting together the sound effects for battle scenes of the first World War. These are being used in "Wilson," the story of the life and time of President Wilson.

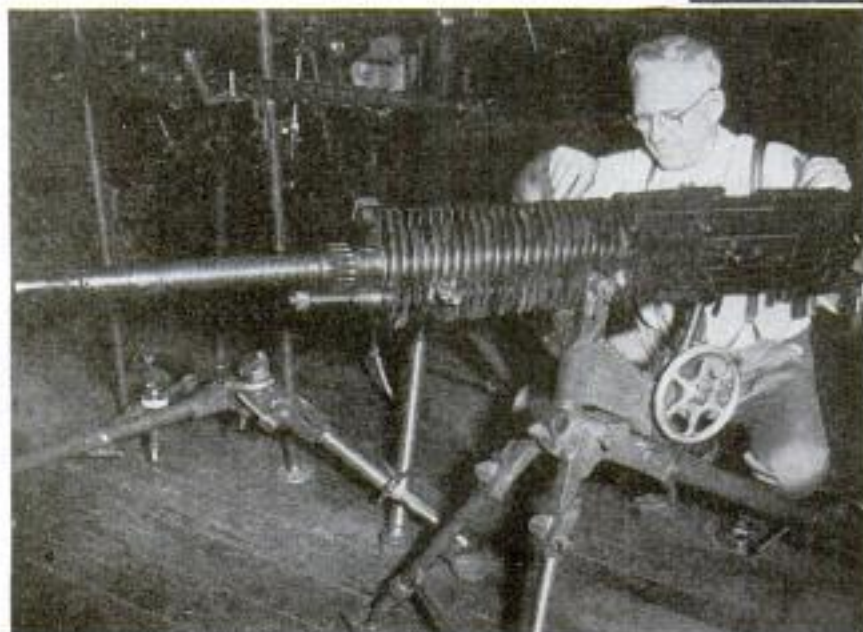
A bazooka sounds like a sky rocket when it is fired. Delfino expects to imitate this new type of projectile with compressed air when the need arises. Compressed air, too, probably will produce just the effect desired when the noise of a jet-propulsion airplane is to be simulated.

Delfino's department at Twentieth Century-Fox resembles a maniac's museum. It's filled with a weird collection of impractical-looking devices built from boxes, barrels,

lengths of rubber tubing, and assorted junk. Each machine produces a particular sound. Turn the handle of one and the rumble of an elevated train is heard. Operate the plunger of a second and the chuff-chuff of a tugboat's exhaust is produced. To get the effect of a ship's hawser straining against a bollard you move a friction lever that presses against a leather collar, making a realistic creaking and groaning.



Above, preparing to install directional microphone in place of conventional "mike" on boom. Left, building replica of Jap machine gun for a movie



Delfino has created some 3,000 mechanical sound makers, all different, and he's never been stumped. In his department, too, are hundreds of domestic and foreign musical instruments, horns, chimes and whistles.

Part of the sound man's job is to produce silence on occasion. Musical instruments such as a bugle or piano are deliberately muted before they are

played upon in front of the camera. It's best to record the notes in a special acoustical recording room and then dub in the music on the sound track, matching the sound to the action on the film.

The studio's sound library, incidentally, has a large collection of the cries and noises of many wild and domestic animals. But the studio doesn't turn to Delfino when it needs an animal cry that isn't in its files, nor do the sound men head for the nearest zoo. Among Hollywood's odd professions is that of animal imitator. The studio merely calls in an expert who can bark, howl, or growl as needed. Practically all the screams, baby talk, and childish cries that are used in the movies are also produced by these adults.

In producing a war picture the movie makers create explosions and shell bursts in full size for the camera, yet the noise that is to accompany these explosions is often recorded in miniature. A bomb that apparently blows up a gun position right in front of the camera would wreck the camera and sound equipment as well, if the bomb were real. Movie explosions are created by firing buried charges that harm no one. These explosions don't always make a convincing noise, however, so the sound men make recordings of the explosions of small cartridges and charges that sound just right, close up. In the laboratory they can build up the volume of the miniature explosions to an intensity that suits the action of the picture.

Even most of the news reels of the war have had their sound added this way. Most actual battlefront films are made with 16 millimeter cameras unaccompanied by sound. The synthetic sounds that are added when the small film is enlarged to 35 millimeters for projection in the theaters are just as realistic as if made on the spot.

Plastic Molds Pop Out of Unit After Pre-Heating to Order

Like an automatic toaster, an RCA electronic power generator pops up plastic preforms for moldings after pre-heating them to order. The cabinet-like heater, which is rolled from one molding press to another, can prepare preforms for moldings weighing up to one pound. It includes an automatic timer which is set to the number of seconds required to heat a particular weight and shape of material.

Radio Corp. of America
SEPTEMBER, 1944

G. C. A. Victor Div.
Couders, N. J.

Sweeper With Magnetized Drum Picks Up Dropped Nails

Dropped nails, screws, washers, and other metallic objects can be picked off the floors of industrial plants by a magnetic floor sweeper operated like a lawn mower. Its revolving drum is permanently magnetized and requires no cumbersome energizing cables that trail and entangle the operator. The drum is 18 inches wide.



0 222
Stearns Magnetic Mfg. Co.
Milwaukee 47 Wis.

Magnifier for Micrometer Scale Speeds Reading of Numbers

Micrometers are quickly and accurately read without the usual eye strain with a transparent plastic magnifier that covers the scale. With the magnifier, tool and die makers and inspectors find it easy to split the divisions of the ordinary micrometer into tenths. The magnifier not only reduces errors in reading the scale, but protects the micrometer from dirt. It is available to fit all standard micrometers.



0 277
Labor Research Lab.
711 W. Lake
Menard, 8, Missouri

"Business Week"
5/20/44

. . . The **WORLD'S WORST**



The "Little Burma Road," a trucker's nightmare 11½ miles long, is a rugged testing ground for jeep combat drivers at Camp Walters, Tex. To get cars over bridgeless streams, they must be hauled over on a suspension line (above) or wrapped in big tarpaulins and floated over (upper left)



Motive power for a floating jeep (above) is supplied by G. I.'s paddling with shovels. Below, jeep is driven along sharp incline



*Little Buena Rd.
Driver Training Course
Camp Waltham, Texas*

0294

ROAD ..

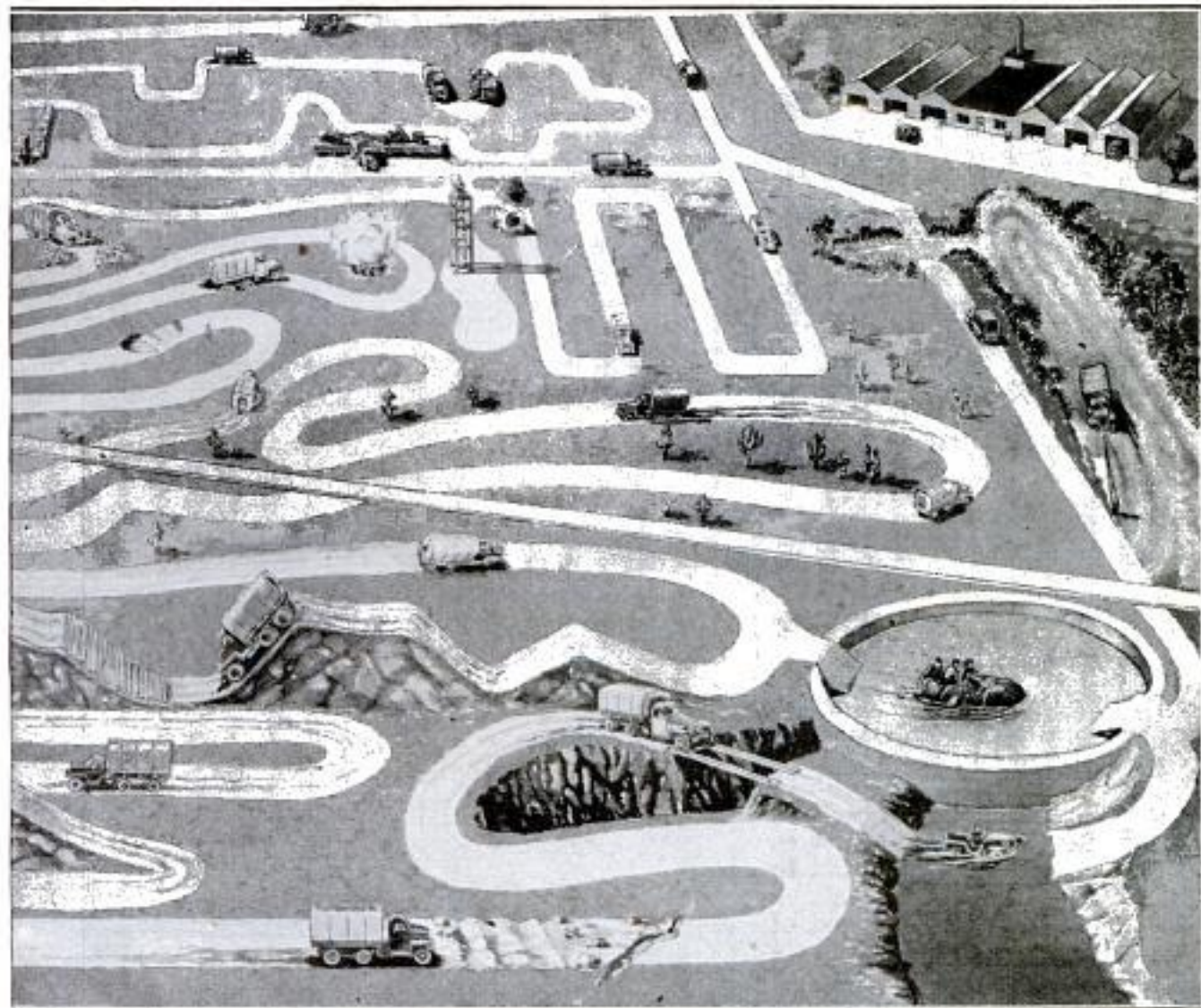


Right, jeep gets stuck in mud, one of the 28 obstacles driver must overcome to prove himself



Signal Corps photos

Below, map of the road, which was bulldozed out of rough terrain and then left to the mercy of the weather. In lower part, note the small, steep hills, which include two down grades of 45 and 75 percent and two up-grades of 45 percent. In extreme lower left-hand corner is a "corduroy" section—300 feet of railroad ties. Other obstacles are tank trap road blocks, blind curves, shelled area with holes four feet deep and desert area



Torch Signal for Night Raiders Directs Bombers to Stations



Traffic cops of the R.A.F. use electric torches to direct bombers to their dispersal stations after night raids over Germany. Just like the signalmen on the decks of aircraft carriers, the R.A.F. torch swingers have a special wigwag code. While the torches convey vital information to bomber crews, they don't give any secrets away to an enemy alert to radio waves. The signals are also useful when radio equipment on the planes has been knocked out of commission in combat.

Clotter Made Out of Blood Aids Brain Surgery

Made from the blood of volunteer donors, a spongy substance called "fibrin foam" quickly stops bleeding. It shortens the time previously required for brain and nerve operations, according to Army neuro-surgeons who acclaim it as one of the great medical discoveries of the war. Fibrin foam, which is rapidly absorbed by tissue, can be applied in sizes ranging from that of pinhead to golf ball. The larger applications are for implanting in the bed of removed tumors. Another development from blood plasma, is "fibrin film," which is being ap-

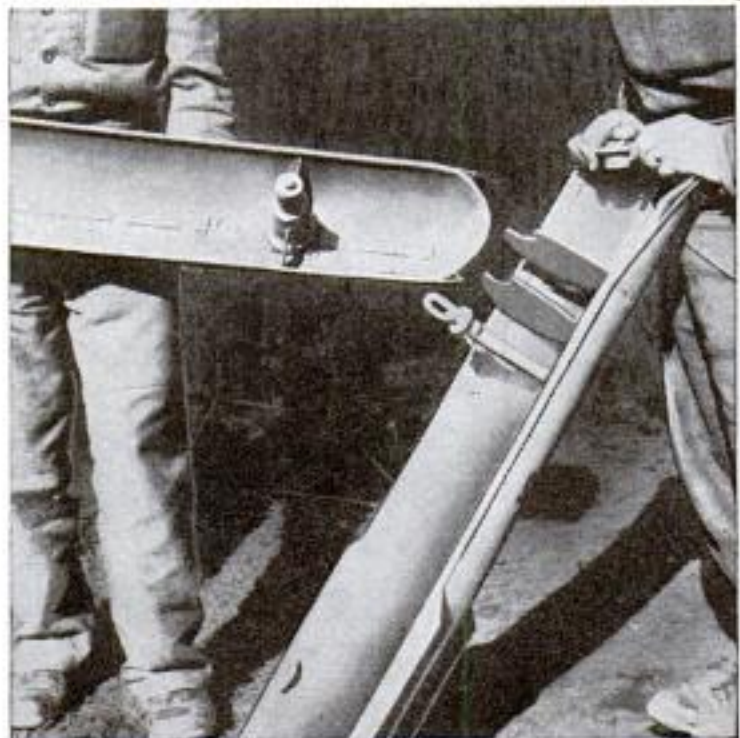
praised by the Army. It is a thin, tough material designed as a substitute for the "envelope" which surrounds the brain. Both "fibrins" are products of the department of physical chemistry at Harvard University.

Plastic Survives Boiling Without Losing Shape

"Cerex," a new thermoplastic which withstands sterilization, has been developed by the Monsanto Chemical Company. The plastic, which holds its shape and strength in boiling water and yet can be molded by the fastest, most economical methods, is used widely in radar, radio and other military electronic equipment where there is a demand for lightweight substances which have electrical and heat-resisting properties.

German "Butterfly" Bomb Scatters Explosives

Among the surprise weapons of the Germans is an anti-personnel bomb which Allied soldiers dubbed the "butterfly." It is dropped from a plane and opens after dropping a predetermined distance to scatter many small bombs in the path of advancing troops. The small bombs are of the delayed-action type. They often explode a day or two after they are dropped.



developed by: Dept. of Physical Chemistry, Harvard Univ.

all done in Mo.

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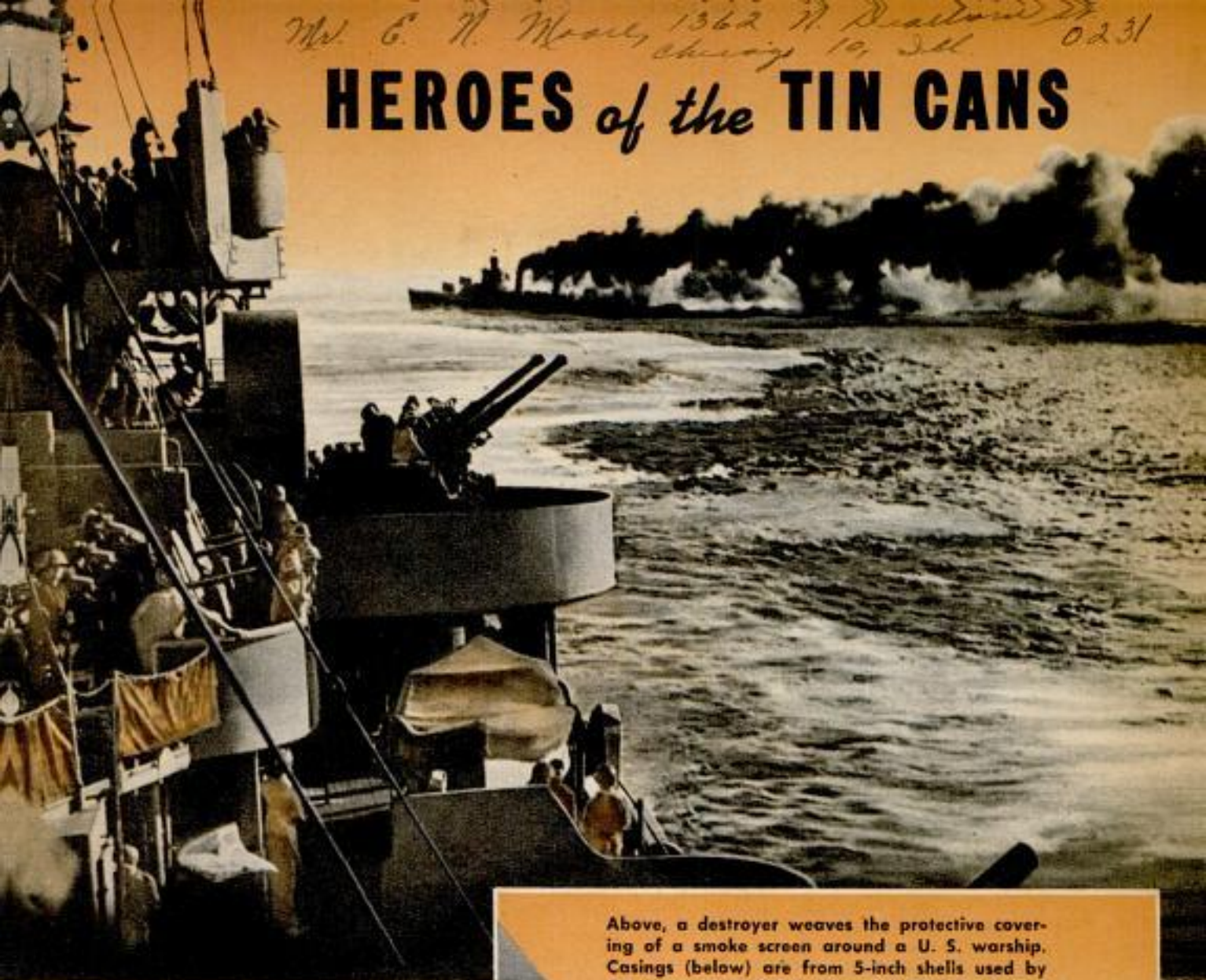
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penel

Mr. G. W. Moody, 1362 N. Beethoven St., Chicago 19, Ill. 0231

HEROES of the TIN CANS



Above, a destroyer weaves the protective covering of a smoke screen around a U. S. warship. Casings (below) are from 5-inch shells used by the destroyer to sink a submarine the night before

THE officers and men of Desron-Two had nineteen Navy Crosses, two Distinguished Service Medals, thirteen Silver Star medals, two Navy and Marine medals and 56 letters of commendation for outstanding service in action.

Desron-Two—official name of the Navy's Destroyer Squadron Two—had been literally everywhere in the war against the Japs. Its list of battles was impressive—Makin, Lae, Salamaua, Tulagi, Coral Sea, Midway, Santa Cruz, Guadalcanal. Its deeds in action were heroic—for example, most of the men rescued from three aircraft carriers sunk in the Pacific, the Lexington, the Yorktown and the Hornet, owe their lives to ships of Desron-Two.

Twelve destroyers comprised Desron-Two when it was organized in mid-1940. Five of them—the Sims, Hammann, Benham, O'Brien and Walke—were sunk





Above, destroyer knifing into a fairly rough sea. Note the ack-ack guns, depth charges and life raft on crowded superstructure

Below, U. S. aircraft carrier with escort destroyer. An important job of the "tin cans" is guarding "flat tops" and darting in to pick up the survivors if a ship or plane goes down



by the enemy in the Pacific. Yet not a single ship screened by this squadron had been lost through submarine action.

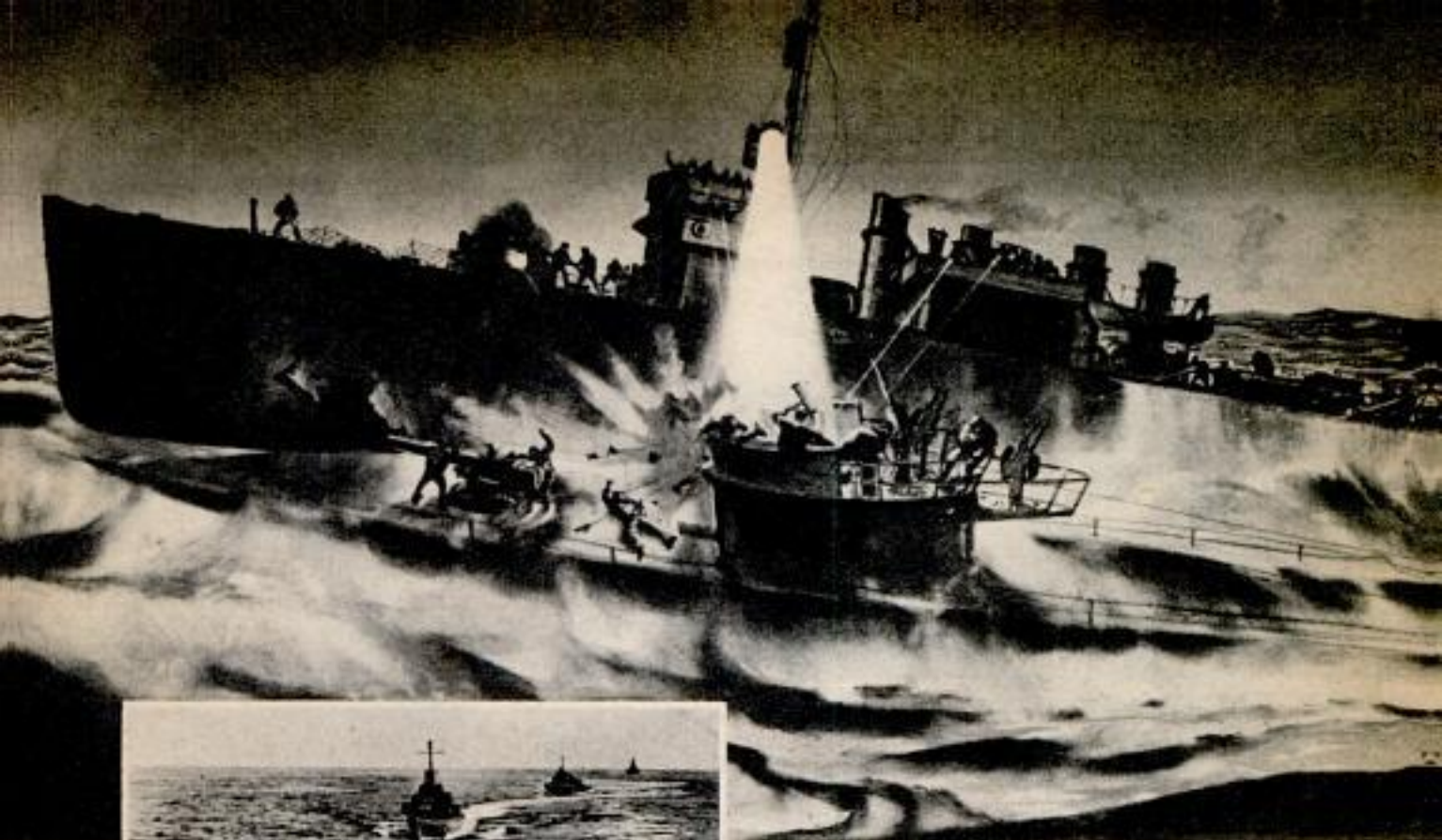
Yes, it looked very much like Desron-Two was about due for a Presidential Unit Citation, highest honor that can be bestowed on any unit of the fighting forces.

But when the citation was not awarded, the men of Desron-Two were neither surprised nor disappointed. For they knew, as did Admiral Chester W. Nimitz, commander-in-chief of the Pacific fleet, that their achievements had not surpassed the accom-

plishments of other destroyers and destroyer squadrons. They knew what Admiral Nimitz was talking about in quoting from the section of the General Order creating the unit citation, which reads:

"Recommendations will be confined to cases wherein the unit performs services in action above and beyond the high standard expected of our forces and is considered outstanding as compared to services of other comparable units engaged in the same or similar actions."

The work of Desron-Two can be regarded as typical of all destroyer action.



Above is a drawing which shows the U. S. destroyer Borie ramming and strafing a submarine. Searchlight shows German hit by shell case thrown by Navy gunner. Left, "tin cans" follow "flat top"

ute combat that saw the destroyer Chevalier sink after a hit by a torpedo. But despite great honors won by destroyer officers and men, and the notable part destroyers have played in almost every United Nations campaign where sea operations were involved, their activities, more often than not, are unheralded or overshadowed in the news by the operations of larger ships. On any basis of calculation, however, destroyers can be given a top-ranking role whether it be in convoy, in screen-

There are individual destroyers, of course, that have made headlines on many occasions. One of these is the O'Bannon which did receive a Presidential Unit Citation for a single ship as a result of a long battle record that culminated off Jap-held Vella Lavella when the O'Bannon, with two other destroyers, engaged a force of nine Jap ships, sank three and routed the others in a fierce 30-min-

Gun crew on deck after destroyer firing in night action





armor, weight being sacrificed for speed and great maneuverability. It has been estimated that the life of a destroyer in battle is only eleven minutes and the end of the Hammann in the battle of Midway when it was struck by torpedoes aimed at the carrier Yorktown came in just five minutes with a greater loss of life than was suffered by the entire air personnel participating in that historic engagement.

This "thin skin," however is not always dan-

Above, crew fires 20 mm. burst from destroyer escorting an Allied convoy. Right, destroyer guns are aimed skyward to protect perilous landing of American Fifth Army on the beach at Salerno, Italy

ing or escort work, in battle action, in anti-submarine operations, in bombardment of land installations, or in rescue tasks from the arctic to the tropics and from one hemisphere to other.

In Navy parlance, destroyers are called "tin cans," because of the lightness of the destroyer's protective



Below, the U.S.S. Nicholas, one of the 1940 Fletcher Class destroyers whose particulars were kept a secret from the public



gerous, for the destroyer's swiftness and agility is a great advantage in eluding enemy fire and darting in and out to deal quick and devastating blows. On one occasion, when the Japs held four remaining atolls in the Marshalls, the pilot of a Corsair fighter plane was shot down close to a shore where enemy guns were in action. A destroyer at once slipped in and picked up the airmen, all the while dueling shot for shot with the land batteries with the ship's quick-firing 5-inch guns. Though some of the firing was at close range, the "tin can" completed its mission with minor damage from two hits.

Rolling, pitching and plunging, even through heavy seas with breath-taking speed, U. S. destroyers can unleash terrific firepower.

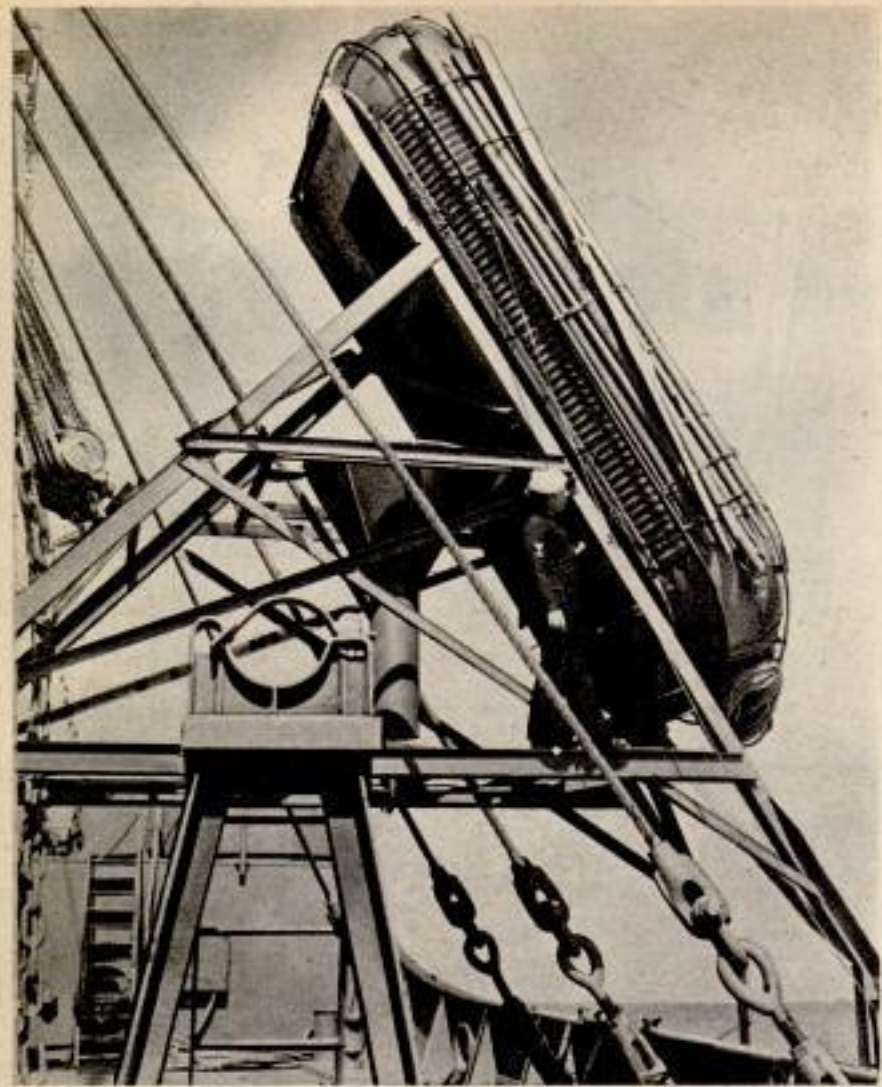
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Above, message secured to a line from a U. S. Coast Guard cutter is hauled aboard a destroyer. Below, wounded airman rescued by a destroyer is swung aboard an aircraft carrier by breeches buoy



Unsinkable Steel Life Raft Carries Twenty Men



Made of 16-gauge cold rolled steel, a life raft used on Victory ships can carry 20 men and is unsinkable. In addition, it can load a half ton of supplies and equipment, including mast, oars, sails, food, blankets, fishing kits, sea anchor, storm oil, Bible, and playing cards. No matter how the raft hits the water, in being launched, it floats topside up, since both sides are exactly alike. It is 16 feet, 2 inches long with an 8-foot beam, and has a bow to aid sailing or rowing. Its outer shell containing 19 airtight compartments is three feet in diameter and has so much buoyancy it draws only 6½ inches of water under maximum load. Empty, the raft weighs 2,425 pounds.

Left, launching the life raft, which always lands topside up, no matter how it hits the water. Both sides are identical

Back Yard "Dive Bomber" Rides Under 50-Foot Cable

With bits of scrap and plenty of ingenuity, an English aircraft worker built a "dive bomber" in his back yard. It "flies" 50 feet. The plane, which holds several children, is suspended from a cable with a pulley arrangement. After the "bombing run" the plane is pulled back up the cable with a rope. Phonograph motors turn the propellers to add to the realism.

in England



Children riding the "back yard bomber" on one of its routine flights

☛ A new automatic high-speed sprinkler system protecting the rocket powder factories of the Hercules Powder company has extinguished fires one-fifth of a second after they started.

"Flying Whale" Carries "Jonah" to Repair Base



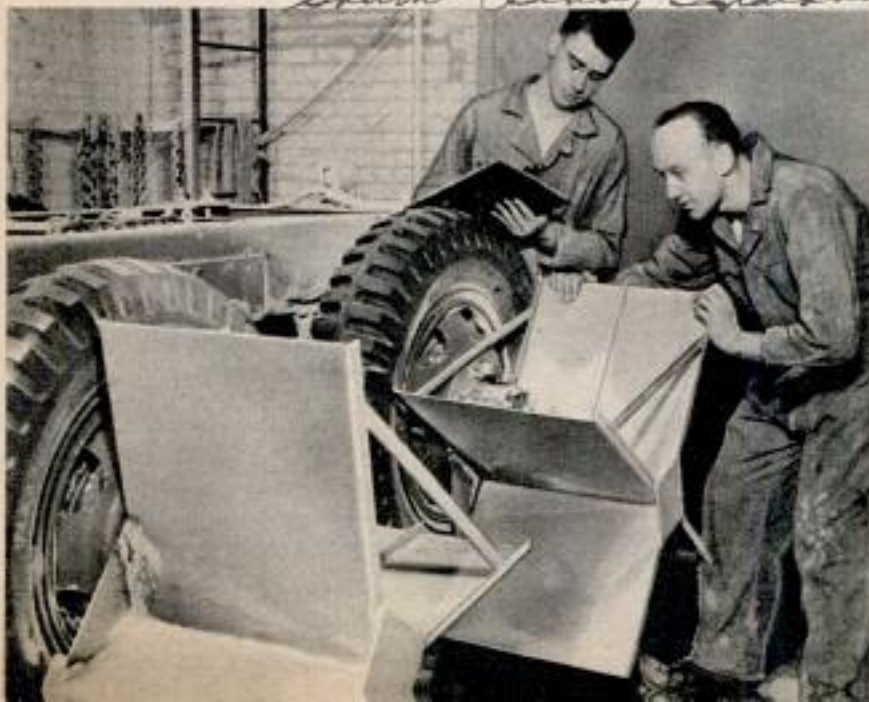
Just as Jonah was once swallowed by the whale, a small plane of the Air Service Command was drawn into the cavernous mouth of a large experimental all-wood cargo plane at Fullerton, Calif., recently for

transportation to a repair base. The small plane had been grounded, with a cracked cylinder head. This was the first time the A. S. C. loaded one plane into another for flight purposes.

Wind and Sand Pelt Tanks in Man-Made "Dust Bowl"

Full-sized tanks, trucks and other military vehicles are subjected to artificially produced sandstorms in a "dust bowl" installed in a Studebaker Corporation laboratory to test the life of mechanical parts under desert conditions. Through a series of air induction jets and miniature wind-

mills, almost any wind velocity and dust intensity can be churned up in the laboratory, believed to be the largest of its kind in the world. Since engineers can enter the dust chamber only when wearing respirators and cumbersome protective clothing, the "driver" sits in a sealed booth before



a window and operates the vehicle by remote control, stopping, starting and steering according to an experimental procedure. One test calls for the wheels of the vehicle, mounted off the floor, to be brought to 35 miles per hour for five minutes, then braked to a stop. Driving over rough terrain is simulated by eccentric weighting of the wheels so that they bob up and down. Wheels are fitted with huge paddles to cause a maximum whirling of dust.

SMOKE *the* LIFESAVER

*Major Gary O. Gilmore, C. W. S.
Information Branch
Chemical Warfare Service,
Army Service Forces
Washington 25, D. C.*



Chemical warfare troops lay a smoke screen before fording a stream on maneuvers in New Caledonia

ENEMY gunners find it about four times as hard to hit the target when smoke gets in their eyes. That's why an ingenious variety of smoke prepared by the Chemical Warfare Service is considered a big factor in reducing American casualties on the fighting fronts.

Adapted for offense as well as defense, our smoke pots and fog machines have covered air attacks, prevented bombings,

shielded river crossings, blinded enemy artillerymen, mystified axis machine gunners and protected our infantry advances. Although the employment of artificial smoke in battle dates back to the days of Caesar and Pompey, who used it in landing operations, its skillful use in enormous quantities is "a startling development of this war," in the opinion of Maj. Gen. William N. Porter, chief of the CWS of the United States Army.

It was 5:50 o'clock one afternoon last November when the sound of a low-flying aircraft sent the port of Naples in "condition red." The order went out, "make smoke!" At 6 o'clock the plane was identified as friendly, and the order came, "cease smoke!" Within that brief ten minutes the whole city had been blanketed under clouds of artificial haze. By coincidence, a German bomber formation was approaching, little realizing that the city was already invisible

Left, loading smoke liquid from 55-gallon drums by gravity feed into smoke tanks in New Guinea

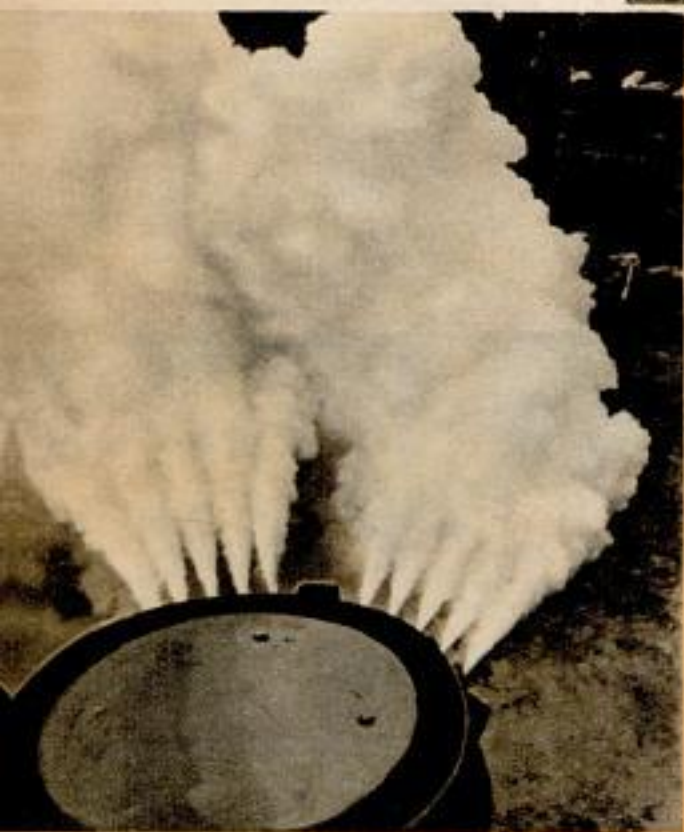


from the air. At 6:06 these German formations were identified and the order was repeated, "make smoke!" The man-made mists over Naples were promptly strengthened.

The German aircraft made a rendezvous while flare-laying planes went over the port to mark the targets. One flare-layer circled over the harbor, searching for his targets in the blinding smoke. The plane was heavily engaged by ack-ack. As the flyer weaved and bobbed in desperation, the bombers waiting for their targets to be illuminated



Above, chemical warfare service company starts a smoke screen with a 4.2 chemical mortar or "goon gun" which fires white phosphorus smoke and some high explosive



Above, smoke issuing from a "fog machine." Right, under cover of smoke pots burning in foreground troops and equipment push ashore from a landing craft during an air alert on the Salerno beach

finally made a half-hearted attack. They dropped their bombs at random, and most of them fell into the sea. By the time the flares had been released, the German bombers were disappearing over the horizon. It was a wash-out raid, made ineffective by Chemical Warfare Service smoke generator companies equipped with fog machines and smoke pots.

On another occasion in Italy a CWS unit with each of its chemical mortars, or "goon guns" lobbing a 25-pound shell every 15 seconds, established a screen nearly 1,000 feet high, for three miles along the Volturno river, to blind the enemy. This screen was maintained for 18 hours while Combat Engineers spanned the stream with





Above, how a plane releases sulphurtrioxide smoke from a belly tank. It can provide a 400-foot wall to screen paratroopers

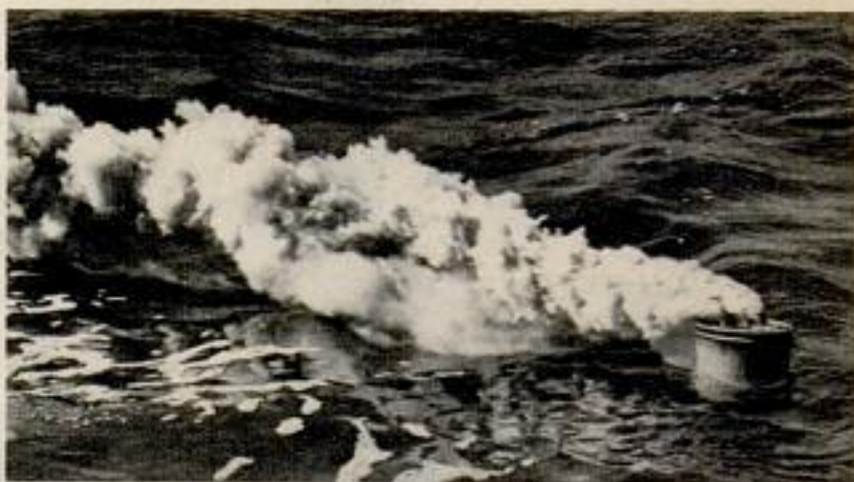
bridges. At other points the supporting Chemical unit threw up screens into which the Nazis poured bullets and shells, confident that the bridge-builders were toiling behind the clouds. The Nazis were wrong. In this particular operation the screens were decoys and the engineers, working several hundred yards away, finished the bridge unnoticed.

Even the humble smoke pot has furnished spectacular assistance. One day last January troops and equipment were streaming along the highways at the foot

Right, a 5-gallon smoke pot for amphibious war. Below, smoke laid by planes covers mass landing of paratroopers

of Mount Trocchio near Cassino. German artillery on the mountain had direct observation of the area and began pumping shells into the road. It was imperative that these supplies be kept moving up to the front. Members of a chemical battalion set out hundreds of smoke pots around the shelled area, producing a huge screen six miles long and two miles high under which the key highways disappeared from view. The Nazi gunners, blinded, fired more than a thousand shells into the area, but because of the protective cover there was practically no damage, and traffic proceeded with little interruption.

One of the most spectacular smoke operations occurred in the Markham River Valley, near Lae, New Guinea. Japanese ground crews at their Nadzab airstrip were surprised on September 5, 1943, as seven Boston bombers appeared over the mountain crests, each carrying two M-10 smoke tanks under each wing. There were faint pops as the glass



outlets of the smoke tanks were blown open by detonators and, as the bombers dropped into the valley, smoke billowed from the aerial tanks, settled rapidly to the ground, then rose to form walls 400 feet high and 4,000 feet long. Under cover of these cloud walls, low-flying transports, which had followed the smoke planes, disgorged more than a thousand paratroopers. By the time the smoke had dispersed, the parachute soldiers had organized for a successful attack on the airfield.

Japanese shipping in Simpson Harbor at Rabaul, New Britain, was attacked on November 2, 1943, under cover of aerial smoke. Jap anti-aircraft gunners looked up to see formations of American bombers roar in over the harbor and split into two separate flights. They saw the bomb bays open and 100 pound phosphorus bombs fall from the planes. Laid in long, neat rows along either side of the harbor, the smoke bombs "walked" through the AA positions. Within seconds the phosphorus had reacted with the air to produce two dense smoke walls, each three-quarters of a mile long, to mark off the harbor.

An instant later, succeeding waves of bombers appeared through a small opening in the screen and streamed low over the vulnerable ships. Blinded by this man-made fog, the Jap anti-aircraft was unable to fire accurately, and the mission was successfully completed.

Military use of smoke is two-fold: Area screening over cities, harbors and vital installations to prevent accurate bombing, and wall-like screening across battle fronts to blind enemy observation.

The CWS makes smoke in four ways: (1) Burning-type munitions, such as smoke pots, using heat to vaporize chemical mixtures. (2) Exploding bombs, shells, and grenades scattering white phosphorus, which reacts on exposure to the air to form dense white smoke. (3) Liquid smoke chemicals sprayed from tanks mounted under wings of planes. (4) Steam mixed with oil spray produced by fog machines, such as the mechanical smoke generator.

The M1 mechanical smoke generator, which screened Naples, is the Army's biggest smoke producer. Resembling a Gay Nineties fire engine, it consists of fuel tanks and a boiler mounted on a trailer for towing and is operated by a two-man crew. With suitable wind one generator can, within ten minutes, screen a square mile.

Vital ports in the North African and Central Mediterranean areas have been protected by these machines ever since the American smoke-makers arrived in Oran in November, 1942. The port of Algiers has had continuous smoke protection since that

Continued to page 154



Gun Shoots Four Miles Higher To Break Ack-Ack Record

Capable of hurling a projectile 20,000 feet higher than any other known anti-aircraft weapon, the army's "stratosphere gun" is one of its most formidable new pieces of artillery. The 120 mm., 4.7 inch gun, which dwarfs other army equipment, is operated by six men.

"Flying Flossie" Tossed Into Air To Test Aircraft Catapults 0256

"Flying Flossie," a steel water tank on wheels, may be a strange looking piece of equipment to be operating with the Royal Navy but she has an important job. Several times every day "Flossie" is hurled into the air to test new aircraft catapults of British battleships. If a catapult proves to be defective, no tragedy results because "Flossie" is built to absorb hard knocks.



BATTLE OVER --- BATTER UP!

By Paul Healy

WHEN the bedraggled Marines disembarked on the small Pacific island for their period of rest, they looked tired, gaunt and lifeless. The memory of killing hung like a pall. But after a refreshing plunge into the sea, they scoured the beach until two of them discovered a coconut. Instead of eating it, they began to toss it—soon the battle-weary platoons were racing up and down the shore in an exciting game of touchball!

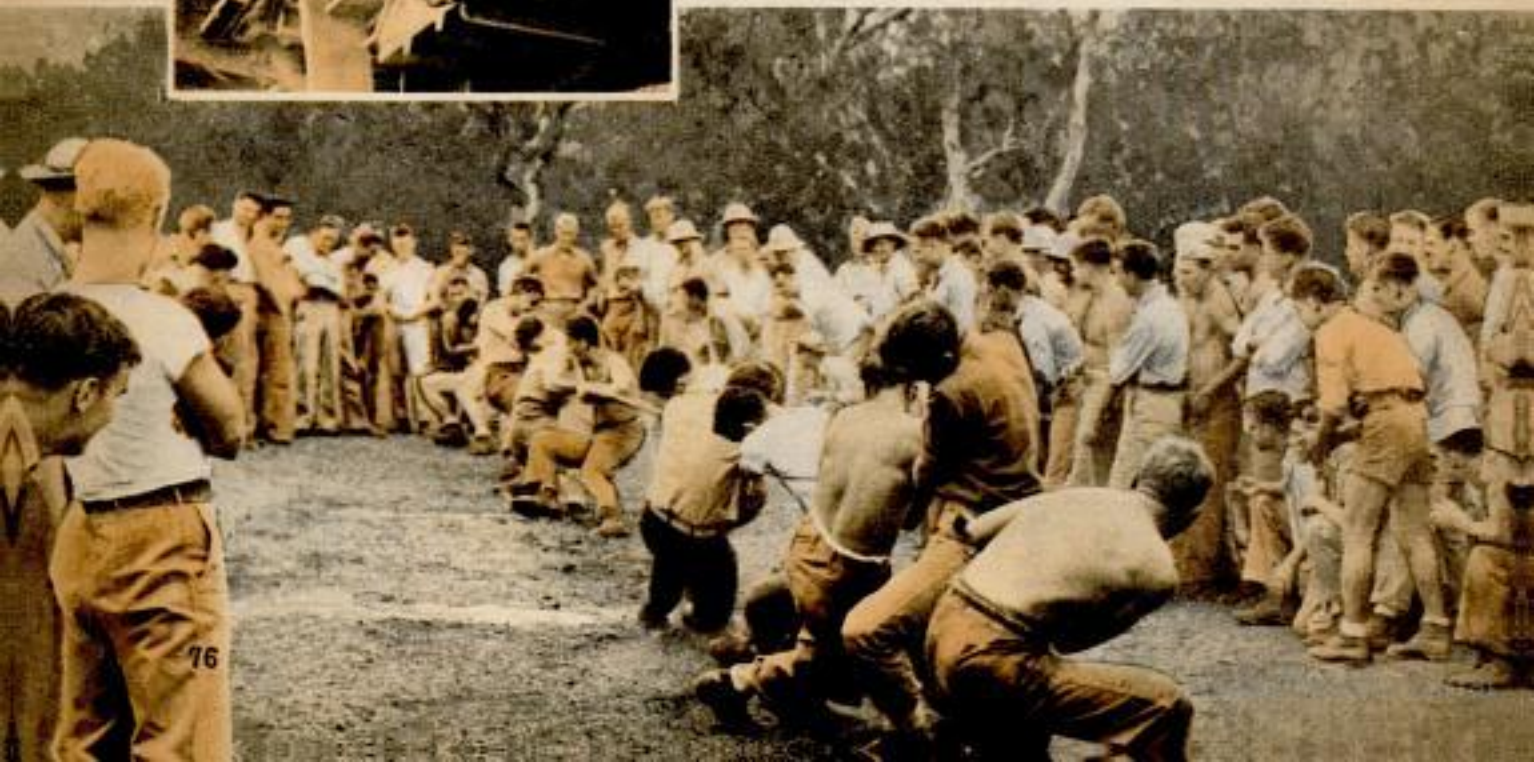
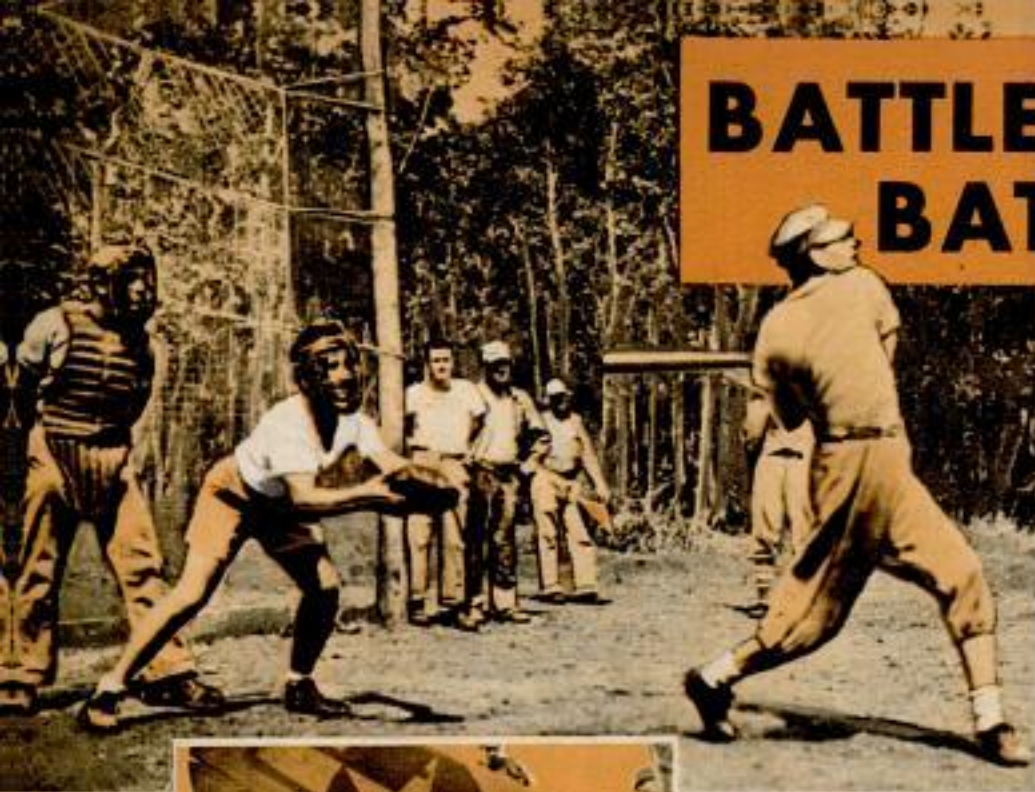
Seabee (above) slams out a hit in game on Guadalcanal

Left, crewman dives from the cat-walk of a U. S. flat-top
U. S. Navy photo

The incident is typical of the ingenious ways in which American servicemen relax at the front. As youths who had hardened their muscles and developed a competitive spirit on neighborhood sandlots and in country fields, they know the value of rough and tumble recreation. Once they lay aside their weapons for a ball and bat (or reasonably accurate facsimiles), trot onto whatever will serve as a playing field, and begin to "rib" their opponents, the strain of combat is temporarily forgotten, even though they may be within earshot of enemy gunfire.

In one manner or another almost all the native

Below, Marine raider battalion puts on tug o' war during field day exercises staged to amuse and relax the veterans overseas
U. S. Marine Corps photo



American sports are staged overseas. Last spring 600 marine veterans on Bougainville organized a softball tournament. With the help of the army engineers and the Seabees, 21 first class diamonds were hacked out of the jungle or built in reclaimed swampland, complete with scraped infields, grass outfields and wire backstops.

One group of Seabees laid out a sporty nine-hole golf course right in the jungle, fashioned their own clubs, and organized tournaments.

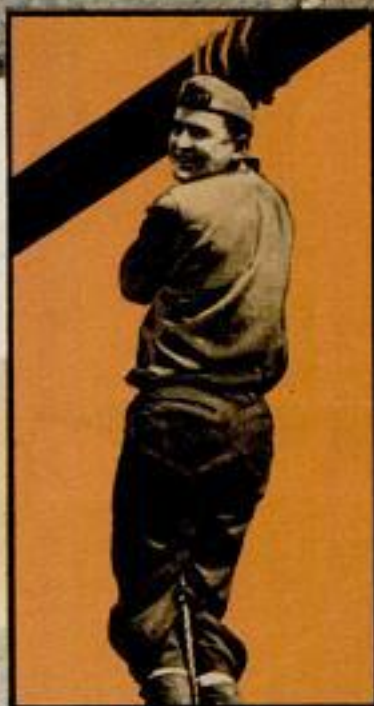
Apparently, no obstacles are too great and no playing fields are too preposterous for our sports-hungry soldiers, sailors and marines. In New Guinea, for example, the only way soldiers could play "golf" was to use darts instead of clubs and balls in the jungle "fairway." The 18 discs which represented holes were distributed on various trees. Heavy darts, thrown from 50 feet, represented the driver and brassie. The light dart was used for approaches and putts. This battalion also carved out of the undergrowth what they claimed



Above "Austus Tussle," a new game played by the Marines

Right, Marine completing 30-foot climb up rope obstacle

Below, flat-top crew relaxes after invasion of Kwajalein





Above, Marines practice football "somewhere in the Pacific"



was the only bowling alley on any fighting front.

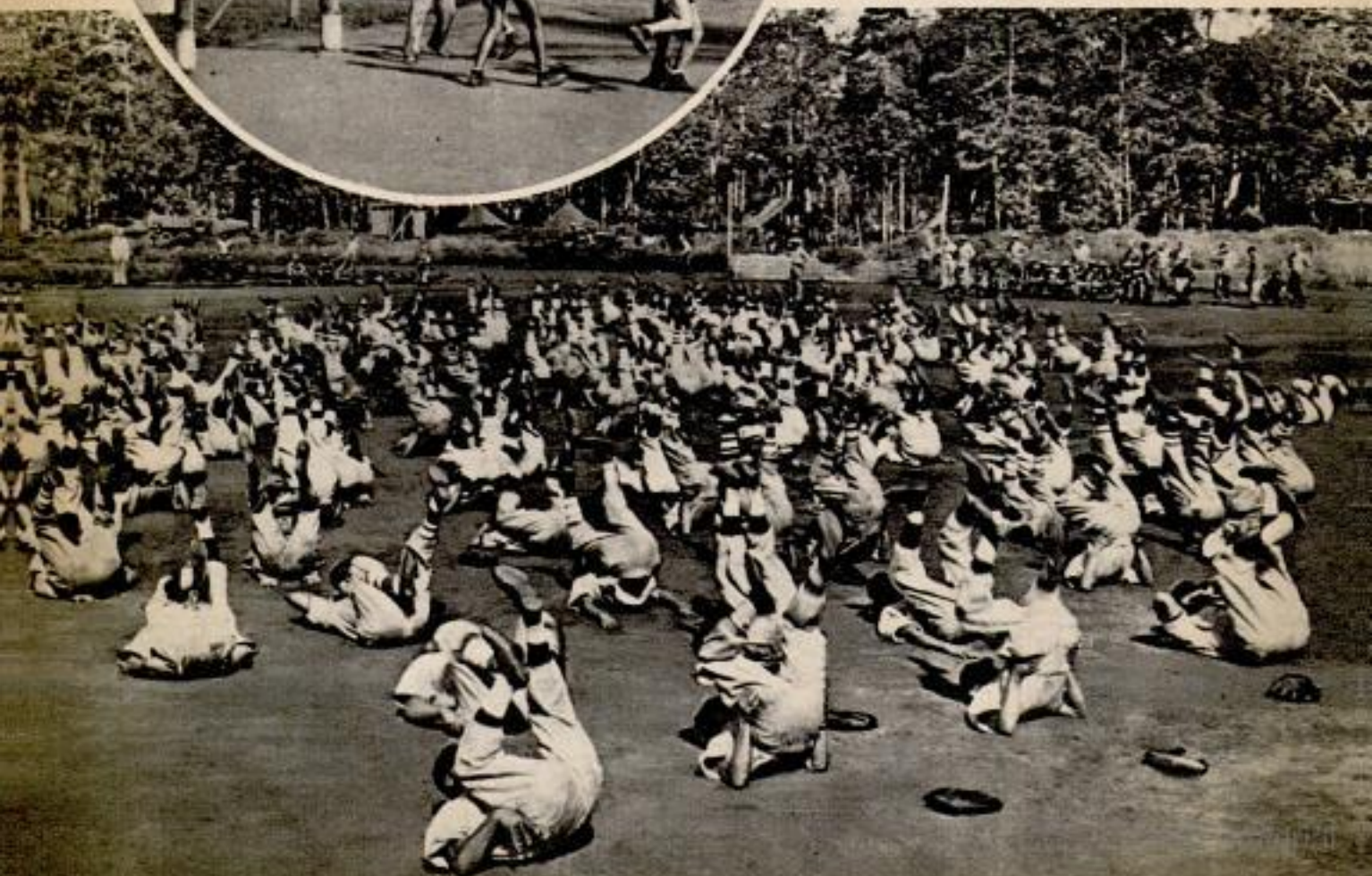
When a lease-lend convoy was marooned at Archangel one summer, baseball bats, playing fields and even a catcher's mitt were improvised on the spot, and a White Sea league of four teams, one from each ship, was organized by Navy men and merchant marine sailors.

Often Yankee ingenuity adapts itself to strange lands by making up new games or changing old ones. Take "underleg," one of the recreational phenomena of World War II. It is a modified baseball, in which the "batter" throws the ball as far from the fielders as possible. He must reach first base before the ball is returned.

New sports devised by the marine corps are "Canteen Canter" and "Austus Tussle." The former is a variation of the old sack race. The contestants, carrying cups filled to the brim with water, try to cover a 50-yard course dotted with holes, logs and other debris with the least water spilled.

"Austus Tussle" is a mixture of Australian and American football.

Tropical Marine basketball court (left) is sand and ball is made of rubber to keep it from getting soggy. Below, Marine ball players perform conditioning exercises





Above, Air Force private is k.o.'d by Marine. Upper right, wild steer bucks off Marine during rodeo at a Pacific base. Right, Marines stage coconut crab race

On an oval field 150 to 200 yards by 100 to 170 yards, the object is to throw or kick the football through the goal posts at opposite ends of the field. There are 18 players on each side, all eligible to throw or receive passes. When a player catches the ball, he is eligible to be played on, and in "Austus Tussle" anything goes.

While resting up from the terrific battle of Tarawa, marines staged an old-fashioned barbecue and rodeo, roping and riding broncos.

On an LSD (landing ship, dock) marines returning from combat swam in the cavernous well deck which was partly flooded so that amphibious tractors could be driven aboard. After the water was pumped out, the Leathernecks started a softball game. Later handball enthusiasts played against the bulkhead and all the way back to the base this open-to-the-sky deck was the center of sports activity.

Many high-ranking officers share the American fighter's passion for athletics. Maj. Gen. Claire L. Chennault, head of the 14th Army Air Force in China, is highly respected as a softball pitcher. Soldiers who saw Lt. Gen. Mark Clark approaching them in the midst of a baseball game in North Africa were delighted to hear him demanding a turn at bat.

So effective as morale-boosters are competitive sports that Adm. Chester Nimitz declared the recreation center organized in the South Pacific by Lt. Comdr. Jimmy Crowley, former Fordham University football coach, to be worth five battleships.

Carrier men race while walking on their hands



NURSES' TRAINING --- AND HOW!



If the troop ship on which they go overseas should be torpedoed, climbing down a cargo net will be old-stuff to the nurses

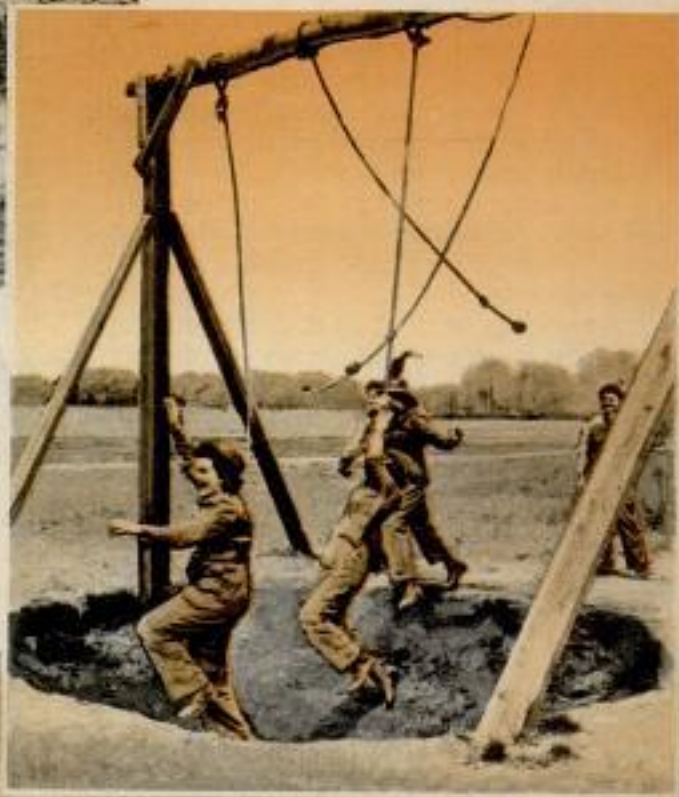
*Major G. Venter
Public Relations
P.O. 7, Westbury
Fort Devens,
Mass.*

Army photos. 1st Service Command

Up and over! U. S. Army nurses clear a three-foot water hazard on the obstacle course at Fort Devens, Mass. Basic training for nurses is rugged, but fits them for overseas duty

There's fun to be had as well as aching muscles by swinging on ropes (right) across pit

Below, crawling through tunnels on all fours may help these nurses dodge bullets at front



'Casey Jones' Jeep Shifts Wheels to Run on Rails

Built to bounce over the roughest kind of terrain, the versatile army jeep has been adapted to skim down the railroad track. A "Casey Jones" model was devised by Maj. H. G. A. Mauldin, of the Royal Engineers, who equipped the vehicle with two sets of interchangeable wheels—four of them with tires and four a variation of flanged trolley wheels. A special clamp holds the front wheels straight for rail travel, at which time the tires are carried in racks. The jeep is used for track inspection and other jobs.



0195

Chemists Find Synthetic Quinine After 100-Year Search

After a search of 100 years, a synthetic method of producing quinine, the anti-malarial drug, has been found by Dr. Robert B. Woodward, of Harvard, and Dr. William E. Doering, of Columbia University. The climax to their laboratory experiments came when they were able to create quinotoxine, a chemical which originally had been produced from quinine by Pasteur.

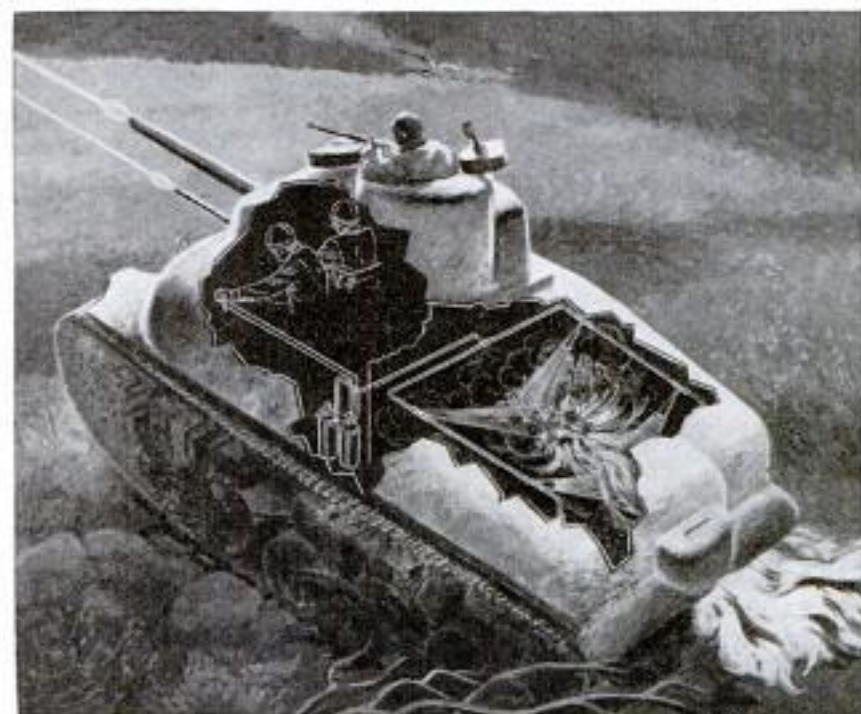
The scientists followed the method found by Rabe, a German chemist, for reconvert- ing quinotoxine into quinine. Natural quinine is extracted from the bark of the cinchona tree, which grows in Java and Latin America. Medical authorities hope the synthesizing of quinine will lead to the development of a prophylactic which can not only fight malaria but prevent it.

Polaroid Corp., Cambridge 39, Mass.

Fire Signal Warns Tank Driver to Kill Blaze With Gas

Flames in United States Army tanks can be extinguished in seconds through an im-

proved fire-fighting system. A detector



whereupon the driver pulls a lever, instantly flooding the engine compartment with a blanket of blaze-smothering carbon dioxide gas. The detector contains two organic filaments, each of which holds open an electric switch. Close approach to flame destroys the filaments and thereby closes the circuit, which flashes the fire signal. Formerly used only in aircraft, the system was adapted to combat the highly flammable vapors of the high-test fuels in war vehicles. The system works whether the tank is on its side, back or right side up, and regardless of the jolting.

*Mfg: Walter Dillinger Co.
88 West St.
N. Y., N. Y.*

0238

0207

*Cont: Spence-Gammell Co.
40 E. 34th St.
N. Y. 16, N. Y.*

RESCUE

From that point on, the rescuers faced few difficulties. The whites—including a Royal Canadian Mounted Police constable, the trading post manager and his wife, and a clerk—were evacuated by the plane, and the Eskimos were brought supplies.

Key to this successful rescue, as in many others equally spectacular, was the parachute. Without it, aerial rescue operations would often be impossible in remote regions where airmen are forced down or travelers stranded. In the Fort Ross rescue, an attempt to land the plane without expert guidance of the officer dropped by parachute might have ended in disaster.

The parachute is the cornerstone of rapidly ex-

Jumper lowers rope from 'chute. Below, huge messages tell story

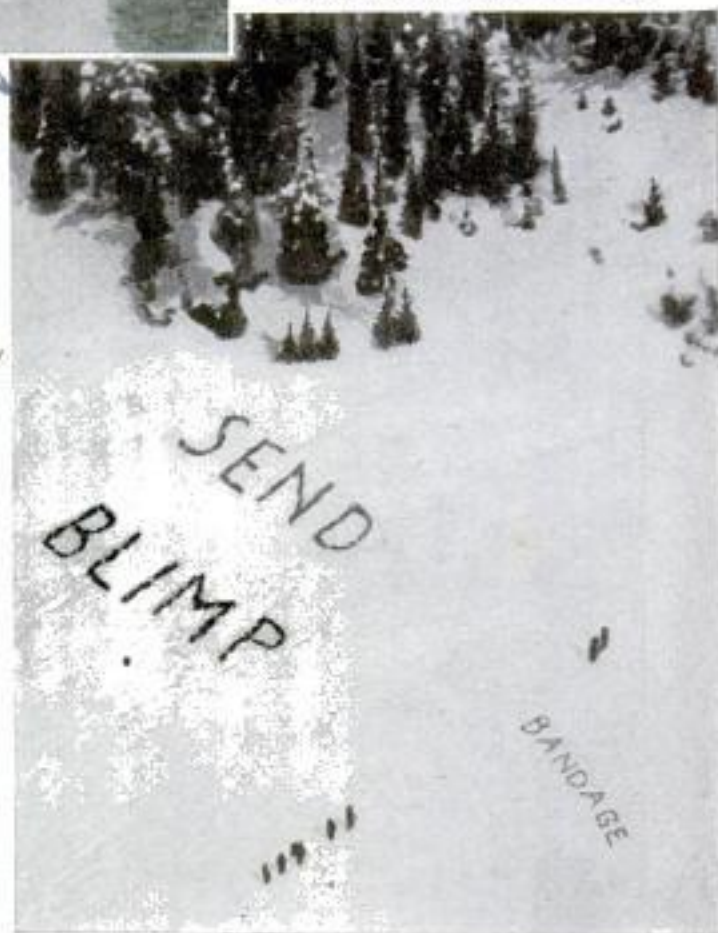


FOUR hundred miles north of the Arctic Circle—at Fort Ross, Hudson Bay Eskimo trading post and farthest north of Canadian settlements—four white persons, one a woman, and 50 natives were marooned.

Eight days' food remained. Their supply ship, *Nascopie*, had failed to break through the ice to the northern tip of Boothia Peninsula on Bellot Strait, three miles from Hazard Bay where the post is situated. The Royal Canadian Air Force had no rescue plane available.

Only one hope remained—the U. S. Army Air Force, to which a rescue appeal was made.

Day and night, the stranded group watched the skies for help. At last a plane was sighted. But it did not land, for ice conditions were hazardous, even for a ski-equipped craft. Instead, by parachute, came 2,000 pounds of welcome supplies—and a U. S. Air Force officer. It was the officer's task to test the ice and select a suitable landing place, then to direct the plane from the ground. Next day, a safe runway was laid out on the ice and marked with bags of coal.



*Mr. G. W. Mason
1362 N. Dearborn St.
Chicago 19, Ill.*

0 156

from the SKY...



AAF rescue squadron applies first aid to "crash victim." Right, ready to go aloft is "para-rescuer" of Coast Guard

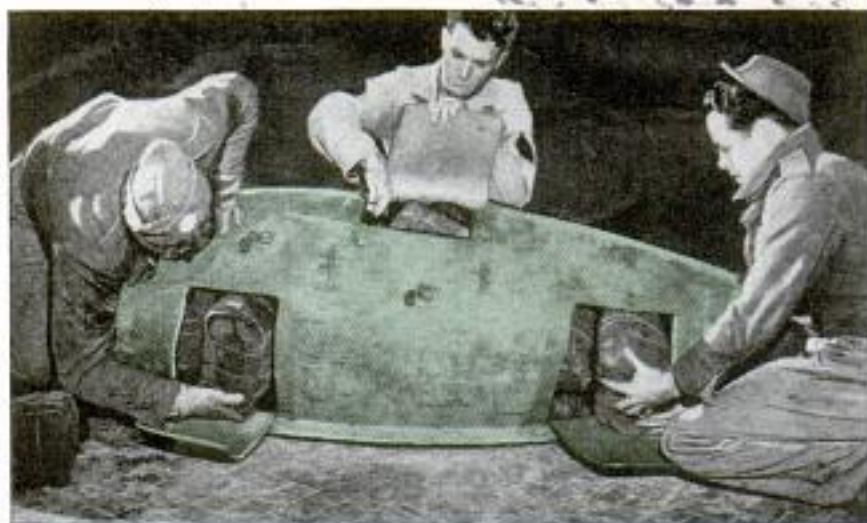
panding aerial rescue programs now extending to all branches of military and civilian aviation, and even to such organizations as the U. S. Forest Service. These programs will be a vital adjunct to postwar aviation when global air lines extend over Arctic wastes, little traveled seas and vast areas untouched by civilization.

Because of its widespread experience in training and employing "smoke jumpers" in fighting forest fires, the U. S. Forest Service of the Department of Agriculture has taken the lead in parachute rescue activities, and the Forest Serv-



Dog team aids work of rescue crew training on snowy lake





Loading rations into auxiliary gas tanks to be dropped to paratroopers at advanced post. Tank is carried (below) on bomb rack under the wing

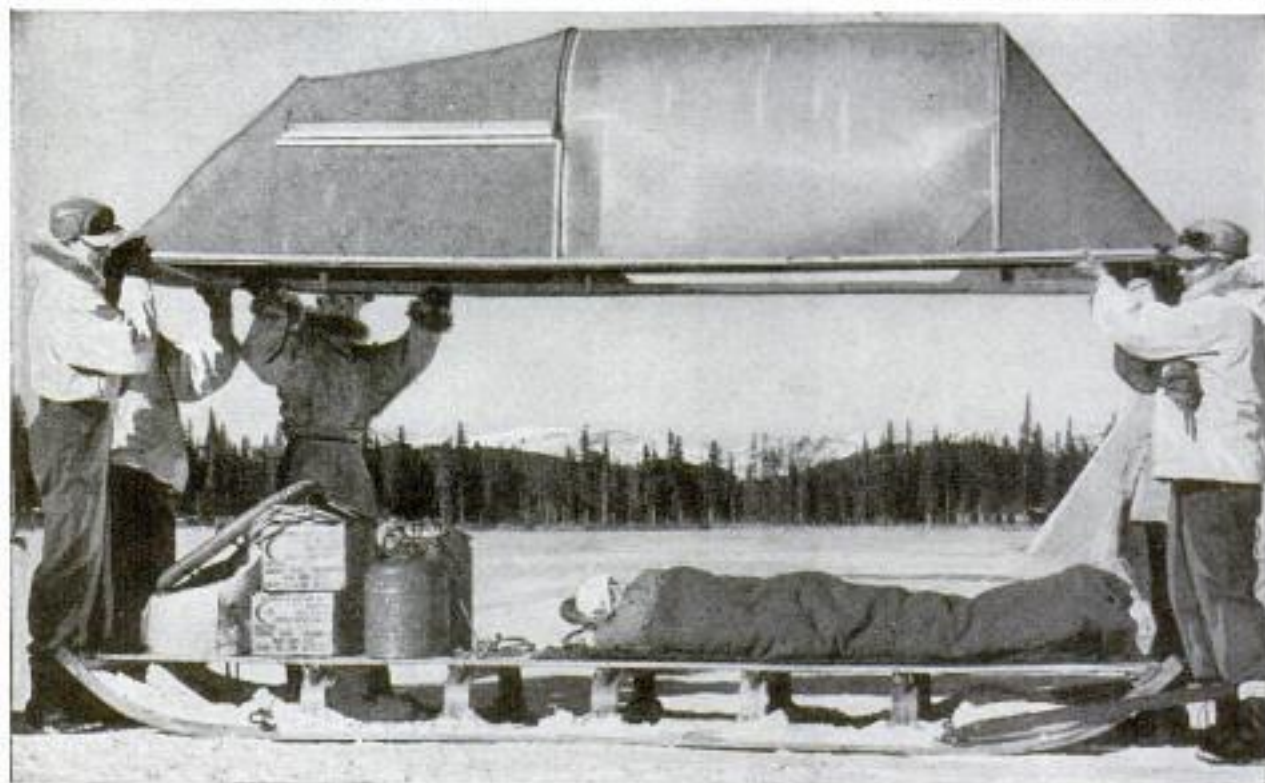


ice station at Seeley Lake, near Missoula, Mont., has become the major center for trainees.

The Forest Service "smoke jumper" methods of parachuting fully equipped men to remote areas were confined originally to work in mountainous and timbered regions during the summer when fire hazards are greatest. It has been found, however, that the same methods were easily adapted to the problem of dropping men and supplies, summer or winter, on any kind of terrain. A series of rigid tests confirmed the effectiveness of the system in winter with minor changes in equipment and technique.

The Forest Service works closely with the Emergency Rescue Branch of the Air Force in training personnel. In addition, the Coast Guard has trained representatives at Seeley Lake, and has established "Para-Rescuer"

Trainees lift cover of sled used to move injured flyers



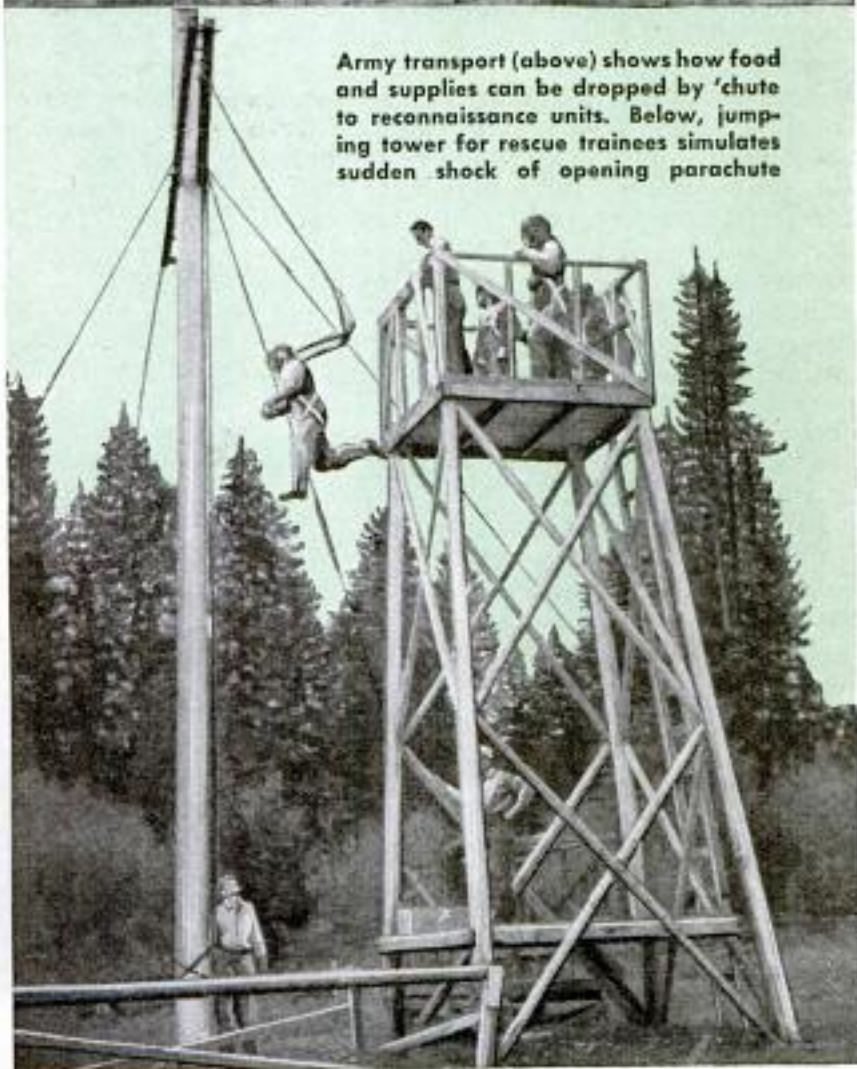
units, the first of which was assigned to duty at Ketchikan, Alaska. The Aeronautics Observation School at Edmonton, Alberta, has sent men to Seeley Lake for training and upon completion of their courses they give instruction to their co-workers in Canada. The same procedure has been followed by the Canadian Pacific Airways. The Army and Coast Guard have sent medical men for parachute rescue training, and the Forest Service has supplemented the 'chute work with courses in woodcraft.

Dropping food and supplies by parachute to stranded airmen and travelers has been done for years, but the technique has been improved. Results include greater accuracy in landing supplies and a careful selection of articles most needed by marooned persons in northern timberland, tropical jungles, Arctic regions, deserts and on the ocean. Two types of crash rescue kits have been developed by the Army Air Force and Forest Service. These include food and medical supplies, camp and trail equipment, radio communication kit, and other items.

The Air Force has produced two emergency parachute kits, one for jungle, and the other for Alaskan use. These include compass, matches, emergency rations, mosquito headnet, gloves, cooking kit, iodine, three-bladed knife, fish line and hooks, camphor gum, insect repellent, quinine, signal flare, machete, sharpening stone and first-aid kit. Particular attention has been paid to insect fighting equipment in Alaskan kits, as well as tropical, because in the summer there are 10



Army transport (above) shows how food and supplies can be dropped by 'chute to reconnaissance units. Below, jumping tower for rescue trainees simulates sudden shock of opening parachute





Yanks load medical rolls in plane ready to be dropped to advanced units

times as many mosquitoes per square mile over two-thirds of the land north of the tree line as in any equal area in the tropics.

A high percentage of air crews forced down at sea or in remote spots have been rescued by squadrons of the Emergency Rescue Branch of the Army Air Forces. In most of these rescues, parachutes were used in dropping supplies or personnel. Rescue squadrons have been activated in every theater of operations where AAF personnel are stationed. Medical men, navigators, radio technicians and persons familiar with the territory make up the squadrons, and all of them are thoroughly trained in the use of parachutes. The squads are reported to be excellent morale builders.

In the main, parachute rescue squads function as determiners of damage and injury resulting from plane crashes, and with the aid of medical jumping officers, provide first aid and emergency medical attention until ground crews are able to penetrate to the scene of the crash. Most rescue work involves injured men who not only need attention on the spot, but as-

Learning to manipulate rope to escape parachute in tree



sistance in traveling back to civilization. Therefore, special emphasis has been placed on first-aid training of jumpers and jumper training for physicians and surgeons.

Special training also is given in the use of parachute cloth itself, either by rescuers or by men marooned in spots after supplies are dropped. Several types of tents may be constructed of parachute cloth, or it may be used as head or body covering. Holes dug in the ground and lined with the cloth will collect rainwater. The tents can be used as fish nets—spread across narrow portions of small streams to trap fish as they swim downstream. On the desert,

spiral gaiters of parachute cloth keep sand out of shoes. Instructions for using the parachute are dropped with supplies.

At Seeley Lake, Mont., the Forest Service has a standard course for training jumpers for rescue work as well as for fighting forest fires. This is divided into two phases, ground training and jumper training.

The ground training occupies a minimum of six days prior to jumper training. A daily portion of the ground training is devoted to physical conditioning on an obsta-

cle course patterned after courses in use in armed service camps. Special attention is given to strengthening arm, leg and back muscles to withstand the rigors of landing and maneuvering the parachute canopy during descent.

Preliminary jump training is done from 25-foot towers. The men are fully equipped, and are stopped in their fall before they reach the ground by means of an overhead boom. This is to simulate the shock of the opening of the 'chute and to overcome the natural antipathy of the trainee to jumping from high objects.

The next training step is called "let-down" training. The trainee is fully dressed in jumping suit and is equipped with harness and chest pack. To the snaps on the shoulders of the harness a single-tree is attached by short lift webs and the single-tree is connected by block and tackle to a cable suspension line 30 feet in the air between two upright poles. The trainee is first hoisted a few feet off the ground and given instruction in the let-down procedure devised to permit jumpers to descend from high trees, using a 75-foot rope which is threaded through the harness and attached to the lift webs of the single-tree.

Considerable of the ground training time is spent in instructing jumpers in safe methods of climbing trees to retrieve their 'chutes without damage. The trainees are made thoroughly familiar with two types of radios used by jumpers. One is a compact, ultra-high-frequency set used for communication between jumpers on the ground and the plane overhead. The other is a medium frequency set for contact with bases up to 75 miles away.

Jumpers also are trained in the use of colored signal panels and code signals.

Advanced jumper training consists of from seven to twelve actual jumps. The first two are devoted to orientation of the men, and after that the instruction includes steering the 'chute, slipping the 'chute to lose altitude, stopping oscillation and other related actions during descent. The first six jumps are made on a cleared area, the rest into timber.

During the training, the more capable men are selected for spotter training to enable them to select jumping spots, determine wind drift with miniature drift chutes, and to time the jumps correctly to compensate for wind and other conditions. For jumps, the planes are slowed to around 70 miles per hour.

Forest Service parachute crews this year are made up largely of conscientious objectors who have volunteered for the work. Coast Guardsmen and other service personnel in training have responded to calls and jumped to fight forest fires.

Inventor: F. H. Wagner
San Antonio, Texas
Globe Gives Life Raft's Position Without Sextant or Compass



Made entirely of Plexiglas and weighing only one pound, a simplified celestial navigation instrument for use on life rafts recently was submitted to the armed forces. The globular device, which will float on water and is visible from a distance of 25 feet at night, combines a sextant for use during the day with a quick means of determining true north, sun time, latitude and great circle courses and direction. Exact reproduction of the movements of all celestial bodies used in navigation just as they are seen from any point on the earth's surface is possible with the instrument. On a life raft, it is said, it would eliminate the need for a nautical almanac, sextant, compass, and involved calculations.

Photo by: Nathan & Shaver Co. 22 Washington St., Philadelphia, Pa.

Hand Gun With 5-Ton Pressure Greases Frozen Bearings

By developing a pressure of 10,000 pounds, a streamlined, hand-operated grease gun easily and quickly forces its lubricant through the toughest frozen bearings. The gun, which dispenses light or heavy grease under all climatic conditions, has a capacity of 18 ounces.



Balkcrank
Balcrank, Inc.
Ann Arbor, Mich.

Vargan X Co.
210 Seventh Ave.
N. Y. 3, N. Y. 0233

Plastic Gift Items Made of Gun Blister Material



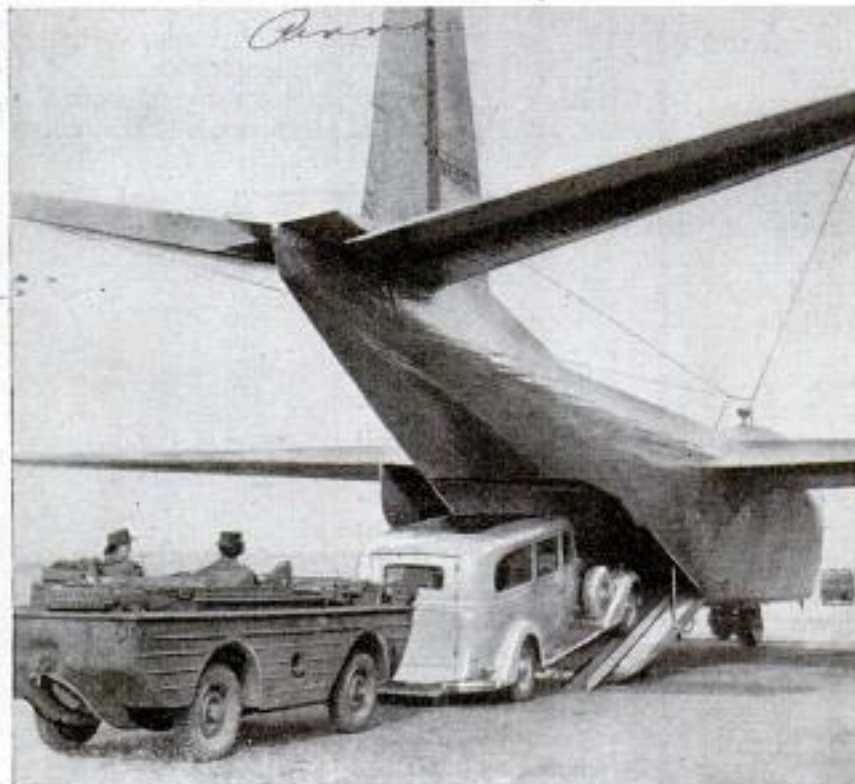
The same transparent plastic used as a blister for observation domes, gun turrets and bomber noses, is being fashioned into a variety of glistening accessories for civilians. Among the gift items made of Plexiglas are a pack holder to prevent cigarettes from crushing, a card holder to keep playing cards fresh and undamaged; a paper-

thin money holder; a two-way pocket photo-holder; and a photo-frame. The featherweight material is not only stain-proof and shatterproof but also may be sawed and carved like wood, or machined, drilled and threaded like soft metal. Until recently transparent plastics had been largely restricted to government use.

Navy's Stainless Steel Air Giant Loads Cars on Belly Ramp ⁰²⁴⁶

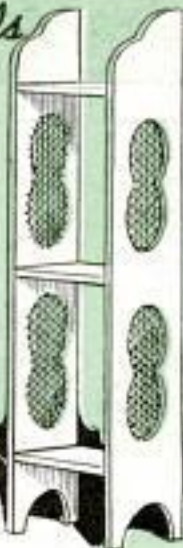
Radically different in appearance, the Conestoga is the first cargo plane made entirely of stainless steel and the first Navy plane designed primarily for cargo carrying. Manufactured by the E. G. Budd Company of Philadelphia, it can be con-

verted into a troop carrier with 24 seats and a flying ambulance equipped with one vehicle and eight stretchers, or 24 stretchers. Paratroops can be launched simultaneously through exit doors on both sides of the fuselage, while troop supplies may be dropped through a unique hatch in the rear of the belly, below the upswept tail, which is 31 feet, nine inches above the ground. The hatch also drops down to form a ramp over which cargo may be moved. For safety in the event of a crash the two-man crew sits above the level of the cargo in the knob-like nose that slopes down to a slimmer mid-section. Powered by two 1,200 horsepower radial engines, the Conestoga can carry 10,400 pounds. It is 68 feet long with a 100-foot wingspread, a cruising speed of 165 miles per hour and a range of 1,700 miles. With auxiliary fuel tanks this may be extended to 2,500 miles.

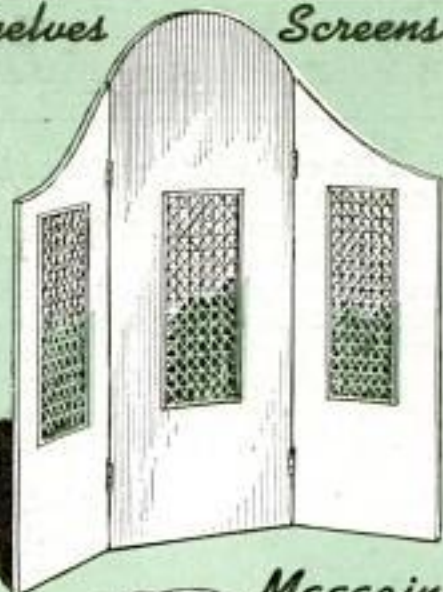




Bookends



Shelves



Screens

APERTURES

strung with cord

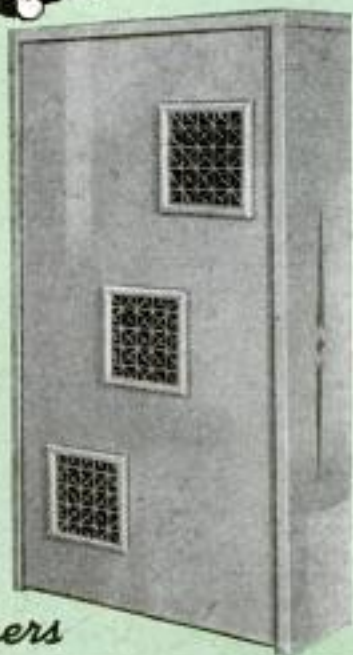
By Charles and Bertram Brownold

FRUIT and bread boxes, clothes hampers and other utility receptacles that require ventilation can be improved in appearance if you string cord across the apertures in much the same way that tennis rackets are strung. The effect will be even more unusual if you use cords of different colors or of varying thicknesses. Other articles such as book ends, wall shelves, screens, magazine racks, waste baskets, etc., also can be decorated by strung apertures even though the openings are purely ornamental and not for ventilation.

In all cases, take care in locating accurately the small holes for stringing the cord, as carelessness in this detail will result in lines that are not parallel, and the symmetry of the design will be impaired. Holes around square or rectangular apertures are equidistant, but this



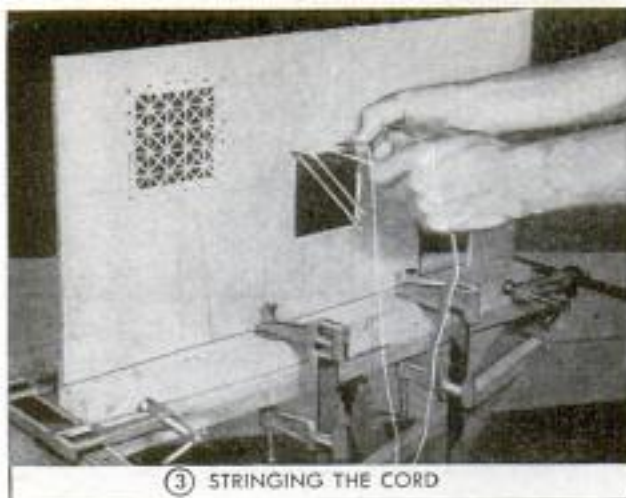
Magazine racks



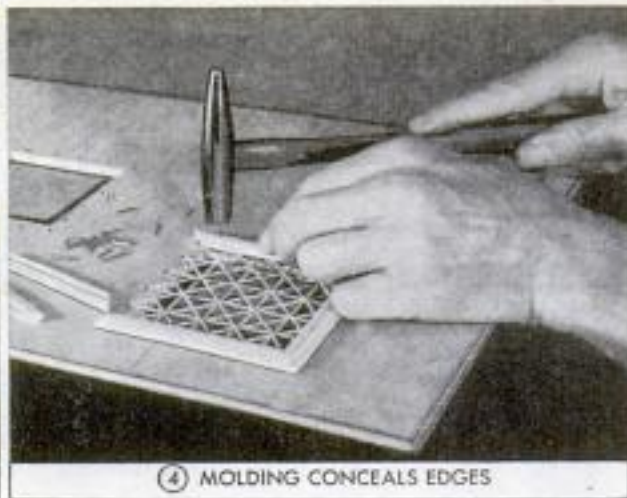
Hampers



① SAW OUT THE OPENINGS ② DRILL HOLES FOR CORD



③ STRINGING THE CORD



④ MOLDING CONCEALS EDGES

is not the case with circular or oval apertures even though the parallel cords are the same distance apart. To guard against mistakes in hole spacing lay out the pattern of the aperture and the holes on a piece of paper, testing the accuracy of the layout by drawing lines from point to point to represent the cord. Then tape the pattern on the work and, with a sharp awl, punch through the paper to locate the holes to be drilled.

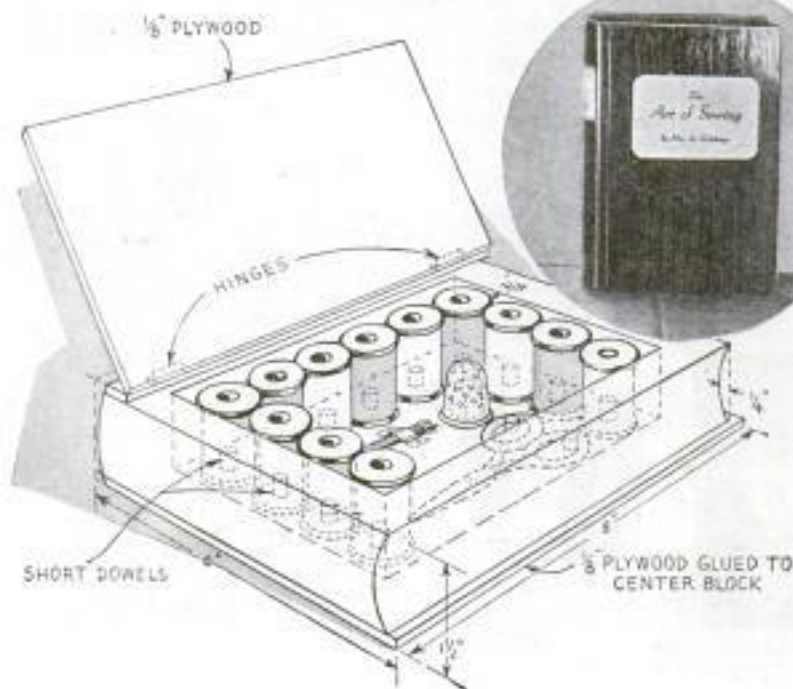
After locating the pattern in this way, cut out the opening and drill the holes as in Figs. 1 and 2. They should be spaced about $\frac{1}{4}$ in. from the edges of the aperture. Then, by measuring the distance from point to point, along the lines to be strung, compute the length of cord you will need for the whole job. If this precaution is not

taken you may run short of cord before the opening is completely strung, which necessitates undoing the cord and starting all over, as knots in the cord spoil the appearance of the weaving. By using two upholsterer's needles you can work from both ends of the cord and thus avoid pulling the entire length through each hole. As you proceed, pull the cord tight and keep it from loosening by forcing small wooden pegs into the holes so that both hands are free, as in Fig. 3, shifting the pegs as the work proceeds, and discarding them after the stringing has been finished and you have knotted the ends. The small holes and the knotted ends of the cord can be hidden by molding, as in Fig. 4, which is rabbeted or shimmed up with splints to a height sufficient to cover the cord.

This Sewing Kit Can Be Kept Handy Between Book Ends

This kit can be kept in a bookcase, between book ends or any other place where

it will keep your sewing accessories handy at all times. It is made from a block of wood which is cut out in the center and fitted with a front and back of plywood or other suitable material, the front being hinged to form a lid. The edges of the block are shaped to resemble the pages of a book. If desired, the front and back can be covered with cloth, imitation leather or other suitable material to make the appearance more authentic. Short dowels hold spools of thread, and thimbles, scissors, etc., are slipped over corks, which are screwed to the bottom of the kit inside the recessed block. — Herman R. Wallin, New York City.



Tips on a BETTER FINISH

LITTLE TRICKS THAT
HELP IN APPLYING A
PERFECT VARNISH



DON'T use varnish directly from the can. **DO** pour what you'll need in a separate cup and discard left-overs



DON'T apply succeeding coats of varnish without first testing hardness. **DO** apply succeeding coats when the varnish resists impression of thumbnail

DON'T apply varnish if chilled—it will be sticky and hard to brush. **DO** warm it by setting the can in hot water (70-90°) and it will level nicely

DON'T rub down coats with fresh sandpaper. **DO** scuff it first by rubbing together to knock off the sharp grits

However careful, dirt specks will get in the finish. These are easily lifted from the wet varnish with a clean sliver of wood tipped with a small ball of burnt varnish to which the specks will cling when touched lightly. Don't wait until the varnish is tacky but remove specks as you go. Burnt varnish consists of varnish, 1 part, melted rosin, 6 parts, well mixed. In use, a drop or two is rolled into a small ball between moistened fingers and placed on a stick. As the specks are lifted from the varnish they are kneaded into the ball



To pick up final traces of dust, the expert uses a "tack rag," which is a cloth moistened with varnish and kept in an airtight can. To make one, dip a cotton handkerchief in warm water, wring out lightly, sprinkle with turpentine and cover with varnish. Wring out until nearly dry

Jig to Hold Auto Piston in Vise While Installing New Rings



Motorists and others who do their own repair work and do not have equipment for holding pistons while working on them will find this simple jig handy for holding a piston in a vise. The jig consists of a piece of flat iron drilled in the center to take a hook bolt. In use, the bolt is hooked over the wrist pin and the nut tightened to pull the flat iron piece tightly against the bottom of the piston, after which the iron is gripped in the vise to hold the piston solidly in a handy working position.

Picking of Berries Simplified With This Container



You can save time when picking berries by using this container, which is suspended from your hand, thus making it unnecessary to reach your hand in and out of the briars to put the berries in a basket or bucket. The container is merely a tin can with one end removed and fitted with a wire bail bent to the shape shown. The bail slips over the hand as indicated, one side

being longer than the other so that the can will hang in a vertical position when the hand is held in a natural position for picking berries.

—William C. Turtle, Portland, Ore.

Ants Kept Out of Lunch Basket

To prevent ants from getting into your picnic lunch basket, invert a bowl in a pie tin, fill the tin with water and set the lunch basket on the bowl. The water forms a moat which ants are unable to cross.



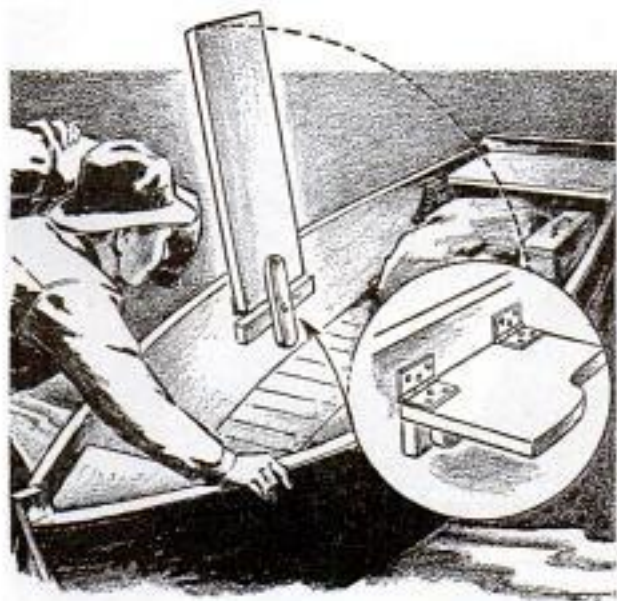
Tar Seepage at Stovepipe Joints Prevented by Extra Damper

A tar-like substance which often seeps through the joints of stovepipe can be eliminated by placing an opening in the smoke pipe directly above the draft damper, which should be near the stove, and fitting the opening with a sliding or flap door. If this extra hole is opened whenever the draft damper is closed, the gases in the pipe will be kept in circulation and will not condense inside.

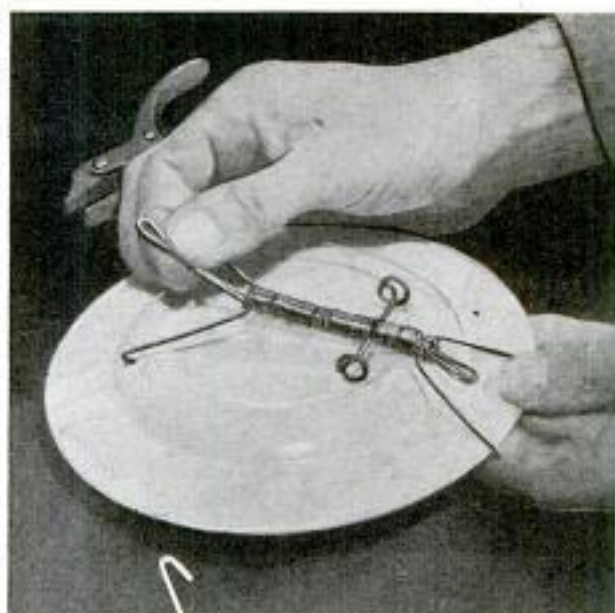
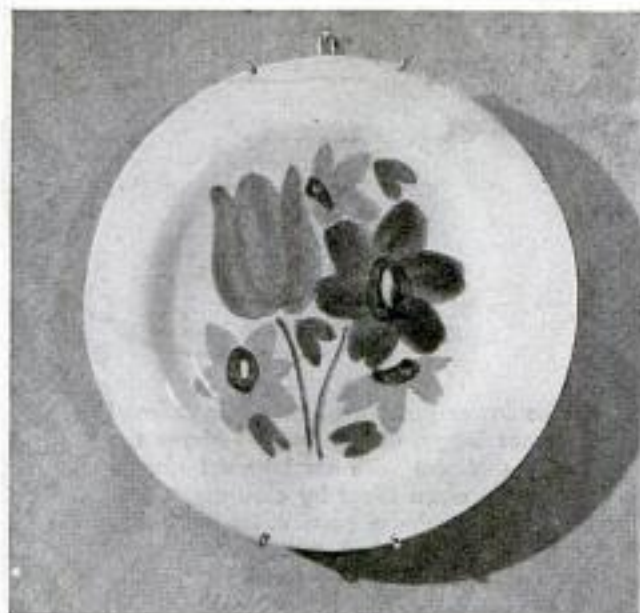
—J. B. Temple, Toronto, Canada.

Hinged Boat Seat Lifts Out of Way For Loading and Cleaning

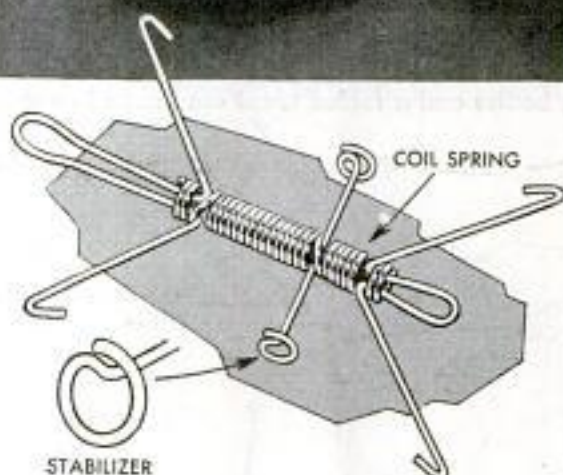
The annoyance of climbing back and forth over the seat of your boat when loading, bailing or cleaning, may be overcome by hinging the seat plank at one end. A long turnbuckle pivoted to the supporting cleat will hold the seat vertically when elevated.



Concealed Wire Hanger Holds Plate on Wall.

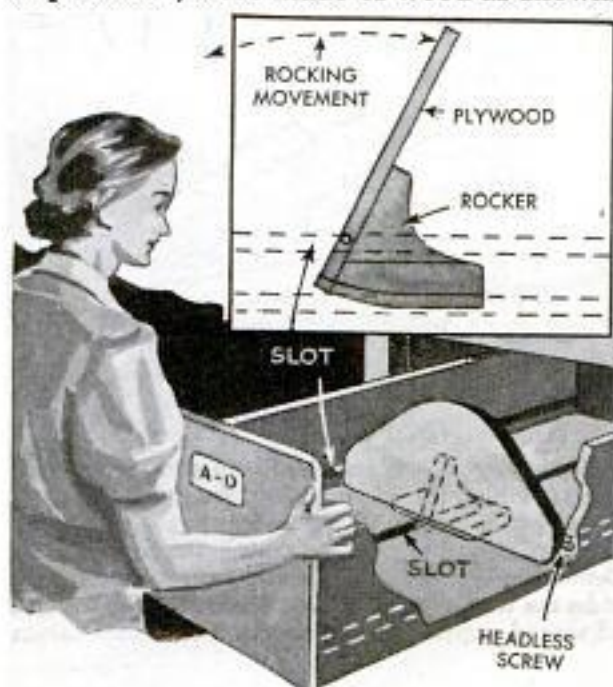


A hanger that will hold a decorative dinner plate steady on the wall and will not be noticed can be made by bending double two short pieces of wire to form the looped-end pieces shown, and turning back the ends into a V with the tips hooked to fit over the rim of the plate. A 2-in. length of $\frac{3}{16}$ -in. coil spring is slipped over the loops. It may be necessary to spread the spring to fit over the doubled wire. Screen-door spring may be suitable in some cases, or a spring of narrower diameter made by winding piano wire around a $\frac{3}{16}$ -in. bolt or drill rod. Then a piece of wire is inserted through the spring and a loop formed in each end as a stabilizer to hold the plate parallel to the wall.



Adjustable Partitions for Drawers of Homemade Cabinet

After making a large filing cabinet having several drawers, the partitions or take-ups for the drawers, which I was unable to purchase, were made of wood as shown.



Each partition consisted of a piece of plywood having a rocker screwed to its back as indicated, the rocker working in a slot in the drawer bottom. Headless screws projecting from the ends of the plywood slide in grooves in the drawer sides. With this arrangement, pressure of the filed papers against the front of the partition tilts it backward, in which position the rocker causes the screws to press against the upper surfaces of the slots and thus keep the assembly from moving. The greater the pressure the greater the binding effect of the screws. The partition is adjusted by tilting it forward and then moving it as desired. The partition can be inverted or removed by laying it face down and twisting it sideways to engage or disengage the headless screws in the side slots.

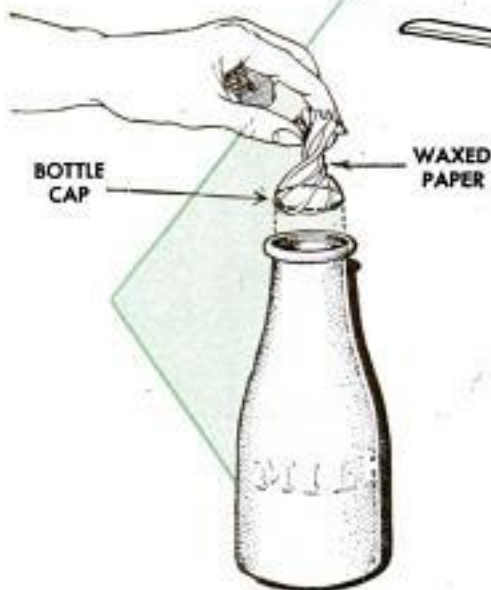
—F. H. Peterson, Monroe, La.

Never allow weeds to ripen or remain in your garden in the fall. If you do, the seeds will drop to the ground during the winter, and more weeds will grow in the spring than would ordinarily.

Solving HOME



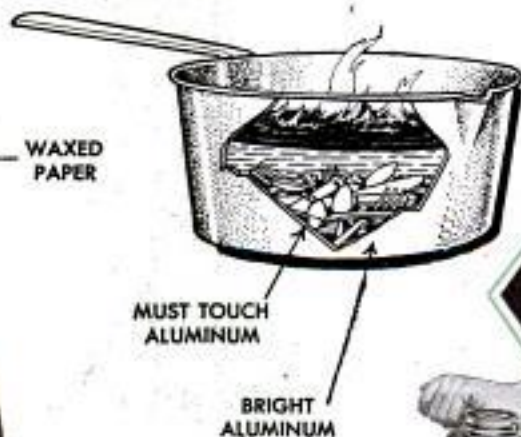
Baby sweaters keep their shape after washing if nursing bottles and a folded towel are inserted as shown



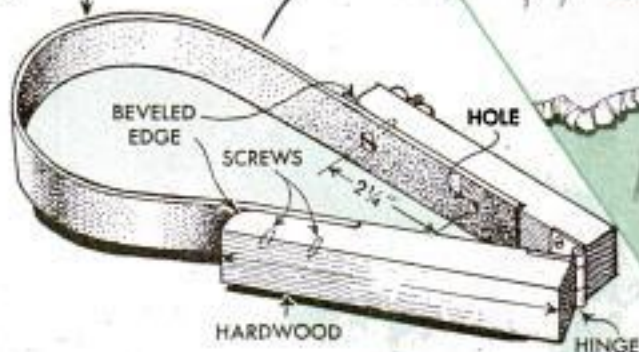
It is easy to remove a bottle cap repeatedly if you wrap a piece of waxed paper on the cap to serve as a handle



If the lower portion of salad in a bowl becomes soggy, simply keep it above the excess moisture with an inverted saucer. Below: To clean silver by electrolysis, put it in an aluminum pan; cover with hot salt water (salt, two tps. to a quart). Keep heated just below the boiling point

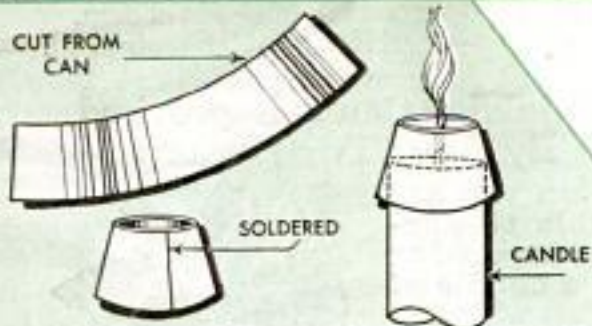


STRAP OR BELTING
1" X 14"

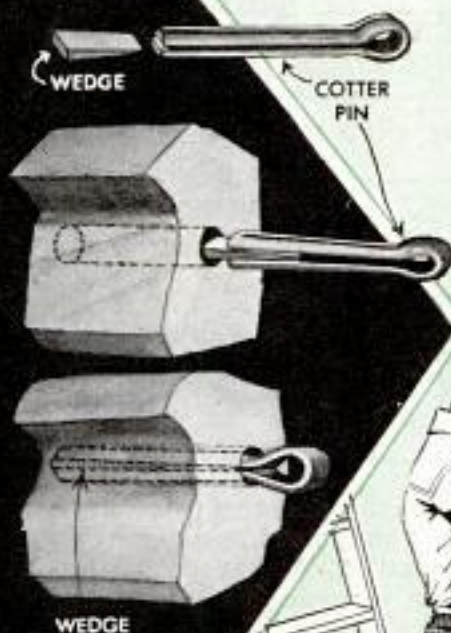


Above: This holder grips a fruit jar firmly and safely while you are screwing on the lid. It is made from an old belt or strap about 14 in. long, mortised in and screwed to hardwood handles, hinged together as shown. The beveled ends of the handles prevent excessive wear. Left: An emergency stopper on the flush-type sink drain can be had by using a piece of waxed paper or a disk from an ice-cream carton

PROBLEMS



Candles will burn longer and wax will not run down the sides if you use this shield cut from a tin can. Right: A warped clean-out door on a furnace or boiler is made draft-tight by holding an asbestos sheet at the opening and closing the door on it



Left: To make a cotter pin hold securely in cement, drill a hole to take the pin and then slip a small steel wedge between the legs before inserting the pin. Driving down the pin will cause the wedge to spread the legs when it hits the bottom of the hole. Right: Odds and ends of soap can be used to make suds in a laundry tub by placing them in a perforated can on the hot faucet



The marring of table tops or other polished surfaces by ash trays can be prevented by two crisscrossed strips of tape placed on the bottom of each tray



One home owner, not having had opportunity to apply numbered tacks to his storm windows, simply identified the windows by writing on them with soap before storage. This is removed when washing the windows before replacing them



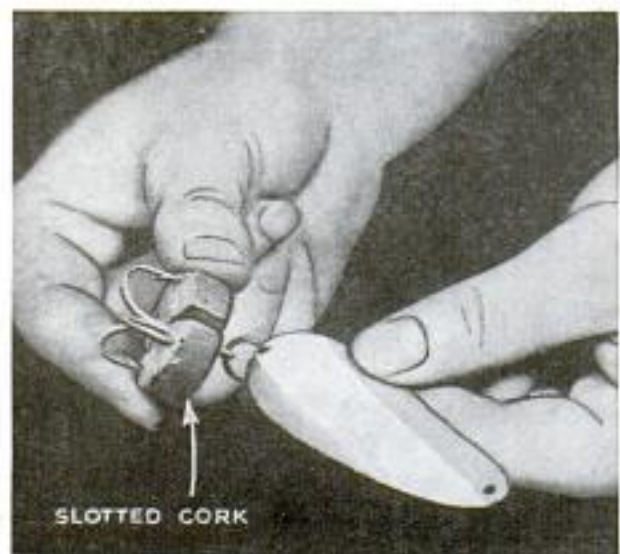
Plywood Trays Pivoted on Stake To Form Picnic Table



Picnickers can gather around this compact tray assembly, spread the leaves and thus provide a handy table. The entire unit can be taken apart in a moment and stacked in a small space in the car when lunch is over. The leg is a hardwood stake about 3 ft. long, which is driven into the ground. A wooden collar supports the trays as they are slipped over the stake.

Cork Shields Casting-Plug Hooks While Carried in Pocket

To shield the barbs on your treble-hooked casting plug so that you can carry it in your pocket when wading in mid-



SLOTTED CORK

stream, and to keep the hooks from tangling when carried in the kit, notch a piece of cork, slip it over the casting plug shank and press it down on the hooks as shown.

—Paul Reed, Indianapolis, Ind.

Sprinkling Can Is Improvised By Using Two Buckets

When you are unable to purchase a sprinkling can, a couple of buckets will serve as a substitute, provided one will fit inside the other. An old leaky bucket will do for the inside one. Punch several holes in its bottom, fill the good one with water and set the old one inside. When it fills with water lift it out and hold it over the plants to be sprinkled.—P. B. Read, Chicago.



Don't Drown Fish on a Stringer



If you have had trouble with fish dying on a stringer, it is possible they were drowned by stringing them through the gills. On some kinds of fish this prevents normal operation of the mouth and gills and the fish soon die. To avoid this, run the stringer through the fish's lips as indicated. When this is done, the fish can operate his gills and mouth in the normal way.

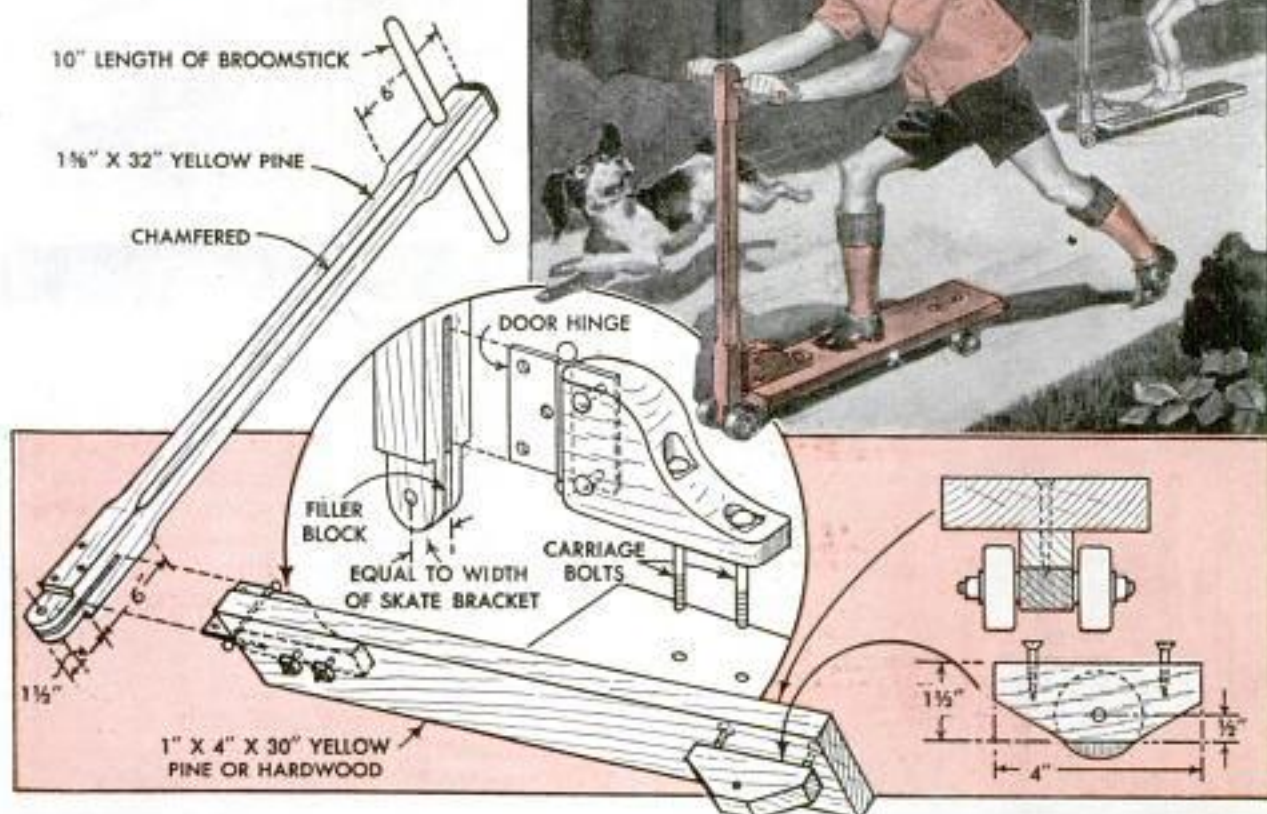
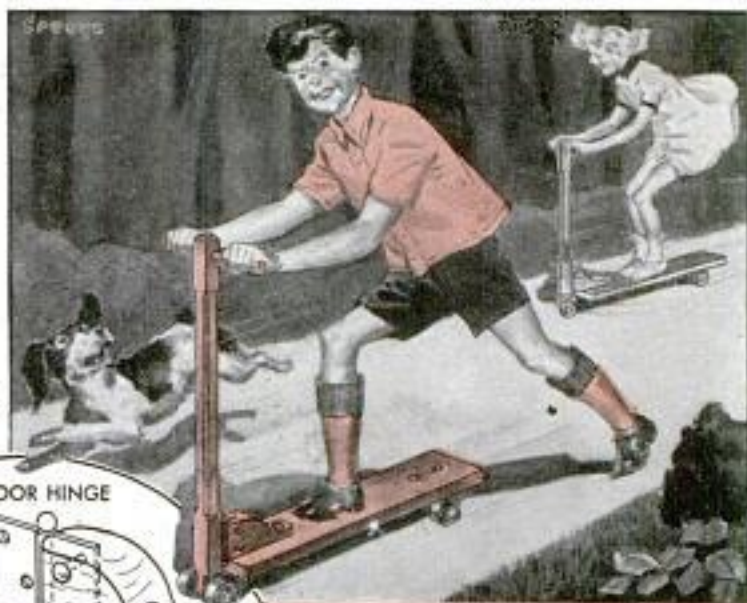
Plant Duster From a Tin Can

A handy and efficient plant duster can be made by punching a series of $\frac{1}{16}$ -in. holes in the lid and around the rim of an ordinary friction-lid can of 1-qt. size. Filled with insecticide to within 2 or 3 in. of the top and shaken over a plant, the can forces the dust downward and outward, thus assuring good coverage of the foliage. Be sure that the lid fits tightly so that it will not come off when shaking the can.



Scooter Steering Post Pivots on a Door Hinge

A door hinge provides a simplified steering pivot easy to install on any type of homemade scooter, whether you use roller-skate or other wheels



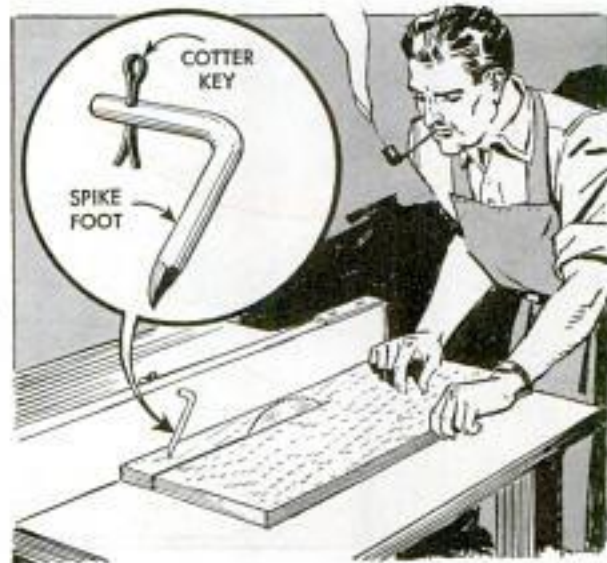
This skate-wheel scooter, unlike the usual homemade type, has the steering post pivoted. A block of 2-in. stock supports the steering post, both block and post being slotted to take a heavy butt-type hinge, which is held in place with stove bolts. The lower end of the steering post and the rear-axle block, both of hardwood, are the same width as the axle supports on

the skates, thus making it an easy matter to slip the skate-wheel axles through the holes and attach the wheels. A filler block is used to close the lower end of the slot in the steering post. For the handle, a 10-in. length of broomstick is inserted in a hole drilled in the steering post and a wood screw is driven in to secure it.

—Harold Gluck, New York City.

Spike Foot on Saw Fence Prevents "Kick Back" of Work

To avoid any possibility of narrow strips of wood being thrown toward him when ripping on his bench saw, one worker installed a spike foot on the fence. The spike, which is shaped as shown, is pivoted through a hole in the fence and is held by a cotter key. In this way, the spike does not interfere with feeding work, but effectively prevents it from being kicked back should it catch on the saw accidentally.

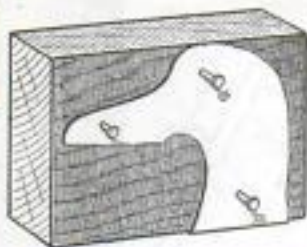


CASH FOR YOUR IDEAS

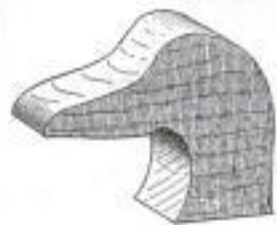
We pay cash for ideas showing simpler and better ways to do daily tasks, shortcuts in shop work, darkroom aids, household hints, auto kinks, etc. Send a good photo or sketch and a concise but full explanation of your idea to the Homecraft Editor, Popular Mechanics, 200 East Ontario St., Chicago.



MAKE YOUR



① CARDBOARD PATTERN

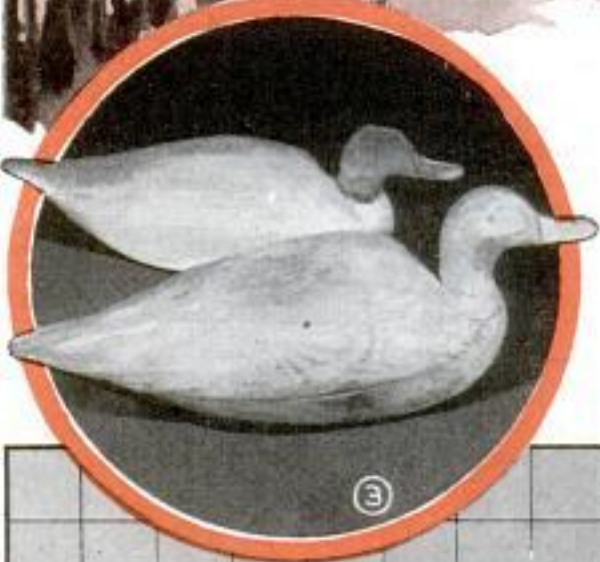


② SAWED TO OUTLINE

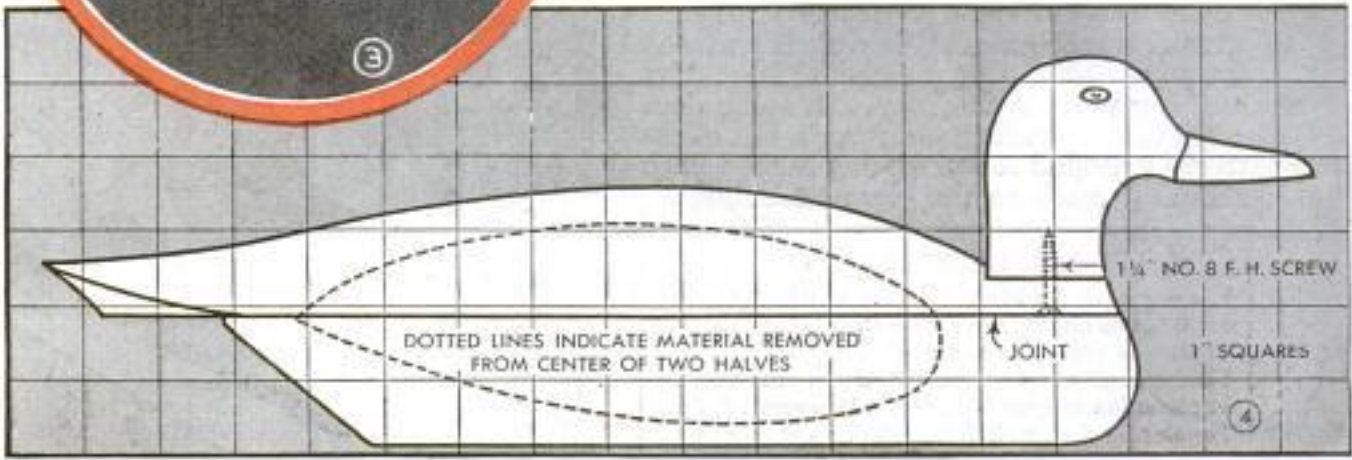
By W. C. Lamme

MAKING wood duck decoys is just another of those craft jobs which may seem difficult, but actually are very easy to do. Likely the most difficult part is carving the head, but if you cut and shape it separately and then attach it to the body, the work will be easier and you will have a better job.

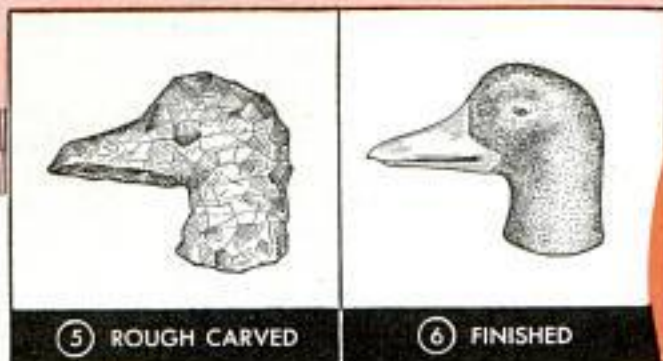
Figs. 1 and 2 show the first steps. The pattern is drawn from Fig. 4 by laying off the profile of the head full size on heavy cardboard or $\frac{1}{4}$ -in. wood. Then, after sawing out the pattern, tack it to a white-pine block 5 in. long, $1\frac{3}{4}$ in. thick and 3 in. wide. A similar length of ordinary 2 by 4-in. stock is just the right thickness and width. Don't use any pieces that are knotty, cross-grained, or full of pitch. Band-saw the head to the shape shown in Fig. 2 or remove the waste in straight cuts with a handsaw. Now, after sharpening a small blade of your pocket knife to a razor-keen edge you're ready for the carving, Fig. 12. Start the cut at the edge of the wood. You will see that by starting on the original edge anywhere and making a cut you produce two other edges which in turn are cut



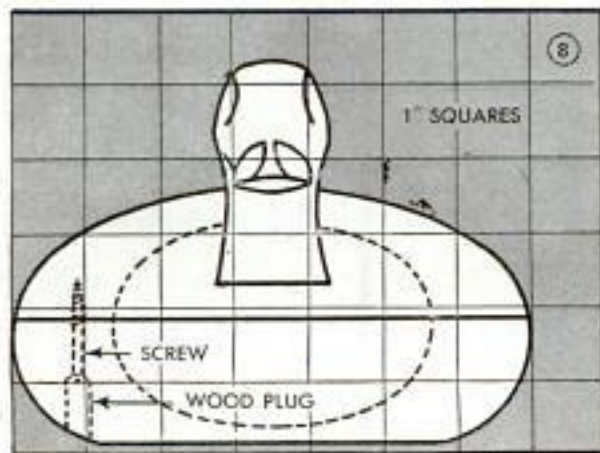
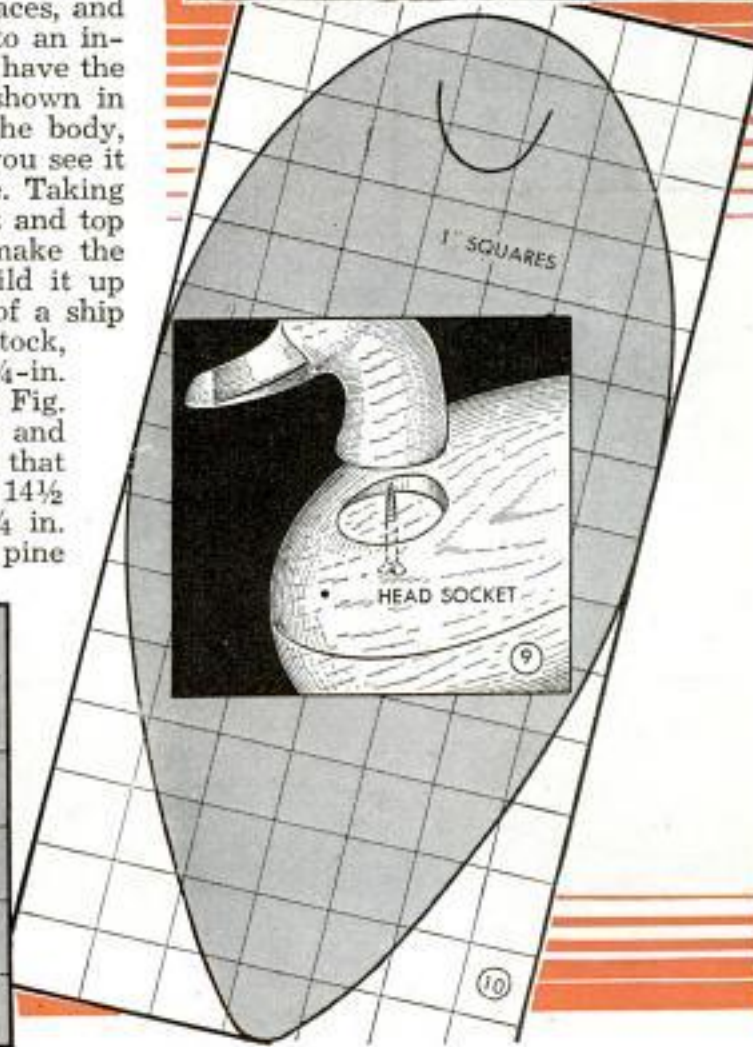
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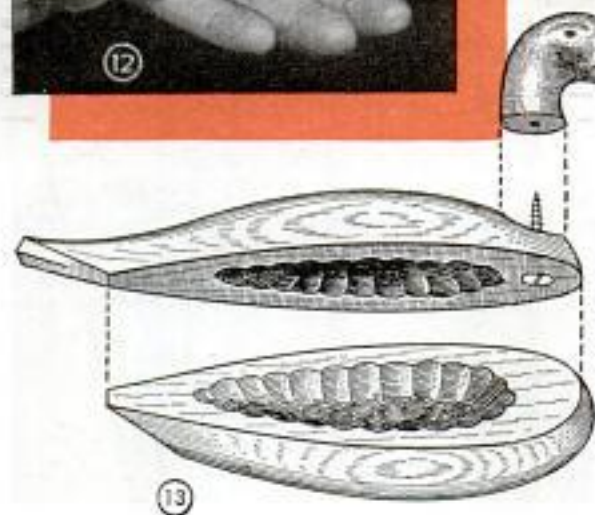
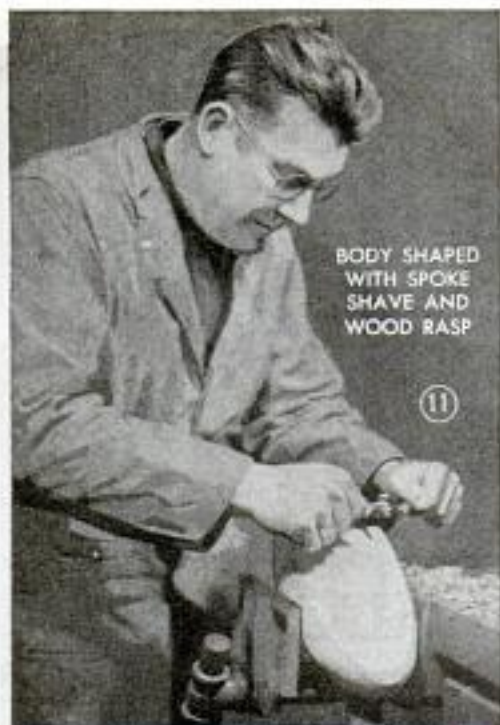


OWN DECOYS



down. That's the trick in carving such a shape as this. Be careful to prevent splitting at the top of the head and along the bill where the grain is straight. Make short, scalloped cuts to avoid lifting long chips. At the upper curve of the neck near the back of the head, and under the head in front, the job may be a little difficult. Merely bring these areas to a rough round shape and leave the rest to the wood rasp. After you have rounded over the corners until the curves meet at the center of the flat surfaces, and have trimmed the top of the bill to an inverted, flattened V-shape you will have the head rough carved to the stage shown in Fig. 5. Now, you start work on the body, since the head can be finished as you see it in Fig. 6 only after the body is made. Taking Figs. 4, 8 and 10 as the side, front and top views of the contours, you can make the body in either of two ways: Build it up "sandwich" fashion like the hull of a ship model from a number of pieces of stock, or make it from two pieces of 1 3/4-in. stock with a hollowed center as in Fig. 13. The latter method is the best and quickest. Note from Figs. 4 and 8 that there are two pieces, the top one 14 1/2 in. long and the lower about 12 1/4 in. long. Ordinary 2 by 8-in. selected pine

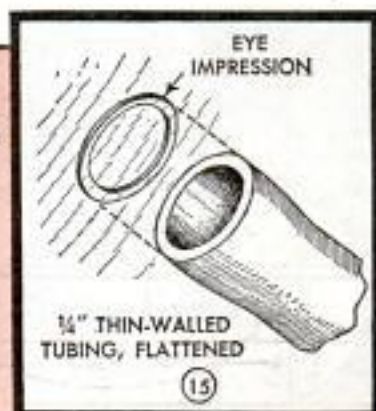
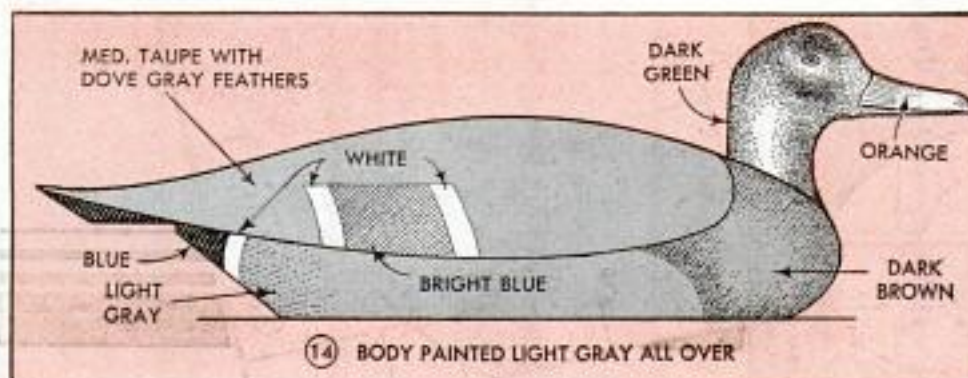




or fir stock is just right. Both top and bottom pieces are sawed to the shape shown in Fig. 10 except, of course, the lower piece is shorter, and one end is cut at an angle as in Fig. 4. Dotted lines in Figs. 4 and 8 indicate approximately the amount of waste to be removed from the halves. This is done with a gouge as in Fig. 7. If desired, you can make cardboard templates from Figs. 4 and 8 to aid in shaping the body curves. The whole job amounts to little more than rounding the curved edges with a spoke shave as in Fig. 11, but here's a point to remember: If you are making a number of decoys, Fig. 3, it's a good idea to bring them all to a finished stage, make a trial assembly of each, and then weigh them individually. In this way you can disassemble and trim out more waste from the centers to bring them all to a uniform weight. This is quite important in the full-bodied decoy.

The head is attached with a single screw as in Figs. 4 and 16, but before attaching, a socket must be formed for the neck, as indicated in Fig. 9. Be sure that the head is no higher in relation to the body than indicated in Fig. 4 as a head raised high is an attitude of alarm in live birds. Once the head is attached, assemble and finish the body surfaces with a wood rasp. Then disassemble, coat the joints with waterproof resin glue, drive home the body screws and fill the holes with plugs as in Fig. 8. No need to sand the surfaces; it is better to leave them rough in the "rasp" finish. Figs. 15 and 19 show one quick method of making a passable eye. Ready-made glass eyes can be used if desired. Practically speaking, the eyes are not at all essential.

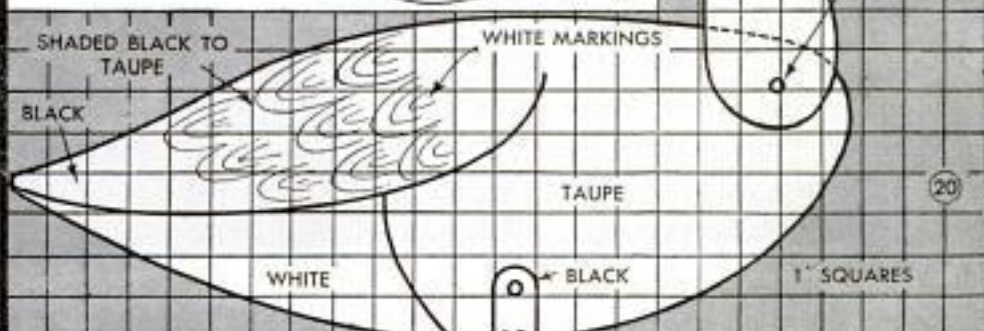
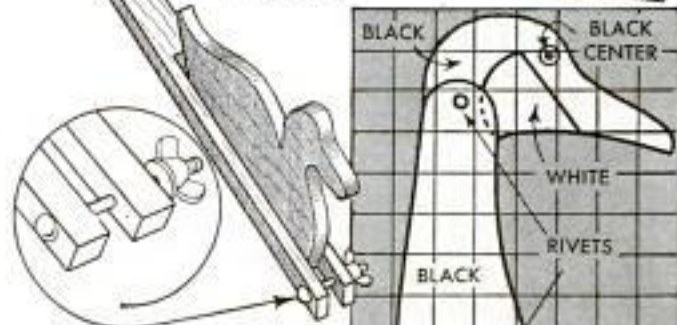
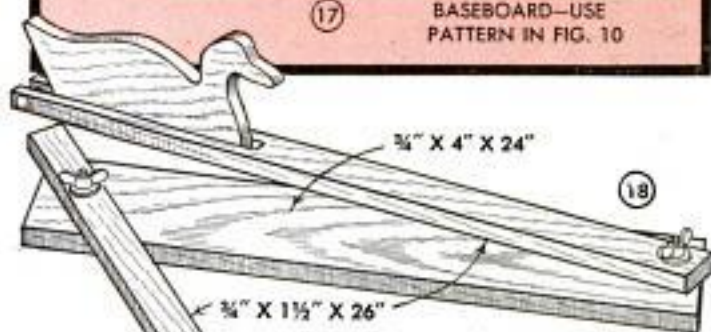
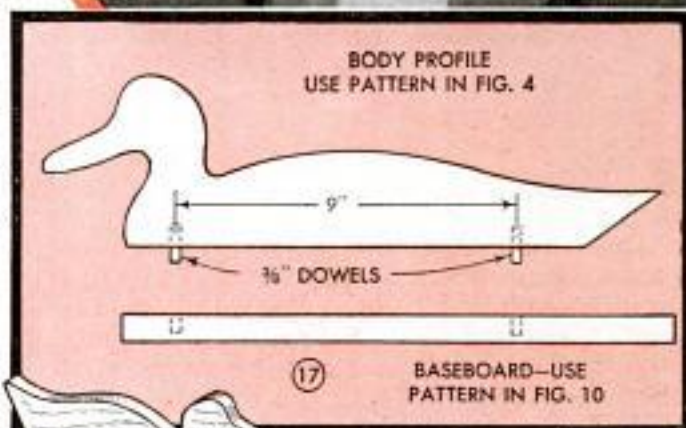
Fig. 14 gives a fairly simple color key for painting the body in simulation of a mallard drake. A good job will take time and care. If available, use japan colors over the gray ground coat. Otherwise use ordinary outside oil paints and, when these are thoroughly dry, finish with a coat of flat varnish to dull the gloss. If done carefully, this procedure results in a very natural appearing job. However, many practical and experienced wildfowl hunters consider the attempt to simulate the natural plumage colors in intricate detail as unnecessary. They prefer that their decoys be painted only in monotone variations of gray and brown, which makes it possible to use the same decoys on a number of the common

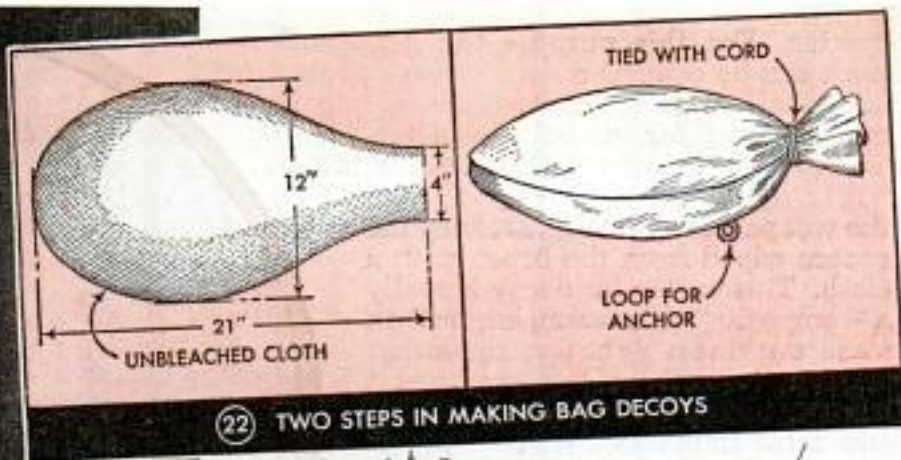


species. For this purpose the head and neck can be colored a dark green and the breast a brown which is blended into a medium gray for the balance of the body. The simulation of wing feathers is made with a lighter gray. When you blend the wet paint colors, Fig. 21, keep the excess wiped from the brush with a cloth. This particular decoy is really a "composite" simulation, larger than some common species, somewhat smaller than others, but experiment has shown it to be effective, durable, and most important, it rides rough water well. To finish, turn a small screw eye into the bottom about 4 in. back of the breast curve to provide for attaching an anchor.

Profile or silhouette decoys are simple to make. They are effective lures and have the advantage of being light and easy to transport and set out. Figs. 17 and 23 show one type of silhouette which is loose-doweled to a base or float. To make the body, lay off a pattern, less $\frac{1}{2}$ in. from the height, from Fig. 4, and for the base a pattern from Fig. 10. Transfer outlines to $\frac{3}{4}$ -in. stock and saw in the usual way. Some makers use $1\frac{1}{8}$ -in. stock for the base. Dowels are glued in only one of the members so that the parts can be separated and carried flat. Fig. 18 shows another version, a folding affair which is exceptionally handy. Slots are cut in one end of each arm to take silhouettes band or scrollsawed from $\frac{3}{4}$ -in. stock. Again use the profile in Fig. 4, but add about $\frac{1}{2}$ in. to the height of the body. Use $2\frac{1}{4}$ -in. bolts with wing nuts to provide adjustment in the arms and hold the silhouettes.

Next comes the silhouette goose decoy, a "collapsible" affair with folding head and leg. A 21-in. length cut from a $\frac{3}{4}$ by 8-in. board and band or scrollsawed to pattern serves for the body. Head, neck, and leg are separate pieces attached to the body





23 SILHOUETTE DECOY



24 BAG DECOY

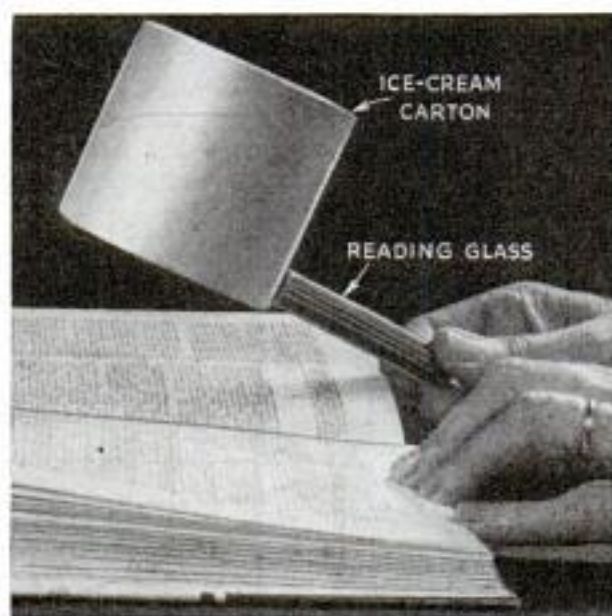
with rivets. Use $\frac{1}{2}$ -in. stock for these parts. Colored areas are indicated in Fig. 20. The silhouette duck decoys, Figs. 17 and 18, are best painted a medium gray all over with a green head and brown breast, the latter color blended into the gray. To make representative eyes on both the duck and goose silhouettes, first paint a small area an orange color where the eye is to be. When dry, draw a $\frac{3}{16}$ -in. circle with india ink. Bring the head color up to the inked line and paint a black center as indicated in Fig. 20. The eye on the goose decoy is somewhat larger. Both are "conventional" eyes but they will serve the purpose. Remember, if you use oil paints for either of these jobs to finish with a coat of flat varnish to kill the gloss.

Last comes the bag decoy and that's literally what it is. A crude affair to be sure, but very effective; in fact it is quite widely used by experienced hunters. To make it, cut two pieces from unbleached cotton cloth (some use light canvas) to the size indicated in Fig. 22. These are sewed together with a double seam, then reversed, and the resulting bag stuffed, the open end being tied with a stout cord. Sew a loop to the underside for attaching an anchor. Ordinarily, the material known as kapok is best for filling, but lacking this, cedar shavings or upholsterers' curled hair will do. Most of the materials used for treating canvas will serve very well for waterproofing the cloth. Two coats of linseed oil will serve nicely for this purpose. Coloring the cloth body can be done in the

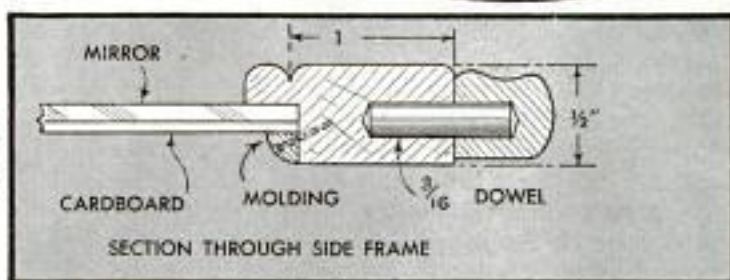
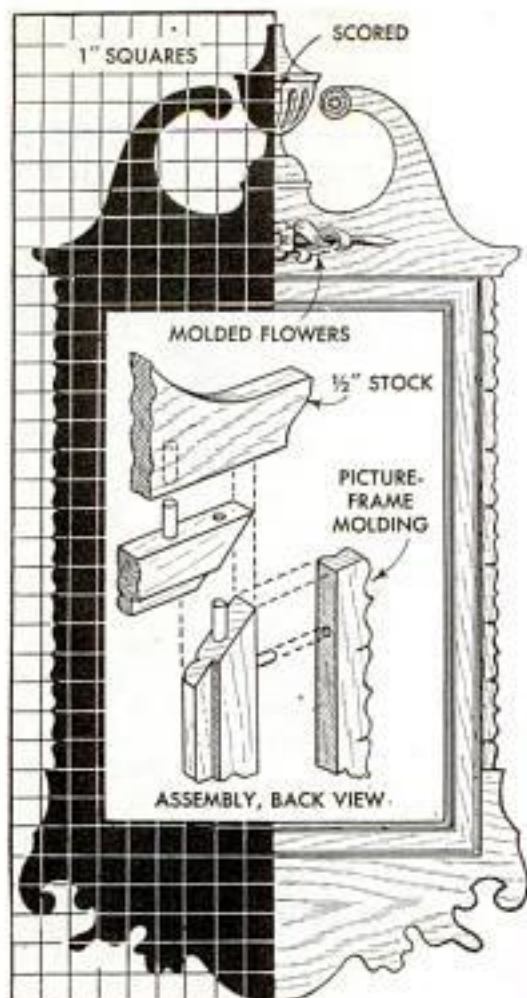
same way as described for the full-bodied wood decoy, using oil paints or japan colors. With a spring clothespin for a bill, Fig. 24 shows about what you get, unimpressive perhaps in a closeup, but from a "duck's-eye" view quite effective.

Reading Glass Fitted With Shield To Avoid Reflections

Reflections that sometimes make a reading glass difficult to use can be avoided by shielding the glass. A small ice-cream container will serve excellently for this purpose. Remove the lid and bottom from the container and cut a small hole in the side to take the handle. Unscrew the handle, put the glass inside the container and screw on the handle through the hole.



Scrollsawed Frame Renews the Old Wall Mirror



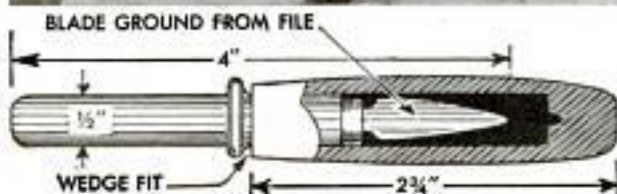
There's no need to discard an old mirror that has an outmoded frame, as you can provide a new scrollsawed frame of period design similar to the one illustrated. If the old frame is straight you need add only the scrollsawed plywood pieces at the top and bottom, and ornamental strips at the sides, which may be cut from a discarded picture's

frame. If you make up a new frame, miter the joints and fasten them together with dowels and glue as shown in the lower detail. The urn is scored with a gouge or router, and the ornamental molded flowers are glued on. Stain and wax may be applied as a finish or the frame may be painted in harmonizing colors.

Knife Made From Old File Has Turned Handle and Cap

You will find many uses for this little knife, the blade of which is shielded when not in use. The knife is especially useful around a desk or sewing machine and, if desired, it can be carried in your pocket or in a lady's purse. The blade is made from a small file, the tang of which is ground down and driven into a small turned handle. A ferrule for the latter can be made from an empty cartridge. A cap or shield is made by boring out a hardwood block to slip over the blade and part of the handle, and then turning it to shape.

Garage doors will not freeze shut if old crankcase oil is applied along the frame and door edges with a paintbrush as this keeps moisture from seeping in.



Neat Temporary Stoop of Brick And Concrete Is Inexpensive



Home owners who plan to raise their houses to install new foundations often find it a problem to make a suitable temporary stoop for outside doors. An attractive stoop can be made without great cost, adding to the appearance of the home as well as the safety of its members. Six or eight concrete blocks, about 6 by 8 by 36 in. provide a rim for a stoop one step high. The rim is filled with sand, tamped down well, and surfaced with brick, flagstone, or irregular thin concrete slabs. This stoop can be removed easily when the house is raised.

—Michael Ligocki, Gary, Ind.

Adapting a Watch to Show Time In 24-Hour Periods



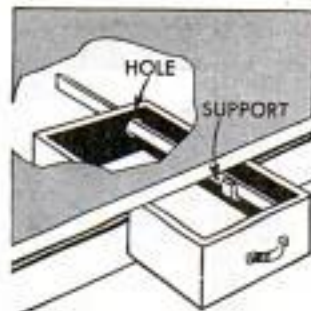
To make your watch dial show a day of 24 hours rather than one of two 12-hour periods, and thus correspond to the system used by the military forces, remove the cover glass, pry off both the hour and minute hands carefully and with a pencil compass scribe two circles beneath the ring of numerals, as shown. Then, directly under figure 1, draw in the numerals beginning with 13 and ending with 24 under the 12-hour mark. To make these figures easily readable, they should be inked in before re-

placing the hands and cover glass. By using a 24-hour dial you will be able to tell by simple subtraction how many hours and minutes intervene between any two designated periods of the day.

—A. E. Rohmer, Washington, D. C.

Hole in Drawer Permits Storage Of Long Articles

Long tools, such as trammel arms, straightedges, scales and many other similar articles, can be stored in a bench drawer that is normally too small to accommodate them by boring a hole or sawing a slit in the back so that the tool ends can project. This system can be used in all drawers that do not take up the entire depth of the cabinet or bench in which they are made. Wooden supports screwed to the side of the drawer hold the tools near the top where they can be reached without disturbing other contents.



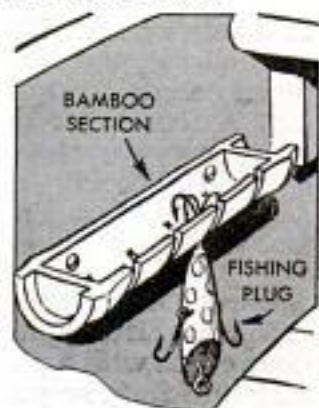
Easy Way to Hold Tablecloth On a Picnic Table



When a card table is pressed into service as an outdoor picnic table, or when it is used as an auxiliary table inside where the cloth might slip off, a rubber band on each leg will keep the cloth in place. Just gather each corner of the cloth against the leg and slip a band over both the leg and the cloth.

Fishing Plugs Kept Handy in Boat With Bamboo Holder

In order to keep his fishing plugs handy for instant selection, one fisherman transfers them from his tackle box to a notched trough of bamboo, tacked to one side of the boat. In this way, several plugs can be kept in order.



Servicing Your **COOLING SYSTEM** *before Winter*

POOR gasoline mileage, burned bearings and valves, and scored pistons are some of the troubles that can be caused by a faulty cooling system. As all oils thin out under heat, a car motor that runs too hot has to operate on lubricants that lack film thickness essential for complete protection. On the other hand, a motor that runs cold is likely to be damaged because of excessive oil dilution. Besides this, a cooling system that allows the motor to overheat must be filled often, Fig. 1, which is both wasteful and costly when anti-freeze solutions are used.

Often, the cause of an inefficient cooling system lies in the thermostat. This should be closed when the motor is cold, but fully open when the coolant reaches a temperature somewhere between 160 and 180 degrees Fahr. It is easy to test the thermostat, which is located either in the upper hose or in the cylinder head close to where the hose attaches. In either case, the hose must be removed, Fig. 2, to get at the thermostat, which then can be removed and tested in a pan of heated water as in Fig. 3, using a thermometer to check the water temperature. A thermostat for use with alcohol should be open completely at 160 degrees and for permanent anti-freeze it should be open at 180 degrees. If the thermostat opens too soon, the motor does not warm up quickly and operates too cool. Opening too late may cause overheating.

Another cause of inefficiency in a cooling system is loose and worn fan belts, Fig. 4, and misalignment between the belt pulleys, which causes early failure of the belt, Fig. 5. When a motor runs too cold, unburned gasoline works down into the crankcase and dilutes the oil, resulting in

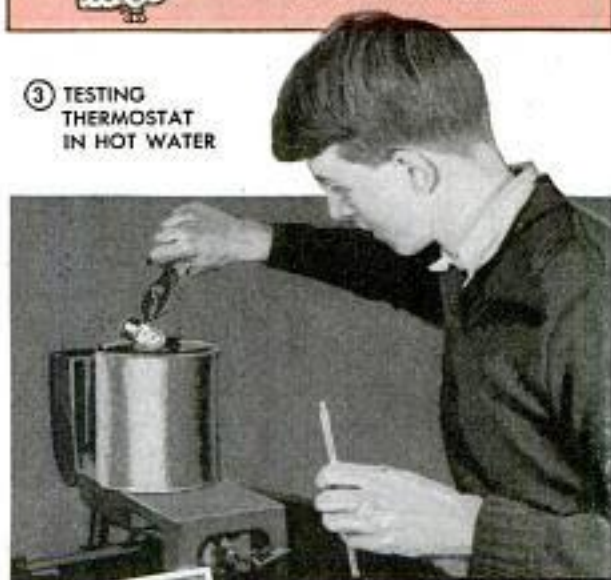


① FAULTY COOLING SYSTEMS NEED WATER OFTEN



② DISCONNECT UPPER HOSE TO REMOVE THERMOSTAT

③ TESTING THERMOSTAT IN HOT WATER



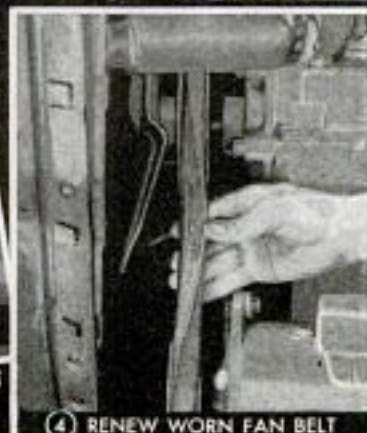
⑥ BURNED VALVES



⑤ MISALIGNED FAN BELT

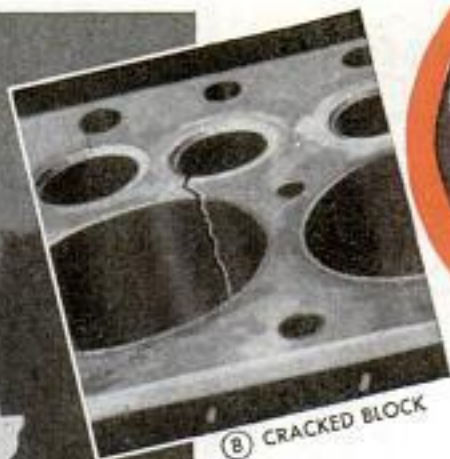


④ RENEW WORN FAN BELT





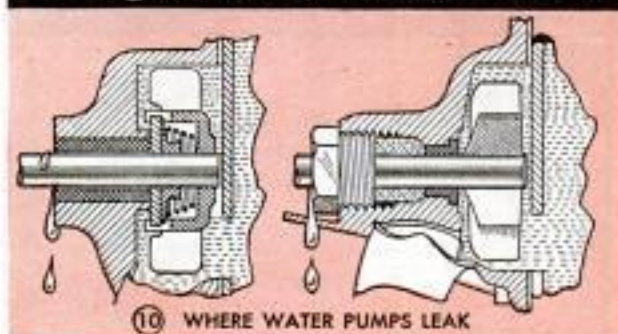
9 APPLYING CEMENT TO GASKET



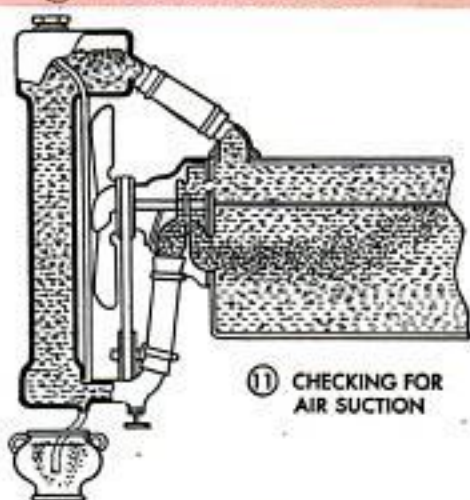
8 CRACKED BLOCK



7 RUINED PISTONS



10 WHERE WATER PUMPS LEAK



11 CHECKING FOR AIR SUCTION



12 HOSE AND FAN BELT REMOVED BEFORE CHECKING FOR EXHAUST-GAS LEAKAGE

excessive wear and corrosion of vital parts such as pistons, wrist pins and bearings. On the other hand, distortion of metals from overheating, and reduction in the thickness of the oil film from high temperatures can be the cause of burned valves, Fig. 6, stuck piston rings and scored pistons, Fig. 7, and sometimes cracked blocks as in Fig. 8.

Still another common cause of trouble in a cooling system is a leaky water pump or lower hose connection. Fig. 10 shows where water pumps usually leak. But even more serious is the leakage of air into the cooling system. Constant introduction of air as a result of water-pump suction so aerates the coolant that it will increase in bulk, with the result that some will be lost through the overflow pipe. Another action resulting from the presence of air in the coolant is the extremely high rate of rusting in the cylinder block. To test for air leakage, be sure that the coolant level in the radiator is at normal height with sufficient room for expansion, and then place the radiator cap in position so that it is air tight. With a rubber tube attached to the lower end of the overflow pipe and placed in a jar of water, you are ready to test for air leakage as in Fig. 11. The motor should be operated at a rather fast speed until it is warmed up to proper operating temperature. Then, with no change in speed, see if air bubbles continue to rise in the jar of water. This indicates conclusively that an air leak exists. With the equipment attached, necessary corrections should be made on the water pump or loose connections until the trouble has been eliminated.

Another cause of corrosion is the seepage of exhaust gas from the combustion chamber into the coolant. To test for this condition, remove the fan belt and the upper hose as in Fig. 12 and adjust the water level in the cooling system so that it is just visible at the upper outlet from the motor. The thermostat should be removed. Then, by idling the motor and suddenly "gunning" it for very brief intervals, bubbles can be seen rising through the cooling



13 LEAKY RADIATOR

liquid if there is an exhaust leak. Introducing a little oil into the carburetor to cause smoky exhaust will make the presence of exhaust gas in the coolant more conspicuous. While the leakage of exhaust into the cooling system is bad because of its highly corrosive effect, the loss of coolant into the engine, probably through the same leak, is also extremely destructive. In cases of this kind, new cylinder-head gaskets, if available, should be installed or the old ones, if in good condition, should be made tight with the use of gasket cement, Fig. 9. A common cause of leakage is unequal tension of the cylinder head bolts.

It's a simple matter for any car owner to service his own cooling system twice a year. Use of any of the well known radiator cleaning compounds, as in Fig. 14, is a



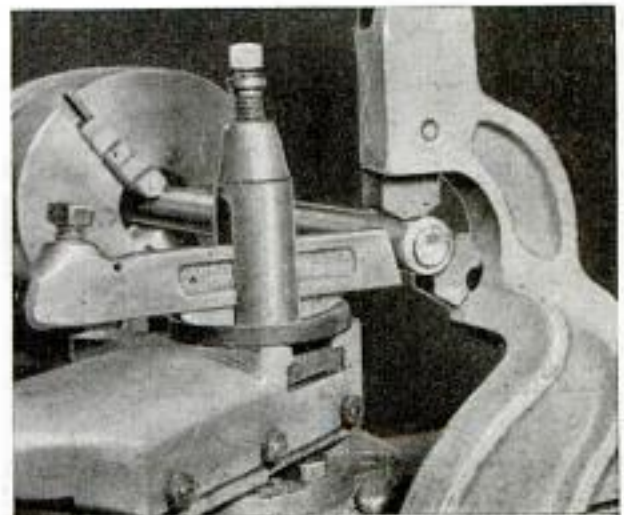
14 IT'S EASY TO USE COOLING-SYSTEM CLEANERS

wise precaution. Be sure to follow the manufacturer's directions as to use. After the compound has remained in the system the specified time, remove the hose connections and allow the liquid to gush out for the greatest cleansing effect. Then flush out gently with a garden hose. Merely opening the petcock does not provide a sufficiently fast flow to carry away the foreign matter loosened by the cleaner. Looking closely at the radiator of any car that is a year or two old, it is not unusual to see white blotches on the fins as in Fig. 13. These blotches are lime deposits, each blotch indicating the presence of a leak in the core. Accordingly, when a cleaning agent is used in a radiator that has white blotches on it, it is not unlikely that leaks develop as a result of using the cleaner, although it did not cause the leaks. They were there previously, and were merely clogged with rust and lime.

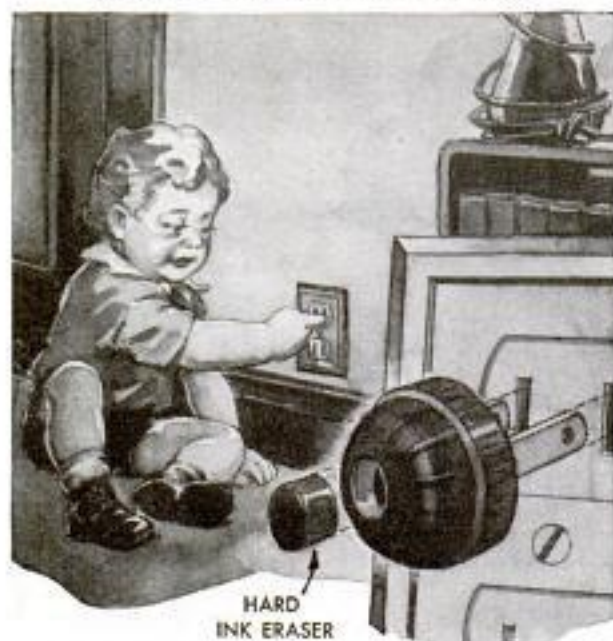
Lathe Follower and Tool Holder Used as a Steady Rest

When a lathe steady rest is not available, one can be improvised for certain kinds of work by using a follower in connection with the tool holder as shown. The latter is reversed in the tool post and placed so that it serves as the third work support, thus the follower and holder combined form a steady rest. Such a rest is most useful when using drills and other tools that can be supported by the tailstock.

One basement shop owner, requiring a drill press for drilling large panels, solved the problem by mounting a bench drill press on the ceiling; a level table mounted below the head gave all necessary working space.



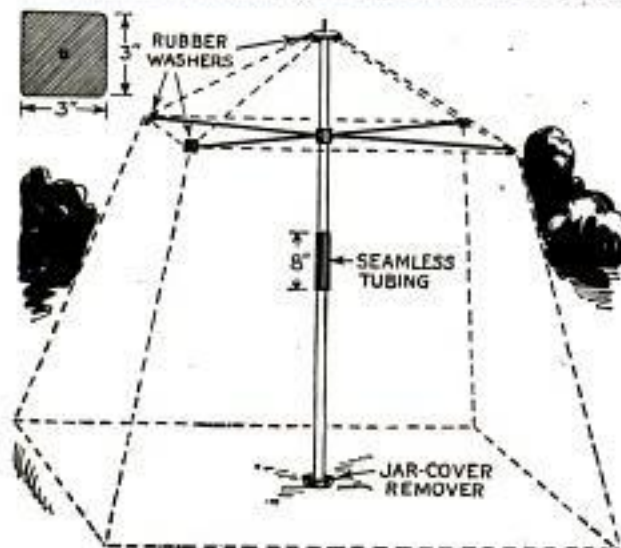
Dummy Plugs in Wall Outlets Protect Small Children



Small children who persist in playing with electric wall outlets, poking their fingers or metal objects into the slots, can be discouraged from such a dangerous habit by covering the outlets with tight-fitting dummy plugs. The ordinary cord plug can be used for this purpose by detaching the wires, inserting it into the socket and stuffing the opening with a tight-fitting plug made from a hard ink eraser. The eraser should be cut off flush with the face of the plug. When you want to use the outlet the dummy plug can be removed and a plug with wires inserted in its place.

Simple Precautions for Reducing Wear on Your Tent

Campers can prevent excessive wear on their tents, especially at the corners and top peak, which bear the greatest strain when the tent sways in a high wind, by



cutting 3-in. squares from an old inner tube and placing them over the ends of the center pole and spider before inserting them through the grommets in the canvas. And some of the wind sway will be reduced by substituting an 8-in. length of steel tubing for the tin sleeve sometimes used to connect the two pieces of the center pole. A jar-cover remover set under the center pole, and caster cups placed under the legs of a steel cot used in a tent will protect the flooring.

Long Window Cornice Rabbeted To Give Daintiness and Rigidity

Thick stock can be used for window cornice boards without looking bulky by rabbeting the wood along the lower edge to reduce its thickness. As the thickness of the wood at the top cannot be seen when the cornice is hung, it will appear from a distance to be of thin wood, thus giving a more pleasing appearance without sacrificing rigidity.



Putty Protects Insulator Screw



When putting up screw-type insulators, one electrician places a small amount of putty around the base of the screw as indicated. When the insulator is screwed in place the putty spreads out between the porcelain and wood, forming a watertight joint that protects the screw against rust.

When the insulator is screwed in place the putty spreads out between the porcelain and wood, forming a watertight joint that protects the screw against rust.

Chair Leg Is Used as a Shoe Last When Attaching Heel Cleats

A chair leg is handy when attaching the metal cleats to prevent excessive wear in one spot on the heel of a shoe. The chair is merely turned upside down and the shoe placed over the leg as shown.



CORNICE BOARDS for Children's Rooms



It's Fun to BLOW

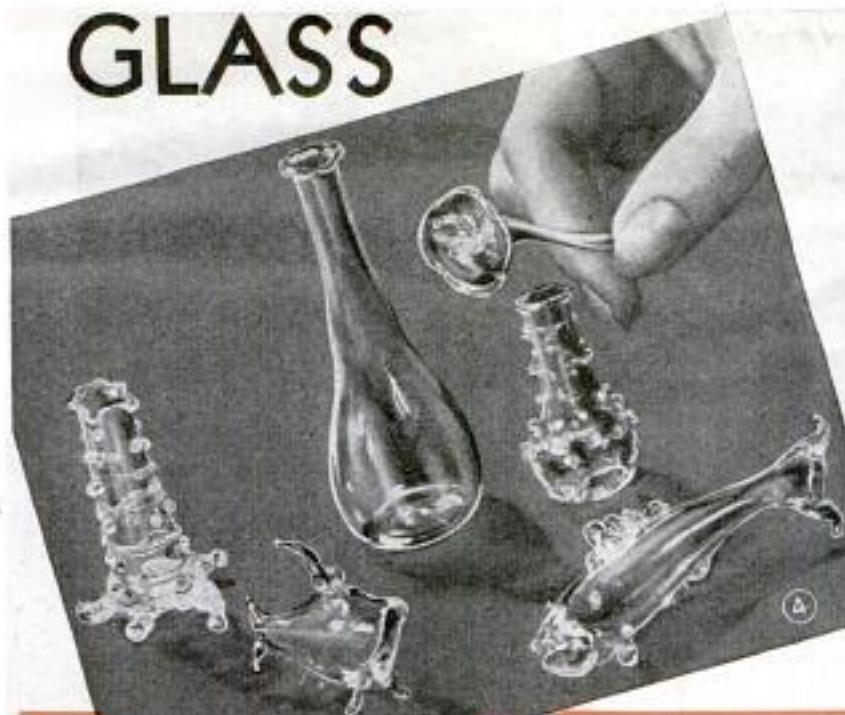


By Alexander Maxwell

THOUGH it takes long practice to fashion the artistic glass ornaments you see in novelty shops, anyone can learn in a short time to turn out simple pieces such as the vases, flowers and fishes shown in Fig. 4. These are made from ordinary soft glass tubing like that used in high-school chemistry classes and shown in the upper detail of Fig. 2. To succeed in making even these elementary objects, you must observe a few basic precautions. Glass is blown while it is red hot. At this heat it has the consistency of thick sirup. To



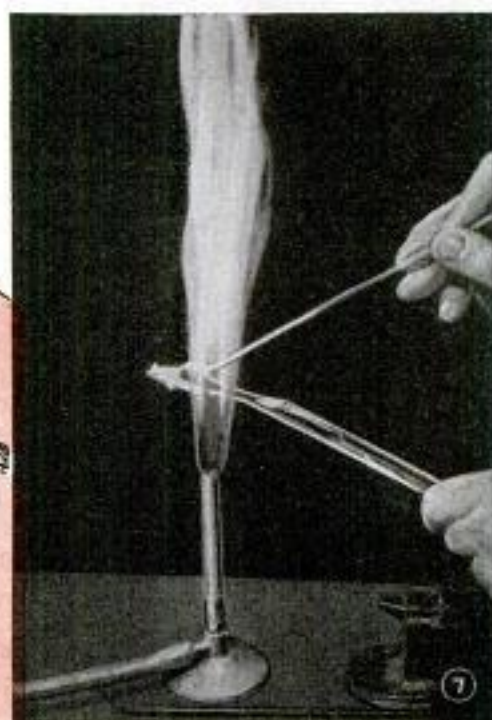
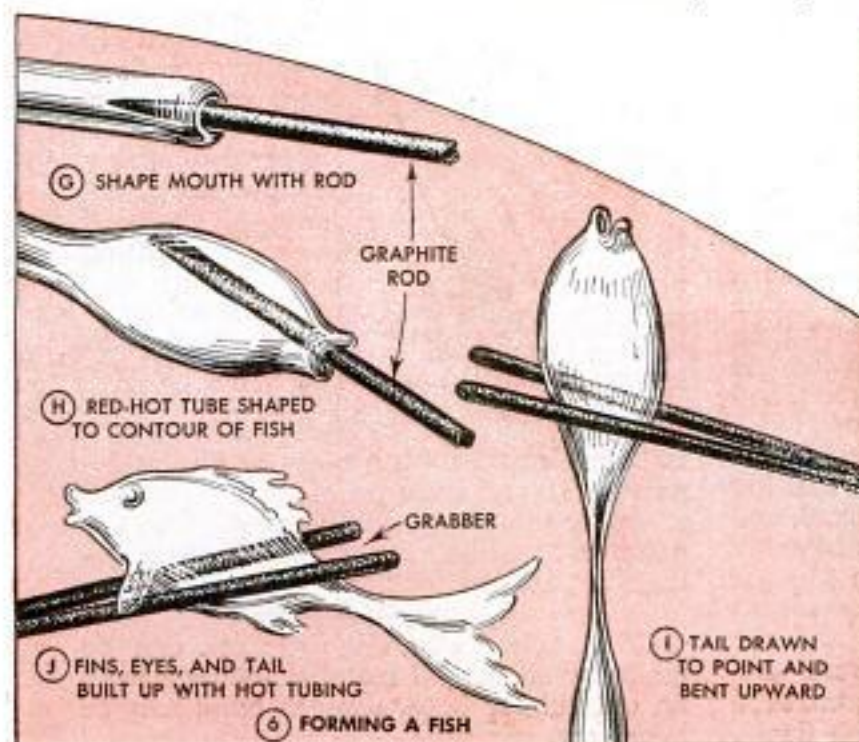
GLASS

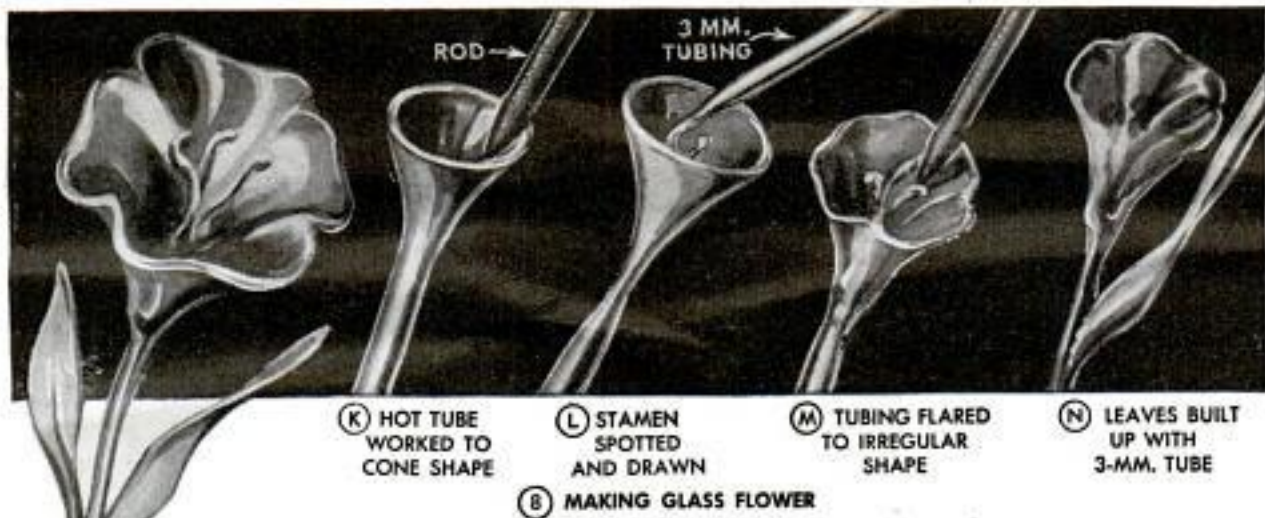


keep it from dripping, therefore, you must keep rotating the tube and blowing into it, otherwise it will sag or wrinkle from lack of sustaining pressure. Furthermore, the room in which you work must be free of drafts, for a sudden puff of cool air coming in contact with the hot glass will shatter your work in a moment.

You will need a few tools and some equipment, illustrated in Fig. 2, for heating, shaping and gripping the work. Most of these may be purchased from chemical supply houses. An ordinary gas plate, Fig. 1, may be used instead of a Bunsen burner,

shown in Figs. 5 and 7. The gas plate, however, is especially suited for heavier work, while the burner generally is preferred for more delicate heating. Graphite rods, which must first be heated, are used to form lips, flares and indentations on the work, and a graphite slab—also preheated—is used to form a flat bottom or base on the glass, the latter being pressed against it. The slab is moved by means of tongs. Work is held between the tines of the neck grabber while applying finishing touches, such as the tails on the fishes shown in Fig. 6. The tines are stationary and so cannot press in against the fragile glass. With the file you cut off the formed object or cut





small pieces from cold tubing. For the first project it is better to make something simple, such as the vase shown in steps A to F of Fig. 3. To start, grease your lips with petroleum jelly to prevent them from adhering to the glass. Then take a length of 3-mm. tubing, seal the end by heating it in the flame (A) and, placing the other end between your lips, gradually blow out a bubble with a steady pressure while rotating the tube (B). The bubble should not be larger than five times the tube's diameter. To prevent the glass from wrinkling, keep up the pressure until it hardens. If the bubble is not large enough, reheat the tube and blow it up again, but do not keep it in the heat long this time or the bubble will collapse. The base is formed by pressing the bubble gently on the heated graphite slab (C) while blowing lightly to keep up the pressure. To "hobnail" (D), keep the partly finished vase in the flame, gently press the red hot point of a 3-mm. tube against it as shown in Fig. 7, and then pull it away, leaving a drop of melted glass on the vase. The drops must be completely fused with the vase, however, otherwise they will break off in cooling. Decorations can be applied in like manner by touching a white-hot tube to the work in the flame. The melting tube will flow out in a fine line as the work is rotated. The neck then can be cut off with the wheel of an electric hand grinder (E), or the edge of a file, and the lips or flares formed at the end with the point of a heated graphite rod (F).

The same general rules apply to making the fish shown in details G to J, Fig. 6, and the flowers, Fig. 8, except that no blowing is necessary. Instead, the molten glass is formed with the rods, and the appendages—fins, tail and eyes of the fish, and the stamens and leaves of the flowers—are fused on by touching a melting 3-mm. tube to the work while it is held in the flame,

as the "hobnails" were added to the vase.

In general, do not remove any piece from the heat longer than necessary for a brief inspection, and watch carefully for indications of sagging. After the general shape has been formed, never reheat to more than a dull pink or the piece will begin to flow and so lose its shape. In pieces such as the fish and flowers that are not blown to shape, the sagging of a part cannot be prevented since there is no internal air pressure to keep them inflated. However, a gracefully drooping leaf or the bending of a fin may suggest the natural action of flowers and fish and need not be corrected. When the object is finished, lay it on the hot slab, put a tin can or other cover over it while it cools, and leave it for at least an hour.

Linoleum-Paste Spreader Made From Hard-Pressed Board



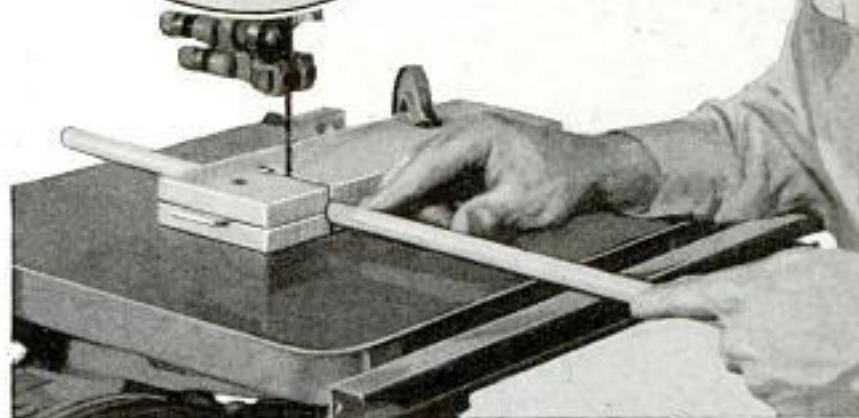
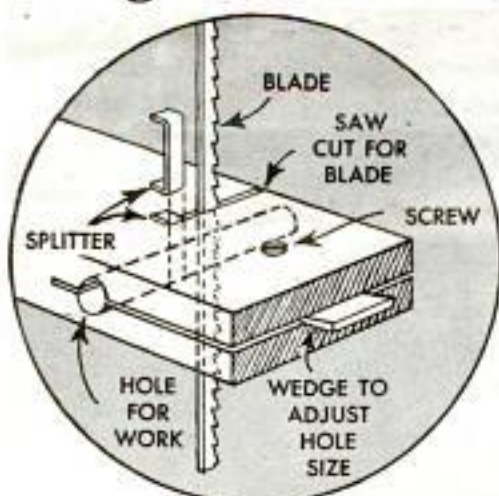
If a suitable spreader for linoleum paste is not available, one can be made from a piece of tempered, hard-pressed board by cutting teeth along one edge. After forming the teeth with a thin file or a knife, they are all worked down to a

uniform length with a piece of fine sandpaper. Being waterproof and strong, a spreader of this type will not stick to the paste and will be very effective in spreading the paste uniformly.

Good substitute hose washers can be made by slicing off suitable sections from an old rubber hose, using a band saw or hack saw.

Jig Permits Splitting Dowels Without Spiraling

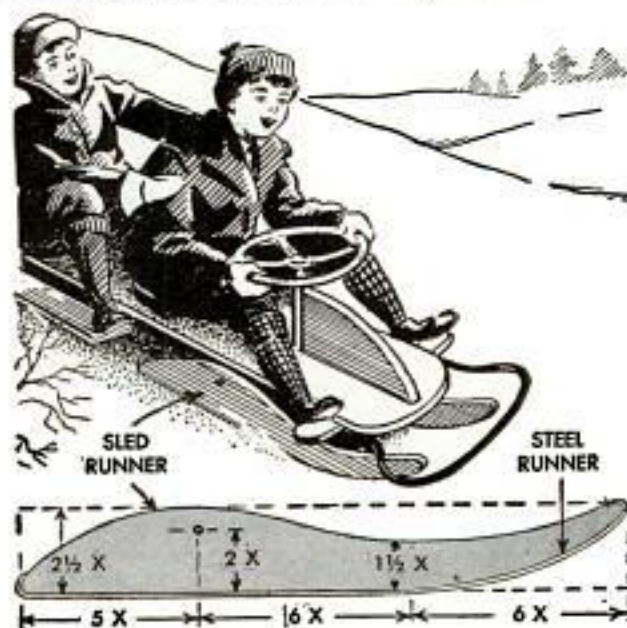
With this jig it's easy to saw wood dowels or metal tubing exactly in half lengthwise without spiraling. To make the jig, drill a hole across the width of a piece of suitable stock, from edge to edge, making the hole the same diameter as that of the dowels. Then make a cut from one edge of the board exactly through the center of the hole, running the cut halfway across the board as shown in the detail. At the end of the cut fit a sheet-metal splitter of the same thickness as the saw cut. A second band-saw cut, made from the edge of the board directly through the center of the hole and perpendicular to the first saw cut, is useful for inserting a wood wedge by which the size of the hole may be adjusted.



Bobsled Runner Pivoted to Avoid Digging Into Snowdrifts

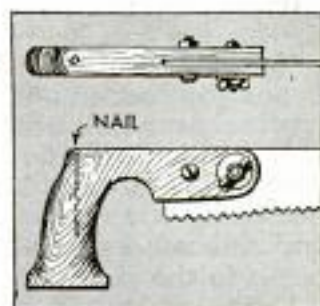
In building a bobsled, particular attention must be given the design and construction of the runners, for if these are pivoted far enough back, they will tend to ride over the bumps and snowdrifts instead of digging into them. The runner illustrated here is pivoted approximately one-third the distance from the back, and each runner pivots independently like "knee-

action" automobile wheels. Note that the tip is slightly above the pivot point. The profile is cut according to the pattern in any size desired, the measurements given here being those of proportions, not inches or feet. For runners use ash or other hardwood 2 in. thick. Fasten a length of $\frac{1}{8}$ -in. flat iron along the bottom edge with flat-head screws.

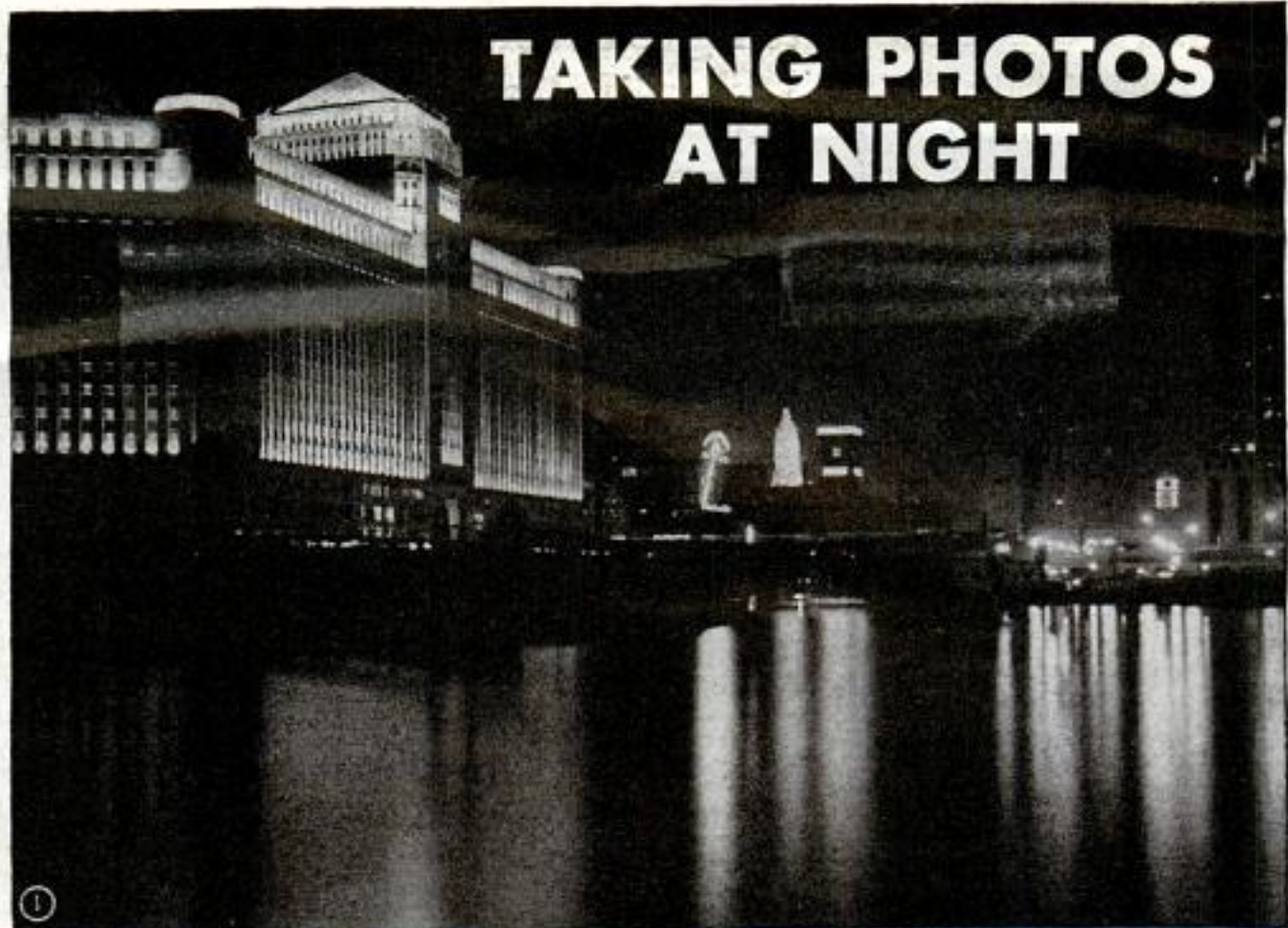


Separate Handles for Saw Blades Encourage Their Correct Use

A workman who has only one handle for a nest of saw blades is likely to use one blade for all jobs rather than change saw handles. To avoid doing this, a handle should be provided for each blade. The handles are cut easily to the desired shape from hardwood and can be reinforced by driving a nail into the end of each as indicated. It is still better to bore a pilot hole and drive in a long slender screw, taking care not to split the wood.



TAKING PHOTOS AT NIGHT



By Fred G. Korth

ONE of the easiest ways for a beginner to make interesting pictures is by night photography. While a few experiments with your type of film may be needed to determine correct exposure, it is probable that you will get some good results from the start. Roll film or film-pack is preferred to cut film or plates because the film base is much thinner and therefore less halation of the highlight areas in the picture can be expected. So-called "double-coated" film is best; it has the fast emulsion on top and a much slower one underneath. Seldom will the highlights be strong enough to spread in the thin film base or be reflected by the rear surface of the film and still cause a lot of exposure blackening to the slow second emulsion.

Exposure meters are not of much help as they do not react to the weak light available at night and therefore you will just have to guess. Modern film emulsions have quite a latitude allowing for errors in exposure one way or another. That's why it may be



sufficient to make three shots in the beginning, if you vary the duration of exposure considerably. For time exposure, it is absolutely necessary to have a sturdy tripod or some other object on which the camera can be supported solidly.

Assume that you are to take a scene in the city somewhat like those shown in Figs. 1 and 3. There are some floodlighted buildings, some windows are lighted, street lights are illuminated and there is light from automobiles. Your estimate may be an exposure of 30 sec. at F 8. To make sure of getting the picture you make two more exposures, one for 8 sec. and the other for 2 min. with the same lens opening. After normal development of the film you will be able to judge



which of three time exposures came closest to being correct.

A floodlighted statue like the one shown in Fig. 2 requires a different sort of calculation. In most instances lights are placed a good distance away, and statues are not illuminated brilliantly. However, you must give the subject sufficient exposure so that it will appear light against the dark buildings, sky and other dark background. Offhand, you can allow an exposure ten times that required for Figs. 1 and 3. Speaking of sky, avoid including the moon or some bright stars, as these may cause short white streaks in time exposures, owing to the rotation of the earth. Fig. 4 likewise requires a long exposure because a courtyard such as shown here usually is illuminated by lamps of rather low wattage.

Fig. 5 is typical of the interesting opportunities that present themselves. The shot was made while it actually was snowing. A lens hood of ample size kept the snow flakes from getting on the



lens, and the focusing cloth was wrapped around the camera to keep it from getting wet. The exposure was 15 min. at F 8 with an ordinary street lamp as the only source of illumination standing 60 ft. to the left outside the picture. Whenever a lamp is not included in the negative area it is unlikely that overexposure is objectionable; a slight overexposure will help to bring out shadow details of dark objects.

Entirely opposite conditions are encountered in taking a shot like the one

shown in Fig. 6. Hundreds of people assembled for some special occasion are milling around a brilliantly illuminated fountain. Obviously you don't want a blur of humanity in motion. Therefore you open up your lens diaphragm as far as possible, use the fastest film available, and take a chance with a short exposure and subsequent strong development of the negative. In such cases you will have to forget about shadow details.

So far the illustrations have shown subjects as they are found at night. There are, however, possibilities of using other sources of light to help bring out seemingly hopeless subjects that do not have any illumination from the outside. Fig. 7 shows a factory. There were lighted lamps inside the building. A straight time exposure would have given an impression of the window areas only and the important outline of the plant would have been lost. So daylight was brought to the rescue. This sort of thing requires nothing but patience, and it is

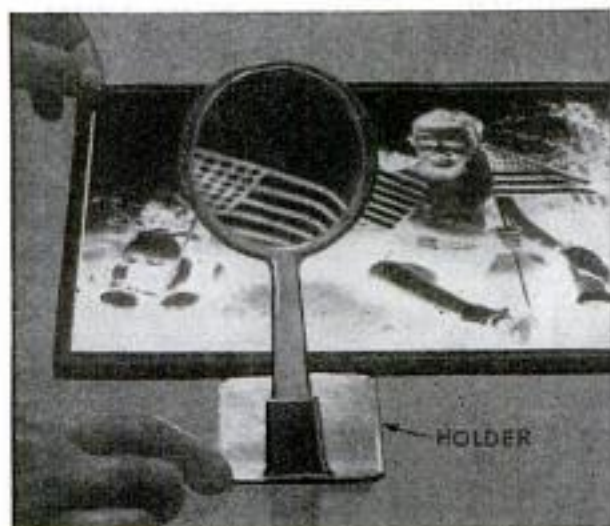


bound to work every time: Put the camera on a very substantial tripod and make a short exposure some time before sunset. If $\frac{1}{2}$ sec. would give a bright picture, give it $\frac{1}{10}$ sec. for a night effect. Then wait until total darkness, avoiding any slight movement of the camera, and take a time exposure of say 10 min. to get the lights and windows. In Fig. 7 the weak light in the sky section of the first exposure blends nicely with the bright lights in the windows obtained with the second exposure. In winter when such waiting might be somewhat uncomfortable you can use a photoflash lamp. The home in Fig. 8 was first prepared by turning on all lights in rooms facing the camera. While the shutter was



open for the short time exposure, the writer walked to the right and to the left and shot a photoflash lamp at the house from each side. The lights were held as high above the ground as possible in order to get at least a faint image of the roof.

Stand Supports Magnifying Glass Used to Focus Enlarger



When a magnifying glass is used to inspect a projected image from an enlarger as an aid in getting sharper enlargements, time lost in focusing the glass continuously during the inspection can be saved if the glass is supported in a holder as shown. A dime-store reading glass will do, and once it is adjusted in the holder to suit the focal length of the lens, inspecting an image is just a matter of setting the holder on the enlarging easel and looking through the glass, thus leaving your hands free to adjust the enlarger. The holder is shaped from thin sheet metal to provide a base and a socket is formed to take the reading-glass handle.

—Howard Rozelle, San Diego, Calif.

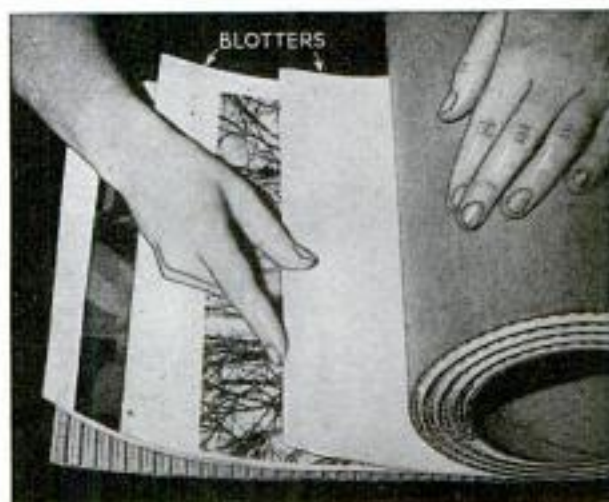
Capacity of Blotter Roll Easily Increased to Dry Several Extra Prints

When a blotter roll is filled to its usual capacity, several extra prints may be dried at the same time by inserting a few blotters between the cardboard roll and the linen backing paper. Extra prints are placed between the blotters and the linen paper.

Eliminating Shutter Stickiness

A drop or two of carbon tetrachloride between the leaves of the shutter diaphragm will help to eliminate shutter stickiness. Even if it is necessary to repeat the process once or twice to allow the solvent to work in thoroughly, it will not harm the shutter.

—Dr. R. R. Voorhees, Pueblo, Colo.



Films Squeegeed Before Drying With Dentist's Cotton Rolls



You can improvise efficient squeegees from dentist's cotton rolls for wiping excess moisture from film before drying it. These come in several diameters, but for this purpose the $\frac{1}{2}$ -in. size is most desirable. Since the cotton rolls are inexpensive, you can use new ones for each film.

Shipping Tag Identifies Film Loaded in Camera

Cut down and snapped over the fastener of the camera carrying case, a shipping tag is handy to carry necessary information regarding the type of film and the date it was loaded into the camera. Other data such as type of lighting, exposure, etc., can



be jotted down on the tag and placed in the film container until development. Absence of a tag can be used to indicate that the camera is empty.

Negatives Held Firmly by Tape On Printer or Enlarger Masks

Negatives are much easier to manage in a printing frame or enlarger when a strip of cellulose or other tape is placed along one of the inside edges of the negative mask. To hold the negative in place, one edge of it is slipped under the portion of the tape, which is kept from sticking to the film by a strip of plain paper.—Richard R. Busch, Chicago.



Focusing Cloth Held by Clips Will Not Slip Off



A focusing cloth will not slip from the camera if it is held in place by two or three spring-type paper clips as shown. Spring clothespins or other available types of clasps also would serve the purpose equally well if you are unable to obtain paper clips.

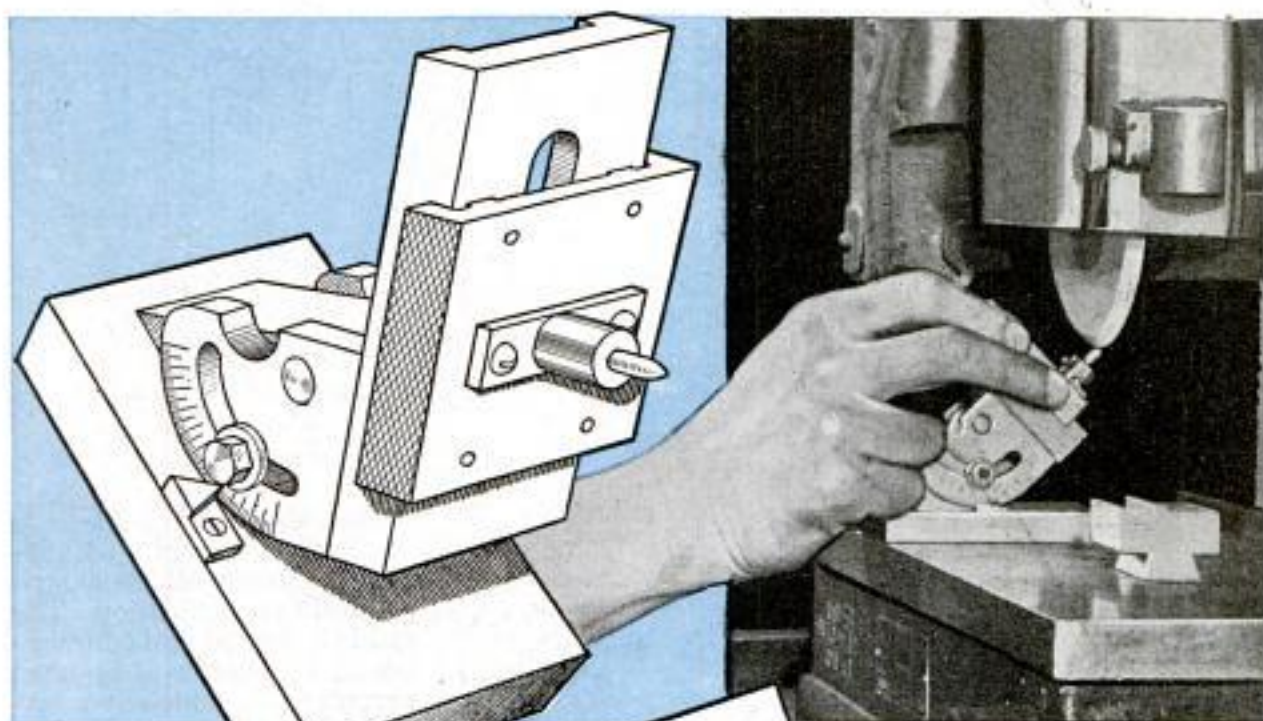
Envelopes Attached to Notebook Provide Negative File

A simple but effective negative file is made by cutting off the flaps of ordinary envelopes and taping the envelopes to the covers of a stenographer's notebook from which the used pages have been removed. With each envelope suitably classified, negatives are easily located.





SHOP NOTES



Accurate

WHEEL DRESSER

Cuts Bevels

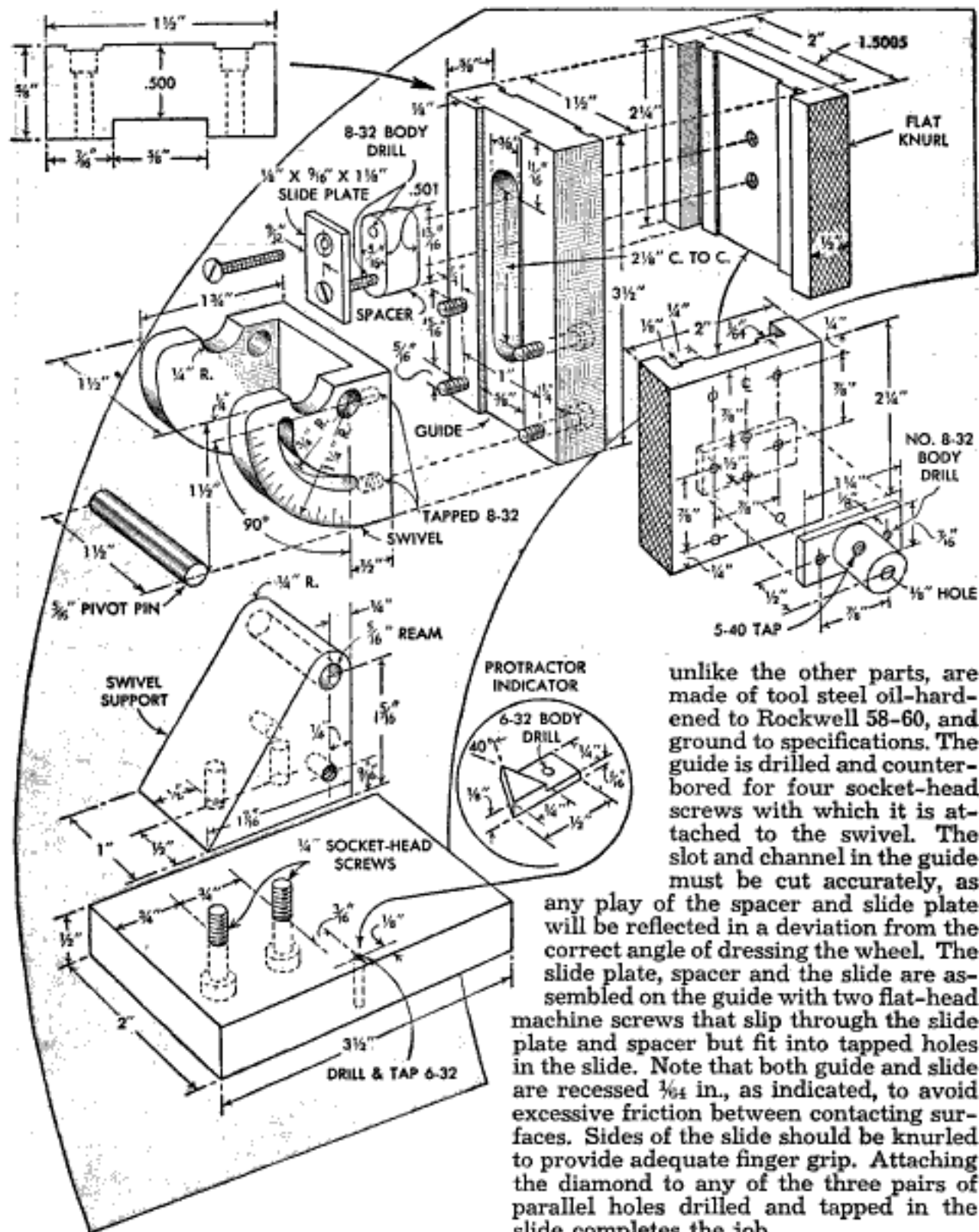
By
Charles F. Brien

FOR surface-grinder work in the small shop not equipped with an adequate wheel-dressing jig, this one, especially designed for bevel dressing, can be made up by any machinist or tool maker. It will be of help whenever it is easier to dress the wheel than to hold the work at an angle. Previous to making the one shown here, the writer spent considerable time in dressing the wheel by hand, using a parallel strapped to an angle block, and sliding the diamond up and down on the parallel by hand, but this resulted in broken wheels and involved accident hazard.

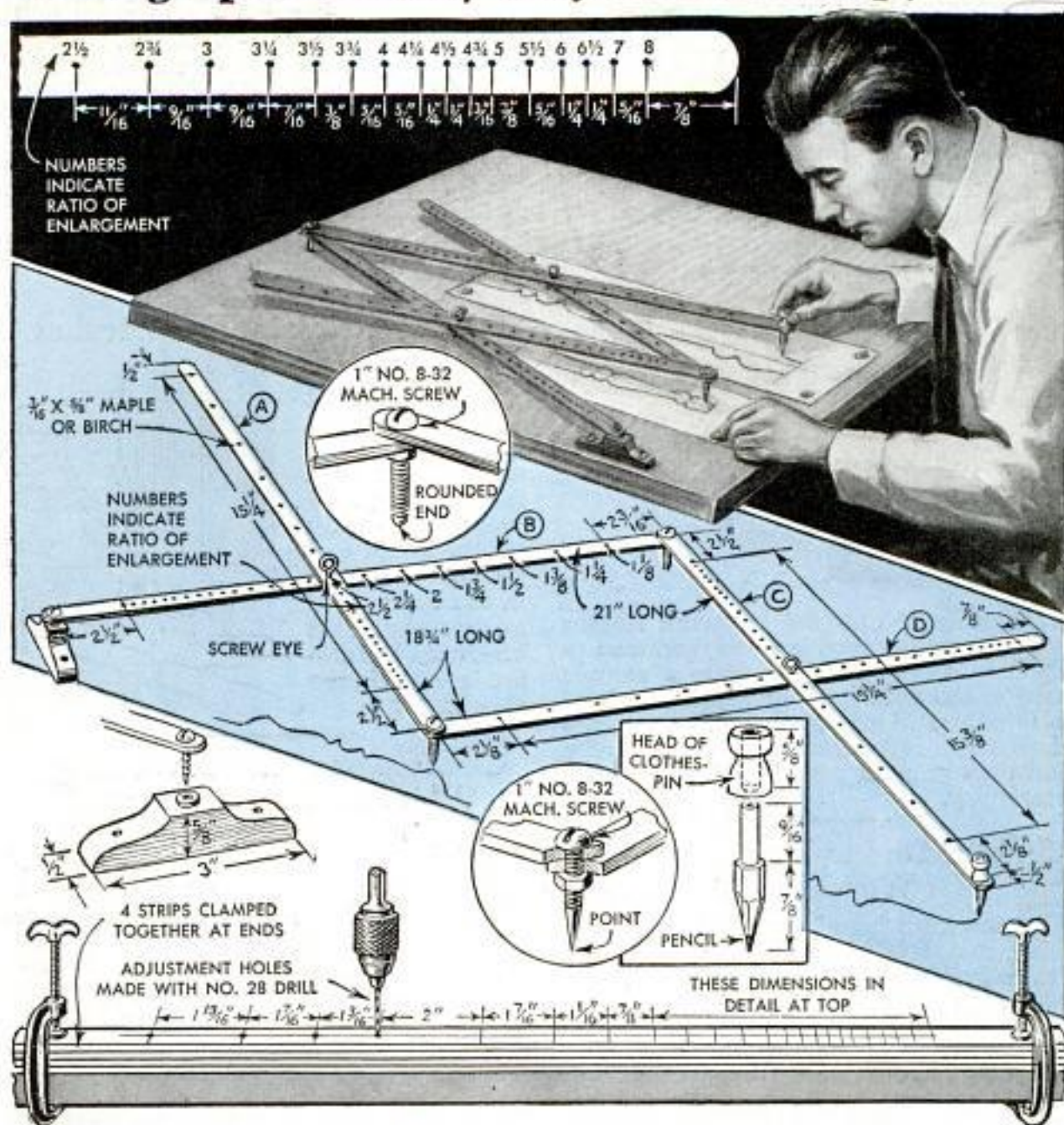
The swivel or protractor of this dresser can be set and locked securely at any predetermined angle, and the diamond can be put in any of three different positions, after

which the dresser is properly mounted in correct relation to the wheel. Moving the knurled slide up and down by hand raises and lowers the diamond without endangering the operator's fingers.

All the parts, except as otherwise specified, are made of cold-rolled steel. Start by making the base. This is drilled and counterbored for two socket-head screws, which are used to fasten the base and swivel support together securely. The base is fitted with a protractor indicator shown in the circular inset, which is fastened permanently to the base with a flat-head machine screw. The swivel support is drilled and tapped to take the screws that fasten it to the base as well as two locking screws on opposite sides, which serve to tighten the swivel at any position. These fit 90-degree, 1/4-in. slots in the swivel. Although shown on one side only, a slot must be made in each side of the swivel. The lower



Pantograph Is Easily Adjusted for Copy Work



Suitable for copying maps and diagrams and for making enlargements of woodwork patterns, this pantograph can be made from four strips of birch or maple pivoted together by brass machine screws. The holes for the pencil, tracing point, pivot block and the round-end pivot screw are drilled $\frac{1}{2}$ in. from the ends of the strips. The adjustment-screw holes are spaced identically on all four strips, except that the first holes in strips A and B are measured $2\frac{1}{2}$ in. from the center of the large holes at the end for the bolt pivoting strip B to the block and for the tracing point in strip A; and $2\frac{3}{8}$ in. from the center of the large hole for the pencil in strip C and from the center of the hole for the tracing point in strip D. Also, notice that the strips are joined

so that the ends of strips A and C in which the holes are closely spaced are connected to strips D and B at the ends where the holes are widely spaced. After marking the beginning of the enlargement scale, all strips may be clamped together and drilled at the same time. Since the accuracy of the instrument depends upon the correctness of the hole spacing, care should be taken to lay out the intervals precisely, for the pantograph will exaggerate even a small divergence from exact measurement which, though this may not be important to most copy work, will materially affect the accuracy of scale drawings.

☐ A small fly sprayer is handy for applying antiseptic to cuts and sores on animals.

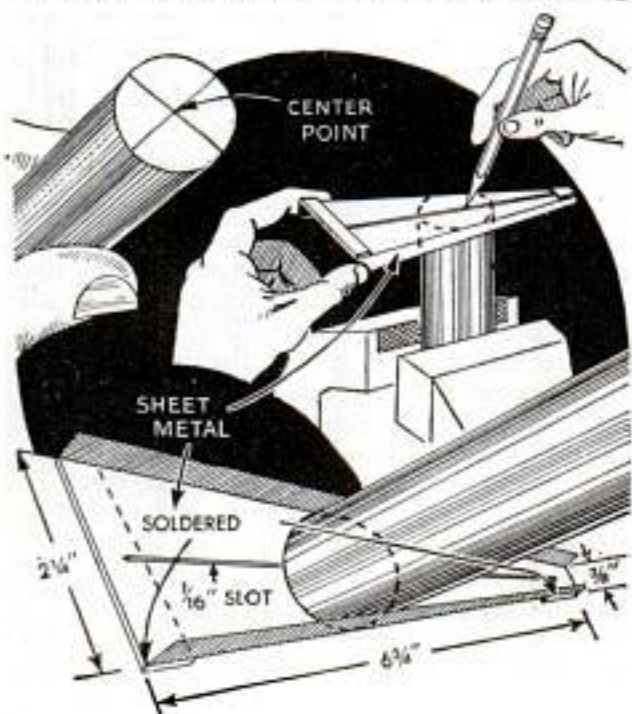
Workman's Folded Work Clothes Carried With Trouser Hanger



Difficulty of carrying his work clothes to and from his shop led one workman to devise a carrying handle from a trouser hanger, the wire hook of which was bent to form a good grip as shown. In use, the clothes are rolled into a suitable bundle and then gripped with the hanger in the usual way.

Simple Tool to Locate Centers Of Wood Turnings

Fitting work from $\frac{3}{8}$ to 2 in. in diameter, this center-marking tool can be made by anyone, and is a timesaver for the woodworker where exact location of the centers



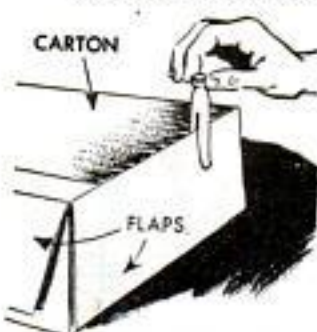
is not critical. The tool is made of sheet metal as indicated and can be almost any size desired, although the size given will be suitable in most cases. In use, the tool is placed over the end of the work and adjusted so that the sides are a snug fit against the work, after which a line is made across the end of the work with a lead pencil in the tool slot. Then the tool is turned to bring the slot at right angles to the penciled line and another mark is made. The intersection of the two pencil lines is the center of the work.

Clay Holds Paint and Brushes On Window Ledge

To hold paint and brushes on a window ledge, one sign painter uses modeling clay. By pressing the clay on the ledge and setting the can on it, the can is held securely. The brush handles also are inserted in the clay, as shown.



Clothespins Hold Cover Flaps While Cartons Are Packed



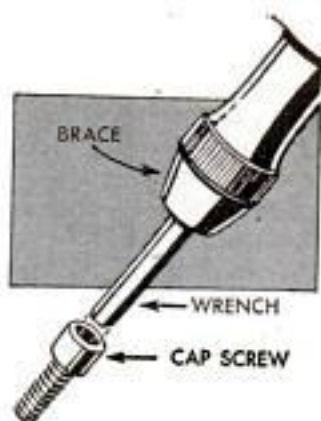
A good way to keep the cover flaps folded down while packing cardboard cartons is to place ordinary clothespins over the folded edges. This method eliminates the use of projecting

arms sometimes installed on packing benches for this purpose.

—Harry Radzinsky, Great Neck, L. I.

Speed Wrench for Socket Screws

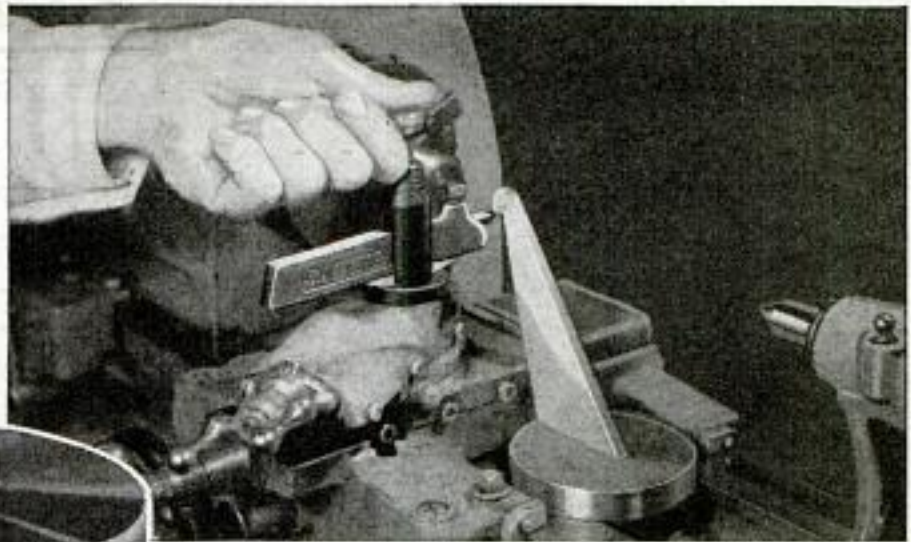
An ordinary carpenter's brace can be used as a speed wrench for tightening or loosening hollow head cap screws. Just cut off the short arm of the regular wrench included with every box of screws and use it in the brace chuck.



Piston-Base Height Gauge Centers Lathe Tool



When the cutting edge of the tool bit must be set at exactly lathe-center height in certain operations such as thread cutting, taper turning and parting, this height gauge will save time. The gauge can be made from the top of a discarded auto pis-



ton and a small piece of $\frac{1}{4}$ -in. flat stock cut to the shape shown. Turn the piston head absolutely flat at top and bottom and fasten the vertical part to the base with two 10-32 screws. The overhanging tip of the gauge should be made to indicate the exact lathe-center height when the gauge is placed on the lathe ways.

—C. W. Woodson, East Aurora, N. Y.

Determining Length of Rope Wound Tightly on Drums

When it is necessary to determine the length of rope, cable or similar materials wound tightly on drums where the drums are either full or where part of the material has been removed, here is an easy way to do it: Measure the depth of the material H , on the drum and to this add the diam-

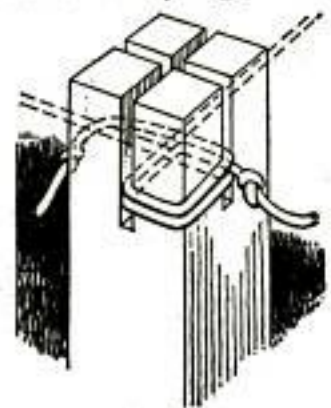
eter S , of the drum. Multiply this sum by the depth H . Then, multiply the product by the inside length L , of the drum. Next, divide this product by the square of the diameter D , of the rope, cable or other material on the drum, all of the above measurements being in inches, and then multiply the quotient by .262 which will give the approximate length in feet of the material on the drum.

—W. F. Schaphorst, Newark, N. J.



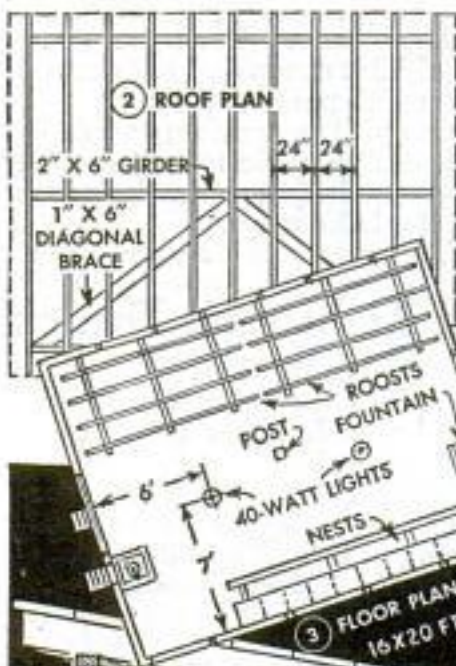
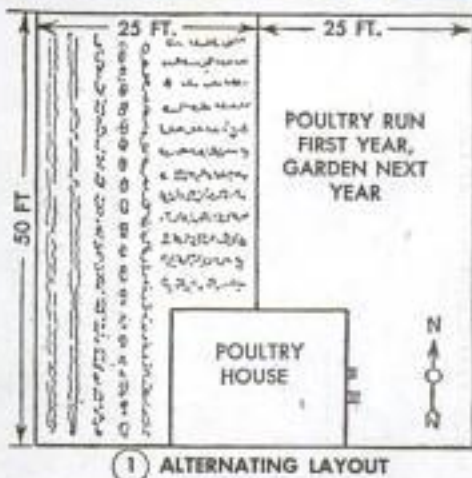
Excavator's Line Held Securely On Stakes Without Tying It

Annoyed by frequently tying and untying his marking line to take up the slack, one mason sawed cross slots in the corner stakes and threaded the line through them. In this way, the line could be held securely without tying it. Also, this arrangement made it possible to tighten each section of the line between the stakes without the preceding section loosening.

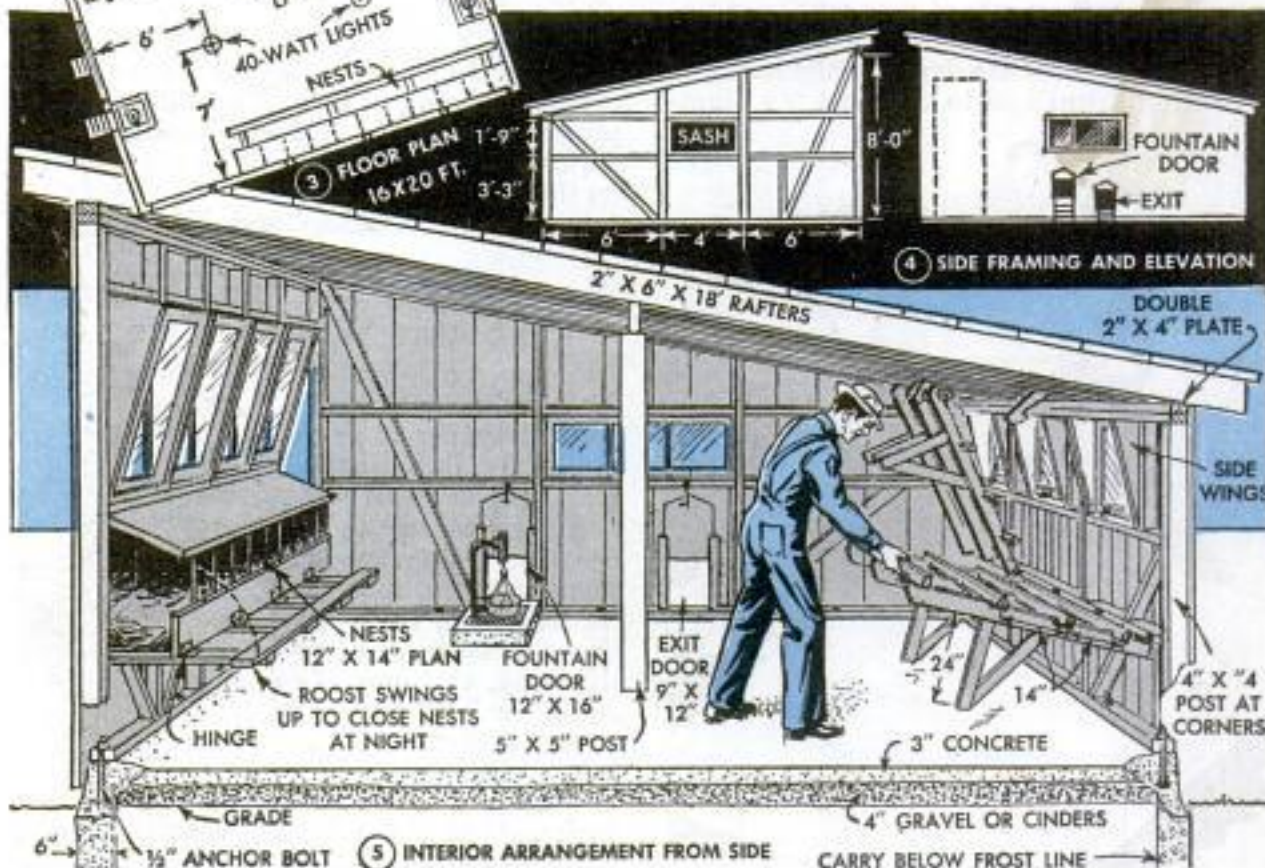




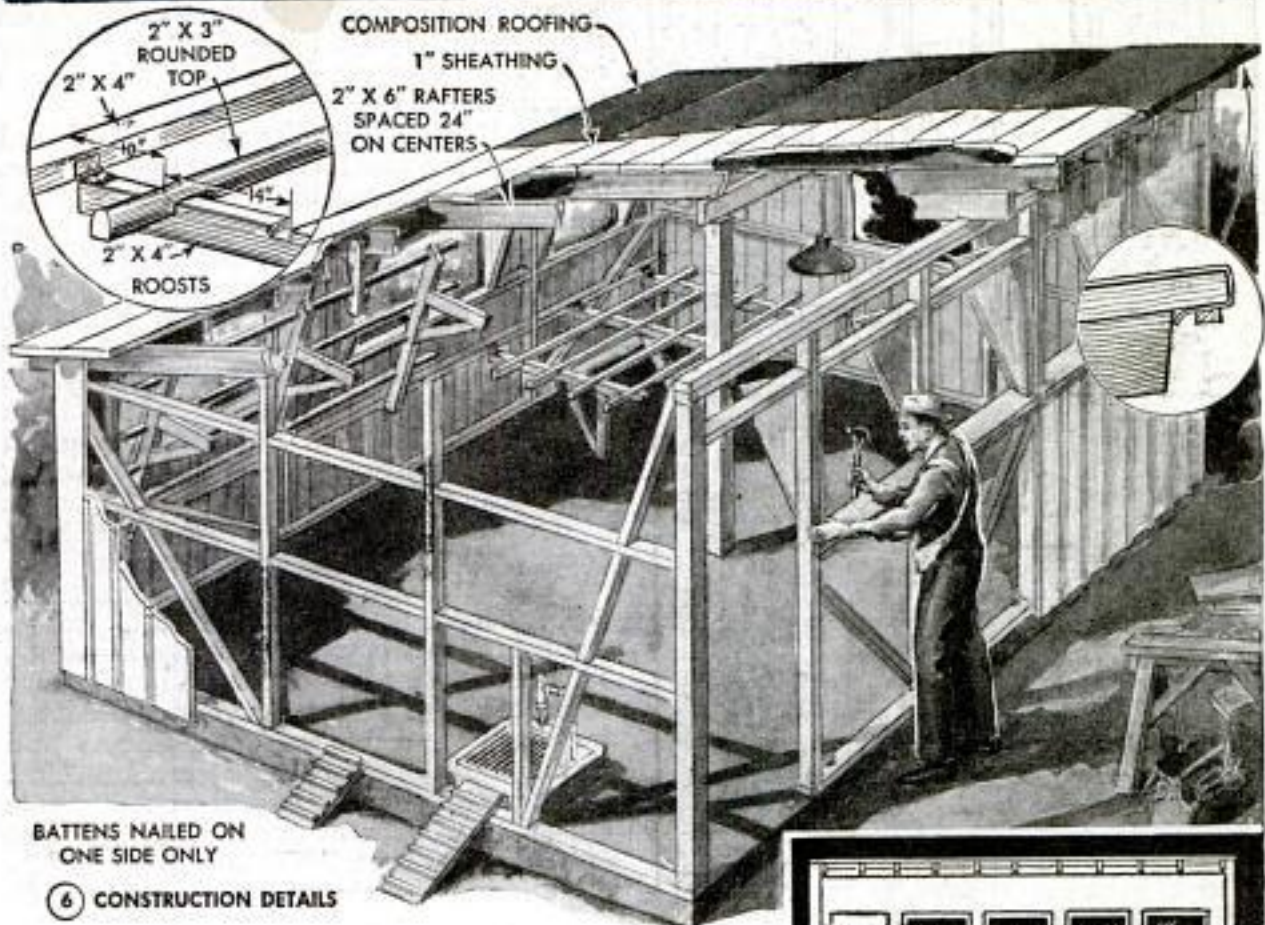
POULTRY



SUCCESSFUL poultry raising requires first-class housing, which means ample space, dry floors, plenty of sunshine, good ventilation without drafts, and protection from the elements. About 3 sq. ft. of floor space should be allowed for White Leghorns, and 4 sq. ft. for the heavier meat breeds, such as Rhode Island Reds and Plymouth Rocks. The outdoor pens should allow at least 7 sq. ft. of space per bird. A desirable arrangement for a pen is to have two runs, alternating these for use as a garden in successive years. Fig. 1 illustrates a layout for 100 birds on a 50-ft. plot with one house and two pens. Where space permits, the flock can be doubled or tripled if sections are added to the original house and pens.



HOUSES You Can Build

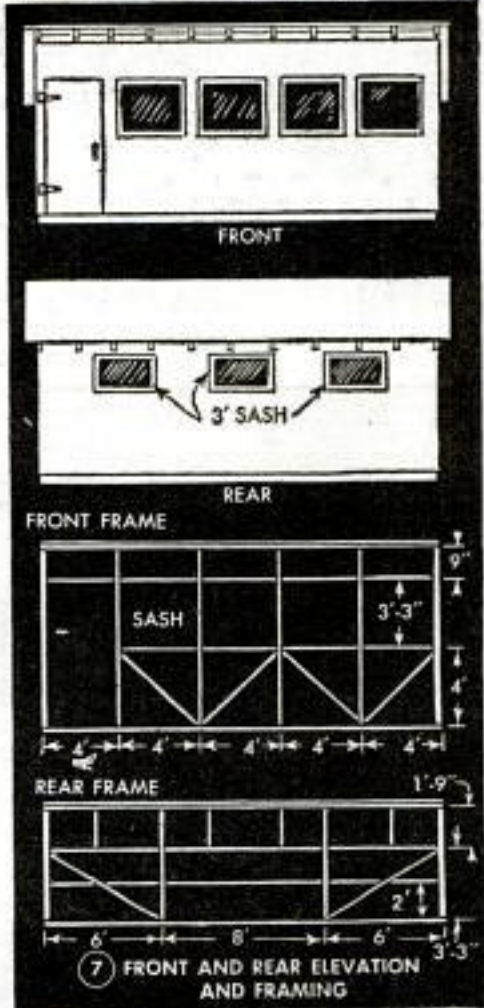


BATTENS NAILED ON ONE SIDE ONLY

6 CONSTRUCTION DETAILS

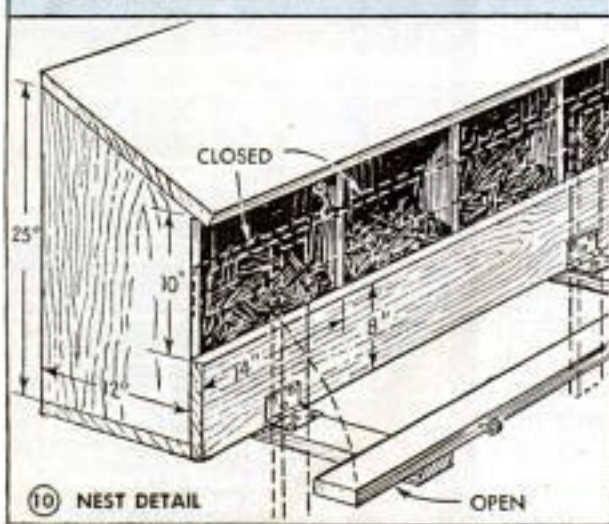
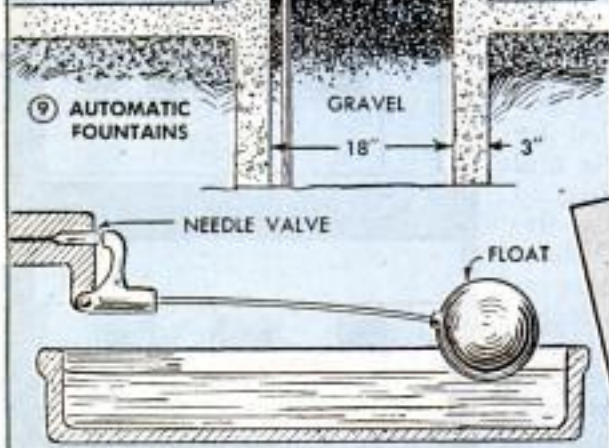
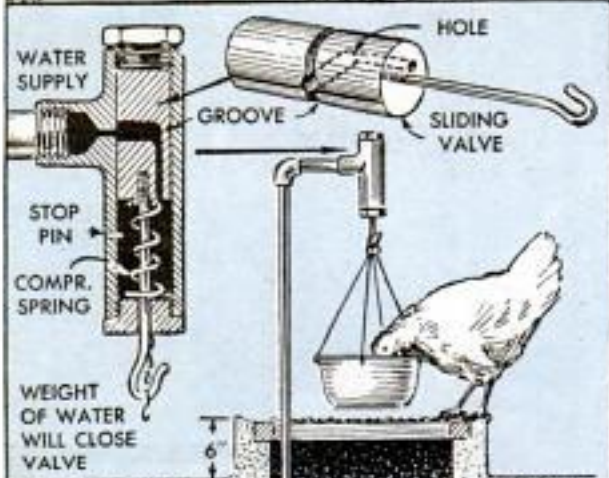
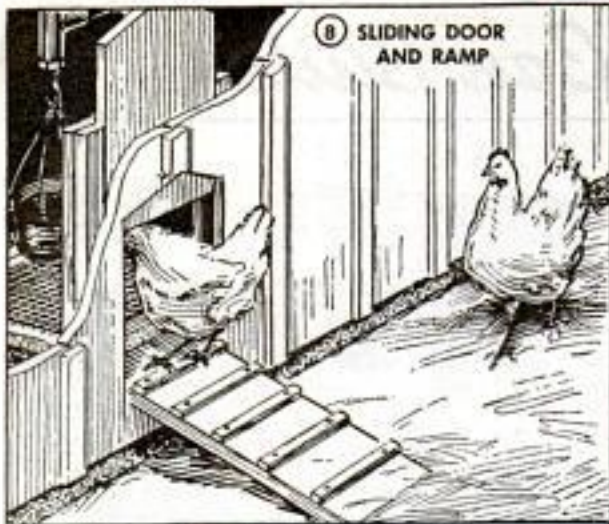
The floor plan shown in Fig. 3 is arranged to combine the best features of those recommended by successful poultry raisers, agricultural schools and government farm bureaus. This house is designed for White Leghorns. For larger fowl, increase the length to 24 ft. The elevations in Figs. 4 and 7 show the ample lighting arrangements, with windows on all sides and a single door conveniently in front. Board-and-batten construction does not require as much framing as horizontal sheathing. Note that diagonal braces are used generously, as this is very important in a light structure. One common fault of the average "hen house" is its slant away from the prevailing wind, due to not having "sway braces." Even the rafters should have diagonal braces as in Fig. 2. These are 1-in. boards and prevent a twisting effect in high winds. The sectional view in Fig. 5 gives a good idea of the construction. Concrete is the best material for a floor as it does not rot, is rat-proof and more easily cleaned than boards, which tend to splinter. If a wooden floor must be used, build it at least 18 in. above grade so that vermin cannot make nests beneath, and dogs can get under to discourage rodents.

Footings are carried below grade and cinders or gravel are used as fill between them to a depth of 4 in., after which concrete is poured over this to a depth of 3 in. The footings should extend below the frost line, and 1/2-in. anchor bolts spaced 4 ft. apart



7 FRONT AND REAR ELEVATION AND FRAMING

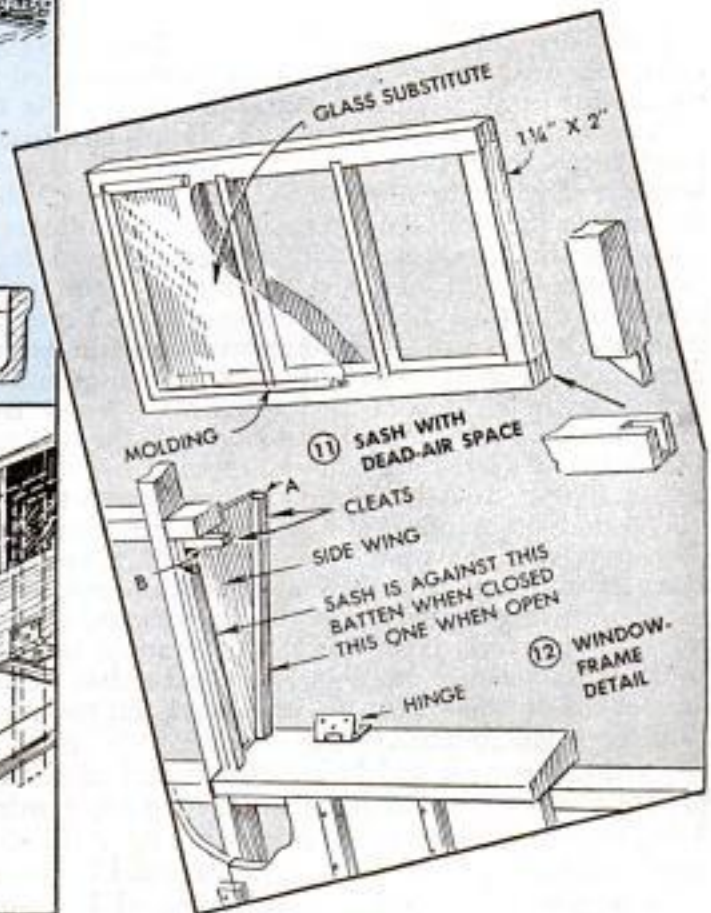
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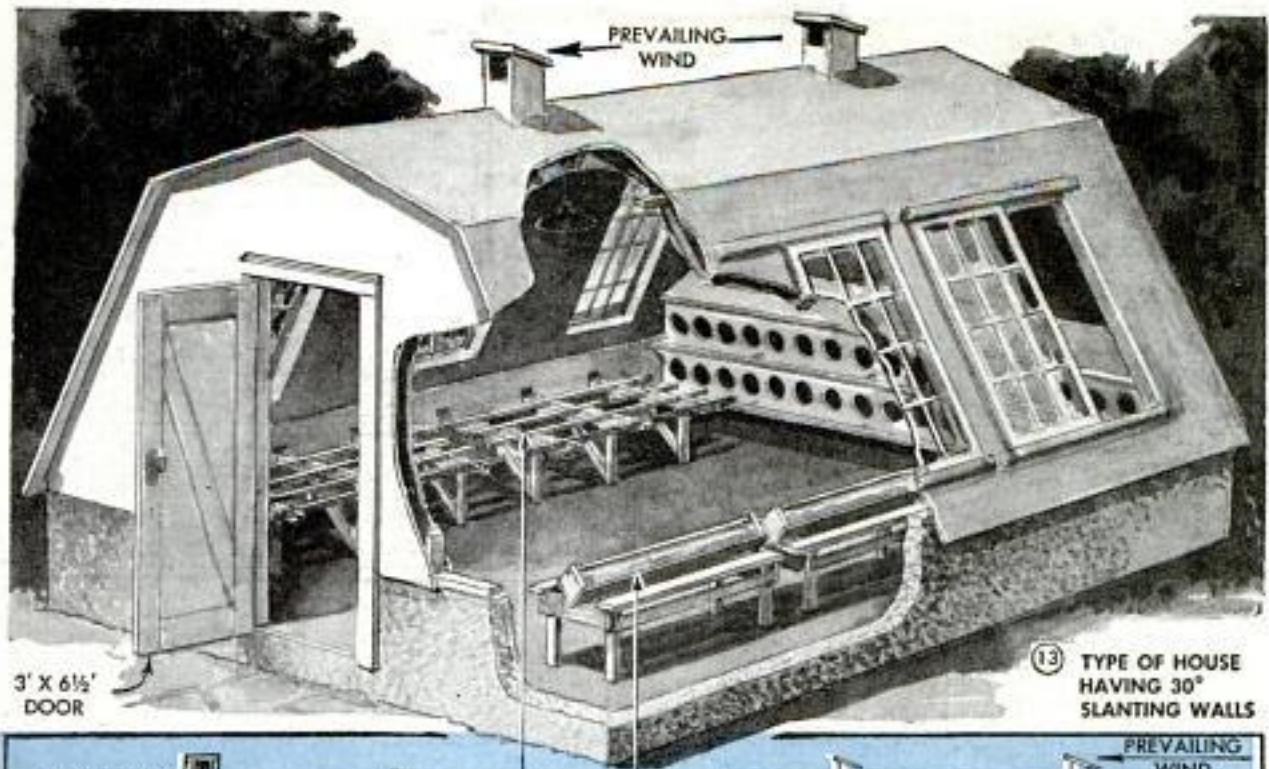


should be embedded in the wet concrete to anchor the sills. Studs are toenailed to them and horizontal members and plates are installed as indicated in Figs. 4 and 7. The siding boards then should be nailed on the framing, space being left for window and door openings, before the rafters are installed.

Note in Fig. 5 that the sash are designed to tilt inward and have wings on each side. This forces the ventilation upward, away from nests and roosts, and also affords some protection for the glass-substitute which will last longer than if exposed directly to the force of a heavy downpour. Nests are arranged along the front wall just below the sash, and have a hinged perch which is swung up at night to keep the birds from getting into the nests. Roosts are arranged to swing up out of the way when cleaning the floor. A single center post supports a girder under the rafters. Houses only 12 ft. or less in depth do not require this.

General assembly and arrangement of the structure are shown in Fig. 6. Roosts are built in two units for easy handling. Their construction is shown in the circular detail of Fig. 6. Although not indicated, the framing should be sheathed inside as well as outside where the nests are installed. When putting battens over the siding joints outside, nail each at one side of the joint only, doing this on the side facing prevailing winds. The siding boards will shrink

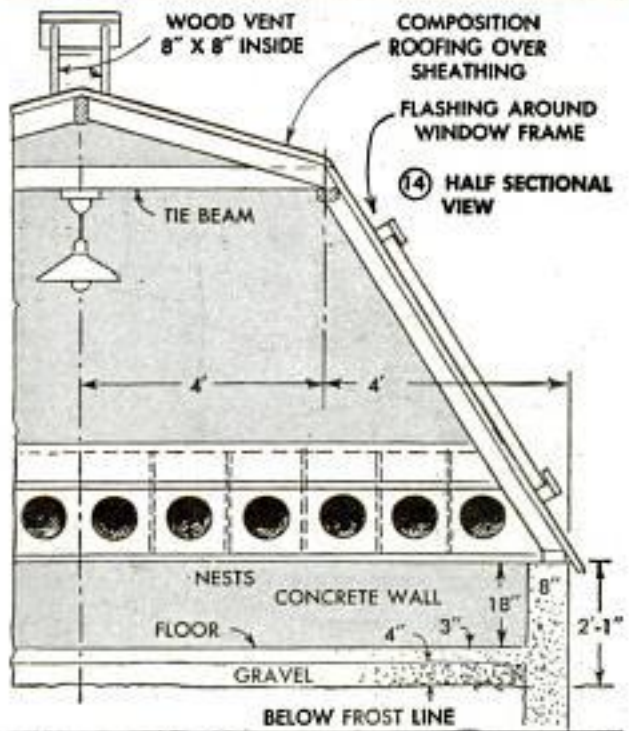


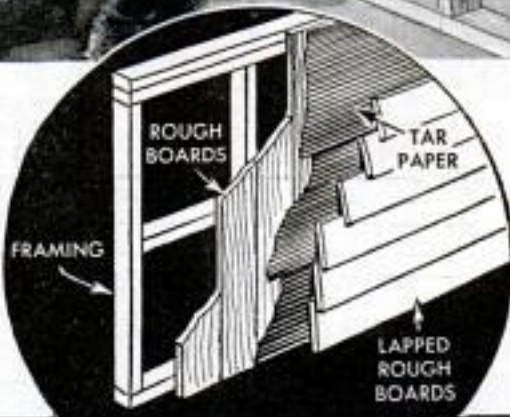
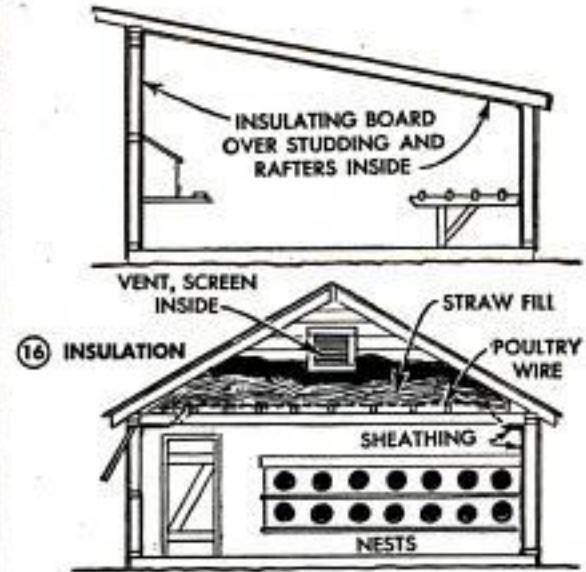


in dry weather and battens are absolutely necessary. If they were nailed on both sides of the joints shrinking of the boards would split them.

Fig. 8 shows a section through the exit door, which is similar to the one for the fountain. The latter, by the way, is housed inside for use in bad weather and to protect it against freezing. To prevent water spilling on the floor and to keep out litter, the fountain is placed over a raised, gravel-filled well, which is fitted with a lift-out frame of hardware cloth. An automatic fountain can be made as shown in the upper detail of Fig. 9, in which a plunger valve is forced up by a compression spring when the level in the water pan becomes low. This is a machine job and should be made of brass or bronze which does not rust. A more common type of valve having a float, is shown in the lower detail.

Nest construction is shown in Fig. 10.

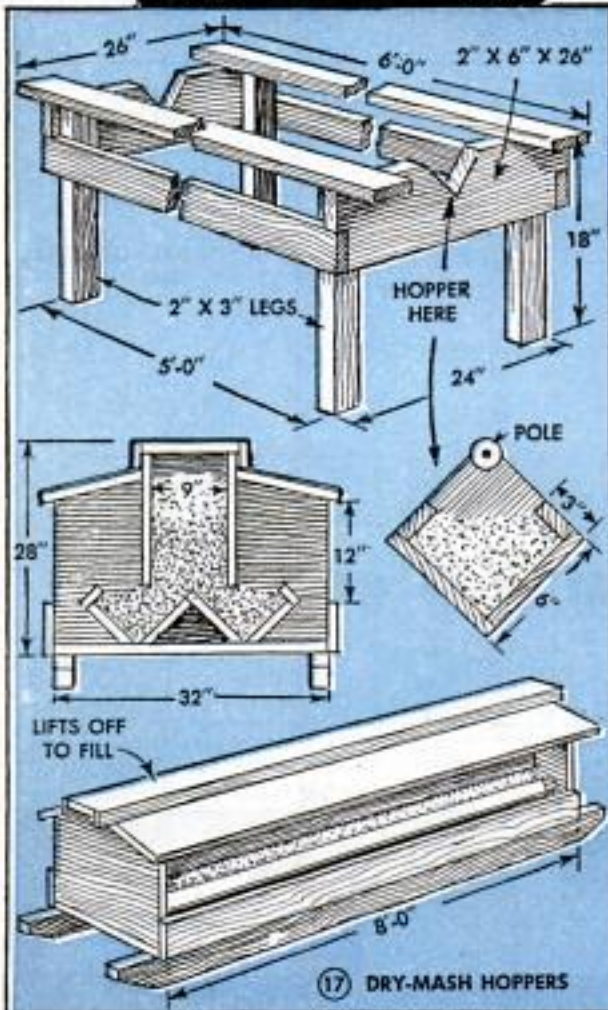


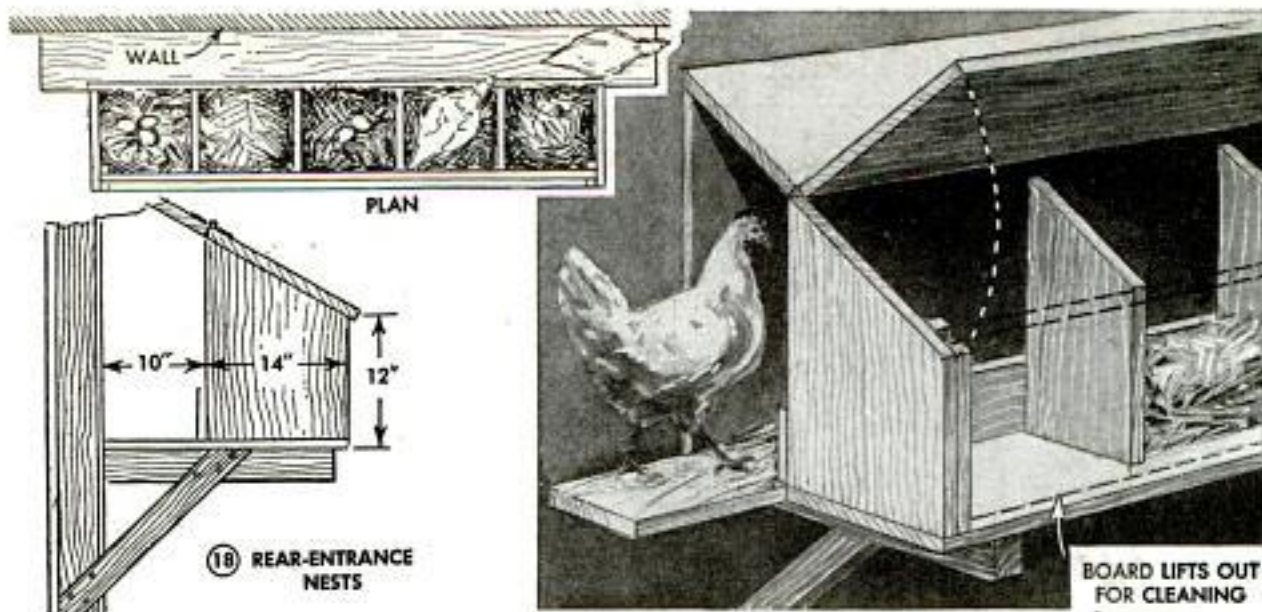


There should be one nest to each five birds, or twenty for the hundred in this unit. Another arrangement of nests is shown in Fig. 18 in which the hens enter along a "catwalk" at the rear. The advantage of this arrangement is that the nests are dark, which reduces the possibility of hens eating the eggs.

Side wings for the window sash are shown in Fig. 12. The sash should be hinged at the bottom and fitted with a crescent catch at the top to draw it snugly against the cleat B. When open, they rest against cleat A. The sash are made as in Fig. 11, with mortised corners and a glass substitute on both sides to provide a dead-air space for good insulation without appreciably detracting from the light. Real glass, incidentally, does not retain warmth at night, nor does it pass as much of the health-giving ultra-violet rays as does glass substitute.

Another type of house is illustrated in Figs. 13 and 14, in which the side walls incline at 30 degrees from the vertical, thus permitting light to enter the windows for a longer period than if they were vertical. In this case glass substitute should not be used in the sash, which slide sideways in rails to give more ventilation than afforded by the wooden ventilators on top. Arrangement of the floor plan is similar to that of the preceding design, and construction of the floor is the same except that concrete walls are carried up 18 in. all around. Sides as well as roof are covered with composition roofing, and care must be taken to install flashing around all window frames to render them rainproof. Various types of roofs can be used on poultry houses as shown in Fig. 15. The combination and gable roofs, A and B, are desirable for large structures, but are too deep for the shed roof design described first. The



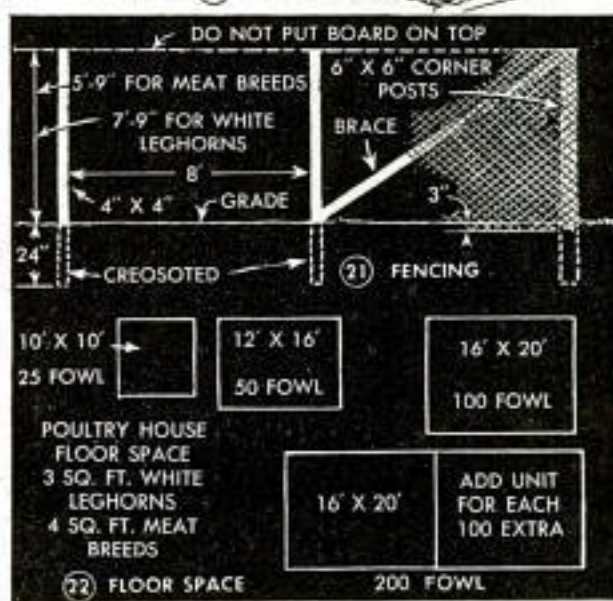
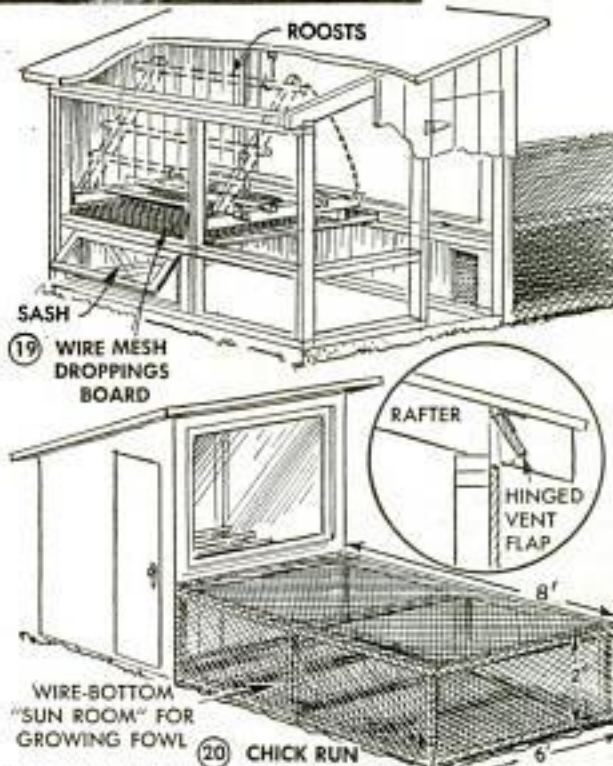


monitor and semi-monitor types, C and D, allow for top ventilation as well as added light through swing-in sash.

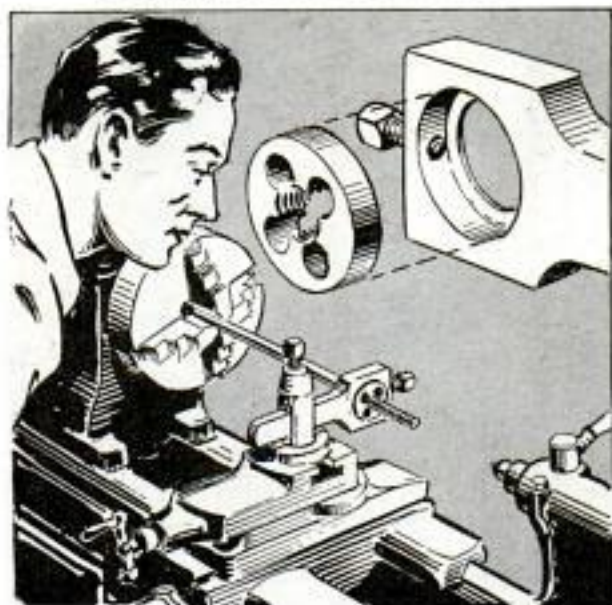
Two methods of insulation are illustrated in Fig. 16. Simplest is to line walls and ceiling with insulation board. In cold climates this is important, and in all cases, insulation should be installed behind and above the roosts to prevent chill at night, or moisture condensing on the walls.

Some poultrymen install a droppings board under the roosts, with poultry wire to keep the chickens away from the droppings. The roosts are arranged to swing up as in Fig. 19 to facilitate cleaning. A vent at the eaves is provided by a flap between the rafters and above the plate as indicated in the circular detail of Fig. 19. For growing fowl or young chicks, a "sun room" is made having sides of poultry netting and a hardware-cloth floor just above the ground as in Fig. 20. In the outdoor runs, posts are placed 8 ft. apart and 24 in. deep, with ends creosoted and the wire about 3 in. below grade as in Fig. 21, but deeper if troubled with skunks or other burrowing animals. However, do not put a rail across the tops of the posts as the full grown fowl, especially White Leghorns, will fly up to it. Floor space required for various numbers of hens is given in Fig. 22. Bear in mind that this is about the minimum; allow more if you have the area and the material available.

Dry-mash hopper design is important where a large number of fowl are kept, because when improperly constructed, a considerable waste will result. Two approved types are shown in Fig. 17, each being made of wood. Poultrymen, specializing in egg production, recommend having ample hoppers filled at all times for best results. As much as 24 ft. of hopper length per 100 birds is not too much.



Slender Stock Threaded in Lathe Using This Die Holder

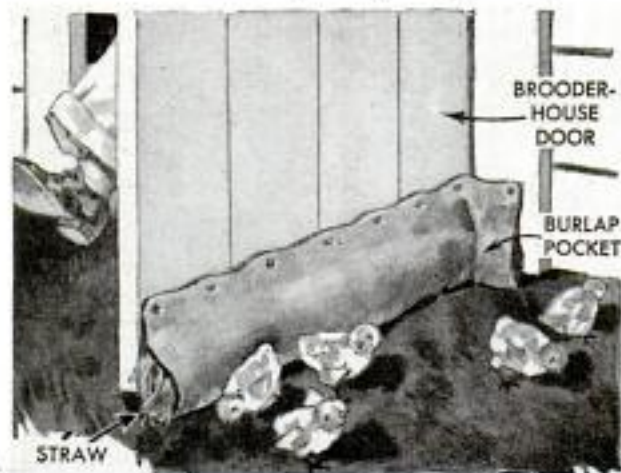


Long slender rods may be threaded more accurately on a lathe with less danger of damaging them if a die holder like the one shown is used. It consists of a handle long enough to clamp in the tool holder and a head reamed as shown to take standard button dies, which are held by a setscrew. When clamped in the tool holder, the cutter is lined up by centering with the tail-stock center and is squared with the lathe by pressing flush against the face plate. To start the threading, push the die up to the work until the first few threads have been cut and the die begins to pull the carriage. For removal, if the lathe does not reverse, the setscrew can be loosened and the die twirled off the rod.

—Russell Rosendahl, Muskegon, Mich.

Brooder-House Door Padded To Protect Small Chicks

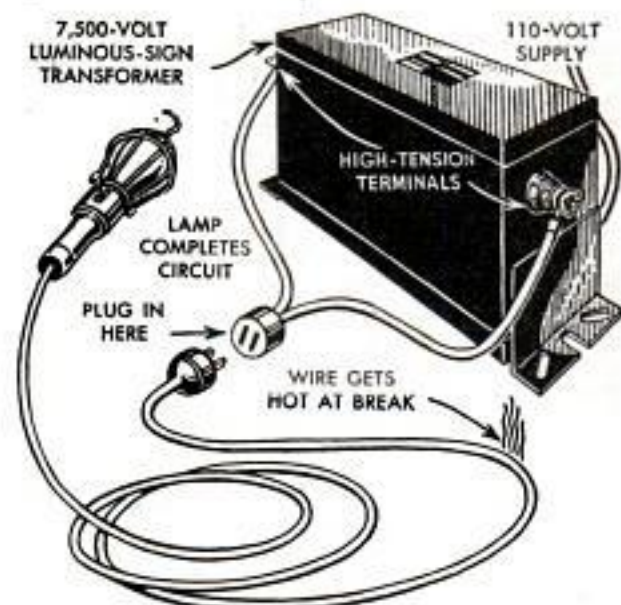
To keep chicks in his brooder-house from being injured under the edge of the door when it was opened, one poultryman



tacked a folded piece of burlap to the bottom edge of the door and filled it with straw to provide a cushion. When the door is opened, the cushion brushes the chicks harmlessly out of the way.

High-Tension Current Locates Breaks in Extension Cords

In one shipyard where a great number of extension cords were used, the wires inside the cord often were broken without leaving any indication of the break in the insulation or covering. Thus it was difficult to locate the break by the usual means and many hours were lost in repairing the cords. To save this time, the cords were connected to a 7,500-volt luminous-sign transformer with a secondary capacity rating of 60 milliamps as shown, using a lamp at the end of the cord to complete the electrical circuit. In passing through the cord, the high-tension current will jump the break in the wire, heating it and causing



the insulation to become warm at the break, which can be located by running the hand over the cord. If the current is left on for two or three minutes, the wire will become hot enough to burn through the insulation and thus automatically locate the break in the cord.

—C. W. Furnberg, Portland, Ore.

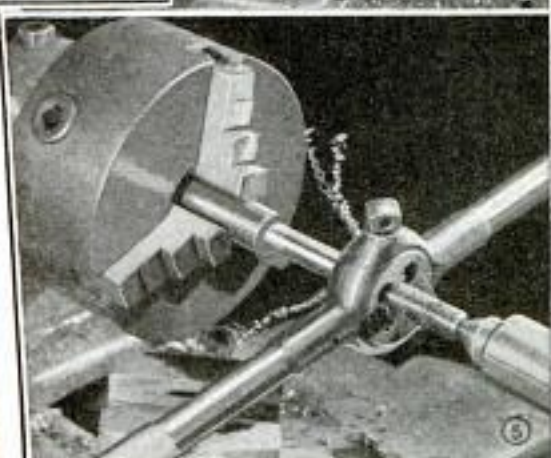
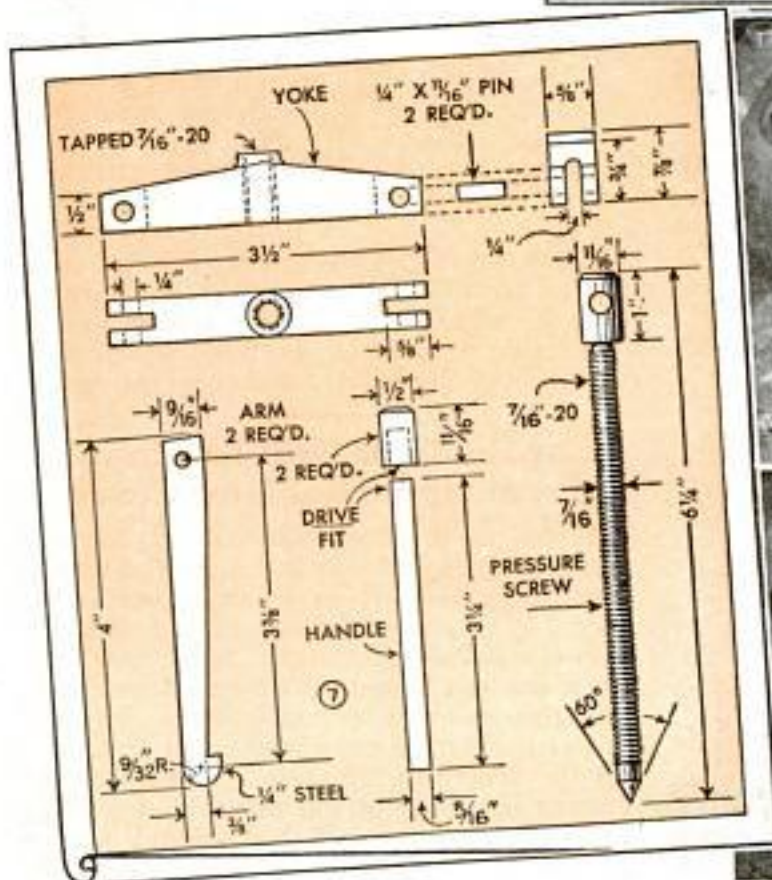
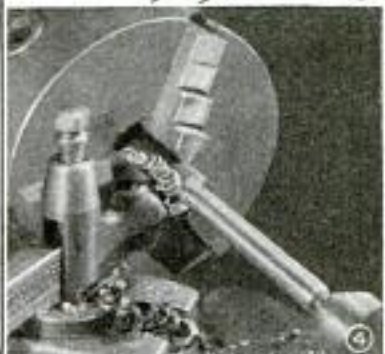
WRITE FOR POPULAR MECHANICS!

Readers are paid cash for ideas printed on these pages. You too, may know of a simpler, faster or better way to do some daily chore about the home, farm, office, shop or garage; an aid to amateur photographers, model makers, workshop fans, car owners, hobbyists, etc. Just send a short but complete description plus a sketch or photo to the Homecraft Editor of Popular Mechanics. Checks sent promptly for accepted ideas.

You can make this WHEEL PULLER



For removing wheels, gears, pulleys, etc., a small wheel puller like the one shown in Fig. 3 is just the thing. Fig. 7 shows the sizes and shapes of the various parts and Fig. 1 shows how the yoke can be shaped in a lathe and then drilled and tapped as in Fig. 2 for the pressure screw. The arms or side clamps are shaped with a hack saw and file or on a grinder, or you can even use a disk sander as in Fig. 6. After assembling the arms and yoke, the pressure screw is turned to size as in Fig. 4, leaving a head at one end to take the handle, after which the screw is threaded as in Fig. 5. The lower end is turned to a 60-degree angle and a hole is drilled through the screw head to take a handle, which is fitted with endpieces to hold it in place.



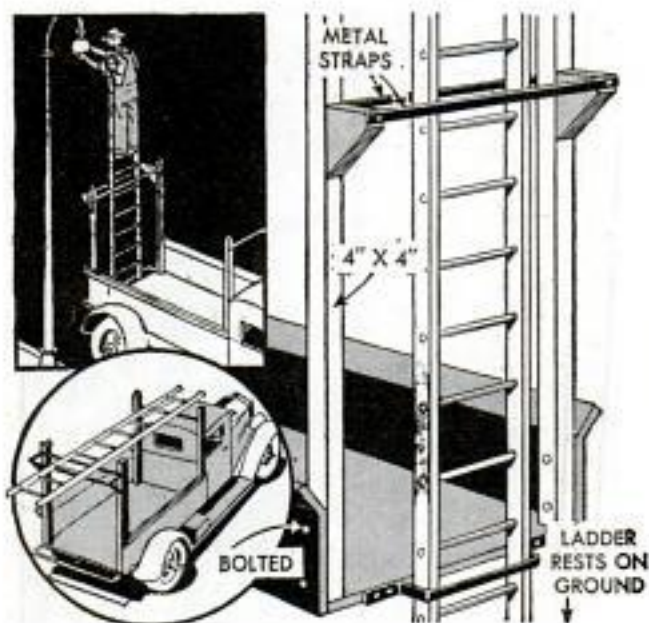
Swinging Tray Under Bench Vise Prevents Loss of Small Parts



Small parts, such as screws, nuts, etc., that are dropped accidentally when working on a carburetor or other mechanism clamped in a vise, will not be lost if a tray is mounted under the vise to catch them. The tray can be made of wood or sheet metal and is pivoted to the underside of the bench by means of a bolt and wing nut, the bolt being located in one corner of the tray. When not in use the tray can be swung under the bench out of the way.

Ladder Supported at End of Truck For Painting and Cleaning Work

Although professional painters and the workmen of street departments of many cities have trucks with specially built bodies for use in cleaning and painting street lamps and similar work, it is easy to



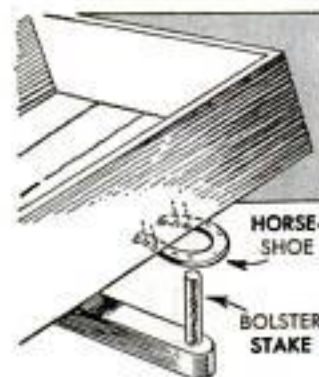
improvise suitable equipment for such work where the special-type trucks are not available. The equipment shown for cleaning and painting street lamps is a good example. Here the body of a regular truck is fitted with four posts for carrying ladders and the rear two posts are equipped to support a ladder in a vertical position, the lower end of the ladder resting on the ground. When not in use, the posts can be removed by taking out two bolts in each one.

Price Tickets Easy to Change On This Show Card

Merchants who use show cards can save time and expense, where prices change frequently, by using the method shown. Tabs are cut in the card so that price tickets can be slipped under them.



Horseshoes Used as Bolster Cleats For Box on Farm Wagon



Cleats nailed across the bottom of a farm-wagon box to keep it from sliding back and forth on the bolsters of the running gear often are unsatisfactory because they rot quickly or because they allow the box to

bounce out of position when driving over rough ground. To avoid this, one farmer uses horseshoes, which are nailed to the underside of the box so that they project to slip over the bolster stakes as indicated.

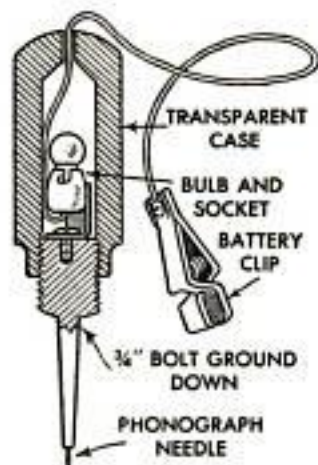
Car Radiator Grill Fashioned From Home Radiator Cover

If you need a replacement for your car radiator grill and one is not available, the type of grill used to cover an ordinary home or office radiator can be fashioned into one suitable for a car. Select a design open enough to permit free passage of air and thin enough to bend easily. Form a pattern of heavy wrapping paper to transfer the design to the metal. You can make curves by forming the metal and joining the seams with small sheet-metal screws or bolts through holes bored in the grill,

fastened to pieces of heavy gauge galvanized metal underneath. The grill may be chrome plated, but if this is impossible a covering of paint front and back will do.

Handy Test Lamp for Checking Circuits in a Car

Here's a lamp that is just the thing for testing electrical circuits in a car. The sharp pointed prod can be pushed into insulated wires or cables to trace a hot wire, and is especially

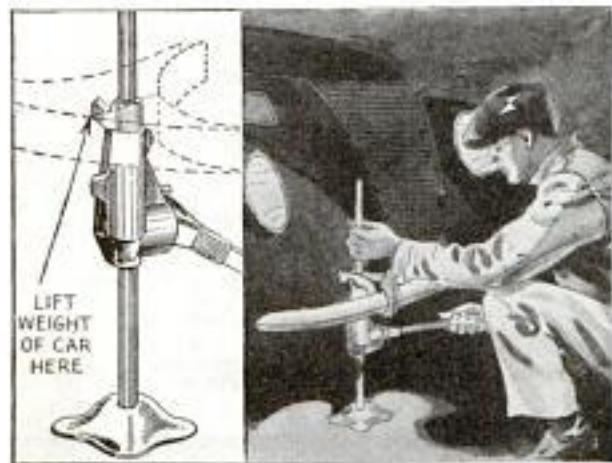


handy to get into hard-to-reach places. To make the lamp, drill out the plastic handle of an old screwdriver to take the bulb and bracket of a small dash lamp. Tap the hole to take a bolt that has been ground down to the shape indicated. Then sweat-solder a phonograph needle

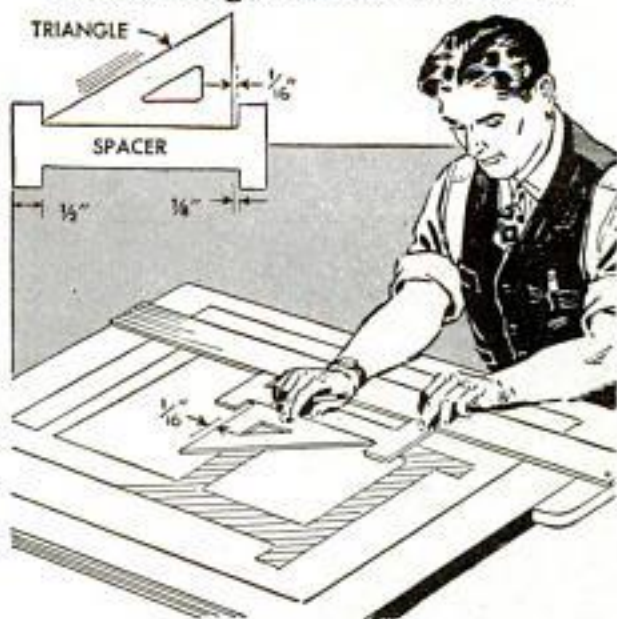
to the pointed end of the bolt and solder or rivet the lamp socket to the other end. Connect a lead wire to the socket and run it out through a small hole in the upper end of the handle. Put a battery clip on the end of the wire. In use, ground the lamp by slipping the clip over the frame or a bolt head in the car. When the lamp lights it can be seen through the handle.

Crankcase of Car Removed Easily When Front End Is Raised

The next time you have to remove the crankcase from a model-A or V-8 Ford, put a jack under the front bumper brackets and raise the car until the wheels just start to clear the floor. This will allow the radius rods to lower enough to slip out the crankcase without having to remove them.



This Spacer Gauges Section Lines Indicating Steel or Cast Iron

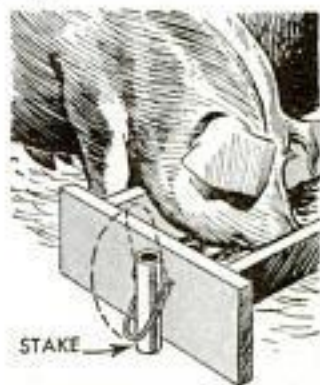


With this spacer, draftsmen will save much of the time they formerly spent in drawing shading lines to indicate steel and cast iron. The spacer is a piece of $\frac{1}{10}$ -in. hardwood with a section cut out on each side, one to measure $\frac{1}{16}$ in. longer than the triangle base and the other $\frac{1}{8}$ in. longer. For spacing lines to indicate cast iron, the triangle is placed in the cutout with the apex touching one side of the spacer, after which a line is drawn and the triangle moved over so that the base butts against the other side. The lines drawn on the hypotenuse will then be spaced exactly $\frac{1}{16}$ in. apart. Similarly, in designating steel, the spacer is reversed and the triangle base set $\frac{1}{8}$ in. from the arm.

—Richard F. Crooker, Worcester, Mass.

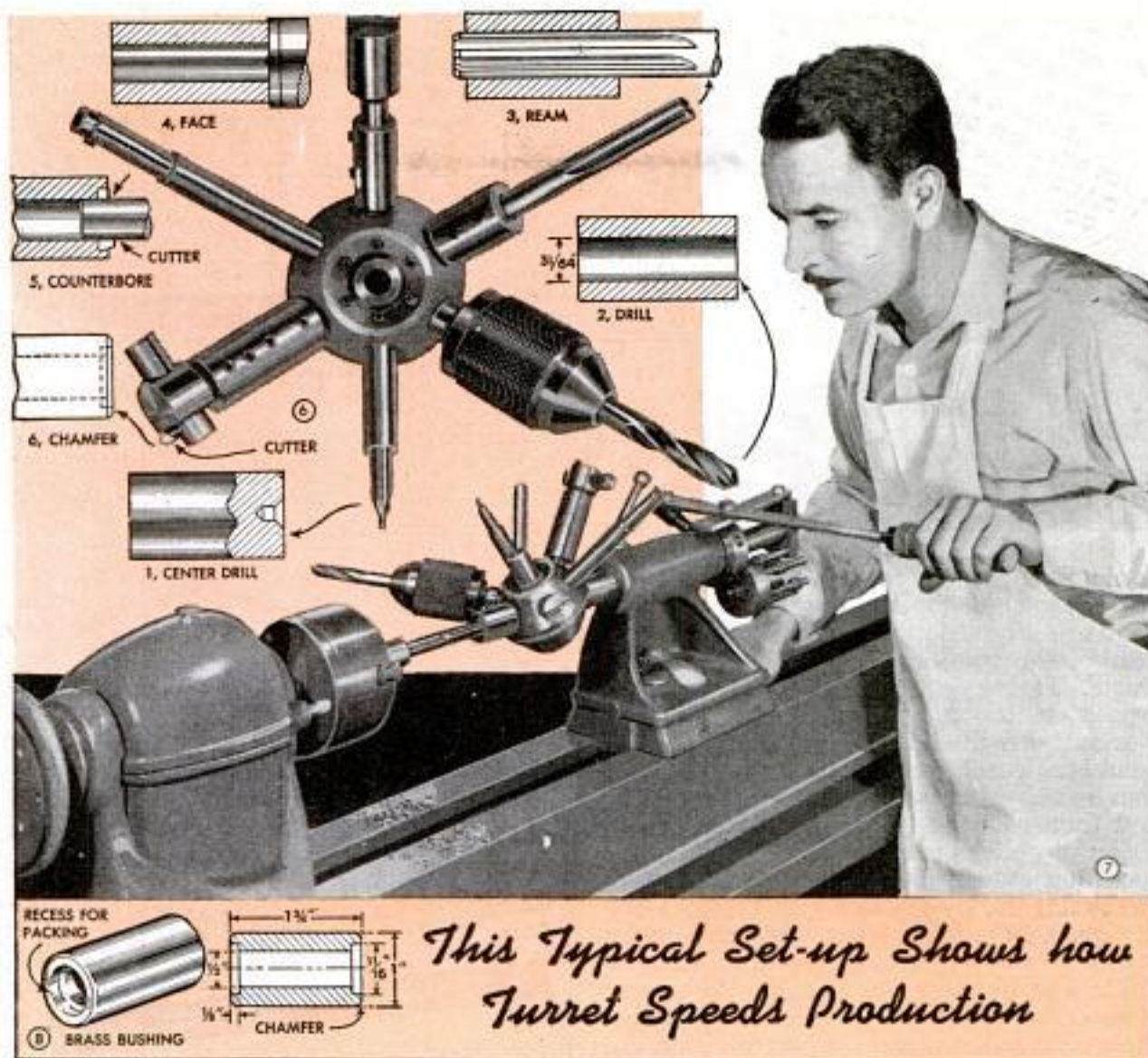
Anchoring Trough on Concrete

To anchor a hog trough on a concrete feeding floor so that it could not be moved or tipped over by the animals, yet be released easily for emptying or cleaning, one farmer anchored it as shown. A pipe stake was set



in the concrete at each end of the trough, which was fitted with wire loops to drop down over the stakes. If the loops are long enough to come within an inch of the floor, when they are in position over the stakes, there will be little possibility of the pigs rooting them off the stakes.

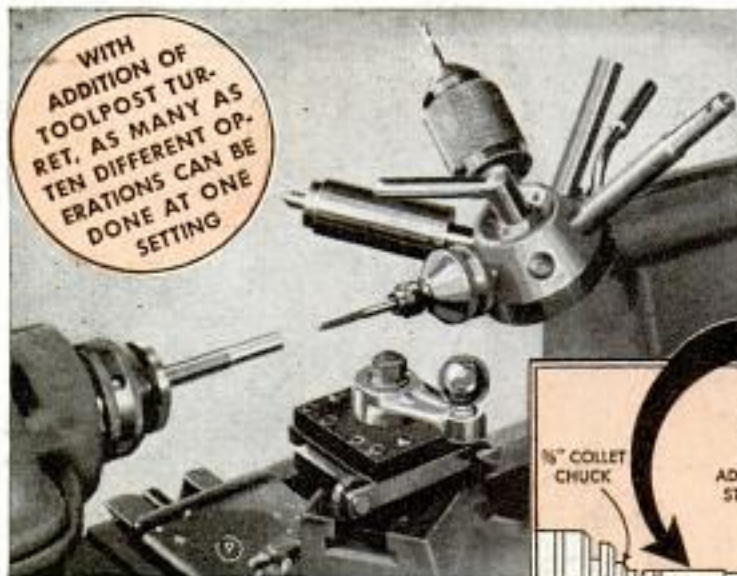
—G. E. Hendrickson, Argyle, Wis.



of the turret controls the depth of feed for each tool. Construction of the turret is shown in Figs. 4 and 5. Starting out, you make the ram or tailstock spindle first, making the larger diameter of this the same as the regular tailstock ram on your lathe. A new tail nut, threaded to fit the lathe and bored $\frac{1}{4}$ in. less than the full diameter of the ram, Fig. 2, is next, followed by the tool-head and stop-rod index plates. The rear of the lower portion of the tool head is flattened to furnish a neater and more substantial joint with the ram spindle. The flattening job can be done by routing and grinding on a drill press with the work held at the required angle in a vise (or the drill table is tilted). In the same working position, the hole for the ram thread is drilled and the tap started, as shown in Fig. 3. The tool head is finished complete except for the tool holes; the drilling of these should be the last operation and is done by a reversal of the process which the turret will later do on actual work. Fig. 1 shows the operation. It can be seen that absolute accuracy is assured.

The stop-rod device consists of two plates. One of these carries the six stop rods, and the other is fastened to the rear face of the tail nut, as can be seen in Fig. 5. The position of the two flat-head machine screws used for mounting should be figured closely, as the hole for the index pin will be drilled between them later. Actual indexing of both stop rods and the tool head is controlled by a hardened steel pin under spring pressure, which engages in conical recesses in the tool-head top and index plate. The feed mechanism is a simple arrangement of levers, permitting a feed of about $3\frac{1}{2}$ in. The short lever should be positioned to ride on the tail nut, which supplies a support. The endpiece of the ram is held in place by a setscrew, and is drilled to slide over the uppermost stop rod.

Typical setups: A typical setup using the six-position turret is shown in Figs. 6 and 7. Fig. 8 shows the job—a plain brass bushing with recessed ends to take packing rings. Preparatory to turning, the 1-in. bar stock used is sawed to length, allowing about $\frac{1}{16}$ in. for trimming. Then the work



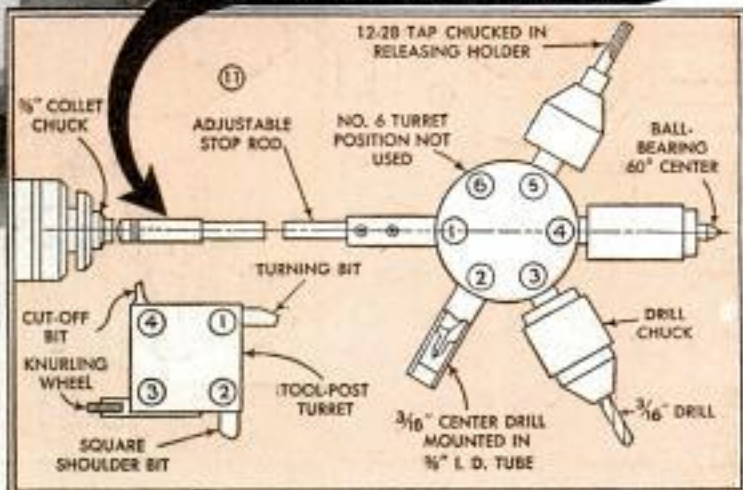
is chucked in a three-jaw chuck, and the various tools in the turret head are brought into play in succession to complete the required shape. Turret positions 4, 5 and 6 repeat on the opposite end of the work after rechucking. The turret head is released for each new station by releasing the clamp handle and then rotating the tool head until the index pin clicks into position. The corresponding stop rod is indexed with a flip of the fingers.

Figs. 9, 10 and 11 picture another simple setup. In this case, the job is an aluminum guide post as shown in Fig. 10. Bar stock is used and is fed in suitable long lengths through a collet chuck, turret position A, controlling the advance of each new piece. Other operations follow in rotation, as can be seen in Fig. 11. It will be noted that four of the operations in this setup are worked from a four-position tool post turret. Placement of this device for the various cuts should be controlled by swinging stop links clamped to the lathe bed and cross slide.

Determining tool lengths: An important part of any turret setup is the determination of suitable working tool lengths. If the setup is made by fit-and-try methods, one or more tools may be found to be too long or too short to permit working. A chart similar to the one shown in Fig. 12 should be made up for each new job. This sample applies to the job shown in Fig. 11. Columns 1, 2 and 3 of this are self explanatory. Column 4 is obtained by subtracting the feed needed by each tool from the maximum feed. Thus, if the maximum feed is $3\frac{1}{2}$ in. and the feed required for turret position No. 2 is $\frac{3}{4}$ in., the figure opposite No. 2 station on the chart will be $2\frac{3}{4}$ in. Column 5 shows a heavy box in which is marked the length of the longest tool used



OPERATIONS IN MAKING THIS PIECE

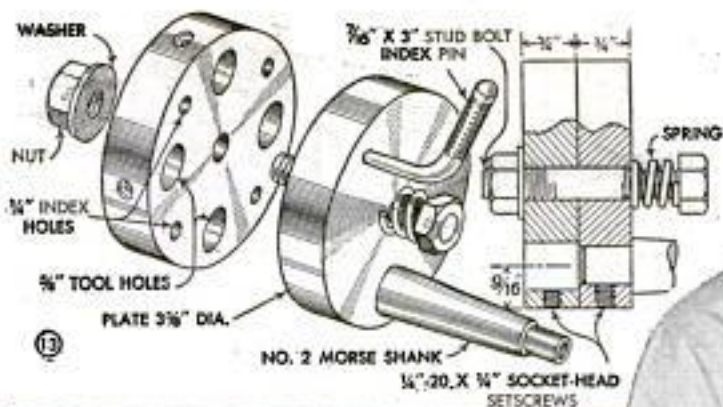


Turret Position	Job	Feed Needed	Max. Feed Less Feed Needed	Tool Length
1	Stop Rod	0"		
2	Center Drill	$\frac{3}{4}$ "	$3\frac{1}{2}$ "	$2\frac{3}{4}$ " to 6"
3	Tap Drill	$\frac{3}{8}$ "	$2\frac{1}{2}$ "	$3\frac{1}{4}$ " to 6"
4	Tail Center	$\frac{3}{8}$ "	$2\frac{1}{2}$ "	6"
5	Tap	$\frac{3}{8}$ "	$3\frac{1}{2}$ "	$2\frac{3}{4}$ " to 6"
6	Open		$2\frac{3}{4}$ "	$3\frac{1}{4}$ " to 6"

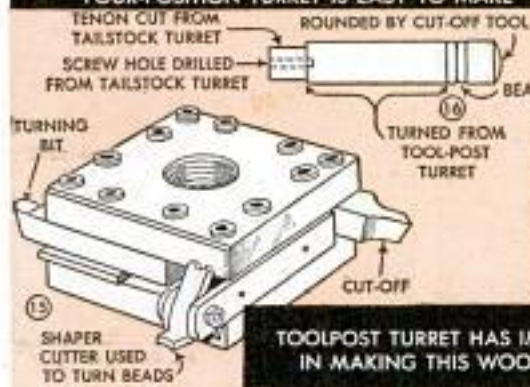
12 CHECK CHART TO DETERMINE TOOL LENGTHS

in the setup, as measured from the face of the turret to the end of the tool. From this figure (6 in. in this case) are subtracted the figures in column 4. The result in each instance is the shortest possible length of each tool, and the bushing or other holding device used for the tool, should be made or arranged so that the total length of the tool comes between the minimum and maximum length. Altogether, this sounds a bit complicated, but you will find it quite simple and a real timesaver in making setups. Obviously, if fittings already available show short on two or more turret positions, it is advantageous to reduce the length of the longest tool. In actual work, this usually will be a drill or reamer held in a chuck, and shortening can be done by rechucking the drill or reamer in a solid bushing.

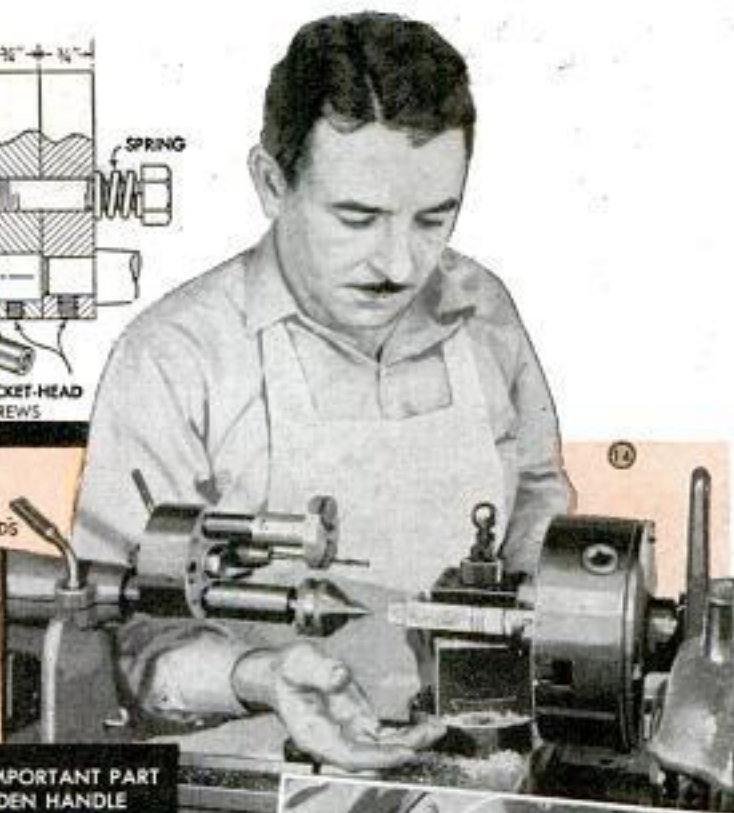
Four-position turret: The four-position turret is a simple device with less scope than the six-position turret, but nevertheless a good accessory. As shown in Figs. 13 and 14, it is fitted with a Morse taper shank and is mounted and worked in the



FOUR-POSITION TURRET IS EASY TO MAKE



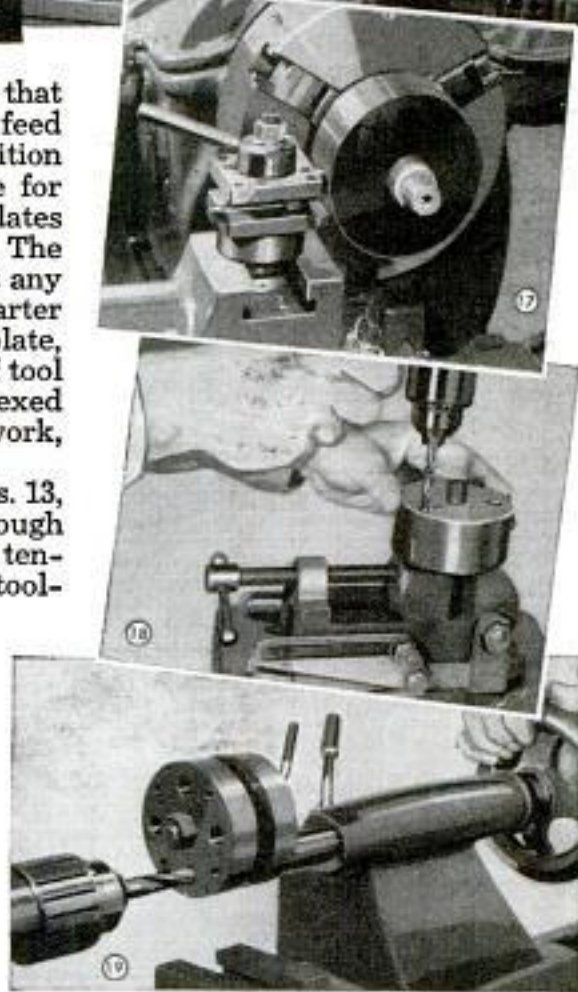
TOOLPOST TURRET HAS IMPORTANT PART IN MAKING THIS WOODEN HANDLE



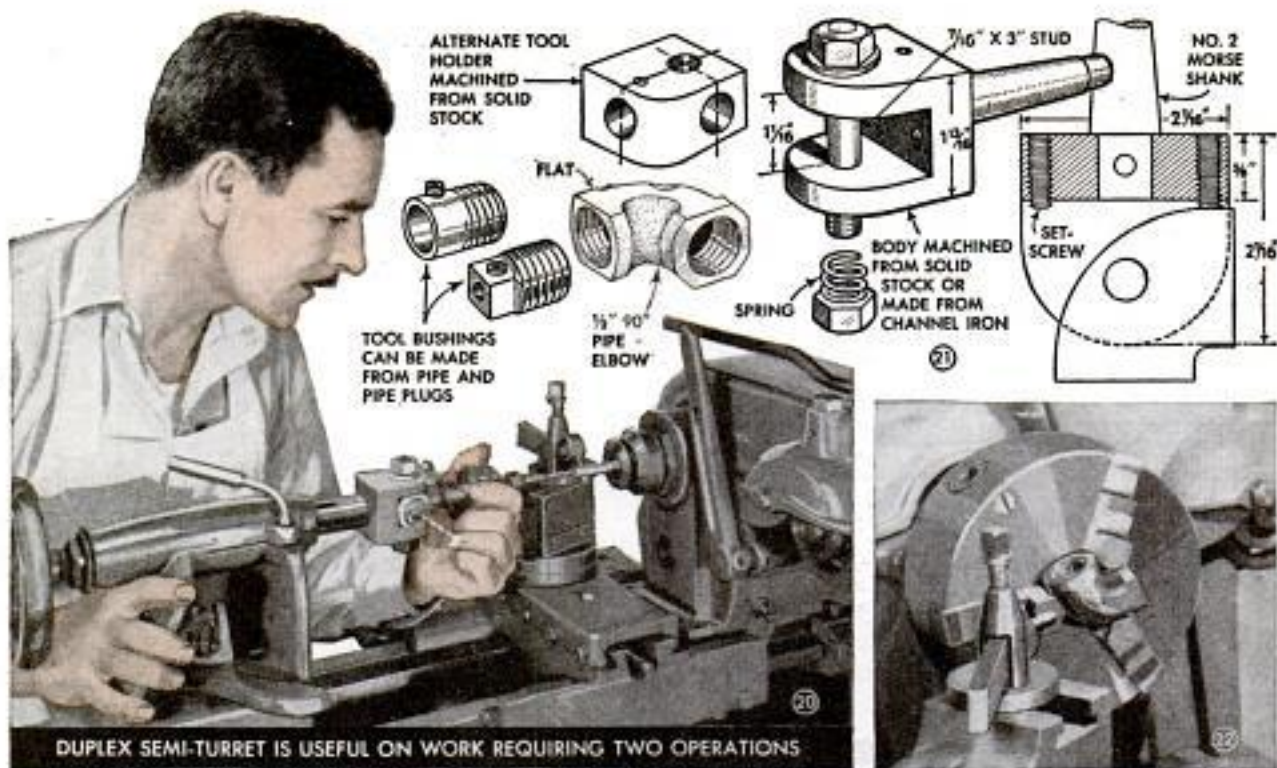
regular lathe tailstock. However, it is apparent that the same turret could be used with the same feed mechanism previously described for the six-position turret. In making this turret, the center hole for the stud is drilled first, after which the two plates can be mounted on the stud and turned, Fig. 17. The index holes are made by first drilling a hole at any point in the back plate and then moving it a quarter turn to drill each of the four holes in the front plate, Fig. 18. As in the six-position turret, drilling of tool holes comes last, with the head setup and indexed in the same position as it will take in actual work, Fig. 19.

A sample job with this turret is shown in Figs. 13, 15 and 16. The 3/4-in. dowel stock used is fed through the lathe headstock spindle. After drilling and tenoning the work from the tailstock turret, the toolpost turret is brought into action, the work meanwhile being supported by a spinning center mounted in the turret.

Duplex semi-turret: The duplex semi-turret is a two-position tool holder, simple and practical for such jobs as drill-and-ream, drill-and-counterbore, drill-and-tap, etc. The one shown in Fig. 21, is made from a 1/2-in. 90-degree pipe elbow, which is machined flat in the lathe, as shown in Fig. 22. The sample operation with this turret, as pictured in Fig. 20, is a simple drill-tap and cut-off job on a brass rod. The method of tapping is worth noting. The tap is held in a bushing made to fit an inexpensive type of ball-bearing spinning center. By holding the spinning center stationary by hand, the tap can be fed into the work by pushing the tailstock. After cutting to depth, the spinning center is released, allowing the tap to spin with the work. Then



the spindle is reversed to back the tap out of the hole. This method is practical on brass and aluminum; steel, too, when the tap is not over 1/4 in. diameter. With a suitable bushing holder, the same setup can be used for small dies.



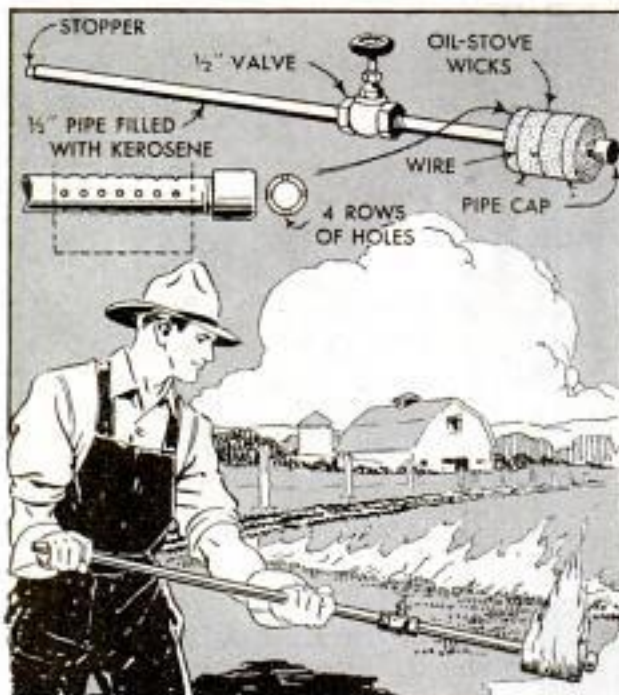
DUPLEX SEMI-TURRET IS USEFUL ON WORK REQUIRING TWO OPERATIONS

<i>Turret Tooling</i>	
SUGGESTIONS FOR VARIOUS JOBS	
JOB	TOOL OR METHOD
DRILL	USE DRILL CHUCK OR MAKE BUSHING TO FIT
REAM	REAMER CAN BE HELD SAME AS DRILL, BUT FLOATING TYPE OF HOLDER SHOWN IS BETTER
BORE	BAR OR SOLID CUTTER ADJUSTABLE HOLDER
COUNTER-BORE	USE STANDARD COUNTER-BORES. BUSH TO FIT HOLES IN TURRET
FACE	MAKE OR BUY TWO-BLADE CUTTERHEAD. END MILLS CAN ALSO BE USED
TURN	SIMPLEST SET-UP IS TO DO ALL TURNING FROM TOOL-POST TURRET. HOWEVER, A PLAIN TURNER FOR USE IN TAILSTOCK TURRET OFTEN CAN BE USED TO ADVANTAGE BUSHING
CENTER SUPPORT	USE 60° PLAIN OR BALL-BEARING CENTER PLAIN B. BEARING
MILL	THREE AND FOUR-FLUTE HOLLOW MILLS ARE EXCELLENT FOR END-TURNING TO DIAMETER
THREAD	LIGHT WORK CAN BE DONE BY MOUNTING TAP OR DIE IN BALL-BEARING CENTER AS SHOWN IN FIG. 20 AND EXPLAINED IN TEXT. FOR HEAVIER CUTS, A HOLDER WITH BUILT-IN RELEASING CLUTCH SHOULD BE USED BUSHING

Turret tooling: Tooling up for any particular job is largely a matter of head-scratching, more or less simplified by the variety of standard tools you have on hand. While it is possible to buy over 200 types of special turret tools covering every conceivable type of operation, the money involved is not usually justified on short-run work. Most setups with the light-duty turrets described are standard lathe items or fittings that can be made readily. The chart at the left covers several standard operations as done with simple tools, and it will be found that most jobs come within this list. The less expensive turret tools, which may be purchased if desired, include a floating reamer holder, an adjustable reamer holder (rigid type with adjustment for exact centering), a plain turner and a facing tool. Releasing tap-and-die holders, which spin with the work when feed pressure is removed, are not too expensive and are a worthwhile investment when considerable threading is to be done. Most expensive and most versatile of the commoner turret tools is the box tool (not shown) used for turning to diameter, chamfering, forming, etc. Except on continuous production, it is more economical to substitute turning from the tool-post turret for all cuts commonly done with box tools on heavy turret lathes.

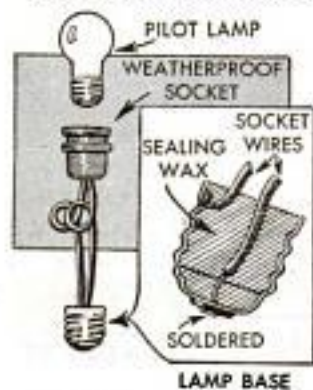
When heating a soldering iron in a gas or charcoal furnace, it is easy to determine from a distance when the iron is ready for use if you observe the color of the flame, which will be a bright green when the iron is hot enough to flow solder.

Handy Torch Used to Fire Weeds And Piles of Brush



One farmer who fires brush piles and burns dead grass and weeds from his pastures uses this torch for starting the fires. The torch consists of a length of $\frac{1}{2}$ -in. pipe, which is fitted with a valve and capped at one end. Four rows of small holes are drilled near this end, and several wicks from an old oil stove are wrapped over the holes where they are held with wire. The part of the pipe between the valve and the other end is filled with kerosene, which is retained by a cork stopper. In use, the valve is opened to wet the wicks with kerosene. After the wicks have been ignited, the flame is controlled by the valve. The torch is extinguished by smothering the flame.—James Vick, Church Road, Va.

Shock Absorber for Pilot Light



The life of a pilot light, mounted on machinery subject to vibration, can be lengthened if the vibration is prevented from being transmitted to it. This can be done by mounting the lamp as shown. A weatherproof socket is connected to an attachment plug by means of two wires, which then are coiled to act as a flexible shock absorber. Where the lamps used are of such size that no sockets or attachment plugs are available, a substitute may be made as shown

in the lower detail. A socket of the proper size to fit the pilot lamp, with wires attached, is connected to a discarded lamp base by soldering the wires to the metal shell and to the metal center contact, and filling the base with melted sealing wax.

—Thomas Trail, Baltimore, Md.

Glass Plate on Job-Press Table Keeps Checking Copy at Hand

The make-ready of a job on a platen printing press often requires reference to an original copy, which may become badly soiled in handling or even become lost before the work is completed.



To avoid this possible trouble, one printer put a piece of glass on the press table and kept the copy under it. Also, the glass permits easy checking with the original copy on long runs of color printing where several runs are required to complete the job.

Employees' Arrival and Departure Recorded on Plywood Indicator



This indicator board shows at a glance at what time any salesman or other member of the personnel left the office and when he is expected to return. Mounted at a convenient angle is a piece of plywood ruled into columns, the first column to be used for the employees' names and the others for the hours of the working day. In each of these hour columns holes are drilled, each hole representing a 15-min. interval from 0 to 45 minutes. A golf tee or other suitable peg is then inserted in the hole corresponding to the 15-min. period during which an employee left the office, and another such peg, colored differently, is placed in the hole which indicates the period in which he is expected to return.



Radio

HINTS FOR HOME RECORDING

HOME recordings, or "snapshots in sound" as some prefer to call them, make permanent records of your baby's first words, birthday greetings and "letters" of spoken words to mail to distant friends and relatives. Similar recordings are made in teaching music and speech.

Owners of home recording apparatus, and phono-radio combinations with built-in record-making facilities sometimes encounter difficulties through lack of proper instruction, as they usually depend on short demonstrations given when they purchased the instrument.

The blanks, or "recordises," come in various sizes and thicknesses, coated and ready for cutting. A magnetic recording head is shown in Fig. 1; the armature is suspended in rubber with a stiff bearing at the bottom and a flexible damping block at top. Motion is imparted to the stylus as the armature vibrates in response to the alternating current in the coil. It is a delicate cutting tool and must be adjusted correctly. See that the stylus is inserted all the way into the cutting head with the flat side of the shank facing the thumbscrew. The cutting face of the stylus must be perpendicular to the disk, Fig. 2. Figs. 3, 4 and 5 illustrate and explain typical troubles.



FIG. 3

Bent or misshapen recording blanks sometimes produce a "skip" pattern when the recording head is unable to cut a "low" area after bouncing upward over a "high" portion of the blank

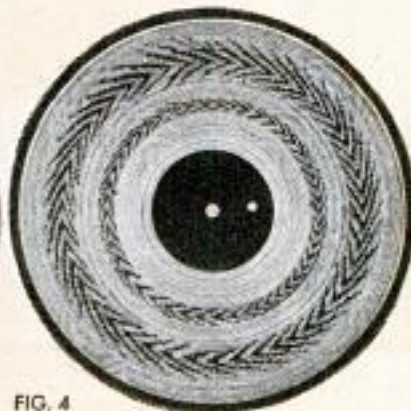


FIG. 4

Vibrations in the recording machine produce a "moire" pattern. Other common causes may be hum in the amplifier, dirt in the cutting mechanism, worn drive-wheels or overloaded motors

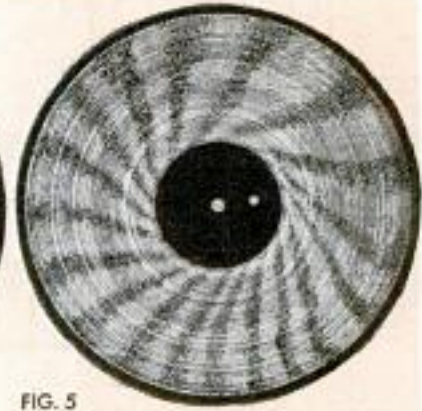


FIG. 5

Another "imperfect" pattern to watch for is the "spoke" design. Usually caused by overloaded motors or vibrations due to worn drive gear

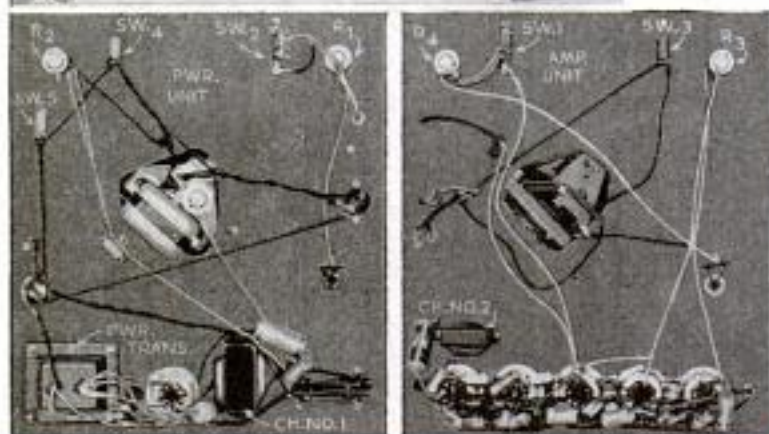
DUAL PHONO UNIT

Part II



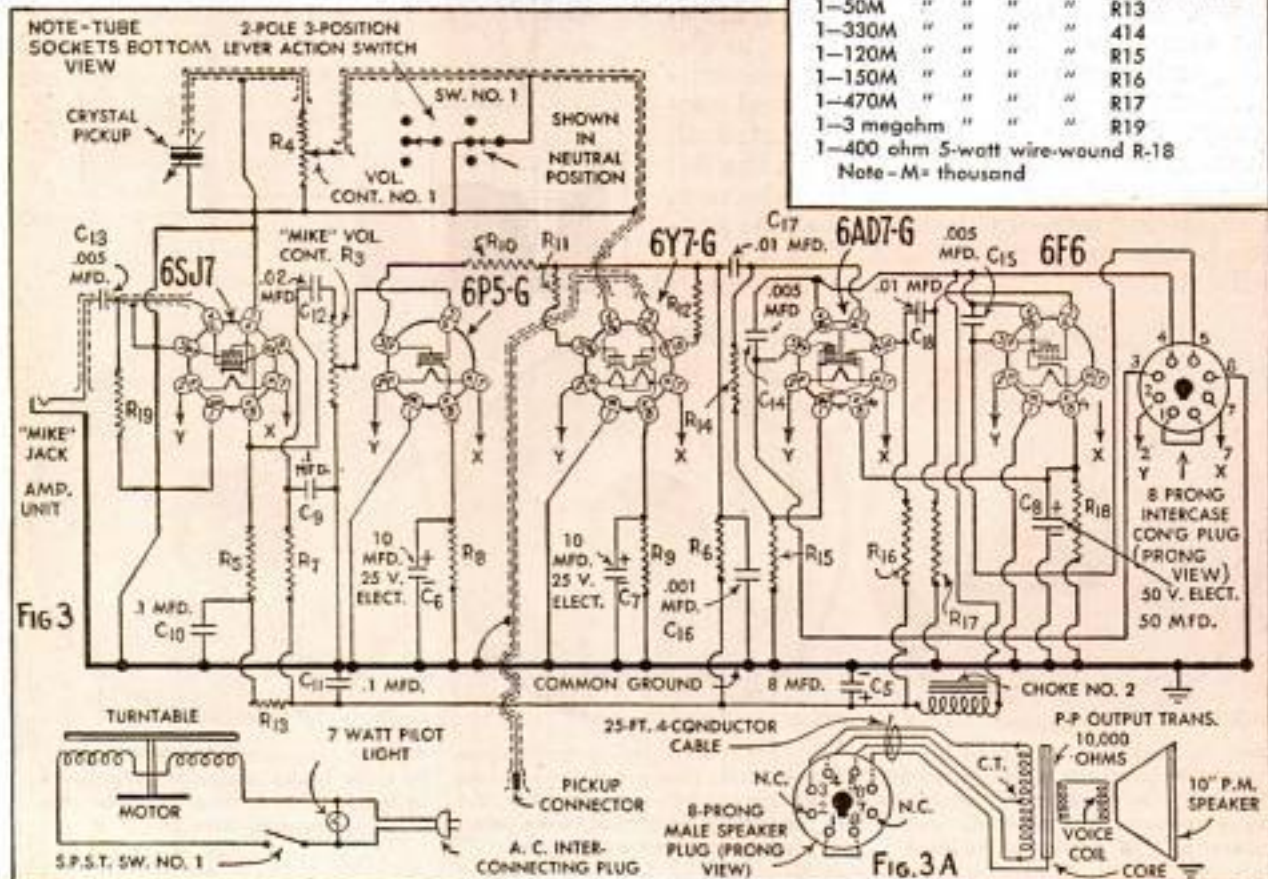
CONTINUING with the construction details for the amplifier section of this electronic dual phono unit and public address system, please note that the tube sockets are recessed by the same method that was employed to mount the rectifier tube in the power unit diagram Fig. 2 that appeared in the August issue. By means of this arrangement it is only necessary to remove the hoods from the pilot lamps in order to close the case. A short length of rubber tubing placed over the center pins prevents the turntables from falling.

The amplifier consists of a 6SJ7 tube as a pre-amplifier feeding into a 6P5 triode, and its output is paralleled with the output of both triode sections of the 6Y7-G tube. The input grids to the 6Y7-G are used for each individual pickup. The output of the 3 paralleled triodes is then coupled to the 6AD7 tube in a phase inverter stage, which,



Fixed Resistors			
2-250M ohm	1/2 watt carbon	R5, R6	
1-1.5 megohm	"	"	R7
1-3,000 ohm	"	"	R8
1-1,500	"	"	R9
3-25M	"	"	R10, R11, R12
1-50M	"	"	R13
1-330M	"	"	414
1-120M	"	"	R15
1-150M	"	"	R16
1-470M	"	"	R17
1-3 megohm	"	"	R19
1-400 ohm	5-watt wire-wound	R-18	

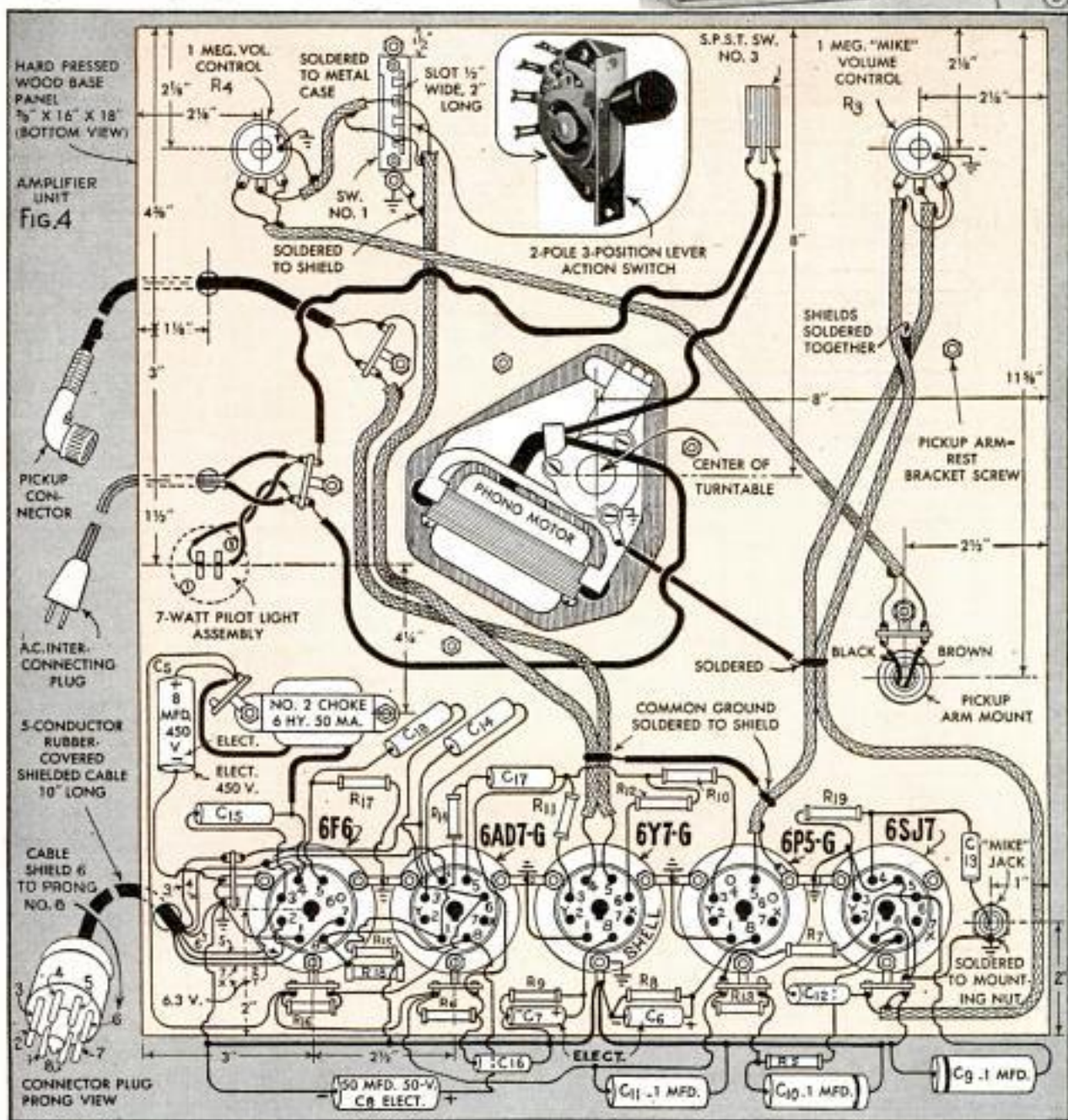
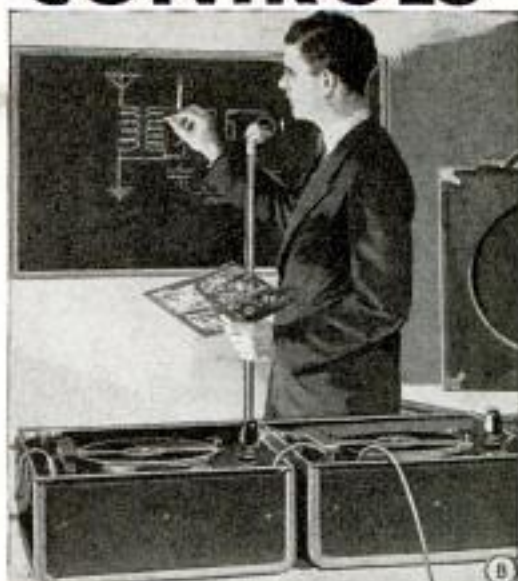
Note - M = thousand



HAS ELECTRONIC CONTROLS

with the 6F6, provides the push-pull output stage. Students will note in Fig. 3 that the phase inverter triode is part of the 6AD7 tube, the other portion being equivalent to a 6F6 output pentode.

Pictorial wiring diagram Fig. 4 shows all amplifier controls and wiring details. The Amphenol socket mounting shells are all connected together at common ground and substitute for a metal chassis. Choke No. 2 is a common 300-ohm type; all unmarked condensers are 600-volt tubular paper types. Detailed student material list R-327 is available from Popular Mechanics radio department, upon receipt of postage. By referring to all diagrams it will be noted that the interconnecting sockets are interchangeable; the a.c. line circuit cannot be completed until both the speaker and amplifier are plugged in for proper load.



Ultra-Short-Wave Receiver in a Tobacco Tin

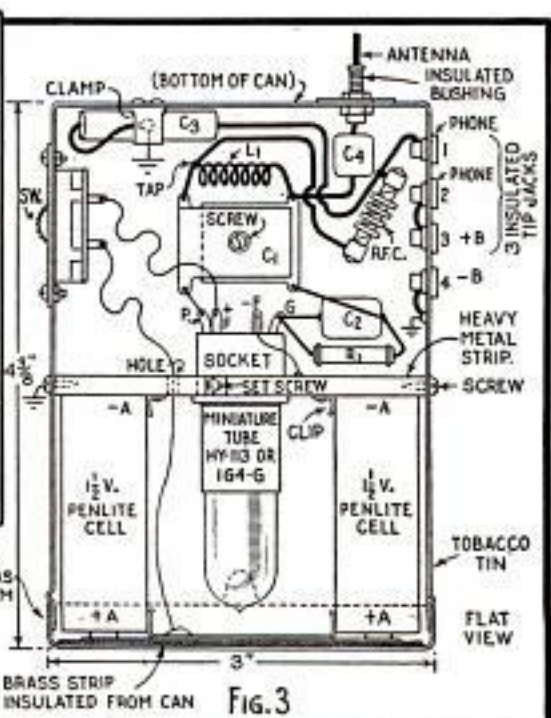
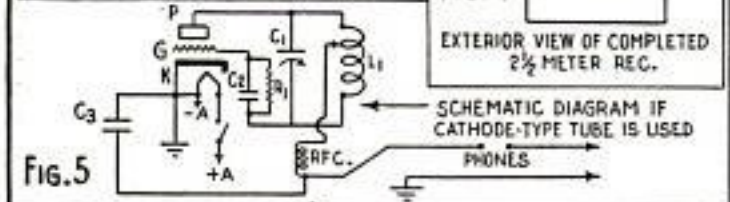
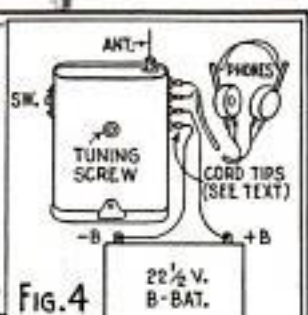
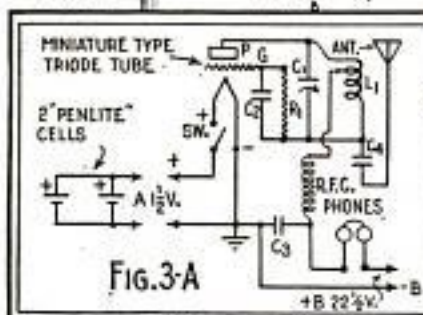
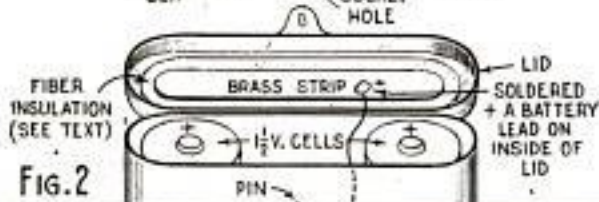
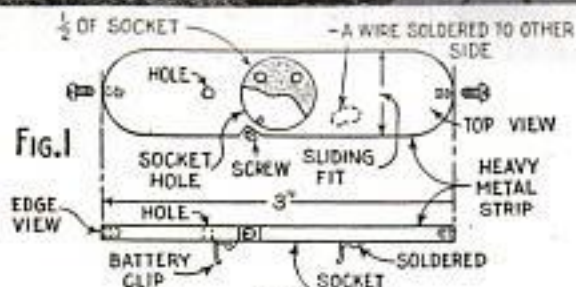
By L. B. Robbins



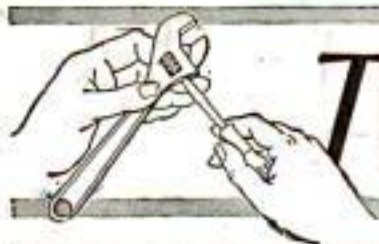
DESIGNED for those who like to construct miniature radio apparatus from odds and ends of parts, this tiny 2½-meter receiver is housed in a 1½-ounce tobacco tin, and is useful in WERS activities.

Two 1½-volt "penlite" cells are connected in parallel for the A-battery and these are easily renewed by means of a simple clip arrangement illustrated in Figs. 2 and 3. The most important part of the chassis is detailed in Fig. 1. This piece of flat metal is shaped to make a close sliding fit.

Pictorial wiring diagram Fig. 3 shows all parts and wiring in a "cutaway" view. The positive A contact strip with clips is cemented to the fiber strip which in turn is cemented to the inside of the lid. Coil L₁ turns and spacing must be determined by test to gain the spot in the 2½-meter band between 112 and 116 megacycles where the tuning condenser C₁ is effective with a 4-ft. antenna. Tuning is done by means of a fiber "screwdriver." The schematic circuit diagram appears in Fig. 3-A and Fig. 5 and the completed assembly is shown in Fig. 4. Any miniature tube that will operate at ultra-high frequencies may be used. Assemble and wire the parts flat on the bench first and make all tests before mounting the chassis in the can. A hearing aid type B-battery can be employed. The r.f. choke is a 2 mh. type; the coil tap point near plate end being determined by trial. Grounds may be soldered to the can by pushing the wire through holes and soldering outside.



- C₁ = 3-30 MMFD. TRIMMER CONDENSER
- C₂ = 50 MMFD. MIDGET MICA CONDENSER
- C₃ = .01 MFD. PAPER CONDENSER 300 V.
- C₄ = 50 MMFD. MIDGET MICA CONDENSER
- R₁ = 5 MEG. RESISTOR, ¼ WATT
- R.F.C. = UHF. R.F. CHOKE OR OHMITE TYPE Z-O
- SW. = SLIDE SWITCH
- L₁ = 3-4 TURNS NO. 16 WIRE SPACE WOUND ON 15" FORM

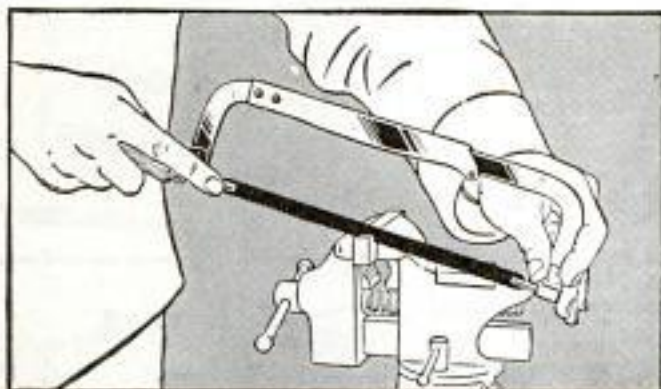


TOOL NOTES

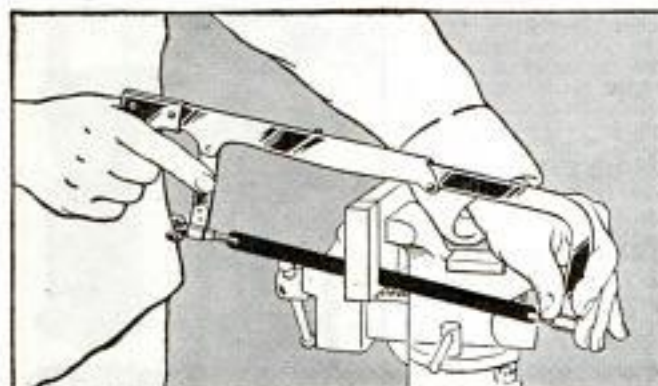
Maintenance
and Repair
Suggestions to
Prolong Tool Life

No. 18 PICKING THE PROPER TOOL FOR THE JOB

With Hacksaws, the question of picking the proper type concerns the blade more than the frame. However, reasonable judgment should be exercised in choosing a saw for a specific job.



Crescent's No. 1042, for example, is relatively light and is intended for average rather than heavy duty service. Depth of cut is another matter to be considered. The frame above cuts only to a 2-1/2" depth, which might not be sufficient for the job at hand.



Crescent's No. 1047, with its heavy rigid frame, on the other hand is designed for the hardest work imaginable. Its 3-1/4" depth of cut is sufficient for the job illustrated and its big, comfortable, pistol-grip handle enables the operator to put more power in the cutting stroke.



Blades are made with a varying number of teeth per inch, ranging from 14 to 32. Selection of the blade should be based upon material to be cut. Blades with 18 teeth per inch are the best for general use, but there is no such thing as an "all-purpose" blade.

USE 14 TEETH PER INCH	IRON SOFT STEEL RAILS
USE 18 TEETH PER INCH	TOOL STEEL IRON PIPE LIGHT ANGLE
USE 24 TEETH PER INCH	COPPER BRASS MEDIUM TUBING SHEET METAL
USE 32 TEETH PER INCH	THIN TUBING THIN SHEET METAL

Select your blade according to the above chart. Never permit a condition wherein the teeth "straddle" the work. Use a blade of finer pitch or change the angle between blade and work so at least two teeth are always engaged. Have work securely held when sawing.



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1 The contest is open to any person of any age (male or female) residing in the United States or Canada, except employees of The Delta Manufacturing Co., dealers and distributors of Delta products and their employees, employees of Delta's advertising agency, and members of the immediate families of any of the above.

2 Entries are to consist of a floor plan or layout of the entrant's proposed post-war homecraft shop showing position of power tools, workbenches, and other major equipment, together with a statement giving the following information:

- Reasons for adopting layout and equipment shown in floor plan.
- List of power equipment now owned.
- List of power equipment planned for purchase after the war, the prices you would pay, and name of store where purchase would be made.
- List of hand tools and other accessories now owned.
- General type of work to be done in the shop.

3 Entries will be judged on their suitability to the type of work to be done, efficiency and ingenuity of arrangement, and use of space available. Neatness and clearness will count, but not costliness or elaborateness of the proposed shop, or elaborateness of the presentation.

4 All entries must be postmarked not later than midnight Tuesday, October 31, 1944. They are to be mailed to Contest Editor, The Delta Mfg. Co., 681K E. Vienna Ave., Milwaukee 1, Wis. Entries become the property of The Delta Mfg. Co. to be used as they see fit, and none can be returned.

5 Decision of the judges will be final. In case of ties, duplicate prizes will be awarded.

6 Contestants are limited to one entry. If more than one entry is submitted by a contestant, only the first one received will be considered.

7 Final judging will be done by:
William Bachrach, Regional Coordinator of Engineering, Science and Management, War Training.
E. R. Haan, Technical Editor, Popular Mechanics.
Harry Walton, Home and Workshop Editor, Popular Science.

★ **1st Prize** ★
Your choice of \$1,000.00 in Delta Equipment—(retail value) Enough to have a complete Delta-equipped homecraft shop you can really be proud of!

★ **2nd Prize** ★
Your choice of \$500.00 in Delta Equipment—(retail value)

★ **3rd Prize** ★
Your choice of \$250.00 in Delta Equipment—(retail value)

★ **4th to 8th Prizes** ★
Your choice of \$75.00 in Delta Equipment—(retail value)

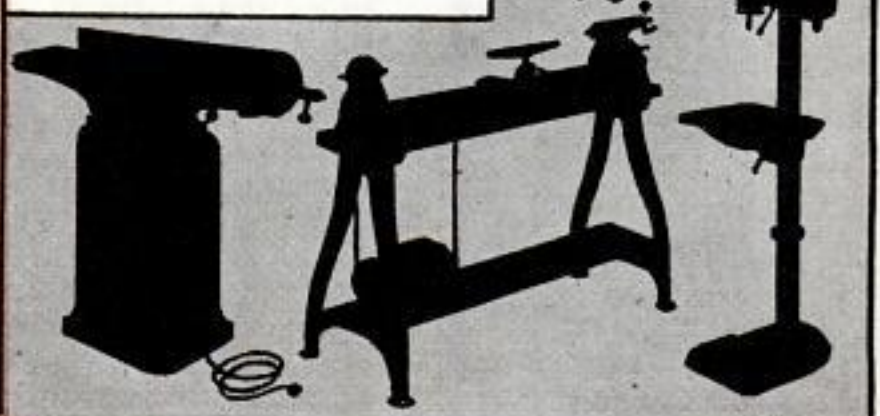
★ **9th to 20th Prizes** ★
\$10.00 worth of Delta Accessories and/or Supplies!—(retail value)
(Merchandise certificates will be awarded to winners entitling them to prizes when materials required for making Delta equipment are released by the government.)

★ **21st to 40th Prizes** ★
Set of 27 Deltacraft Project Books and Manuals! \$4.50 value!

★ **41st to 60th Prizes** ★
Set of 6 Delta Tool Manuals — Value \$1.50!

★ **61st to 200th Prizes** ★
1 Year's Subscription to The Delta-gram!
Value 50¢.

Here are the Prizes!



★ **1st Prize** ★

\$1,000⁰⁰ in Delta Equipment
(Retail value)

for a Homecraft Shop!

**Nothing to buy! No entry fee!
You don't have to be an expert to win!**

Think of the thrill of winning \$1,000.00 worth of famous Delta equipment (post-war delivery)! Or one of the many other valuable prizes in this big contest!

And think of the fun, the healthful recreation you and your family can get from these tools, as you create things of beauty and utility out of wood and metal and fascinating new plastics!

Here's How to Get It!

All you have to do is to put down on paper your idea of a practical homecraft shop. Maybe it's that shop you've been dreaming about — or perhaps it's an improvement on the one you now have.

Whatever it is, simply send us a sketch of the floor plan (don't worry, we don't expect a mechanical engineer's finished drawing)—together with a statement covering the points given in the rules shown here.

Well Worth Trying For!

You haven't anything to lose by entering this contest — except the little time and trouble you take to get your entry ready. But you do have a lot to gain!

Delta homecraft power tools — made by the largest manufacturer of power tools for the homecraft shop — are truly fine tools. They're *accurate*—they're *dependable* — they're *safe*.

It's Up to You!

Now, whether *you* win these dandy Delta prizes—or whether someone else wins them — depends solely on *you*. Certainly you can't win, if you don't enter the contest. But you *do* have a chance, if you do send us your plan.

So read the rules now. Then, get a head-start on the others by going right ahead preparing your entry.



Some Helpful Tips that may make YOU one of the winners

To start you off on the right foot, we're going to tip you off here to some of the things the judges will look for. The judges, incidentally, are recognized authorities, not connected with The Delta Manufacturing Company. They will have the final say-so on the winners.

Check off the items as you include them in your plan. That way, you won't forget anything.

- Include a floor plan or layout of your proposed post-war homecraft shop, showing location and position of the power tools you would use. Indicate the size of area it would cover.
- List the power tools you think should be part of a complete homecraft shop.
- List the Delta power tools that you would like to get after the war. Give the name of the store where you would be likely to make such purchase.
- List the power tools — if any—that you now own.
- Are any of the following materials difficult to obtain in your locality during normal times? Wood? Paint? Finishes? Hardware? Plastics?
- What kind of tool racks, paint racks, storage bins for nails, screws, etc., would you recommend? How about lumber storage?
- Do you prefer to work in wood? Metal? Plastics? Or combination of all?

The above are simply suggestions. Include any other material that you think can help put you among the winners.

BUILDING AIR POWER WITH ELBOW GREASE



Photo courtesy Republic Aviation Corp.—
Special-file operation on edge of casing.

THE mass-production of airplane, tank, truck and engine parts by automatic-machine operations excites wonder. But it still takes human skill, good hand tools and plenty of "elbow grease" to "put things together." Knowing the *right* tool for each job is of first importance in any mechanical "I.Q."

Files . . . there are *several thousand* kinds, cuts and sizes. Yet, to keep up with the new materials and production problems of this skilled-mechanics era, Nicholson still finds needs for files of new design or characteristics.

FREE BOOK, "FILE PHILOSOPHY"—for production and purchasing heads, foremen, key mechanics.

NICHOLSON FILE CO., 22 Acorn St., Providence 1, R.I., U.S.A.
(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES FOR EVERY PURPOSE

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

Picking the Target

Continued from page 31

ed a mission and has film left he takes a few extra shots while zigzagging home. That was how the synthetic rubber plant at Huls was discovered. The photographs showed a large camouflaged factory using great quantities of coal and oil. The interpreters guessed the plant was making Buna rubber. This was confirmed by study of the type of plant required along with a study of the layout of the factory at Huls.

The photo-interpreters went so far as to select vital points within this strategic target, such as the boiler house. One expert even determined the amount of pressure in the boiler from enlarged photographs. When the crews of Flying Fortresses were briefed for this target, they were shown detailed photographs with the boiler house as the prime target. When pinpoint bombing struck, its accuracy was proved by steam that shot a mile into the air.

Photo-reconnaissance units in England have a long list of targets which they photograph at varying intervals. These include more than 400 air fields, two other synthetic rubber plants besides the one at Huls, 29 submarine building yards, numerous aircraft factories and scores of others. Pictures of the flight strips adjoining aircraft plants have given our combat pilots their first views of every new model introduced by the enemy. Also high on the photo-reconnaissance priority list are radar stations and radar manufacturing plants. The radio detection factory at Friedrichshafen was bombed after an enlarged photograph showed 250 pairs of the basket-type apparatus lined up in the open beside the plant.

One of the toughest jobs handled by U. S. photo-reconnaissance pilots was to "shoot" 100,000 square miles of territory in the South Pacific. Until this was done, the only available maps were more than 50 years old. The new maps have pointed the way for both island-to-island and leap-frogging tactics, and the aerial photos have made Jap defenses an open book.

When headquarters wants pictures in a hurry they are developed on the planes in a few minutes and dropped in containers with sponge rubber shock absorbers.

High ranking officers such as Generals Eisenhower, Spaatz, and Doolittle, have repeatedly heaped praise on photo-reconnaissance units. Every pilot, although he flies without guns, is said to be directly responsible for destroying at least 10 enemy planes. That should make them aces in any man's war.

INSIGNE OF THE CORPS OF ENGINEERS



WHERE PERFORMANCE REALLY COUNTS...



Dependable

... CHAMPION SPARK PLUGS ARE IN THE VANGUARD!

When the Corps of Engineers take hold, things move. Masters, of every type of engine-driven vehicle and power equipment, dependability is the measure of everything they use. That's why Champion Spark Plugs are on active duty with the Engineers, as they are with every branch of our armed forces on land, water and in the air; for dependability



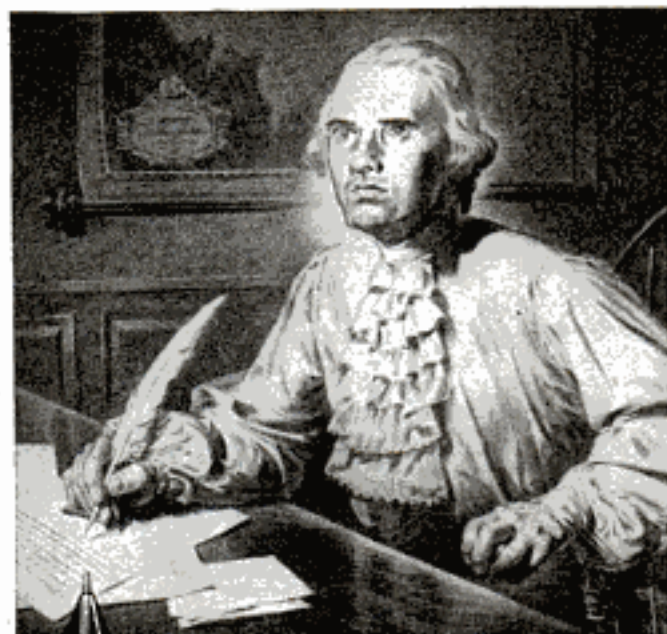
has been Champion's hallmark for more than thirty years. When you need new spark plugs, demand dependable Champions. Remember, too, that all spark plugs should be inspected, tested and cleaned at regular intervals for maximum engine efficiency and economy.

Champion Spark Plug Company,
Toledo 1, Ohio.



TO SAVE
GASOLINE
—KEEP SPARK
PLUGS CLEAN

BUY MORE AND MORE WAR BONDS UNTIL THE DAY OF VICTORY



THE PASSION of great purpose

With white heat in his mind, and the passion of great purpose . . . Thomas Jefferson in 1776 drafted the Declaration of Independence . . . using goose quills for pens.

Today no man needs pointed feathers or any other antique implement for writing. Because in Inkograph he has an indomitable pen to pace his swiftest thought . . . with a point that pressure will not injure . . . fast acting, reliable, adapted to any hand—dependable for years.

Inkographs are preferred by men in service. So if your dealer doesn't have one, keep trying!

The name Inkograph on the barrel identifies the genuine. Sorry, no mail orders—only dealers can supply you.

Use any pen to sign up for more
WAR BONDS!

INK-O-GRAPH²

Inkograph Co., Inc., 200 Hudson St., N. Y. C. 13

First Aid for Wounded Warships

Continued from page 53

case of additional damage. Men go down into the flooded compartment in shallow water diving outfits. They locate the hole in the hull, place mattresses over it, and secure the mattresses in place with timbers. Then the water is pumped out, sometimes by a submersible electric pump.

One of the handiest tools the damage control men have is a new portable jack-of-all-trades device called a velocity power tool. This machine will punch a hole in steel plate, pound down the head of a rivet in one blow, cut steel rope, splice the ends of steel rope, and do a variety of other jobs. It looks like an overgrown rivet gun and is loaded with an explosive cartridge. A special head for the job in hand is fitted to the tool and then the cartridge is fired, forcing the head to punch a hole or do other work. This power tool works in air or water.

Large warships have a "damage control central" to which damage is reported and from which assistance is dispatched. In addition, damage control parties are stationed at different points in a ship.

During a night battle against the Japs, the U.S.S. New Orleans was shaken by a terrific explosion. Down below, damage control men began to make their way forward along a passageway, when suddenly they found themselves staring out at the stars. One hundred and sixty-four feet of the ship's bow had been blown away when the magazine exploded. The ship's compartmentation kept her afloat and the engines were still able to turn over. After rigging a temporary bow of palmetto logs at a nearby island the New Orleans made her way to Sydney and thence to a United States naval yard where she was fitted with a new bow. Since then she has engaged in several operations against the enemy.

Time after time the Jap radio has announced the sinkings of portions of American naval task forces. "A Yankee battleship and two cruisers were sunk in yesterday's engagement," the Japs boast, believing every word of it. Their aviators had told them that the battleship was on fire and that each of the two other ships had taken a torpedo.

But more often than they know, the Japs are wrong. Damage control men had fought the fires, isolated and pumped out flooded compartments, and had made it possible for the ships to be worked back to repair bases. A few days or a few months later the same vessels were back in action. Perry's old slogan "Don't Give Up the Ship!" has taken on a new meaning.

Tough

BUT

OH SO GENTLE



Want a new car? Well, you can't get one. So you'd better take good care of the one you already have.

Wear-wise car owners watch the engine. They know that oil-pumping is a sign of worn-out piston rings—that neglect can lead to serious trouble.

Millions have learned that Hastings Steel-Vent piston rings stop oil-pumping, check cylinder wear, restore engine performance and gasoline mileage.

When your motor specialist recommends new piston rings, it will pay you to install Hastings Steel-Vents.

HASTINGS MANUFACTURING COMPANY • HASTINGS, MICHIGAN

Hastings Mfg. of Canada, Ltd., Toronto

★ *It's a privilege to buy War Bonds*

HASTINGS STEEL-VENT



PISTON RINGS

TOUGH on oil-pumping • **GENTLE** on cylinder walls

Will Your Car Outlast the War?

As a special wartime service to owners of **ALL MAKES** of cars, General Motors offers a new edition of *The Automobile User's Guide*, containing 196 practical suggestions on such subjects as *how to get better gasoline economy, how to prolong tire life, how to keep your car in the best operating condition, how to preserve exterior finish, etc.*



You can get your **FREE COPY** from any General Motors dealer or by using the coupon below.



Customer Research Dept., Room 1763
GENERAL MOTORS, DETROIT 2, MICH.

Please send **FREE COPY** of new 64-page
"AUTOMOBILE USER'S GUIDE"

Name
please print

Address
please print

City State

Make & Model
of Car Owned

Heroes of the Tin Cans

Continued from page 69

Main guns of destroyers are four- and five-inch, and all the newer ships have the Navy's new quick-firing five-inch weapons that are effective, horizontally, up to a range of ten miles, and vertically against planes, to five or six miles in the air.

Though every inch of space on a destroyer deck is at a premium, it must be made to accommodate from four to 16 torpedo tubes. Most effective at close range, torpedo action really comes into its own in battles such as that in Macassar Straits.

The night was dark and misty when a large Jap convoy was caught in the straits. The ships were massed, made to order for destroyer attack. And four destroyers, aided by planes and subs, did attack, knifing up and down, guns and torpedo tubes going full blast. At least four large transports were sunk, two medium transports possibly sunk, two transports damaged.

Thrilling chapters in destroyer history have been written when submarines were the only foe. One of these was in the Atlantic when the Borie went down after a terrific death struggle with two subs, part of which was fought at such close range that one member of the Borie crew, a fireman, David Southwick, knocked a German off the sub's deck with his sheath knife.

The Borie was one of the overage destroyers which have staged so remarkable a comeback after nearly 20 years on "Red Lead Row" with their bottoms painted with red lead paint and their machinery painted with preservative. Most of these vessels were built in the first world war, and now are doing duty as troop transports, minelayers, minesweepers, seaplane tenders and convoy escorts. The Dallas, the Cole, the Bernadou and the McFarland have been cited on at least two occasions—the landing of troops in the face of enemy fire in French Morocco, and the delivering of badly needed supplies to Guadalcanal.

Casualties among overage destroyers have been heavy. Ten of them have been lost in the Pacific, and another, formerly the Buchanan but later the British HMS Campbelltown after the 50-destroyer trade with Britain, lies in the harbor at St. Nazaire, France, where she was deliberately blown up to make the dock gates of this German-held sub-base useless.

The destroyer Ward fired the first shot against the Japs at Pearl Harbor when she sank an enemy submarine, the Greer was the first U. S. warship attacked by a sub in the Atlantic, and the Reuben James was the first sunk by a German torpedo.

AUTO-LITE SPARK PLUGS

IN SERVICE ON EVERY FRONT



"Pears like them Army fellers is buildin' a bridge . . . wonder what fer?"

PLAY IT SAFE...GET A "PLUG-CHEK"

To find out, quickly and accurately, whether your plugs are wasting gas coupons for you, drive in to your local Auto-Lite Spark Plug Dealer. Ask him for Auto-Lite's famous "Plug-Chek"—the scientific inspection service that helps spot the plugs that waste gas. You may find all that is needed is cleaning or regapping your present plugs. But if new ones are necessary, install Auto-Lites, the spark plug that's ignition engineered.

THE ELECTRIC AUTO-LITE COMPANY
TOLEDO, 1 • Merchandising Division • OHIO
BACK THE ATTACK—BUY WAR BONDS

Tune In
AUTO-LITE'S
GREAT RADIO SHOW
**"EVERYTHING
FOR THE BOYS"**

Featuring men and women at
the fighting fronts
Tuesday Night—NBC Network



"A Thing of Beauty
AND A
(SMOKING) Joy Forever!"

Just as fine embroidery deserves fine linen, so fine pipe craftsmanship deserves fine briar!

There is no substitute for imported briar from the Mediterranean region. So that's the material we give the master pipe-makers of LHS to work with—that and solid rubber bits, sterling silver bands, and years of pipe-making "know how".

LHS

STERNCREST

STERLING

Some things
haven't changed!

\$5

Smooth and Antique-Finish . . . many handsome models, each one numbered, registered and guaranteed by LHS.



No. 12
Golf Model

LHS

STERNCREST 14K

We select briar of rare grain and beauty, circle it with solid gold, and offer the Sterncrest 14K to the ultra-discriminating who want to own, and \$7.50 give, the ultimate in pipes.

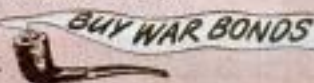
All good pipe dealers carry LHS famous pipes

L. & H. STERN, INC., Stern Bldg., Brooklyn 1, N.Y.

Makers of LHS Ultra-line \$10 and Purex Pipes \$3.50, \$1.50

YOU WILL UNDERSTAND—Thousands of LHS pipes are now going to the armed services. If you can't always locate the LHS model you want, remember, any LHS is "Perfection in a Pipe."

Put this in your pipe and smoke it.



Smoke the Lifesaver

Continued from page 75

date. During this period no shipping was sunk and no serious damage ever accomplished by enemy bombers.

Such screens are generally created by the coordinated operation of one or more CWS smoke generator companies. As a rule, smoke pots are placed by the hundreds in an inner ring around the most vital areas to provide instantaneous screening. In an outer ring around the city are mobile mechanical generators which move back and forth to fill in any rifts in the screen.

Canned smoke comes in several forms. The M1 HC smoke pot, filled with hexachlorethane, weighs about 11 pounds and burns about six minutes, giving off dense clouds of white smoke. The HC M4 floating smoke pot, a larger version, is dropped from naval vessels. A five-gallon steel pail filled with hexachlorethane, the M4 burns for 10 to 15 minutes. The CWS has also just standardized a new 30-pound HC smoke pot which burns for 20 minutes. Smoke pots also have been used to mark off beachheads for landing forces, indicating to Naval artillery where not to fire.

Although primarily an antipersonnel weapon, the M15 white phosphorus grenade can also be used for laying small smoke screens. The M47 white phosphorus bomb weighing 100 pounds, used at Rabaul, presents a triple threat since the phosphorus acts as an incendiary, produces smoke and also harasses the enemy with flaming fragments which sear and cling to all persons within the bursting area.

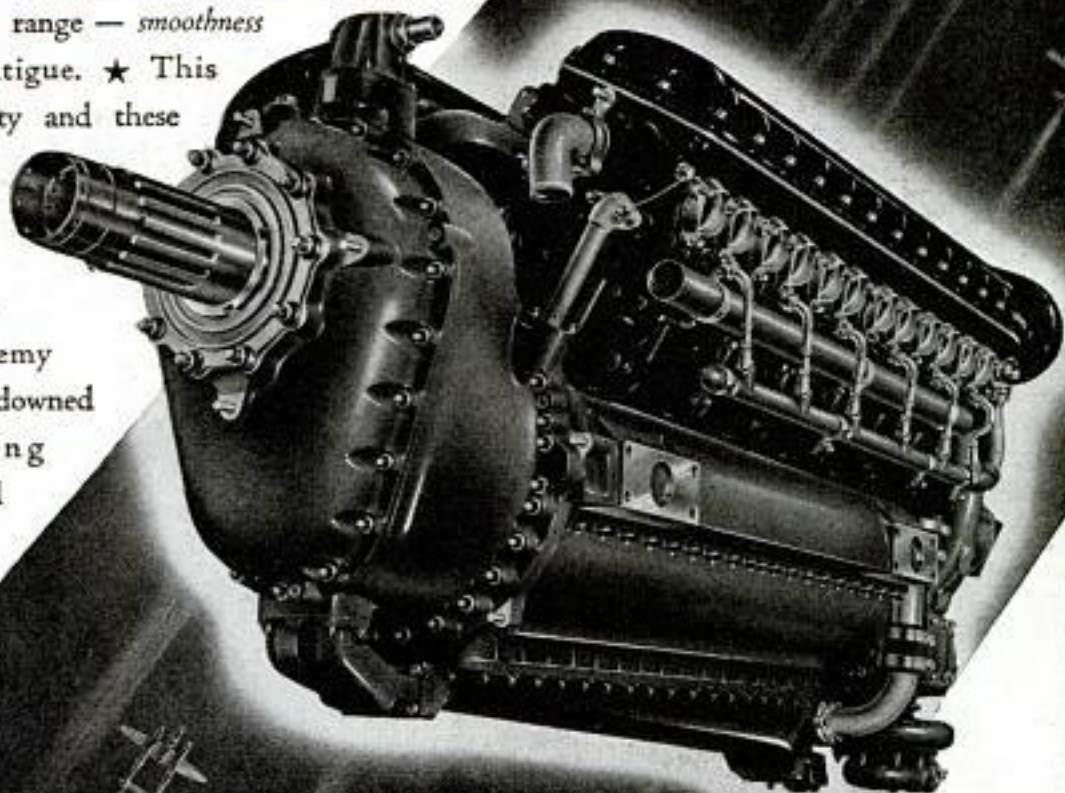
Shells filled with white phosphorus smoke agent, a non-toxic chemical, are issued to the field artillery both for marking targets and for laying screens. The most effective is the versatile 4.2-inch chemical mortar, which can fire 20 rounds a minute at ranges up to two and a half miles.

The first historical reference to wartime use of smoke was the miracle whereby the Israelites were protected on their march from Egypt to the Promised Land. After the civil wars of the Roman empire, little was heard of smoke until 1632, when Gustavus covered his crossing of the Lech in face of Tilly by a smoke screen created from burning wet straw. The first use of smoke in the first world war probably was the burning of a haystack that enabled a British company to withdraw from the La Basse canal defense in October, 1914. By 1916, smoke shells were in use. Not until the battles of Arras, in 1917, were the art of accurate projection of smoke shells and their great value appreciated.

FIGHTING EDGE

U. S. Army pilots have flown more Allison-powered fighter planes into battle than planes powered by any other engine.

★ Pilots like Allison *reliability* to get there and back—*durability* to stand up under more fighting hours—*economy* to extend range—*smoothness* to reduce pilot fatigue. ★ This numerical superiority and these Allison qualities have added much to America's fighting edge. Thousands of enemy planes have been downed by pilots flying Allison-powered fighters.



POWERED BY ALLISON

P-38—Lightning

P-39—Airacobra

P-40—Warhawk

A-36 and P-51—Mustang

P-63—Kingcobra

Allison has already furnished more than 50,000 engines for use in these planes.

LIQUID-COOLED AIRCRAFT ENGINES

Allison

DIVISION OF

Indianapolis, Indiana

Every Sunday Afternoon

GENERAL MOTORS SYMPHONY OF THE AIR—NBC Network



**KEEP AMERICA STRONG
BUY MORE WAR BONDS**

Nowhere is reliable performance more indispensable than with America's buses. So, there is a tip for you in the way the bus transportation industry cares for spark plugs. All plugs are thoroughly cleaned and accurately adjusted every 3,000-5,000 miles. When plugs are finally worn out, new ones are installed promptly,—and thousands of them are AC Spark Plugs.

Follow this same system with your own spark plugs, and you will not only enjoy the utmost in plug reliability but also conserve urgently needed materials and fuel for our fighting men.



BRING YOUR FIGHTING MAN HOME SOONER
BUY ANOTHER WAR BOND

Highballing 500 Trains a Day

Continued from page 37

ley and substations in his area. However, the power director must obtain permission from the load dispatcher at Philadelphia before opening any transmission lines.

Across the street from Pennsylvania Station in New York the power director presides over the station from which direct current is supplied to the 11,000-volt, 25-cycle overhead catenary wires. Before him is an illuminated map of the circuits, trouble showing up instantly with lights indicating circuit breakers in operation.

The ability of the electric locomotive to accelerate rapidly and to maintain a uniform high speed uphill and down by utilizing the overload capacity of the motors on the upgrades has enabled the Pennsylvania to cut 45 minutes from its fastest schedules between Washington and New York.

Having no power plant to carry, the electric locomotive can be maintained in fewer hours than steam or Diesel. On the Pennsylvania, electric locomotives run about 25 percent more annual mileage than steam engines on similar service. Winter brings problems of wires sagging with ice and pantographs dragged down by ice outweighing their springs. When ice is forming, they send out a 12-car train with all 12 pantographs up to scrape sleet from the wires, and they are trying electric heaters on pantographs to keep ice from forming.

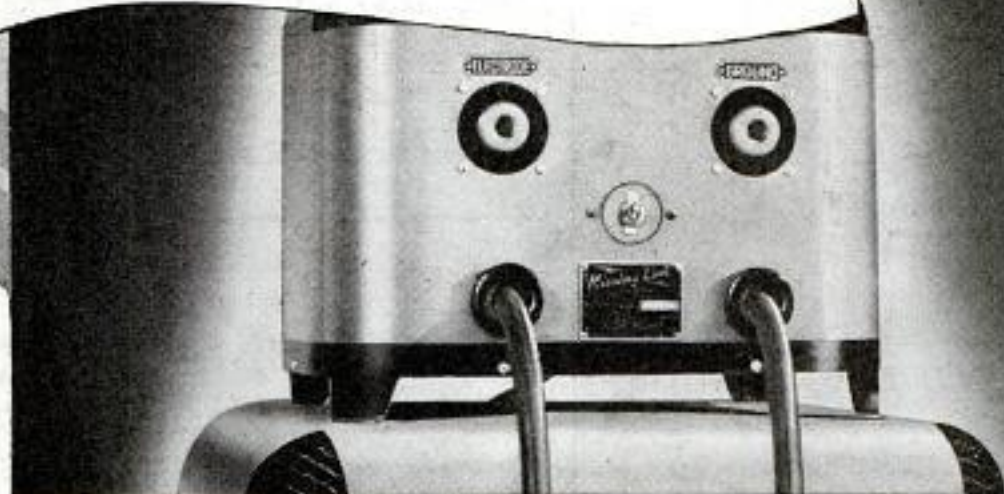
J. V. B. Duer, assistant to the vice president in charge of operations, reports that passenger schedules were shortened on the average, about an hour and freight schedules two hours by electrification, with little or no increase in maximum speeds.

"With freight trains," he says, "two things affect the improvement of schedule. First, the electric locomotive is a more reliable motive power unit, and freight trains can be run among passenger trains with greater assurance of non-interference with passenger trains. Second, the electric locomotive lends itself to a rather high average speed in momentum operation of trains. Although it loses some speed going uphill, it passes over the top at a higher speed than a steam locomotive does, because it uses excess power available in the trolley and overload capacity available in the motors to arrive at the top of the hill at a higher speed than if it carried its generating equipment." But he adds that advantages of electrical operations occur only where they are applied, in fast movement of a large number of heavy trains, and in tunnels and terminal operations.

Continued to page 158

Ingenious New Technical Methods

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



Revolutionary Hy-cycle Automatic Arc Pro- vides Complete Control of Arc and Heat

At last, a development that automatically starts the arc before the welding electrode actually comes in contact with the work! Eliminating the "pecking" or "scratching" that so often creates tension and operator fatigue. Its many advantages contribute largely to saving time and labor because an operator can be trained in far less time than usual, and higher speeds can be obtained. This hy-cycle automatic arc unit, called "Missing Link," permits the operator to weld with any welding rod, bare steel or alloy. Rods that could not be used before can be burned with ease—such as bare mild steel, dust coated, reverse polarity, aluminum, bronze, stainless steel, etc., AC or DC.

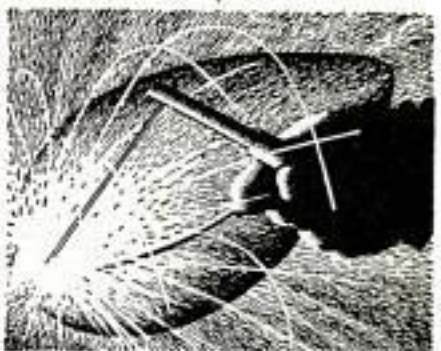
One of its most important advantages is welding light gauge. Light gauge requires low heat—making many jobs almost impossible for ordinary methods. Since the "Missing Link" starts automatically on as low as one ampere of heat, the welding of light gauge sheet can be done with surprising speed with no time out for "pecking" and "sticking."

You all know that our fighting men need the finest quality materials that we here at home can produce. That goes for Wrigley's Spearmint Gum, too. Although our stock pile of quality raw materials is getting lower and lower we are maintaining our standards of quality. Naturally, we are forced to limit production. So we are giving priority where it is needed most—and where you want us to—our fighting men and women overseas only. Because chewing gum is essential to them—they are getting all of our limited production of Wrigley's Spearmint Gum.

You can get complete information from Mid-States Equipment Company, 2429 South Michigan Avenue, Chicago 16, Illinois.



Simplifies welding vertical
and overhead



Makes it easy to weld light
gauge work

Y-136

Act now to avoid a *Frigid Family*



...INSULATE YOUR ATTIC WITH BALSAM-WOOL



Will another winter of shivers and shakes afflict your family? Will cold wave warnings again make you shudder? Not if you insulate your attic—now—with Balsam-Wool Attic Insulation! It's the simple, practical, inexpensive way to keep more comfortable—while you save up to 20% in fuel.

Balsam-Wool Attic Insulation is so easy to apply! It's laid like a rug in your attic—no fuss or muss. Windproof, moistureproof and fire resistant, it gives lifetime service, saving money on your fuel bills year after year. In fact, Balsam-Wool is so good that it's sold under a *money-back guarantee* of complete satisfaction! Mail the coupon or see your **lumber dealer** about applying Balsam-Wool before it's too late—don't let a possible insulation shortage cheat you out of comfort!

Balsam-Wool

SEALED ATTIC INSULATION

Balsam-Wool... Products of Weyerhaeuser... Nu-Wool

WOOD CONVERSION COMPANY
Dept. 210-9 First National Bank Bldg.
St. Paul 1, Minnesota

Gentlemen: I want to know more about Balsam-Wool Double-Value Attic Insulation.

To assist us in giving you special information, please check: I am a home owner
renter architect contractor
student postwar planner

Name.....

Address.....

City.....State.....



A plume of white comes into view far down the track below Union Tower.

"Troop train," remarks the block operator as he jots down an entry on his log a minute later. Boys in khaki peer from the troop sleepers. The towerman observes:

"G. I.'s on their way."

The bay window of Union Tower looks down on a kaleidoscopic view of the war. American railroads carried more carloads of freight to the ports in March than any other month in history. The towerman got an eyeful of the invasion in the continuous preview rolling past... boxcars and Pullmans, flatcars laden with tanks and boats, alligators and enormous crates... 500 trains a day highballing through, 7,000 cars of freight moving at almost passenger train speed. And this is just one of the railroads feeding the world's busiest port and the Yanks overseas.

High Chair Bombardiers

Continued from page 43

able electric control panel, which may be set at the instructor's desk. The altimeter is driven at 1,000 feet per minute and the compass, airspeed meter and temperature gauge are driven at speeds which permit accurate setting on each. Quick and smooth changes in altitude, temperature, heading, and airspeed may be accomplished by a flick of the finger. An entire classroom may be flown on all headings and at a wide range of altitude, airspeed and temperature. Each student is made to set his watch accurately and can then be taken over a rapid flight in which he is kept hopping in order to keep up with his log entries.

It also has considerable value in altitude and computation training for bombardier students. The flight data such as barometric pressure, target, and runway elevation are furnished on a simulated flight board. The class may be flown to a desired indicated altitude and the instruments set for any desired conditions. Making use of bombing tables and computers, the student is required to compute correctly the true altitude above target, true airspeed, trail, and disc speed.

A remarkable series of training aids has been developed by Lieut. Joseph Chopp. One of them is a working model of the Norden bombsight—about 15 feet long and five feet high. The huge sight can be dismantled and put back together again. Separate models show different portions of the sight. Full-size mock-ups acquaint students with the bombardier compartments of the principal types of combat planes.

Continued to page 160



“... but this one's my favorite”

“I knew you'd want to look at *this* one. Most everybody does. I'll bet my Savage Model 99 has been out of the rack a hundred times.

“I've done a lot of big game hunting in my day and I expect to do a lot more after the war. I've handled a flock of guns, too, but this Savage is my favorite. Talk about streamlining and balance! Just handle it. This rifle is chambered for the famous Savage .300 cartridge—one of the most powerful ever developed for light, fast, lever action rifles. But, in the Savage Model 99, you have the choice of several other calibers. For example, there's the Savage .250-3000 ... one of the first of the high

velocity, flat trajectory type cartridges. It really reaches out for long range shots on coyotes, mountain goats and other medium-size game.

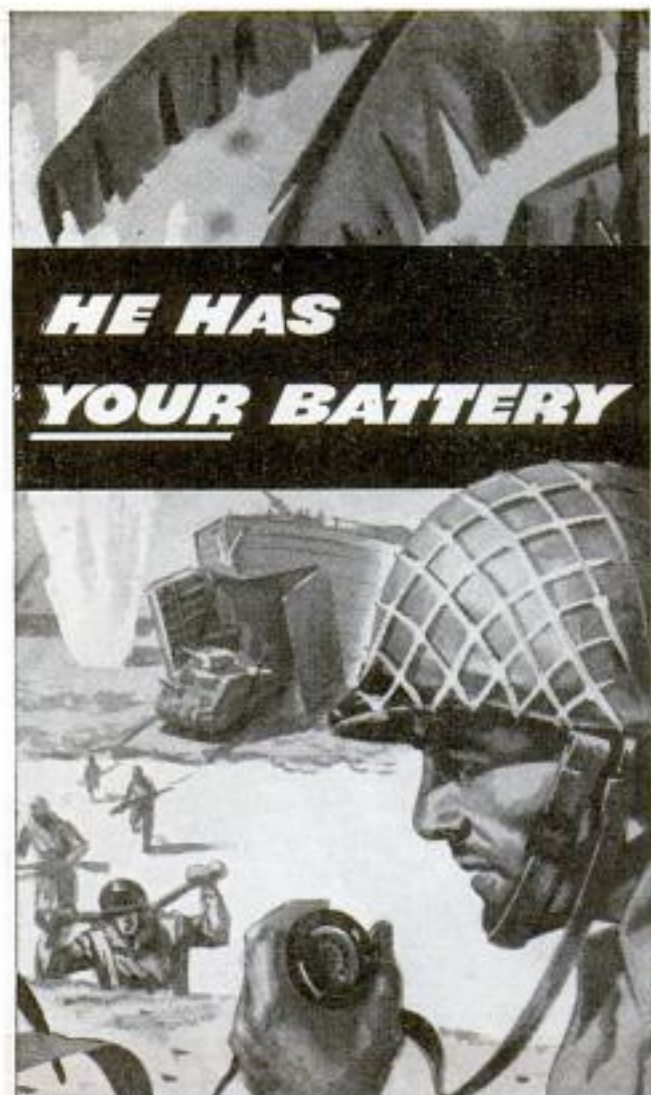
“So here's a tip ... when the time comes ... pick a Savage Model 99. Then you'll know why it's my favorite.”

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Huge quantities of military arms have been produced by Savage. This same capacity for precision manufacturing in quantity will make future Savage Sporting Arms your first choice.





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BURGESS BATTERIES

IN THE NATION'S SERVICE
On the Fighting Front
On the Home Front

Mock-ups of bomb racks, with empty bombs ranging from 17-pound anti-personnel missiles to 2,000-pound blockbusters, are used to teach problems of loading.

Another innovation is the sonic system for scoring bomb hits on the target ranges. Four microphones set in a square pattern each 500 feet from the target's center, are wired to a recorder several thousand feet away. By recording the time of arrival of the sound at each microphone an indication of the bomb's position is obtained. For instance, the sound wave from a bomb hit in the center of the target will reach all four microphones at the same instant. An off-center hit will activate the nearest microphone first and the others in order of distance from the explosion. This record is applied to a hyperbolic board on which the position of the point may be plotted.

This unit lies inoperative until a bomb impact shakes the ground. This ground or seismic wave is picked up by buried geophones and starts the recorder going in time to record the sonic waves.

These are a few of many devices and techniques in use throughout the AAF Training Command to make certain that American bombardiers continue to be the world's best. The effectiveness of this "synthetic" training is being demonstrated, with real bombs, on every fighting front. Midland Army Air Field's own graduates are demonstrating it with bombs that are smashing enemy factories, sinking enemy ships, blasting a road to Victory.

"The Rocket's Red Glare"

Continued from page 5

er simple shell tube containing powder. When fired, the flow of gas issuing from its tail propels it in the sighted direction, its flight being stabilized by fins. It is therefore especially useful for low-level attacks and strafing, when the kick of a cannon slows the plane and unsteadies it.

Because of this specialty of blasting accurately at high speed and low altitudes, the rocket fighters were assigned the job of knocking out all German radio installations that had survived the pre-invasion attacks by heavy and medium bombers. The flying bazookas did the job neatly.

British Typhoon torpedo bombers carrying rockets were called on for help during the assault on Caen, when 25 Nazi tanks were massed for a counterattack. A German prisoner told his captors the Typhoons had wrecked 17 tanks beyond repair.

Grumman Avengers of the U. S. Marine Corps gave the Japs their first introduc-

Continued to page 162



Needles and nails made his first watch tools . . .

THE March wind rattled the bedroom window. But the lantern on the floor gave a steady glow to warm the boy's feet.

Then his head bent more closely to the work. He nudged the balance wheel—and life came back into the timepiece.

Watch repairing was coming easier to young Henry Ford. He had started at 14 and the first watch (today in his collection at Dearborn) had been mended with a shingle nail, a corset stay, and knitting needles. Now, after school, he was neighborhood watch repairer.

Everyone was enthusiastic

about his work, particularly because he didn't charge for it. But it wasn't money that Henry Ford was interested in. Here was an opportunity to *learn by doing!*

Years later, the watchmaker's precision learned by Henry Ford in those winter nights was to guide the building of 30 million cars and trucks. Moreover, it was Mr. Ford's knowledge of watchmaking that prompted inauguration of the assembly line. This in turn brought shorter working hours, increased wages, made life easier for millions, and is now speeding equipment to preserve our American way of living.

New cars belong to the future. But when tomorrow's Ford, Mercury and Lincoln cars arrive, they will reflect anew the watchmaker's skill, the workmanship and engineering resourcefulness that are typical of Ford Motor Company.

As in the past, they will be motorcars that are reliable and economical, smart and comfortable. And they will be priced within the means of the greatest number. For Mr. Ford has declared: "The profits we are most interested in are those the public gets from using the things that we produce. The only real profit is the public benefit."

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tion to the airborne rocket in the South Pacific. Staff Sergeant Dan Bailey of Atlanta, Marine combat correspondent, rode along when the Avengers lit into a Japanese bivouac area on Bougainville.

"The Jap camp was in a clearing a mile or so inland," he reported. "From the air the native huts and tents stood out like gravy spots on a green vest. We flew toward it in a low glide. . . I caught a glimpse of brilliant red balls racing away from the plane with a loud whistling sound.

"The rockets smashed into the center of the target, throwing a purple mushroom of flame, smoke and debris more than 100 feet into the air."

In the amphibious assaults at Arawe and Cape Gloucester, New Britain, rocket-firing Ducks led the troops ashore, blistering the Jap beach defenses with a barrage from multi-barreled rocket projectors.

For the invasion of Europe, the amphibious forces took the small infantry landing craft and adapted it for bombardment. It became the Landing Craft, Rockets.

Only a small crew is needed on the LCR. The craft is navigated from an asbestos-guarded post at the stern. The forward part of the boat is lined with racks of the light rocket projectors. Once loaded, these tubes are fired by remote control from the stern.

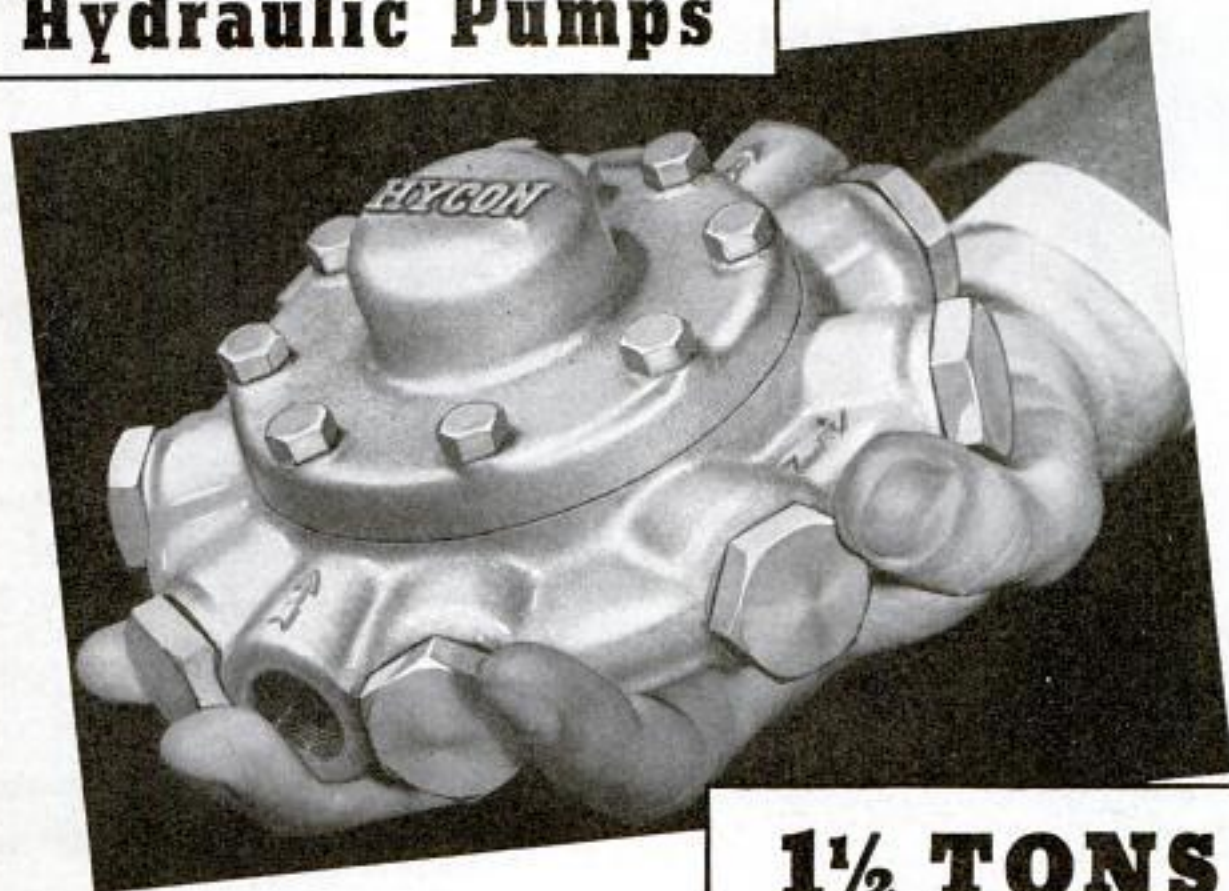
The full broadside of these rocket boats is said to be more powerful than a salvo from the nine big 16-inch guns of the British battleships Nelson or Rodney. It is no wonder that a German prisoner on the Cherbourg peninsula said the rockets were the most terrible thing he had ever faced.

There is no doubt that developments in the last few months point to a new departure in warfare. The rocket itself is not new—witness the "rocket's red glare" when the British attacked Fort McHenry in 1814, and even earlier uses of the rocket against Napoleon at Waterloo and in an expedition against Boulogne in 1805, when the British equipped boats for salvo firing of rockets.

But today the rocket has acquired a new terror. There is speculation over giant robots that might be sent across the Atlantic, at which scientists scoff because of the inaccuracy of any long-range robot and the tons of fuel such a weapon would require. However, a huge launching site captured near Cherbourg was believed to have been ready for a monster brother of the winged robot bomb already blitzing London. The launcher might accommodate a rocket bomb carrying five tons of explosives. In the shape of today's rocket may be seen the shadow of the next and more terrible war, unless the United Nations are wise enough to prevent that tragedy.

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A TRAIN

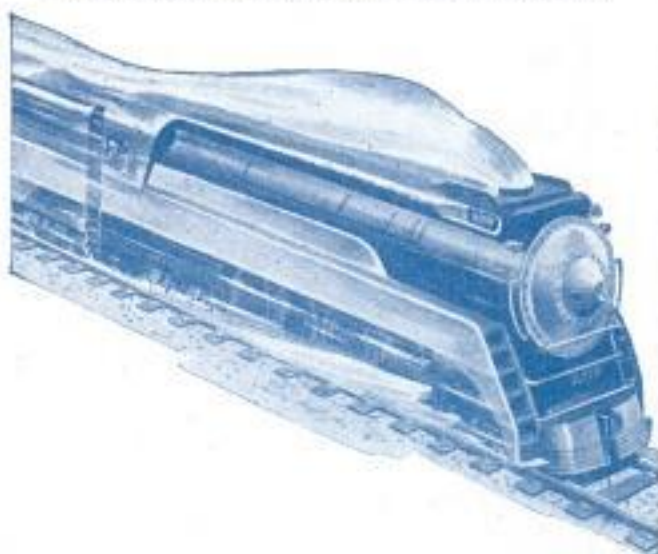
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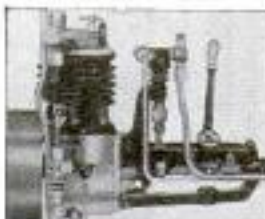
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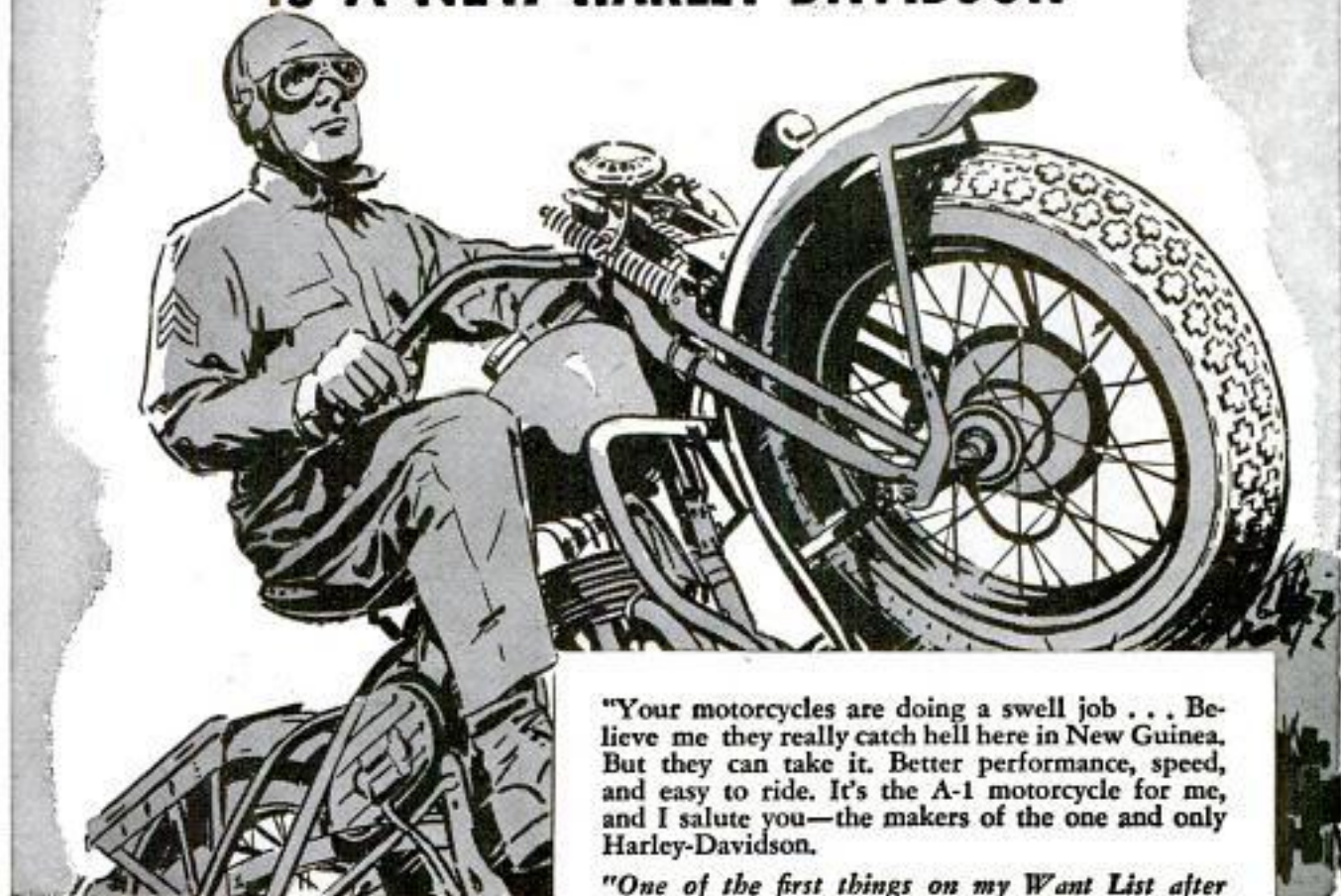
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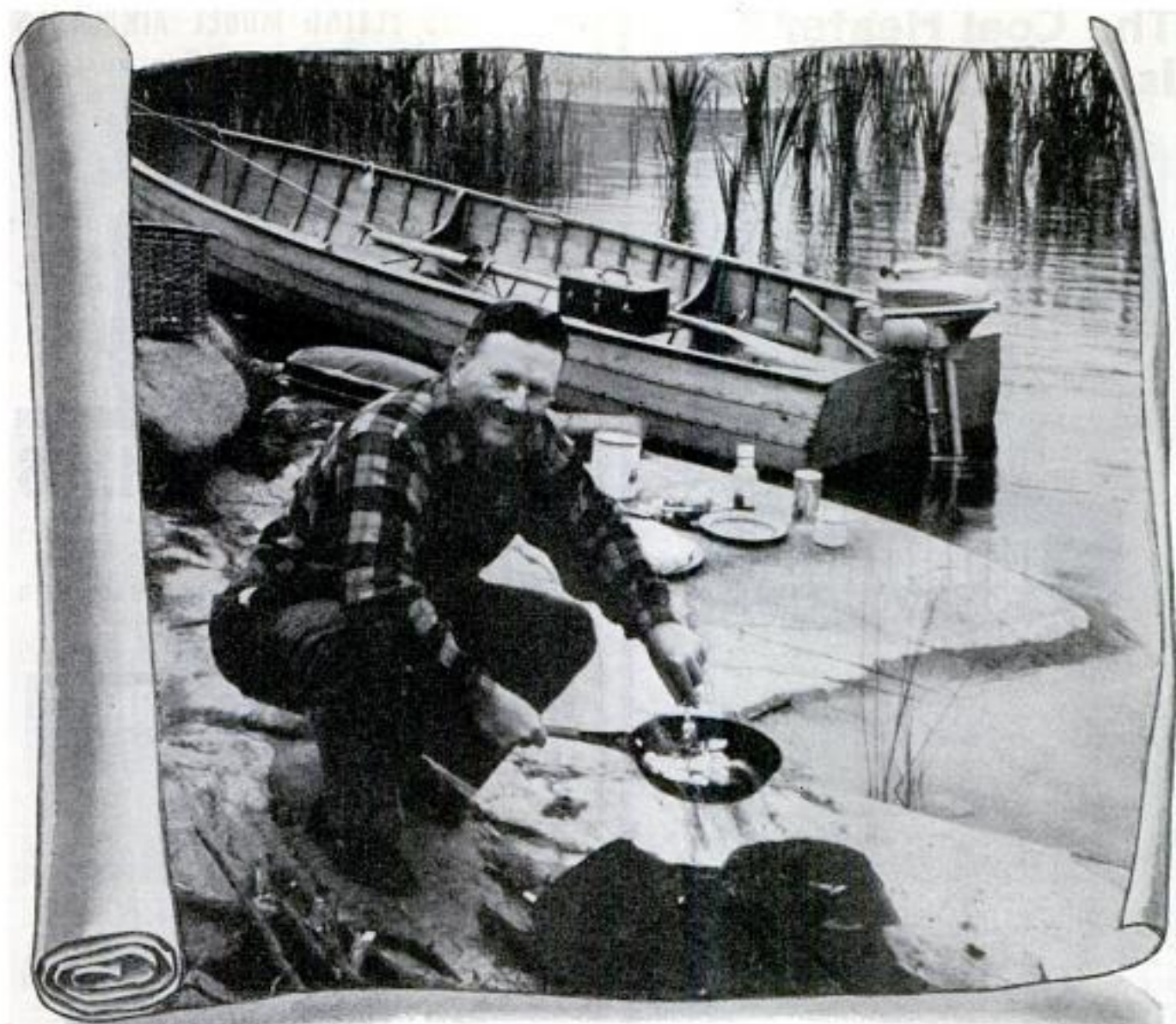
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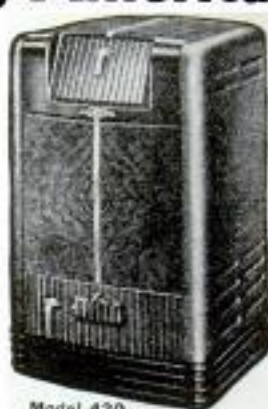


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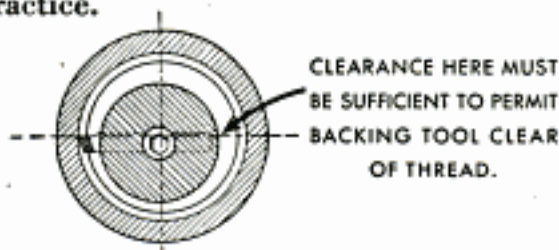
CANDEE, 2641 S. Hill • Los Angeles-7

THE **HOW AND WHY** OF

WILLIAMS
DROP-FORGED TOOLS

INTERNAL THREADING WITH WILLIAMS' BORING TOOLS

● Internal Threading on an engine lathe involves practically the same operations as external threading (described in another Williams Data Sheet) except for the tool used and its application to the work. Three types of Williams' Boring Tools are used extensively for internal threading. Instructions for the use of the three types illustrated are identical, and represent our recommended practice.



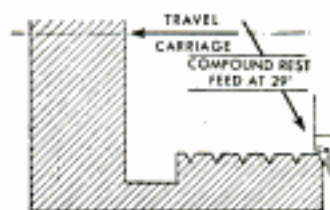
Since threading cutters are not regularly furnished with Williams' Boring Tools, the first essential is to provide a cutter bit ground to the proper angle, 60° for American National Threads. For internal threading more front clearance is required to prevent the heel of the tool from rubbing than is required for external threading.

The top of the cutter bit should be set at exact center as shown above, and a bar of

the largest practical diameter used in order to provide maximum rigidity. For right hand threading, the Compound Rest is rotated counter-clockwise (feed crank swung to right) and accurately set at 29°. Now mount the tool so that the bar is parallel to the lathe centers and align the cutter bit accurately with a center gage with the point of the bit to the wall nearest the operator.

With the work chucked or held on a face plate, right hand threading is done from the outer edge of the bore toward the headstock. Left hand threading is done from left to right, with the lead screw direction reversed.

Using the Compound Rest Screw (not the Carriage Cross Feed) feed into the work .002" to .004". Repeat until desired depth is attained, finishing off with depth of cut reduced to .001" on the final pass.



Action of the Thread Cutting Tool, with Compound Rest set at angle of 29°, is shown at left. Left side of Tool removes main chip which curls

clear better than when Tool is fed in at 90° angle. Right side of Tool merely shaves the thread smooth and helps produce a good finish.



WILLIAMS' ADJUSTABLE BORING-TOOL POST

4 sizes for bars 1/2" to 2-1/4". Height of bar easily adjusted with knurled ring.



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5 sizes for bars 3/16" to 1-1/8". Each takes many sizes of bars.



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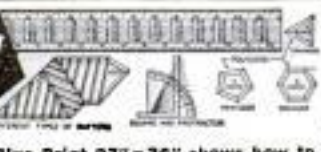
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With the exclusive new Zenith NEUTRAL-COLOR Earphone and Cord, even the most sensitive-minded person can wear an aid with new confidence and poise. For what modern styling did for eye-glasses, this smart Zenith ensemble does for the hearing aid: gives it a new "look of youth." The visible parts are *scarcely noticeable*—they complement any complexion.

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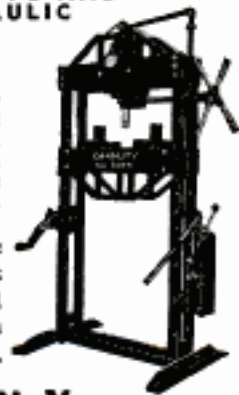
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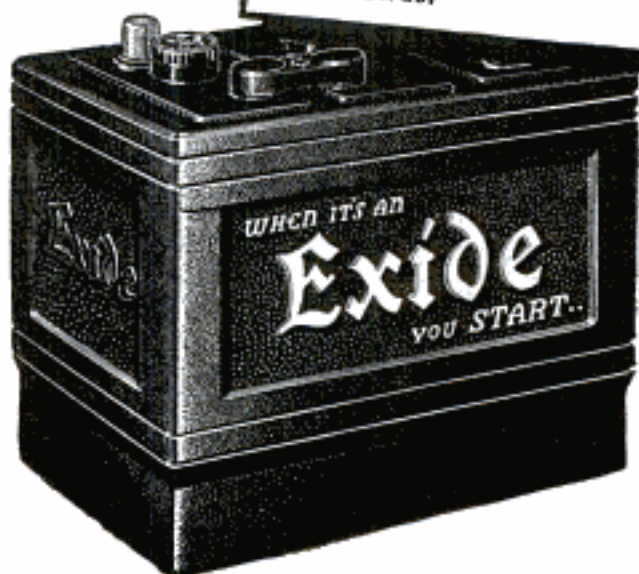
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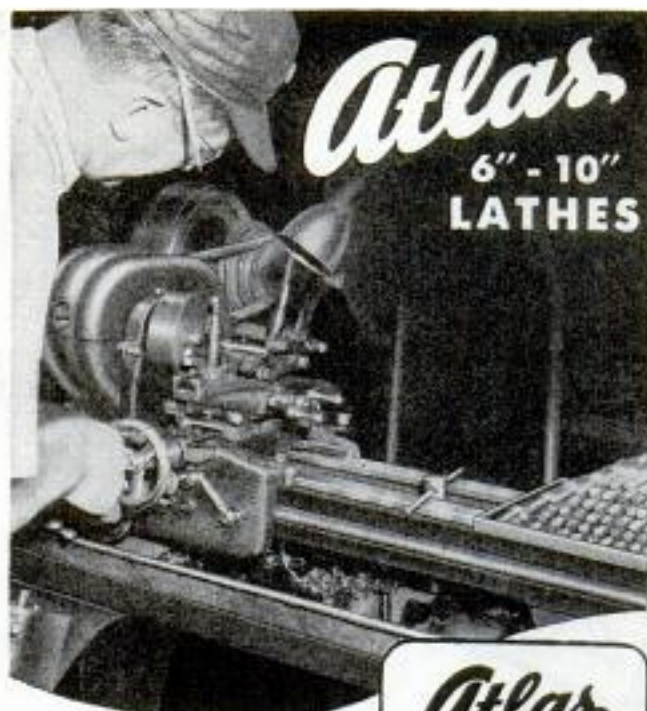
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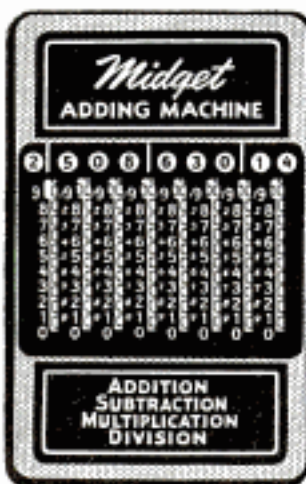
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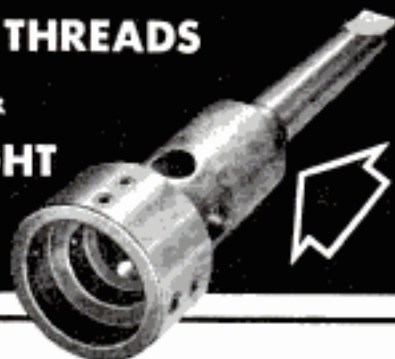
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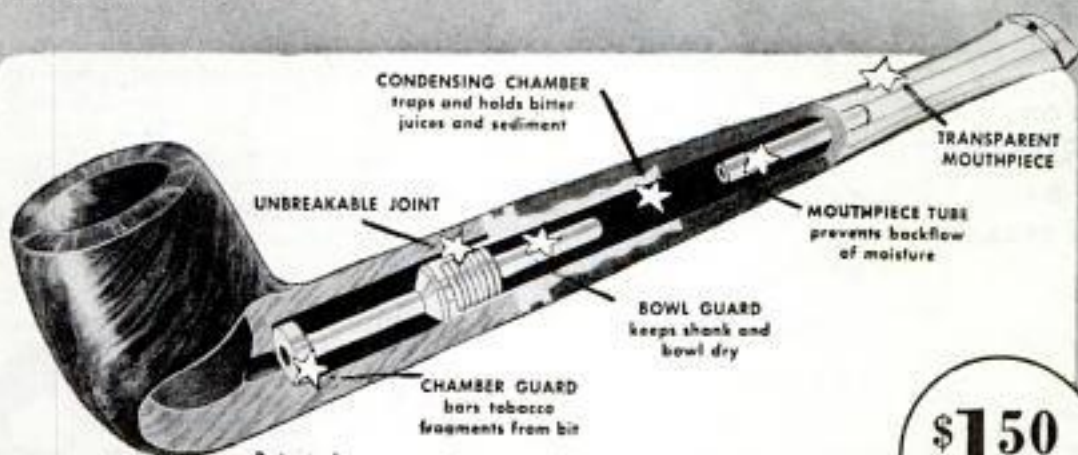
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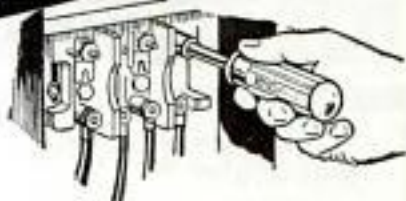
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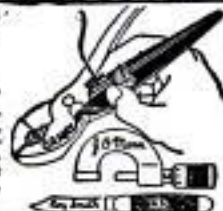


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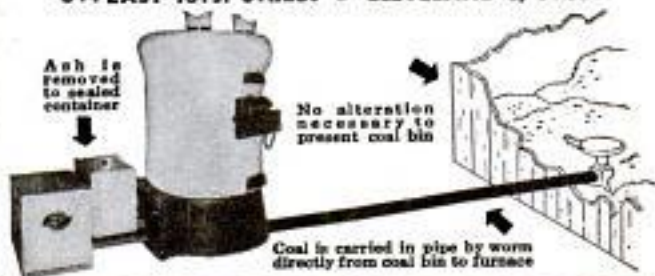
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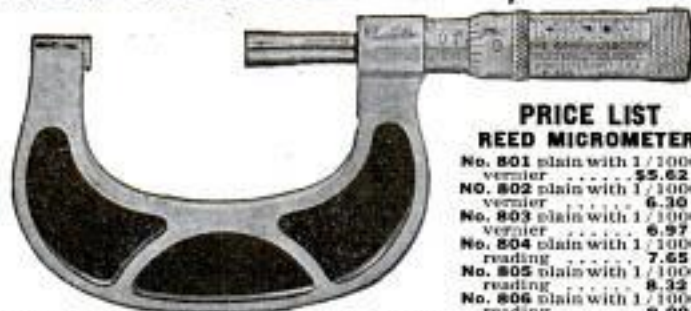
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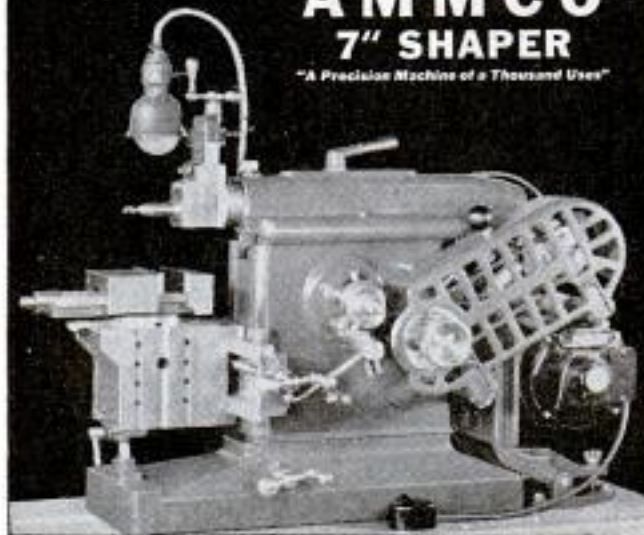
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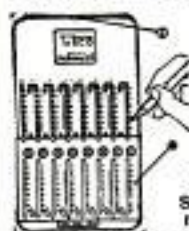
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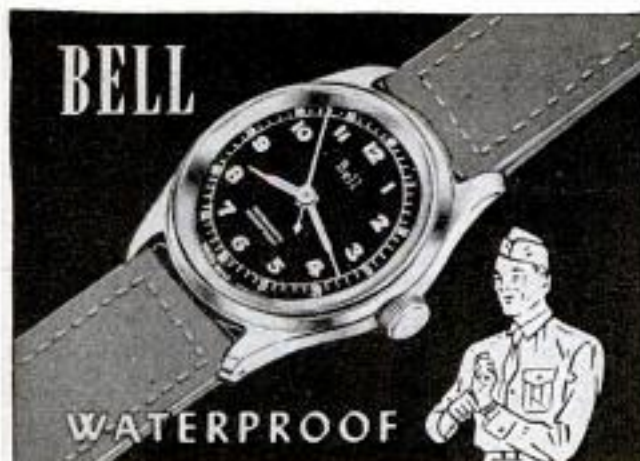
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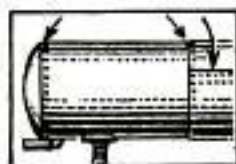
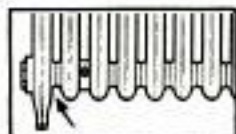
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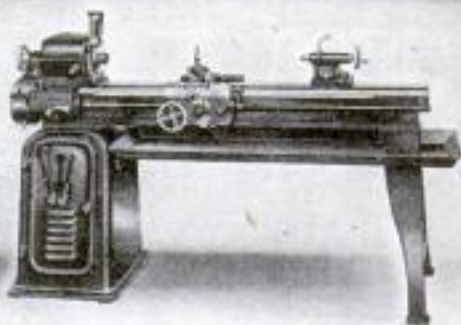
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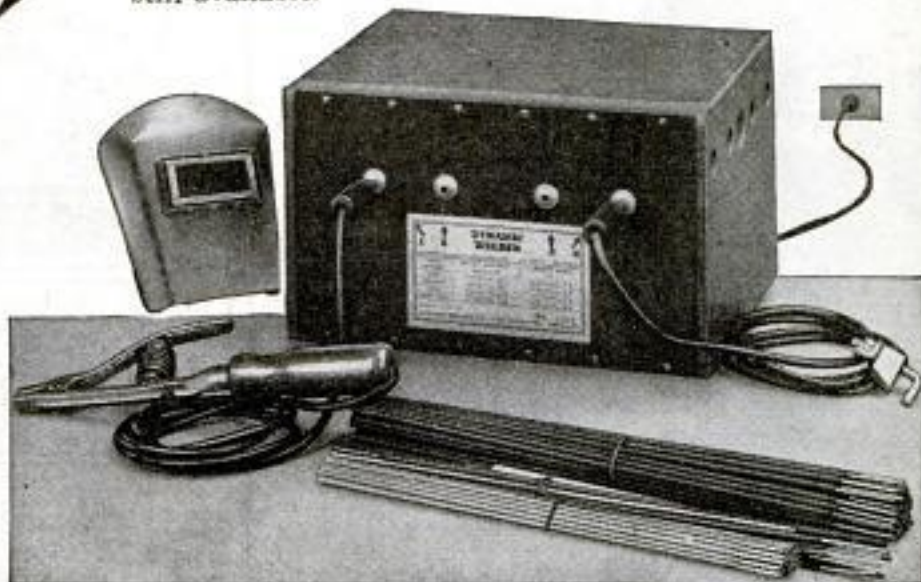
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• In addition to establishing new mileage records on cars in all sections of the country, the Vacu-Matic has proven itself on thousands of road tests and on dynamometer tests which duplicate road conditions and record accurate mileage and horsepower increases. Thousands of motorists now enjoy extra mileage—improved performance with Vacu-Matic.

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• Vacu-Matic is constructed of six parts assembled and fused into one unit, adjusted and sealed at the factory. Nothing to regulate. Any motorist can install in ten minutes. The trial offer coupon will bring all the facts. Mail it today!

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• Vacu-Matic offers a splendid opportunity for unusual sales and profits. Every car, truck, tractor and motorcycle owner a prospect. Valuable territories now open. You can obtain one for your own car if you help us introduce it to a friend. Just check and mail the coupon today.

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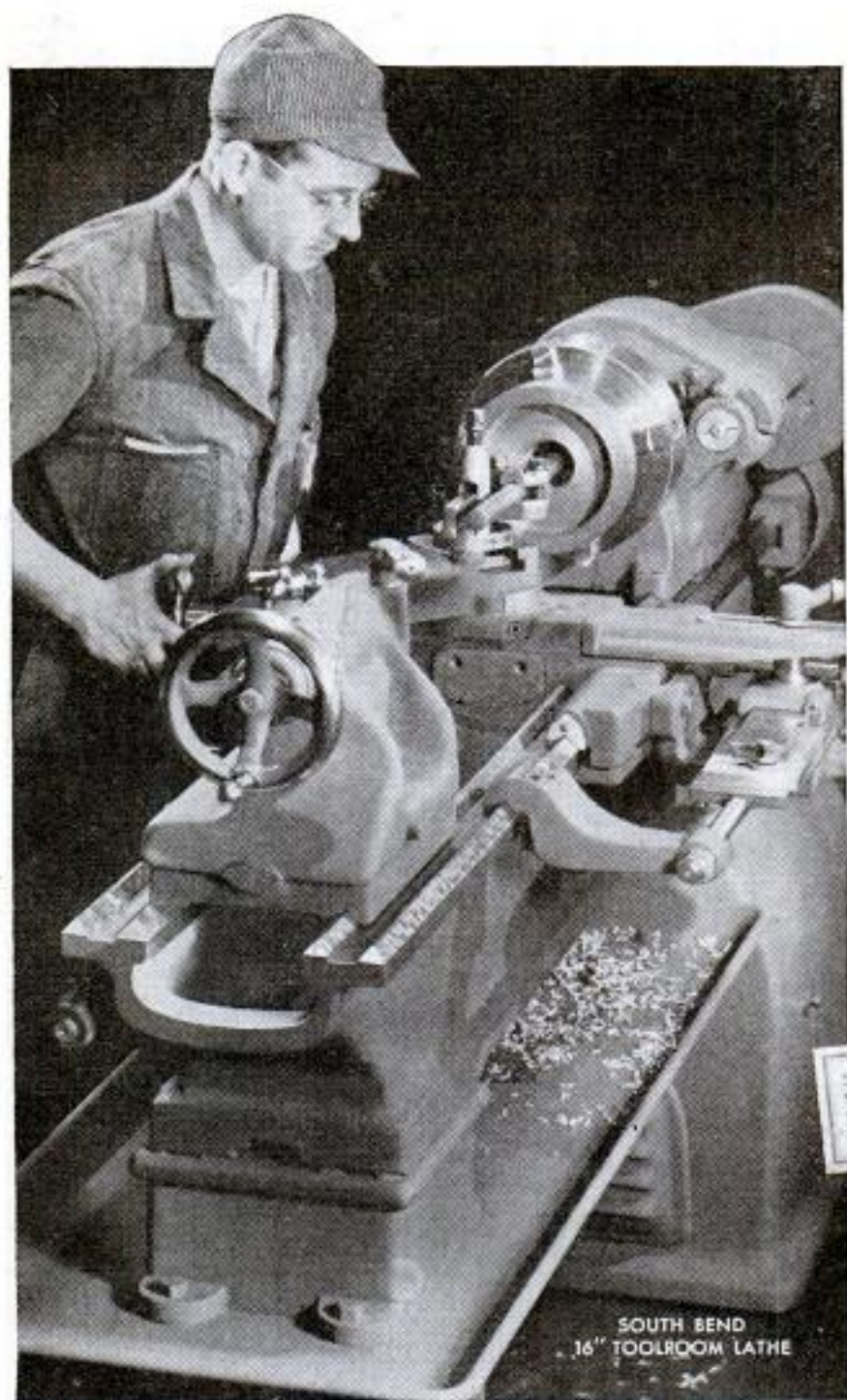
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To those who cannot qualify for a war-time priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions necessitate, the order may be cancelled at any time. Write now for details of this plan—and our Catalog No. 100-C.

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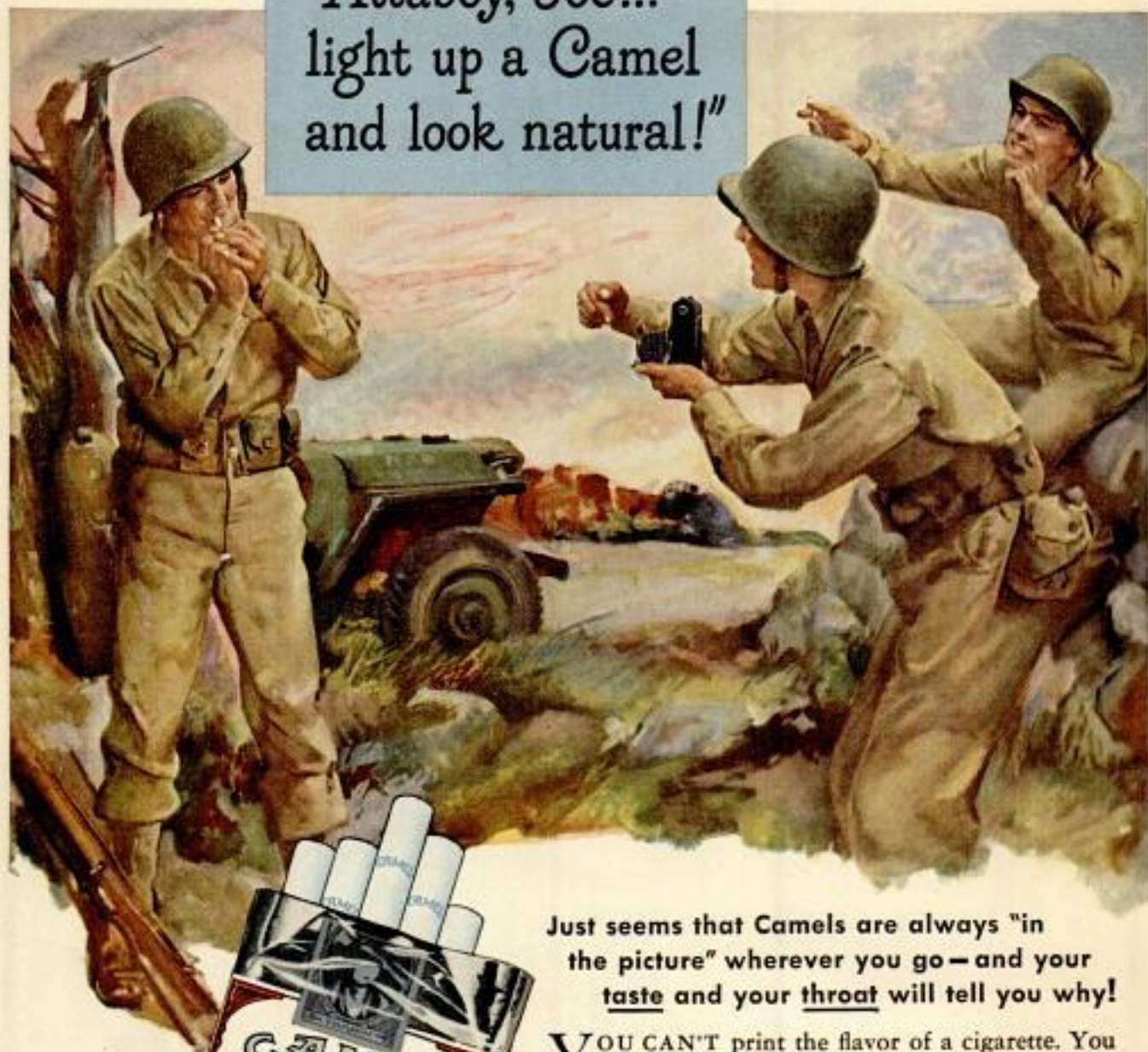


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