

Tough Guys

a **POPULAR
MECHANICS**

MAGAZINE

WRITTEN SO YOU UNDERSTAND IT


REG. TRADE MARK GREAT BRITAIN NO. 410426

EST. 1902



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SEE PAGE 7

 **BUY UNITED STATES
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HERE'S PROOF

Pittsburgh Testing Laboratory tested a badly sludged motor at zero without Casite. Motor failed to start seven out of eight times. After adding Casite, same motor started promptly every time.



FOR QUICK STARTING HORSEPOWER

Get CASITE

Some good news about Tin we think you should know

IT'S NO SECRET that the Japs are camped on 80% of the world's tin supply and that America is facing a critical tin shortage.

You have been asked to salvage every single tin can you use—to save every possible ounce of this vital war material. But, today, there is *good* news about the tin you salvage—and we believe you should know that news.

This is it: A new electrical process makes the tin used in tin cans go 3 times farther now than it did before.

Tin plate was formerly made by dipping thin steel sheets in molten tin. It produced a satisfactory coating, but used more tin than was really necessary.

American engineers devised a new method—*electroplating* the steel with pure tin—and the result was a coating that required only *one third as much tin*.

But the new tin plate had disadvantages. It was porous and did not provide complete protection against the acids in certain kinds of food.

Then Westinghouse stepped in.

Our research men and engineers, in co-operation with engineers of the steel industry, found a way of using *radio waves* to *heat* the dull, imper-



fect surface so that the tin fused almost instantly into a smooth, protective coating.

And the process is fast. A single machine can turn out enough tin plate in 18 minutes to cover an area the size of a football field!

This new device is a typical example of *electronics at work*—a result of Westinghouse electrical research and “know-how.” Already it is being installed in mills that turn out tin plate for a third of all the nation’s food cans.

Naturally, this does not mean that there is less need for you to salvage your old tin cans. On the contrary—*more than ever*, tin is needed to protect the food supplied to our fighting men all over the world.

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Popular Mechanics Magazine

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

February, 1943

Vol. 79, No. 2

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My Boys Shoot Down Zeros

SIX Flying Fortresses coming home from a job over the Pacific spotted a flight of 18 Jap Zeros peeling off overhead. The big Forts sailed straight on their course as the Japs came down. Then the Yank gunners let loose, and 17 Zeros were blasted out of the sky. The 18th ran for home. That's one of the tales recounted by a U. S. Air Corps officer and flying instructor in a thrill-packed feature next month. The Japs, he says, don't carry parachutes; it's not honorable to be captured. He tells of planes that dish out 200 bullets per second, flying with wingtips almost touching.

Longest Road in the World

ONE-THIRD of the way around the world from Fairbanks, Alaska, lies Buenos Aires; between them, with only a half dozen gaps in Central America uncompleted, lies the longest road in the world. The story of the 16,000-mile Pan-American Highway is an epic of hemisphere cooperation, vital to us in a war of communications. Read it in the March issue.

Next Month

WE DON'T advise trying it, but you can drop a heavy weight on a chunk of TNT without exploding it. Similarly, this strange stuff rides a shell serenely undisturbed by the bang of leaving a cannon or the impact of piercing a battleship's side, but inside its target the TNT bursts into a tornado of destruction. Until a year ago we made it from coal tar. Now it's a petroleum by-product. Dr. C. M. A. Stine, a vice president of the DuPont company, tells some interesting sidelights of this "Tornado in a Bombshell" in a March story.

Bomber's Seeing Eye

PILOTS of the Flying Fortresses call their navigators "high-altitude bookkeepers." Maybe theirs is just a desk job, but the desk is alongside the bomb rack. The fellows up in the cockpit have plenty of respect for the navigator, for every pilot and bombardier knows that man with the sextant and map and drift indicator can guide him to Rabaul or Stuttgart and back. Read "Back Seat Driver in a Bomber" next month.

Ready for the Worst

NO ONE wants to use poison gas. For one thing, it is primarily a defense weapon, and Allies and Axis alike want to keep the offensive. But we're ready to use it and fight it if we must. One defense is a "zoot suit" so airtight men have lost 10 pounds in 30 minutes wearing it. News of gas warfare is told in a March article, "Preparing for the Worst."

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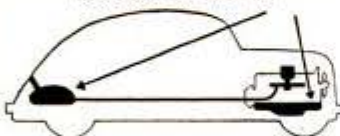
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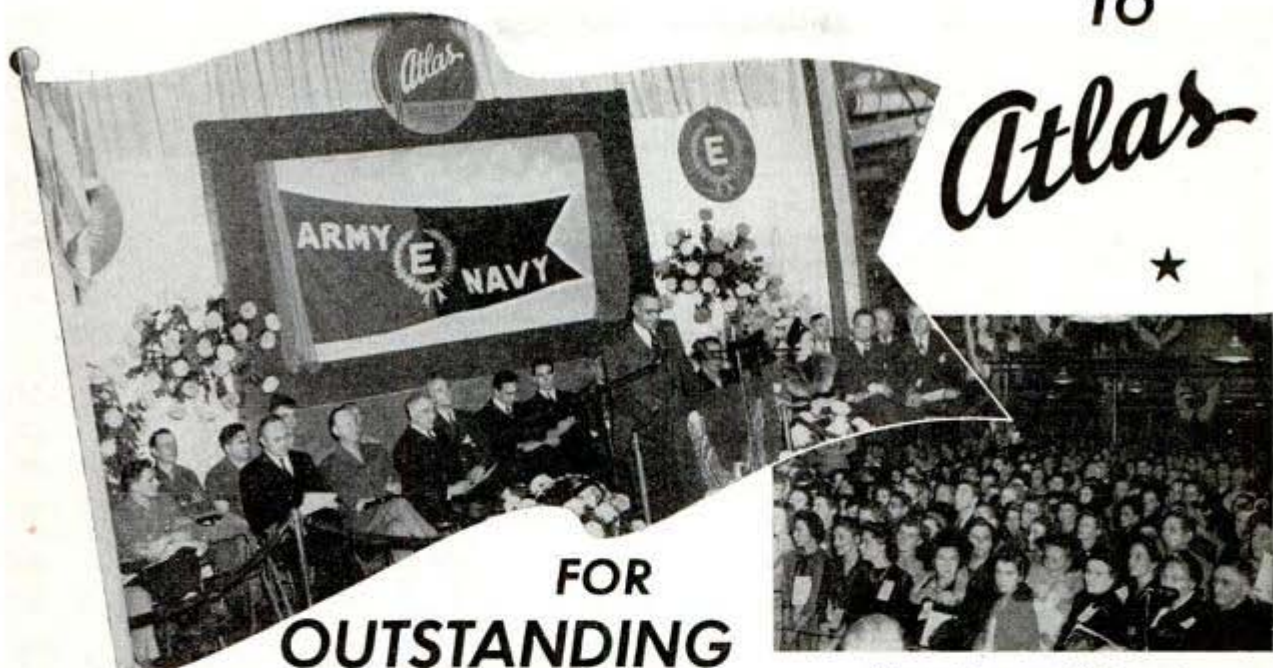
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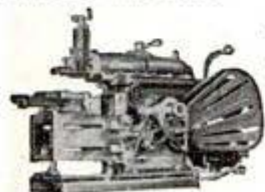
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FEBRUARY, 1943

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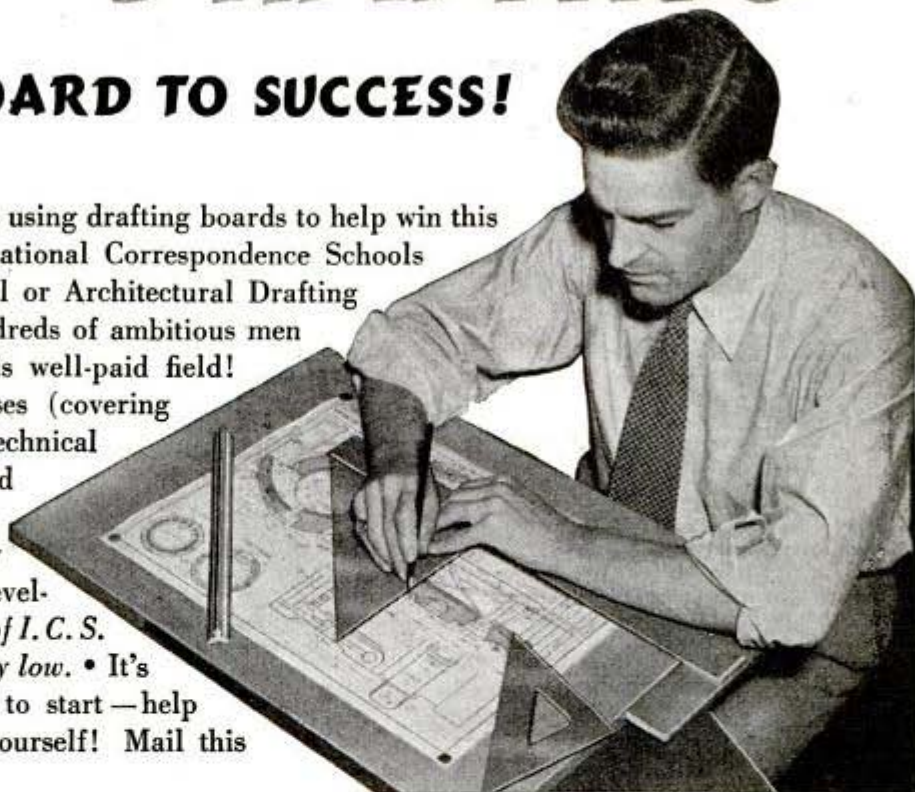
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... during the Dieppe raid, Gen. Roberts commanded from headquarters on a destroyer.
... along a nine-mile front wireless [radio] messages could be heard coming in . . .
... a smoke shield was ordered for troops on the "west beach" . . . the [radio] order was given to the Fighter Command . . . two hundred miles away . . . WITHIN A FEW MINUTES Douglas Bostons were dropping a heavy pall of concealing smoke . . . (news item)

Interesting!

Watch for radio use in the war news—you'll find it in the air—on the ground—and at home!

WITHOUT radio, the movement of war would still be anchored by telephone lines—the physical hazards of the courier and visual signals.

Now war moves swiftly over the whole face of the earth—instantaneous radio communication thru the ether instead of over copper wires has blasted the barriers of space and time.

So today all our radio production centers on war use.

But what of tomorrow—what effect will this have upon the future—after victory?

One thing is certain—it will revolutionize and speed the great new future form of transportation.

Radio has never been universally necessary in transportation before. In automobiles—on trains—it has been entertainment—in boats it has been a great aid but not an essential.

But today for the future, in that great, new universal transportation that is forming itself—the airplane—radio is essential as the engine itself.



Zenith's leadership in the radio industry has been established by a constant achievement of "firsts." Repeatedly, ideas "brand new" when Zenith "first" introduced them, later became essentials on all radios. And that same "forward thinking" of engineers and factory and organization now concentrates on war production of the thing we know—radio—exclusively radio. We are progressing—we learn every day—and this new experience will inevitably reflect itself when Zenith again produces for peace.

For over seven years Zenith Radio Corporation has advertised on short wave sets—"Europe, South America or the Orient—every day or your money back." It has never been called upon for a refund.

—a Zenith Radio Dealer near you is giving reliable service on all radios—regardless of make.

ZENITH RADIO CORPORATION—CHICAGO

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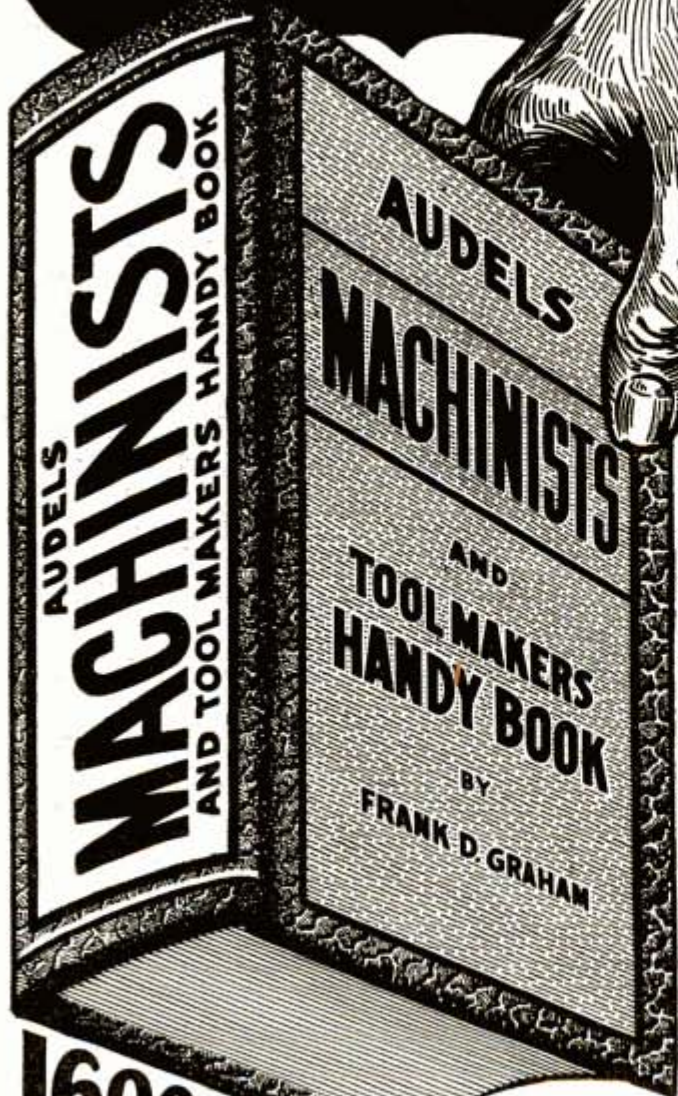
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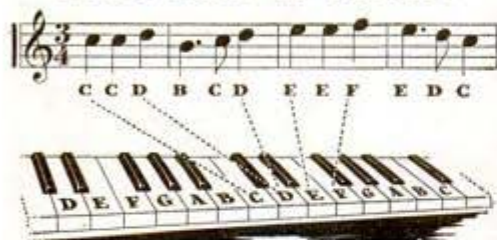
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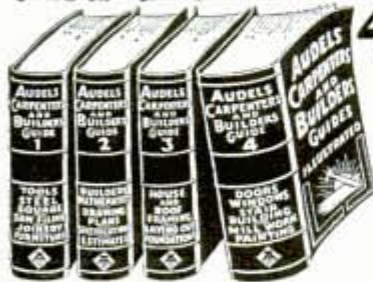
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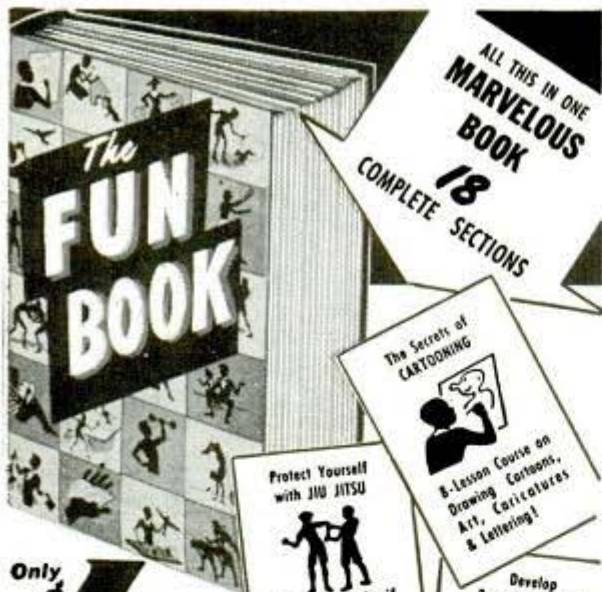
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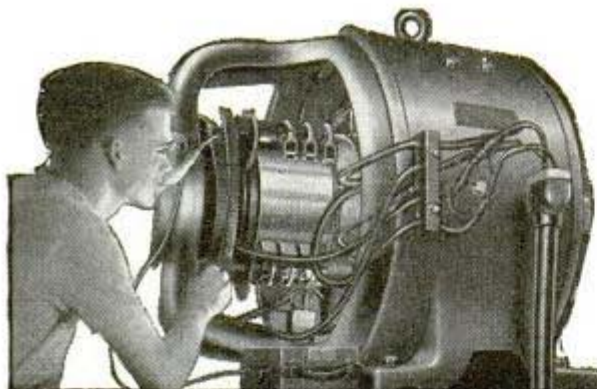
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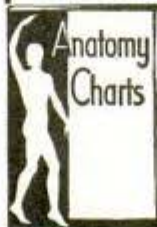
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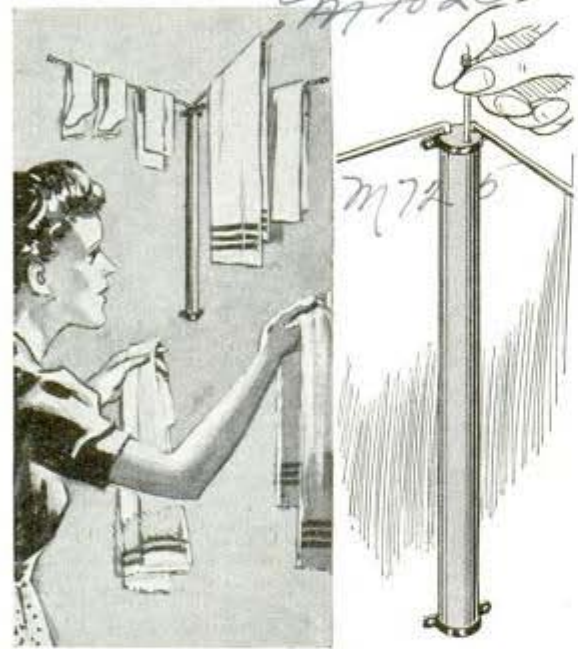
POPULAR INVENTIONS

For Your Home

Where-to-Buy-It index of commercially available Popular Inventions appears on page 28A

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Disappearing Rack for Towels Drops Into Wall Holder



Bumping into towel racks when they are not in use can be eliminated with hanger rods that drop back into a metal tube. The tube, containing three 10-inch rods, is attached to a wall in a vertical position. The rods are lifted from the top of the tube and brought forward where they may be fanned out to hold several towels. This is a space saver for the small kitchen or bathroom.

Ice Cubes Ejected From Tray By Contraction of Metal

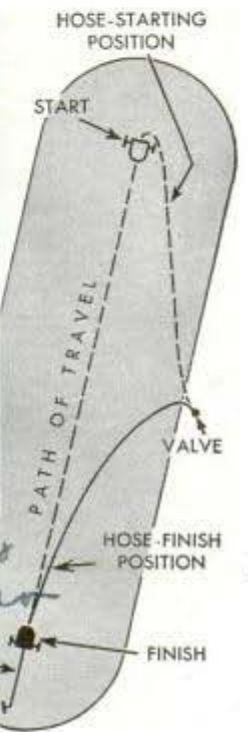
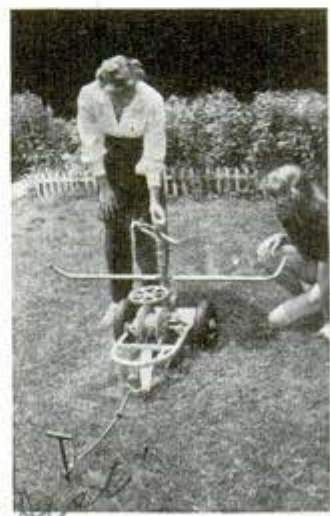
Melting away a good portion of the ice cube to remove it from the freezing tray will not happen with a tray patented recently by Thomas Barish of Jamestown, N. Y., which uses the freezing process to loosen the cube. The secret of the automatic action is in the use of two metals in the container, one of which contracts more than the other as their temperature is lowered. During the freezing, the corrugated

walls of the cup straighten out somewhat, thus drawing the walls away from the ice. This action is opposite to that of the ordinary ice tray which contracts throughout and grips the ice tighter. In addition, the bimetal bottoms of the cups bulge downward, and in a dropping temperature the bottom straightens out and may even bulge upward, lifting the ice cube. However, since the metals are nickel-steel and copper, it is not probable they will be in production until after the war.

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(More Popular Inventions on page 24A)



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POPULAR INVENTIONS

For Your Home

(Continued from page 22A)

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*Ref. Co. Inc. 4723 S. Hoover
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(More Popular Inventions on page 28A)

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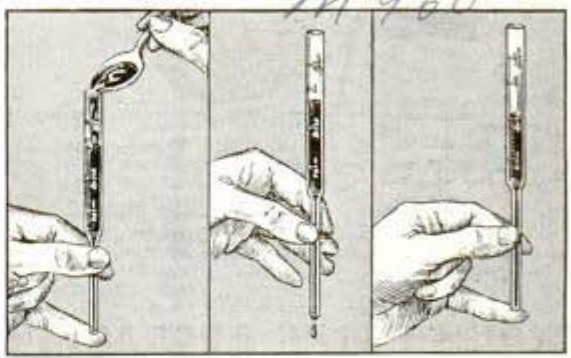
POPULAR INVENTIONS

For Your Home

(Continued from page 24A)

is formed by clipping the flanged hose-collar into the groove of the faucet collar. The coupling can be disconnected easily by sliding out the lower piece. If the hose is used with several different faucets, each one may be fitted with the coupling device.

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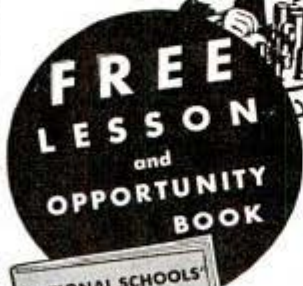
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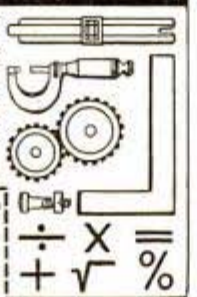
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1000 MIXED Poster stamps and patriotic labels \$1.00. Rooney, 116 Prince Street, New York City.

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NEWFOUNDLAND—50 All different \$1.00. Charles Campbell, Ford Hotel, Toronto, Canada.

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U. S. Approvals—Large stock—Parks complete 19c. Box 488, Minneapolis.

WORLD'S Smallest airmail—diamond and triangle stamps, free stamp magazine, also magnifier to study your stamps, with large collections of stamps from scarce countries. A bargain, 5c with approvals. Capital Stamps, Dept. 2, Little Rock, Arkansas.

WE Buy stamp collections, paying \$5.00 to \$2,500.00 cash. 40,000 varieties available on our approvals from 1/4c up. PKEigwin Company, Vineland, N. J.

TEN Dominican Republic commemorative, 10c, with approvals. Read, 3401 Farnell, Chicago.

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U. S. \$2.00 stamp No. 572 (perf. init.) 10c to applicants for U. S. approvals. M. Haycock, 8931 Metropolitan Ave., Forest Hills, N. Y.

50 DIFFERENT Brazil, 15 cents with approvals. Quality Stamp Service, Waverly, N. Y.

20 DIFFERENT Foreign commemoratives 5c! Approvals. Bentoni Ryan, Middletown, Connecticut.

NEWFOUNDLAND Dollar special buys, 40 different catalog \$2.50. Califax, 807 South Westlake, Los Angeles, California.

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APPROVALS Any country. Want lists filled. Melbees, 149-36 Beech, Flushing, N. Y.

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LIBERIA Triangles No. 242-7 (6) 10c with 1/4-1/2-1c approvals. Carroll's, 745 W. 45th St., Los Angeles, Calif.

U. S. Approvals. Low priced stamps. Stamp Agency, Y-104 Dunlap, Pittsburgh, Penna.

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FREE! Complete "United States" stamp catalog with 1,000 illustrations! Send 3c for postage. Harris & Co., 137 Transit Building, Boston, Mass.

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WEEKLY Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

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PENNY Approvals, that satisfy. Neil Gronberg, Box 5441-P, Philadelphia, Penna.

GIANT Packet 136 all different from Africa, South America, South Sea Islands, etc. Includes Nicaragua airmail, two scarce unused United States cataloging 2c, triangle and animal stamps; many others. Also includes fine collection 25 different British Colonies—Charkari, Jamaica, Johore, etc. and United States \$4 and \$5 high values. Total catalog price over \$4.00! Everything for only 5c to approval applicants! Mystic Stamp Company, Department 80-A, Camden, New York.

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UNUSED Book match covers, 100 all different. \$1.00. Free list. Charles Edelman, 1311C East 84, Cleveland, Ohio.

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SPEED-O-COPY Groundglass focusing attachment for Leica, Contax, Argus C-2 and C-3. Send for literature. D. Paul Shull, Dept. PM-2, 240 So. Union Ave., Los Angeles, California.

MAKE Money in photography. Learn quickly at home. Easy plan. Previous experience unnecessary. Common school education sufficient. Booklet and requirements free. American School of Photography, 1315 Michigan, Dept. 3431, Chicago.

BASS Says: War time proves Bass leadership. Amazing selection of finest still cameras—Leica, Contax, Korelle relex Argus, new and used still available. Write for quotations. Satisfaction guaranteed or your money refunded. Bass buys 'em, sells 'em, trades 'em. Bass Camera Company, Dept. AG, 179 W. Madison St., Chicago, Illinois.

HAVE You a camera? Send ten cents for recent number of our big magazine, showing how to make better pictures and earn money. American Photography, 116 Camera House, Boston, Mass.

CAMERA Repairing. Bellows made to order. Shutters repaired. Bellows made to fit all standard cameras! United Camera Co., Inc., A-1515 Belmont, Chicago.

CASH! Spot cash for cameras, lenses, binoculars, movie or still, sound projectors. Send full description by mail, or wire for prompt cash offer. Over 30 years of dependability insures honorable dealings. Bass Camera Company, 179 West Madison Street, Chicago, Illinois.

ALL Makes camera films, 100 ft. 16mm. \$2.00, 8mm, 25 ft. double \$1.25. Developing free. Also complete movie subjects available. Write for catalog. Star Safety Film, Film Center Building, New York.

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READY-TO-FRAME 6x4 Enlargements, 5c! Hand colored 20c—from your negative, 16 reprints your negative, 25c. Kodak roll developed with 16 guaranteed deckle-edge Velox prints 25c! 36 exposure 35mm. roll developed, vapo-rated, enlarged to 3x4, \$1.00. 3x4 reprints, 3c each. Immediate service! Free mailers! American Studios, Dept. 510, LaCrosse, Wis.

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REPRINTS 2c Each, 100—\$1.50. 6 or 8 exposure rolls developed 2 prints each exposure 25c. 36 exposure 35mm. rolls fine grain enlarged prints \$1.00. Mailing bags free. Mercury, A-109 North Dearborn, Chicago.

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FILMS Scientifically developed with 8 4x6 enlargements 30c. Send for price list and mailbag. Photo-Service, 107 Dewey St., Newark, N. J.

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MOVIE Library, 8mm., 16mm., 35mm. Religious, educational, sports, comedies, travel. Request catalogs. Cameras, projectors, buy, sell, exchange. Time payments. Mogulls, (Established 1914), 64 West 48th, New York.

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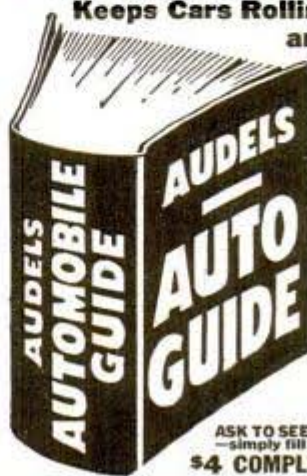
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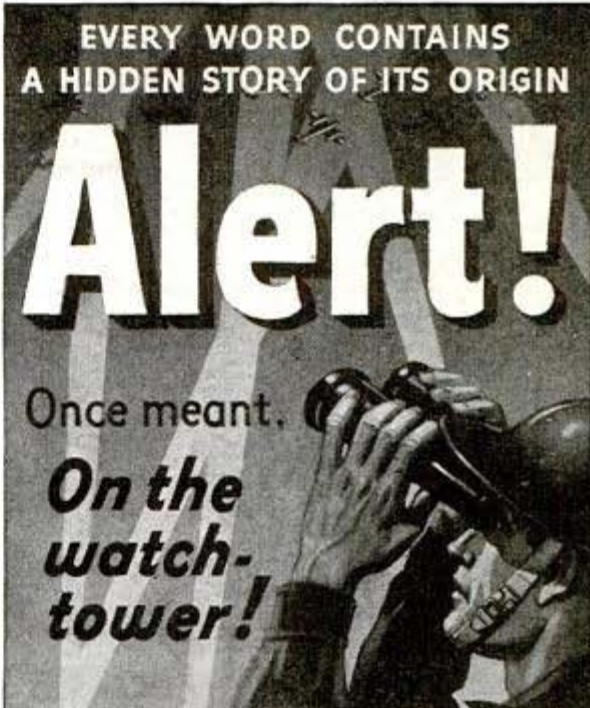
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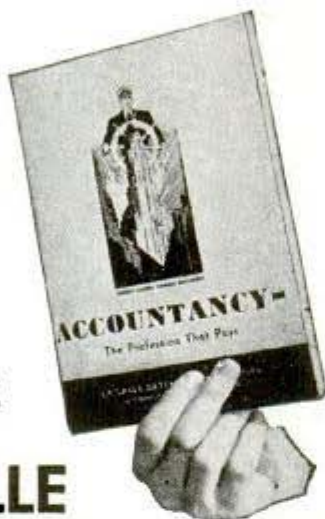
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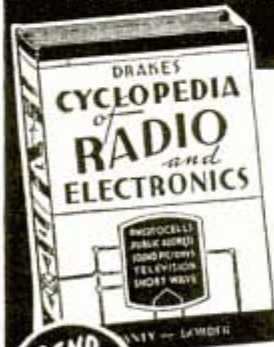
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Forget the Defense urgency—forget all the new finger printing jobs opened by the war emergency. Just look at the regular normal growth and expansion of the finger printing profession. In 1923 there were 393 Identification Bureaus in the United States, as stated above. In 1929 it grew to 604. At the end of 1929 there were 604. At the close of 1937 there were 979, and at the beginning of 1942 there were 1453 official Identification Bureaus in this country and—43% of these bureaus are run by graduates of the Institute of Applied Science. Yes, 43%—almost half! We believe this to be a world's record.

The Cost of Training is Extremely Low

It's not like learning many other things . . . no long years of study—no heavy expenses. Learning to become a finger print expert costs you very little—so little you'll wish you'd started

in this extremely important profession a long time ago. And you can get this training on the payment plan if you want to. Seize this chance—begin by mailing the coupon—get started—be through and ready in plenty of time to cash in on the opportunities in finger print work.



FREE BLUE BOOK OF CRIME

This book takes you right on the inside of Scientific Crime Detection, tells you about finger printing, firearms identification, police photography and explains just how many types of crime are cleared up. It will be sent to you entirely free of charge. The coupon below brings it.

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 1352, Chicago, Ill.

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 1352, Chicago

Gentlemen: Without any obligation on my part whatever, send me the Confidential Reports of Operator No. 38, also illustrated "Blue Book of Crime," complete list of 840 bureaus employing your graduates, together with your low prices and Easy Terms offer. (Literature will be sent ONLY to persons stating their age.)

Name

Address

Age

WONDERS OF AMERICA

Pilot's Pinwheel!



THIS QUEER MACHINE TESTS A FLYER'S ABILITY TO WITHSTAND HIGH-SPEED TWISTS, TURNS, AND DIVES. THE DEVICE WILL TURN UP TO 54 TIMES PER MINUTE



YOU'D HARDLY BELIEVE IT, JUDGE ROBBINS, BUT THOSE MEN WERE WHIRLING FASTER THAN THE BLADES OF A SMALL ELECTRIC FAN

REMINDS ME OF HOW I ONCE WENT AROUND IN CIRCLES LOOKING FOR THE RIGHT PIPE TOBACCO



SAME HERE. EXTRA-MILD, GOOD-TASTING PRINCE ALBERT FIXED THAT FOR US ALL RIGHT, EH, JUDGE?

PRINCE ALBERT IS THE **NO-BITE SMOKE** — SO MILD — EASY ON THE TONGUE

P.A. FOR **RICH TASTE, TOO** — IT'S BETTER TOBACCO

SEE HOW SMOOTH THE P.A. CRIMP CUT PACKS, DRAWS

IS THAT BOY LEARNING TO WALK A TIGHT-ROPE?

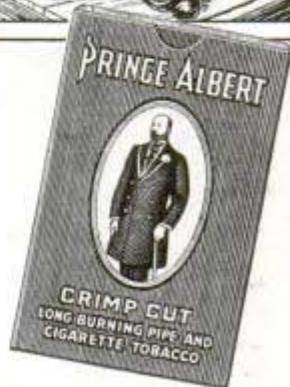


HE MIGHT AS WELL BE ON THAT SHAKY PLATFORM. HE'S TRYING TO KEEP A PIN-POINT IN A TINY HOLE WITHOUT TOUCHING THE SIDES. IT'S A TEST FOR SELF-CONTROL WHILE FLYING

PRINCE ALBERT STANDS WAY OUT IN THE PIPE-SMOKER'S TEST. IT'S THE MOST COMPLETE ENJOYMENT OF PIPE-SMOKING THAT I KNOW

THAT GOES FOR P.A. IN ROLL-YOUR-OWNS, TOO. THERE'S NO EQUAL TO ITS SMOOTH MILDNESS AND GOOD, RICH TASTE

50
PIPEFULS
OF FRAGRANT
TOBACCO
IN EVERY
HANDY POCKET
PACKAGE OF
PRINCE ALBERT



PRINCE ALBERT

Con: Allen Warren Elliott
7 Park Ave, NYC.

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 79

FEBRUARY, 1943

No. 2

NEW MAGIC From TEST TUBES

IF YOU have ever watched a magician working his miracles on the stage, you can better understand what is happening in the world today.

The magician excites you with his actions and talk and attracts your attention to one hand while his other hand works apparently impossible feats.

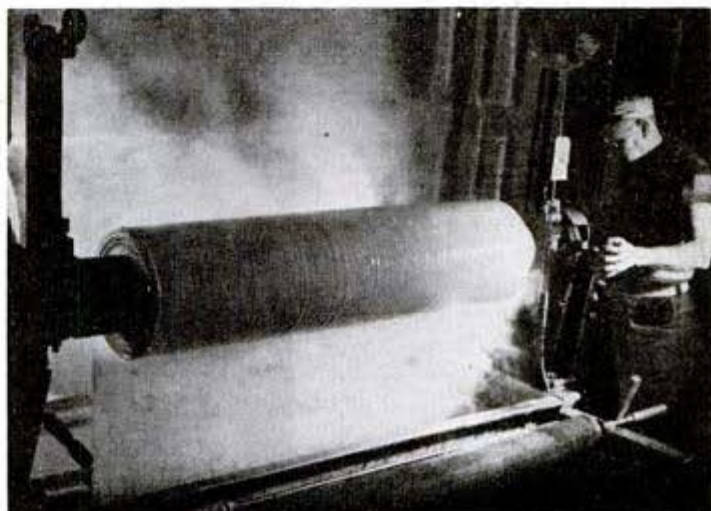
The war is like the magician. Our attention is attracted on one hand by battles, shortages, rationing, taxes. Meanwhile the other hand—which is chemistry—is preparing new magic from test tubes which will probably astound all of us before we are much older.

Many of the wartime chemical developments are so far-reaching that eminent scientists state we will hardly recognize our civilization as soon as peace lifts the lid off the boiling cauldron of chemical discovery.

One foremost scientist, Dr. Charles M. A. Stine, a vice president of the DuPont Com-



Airplane tires of DuPont rayon cord, above, are 20 pounds lighter. Below, manufacturing a tough, lacquer-covered fabric

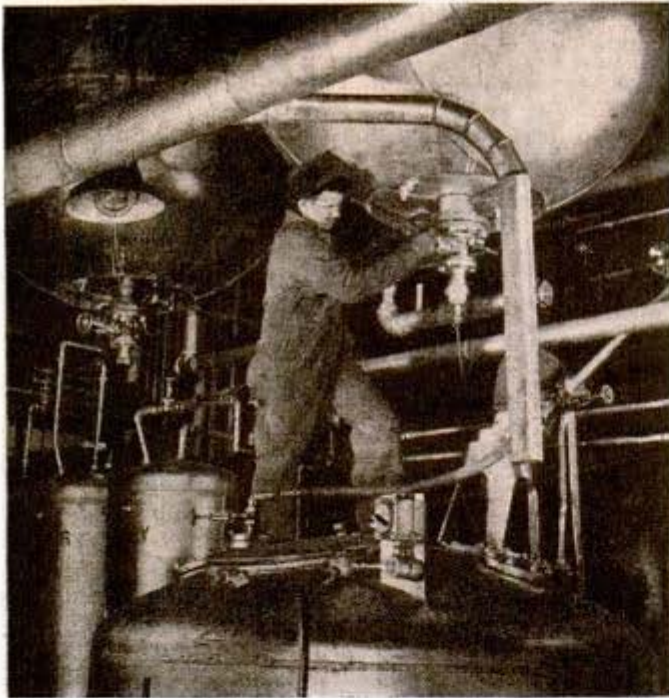


"Fabrikoid" - DuPont 1

FEBRUARY, 1943

Иллюстрация: записанный авторские права

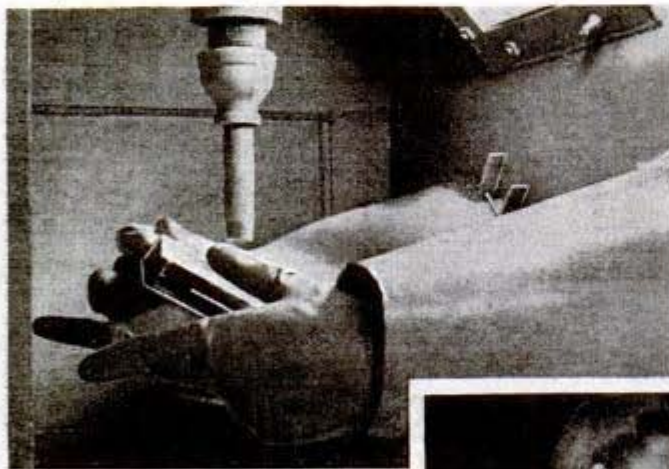
cordura rayon



OEM photo

Standing on a "blow down" tank in a Goodrich synthetic rubber plant, a worker taps latex from the blending tank above

Aaron D.



Resistoflex

Plastic rubber sheets protect a worker's arms (left) from sand blast in war plant

Installed with stapler (inset), window panes of wire screening sandwiched between cellulose acetate will withstand blast of 150-pound bomb exploding eight feet away

Monsanto Chemical Co.

"Vnelite"

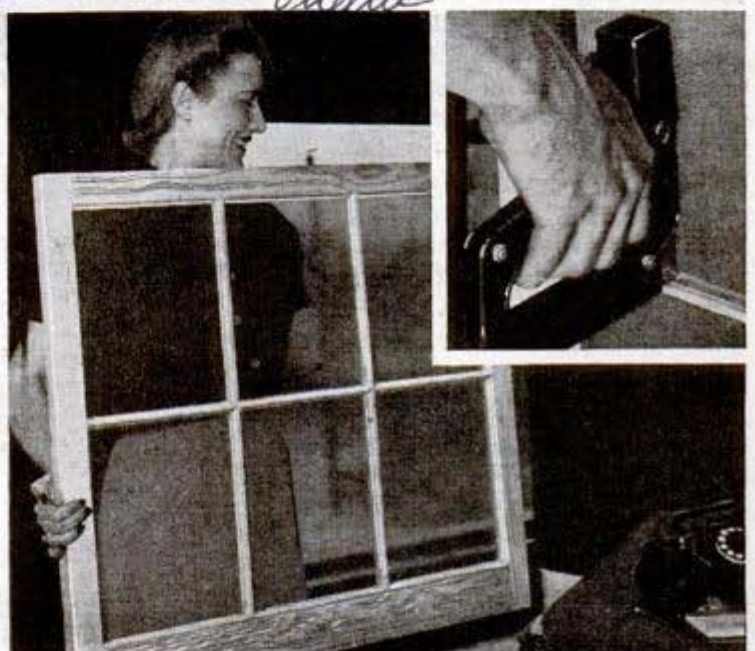
pany, asserts our automobiles have aged technically at least 20 years in the past few months because of what has been learned in the first year of war. Post-war cars will have sealed cooling systems developed for war planes. Research in metals will cut automobile weights in half. New fuels will give 50 miles to the gallon.

The high-pressure synthesis of ammonia, he says, has made the manufactured fertilizing chemicals so plentiful that agriculture will be

completely revolutionized. Using the new building blocks developed only recently from air, coal and water, we will have glass which won't break, but will float; wood that won't burn, and plastics stronger than metals; shoes without leather; window screens without wire; machinery bearings minus metal.

New methods of aluminum processing have raised production to seven times the output which it took 50 years of research to reach. Petroleum processing has made every motor in existence out of date and fuels have exceeded our octane scale in power rating. Magnesium, a lightweight metal extracted from sea water, has climbed out of the curiosity class and our capacity for producing it is double our aluminum output for 1939.

The production of rubber substitutes from petroleum, alcohol, coal and limestone may reasonably wipe out the rubber tree as an important economic factor. New type houses will be painted with strange paints. New fabrics will produce



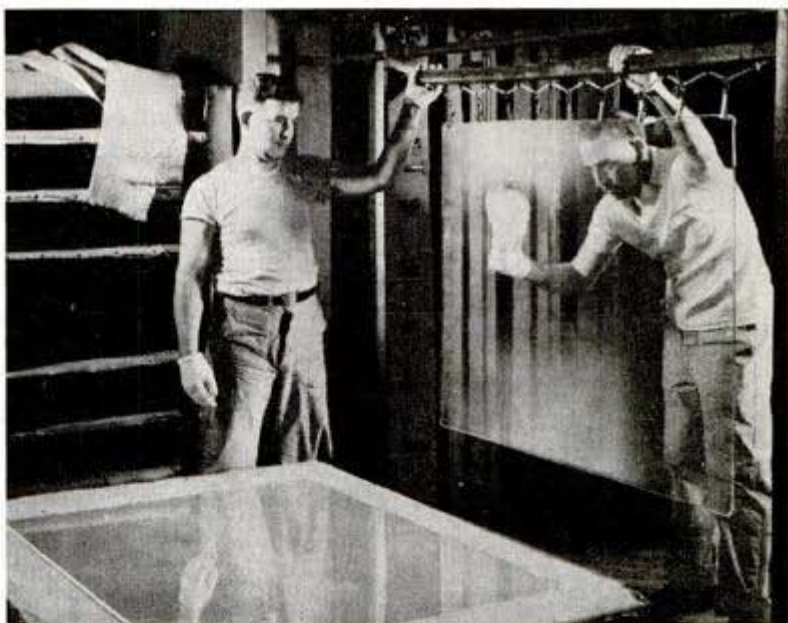
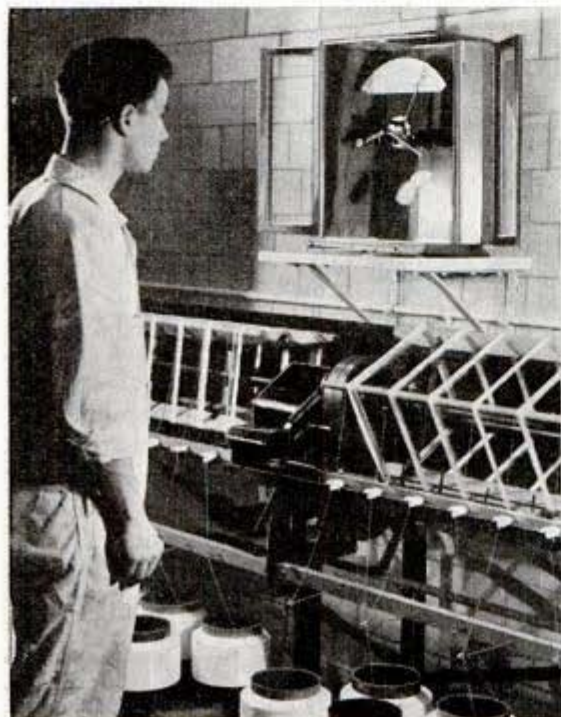
clothing that cannot be imagined now.

Other chemists see steel's future principal use as cutting and wearing edges with newly developed lighter metals replacing it in trains that ride as if on air and bridges and houses of comparative feather weight. Blankets of fluffy glass and inexpensive furniture of plastics are predicted.

Though many current developments are reserved for war use and are secrets, it is no secret that the rapid development of plastics has already brought the number of successful ones beyond the 1,500-mark, each plastic having some advantage over the other and over pre-war materials. Shoes, aprons, capes, heel pads, jackets, umbrellas, shower curtains, key chains, garment bags, bathroom fixtures, faucets, and hundreds of familiar objects are being made with plastics for the first time.

Proof of the future is already mirrored in the present miracles produced by chem-

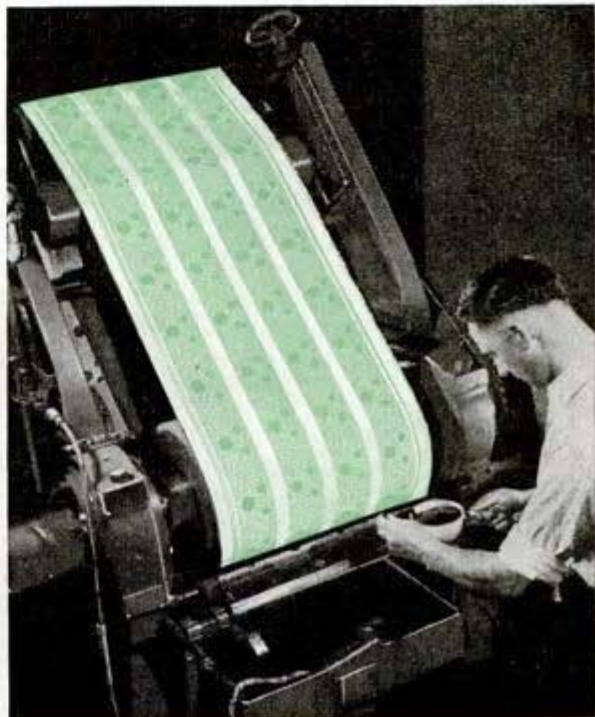
Nylon yarn must be of uniform weight, and is weighed by sample on a glass-enclosed precision scale

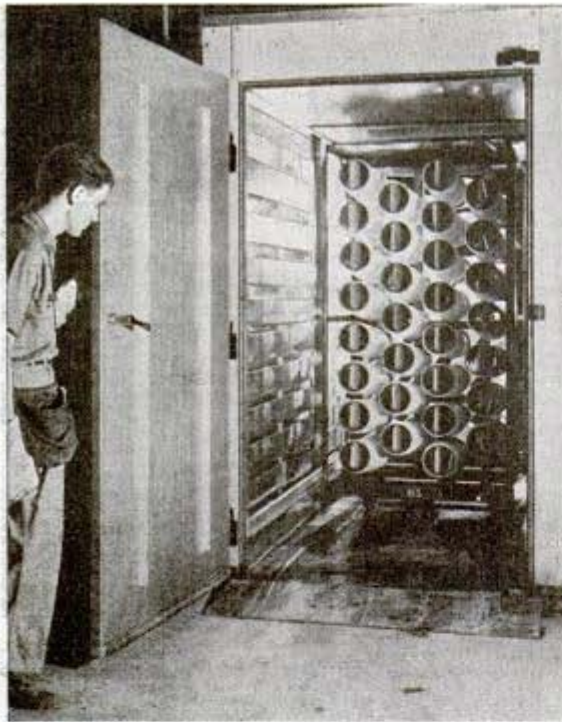


DuPont's Lucite, a plastic made under 5 tons per square inch pressure, has gone to war in transparent aircraft turrets and cockpit enclosures

istry. Du Pont scientists estimate that a bridge of ships spanning the Atlantic Ocean, spaced about a mile apart, would be required to bring to America only five of the many vital war products which have been produced synthetically since the last war. These are rubber for transportation, dyestuffs for uniforms and camouflage, fibers for parachutes, powder bags and many industrial uses, camphor, for medi-

In a dye laboratory a printing machine which prints only for test purposes, runs off a roll of wallpaper





Baking nylon yarn to set the twists before winding it for test, inspection and shipment to war industry

cine and chemical uses, and nitrates for explosives and fertilizers. The chemical manufacture of nitrogen alone has saved for other purposes the cargo capacity of more ships than the Axis powers have sunk during the war.

Some idea of the importance of nitrogen, which is obtained from the air, may be gathered from the fact that every 600-pound bomb requires 85 pounds of it and a 24-foot torpedo would be just a hunk of steel without 100 pounds of nitrogen. A

16-inch gun shoots 120 pounds of nitrogen at the enemy.

Many of our chemical discoveries which had commonplace uses in peacetime have gone to war, just as many wartime discoveries will be converted to peaceful uses later on.

Ammonia, which the housewife used to clean windows, woodwork and tile, now has at least 2,000 industrial uses connected with the war. It is an ingredient in explosives, hardens metals for tanks, planes and guns, helps make nylon, can be turned into fertilizers, is useful in the manufacture of plastics which are made into noses, gun turrets, navigation blisters and other transparent sections of war planes.

This chemical helps in refining petroleum products by neutralizing acids harmful to stills, increases the sterilizing effect of chlorine in drinking water, is an important part of a combination of chemicals used for fireproofing, acts to form the bubbles in sponge rubber, and is important in the manufacture of dyes, among other things.

Other familiar products of chemistry have joined the fight. A colloid treated fabric, Celastic, used in peacetime to give strength and resiliency to box toes of shoes, now serves to speed military production by making possible quick and easy repairs and changes in patterns for metal castings. Looking like a piece of cotton blanket, the fabric can be moistened, shaped and on drying will harden in any desired form.

The cellulose hood which protected your milk bottle in peacetime is now serving as a cover for the open ends of fuel and hydraulic lines and other pipes and tubes during assembly and shipping, replacing plugs. Made of a wood base, this plastic cap is painted bright red so it cannot be overlooked in assembly operations. It also serves as a seal to warn of tampering if broken. Placed on wet, it dries and shrinks tightly in a few minutes.

The fluid your neighborhood dry cleaner used to take spots out of a vest has been improved for war use and is applied in huge quantities to degrease metal parts, from hair-size radio tube fila-

(Continued to page 181)

Transparent plastic gloves, resistant to oils and solvents, are made of this elastic, synthetic resin—a rubber substitute



POPULAR MECHANICS

Resistoflex

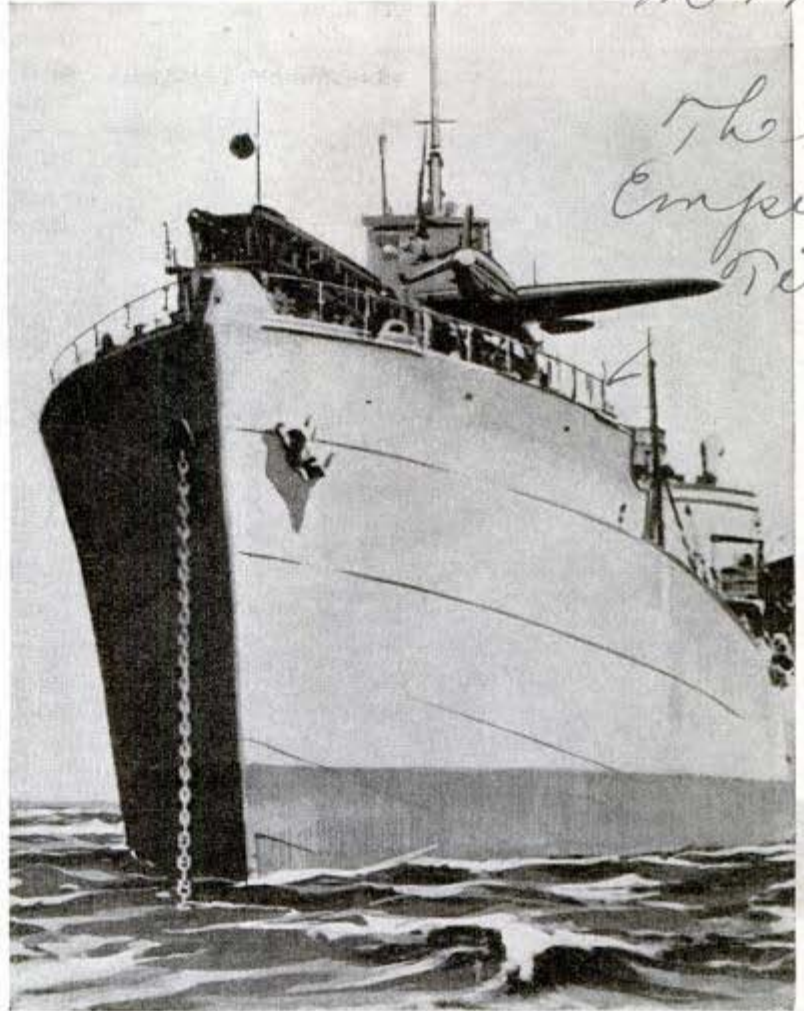
Wright drank water

*Some Newspictures, Inc.
461-8 av NYC.*

Cargo Ship Launches Fighters From Catapult

m 971

British convoys are protected from enemy bombers far out at sea by fighter planes catapulted from the decks of cargo vessels. After shooting down one or more of the bombers and breaking up an attack, the fighter pilot bails out and is picked up by one of the escort ships. The plane is lost, but every lost fighter generally has cost the enemy two or more bombers. In the United States, some freighters have been converted to auxiliary aircraft carriers for use on convoy duty.



The Empire Tide

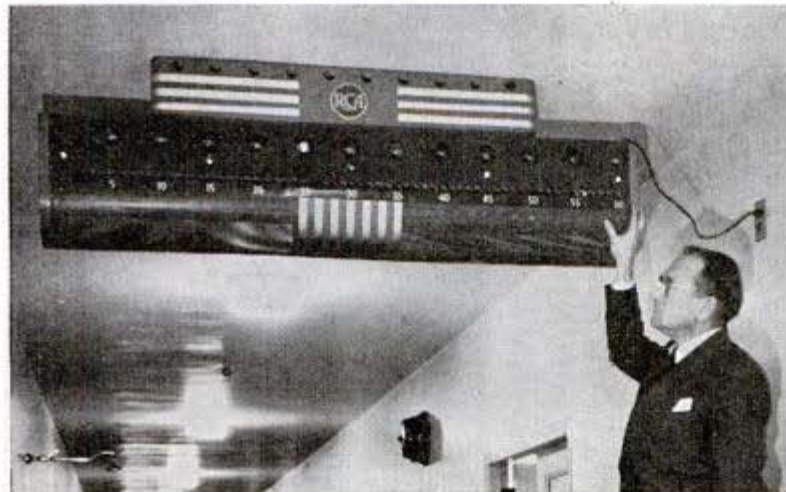
This British merchantman carries deadly surprise for enemy bombers attacking ships in convoy. Fighter planes are launched from catapult on deck. After driving off foe, pilots bail out and are rescued. Fighter craft are not recovered

Electronic Clock Without Motor Tells Time by Lights

m 1038

Having no moving parts—no motors, wheels, mainspring or hands—an electronic clock installed in the new RCA laboratories

in Princeton, N. J., indicates time by lights. The timepiece, containing more than 170 electronic tubes, plugs into an electric outlet



and the 60-cycle current provides pulsations for flashing lights on and off to show the time in terms of seconds, minutes and hours. Scientists who have examined it believe it may form the basis for household clocks of the future.

30 Rochester Pk. N.Y. 10024

Lights going on and off across electronic clock "tick off" the seconds

☐ Strawless "straw hats" for 1943 that look like straw, feel like straw and will not collapse in the first summer rain, are being woven of cotton.

FEBRUARY, 1943

*Dr. V.K. Zworykin
Asst. Dir. Res.* *Frank Lee Co
Danbury, Conn.*

Dummy Cockpit of Sinking Plane Teaches Pilot to Escape



Cadet learning to escape from an airplane after crash in sea

Pilots are trained to escape from a sinking airplane with a dummy cockpit developed at Sand Point Naval Air Station near Seattle. First, the cockpit is suspended in a pool by ropes while the pilot, wearing flying suit and parachute, straps himself in. At a signal, the "fuselage" is allowed to sink. The pilot unsnaps the safety belt, pushes himself clear and swims away.

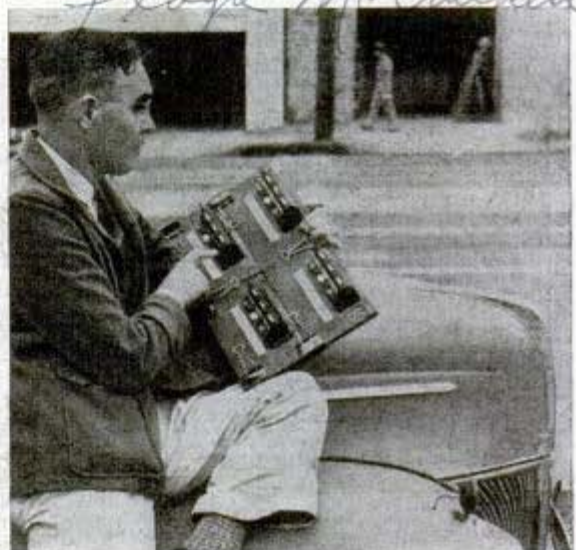
Ten Ways to Stretch Your Gas Listed by Auto Experts

Gasoline rations can be stretched as much as 50 percent, according to the War Engineering Board of the Society of Automotive Engineers, if the motorist will follow a 10-point system of correct and careful driving. Not only gasoline, but undue wear and tear on tires, brakes and mechanism will be saved by a scrupulous adherence to the rules. Here they are: (1) Drive at moderate speeds, 30 miles per hour being suggested; (2) accelerate moderately; (3) use brakes only when necessary; (4) avoid idling engine unnecessarily, "racing" the motor, "pumping" the accelerator

and excessive use of choke; (5) use lightest lubricants recommended for engine, transmission and differential; (6) keep chassis and parts well lubricated; (7) keep ignition system, carburetor and air-cleaner clean and in good condition; (8) keep motor properly tuned, brakes adjusted and wheels aligned; (9) keep cooling system thermostat at proper setting, and (10) keep tires inflated to five pounds above specified pressures.

Counters Tally Riders In Passing Cars

Passenger loads in passing automobiles are counted easily by four ordinary three-key traffic counters mounted on a board. One such counter is sufficient to tally the number of cars, and if desired the operator may keep track of three different types of vehicles. For taking a record of passengers, the four counters provide a total of 12 tabulating keys, which are numbered consecutively from one to 12. The operator simply notes the number of passengers in a car and punches the key bearing the corresponding number. At the close of the test period the total shown for each key is multiplied by the number of the key to obtain the total persons carried by cars in each group.

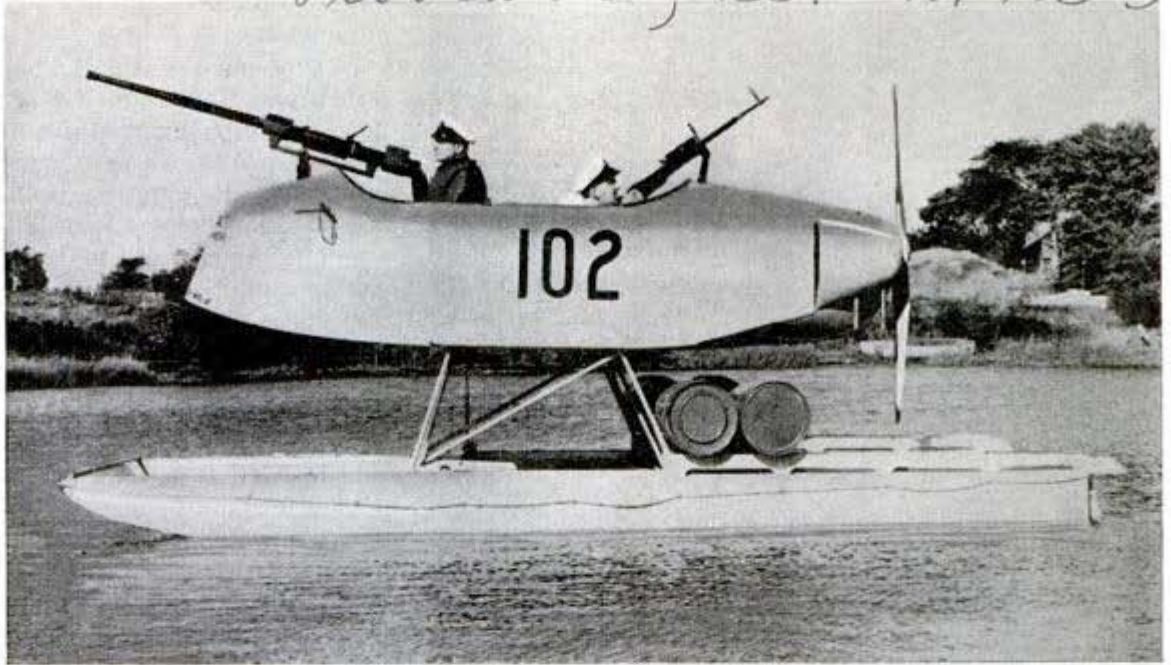


Four three-key counters make 12 separate records

City specialist Douglas Jackson

29th 39 2021 nyc

Ino. Antoine Dazha, Dazha
Eng., 1712 Industrial Trust Bldg
"Noiseless" Sea Skimmer to Battle Submarines
Providence, R.I. m 1053

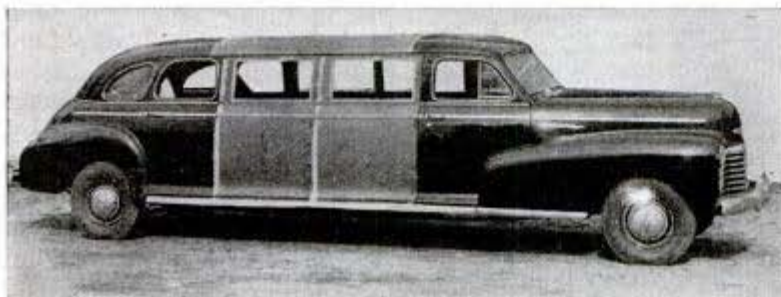
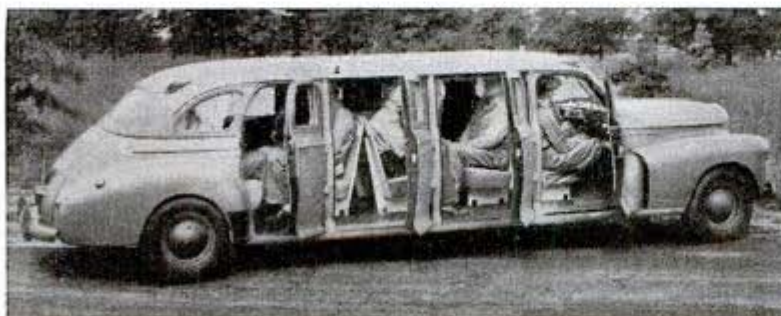


"Sea skimmer," armed with guns and depth bombs, can stalk subs without fear of detection by sound

Gliding swiftly over water, the "sea skimmer," designed to fight submarines, does not transmit telltale noises through the water since it is driven by an air propeller instead of water screw. Manned by a crew of two and reaching a claimed speed of 50 miles an hour, the sub-chaser carries a 20-millimeter Oerlikon cannon, a machine

gun and four depth charges. The latter may be replaced by torpedoes. It is said the hydroglider handles easily in rough seas, and it can be hoisted aboard a vessel as easily as a lifeboat. Except for engine and propeller, the craft is built of non-strategic materials, and could be made by the thousands in mass production.

Sedan Is Cut in Two and Rebuilt to Carry 15 Passengers



m 1059
 Capacity of a four-door passenger sedan was tripled by cutting the car in two and inserting a six-foot extension in order to carry workers to war plants. Three additional seats are made of plywood and most materials in the extension, including white ash and tempered Masonite, are non-critical. The converted sedan requires oversized tires and either replaced or strengthened front and rear springs.

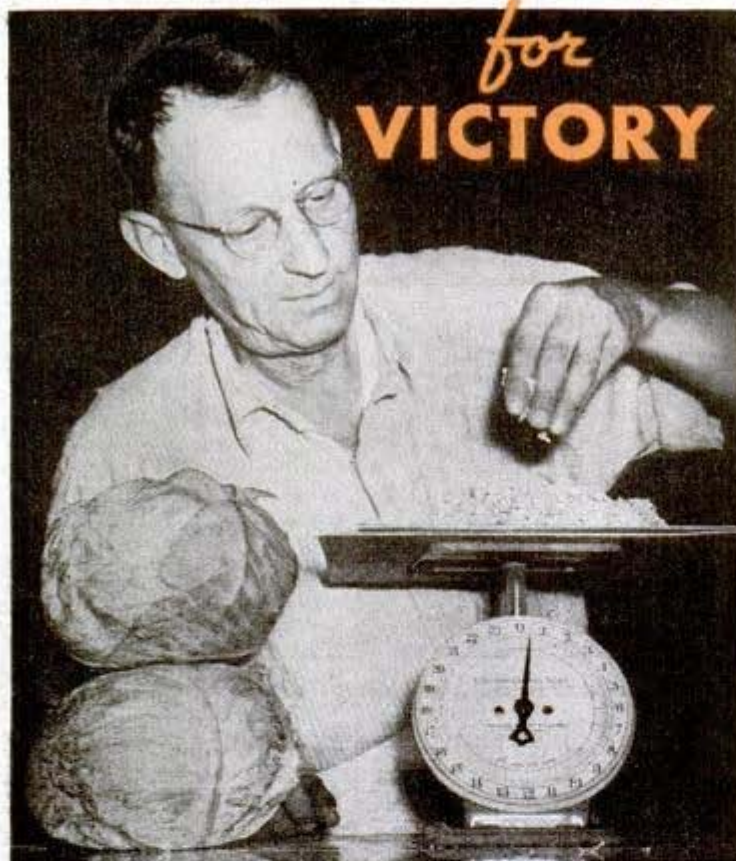
Top, rebuilt sedan with additional seats; lower view shows the extension

Of the passenger cars used on farms, 30 percent are 10 or more years old.

FEBRUARY, 1943 *Fitzgibbon Coach Co*
Muskegon, Mich

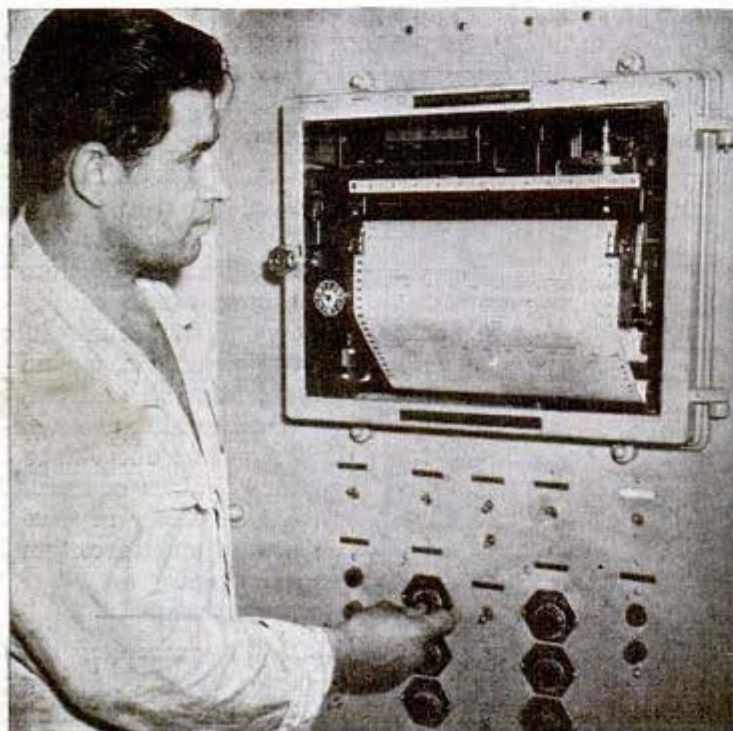
Thos E Stimson Jr 3872
Franklin Ave Los Angeles Calif

"MUMMY" FOODS



Five pounds of cabbage (left) are dehydrated into a handful of chips of equal food value but weighing under a half pound

Heat and humidity must be carefully controlled, temperatures being lowered gradually as the vegetables become dehydrated



A HEARTY meal, in its latest form, takes up no more room than a package of cigarettes.

Out of such a small container you might get a large bowl of soup, big helpings of mashed potatoes and hamburger steak, and plenty of beets and carrots. Just add water to the package of dried, compressed food chips and you have the makings of a tasty, full sized meal. You might even have a slice of dehydrated fruit candy bar for dessert.

Dehydrated dinners aren't put up in handy packages yet but it's only a question of time. All the ingredients are being made.

American housewives buy dehydrated soups at the rate of about 100,000,000 packages a year. American soldiers eat scrambled eggs made from dehydrated powder, a five-ounce package equal to a dozen eggs. A five-gallon can of tomatoes swells to a quarter of a ton when water is added. Soldiers eat corn that gains four times its dehydrated weight when water is added.

Londoners are eating meat loaves and stews that crossed the Atlantic as tiny shreds of dried meat. Milk, butter, citrus juices, as well as potatoes, peas, spinach, and a host of other vegetables are dehydrated to conserve shipping space. Dehydration plants are producing millions of tons of dried vegetables and other foods per year, mostly for shipment abroad. One ship loaded with dehydrated food can carry upwards of a dozen times more food than a ship loaded with bulk. The chances are, if the war lasts a long time, that increasing numbers of dehydrated foods will take the places of canned foods on the shelves of American grocery stores.

Ref. office of Director College of Agriculture, U. of Calif., Berkeley, Cal.

Inspector wearing a dust mask sorts a handful of dried chips that were a bucket of tomatoes



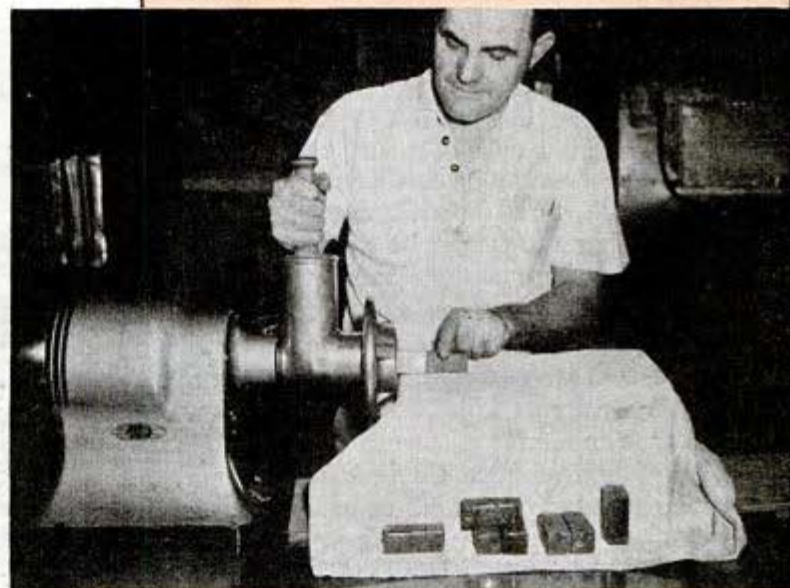
Food is bulky because it is mostly water. Dehydration removes most of the water content, transforming such a food as sliced carrots into small dried shavings that resemble wood chips. Soak these chips in water several hours and they swell to their original size and appearance.

What do "rehydrated" foods taste like? Generally speaking, they compare pretty well with food preserved by canning or freezing. Some of the flavor and aroma of the original fresh product may be missing but the taste is essentially the same. Vegetables properly dehydrated retain their mineral values as well as much of their vitamin content.

Dehydrated rations were shipped to France during the first World War but complaints came back that the foods were tough and unpalatable and didn't keep well. Since then the Department of Agriculture, universities, and commercial dehydration concerns have studied the process and corrected these objections. Test meals prepared from dehydrated foods have been served to groups that accepted them without question.

At a commercial dehydration plant, truckloads of vegetables fresh from the field are first washed and then trimmed by a crew of girls who remove all tough stalks and injured parts. An endless belt then carries the vegetables to a chopper that slices or shreds the food into small pieces. These are spread over trays and wheeled into a steam room for a blanching

Forming bars of dried fruit mixture. Each bar provides a full meal as emergency army ration



Vegetable	Types	Preparation	Steam Blanch
Cabbage	Savoy, Danish, No krauts	Shred into 1/2-inch wide strips	Until ribs are translucent, 3 to 4 minutes
Carrots	Highly colored such as Morse Bunching	Slice or cube	Same as above
Greens	Spinach, kale, chard, beet tops, mustard greens	Whole leaves. Remove heavy mid-rib of chard	2 to 4 minutes
Onions	Strong types such as Ebenezer, White Portugal, or Red or White Creole	Slice 1/2-inch thick	None
Rutabagas	Amer, Purple Top, Bangholm, Early Neckless	Slice or cube	4 minutes
Beets	Dark red types such as Detroit Red	Slice or cube	Steam cook 30 to 40 minutes, then peel and slice or cube
Sweet Potatoes	Most types	Slice or cube, then wash thoroughly in cold water	Until translucent, about 6 minutes. Use wood or non-metallic trays throughout
White Potatoes	Mealy types such as Idaho Russet	Slice or cube, then wash thoroughly in cold water	Until translucent, about 3 minutes
White Potatoes (Precooked)	Same as above	Rice into small pieces	Steam cook until soft, then rice for drying

The chart above reveals the varying treatments given some of our common vegetables in dehydrating



Rats are used to learn effect of dehydration on meat's growth-promoting value

U. S. Department of Agriculture photo

a press, further reducing their volume. Experimentally, dried foods are being packaged under vacuum in Pliofilm and paper containers.

An experimental emergency ration being tried out by the army consists of a small bar similar to a candy bar, composed of dehydrated fruits and other dried ingredients. Each bar is the equivalent of a full meal. It may be eaten with no preparation and the soldier is not even thirsty when he finishes.

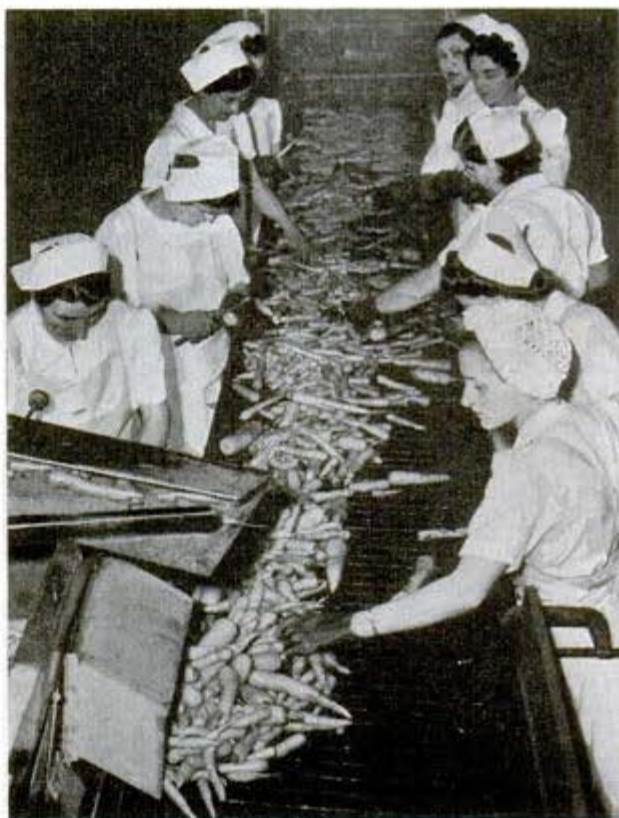
Another use for dehydrated foods is in the compounding of concentrates, rich in vitamins and minerals, for use as dietary supplements. Anabolic Food Products, Inc., of Glendale, Calif., grow certain vegetables in soil that has been enriched with desired minerals, then dehydrate the matured vegetables and grind them into

process that seals in the flavor and color. After a few minutes of this precooking the trays are wheeled into the dehydration chamber where a controlled flow of hot air removes nearly all the moisture. Sliced carrots are changed into tiny dried chips. The final step is to pour the chips into five-gallon tins, forcing carbon dioxide gas into the tins to remove the oxygen of the atmosphere before sealing. Dehydrated foods prepared and stored this way will keep for years.

Right now most foods must be shredded or minced into small pieces for proper dehydration. One avenue of research is directed toward drying larger units so that cuts of meat such as steaks and roasts can be dehydrated. Most foods, too, must be dehydrated while raw. Then they must be soaked for several hours to restore them to their full volume before they are cooked. Research is being carried on to find the best way to precook them before dehydration. This would reduce the time needed to prepare a meal from dehydrated foods. Some dried foods are squeezed into small cakes in

powder, to be placed in capsules together with other ingredients.

There is no reason why you shouldn't dehydrate your own vegetables if you wish.



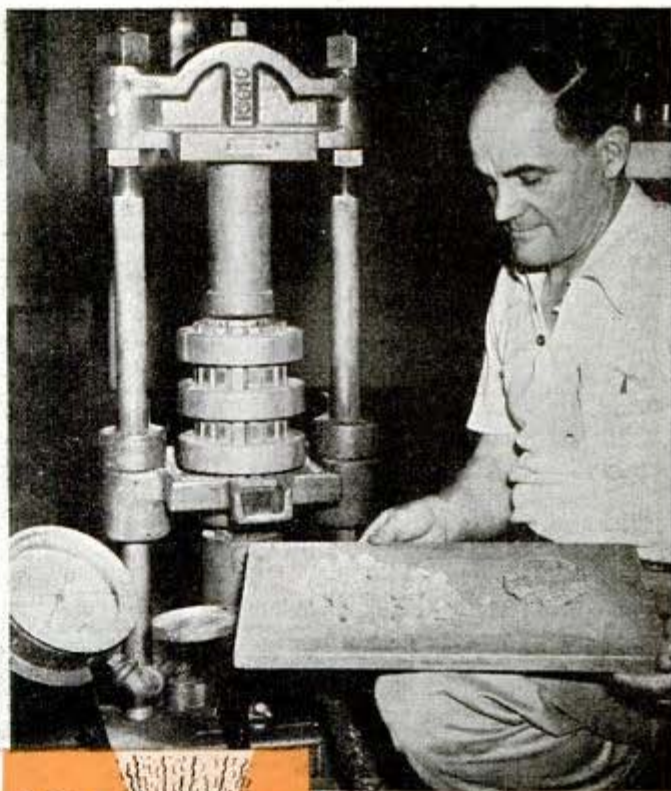
Washing, sorting and trimming carrots, first steps in a California vegetable-drying plant

It is even possible to dry fruits and vegetables in the oven of a stove, provided the door is left partly open for circulation. The temperature must not be allowed to rise above 140 degrees.

Better results are obtained by using a wooden cabinet-type dryer that you can build yourself, with an oil stove for the heating unit. Such a cabinet may be 8 or 10 feet high and 1½ by 2 feet in cross section. The walls are plywood, with a door in front. The food is spread on trays racked inside the cabinet. Each tray consists of a lath frame with a galvanized iron screen bottom, over which is spread a piece of cheesecloth. The trays are shorter than the runways, so they may be staggered, one against the back, the next against the front, and so on. This leaves an open, circuitous air channel for the ascending hot air. The bottom of the dehydrator, above the oil stove, is left open but has a "heat spreader" in the form of a square metal plate suspended above the heater. This spreads the hot air so that it ascends evenly. The top of the dryer is left partly open, having a three-inch-wide ventilation hole running across the top to allow vapor from the vegetables to escape.

(Continued to page 171)

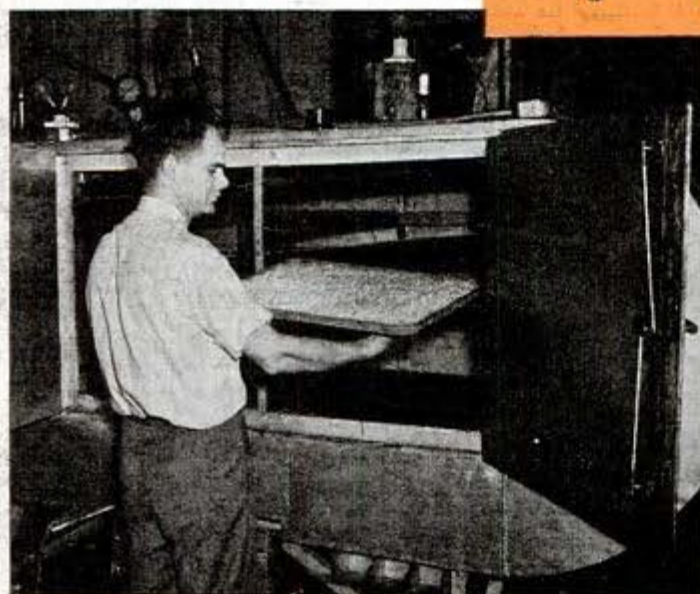
Placing a tray of corn in test dehydrator



↑
Double handful of dried carrots at left of board comes out of press as small compact cake seen at right

←
Drawing illustrates a natural-draft evaporator for home drying of vegetables or fruits in any climate

↓
Baffles seen in the end of the commercial dehydrator, below, are used to control the flow of the warm air



Acme Newspictures Inc
461 - 8 av, nyc.

Replica of Nazi Aerial "Block Buster" Stands Sixteen Feet High



Taking measure of model of big Nazi bomb weighing about 5,500 pounds

"Max" is the biggest member of a family of Nazi bombs reproduced by Columbia Studios and placed on exhibition in Los Angeles by the Civilian Defense organization. The bombs range in size from 50 to 2,500 kilograms, the latter equalling about 2 $\frac{3}{4}$ tons. This huge bomb, 16 feet high and 12 feet around, can demolish six square blocks.

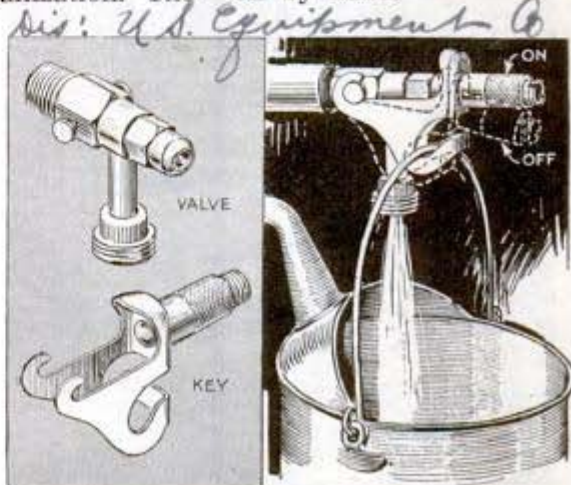
Nylon Bristles for Paintbrush Wear Three Times Longer

Synthetic bristles of tapered nylon have been developed with the resiliency and toughness of the natural product, and they wear three times as long. The bristles can be cleaned with ordinary paint cleaners and will not deteriorate in storage. Development of this synthetic product—the goal of chemists for many years—was accom-

plished in the laboratories of the Du Pont Company. Tapering of the bristle is achieved by pulling a nylon filament from a special spinning device at a controlled speed, the size of the bristle varying with the speed of pulling.

Pail on Tap Hook Shuts Off Water When Filled

At filling stations where full water buckets are kept on hand for replenishing radiators, an automatic valve that may be attached to any water faucet can save time of attendants. It is not necessary to stand around and watch a bucket being filled, because the increased weight will close the valve when the bucket is nearly full. The attendant simply hangs the empty bucket on the hook and goes about his other duties. The automatic faucet is adjustable for small and large containers, and it does not interfere with ordinary uses of the outlet such as attaching hose and filling other containers, since the faucet may be turned on and off by hand.



Full bucket pulls key downward to shut off faucet

Ed DuPont de Nemours Co
Wilmington, Del.

POPULAR MECHANICS
2634 S. Michigan
Chicago, Ill.

*Acme Newspictures Inc.
461-8 av, nyc.*

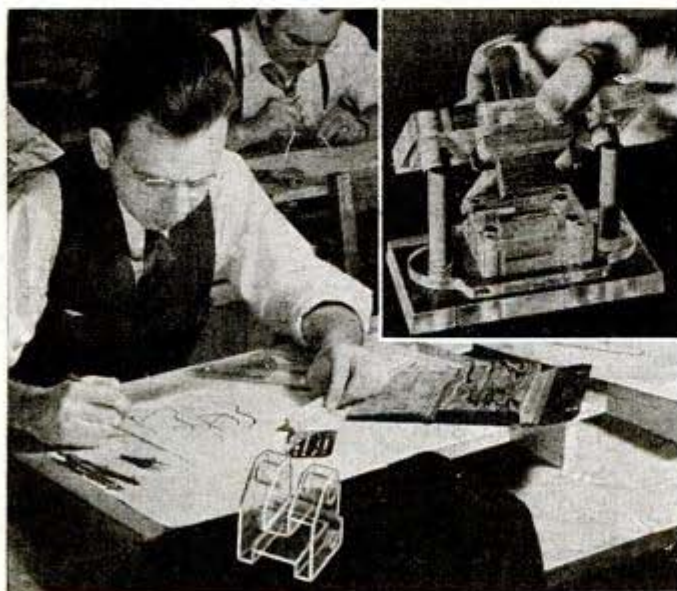
Four-in-One Antiaircraft Gun Focuses Its Fire

Four streams of bullets from multiple gun mountings will present a hot reception to any Jap planes attacking Australia's east coast. This quartet of Lewis machine guns, devised by the artificer of an antiaircraft battery, has its four barrels fixed at an angle that will produce a concentration of fire at a predetermined point. A touch of the master trigger flings four lanes of simultaneous gunfire spelling death to an enemy raider within range.

Four streams of bullets from multiple antiaircraft gun converge upon an enemy plane



Phantom Models Speed Training in Tool-Design Course



Students can literally "see through" complex problems in tool design with models made of transparent plastic. Training men for war production jobs is cut to a minimum of time with these models which reveal details of complicated shapes and mechanism. In die design, for example, models show the working of every hidden part during a stamping operation. Models made under the sponsorship of the extension service of Pennsylvania State College are being distributed to training centers of the U. S. Office of Education.

State College, Pa.
Using plastic model to speed tool design; inset, model of die

Breakdown of Lubricating Oil in Engines Traced to Tiny Particles

Blame for the breakdown of lubricating oil has been fixed on the heated metal of the engine, unburned gasoline and oxidation products of the oil itself, but R. G. Larsen and F. A. Armfield of the Shell Development Company, now point out as the real culprit the tiny black particles that flow in all long-used oil. These originate in many ways, since they consist of micro-

scopic bits of metal worn off the engine parts, dust from the air, and especially the chlorides of iron and bromine which arise from the use of leaded gasoline. The black particles act as catalysts, aiding the oil to contract an undesirable union with oxygen followed by deterioration. The experiments of the two men pointed to the importance of a good filter.

Allen Warren Elliott 7 Park Ave
n.y.c.
TRICKS for TROOPS
m. 1029

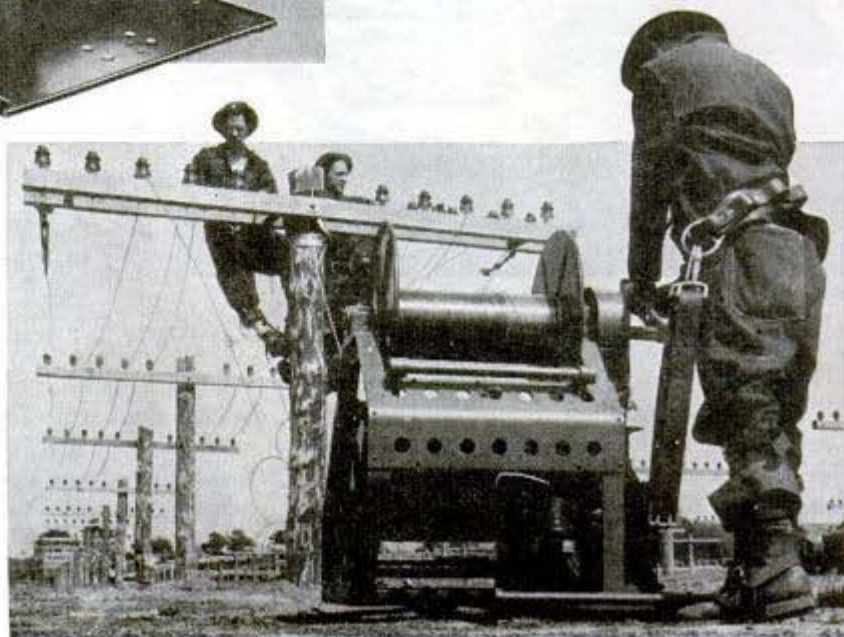


It is no military secret that U. S. inventors have gone "all out" for the armed forces. Below, folding mess kit of aluminum opens to form two dishes



Gasoline-driven drill (right) is intended for service in bombed cities where electric power has been disrupted. Left, desk-in-trunk for officers in the field is a big help

Something wrong with the perspective here? No, it's just the telephone poles which have been sawed off, giving an odd effect. The men on the poles are being trained as communication experts by the U. S. Army Signal Corps. The machine in foreground is for wire stringing. Many lives are saved during training with the short poles, for fall from the top is only a few feet. In every branch of military service experts are constantly on the alert to guard against injury to the men now being trained



Russell Peck, Red Cross
field officer

Rubber "overalls" (below) are slipped over sailor's regular clothes when order comes to abandon ship. Suit has a "built-in" flashlight; soles of the shoes are weighted to keep wearer upright

made by
B. F. Goodrich



This specially designed desk is used by the Red Cross in field. It is collapsible, can be set up in a jiffy and weighs only 15 pounds. It holds typewriter

Patricia Hartnett



U. S. Rubber Co

The double-tube life belt above is so light it can be worn on duty about ship. It is inflated by squeezing tubes together which releases buoyant gas. Left, demonstrating how army's new folding wood chair can "take it." Formerly these chairs were made out of steel



*Acme Newspictures, Inc.
46 - 8 av, NYC.*

Bomber Crew "Bails Out" on Land for Practice

m1081

Should the crew of a Royal Air Force bomber be forced to "bail out" on the sea, they will know what to do even if it is their first experience. Practice for the maneuver of launching a rubber boat from a bomber begins on dry land, and after they learn all the motions the crew members continue the training on water in order to reduce the chance of mishap after the unlucky ones are forced down.

British bomber crew in rubber boat in the sand practice the art of launching a life raft so they will make no fatal errors when it may be their turn to "bail out" into the open water

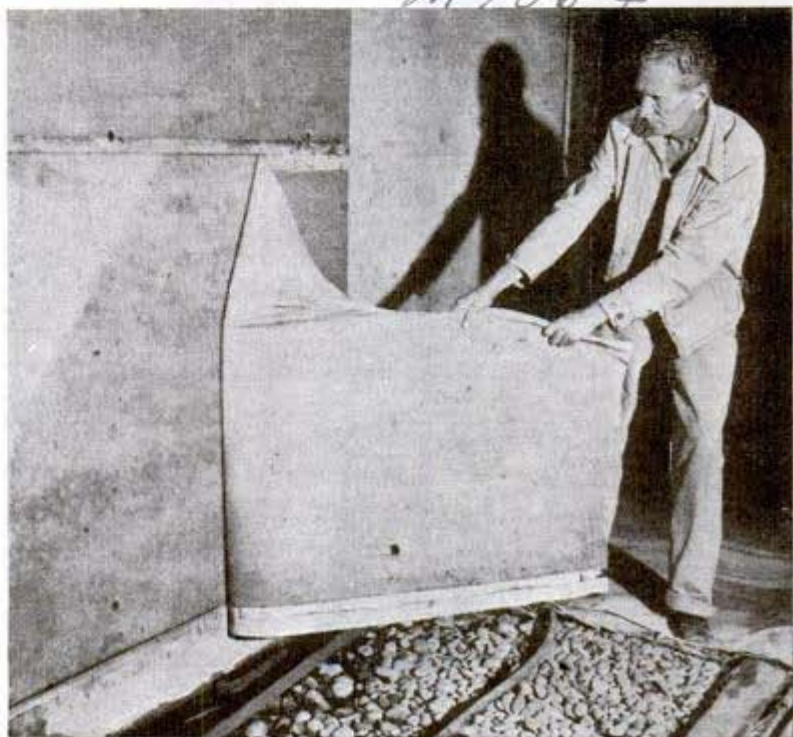


Whitley bomber

Concrete Made Weatherproof by Absorbent-Lined Form

m1064

Water and air bubbles are removed from the surface of concrete by lining the forms with an absorbent material which is peeled off, leaving a smooth weather-resistant finish. The lining strengthens the concrete and eliminates brushing and scraping. It is made of special material faced with fabric and is stapled easily to wood forms. In tests, samples of concrete made with the form linings withstood a bombardment with sharp steel grit, while other samples which had been cast with ordinary wood forms wore away rapidly, some of them as much as one quarter of an inch in one minute.



Peeling off absorbent lining which leaves smooth weatherproof surface

designed by E. B. Nulcebus and Wallace Nyberg, Peoples Federal Savings and Loan Co. Peoria, Ill.

"Tank" in War Bond Drive Offers Curb Service

Peoria Broadcasting Alliance

Using the M-3 war tank, commonly referred to as the "General Grant," as a model for its office, radio station WMBD in Peoria, Ill., has come down to the sidewalks to sell war bonds and stamps in addition to its campaign over the air. Erected near the curbing, the simulated tank has windows facing the sidewalk as well as the street so it may serve both pedestrians and motorists. The riveting effect on the tank-booth was achieved by use of roofing nails, the over-all construction being of plywood.



"Tank" booth sells war bonds and stamps to pedestrians and motorists

Rotating Rack for "Stenotypist" Holds Notes in Easy View

"Stenoscrite"



Transcribing notes made on a Stenotype—the mechanical shorthand writer—may be simplified with a rack that holds the note tapes at eye level for easy reading by the typist. The holder consists of two trays and a rotating easel which picks up the note tape from one tray and deposits the finished portion into the other. When the typist finishes transcribing the notes from the two folds of tape visible, she flips a wheel to lift the next two folds into view.

Rotating easel holds Stenotype note tape at eye level of typist. Twirling the wheel turns arm end over end, causing it to deposit finished portion of tape into one tray and pick up fresh notes with little loss of time

"Swamp Glider" Rescues U. S. Army Fliers Forced Down in Marsh

When an army flier crashes in swampy areas near Langley Field, Va., he is rescued with a "swamp glider" that draws only six inches of water. The craft skims over shallow water that is impassable for land vehicles and ordinary boats. Resembling a cross between a row boat and a small plane, the glider is powered with an airplane motor and propeller. It can attain a speed of 45 miles an hour shortly after a "takeoff."

Maj. J.R. Sifton, in charge fleet. m 992



Airplane motor and propeller speed this craft over the water

Acme newspaper 461-8 av, n.y.c.

Stenotype Co., 410 15th St. Chicago

*2112 7th St. S. Seattle 7 Park
Ave. N.Y.C.*

Tiny Films Speed "V-Mail" to Men Overseas



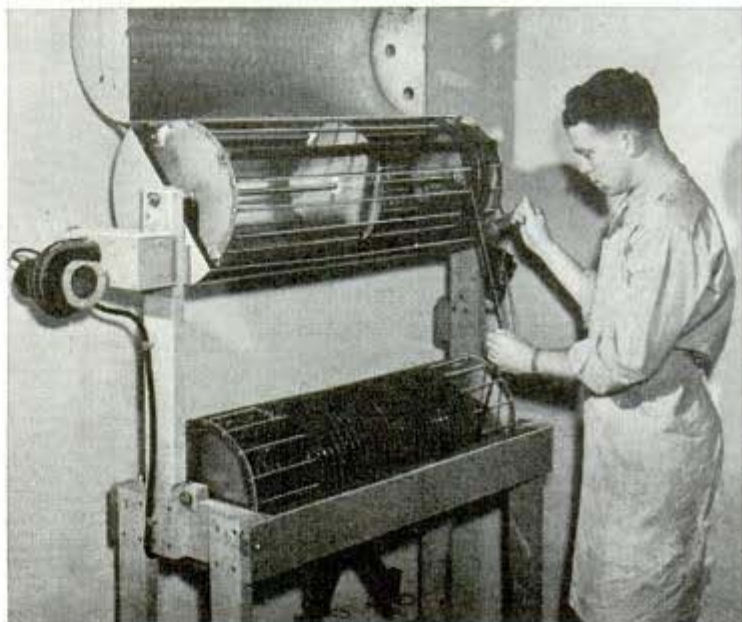
The sergeant is photographing a stack of letters which will be carried on a reel of microfilm for speedy delivery by plane or ship to Yanks overseas
Photos by U. S. Army Signal Corps



Making enlargements, above, from microfilm is one step in processing the new "V-Mail." Left, continuous rolls of prints pass through machine which develops, washes, and dries the letters which are then ready to be cut. V-Mail results in a tremendous saving in valuable cargo space. The two-way service handles millions of letters to and from men in armed forces

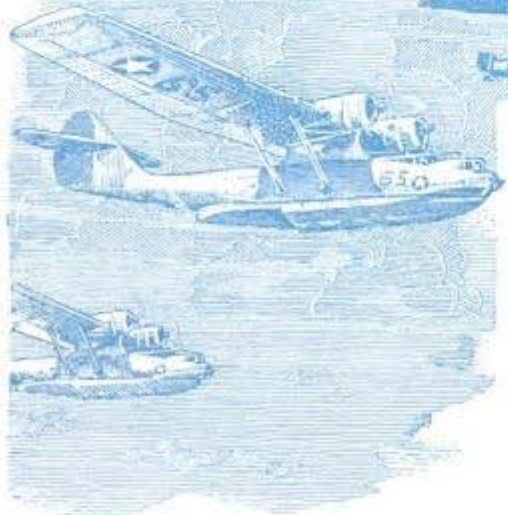
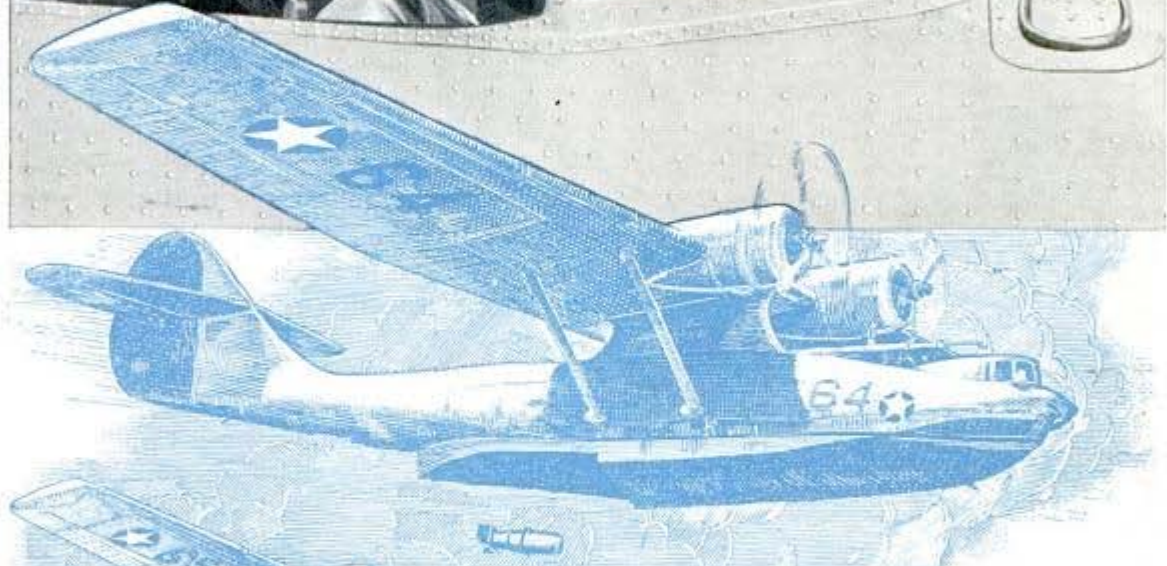


Right, developing and drying film; the lower reel is for developing, the upper for drying. Forty-five pounds of film, which would occupy the space of one mail sack, contain about 150,000 one-page letters. The unfilmed letters would fill some 37 mail bags weighing 2,575 pounds. Where apparatus for developing the microfilms is not available abroad the V-Mail is developed in the U. S. and then shipped, effecting a saving of about 1,000 pounds on 150,000 letters. Army officials laud the V-Mail as a great builder of morale—which can't be weighed



Con: A. J. Hamilton, 1155 Akron St, San Diego, Calif

"HERE COME THE 'CATS!'"



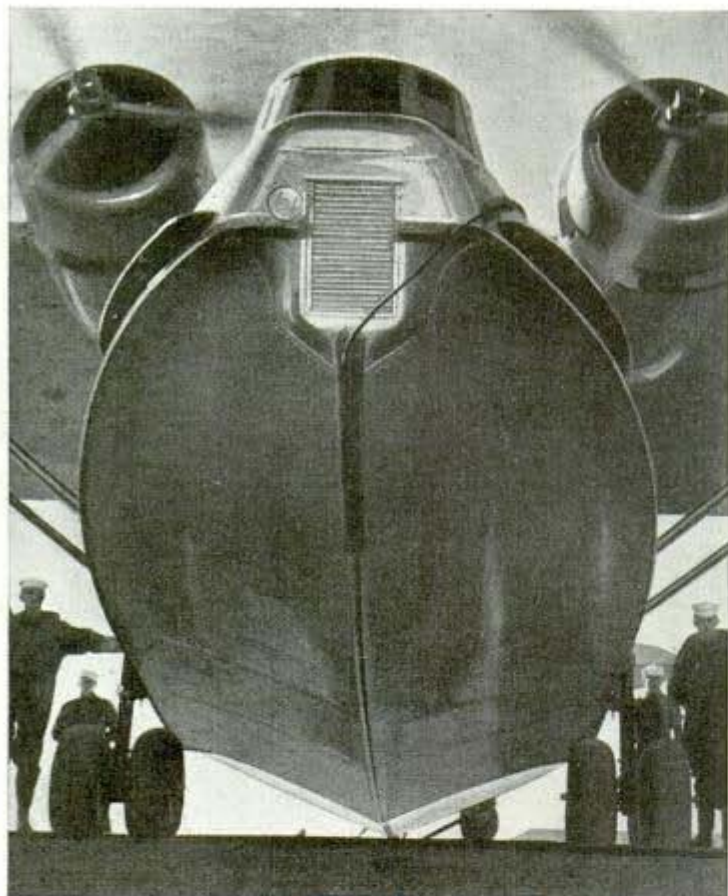
With both motors roaring and her pilots (top) on the alert, the high winged Catalina flying boat is ready to patrol vast ocean distances or drop bombs on enemy ships or bases

M 1022
THE Consolidated Catalina winged its way into Page 1 headlines on May 27, 1941. On that day one of the big American-built flying boats was patrolling the North Sea. It carried the red-white-and-blue roundel of the RAF, but an American naval officer was aboard as observer.

The Catalina shot through a rift in the clouds and all aboard got the thrill of their lives. Below was the biggest battleship ever seen.

"The Bismarck!" was the awed cry that went through the plane.

The German battleship wheeled sharply to port and then let go with all her anti-aircraft fire. Nazi bullets riddled the Catalina's mid-section, but none hit a vital spot. The plane stayed aloft and relayed radio messages to units of the British fleet. Although the German battlewagon



tried to escape, the American-built flying boat hung doggedly on her tail for 27 hours.

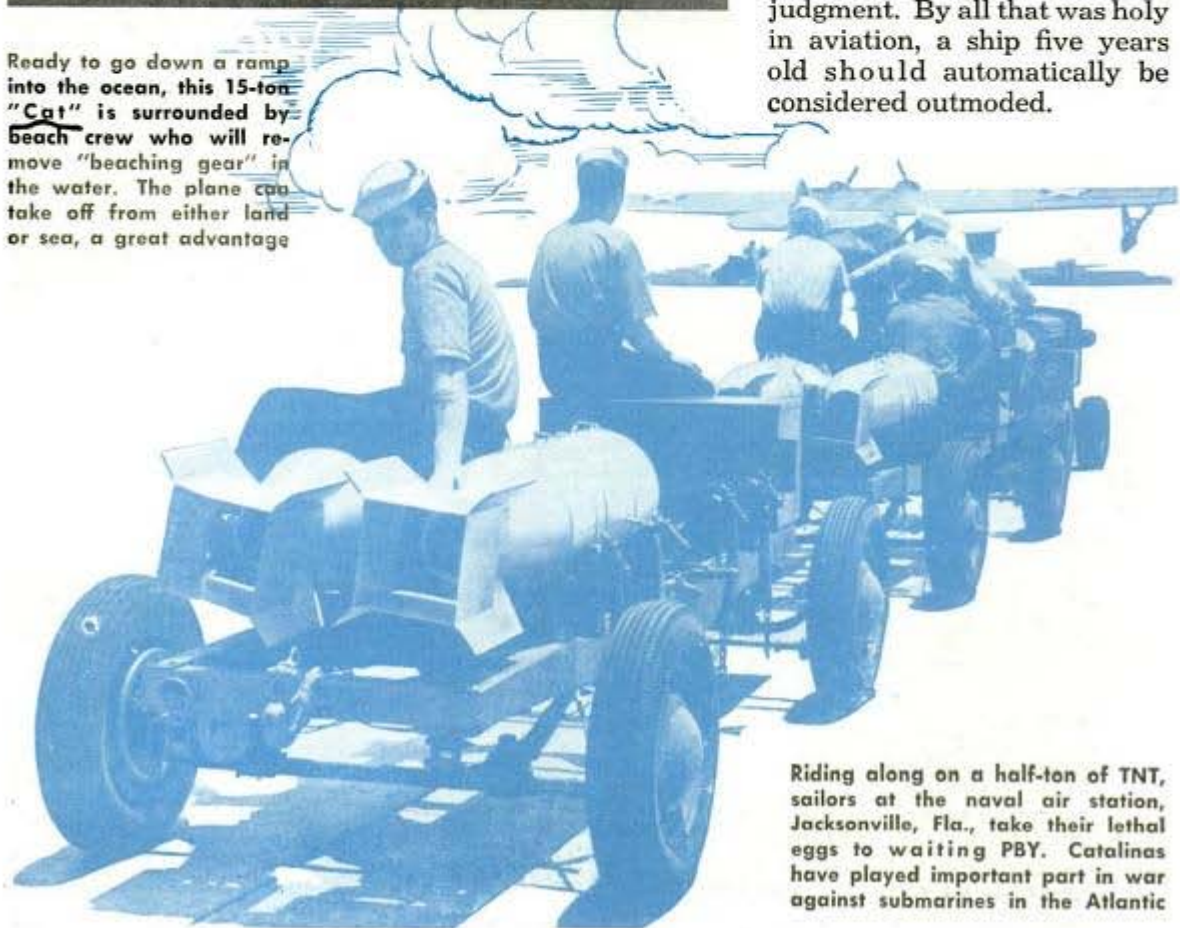
Deep-water navy men as well as aviators give credit to the Catalina for spotting and trailing the Bismarck—the first link in a stirring chain of events which finally led to her destruction.

Since then the "Cats" have made history. They've written glorious deeds of heroism and courage in the skies and waters of the North Atlantic, the South Atlantic, the Mediterranean, the Caribbean, the Philippines, the Dutch East Indies, Australia, Midway and the Aleutians.

Curiously enough, all this has happened since the Catalinas were declared "obsolete"!

In 1939 engineers at the Consolidated plant in San Diego took careful appraisal of the Catalinas—or PBY as the navy calls it—and passed sorrowful judgment. By all that was holy in aviation, a ship five years old should automatically be considered outmoded.

Ready to go down a ramp into the ocean, this 15-ton "Cat" is surrounded by beach crew who will remove "beaching gear" in the water. The plane can take off from either land or sea, a great advantage



Riding along on a half-ton of TNT, sailors at the naval air station, Jacksonville, Fla., take their lethal eggs to waiting PBY. Catalinas have played important part in war against submarines in the Atlantic

Navigator charting course at his desk in the clouds must know the position of flying boat at all times

Two months later, however, Consolidated engineers changed their minds and put the Catalinas back into production. The long, sleek hulls on the assembly line in San Diego today are essentially the same ship designed in 1934 and declared obsolete in 1939.

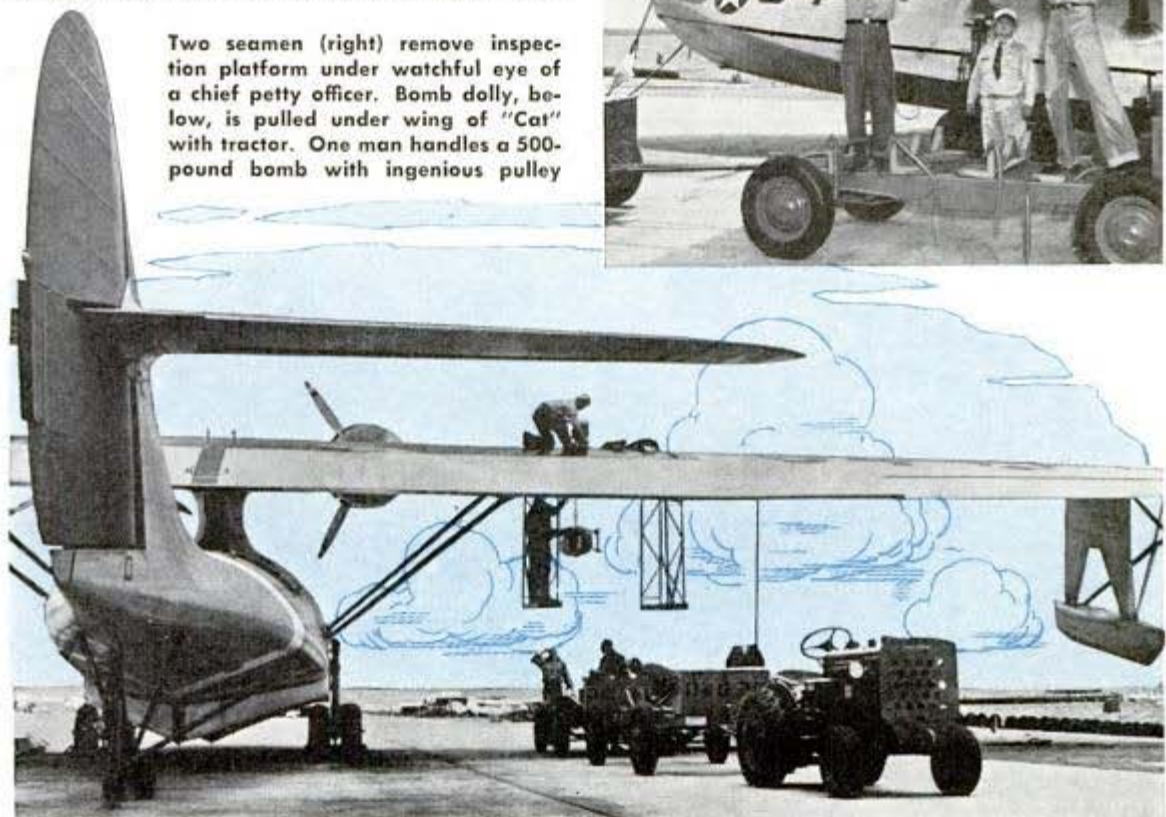
Then the Catalinas proceeded to prove that the engineers' faith in them was not unjustified. They've become one of the most versatile planes the navy possesses. Originally designed for patrolling long distances over open water, these jack-of-all-trades planes have been used as heavy bombers, fighters, torpedo carriers and even as dive bombers!

Before January 1, 1940, 88 PBY's had spanned the 2,553 miles from San Diego to Honolulu nonstop, in groups of 12 or 14. An equal number were flown from San Diego to Coco Solo, covering 3,087 miles, nonstop. Termed "routine transfers of men and equipment" by the navy, these flights carried more than 1,200 men as members of their crews—giving some idea of the magnitude of performance and an indication of what the same ships are doing today.

The Catalina is a twin-motored, high-wing flying boat that can take off from land



Two seamen (right) remove inspection platform under watchful eye of a chief petty officer. Bomb dolly, below, is pulled under wing of "Cat" with tractor. One man handles a 500-pound bomb with ingenious pulley





Here are two of PBV crew's best friends—a parachute and the "galley." This meal, prepared in flight, consists of bacon, eggs, toast and coffee. Below, the big flying boat under its own power is approaching brink of ramp that leads to water. Note bombs under wing



or water. Its fuselage is 60 feet long, its wing span is 100 feet and it weighs 15 tons. Speed is more than 200 miles an hour and the range is 4,000 miles. It carries a crew of seven—pilot, assistant pilot, navigator, third pilot, radioman, and two machinists.

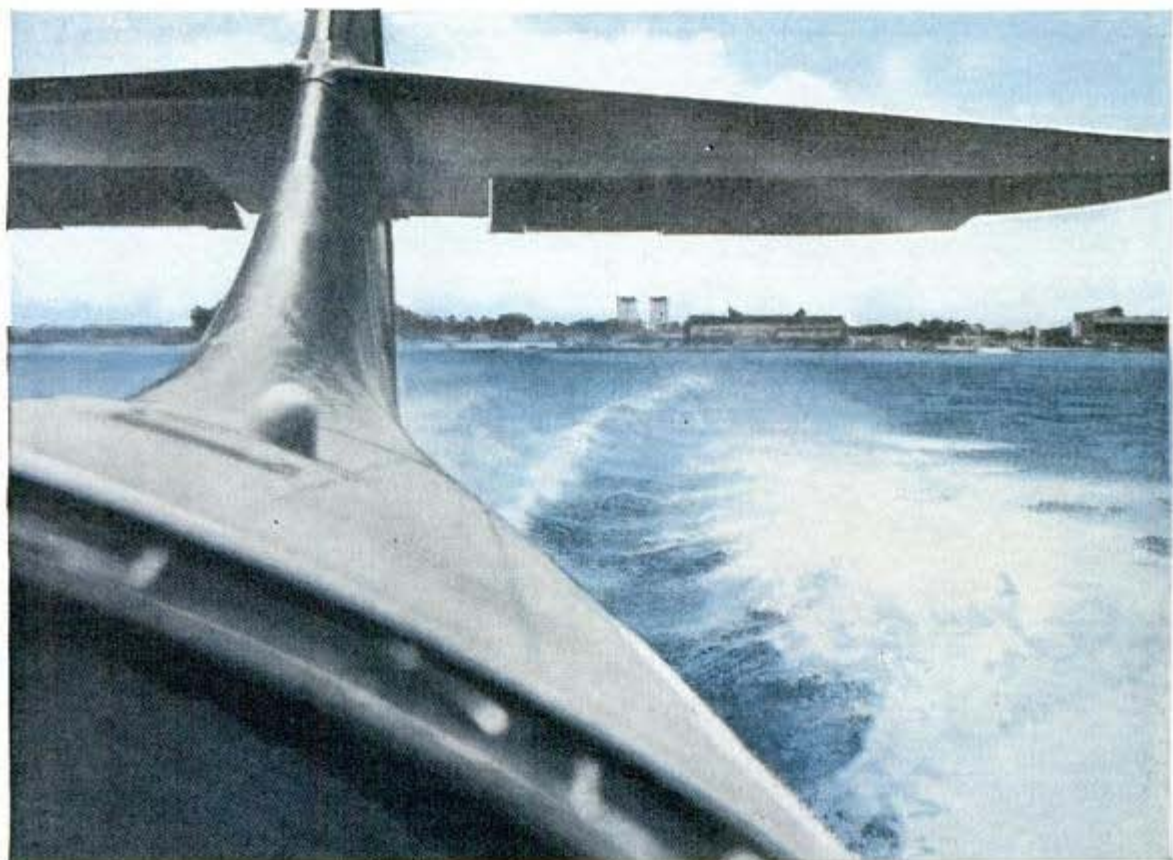
"Here come the 'Cats!'" —spoken in guttural German or sputtering Japanese—is a fearful cry.

But "Here come the 'Cats,' God bless 'em!"—spoken in American accents, clipped British and Australian speech, soft Chinese or warm Russian—is an answer to a prayer.

What have the Cats done in this war? Just listen:

Patwing 10 started out as a U. S. Navy patrol wing of 42 planes when the Japs hit the Philippines. Three months later it reached Australia with only two of the original group. Already Patwing 10 has become a legend in the jungle islands of the South Pacific.

Men of Patwing 10, said



"Excuse my spray," says the Catalina as she roars across the bay for a takeoff. Right, inspecting bomb-attaching mechanism with a detachable platform hooked to bottom of wing. Planes also can carry a torpedo bomb, but how is military secret

official navy reports, "flew into hell and sometimes flew out again, but more often they swam out, or crawled out of the steaming jungle with Japanese machine gun bullets kicking up flurries in the beach sand!"

Told that Japanese warships were 150 miles off Luzon on December 8, 1941, planes of the navy's flying wing flew down on the enemy from the sun and dropped bombs on two battleships and four destroyers. The lumbering Cats didn't have time to stick around and see what damage was done. They drummed back to their base at Cavite. But that base had been fired.

Chief Machinist's Mate Mike Kelly, one of the heroes of Patwing 10, says:

"The Japs finally hunted our bases down and we went to another base, and still another, moving





Carrying "beaching gear" back to ramp after plane has been eased into water. Members of beach crew wear special rubber suits in cold weather

south all the time, still patrolling, but each night coming to roost at a new position."

Kelly says that on one occasion six ships of the wing took off for what seemed to be a perfect setup—a Japanese cruiser, some destroyers and transports, all of which were without fighter protection. They found the ships, but Jap Zeros were hiding in the clouds above.

"They started to dive on us, but we kept our course and went in to bomb the vessels below," Kelly said.

Another group of bombers had already attacked. Antiaircraft guns were barking. One plane in Kelly's section went down. The other two escaped. Not so with the other section of the flight—all were knocked into the water. But even after the Catalinas were downed, it was hard to sink them.

John Cumberland, aviation machinist's mate, tells of what happened to the flying boat he was in when it was forced down.

"We plugged up shell holes," he says simply, "and floated for 30 hours before we were picked up."

On another occasion, a Catalina piloted by Machinist's Mate C. M. Richardson was attacked by nine

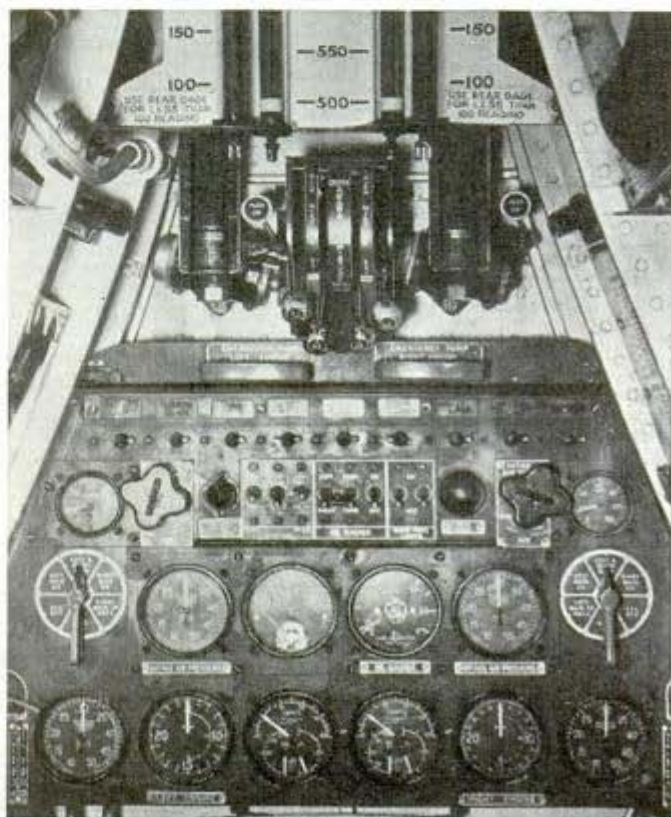
Japanese fighters after it alighted in the water. There were 700 holes in the ship, but Richardson was wounded only in the leg and hand.

In Australia, Air Minister A. S. Drakeford reported that the Catalinas had done a remarkable job in checking the Japanese southward sweep and would "occupy a place of honor in the history of air war."

Halfway around the world at Gibraltar, another Catalina gave a brace of Nazis all the fighting they could stomach. On patrol duty over "the Rock," the PBY cruised slowly through a

seemingly deserted sky.

Suddenly, out of nowhere, four German planes came down. The pilot of the PBY banked his ship, went into a climb. The Germans were below him and the gunners went into action. One by one the Nazi planes fell away. The PBY completed its patrol and returned to its base. Next day



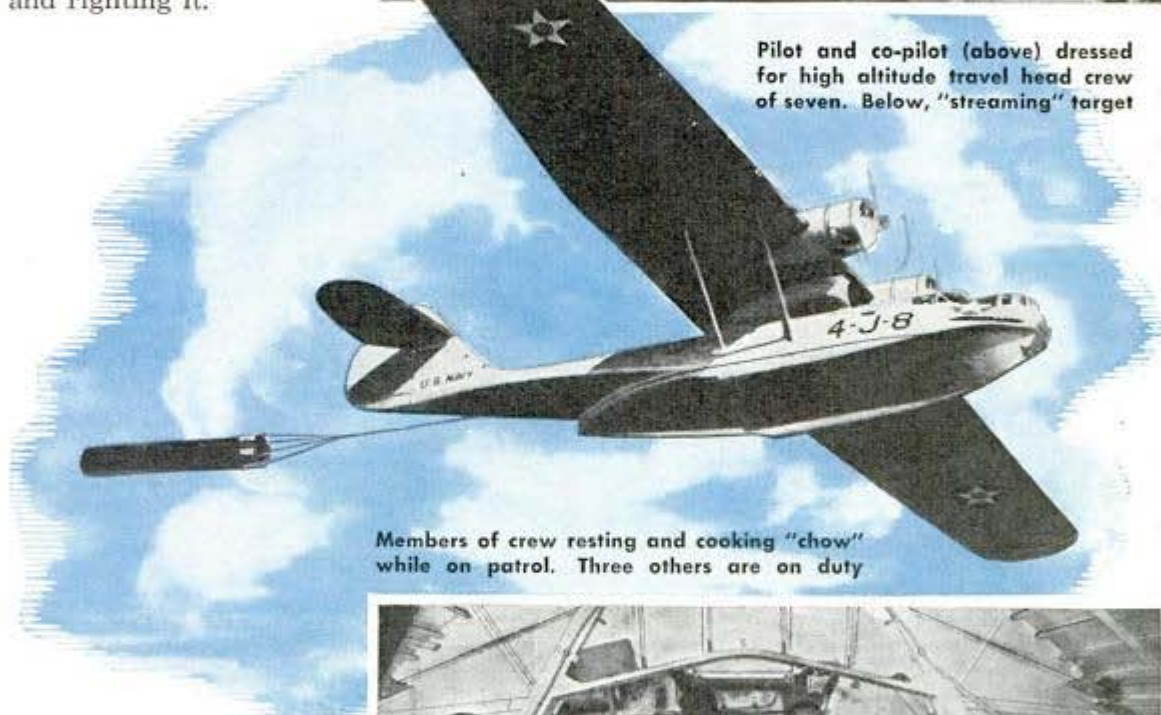
This instrument board in PBY "tower" is used by the mechanic to keep close watch over plane. Any defect is detected quickly

all four German ships were found on the beach near Lisbon.

Additional proof of the Catalina's sturdiness and flyability is seen in the amazing report of a routine Atlantic crossing. Cruising at 18,000 feet, the plane's automatic controls jammed with the starboard aileron full down. The 30,000 pound ship went into a full spiral—hurtling toward the icy water. Just 800 feet above the heaving ocean the other aileron fluttered away, balancing the ship and righting it.



Pilot and co-pilot (above) dressed for high altitude travel head crew of seven. Below, "streaming" target



Members of crew resting and cooking "chow" while on patrol. Three others are on duty

With radio, two ailerons and wing tip missing, the pilot miraculously put the 15-ton Catalina back on its course and completed the trip to England.

The famous Catalinas have done their part in the war against submarines, too. Down below the equator not long ago an Italian submarine surrendered to Brazilian authorities at Natal. It was reported that the sub





Mechanic is seen through window in "tower" which is nerve center of navy's big flying boat

routine patrol, that discovered the Japanese invasion armada off Midway. Circling over the Nip fleet three times without being detected, a young navy lieutenant sent in the report which put the navy's warships on the alert.

Then Catalinas were given another task. Four PBY's were selected for a daring night torpedo attack, the first on record for this plane. Some 40 volunteers, under the direction of Lt. William

hoisted the white flag after being battered by bombs and depth charges dropped by Catalinas.

The "Cats" were in the thick of the Midway battle. It was a Catalina, flying on

Richards, were picked for the job.

Torpedoes were rigged on the Catalinas—where, is a navy secret—and they went in against the Jap ships under the cover of darkness. A direct hit was scored on an

Loaded for patrol duty that may cover 4,000 miles of open sea, the PBY rides proudly out on the water where "ground" crew detaches beaching gear to await return of plane from U-boat hunt



8,000-ton troop transport and an unidentified ship.

During the Midway battle the pilots of the PBY's were in the air 20 hours a day and the ground crews got almost no sleep. This meant a terrific strain on men and planes. But the American airmen proved to be just as tough as the Catalinas.

When the smoke of Midway had begun to clear, the Catalinas were given a third important job. For 10 days they scoured the shark-infested waters, searching the ocean for yellow rubber life rafts. During that time they rescued 27 American pilots.

As in the battle of Midway, the Catalinas were the first to contact the Japs in the fog-bound Aleutians. The PBY's continually harassed the enemy in addition to furnishing reports of position, taking photographs and watching every Jap move.

When there seemed to be a shortage of bombing and fighting planes, the pilots of the "Cats" cheerfully assumed their duties.

Some amazing tales have come out of the Aleutians about the sterling performance of the "Cats." One day a Catalina found a large Japanese submarine on the surface and let a bomb go from 400 feet. This was risky because a lumbering PBY can't get away from the explosion at this close distance. She blasted the sub but one of the plane's engines was disabled by her own bomb and she limped home on a single motor. The flying boats were even used as dive bombers—something their designers had never dreamed of. Over Kiska the pilots would force the nose of the big crates downward and go rumbling through the soup like a landslide.

The heavy planes would shoot out of the clouds over the Japs and release their bombs. After the bombs had fallen clear, it took the strength of both pilot and co-pilot to heave back on the yoke to pull the juggernaut out of her earthward plunge. The big planes would pull out with their panels flapping like a circus tent in a high wind.

Another time a Catalina was hit squarely by a Japanese anti-aircraft shell. By all odds, it should have exploded. But it didn't. It made a neat hole through one side of the fuselage and out the other.

Hundreds of stories can be told—and will be told—about the ruggedness and durability of the Consolidated Catalinas. One navy pilot summed it up when he said:

"If I ever get in a spot where I'm forced to choose just one plane—give me a 'Cat!'"

*Des: Carson Paris
Spall Co, Montreal
State, Chicago*
**Scale Measures the Pressure
For Artificial Respiration**



Amount of pressure on "torso" is revealed by scales

First-aid students are taught to apply the correct pressure in giving artificial respiration with a unit consisting of a torso replica and precision scale. The student learns to apply the necessary amount of pressure in accordance with a patient's age, weight and injury, as well as how to determine the proper timing. Tests show that many students practicing the Schafer method of resuscitation apply pressures as high as 150 pounds.

**Flip-Down Shield for Car Mirror
Stops Reflected Glare**

Glare from bright headlights reflected into the driver's eyes from his rear-view mirror can be reduced by clamping a celluloid shield to the mirror. Crimped to a metal piece which in turn is hinged to a pair of snap-on clamps, the shield may be flipped downward to cover the mirror, or upward out of the way.



Colored shield for mirror may be raised out of way

*2007 S. State
Chicago*

Mr. Whitaker

ROBOT GUARDIANS of BILLIONS



m 889

24:

Photos courtesy of Underwriters' Laboratories

Engineers "turn burglar" with oxyacetylene torch to test resistance of combination lock on a vault door

IT'S 3 a.m.—the favorite hour for burglars. A man with a black satchel clutched under his coat takes a quick look up and down the deserted street and slips into the shadows of the alley.

He chuckles to himself. No cruising police cars. No stray pedestrians. The cop on the beat won't be along for another 20 min-

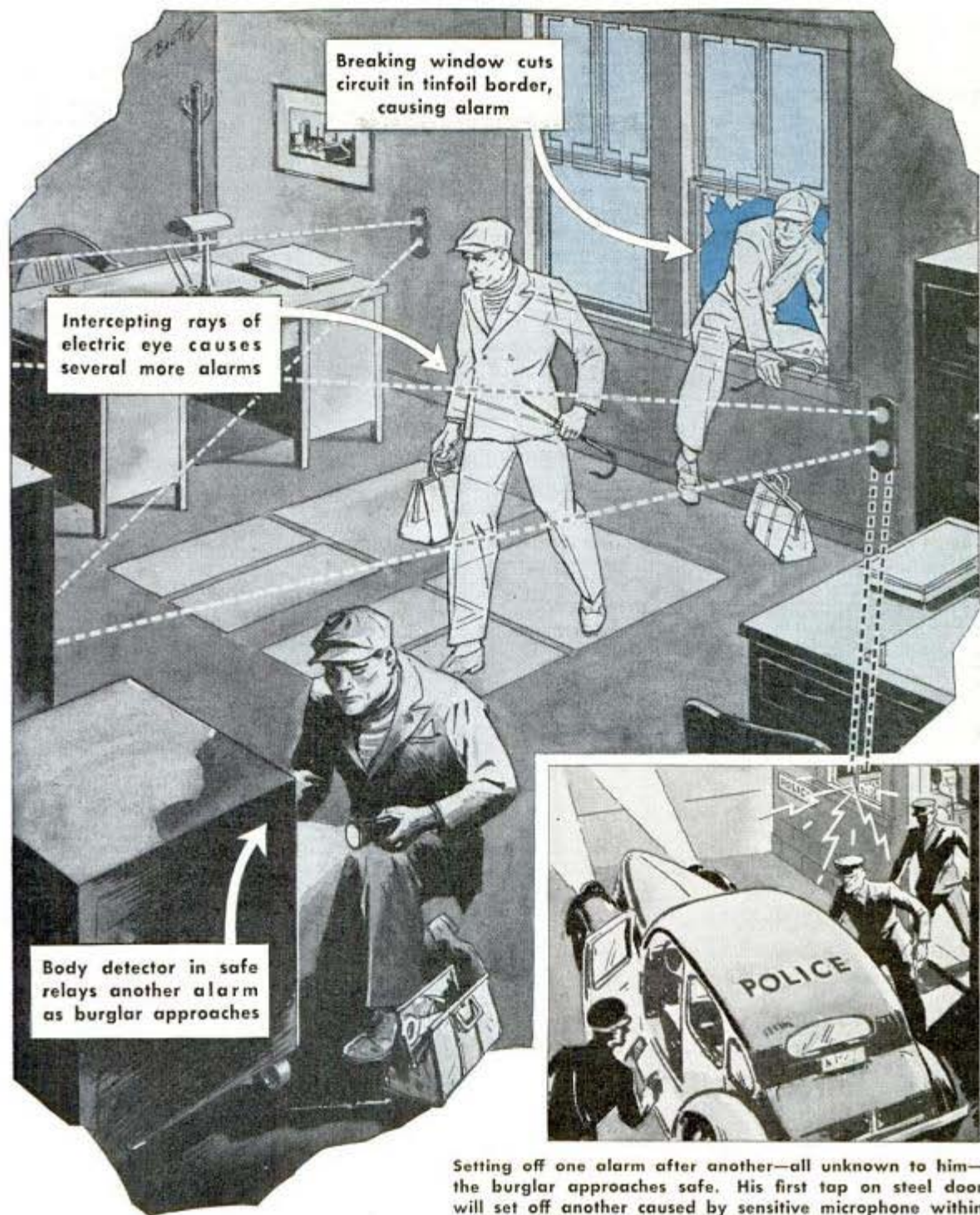
utes. Down the alley looms a four-story department store and on the third floor he knows is a steel safe containing between \$3,000 and \$5,000 in cash.

The burglar, no amateur, had "cased" the place a couple of days before. He learned there were electric alarms on the doors and windows and he figured there would be one on the skylight. (A jail term had taught him that the wires could not be cut without sounding an alarm.) He had also discovered that the place was without a watchman. The job was a cinch—he thought.

In three minutes the burglar is on the roof of the store. He had pulled himself up a rain spout and then swung over to the fire escape. He avoided the lower end of the fire escape because he



Testing sensitivity of microphone hidden inside a safe



Setting off one alarm after another—all unknown to him—the burglar approaches safe. His first tap on steel door will set off another caused by sensitive microphone within

knew that, too, was equipped with an alarm that would go off if the framework were pulled down.

He sets his bag down carefully—which is wise. It contains caps, fuses and nitroglycerin in addition to a crowbar, hatchet, chisel, screwdriver, rope, wire, oxyacetylene cutting torch and various other tools.

After cutting a hole through the roof, he lowers himself into the building. The man looks carefully about for one of the tricky

photoelectric beams that had cost him another jail term. He knows the "black light" is almost invisible until you come into its direct ray; then the beam is broken and the alarm is sent.

Satisfied there is no electric eye in the place, the exconvict hurries down the stairs and makes his way into the office where the safe is located. He opens his kit, almost leisurely, and appraises the square dark object. He looks close to make sure there



Attempting to "defeat" an electrically protected outdoor alarm box with an electric drill in one of testing rooms at Underwriters' Laboratories

is no wooden cage around the safe—a contraption filled with thousands of tiny copper wires that send an alarm if broken or displaced a few inches.

The burglar runs his gloved hand over the combination lock on the door. He isn't naive enough to think he could feel out the combination like the fictional Jimmy Valentine. Locks haven't been made for a long time that can be worked by feel, no matter if a fellow sandpapers all the skin off his finger tips to make them sensitive.

Not a bad safe, this, he decides. Almost sporting. Might take all of 15 minutes to open it with the torch and nitroglycerin.

Two minutes later he jumps as the scream of sirens warns that something has gone wrong. Police and private guards swarm into the building and it is flooded with light. He knows the place is surrounded. Without taking time to gather up his valuable tools, he hides in a clothes closet. There the police find him.

The burglar probably never found out what action of his caused the alarm. It was so simple he

Applying torch to inner compartment of safe after shell of concrete is chipped away

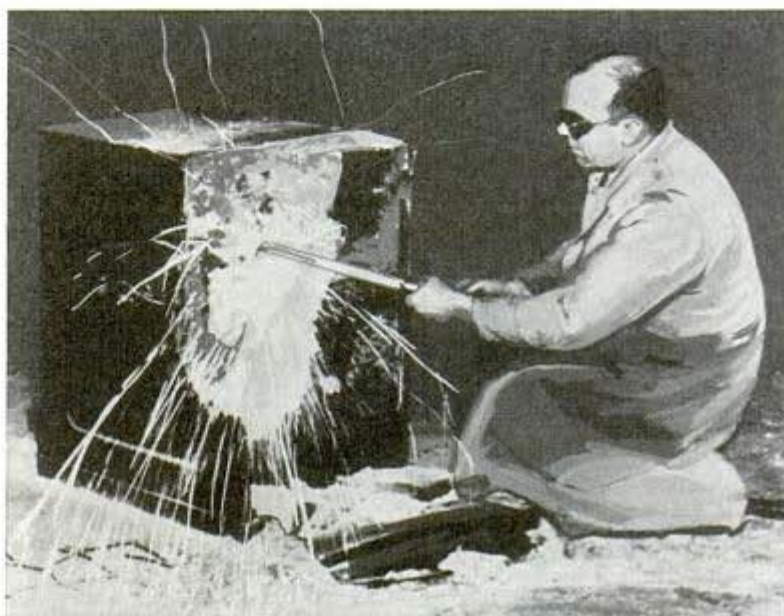
wouldn't have believed it—the mere presence of his body a few inches from the safe. The safe contained one of the new supersensitive devices that operates like the old radio sets that howled when a hand was placed on them. The body detector, as it is called, gives an alarm when a person either approaches or touches a safe where it is installed. Its basic principle is radio frequency. The safe is connected with a nearby control set and acts as an antenna.

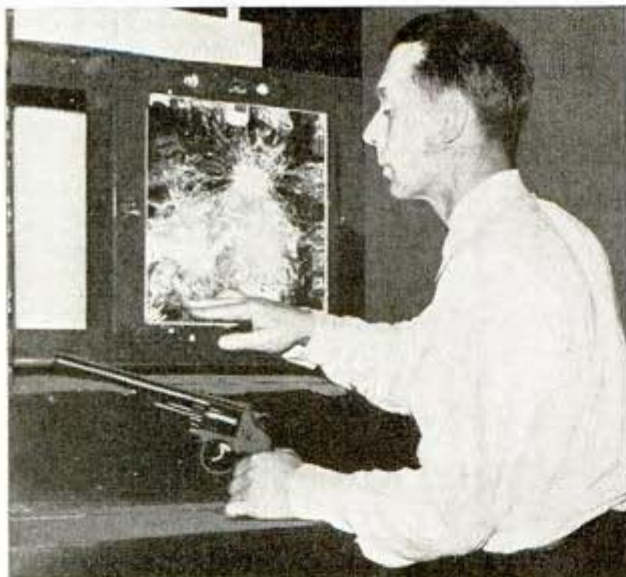
That is just one of the automatic alarms that are on duty in daylight or

blackout guarding billions of dollars worth of valuables—money, jewels, furs and merchandise of all kinds—from an army of 500,000 burglars, robbers and thieves at large in the United States. They commit 1,000,000 crimes a year that cost the nation 15 billion dollars.

A burglary (forceful entry of premises), a robbery (intimidation such as a holdup), or a theft (pilfering) takes place every 30 seconds of each hour every day of the year. One took place somewhere while you were reading the last couple of paragraphs.

Pitted against this army of criminals is an array of intricate protective devices that





Sample of bulletproof glass after three bullets were fired at it from powerful revolver in engineer's hand



Firing at bullet-resisting glass in laboratory range. Various weapons are used for the tests

are the brain children of electrical wizards. There's no guesswork about the approved alarm systems. They are effective because each has been subjected to severe tests by engineers at Underwriters' Laboratories in Chicago, New York and San Francisco. The company also certifies installations and has men in the field constantly investigating the services of protective agencies.

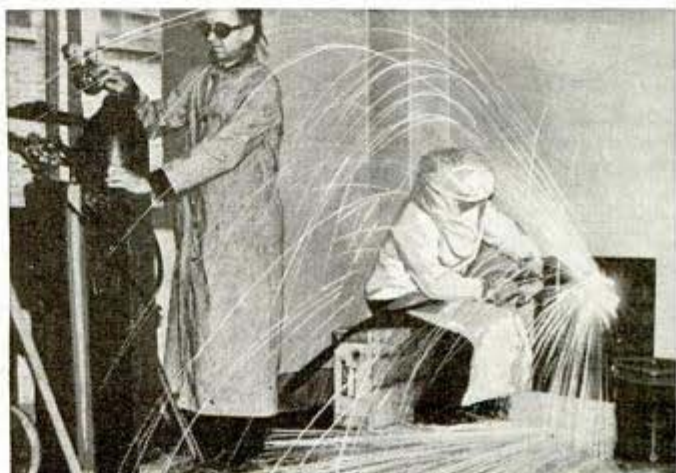
When a new alarm is developed, it is installed in the laboratories and the engineers "turn burglar." First, they study the layout of the protected area and the circuit diagram. Then they go to work with tools that would be the envy of the Lone Wolf, himself. Sometimes a new device gets a high rating after the first test; more often, defects are found and the alarm is turned back to the manufacturer for correction. Then a new test is made and the system rated according to the amount of protection it affords.

Once the burglar or robber had only to cut the wires of an alarm system and his worries were over. Today most alarms—body, sound and heat detectors, photoelectric beams, pneumatic alarms and others—are built on a "closed circuit" that relays a signal the moment it is cut.

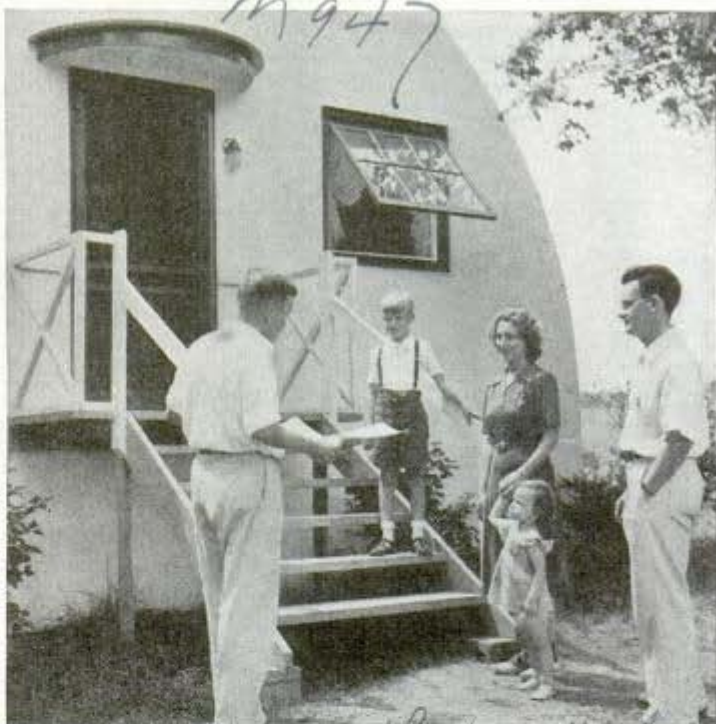
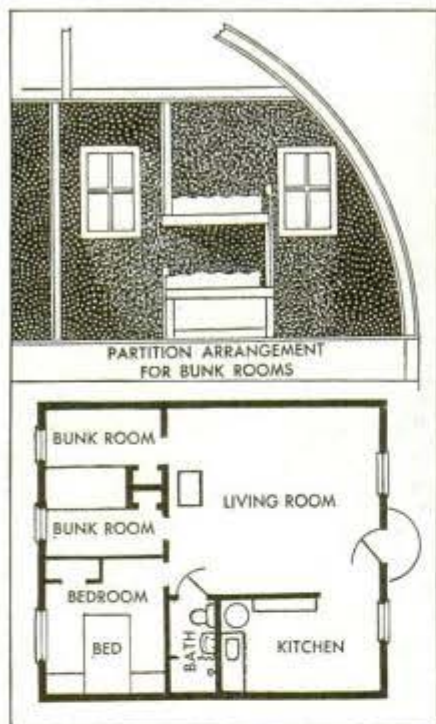
(Continued to page 176)



The locking mechanism of this money chest resisted "fishing expedition" with fine wire after hole had been cut in top. Below, oxyacetylene torch is used on steel panel in wall of vault to determine if microphone on other side of wall will "hear" the noise made by attack, thus causing instant alarm



"Tank" Home Built for War Workers at \$1,500



Paradise Grove, Lafayette, Ind.

To meet the need for temporary homes for war workers' families, Purdue Research Foundation has designed a house which six men can build in a week at a cost, fully equipped, of \$1,200 to \$1,500. Above is the entrance; at upper left, floor plan and cross section show accommodations for man, wife, boy and girl. Only 350 pounds of critical materials are required. Well insulated with glass wool between the outer ½-inch Gypsum wallboard and inner ¾-inch wallboard, the house can be heated by an estimated 2½ tons of coal per year



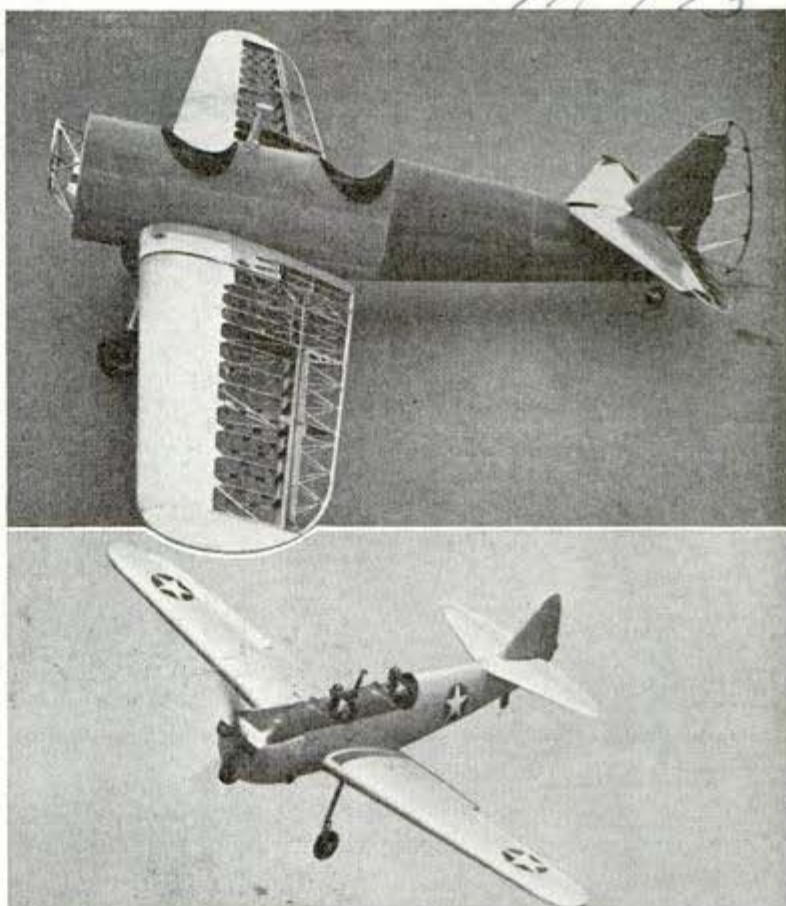
Cellarless, the house is set on field-cast concrete piers, its wood frame sheathed with fire-proof wallboard (at right) and coated with special emulsified asphalt (above) in which sand is imbedded. Over this goes white cement paint. Toilet, lavatory, shower, sink and laundry tubs are provided. A special floor joist spanning full width of the house serves as bowstring of the framing members, eliminating piers in middle of the structure



*Ryan Aeronautical Co.
 Lindbergh Field San Diego
 Calif.
 M 723*

Plywood Trainer Saves Metal for Warplanes

With body, wings and tail constructed of wood, the new Ryan PT-25, a primary training plane developed for the U. S. Army Air Corps, comes close to the goal of eliminating all strategic materials in military aircraft. Little special equipment is required in forming the plywood body, since cold-setting urea formaldehyde glues are used, needing no ovens, baking, complex forms or other "tricky" handling. Standard size flat plywood sheets are employed for all parts of the airplane, except the leading edge of the outer wing panel where molded plywood is used. The wood is waterproof, fire-resistant and not subject to fungus growth, with a weight-to-strength ratio greater than many high-grade steels. Exterior surfaces



Top, plywood plane without covering or engine; bottom, finished and in air

are "armored" against the elements by a lightweight fabric covering stretched over the plywood skin. The only place where any strategic materials are used is the engine cowling which represents less than

two percent of the plane's total weight. It is reported that the ship is light and responsive to all controls, and is capable of easily performing every known military and aerobatic maneuver.

Jeep Converted to Ambulance Carrying Four Stretches



It takes only a few minutes to convert an army jeep into a stretcher carrier with wooden frames that fit over its hood and rear compartment. Four stretchers are strapped to the frames. This method of transporting casualties is efficient for short trips when the terrain is not too rough, according to officials of the Army Medical Corps.

Motorized "handy man" of the army—the jeep—adds ambulance duty to score of uses

Ch. 5. 700 Milton, 11-7-48.
Ensigns and Av. Los Angeles Cal
m 7 66

"MUSTANG" Admirals in the Making



An ensign shows cadets one of the 5-inch guns widely used by the Navy

AFTER the battle of the Coral Sea, a reporter approached Rear Admiral Wilson Brown and the conversation went something like this:

"I notice quite a number of officers who did not attend Annapolis took part in the battle. How did they stack up, sir?"

Admiral Brown replied: "You can tell your readers those fine young Naval Reserve officers are splendid. Afloat and ashore they rank with the best!"

These words of praise from Admiral Brown, formerly head of the U. S. Naval Academy at Annapolis, are a justification of a 17-year-old program to build a backlog of officers to be called in time of war. In 1925 the Naval Reserve and the Naval R. O. T. C. program were organized. The Naval Reserve was established to enroll former World War officers and specialists in civilian life. The Naval R. O. T. C. was intended to

Future officers of the U. S. Navy don masks for a training stroll through billowing clouds of gas



train capable college men as potential officers.

Today thousands of Naval Reservists and R. O. T. C. graduates are standing watches on the bridges of warships, flying naval patrol and bombing planes and doing administrative work at navy bases.

There is Ens. Anthony Akers, lanky 27-year-old Texan who graduated from the University of Texas and attended Northwestern University's V-7 program. He was a skipper of one of the P-T boats in Philippine waters.

One night Ensign Akers piloted his little torpedo boat into Subic Bay through Japanese mines and bamboo nets which foul propellers. A Jap tanker loomed in the darkness. Akers gave a curt order and two torpedoes went straight for their target. After this daring feat, the Texan was chosen to skipper one of the four torpedo boats which whisked General Douglas MacArthur out from under Japanese noses at Corregidor.



Keeping a sharp lookout from the crow's nest. Part of a cadet's training is learning to identify enemy ships and airplanes

Naval Reserve officers performed many deeds of valor at Pearl Harbor. Secretary Knox singled out an unnamed naval reserve ensign who took command of a motor launch. Through the hail of shrapnel and machine gun fire, the ensign rescued almost 100 men who had been blown overboard from a battleship. During the height of the attack, the propeller of the launch suddenly jammed. Cool as ice, the young Naval Reserve officer directed the work of disengaging the propeller as flames from the oil-covered bay licked around his craft. He was cited by his captain for "initiative, resourcefulness, devotion to duty, and personal bravery."

Heroes? Yes—but typical of the young naval reserve officers serving with the U. S. Navy on fighting fronts all over the world.

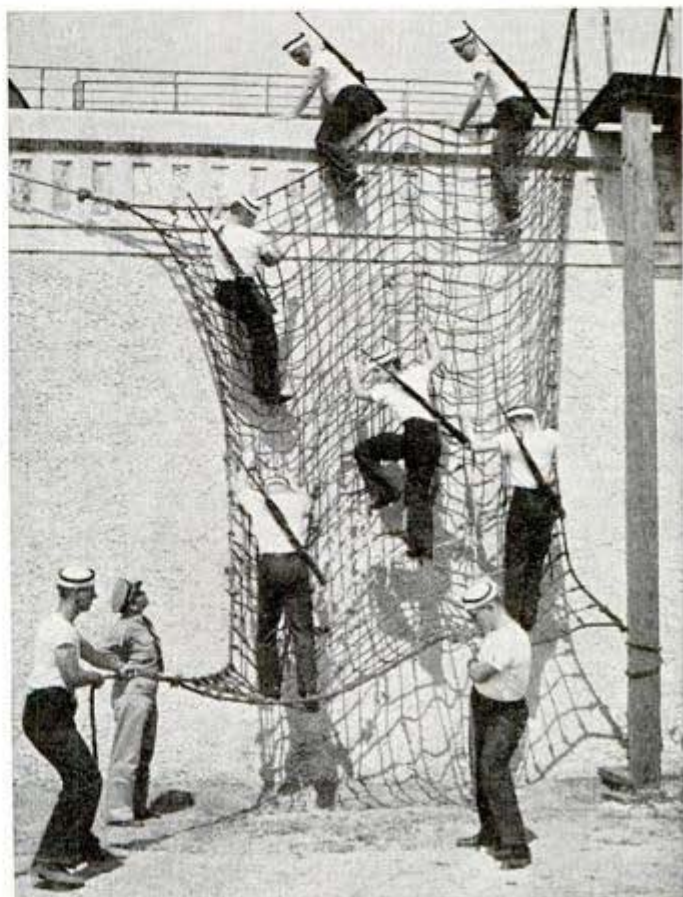
Uncle Sam is now creating the mightiest armada in history. With the fall of France, the United States set out to build a "two-ocean" fleet—368 ships costing \$4,000,000,000. Last June Congress approved a "seven-ocean" fleet of 550 more vessels costing another \$8,500,000,000!

To man this gigantic fleet, the navy will need thousands of highly trained officers. The Naval Academy at Annapolis can supply



The submarine service gets its share of Naval Reserve officers

With rifles slung on their backs, cadets learn to scale landing nets. The exercise builds muscle and makes them surefooted





Flying cadets learn early how to manipulate their parachutes

only 700 or 800 a year. So the Navy has begun to tap a rich vein of officer material: the American college man.

Right now, thousands of men on college campuses are preparing for careers in the navy. And it won't be long before they'll be taking their places beside other non-Annapolis officers fighting on the sea and in the air.

The Naval R. O. T. C. program was launched in 1925 at Harvard, Yale, Northwestern, Georgia Tech, and the University of California. Since then it has been established at 22 more institutions. Some of them in such dry-land places as the University of Oklahoma and the University of New Mexico—but that's not surprising, since the Middle West has always furnished the highest percentage of sailors for Uncle Sam's Navy.

About 5,000 potential admirals will be studying under Naval R. O. T. C. supervision this year. The V-1 program at about 500 other colleges and universities will enroll 80,000 students. V-7 courses for college graduates are already turning out hundreds of ensigns.

Let's take a look at the Naval R. O. T. C.

It's quite a memory feat to learn the patterns and colors of signal flags—but a battle may depend on it

program, which furnished a basis for the V-1 and V-7 programs. The navy is pretty choosy about the youngsters it selects for R. O. T. C. training. It wants smart boys between the ages of 14 and 26 with plenty on the ball—those who lead in student activities and at the same time get good grades. A board of officers of the regular navy, most of them Annapolis graduates, selects the candidates who apply for R. O. T. C. They look for physical fitness, potential qualities of leadership, intelligence and a reasonable certainty that the student will stay in school four years. Only freshmen or sophomores are accepted. The Naval R. O. T. C. comprises four years of hard study—mixed in with plenty of fun.

The course is divided into two parts. The two-year basic course for freshmen and sophomores includes such subjects as naval history, ordnance, seamanship, communications, electricity, and navigation. In the advanced course, the junior year is devoted primarily to navigation; the senior year consists of gunnery, electricity, engineering, aviation, naval administration, and military law.



The cadets are required to take at least one period of summer training to test in a practical way the theory buzzing around in their skulls. In peacetime this summer training assumes the proportions of a pleasure cruise to such travel-folder lands as Hawaii, Alaska, Panama, or Cuba. But last summer (and for several summers to come) the training was on dry land.

"The boys really learn more on dry land than on cruises," an officer said recently. "When at sea, 90 percent are seasick the first few days and 10 percent are seasick all the time. This way none of them suffer mal de mer and bad weather doesn't interfere with training."

In their white enlisted men's uniforms—distinguished only by the blue band around their caps—the



Officers will not have to load guns, but they must be familiar with the routine

Cadets climb the rigging of a former pleasure yacht now on patrol duty in the Pacific



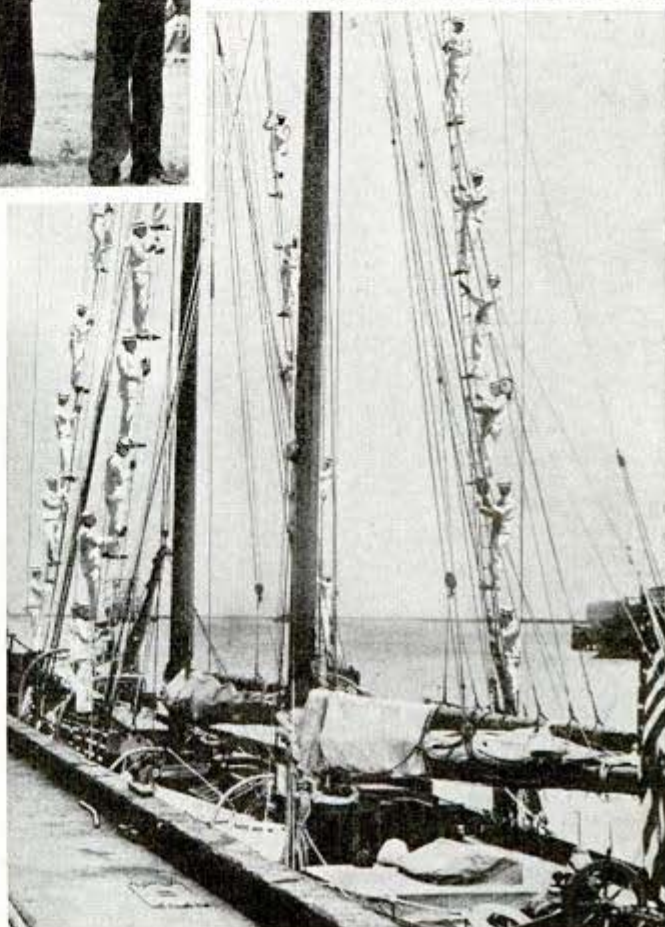
The .45 automatic pistol is an officer's weapon; cadets must learn to use it safely

cadets go through a stiff, three-week training period of work, study, sleep, and eat. They work and study as apprentice seamen at \$50 per month. Thus, when they get to be officers, they'll appreciate the enlisted man's point of view.

They row small boats and handle small craft under sail. They learn to repair and shoot .45 automatic pistols, .30 caliber machine guns, and 5-inch deck guns. With rifles and packs slung over their backs they clamber up and down landing nets. They bone up on the theory of poisonous gas and then don masks to walk through clouds of the stuff.

During his four-year course in

(Continued to page 167)

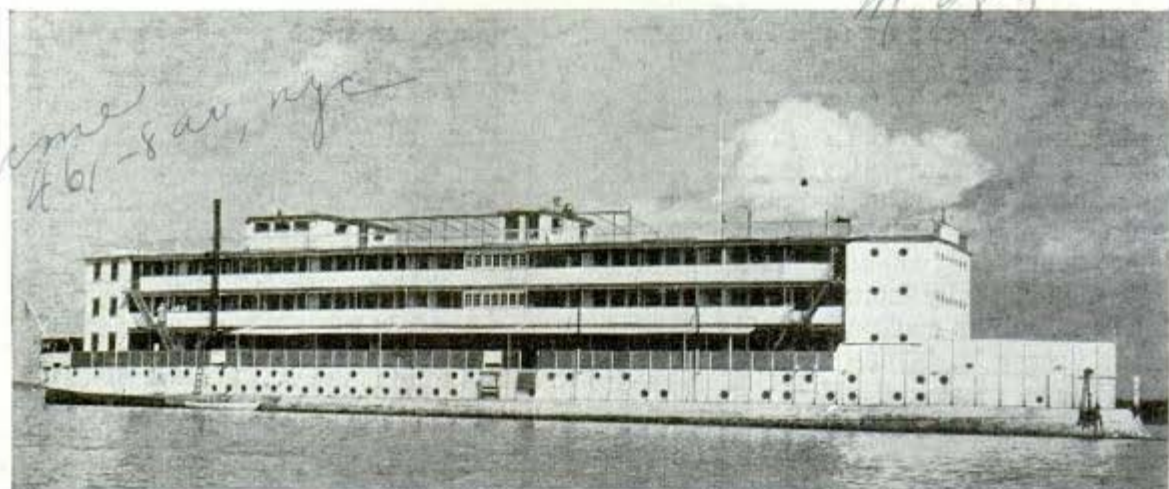


Attached to San Francisco Marine Ave. S. W.

Floating Hotel Houses War Workers in Capital

M 183

acme #61 - 8 av, nyc



Hotel boat augments living quarters for the vast army of government employes now in Washington

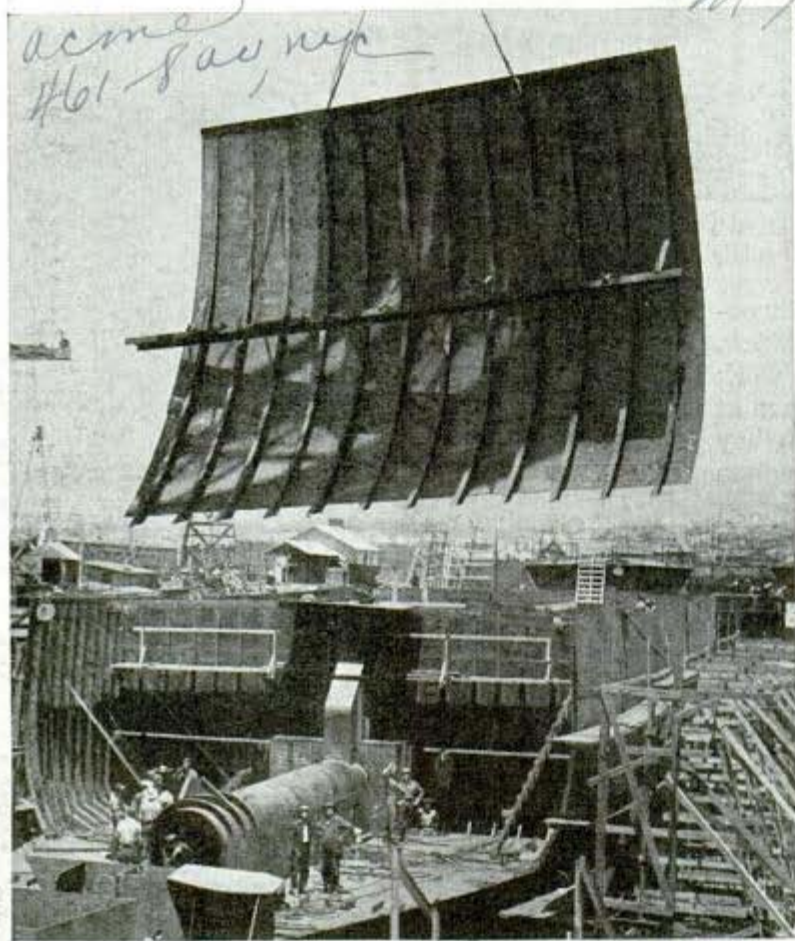
To relieve the shortage of housing at Washington, D. C., a floating hotel has been moored at the Potomac shore. The 265-foot boat, originally costing \$350,000, has five decks, three of them containing 75

rooms approximately 15 by 15 feet each. Some of the rooms have baths, and all are equipped with running water and lavatories. On top is a sundeck, and the lower deck includes dining room and dance floor.

Ship Built in Hole Is Launched by Filling Hole With Water

M 765

acme #61 - 8 av, nyc



Merchant vessels are being built much faster by digging a spacious hole in the ground and there erecting the ship, instead of building it high on the ways whence it must slide down into the sea. Prefabricated ships constructed in this way by one company are completed in about 30 days, and the work involves fewer hazards. The danger of greased ways, for instance, is eliminated, since the ship can be floated out on water released into the hole.

Keel for this vessel was laid in a hole in the ground to avoid the time-honored though risky method of launching by sliding the ship down the ways. Instead, it is launched by filling the hole with water

*Pacific Bridge Co
San Francisco, Cal.*

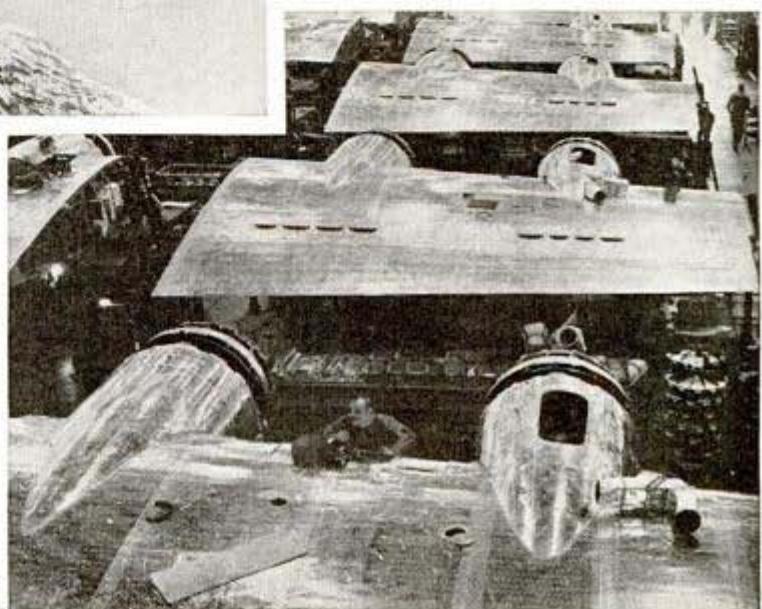
*Boeing Airplane Bureau
Seattle, Wash.
m 913*

Boeing "Fortress" Fleet Crowds the Calendar



Bold innovations in manufacturing methods have put production of "Flying Fortresses" far ahead of schedule at the Boeing plant. Instead of a long assembly line, Boeing breaks up the process into seven major assembly operations, joins the completed installations only at the end, saving factory space that would be occupied by swarms of assembled Fortresses with 104-foot wing spread and 70-foot body. By this efficient use of space, Boeing produces more pounds of plane per square foot of factory space than any other manufacturer. At upper left, dense rows of main fuselage sections are fitted with complete installations. Upper right, completed bodies ready to have wings, engines and guns installed. Their next stop will be the firing line

The eighth in the series of Flying Fortresses tries its wings over Mt. Rainier, above. At right, inboard sections of the wings in their special assembly department where motors and other parts are added. Production has more than doubled since Pearl Harbor. Spectacular advances in technique have contributed to this speedup. Exhaust outlet cowlings once made by drop hammer required 30 minutes work; a multiple action press now produces the part in 15 seconds. Wing jigs that took up vast floor space are installed vertically, skyscraper fashion. Workers have made 5,000 suggestions to help production



TOUGH GUYS



tough young men in training camps are listening to tougher instructors who bark:

"Bust 'em in the eardrums! Kick 'em in the stomach! Break their spines! Gouge, choke, twist and smash 'em."

Shocked? Some of them are at first. But they are taught that it's not a footrace at a Sunday School picnic for which they are preparing, or a Marquis of Queensberry affair. It's war. The rules are made by war sense, the crux of which seems to be:

"Kill or be killed. Capture or be captured."

Every soldier, sailor, marine or coastguardman knows that perhaps some day, alone and barehanded, he may have to face a desperate and tricky foe. When that day comes, Uncle Sam intends to see to it that his boys have better than an even chance.

That is why they are being taught a new brand of fighting. Call it hand-to-hand, close-in, rough and tumble, commando tactics or what have you, but the fact

By
Wayne Whittaker

With bush knife, machete and a wary eye for Japs, the mud-smeared trooper is ready for action. Commando technique, below, for disarming invader

TAKE jujitsu, combine it with barroom and commando tactics, add a dash of American ingenuity and you have the formula for developing the deadliest fighter the world has ever known. He's Uncle Sam's soldier, sailor or marine trained for invasion against a foe that fights dirty.

They asked for it, the Nazis and Japs—especially the Japs with their bodies painted green in the jungles of Bataan; the Japs who carry small razor-sharp knives in their loin cloths to slit the throats of their captors, and who know the bone-breaking tricks of judo.

From coast to coast



Pub Lawrence Dean
Pub Lloyd Taylor
Sgt Howard Belland
POPULAR MECHANICS

all of columns 2 to 3



remains it's plain dirty fighting.

Instructors in the art of the foul blow include such men as Col. Anthony J. Drexel Biddle, veteran of the Marine Corps, who combines bayonet practice with jujitsu; Capt. W. E. Fairbairn of the British Army, who drilled the commandos; Dr. Francois D'Eliscu, formerly of Columbia and New York universities, who specializes in the use of a five-foot sash cord; Col. J. Prugh Herndon, commander of the Bushmasters in Panama; Commander L. S. Perry, director of the Naval Academy's physical training program; Lt. Jack Dempsey, former heavyweight boxing champion, and many others.

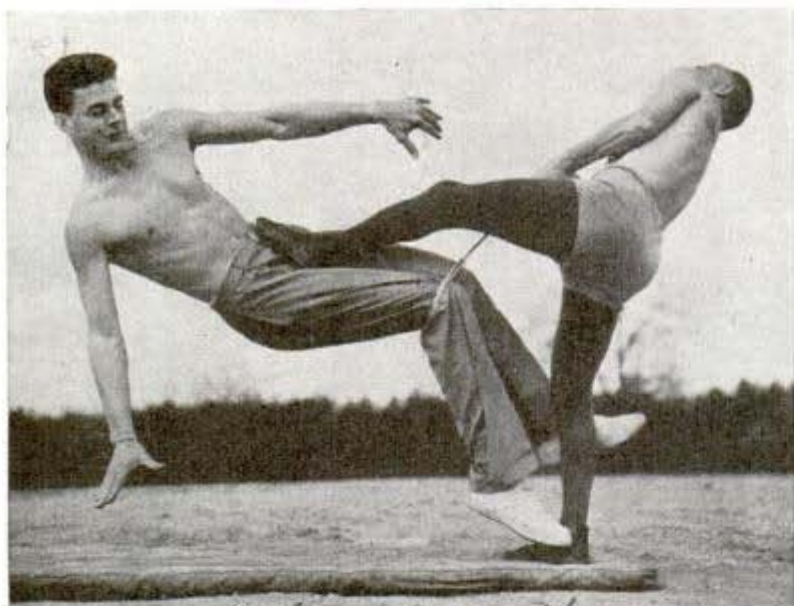
The first rule is never to strike with clenched fist. Hold the hand stiff, fingers straight, and strike with the hard edge of the hand between little finger and wrist. Use a chopping motion and aim for the enemy's Adam's Apple, side or back of the neck, the base of his spine, his kidneys,

Here's a lesson in coolness under bayonet attack demonstrated by Col. A. J. Drexel Biddle who instructs marines

Two marine parachutists show how to keep in top shape with a few turns on the mat
U. S. Marine Corps photo



Langley, Va.



Columbia U
Dr. Francois D'Eliscu demonstrating anti-Jap "rope trick." Above, rope is looped around knees, victim kicked backward. Right, ends of rope are tied around throat

biceps or forearm. With a little practice you can break a bone with this blow.

Then there's the chin jab delivered with the heel of the hand with fingers spread to reach the opponent's eyes. When it comes to kicking, the men are taught never to kick forward, but always to the side for greater force. A side kick just below the knee cap is followed up by scraping down the shin to the instep and topped off with your weight on the enemy's foot to break the small bones.

If your foe is flat on his back take a flying jump for the "bronco kick." Knees are drawn up and when your feet are about eight inches above his body shoot the legs out straight to deliver a smashing blow. (Dummy figures stuffed with grass are used in practice for this one.)

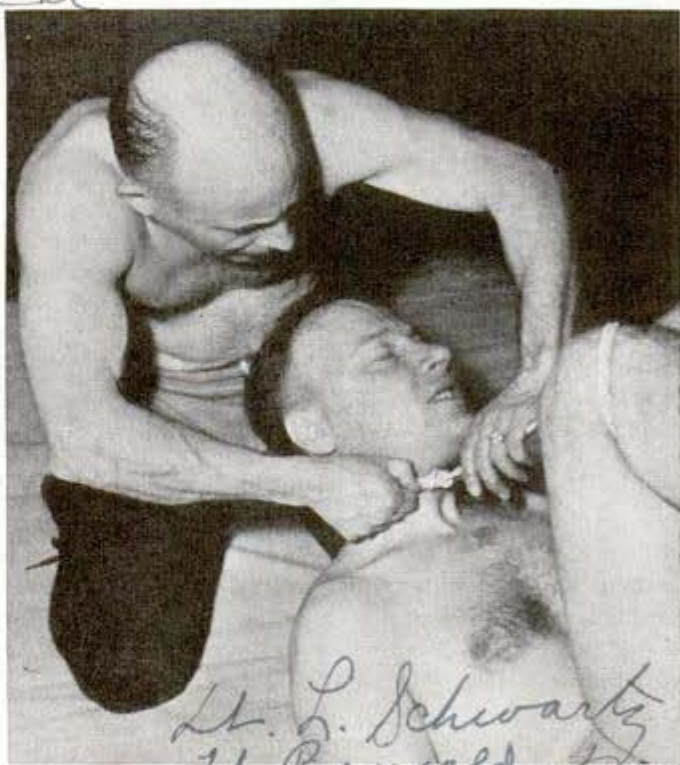
A vicious attack can be made from behind by jumping on a man's back with a sharp kick to the back of his knees as a quick follow-up. He doubles up like a jackknife and if you twist at the same time the spinal cord is severed.

Another back-breaker is delivered by approaching an opponent from the left side and seizing him by passing your right arm over his chest and your left arm under his legs behind the knees. Lift him up and

take a short pace forward with your right foot. Then smash him down on your bent right knee with all the weight of your body.

It's easy to see that these are not parlor tricks. Practicing any of them on friends would be like a high school chemistry student experimenting with TNT. That is why all military classes in hand-to-hand combat have expert instructors.

The men are taught how to break holds during a surprise attack, how to disarm the enemy if he



H. L. Schwartz
H. Ringold, Tex

approaches with gun or knife, how to lead a prisoner with a thumb hold that requires little pressure. They learn that the most vulnerable spots on the human body are the solar plexus, groin, throat and chin.

Suppose a Jap attacks from behind, grabbing a sentry around the throat with his left forearm, his right hand upraised to stab. The right elbow of the alert marine will swing back like lightning into the Jap's solar plexus, doubling him up before he can deliver a death blow. Then the Jap will be polished off by being pulled over



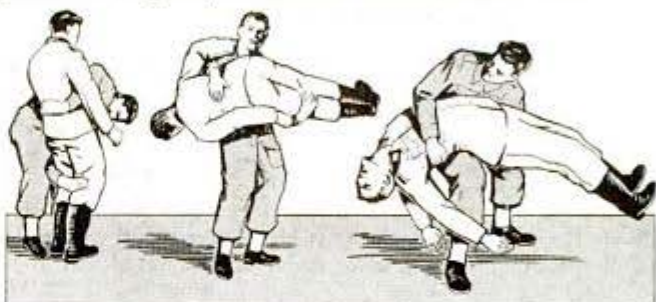
Army officer shows two ways to meet the charge of an enemy in hand-to-hand combat. Left, foe is caught by wrist and sailed over officer's back to land neck first. Right, smashing foe in face with a well-placed knee. Below, demonstrating Capt. Fairbairn's "back breaker" hold

the marine's shoulder and smashed to the ground on his head. This is only one of scores of defensive moves taught to the marines by Maj. Dick Hanley, former football coach at Northwestern University.

If a sailor is seized from in front with his hands pinned to his sides, all he has to do is remember Rule Nine in "Method of Self Defense"; "Kick him in the shins. Stamp on his foot. Bump him in the face with your forehead. Work your hands into the pit of his stomach and force his body backward. Then knee him." The sailor is also laconically reminded to "remain calm and collected throughout any crisis."

The paratrooper who may be dropped behind enemy lines is taught to make a silent approach to a sentry and "eliminate" him without firing a shot or hurling a hand grenade. Cupped hands strike simultaneous blows over both ears, bursting one or both eardrums and probably resulting in a mild form of concussion. Before he recovers from the blow he is caught in one of a dozen strangle holds.

The men are taught to make use of simple weapons that are as innocuous at first glance as a short rope, a wire loop or a stick. Capt. Fairbairn, author of "Get Tough—How to Win in Hand-to-Hand Fighting" (Appleton-Century, New York, \$1), teaches a deadly technique with a small stick. A sharp



Above and below, the navy's "rough and tumble" tactics reveal fine points of throwing man by heel twist and toe hold





Navy instructor rehearses "Nazi reception" with cadet. Left, locking foe's right arm to body, he delivers sharp blow under chin, knees victim. Right, using heel of hand for "snout punch"

blow is delivered to the stomach followed by a jab to the neck. If you miss the neck, the stick which is held in both hands is used to rip across the enemy's face with all your weight behind it.

A bizarre form of "jump the rope" is taught by Dr. D'Eliscu. He uses a five-foot sash cord which he calls a "hog tier." After kicking the enemy in the stomach, the rope is looped around his knees and the loose ends drawn about his neck. If the victim doesn't strangle himself with his own struggles, the process is hastened by sitting on his face and pushing forward on his knees.

Another deadly weapon is a length of wire with a wooden handle on each end. It can be looped over a sentry's head and pulled taut with one motion. The piano-wire garrote with weighted end needs no description to explain its gruesome use or effectiveness.

Machetes, curved knives, tommy guns,



Sketch from Capt. Fairbairn's book "Get Tough" shows a "rib crusher" Courtesy Appleton-Century Co.

high powered rifles and hand grenades are used by American Bushmasters, named for the venomous jungle snake, and Pioneer troops. The Pioneers are picked men from the combat engineers who will clear a path for advancing troops. With mud-blackened faces, ferns and brush stuck into their hats and collars, they creep forward to establish bridgeheads and demolish enemy installations. If they lose their bush knives or guns they can fall back on the Army's version of jujitsu for protection.

One of America's most colorful and least known soldiers of World War II is the Bushmaster. He is as much at home in the Panama jungles as he once was at 42d street and Broadway, or State and Madison streets, or Main street and the county highway. His tactics are borrowed from native jungle fighters, the American Indian, British Commandos, exponents of judo and the Shanghai underworld. His average age is

22 and his favorite weapon is the long-bladed machete.

The jungle commando moves through the bush like a green shadow, flicking his wrist to cut a path with his knife. With his fellow Bushmasters, he disappears from civilization for weeks at a time. The men know how to sustain themselves on wild fare supplemented by concentrated "iron ration" carried in their packs. When they are not testing their camouflage against aerial observers, making camp in a swamp, or working out an intricate code of communications, they practice jujitsu or improve on the native's technique with the machete. The Bushmaster bows to no man in the art of hand-to-hand fighting and any unwary Jap who crosses his path would probably never know what hit him.

One of the prerequisites for efficiency in dirty fighting is excellent physical condition. An extension sports program helps keep the armed forces fit. Baseball, football, boxing, wrestling, tennis, fencing, swimming and other sports serve as both recreation and physical training. Many famous athletes, including Commander Gene Tunney of the Navy, are leaders in the programs designed to build strong fighting men.

Many colleges and universities are expanding their sports programs during the war and some have added classes in "personal defense." The latter is aptly termed "dirty fighting" by the students.

The University of Illinois has a course called PEM 58 which teaches prospective soldiers how to execute the "front choke, groin slam, back flip, wrist breaker, eye gouge" and a few other tricks never before mentioned in faculty circles. The students are taught that the soldier who observes the rules of a gentleman in personal defense is just using poor judgment and probably will be killed or captured. Only the tough guys survive.

The average redblooded American loves a fair fight and good clean sport, but right now he's out to show a below-the-belt, rabbit-punching enemy that if it's a dirty fight he wants, that's exactly what he's going to get.

¶ You can obtain additional information about products described in this magazine by writing to the firms listed in the Where-to-Buy-It index. Say You Saw It in Popular Mechanics.

FEBRUARY, 1943

*Rohm and Haas Co.
515 Greenway
Philadelphia, Pa.*

Plastic Lens on "Jeep" Light, Hides Rays From Enemy

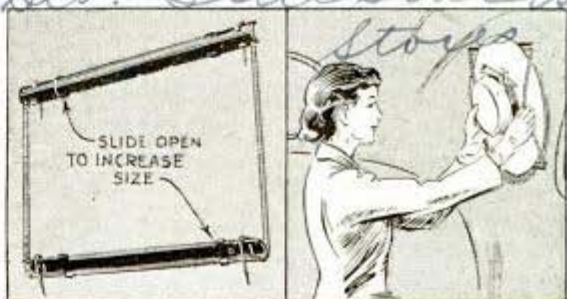


Shields make "jeep" lights invisible from the air

Army "jeeps" can use their headlights at night without risk of being seen by aerial observers, if the lamps are equipped with special lenses made of Plexiglas—the same plastic that protects airplane gunners from the elements and bullets. The unbreakable lenses pass enough light for safe driving but not enough to be seen from the air. They are also used on taillights.

Pin-Up Hat Rack for Car or Tent Fastens on Wall or Ceiling

Equipped with pins for attaching it to fabric surfaces, as in an automobile or tent, a hat holder now available is easy to install on the ceiling or side walls. The pins are mounted at the ends of two parallel metal strips, which are connected by a pair of fine spring coils.



Hat holder, left, can be used in automobile or tent

*2007 S. State
Chicago*

45

GUNS ON WHEELS



This giant of the field artillery, an M-1 155 mm. gun, is the latest and heaviest mobile unit in actual service. It has range of more than 15 miles. The gun rolls along on 10 rubber tires and is towed by a tractor. One major advantage is that it can be moved without dismantling—thus it is ready to blaze away at enemy positions without delay. The army's hard-hitting field artillery prepares the way for break-through by infantry. Big brother of the M-1 is the 240 mm. howitzer shown below ready for action as its gun crew runs to firing positions. This gun is broken down into several loads for transport. An effective long range weapon, it is used for battering heavy fortresses



↑ Modern warfare hasn't become so mechanized that the army can dispense with old stand-by—the mule. Here gun crews are unloading barrel of 75 mm. pack howitzer, lighter than standard field artillery piece



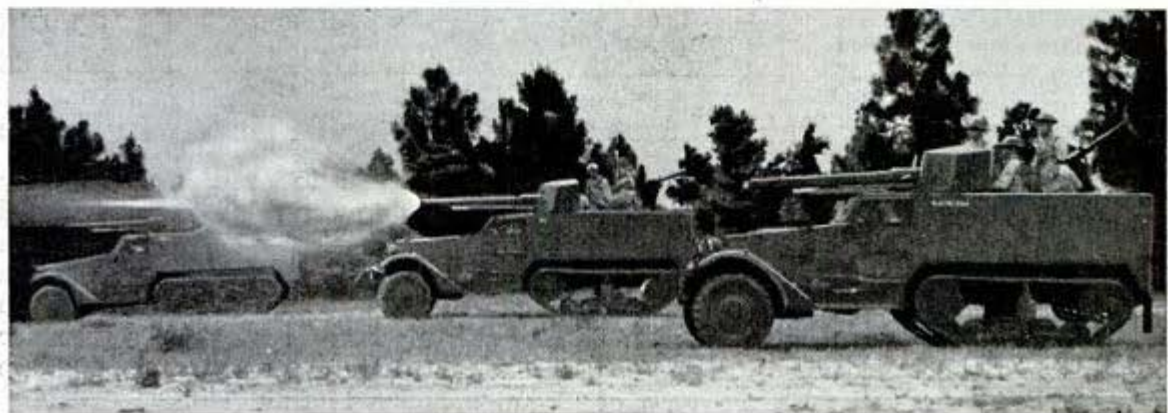


↑ Swinging a big shell toward breech of 240 mm. howitzer with heavy crane. The shell is lifted to movable track which eases it up to the breech to be followed by powder propelling charge. Right, the 155 mm. gun lifts its nose to maximum elevation just before firing. One member of gun crew attaches firing lanyard, or rope, to the breech and in few seconds a command to fire will send the heavy shell hurtling out of the barrel. Members of the gun crew must be strong as well as dependable



↑ Leading mule carrying wheels and breech of 75 mm. pack howitzer. It takes six mules to move a gun

The "tank destroyers" (below) are half-track war machines mounting 75 mm. guns. The one in center has stopped to fire its big gun in maneuvers. These units are extremely mobile, hard to hit. Each carries heavy machine gun and some tommy guns



Doc 1061-8 ad, sup

"Jungle Mudders" Man Guns Hidden in Swamp



Located in the swampy terrain of Caribbean outposts are big guns manned by U. S. soldiers of the coast artillery known as "jungle mudders." The men, toughened by months of training in all phases of jungle warfare, are some of Uncle Sam's most formidable and resourceful fighters. The guns they operate are expertly camouflaged and from the air appear as part of the jungle foliage.

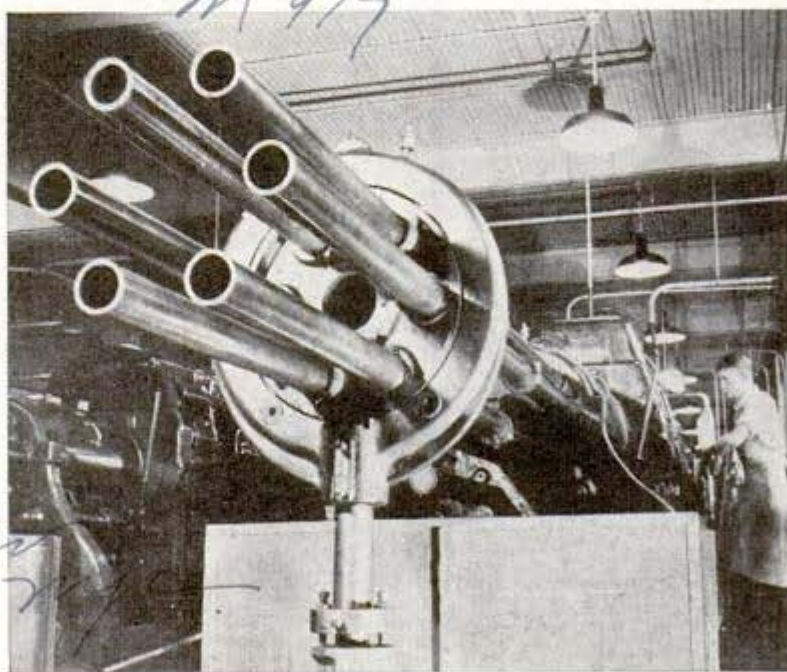
To observers a few hundred feet up, this big gun located in tropic swamp at Caribbean outpost is just part of the dense jungle foliage

Production-Line "Gatling Gun" Helps Turn Out Shells

Far behind the battle lines, a multi-barrel "gun" is doing its bit in supplying shells for armed forces of the Allies throughout the world. It looks so much like a weapon that the men who operate it refer to it as "the Gatling gun of the production line." In reality it is a multiple spindle automatic screw machine, performing operations on shell bodies, and is used by a firm that formerly made cash registers.

Doc 1061-8 ad

This machine is not as menacing as it looks, but it makes shells that eventually find their way to the "real thing"



Power Lines Carry Raid Alarms to Handy Plug-In Buzzer in Home

Both audible and visible warning signals are given with a home alarm which is operated by a special control board attached to the carrier-current transmitter at a power station. Designed for air raid wardens and civilian defense officials, the warning device can be plugged into the house circuit. It is operated with the type of

M 1073

equipment used to send impulses over power lines to control street lights and would relieve telephone lines during an emergency. The alarm is equipped with a buzzer and a rotating colored dial. The dial shows white for all clear, yellow for preliminary caution, blue for advance caution, and red for air raid.

Rome - #61-8 av, nyc

"Flying Jeep" Comes Apart to Load on Truck

When the U. S. Army's "flying jeep" can't be flown to location, they take it apart, load it on a truck and haul it with equipment to the scene. The plane is a small artillery liaison craft now being used in the European war theater. Quickly dismantled and assembled, the tiny ship can land or take off on very small fields, whether they be smooth or rough. On a truck it makes a compact load, its wings lying parallel with the fuselage.

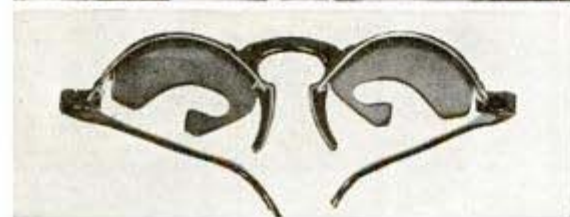


"Flying jeep" assembled for flight (top), and being transported on truck

Thin Glass Fibers Help Camouflage War Plants

Lightweight glass fibers, thinner than a human hair, are used to cover metal-mesh camouflage nets over vital war plants. The flexible fibers which are resistant to weather and fire are painted with designs that blend with the surroundings. The glass-covered nets are supported by a special framework.

Anti-Glare Glasses for Driving Adjust to Fit Conditions



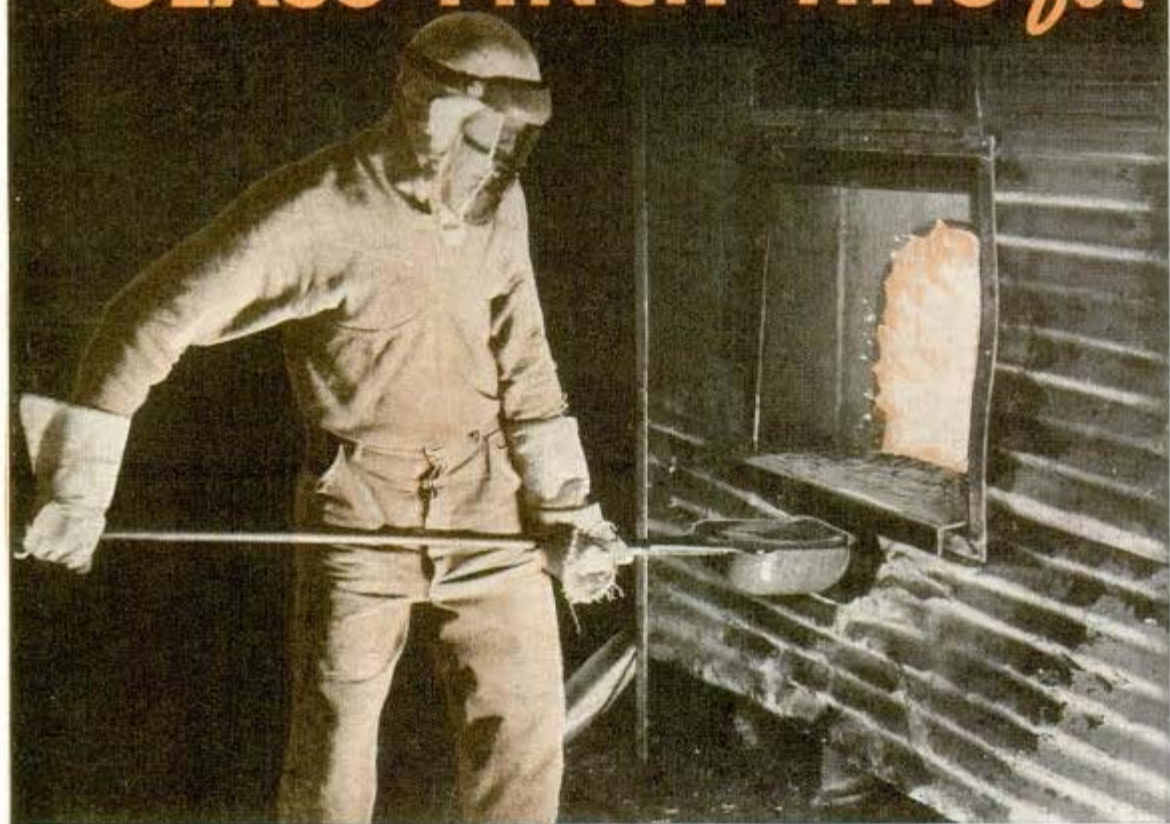
Equipped with adjustable, oddly shaped lenses, driving glasses now available can be changed quickly to fit the wearer and shield the eyes against glare from any angle. For night driving, for instance, the purple lenses may be adjusted to split the road so as to cover headlights of oncoming cars to the driver's left, while leaving the vision unobstructed directly in front. The lenses also may be shifted to take care of daytime glare whether from the left, right or overhead. The plastic lenses are held in slots of the half-rims by friction.

Lenses may be shifted to cut glare from any angle

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

Some discontinued

GLASS PINCH-HITS *for*



Talbot O
It's warm work ladling white-hot molten glass from a furnace at Owens-Corning Fiberglas plant. Below, a worker employed by Libbey Glass Company over a half century polishes the edge of a fine crystal vase



M 857
By Roderick M. Grant

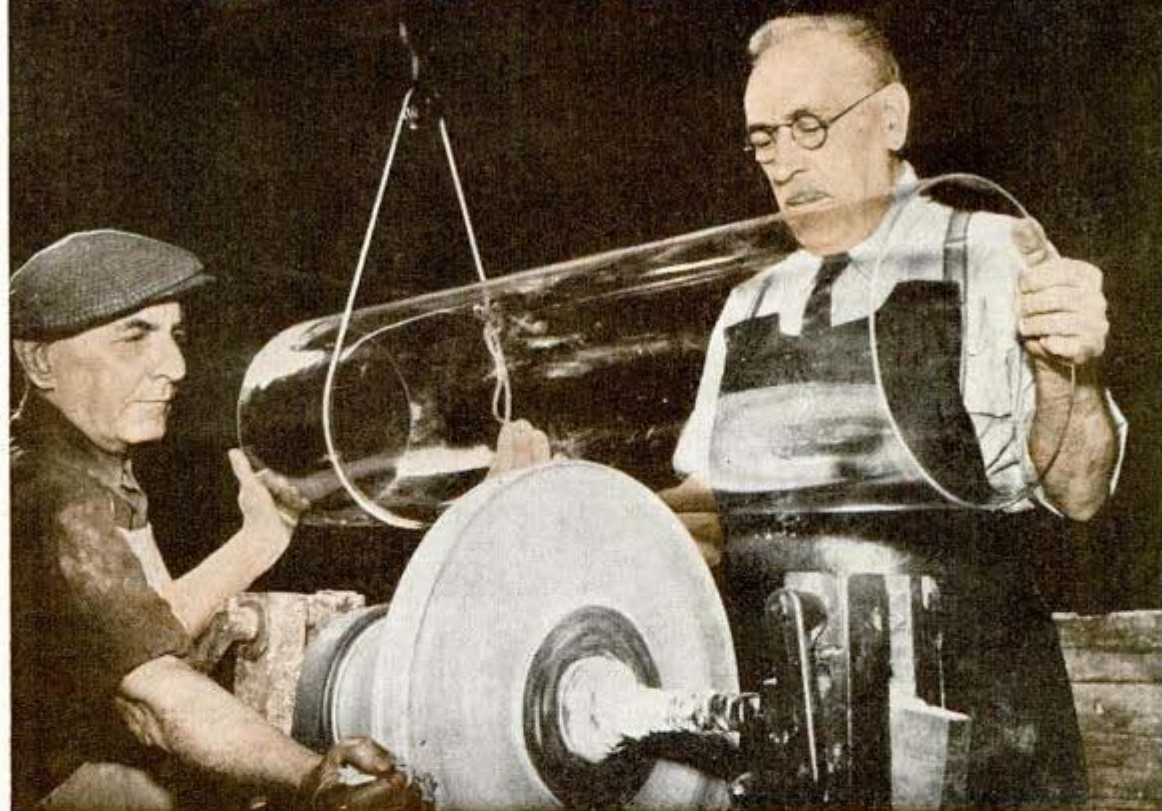
IT'S LIGHT as a bubble and tough enough to stop machine gun bullets. It's as old as Rome and as new as next week. You can wear it, cook in it, live in it. To sailors and surgeons it's a lifesaver. To you it's—glass.

Glass is as vital as Sunday, but you are so completely surrounded by it that you seldom are aware of it until the mirror drops off the wall or a baseball shatters the window. If you read some morning that the Japanese had cut off our sources of glass and that it would be rationed like rubber or tin or armor steel—army first, you last—you would begin to think about how nice glass was.

Very fortunately, Japan can't do that to us. For as long as there are lime and soda ash and dunes of silica sand in America there will be glass; and there are better things to worry about than the end of our lime and soda ash and sand.

Glass is one of the oldest materials invented by man, dating back, according to legend, to a band of shipwrecked Phoeni-

the **WHOLE TEAM**

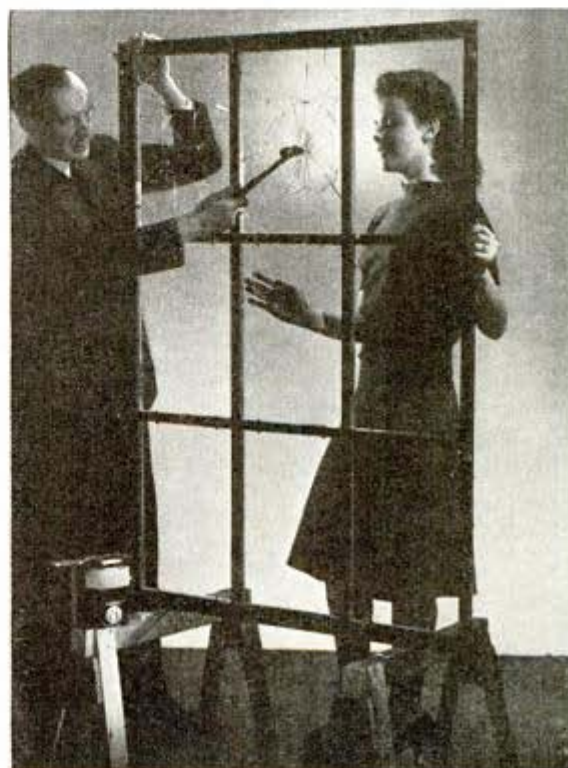


cians who cooked their picnic supper in a pot set on blocks of soda on the sandy shore of a Syrian river and were amazed to see sand and soda fuse into a stream of molten glass. Mesopotamian craftsmen were shaping colored glass into things of beauty 5,000 years ago, and windows of flat glass were found in the ruins of ancient Pompeii.

But after doing business in a conventional way for a few thousand years, the partnership of Soda Ash and Sand has branched out in the last few years into strange avenues of trade. It is like a small boy who suddenly discovers he has muscular talent and immediately takes up football, swimming, badminton, golf, tennis, pole vaulting and the ballet, and excels at them all.

Glass ceased to be merely the stuff of window panes and spectacles and goblets when about 10 years ago Owens-Illinois Glass Company, and later Corning, began spinning out tenuous glass fibers for air filters, insulating wool and textiles. It was insinuating itself more and more into other people's business when it coiled itself into springs with the resilience but not the rusting properties of metal springs; when it was shaped into fire-resistant building

Navy ships are made from blueprints turned out 20 feet a minute by blueprint machine cylinders of special glass hand-blown at Corning Glass Works. Below, a new liquid coating prevents glass from splintering





Made of a blast-cushioning glass fiber material, this mattress was designed to protect electrical switchboards and instruments from bombings

blocks, and tried as a substitute for steel in reinforcing concrete—a project still experimental but nevertheless in work.

Right now it is treading on the toes of rubber and cork and kapok, but a nation hungry for these scarcities is ready to welcome the new Foamglas, developed by Pittsburgh Plate Glass and Corning. Foamglas is a lifesaver in more ways than one. Weighing one-fifteenth as much as ordinary glass, it is a mass of airtight glass cells, permanently buoyant in water, well suited for life jackets, rafts or boats. It is "raised" somewhat as yeast raises bread.

Glass is mixed with a small amount of pure carbon; heated, it softens and the carbon combines to form a gas that puffs up the molten glass into a mass of bubbles that "jells." There's plenty of work for Foamglas to do in the war—in lifesavers, ponton bridge floats and the like; afterwards, its principal job will be to insulate cold storage plants, ice cream factories, dairies, etc. Being solid and moistureproof

Preparing to ship cartons of Fiberglas, versatile material used for heat and sound insulation
OEM photo by Palmer



it is unaffected by the vapor of low temperature rooms, and it is easily sawed and worked with ordinary tools.

Modern war would not be modern without glass. "Golden plate glass" originally intended for decorative mirrors turns out to be ideal for filtering out ultraviolet rays that sunburned warplane pilots in the stratosphere. Two-ton range finders optically ground by Bausch & Lomb are the eyes of the battleship's big guns—and those of the U.S.S. North Carolina are described as the finest in the world. The glass pot on your stove is a cousin of

the heat-tempered glass of army searchlights that withstands the terrific heat of 800,000,000 candlepower light on one side while a blizzard slashes the outside with snow. The slots of tanks are protected by thick glass that will stop a machine gun bullet, and portholes of ships are made of a tough glass that will bend but not break under the impact of a wave. In the test tube and retort, the factory window and incandescent lamp, the microscope, telescope, binoculars, the aerial camera lens and the X-ray, in the new blast-cushioning fibrous glass for blackouts and a thousand

other applications, glass is doing its vital work in the war.

It is functioning quite importantly, too, as an all-but-universal substitute. When the flat glass business was suddenly flattened by loss of the automobile window market, Libbey-Owens-Ford and Pittsburgh Plate Glass and other companies in that field began a search for other markets. They are finding their versatile product a ready stand-in for such widely different priority materials as silk and steel, aluminum and asbestos, syn-



thetic plastics and tin and rubber.

Chrome went out and glass came in as a reflector for headlights and searchlights. Sound studios turned to glass instead of aluminum for the bases of recording platters. Double-glazed, insulated doors for frozen food and ice cream cases and display cabinets replace metal, hard rubber and porcelain enamel. Glass buttons "front" for shell and plastics. Glass storage batteries save hard rubber. Several companies are making hard glass bearings to fill the gap left by restrictions on sapphire jewel bearings for instruments. Road signs may be made of glass if metal is further restricted.

Don't assume that glass is just a pinch hitter without a chance of



Skillful use of ancient tools contributes to fine qualities of handmade occasional pieces at Libbey Glass factory. The craftsman above, known as a servitor, draws out a heavy gob of molten glass to be formed into an exquisite modern vase. To make Fiberglas, a marble is drawn into a continuous filament that would reach from New York to Philadelphia; over 100 filaments are woven to make the finest workable strand. Glass yarn is twisted and plied on standard textile machinery, below, in one step of the manufacture of glass fabric. Glass textiles are made into clothing and fireproof curtains, but principally into tape and cloth for electrical insulation. OEM photo by Palmer.



*W. L. Lacey
Office of Civilian Control*

*M. R. Jensen
Owens-Corning*



A fibrous glass board that can be sawed is used in a window installation

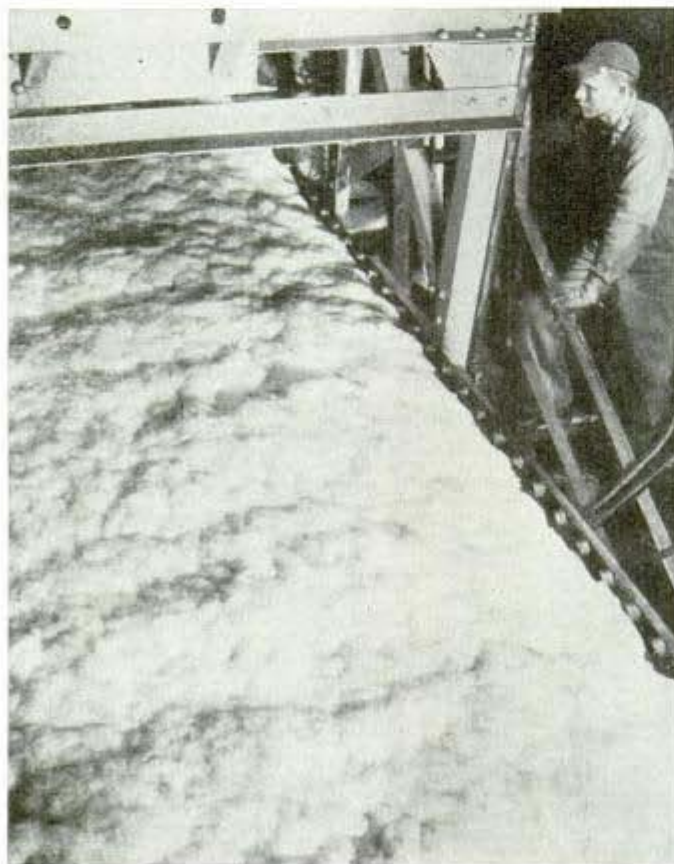
getting into the regular lineup. In many cases glass is in there to stay.

Owens-Corning Fiberglas, for example, has developed a glass thread for surgical sutures, which surgeons believe will end the danger of infections. Catgut and silk used to sew a wound sometimes become the focus of infections, and there are objectionable factors about stainless steel and

gical sponge makes it possible to locate by X-ray a sponge left in a wound.

While the war gave an initial jolt to the flat glass trade, it gave a lift—although with new problems—to the bottle makers. The industry has jumped from an annual production of 68,000,000 gross of containers to 80,000,000 gross. Reads like a nice wartime boom, doesn't it? But it isn't all velvet.

The industry can't expand to take care of increased demand, for it's hard to get machinery; the automatic bottle-blowing machine invented by Michael J. Owens in 1903 has grown into an intricate monster of 10,000 parts forming bottles faster than you say Owens-Illinois Glass Co. The conquest of Malaya and the Indies not only meant less tin for cans and so more bottles for food, but it brought headaches to the bottle cappers. Plastic caps or other seals for bottled foods and fluids must be found. To speed production, fancy shapes are being eliminated and food and drug bottles standardized in plain shapes and fewer sizes. The "deceiver" bottle, made to look like a lot and hold less, is a war casualty unlamented by you and me and the glass industry. The new bottles are lighter and stronger, cost less to ship and to



Looking more like a blanket of fleece than of glass, this heat-insulating glass "wool" is made to Army and Navy specifications

*Blumenthal 300
1631 7th Ave. N.W.
Chicago*

Repair Panel for Car Door Is Easy to Install

pack, take up less space—like the Duraglas milk bottle, one inch shorter and five ounces lighter than its more breakable predecessor, and the new quart fruit jar which weighs half as much as a conventional jar. The milk bottle once had a life expectancy of 34 round trips from dairy to you, but it'll live longer hereafter.

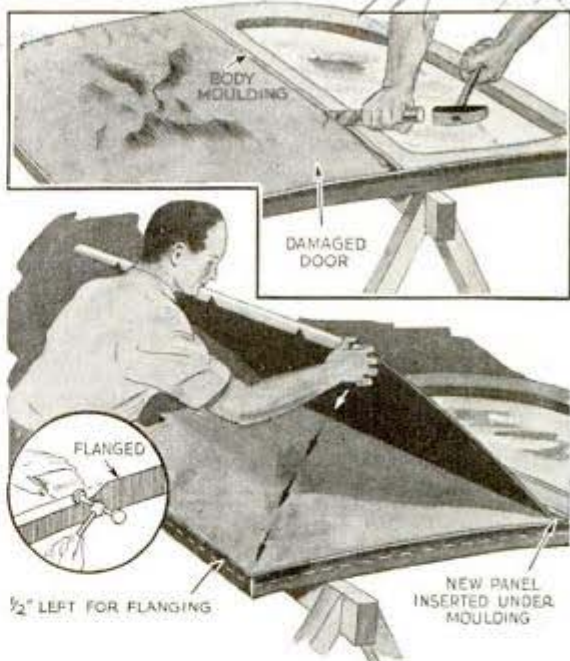
If it has been your ambition to live in a glass house and throw stones, your day is at hand. The things they are doing with glass today are little short of miraculous. You think of it as a brittle material. Yet, toughened by heat treatment, it can support the weight of an elephant; stones thrown against it rebound harmlessly. Some types will withstand a heavy impact, but disintegrate almost to powder when tapped with a hammer. Heat-treated glass like that in your stove-top utensils can be placed on a cake of ice and have molten iron poured into it without cracking.

In England they are already planning glass houses for the postwar rebuilding. Chemists have learned how to mix ingredients for glass walls or windows that will admit just the proportion of ultraviolet and infrared rays desired.

When you're ready to build and decorate that glass house, here are a few things you might include, as a starter—some of them revivals, some born of war metal shortages, some just out of the laboratories:

Glass roofing shingles; glass-windowed, glass-topped stoves with glass-walled ovens evenly lighted; moistureproof, verminproof, fire-resistant insulation; glass "blackboards" for the youngsters, glass bulletin boards for the kitchen; double-glazed windows that admit healthful sun rays and shut out heat; glass shelves and kitchen counters; tempered glass fireplace screens; glass-block walls and partitions; spun glass draperies, silken and flameproof; glass chandeliers, back in vogue in place of scarcer brass; workshop lathes bedded in tempered glass tougher than cast iron; glass "hardware" for doors, sparkling Flex-glass trim on columns; glass-tiled baths; glass agitators for the washing machine; a basement window greenhouse; toaster and waffle iron of glass cemented to metal; springboards of glass for the glazed swimming pool, and a bubble-glass lifejacket on the side; glass chairs, glass bed springs.

But there's one thing that stumps the glass chemists. They haven't cooked up a variety you can eat. Give them time.



Old panel cut off, new one is slipped under molding

To replace a banged-up automobile door is slow these days because of uncertain deliveries, besides being costly. This delay and expense can be lessened by installing a metal panel now on the market in place of the damaged one. The panels come ready to be mounted, fashioned to fit different makes of cars.

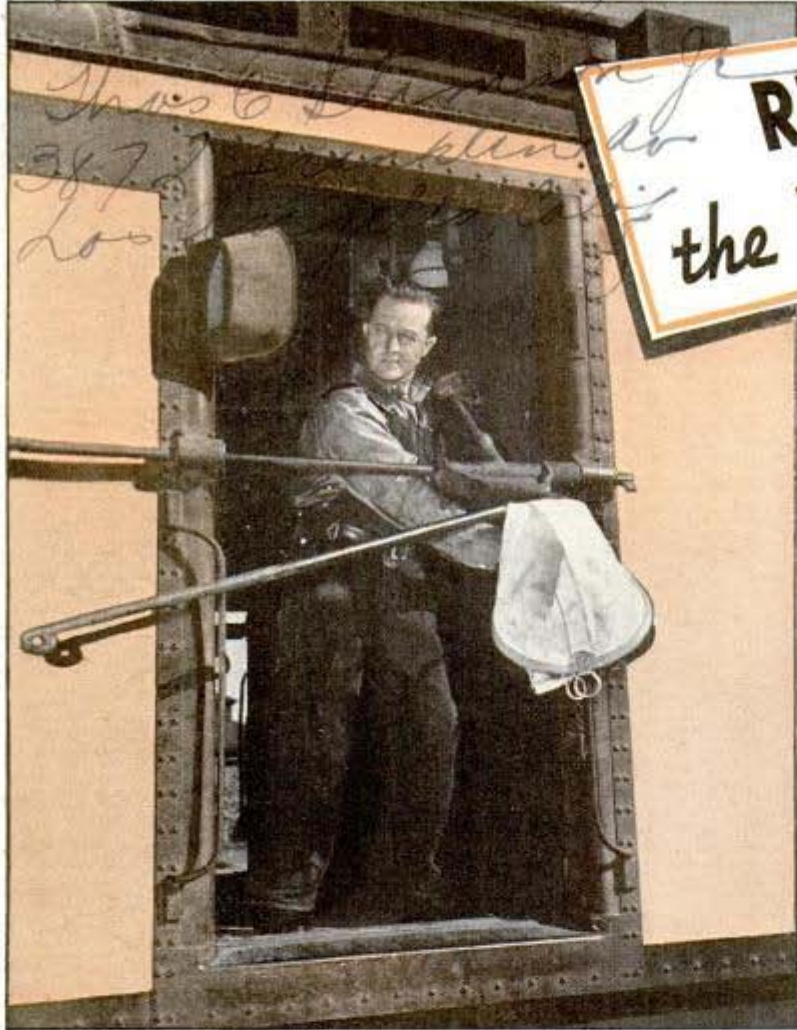
Vanadium Needed to Make Steel Extracted by New Methods

Augmenting the supply of vanadium, heretofore obtained primarily from foreign sources, a new extraction process developed by Dr. J. Perry Morgan of the Standard Oil Company of New Jersey, working under the direction of Prof. Arthur W. Hixson of Columbia University, makes it possible to recover large quantities from Idaho phosphate rock used in the manufacture of fertilizer. The discovery comes at a time when the supply of the metal is becoming inadequate because of large demands for vanadium in toughening iron and steel for armor plate, machine tools and automotive parts. The ores are too low-grade to be worked for the vanadium alone, but it is said that the metal can be extracted profitably and with satisfactory speed as a by-product in making fertilizer.

*sample for 1937-8
clean*

*977
James Morgan*

By: O'Connell & ...
P. R. Co., 560 Main St., Los Angeles



**RIDING
the FAST MAIL**
M 861

THE PASSENGER in the "rider" car was getting a fast trip. The wheel clicks drummed in his ears and he held on as the train rounded a curve.

The "Fast Mail and Express," Santa Fe's Number 7 out of Chicago for Los Angeles, was on time and the engineer was hurrying to keep it so. Its schedule to the coast is five minutes over 48 hours, next to the fastest streamliner time on the road. The train roared past some luxurious passenger coaches parked on a siding to let it by, then began to pick up more speed as it straightened out on a long downgrade.

Railway mail clerk sights through cinder guard window for mail at station, which is picked up by metal arm. Below, armed clerks transfer mail bags to car

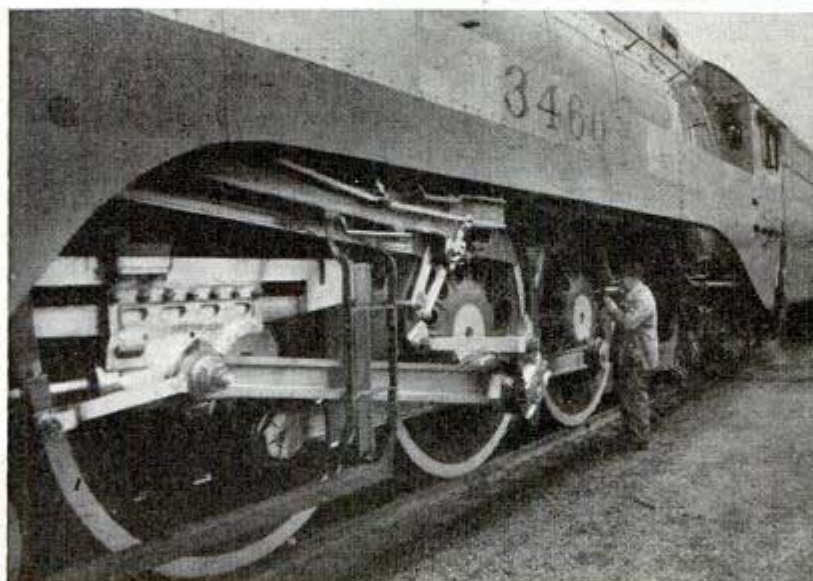
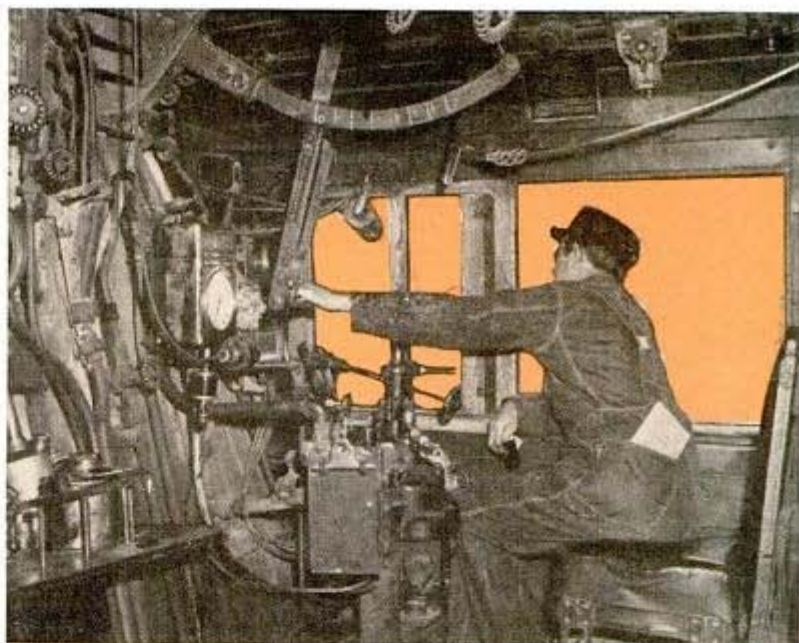


Number 7's big passenger-type steam engine was pulling nearly 20 cars. One was a railway post office car, five were filled with "destination" loads of stored mail, and the rest except for the rear-end rider car were carrying express. In the post office car the armed mail clerks balanced themselves against the centrifugal pull of the curves and scarcely paused in their work of sorting bundles of letters into the pigeonholes and swaying pouches. One of them, hearing the long whistle that announced the approach to a town, opened the side door and swung out the pick-up arm that would snatch a

bag of west-bound mail from the mail crane at the station.

Passengers are carried on Number 7 only as an accommodation. The engineer hasn't time to gentle his train for comfort when he stops or starts at division points. You sleep, if you can, by stretching out in your seat. You eat out of lunch boxes for which the conductor has telegraphed ahead.

Carrying and delivering the United States mails is a giant, complicated, and never-ending



↑
Watching the signal board, the engineer of a heavy passenger-type locomotive grasps the throttle to start the Santa Fe "Fast Mail" on its 48-hour dash two-thirds of the way across continent

No. 3460, which hauls the mail on the Chicago to Los Angeles run, is a fast steam engine with a streamlined "jacket." Its driving wheels are seven feet in diameter

←
At the Los Angeles Union Station the mail trains are shunted from the main trunk lines directly to a post office siding. Below is the interior of the control tower governing the maze of tracks

task. Each letter of all the billions that are posted each year must be routed so that it will reach its destination in the shortest possible time. For postal purposes the United States is divided in 15 divisions, each of these areas containing districts that in turn consist of various post offices. Postal employees pick the best route for each letter by consulting what is called a standpoint scheme. This outlines the primary routing a letter should





Air mail being loaded on plane here, travels faster but the bulk of the nation's tremendous mail cargo still travels by railroad

Unloading sacks of mail from a storage car to moving conveyor belt which takes it to sorting platforms inside the post office



receive and gives the number of the train that should start it on its way.

Nearly all fast trains these days carry some mail. In addition there are the special trains that carry mail and express almost exclusively. When Santa Fe's Number 7 pulls out of Chicago each night bound for southern California, other fast through trains are also leaving for other western destinations. At the same time, trains carrying western mail are leaving the coast for eastern points.

There may be half a dozen or more clerks at work in each railway post office car. Each car contains 744 letter distribution boxes as well as 210 racks and overhead boxes for newspapers and parcels. Distribution en route consists mostly of sorting the last-minute mail that has come on board unsorted, and in routing letters that have been picked up at way stations.

The railway post office clerks work all sorts of odd hours, based on a 40-hour week. Sometimes they spend 15 hours on duty, other times only five or six. Sometimes they make a round trip of



The conductor at the rear of the "rider" car gives the engineer the "highball" signal. The "Fast Mail" carries no sleepers



Inside the railway post office car, left, clerks are busy sorting and distributing the last-minute mail. The wire chief of the Santa Fe railway, right, tests telegraph circuits essential to on-time operations

nearly all the way across the country, then lay off for a couple of days, and sometimes they work steadily for several such trips before taking a rest.

At an important distribution point such as Los Angeles, other mail clerks work at a frenzied pace when a mail train is shunted down the special track back of the post office building. Bags of mail are tossed from the storage cars onto an endless conveyor belt that carries them inside the post office to distribution platforms. One sack may be destined for Los Angeles, another for a nearby army camp, a third must be chuted to a waiting mail truck that delivers it to a suburban electric line. Fifteen minutes in inspecting and tossing the heavy sacks wears a crew of men out, then another group tries to keep up with the flow of sacks while the first group rests.

The railroads, of course, are only one of the many kinds of conveyances that carry the mail. The post office department uses or contracts for whatever kind of transportation is fastest or available. The United States mails are carried by rail, airplane, steamer and

speedboat, on horseback, by dog sled in the north, and even, as was the case at Corregidor, by submarine. Many sparsely settled sections are served by so-called "star routes" on which responsible individuals contract to deliver letters and packages by the best means available.

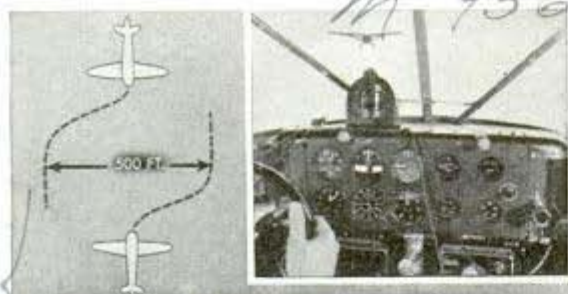
(Continued to page 169)



Pneumatic tubes at a railway telegraph office dispatch train orders to train crews

Baltimore

Flight Training Films in Kit Cover Score of Subjects



If you approach another airplane coming toward you from ahead, or head on, both you and the other pilot **turn to the right** and pass at a horizontal distance of at least 500 feet.



Copyright Jam Handy Picture Service, Inc.

Slide films help train pilot and aviation mechanic

Slide films that cover three branches of aviation training, including pilot instruction, engine mechanics and maintenance, are contained in handy kits. The pre-flight pilot training kit has films on aircraft regulation, traffic, flight instruments, weather, navigation and other subjects. The films are based on the official ground school material of the Civilian Pilot Training Program and approved by the Civil Aeronautics Administration.

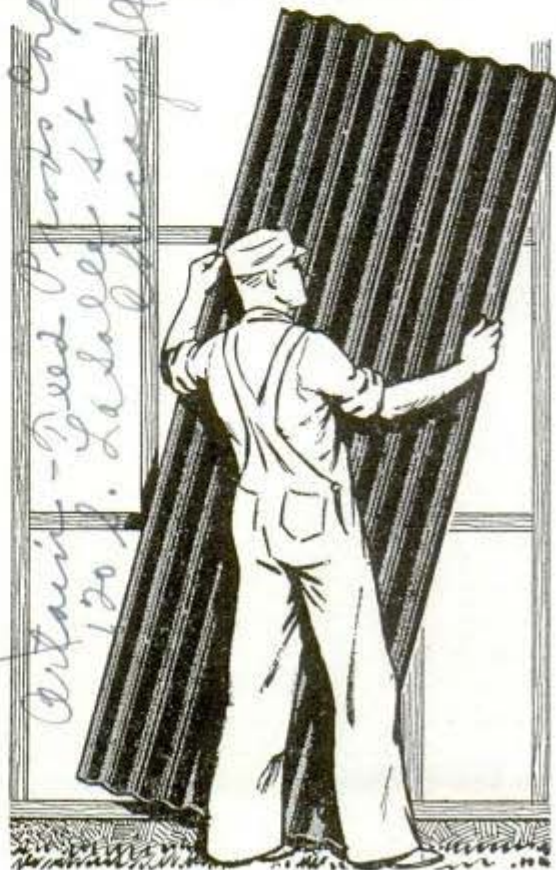
"Heating Pad" for Plane Wings Takes Out the Wrinkles

Operating on much the same principle as an electric heating pad, a giant heater takes the wrinkles out of riveted sheets of aluminum after they are placed on the wing of an airplane. Wrinkling and buckling are caused by the pounding of rivet hammers. The heater, developed by the Glenn L.

Martin Company, fits snugly over the wing and raises the temperature of the aluminum "skin" to 140 degrees. This causes expansion which takes out the wrinkles and buckles. Before the metal cools it is stitch-riveted around the edges and along the ribs, which keeps the skin taut.

Corrugated Asphalt Wall Siding Replaces Metal Sheets

Made entirely of non-critical materials, a new moistureproof durable corrugated asphalt siding is now available for outside walls where steel normally had been used before metals were restricted. It may be applied to many types of buildings, such as factories, warehouses, sheds, and barns. The siding is made by soaking two sheets of heavy felt in a resino-bituminous saturant, and then binding them with a high-melting-point asphalt adhesive. It is said that, due to the high melting point of the materials, the corrugations will not flatten out during hot summer weather either while the sheets are in storage or after being applied to the wall. Asbestos roof coating should be brushed or sprayed on the wall immediately after installation.



Asphalt takes place of metal in outside wall siding

182 of E. Grand Blvd
Detroit, Mich

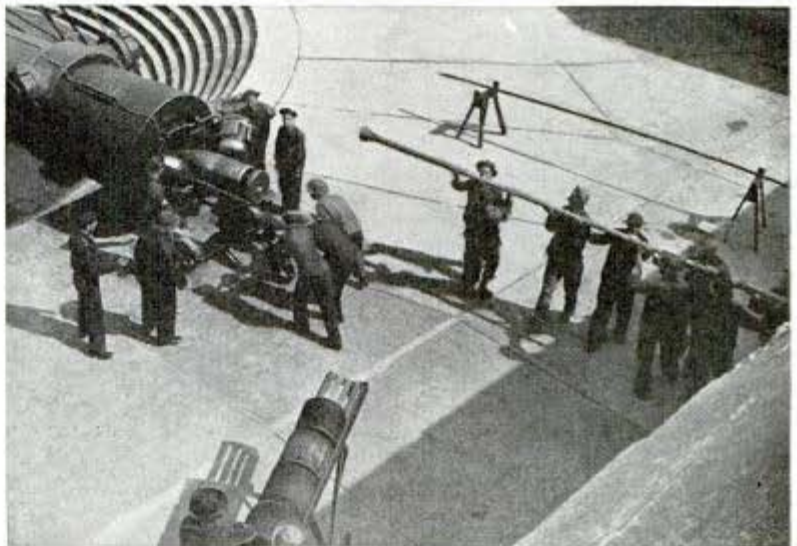
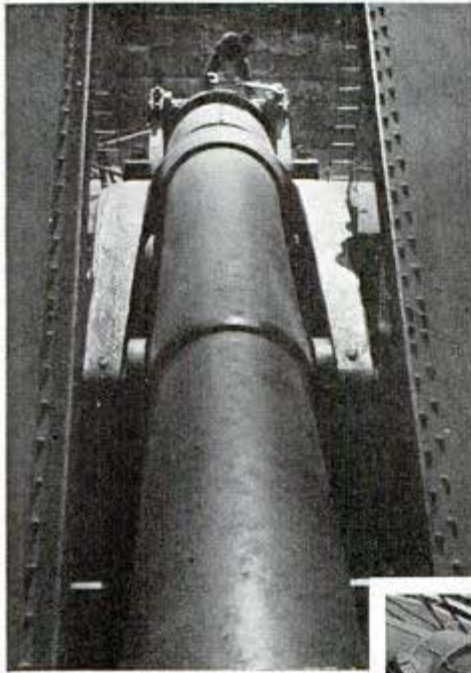
M 956

M 994

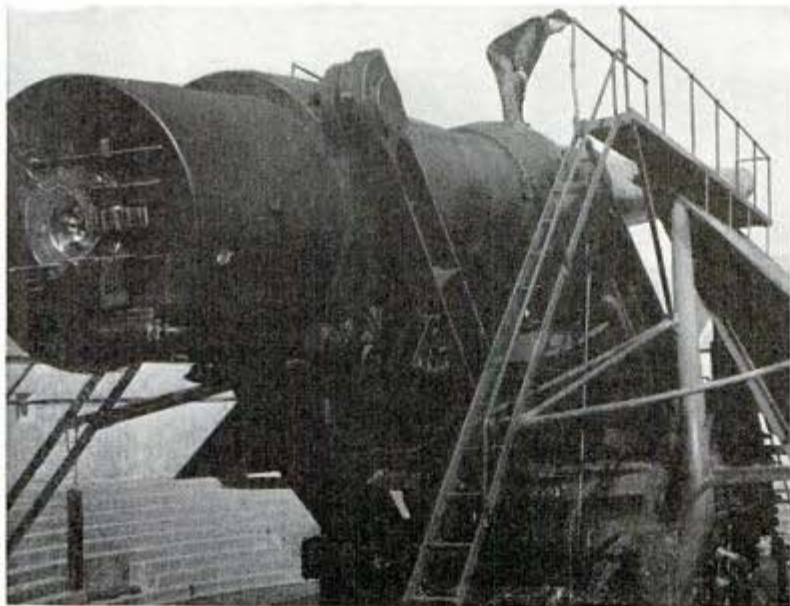
Artway - Reed Photo Corp
120 S. La Salle St
Chicago

Public Relations Dept

Coast Artillery Teaches a 16-Inch Gun to Speak



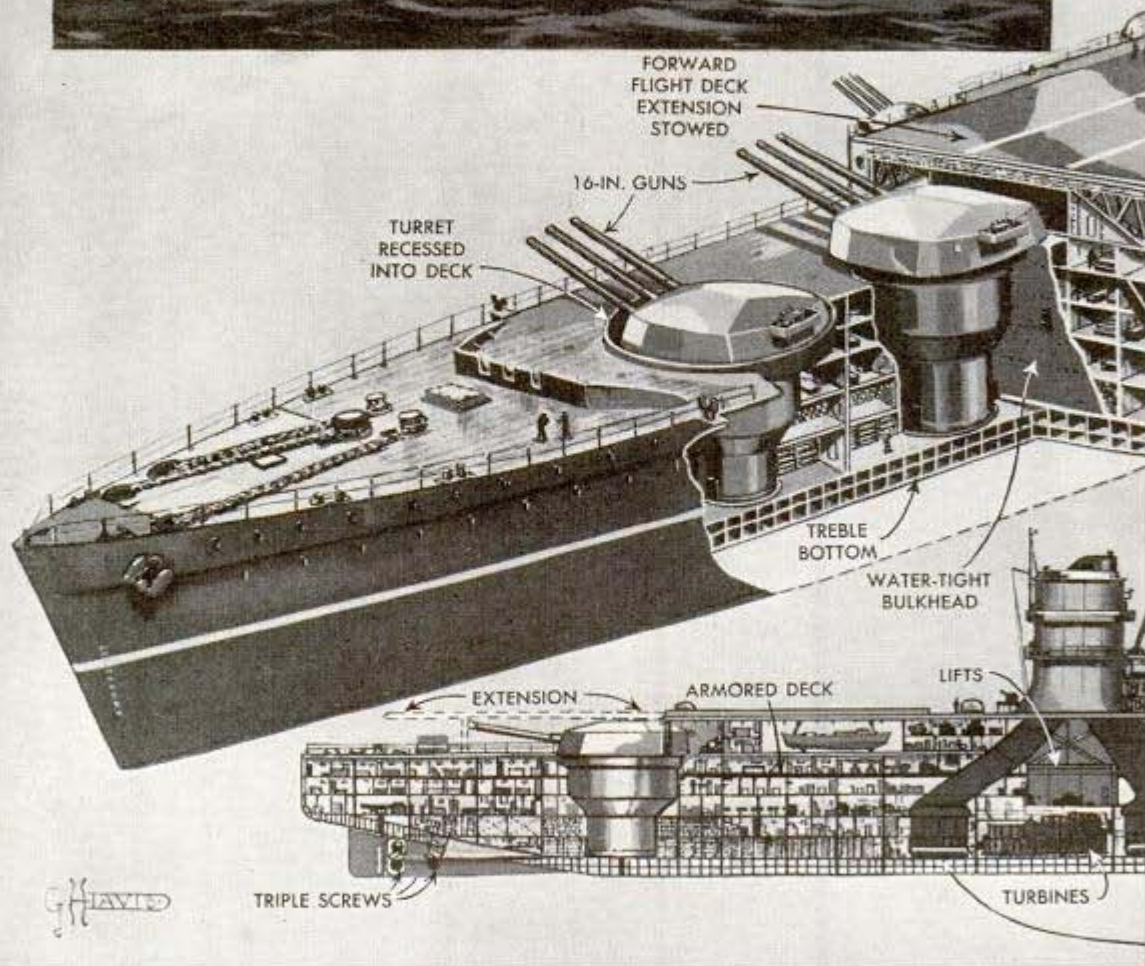
It takes a crew of 42 men to man the big 16-inch guns that guard America's coasts. When the gun commander yells "Fire!" a 2,000-pound shell, propelled by 800 pounds of powder, hurtles forth for a maximum distance of 28 miles. The terrific recoil of the gun, which brings it down 15 feet to loading position, severely strains its foundation. Above, a member of crew tightens a giant nut. Top right, gun pointer sighting through a telescope. His right hand grips firing lever which is pulled up



Above, loading the 16-inch go-liath requires teamwork of high degree. As the shell enters the breech, the ramming rod is lifted to position to force it deep into gun. Then powder bags are pushed up against the shell. Before loading, the temperature of the powder is taken, for the higher the temperature, the higher the propulsive power. At left, the gunner, who just stepped off the "bridge," yells directions down to the sergeant who is giving the mechanical workings of the gun a final check before firing. The gun must be ready for action at all times—as well as the crew. Seacoast batteries are on a 24-hour alert for the duration of the war. Drills are held without warning and at a signal men rush to various posts

London Electric type Agency
134 Fleet St London England
Battleship-Carrier Could Guard Itself in Action

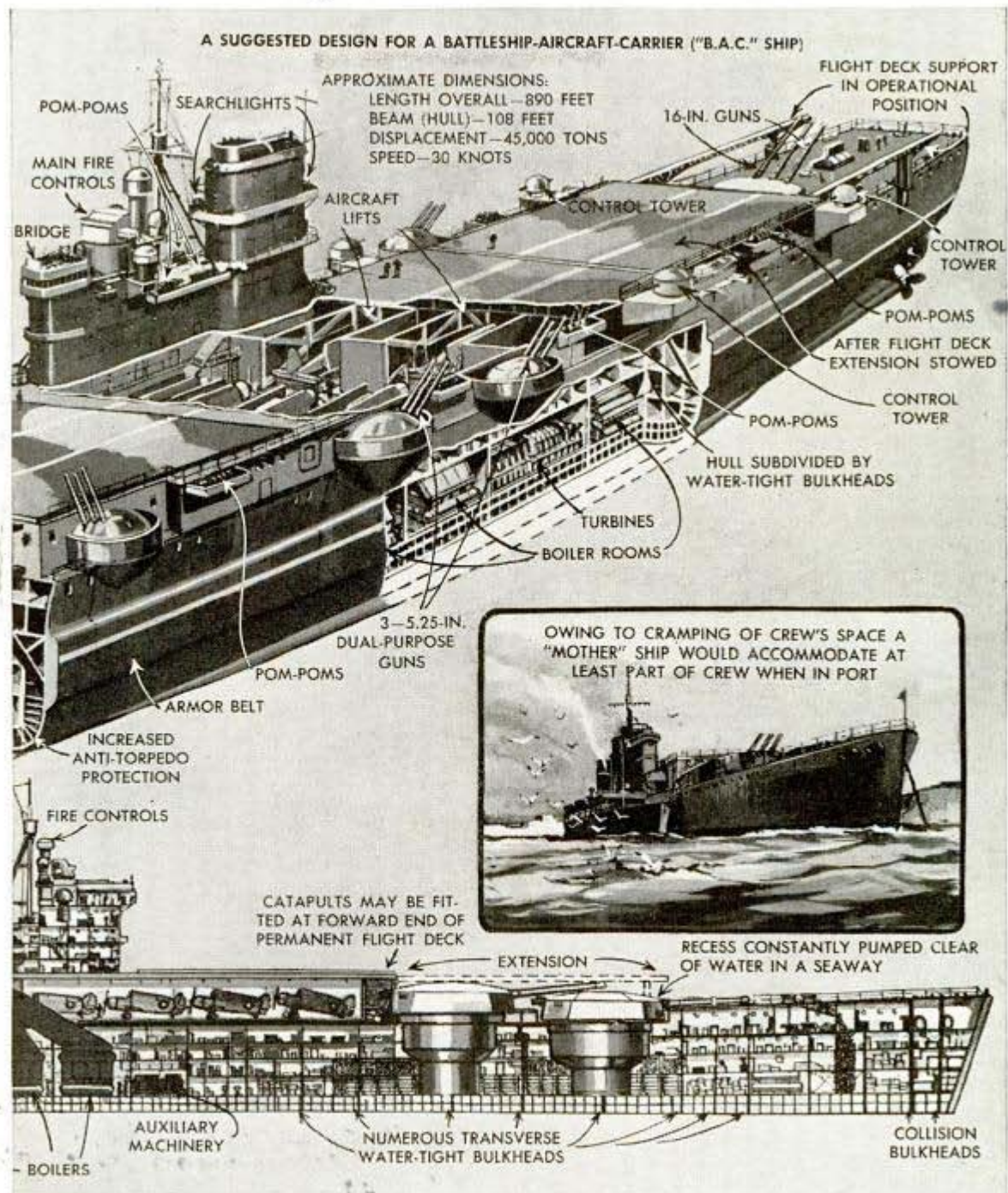
m 9/16



Vulnerability of the aircraft carrier in its present form, coupled with the helplessness of the most powerful battleship without guardian airplanes, have inspired a proposal in England for a combination battleship-carrier armed with turrets of 16-inch guns which could be recessed into the deck to accommodate an extensible flight deck. It would be a tremendous vessel of probably 45,000 tons, incorporating the full armament of the dreadnaught, both

primary and secondary, and would be heavily armored against attack from above or below, with a treble bottom, antitorpedo belts and liberally protected throughout by numerous watertight bulkheads. A ship with these combined functions would necessarily be huge, requiring the immense storage capacity for shells and powder magazines to supply the big guns and anti-aircraft batteries on a long cruise plus the tremendous space needed for hangars, air-

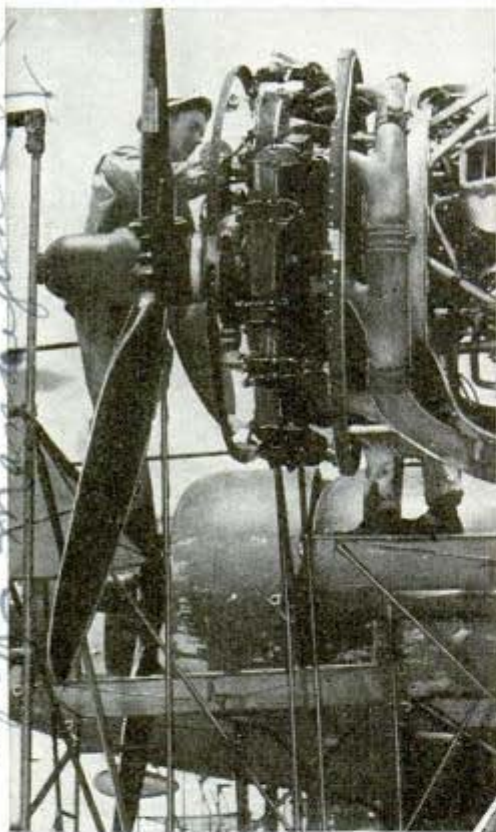
Extensible Flight Deck Covers 16-Inch Turrets



craft repair shops and gasoline storage tanks belowdecks. The compromise would inevitably cramp the quarters of the crew. The battleship-carrier's brood would likely comprise about 15 fighter planes plus two or three torpedo-reconnaissance craft. The central portion of the upper deck would be a permanent flight deck, perhaps with catapults at the forward end. From this permanent deck the extensible sections would extend fore and aft, rolling on

steel bridgework supports which pivot against the end of the permanent deck when not in operation. A heavily armored deck at the level of the hangar floor would protect the vital parts of the vessel from aerial bombs. Two elevators from hangar to flight deck would shuttle the aircraft quickly. The single funnel and the "island" structure for the bridge and main fire controls would be placed at one side as they are on present aircraft carriers.

It's Brawn and Brains That Keep 'Em Flying



Keep 'em flying is a tough assignment if you mean keeping the Flying Fortresses equipped with efficient power plants. It takes a high degree of technical skill to adjust the four engines, as at left, and a liberal amount of muscular strength to replace "tired" engines with new ones, above, when the mammoth ships return from long bombing missions



Photos, Southeast Army Air Corps Training Center

At a southern training center for the U. S. Army Air Corps, the mechanics who restore "pep" to the hearts of war-weary ships cannot be convinced that their work is more than a mere sideshow, shunning any praise for themselves but thrilling at the news that a Fortress has found its mark. Framed in the circular engine mount, above, one of the great ships, carrying wounds of battle, awaits the replacement this corporal and private are pushing along. Left, top being replaced on big crate after removal of its burden, a powerful engine. These crates then go back to their starting point for another new engine

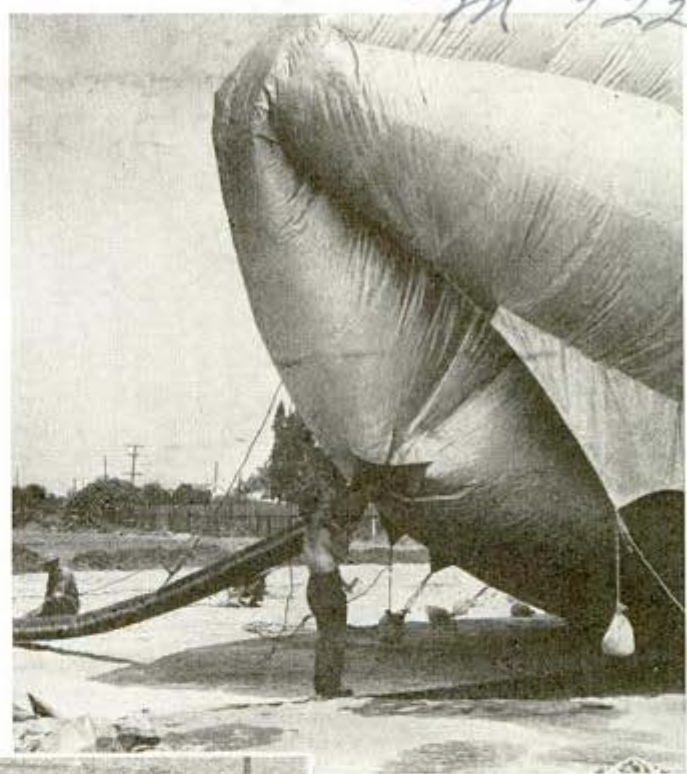
*Corp. Alex. Halston
Dartmouth*

*Mr. John Bacon
The Magazine*

*Office of Asst. Chief of Staff G-12
Maxwell Field, Ala.*

Barrage Balloon Is "Bottle Fed" Through Nose

Inflating the big barrage balloons that protect coastal cities against low-flying enemy planes is called "feeding the baby" by crew members. The "bottles" are hydrogen gas cylinders. Rubber hoses attached to the cylinders carry the gas to twin manifolds which relay it to the balloon's "appendix" located in the nose. The crews maintain that the huge balloons exhibit individual traits, especially when they are aloft, and many of them are named.



"Feeding the baby" is what crew members call the process of inflating giant barrage balloon → with hydrogen gas. Rubber hoses attached to cylinders carry gas to balloon's "appendix" in nose ↓



Americans Growing Near Sighted Due To Indoor Life

America is fast becoming a near-sighted nation, says the Better Vision Institute of New York City. From the beginning of history human eyes had been adapted to far vision, but today most adults spend many hours reading newspapers, magazines and books—all close, hard work for the eyes. More and more, people are moving into indoor occupations most of which require close focusing. This evolution from a far-looking to a near-looking race is gradually bringing about a change that will make our eyes function like those of fishes, whose vision is sharpest when fixed on objects near the end of the nose.

*m 1024
630-5 am*

Derailed Train Clings to Railroad Tracks By Safety Guides on Cars

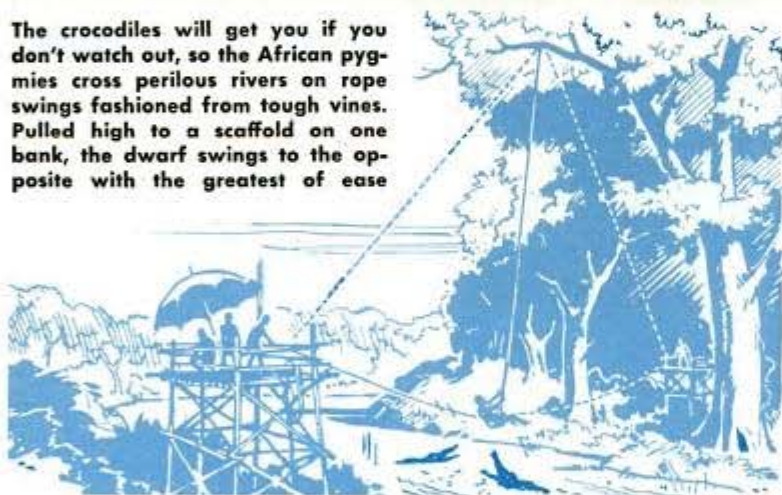
Danger to lives and property when derailments occur on railroads is being greatly reduced by equipping cars with a patented safety guide that keeps a derailed train from jack-knifing, turning over or slithering its cars all over the landscape. Developed by the Southern Pacific Railroad, the guide consists of a simple vertical flange built into the trucks of passenger coaches and extending downward to about 4½ inches above the top of the rail. Its action, in case the wheels jump off the rails, is to skid along the rail and force the trucks to remain in line with the tracks and the car body. This, it is pointed out, would prevent the wheels from turning at an angle that would throw the car sidewise or cause it to run off the roadbed.

*Railway Age
Sept 4 1942*

JUNGLE MECHANICS



The crocodiles will get you if you don't watch out, so the African pygmies cross perilous rivers on rope swings fashioned from tough vines. Pulled high to a scaffold on one bank, the dwarf swings to the opposite with the greatest of ease



By **Attilio Gatti**

Author of "Great Mother Forest" and other books, and leader of ten scientific expeditions into Africa

Stockbridge
PART I
Mass.

IN THE dim light of an African dawn, a score of ponderous grey masses are vaguely discerned trampling through what was, last night, the prospering garden of a small tribe of natives. It is a herd of elephants. Their trunks have ravaged corn and bananas; tusks have dug for peanuts and sweet potatoes; enormous feet have indifferently crushed what capacious stomachs had not devoured.

Finally, satisfied, the oldest female gives a trumpeting order and the herd slowly ambles away.

Immediately, at the other end of the clearing, a group of huts comes to life. Shields used as doors are removed; eyes cautiously scrutinize the surroundings; from each hut a man emerges, followed by his wives and children. They see the garden devastated; the food, which should have lasted them through the dry season, destroyed.

What can these few little men do against a herd of giant pachyderms, nine or ten feet high at the shoulder, every one a ten- or twelve-ton mass of steely tendons and tough hides and seven-foot tusks? All these men have for weapons are a few tiny arrows, a knife or two, some puny spears which they have made out of ironwood and scraps of metal obtained by a primitive smelting of iron ore.



An ear trumpet made of a large leaf improves reception on the jungle tom-tom "telegraph line"

But they are not as helpless against their hereditary enemy as they seem. They have astounding ingenuity and resourcefulness, those Ueles. They—and all the millions of their African brothers — possess a wealth of wisdom and courage; of inventive imagination; of knowledge of the laws of nature; and they have uncanny ways of using them.

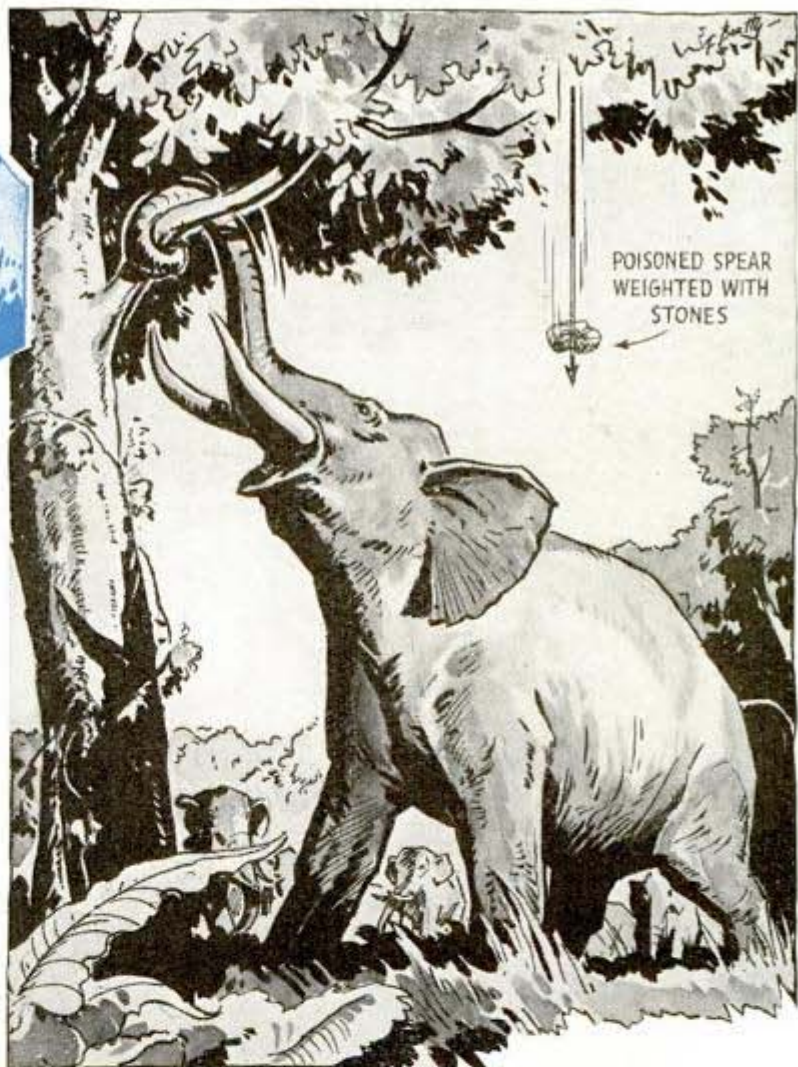
Finally the chief speaks. "The old female must be killed," he says. He points to a footprint, then nods to a hunter.

"Koboko," he says, "shall kill her."

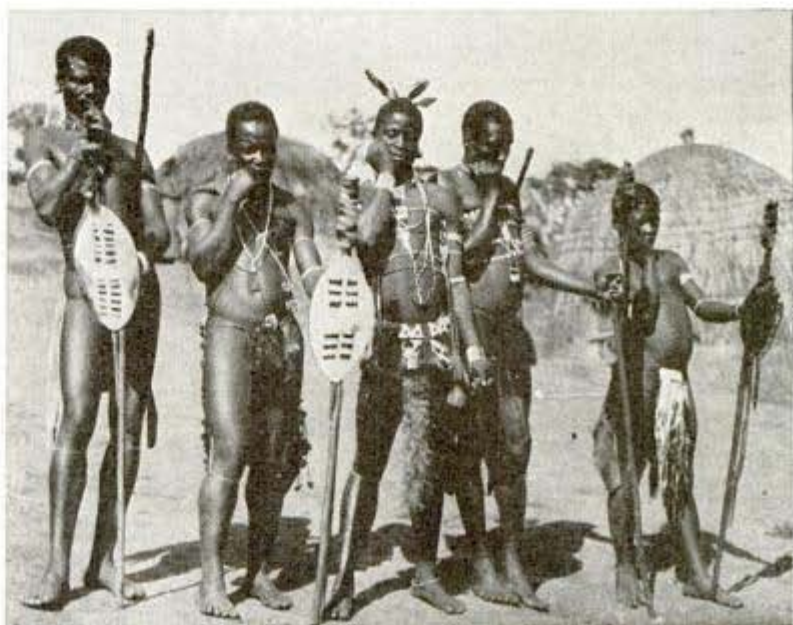
The group dissolves. They know that until the leader is disposed of, the herd will keep returning. But the elephants have a good memory. If their leader is killed immediately after the devastation of the garden, the others will remember the lesson for a long time.

So Koboko checks the sharpness of his spear point, and is off on his mission. He has no other weapon than that spear.

An hour later Koboko reaches a thick entangle-



No human arm could thrust the spear through an elephant's hide, but weighted with rocks and suspended so it will drop when the beast shakes a favorite tree, it pierces and kills quickly. Below, friends show regret as a suitor (in middle) is about to apply for the hand of a bride





The Maker of Musical Instruments of the Azandes plays his homemade guitar, ingeniously fashioned of wood and lizard skin with creepers for strings. Below, Gatti party explores Rhodesian caves in search of rock paintings by ancient Bushmen



ment of vegetation, dives into it. The herd is leisurely taking its ease in the coolest, dampest shadows of the jungle. The elephant's eyesight is poor, but its senses of smell and hearing are extraordinarily developed. A breeze carrying the hunter's scent, the snapping of a twig heard by one of the immense fanning ears will bring 200 tons of maddened, charging elephants upon him.

Koboko is a shadow gliding through the shadows. A long detour brings him around a flank of the herd to a position just leeward of the leader, the old female he must kill. Of course, he knows elephants—what they like best, how the oldest female always gets the finest food. He finds

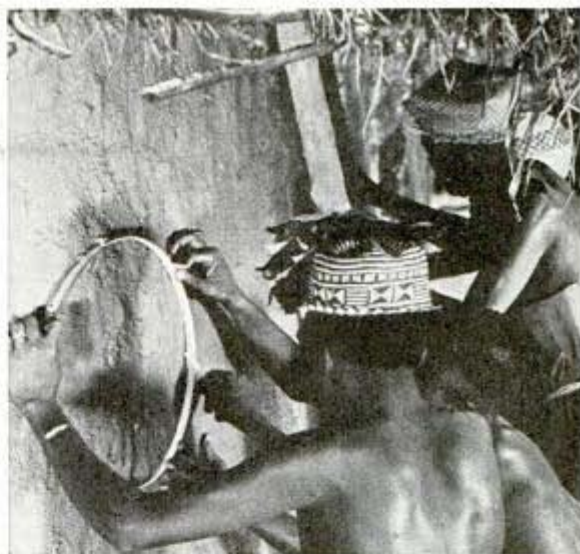
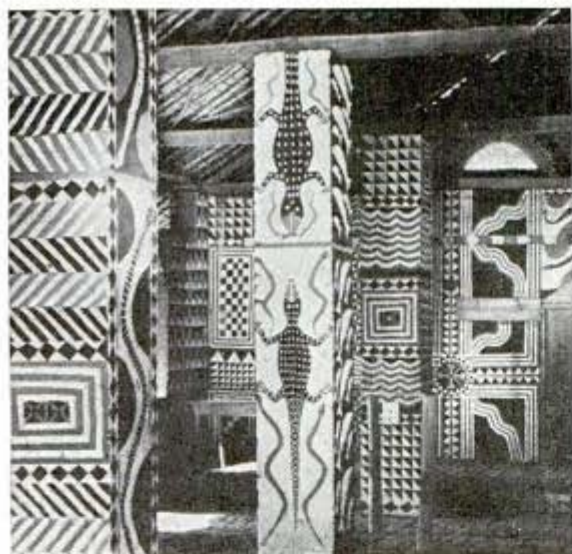
a tree covered with tender leaves, judges position and distances, decides it is suitable.

Instantly he begins to convert that spear, which if thrown would only scratch the elephant's hide, into the most deadly weapon. The point is thickly smeared with a vegetable paste, highly poisonous, but effective only if it reaches the blood stream. Koboko gathers some stones, deftly ties them with creepers to the spear handle, near the point. Another length of creeper he passes through a hole in the handle. Carrying the "loaded" spear in one hand, he climbs up a liana, until he reaches a chosen branch. There, straining to avoid any noise, he uses the creeper in the handle to tie the spear to the branch. The strength of the creeper is calculated just to hold its heavy burden—and to break at the slightest shaking.

Cautiously Koboko retreats to the ground. Ahead of the herd, the great female is advancing toward the tree. She cannot see him, yet, but she seems to feel some forewarning of danger. Her trunk curls and uncurls. Her ears are cocked, like sails, making, with

There's plenty of music in the jungle—a log hollowed out by ants makes an excellent drum, handy for sending telegrams





Mangbetus decorate their huts with chalk, charcoal and pigment, first tracing the designs on the wall (right)

the head, a frightening spread of some 15 feet.

Koboko melts away, creeping slowly at first, making sure the wind is carrying his scent away from the herd. Then he walks faster and faster, trying to retrace the trail of his detour.

Before long a crash stops him. He hears a deafening, spine-chilling trumpeting. The old female has reached for the tender leaves of the tree he chose. Perceiving the scent of a recent human presence, she has grabbed a branch with her trunk, madly shaken it. The creeper has broken. The spear, its penetrative power augmented by the weight of the stones and by the directness of its fall, has pierced her back.

A few minutes, and she will be dead. The

herd, bewildered without its leader, is already trotting away in confusion.

Once sure that all the elephants have gone, Koboko must communicate with his far village. He searches for a tree whose inside the white ants have gutted and devoured. His sharp eyes don't take long to find one. He hammers it with his fists to test it, breaks off two branches and with them beats the improvised trunk-drum.

"Tom—Tom—Tom-tom-tom," throbs the tree until Koboko thinks the message has reached the villagers. Then he "signs" it, three staccato beats everyone knows as his own, and waits for an answer.

But the distance is great, the vegetation interferes with his reception. He makes a funnel of a huge leaf, applies it to his ear.

Mrs. Gatti rides in style on one of her husband's expeditions into a region of Africa unreachable by roads





A hollow stalk provides a pipe for smoking dry seeds

Through it, the answer pours in clearly. He recognizes the "signature" of the chief. Soon the tribe will come and cut to pieces the mountain of flesh he has secured.

While he waits, Koboko decides on a fire and a smoke. He looks around for some dry leaves and branches and for a rock which contains "the power of fire," as his people call the flint. Two leaves he pulverizes between his palms. The resulting powder he deposits on a slab of flint-stone,

which he strikes again and again with a smaller rock, until smoke emanates from the powder. He blows and blows, until the fire communicates to a leaf, then to others, then to branches.

In a few minutes a good fire is blazing. Koboko finds a magongo stalk, which is hollow, and some hairy seeds of mifonde, which to the Ueles is almost as good as tobacco. He loads and lights his improvised pipe and puffs luxuriously near the warmth of the flames.

His mind does not dwell upon the hair-raising danger from which he has just emerged unscathed. More practically and intelligently, it envisions the bustling that will soon follow when the tribe reaches him. The women will build a huge grill of iron wood branches, under which a fire will be kept going day and night, until all the elephant meat is dried and smoked to a crisp for long preservation.

He thinks about the delight of the trunk, which by right will be his to eat; the hairs of the tail which he will weave into bracelets for himself and his wives; about the heavy tusks out of which twenty different implements will be made, some to soften the boiled bark of trees and obtain from it supple loinclothes; others to crush seeds and dried bananas in wooden mortars; others to be carved into earrings, bracelets, necklaces, ankle rings and amulets for women and children, into narrow points and knives and spatulas with which to mix poisons.

It is to this resourcefulness and adaptation to his lush but treacherous world, that the African native owes his survival, and his—on the whole—extraordinarily care-free, happy existence. Money and shops,

Elephants have poor vision, keen smell and hearing. Hunter and cameraman must be silent and stay downwind



to all practical purposes, do not exist for him. The jungle is his only source of supplies. Ingenuity, craftsmanship are the currencies by which he obtains what he needs.

Take, for instance, the Maker of Musical Instruments of the Azandes of Northern Congo. The guitar he makes is a thing of harmony and primitive beauty such as you would probably like to own, and be proud to have made with your own hands.

His workshop is a stool in the shadow of a tree. His tools, all of which he has made of wood and iron hammered into shape with stones, are chisels, scalpels and a couple of round irons, which, when red hot, can burn holes in soft wood. His raw materials are an L shaped, 36-inch-long piece of wood; a two-foot, straight stick of hard wood $\frac{3}{8}$ inch in diameter; the dried skin of a big lizard; some lengths of twine-size creeper.

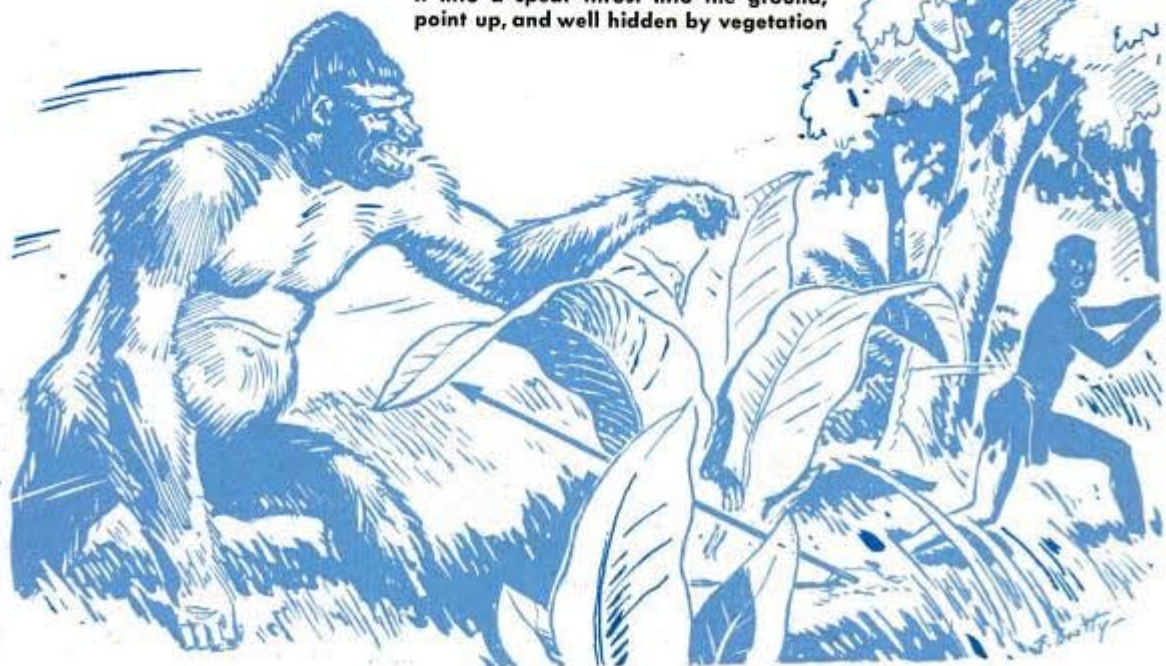
(Continued to page 164)



Tribesmen tie up an offending member of the clan for a court hearing
The village orchestra presents an African symphony on handmade horns

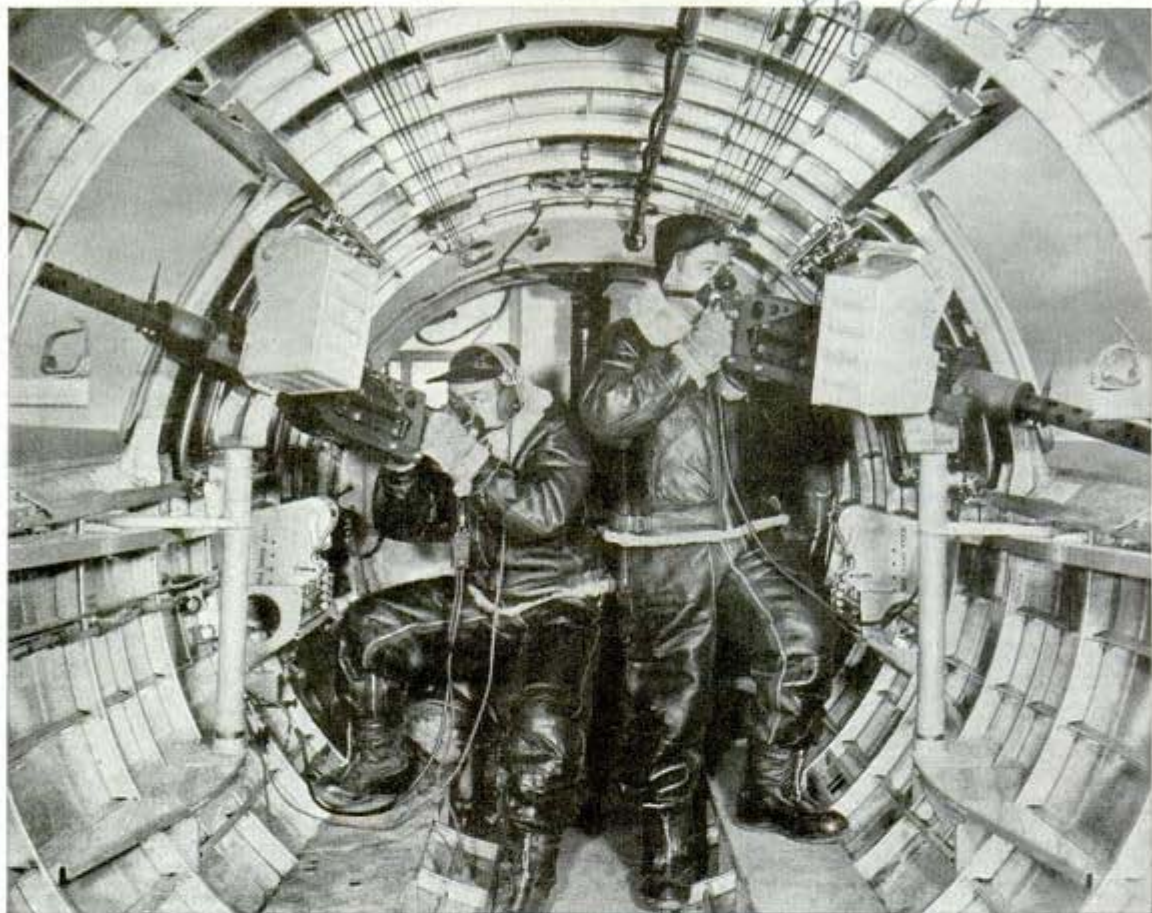


A dwarf kills a giant gorilla by luring it into a spear thrust into the ground, point up, and well hidden by vegetation



Some - 461 - pad nice

High-Altitude Fighting Rehearsed in Full Dress



Bomber gunners, in final stages of training, learn to work under handicap of high-altitude togs

Before hopping to the front for combat duty, aerial gunners in dress rehearsal are given a turn at large caliber machine guns aboard a Boeing Flying Fortress as part of a month of final training. Wearing the

complete equipment they will use in actual warfare at high altitudes, the machine gunners fire at targets painted on cliffs near the bomber operations base as they practice their duties and learn teamwork.

Auto Body Made of Plywood Hints of Tomorrow's Car



Car with plywood body weighs 600 pounds less than all-metal construction

Experimenting with substitutes for steel in automobile construction, Ray Russell of Grosse Pointe Park, Mich., has produced a car made of laminated waterproof bonded plywood. There are two layers of plywood, one running fore and aft, while the other runs diagonally, the sheets being cemented together with waterproof bonding resin and riveted at all seams. The skeleton is a framework of steel

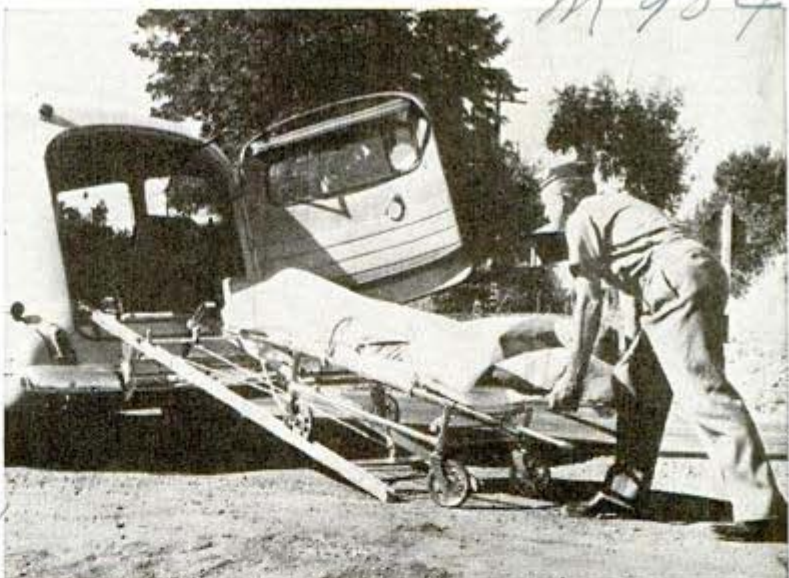
904 Penniston

*not on market
Chry. chassis and motor.*

*Ref. Dr. W. Green
Dr. E. Pennerbaum
W. Johnson
Kalamazoo Mich*

tubing bent to shape and welded to the chassis. All wheels, enclosed within the body, can be reached for tire changing through hinged flaps. The car weighs 2,500 pounds, which is about 600 pounds lighter than a similar one of metal construction. While the auto represents one step in experimental body lines and construction details, it is not suggested for mass production in its present form.

Sliding "Ramp" for Ambulance Makes Loading One-Man Job



Rolling stretcher onto ramp which lifts and slides into the ambulance

Stretcher patients are loaded into an ambulance and unloaded by one man with a ramp arrangement consisting of two double sets of U-shaped tracks. Two of the units are fastened to the floor of the ambulance and the other two, fastened together by bars, slide into this fixed track. For loading, the sliding track is pulled out and one end is lowered to the ground. The stretcher cart is wheeled onto the track and locked on with a special device. Then the sliding track is lifted to the level of the floor track and pushed into the ambulance. The loader was invented by the driver of an ambulance operated by the Amador Post of the American Legion, Amador County, Calif.

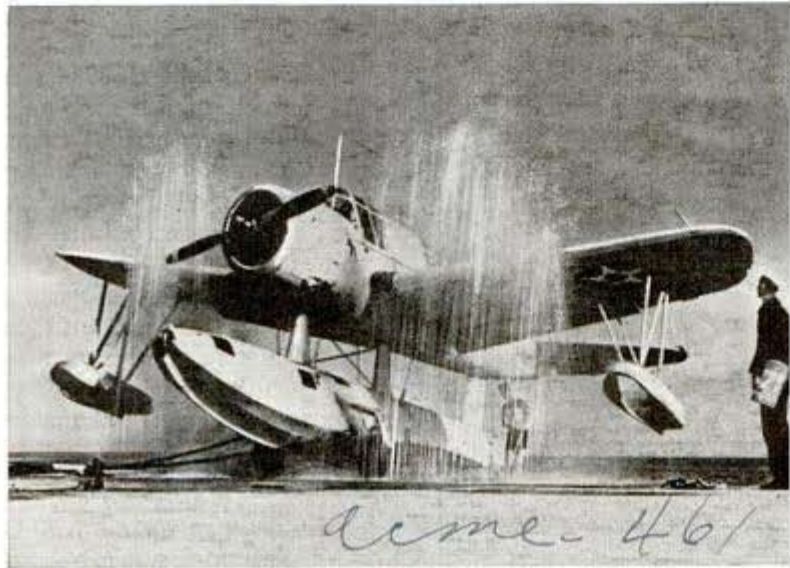
*Joe Navarros
Sutter Creek Calif.*

Mushroom Extract Used to Treat Blood Pressure

High blood pressure may be reduced by injecting a compound extracted from ordinary mushrooms into the blood stream, according to experiments. Chemists who developed the treatment worked on the theory that blood pressure is caused by chemicals that cause the arteries to contract. The new compound, called tyrosinase, oxidizes these chemicals.

m 976

Seaplane Is Given a Fresh Water Bath With an Upside-Down Shower



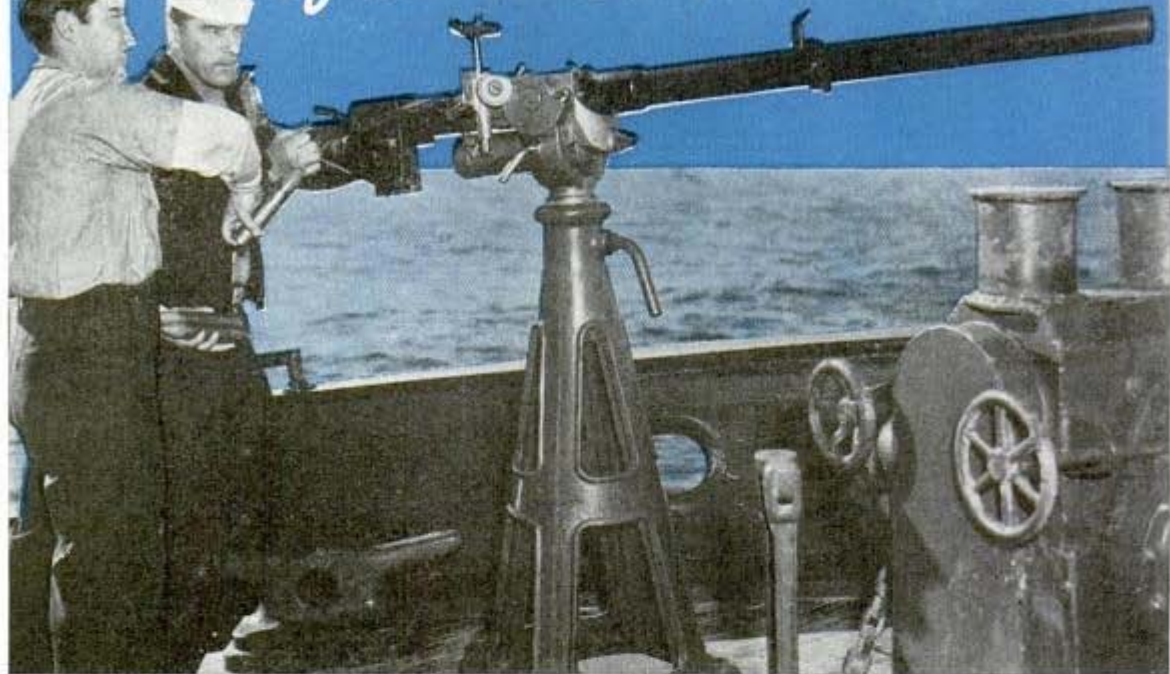
After alighting in salt water, planes at the Naval Air Station at Corpus Christi, Tex., get a shower bath in fresh water. This is accomplished with a water pipe that is extended beneath the planes and shoots a spray upward. Fresh water is used in the upside-down shower because sea water would only add to the accumulation of corrosive salty stains.

Washing salt stains from a seaplane with fresh water sprayed upward from pipes beneath ship

*same 461
Fav, me*

Thos E. Strimason Sr., 3872
Franklin Ave, Los Angeles, Calif

ADVENTURES *M 806* of the INSHORE PATROL



Gunners aboard a mine sweeper of the "inshore patrol" rehearse rapid-fire work with a small deck gun

DAWN was just breaking when the armed minesweeper left her dock in a western harbor. Down channel, a gate boat drew aside the torpedo net to let her through. Beyond the torpedo net lay the submarine net, its floating top studded with spikes that would rip the bottoms out of any enemy mosquito boats that might try to skim over it at high speed. A second gate boat opened this barricade.

By the time the sweeper had made her way through the harbor's own protective minefield, outside the nets, the work of sweeping the harbor approaches to destroy any mines that our enemies might have laid during the night was ready to begin.

Two large metal floats, called "pigs," were dropped overboard at the ends of steel cables. Sea otters, metal grids equipped with cutting knives, followed, and the minesweeper moved ahead, paying out cable until the steering vanes of the sea otters had pulled them 300 yards apart, astern of the sweeper.

Then the sweeping work began. Any moored mine within reach of the cables would be released when the serrated knife of a sea otter cut its mooring line. Bobbing up to the surface, the mine would be exploded by machine-gun fire.

But moored mines are only one of the underwater weap-



The commander focuses his glasses on a suspicious object on the horizon from wheelhouse of a minesweeper



L.H. Lee

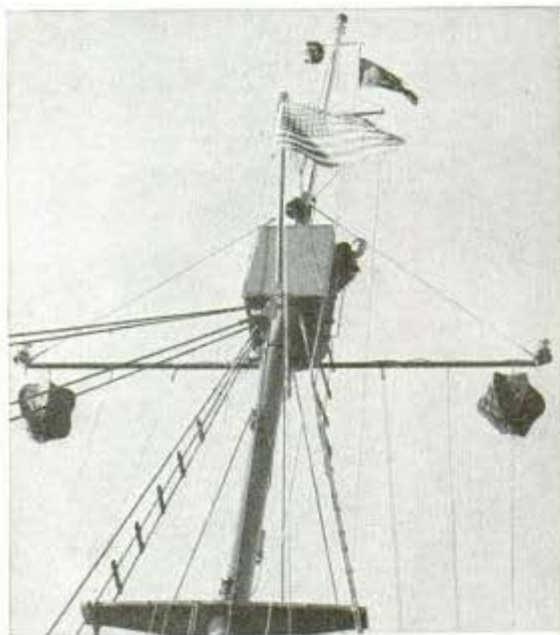
Patrolling the Atlantic coast at 43 miles an hour with torpedo tubes, antiaircraft guns, depth charges and machine guns ready. Below, a sailor brings up a drum of "a-a" cartridges



Radioman on a mine sweeper signals by searchlight to a patrol boat off the California shore

ons of modern warfare. There are also magnetic mines that lie dormant on the bottom until the attraction of a ship's metal hull makes them rise and explode against the ship. The most recent sort of mine is the acoustic type that is actuated by the beat of a ship's propeller. Ordinary sweeping operations are ineffective against such mines as these. The minesweeper has been fitted with special gear to combat them.

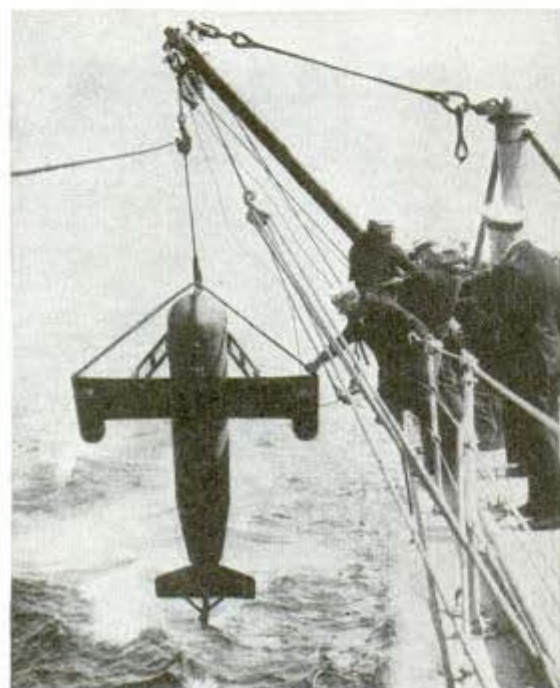
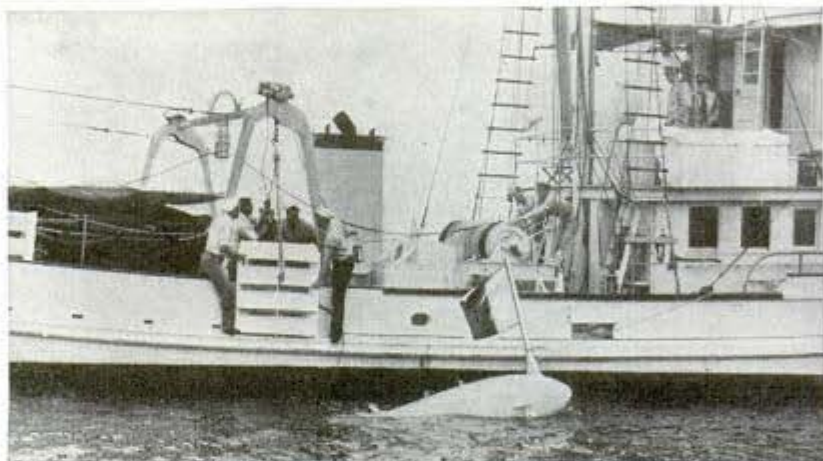
Out at sea, the sweep against moored mines ended, the sweeping gear is brought back on board and the ship once more begins to plow back over



From his post in the crow's nest the lookout aboard one of the "sweepers" keeps a sharp eye open for surface vessels, airplanes and mines

"Pig" buoy is afloat with flag attached while crew lowers sea otter grid over side. Grid stretches sweeping cable at angle from stern and knife cuts mine loose

Resembling a winged torpedo, the paravane is put over side as sweeper starts on its dangerous mission of hunting and harvesting mines



the same area she has just swept. When the minesweeper finishes her sweeping duties for the day, her crew is satisfied that the channel has been swept clear of any hidden dangers that might threaten shipping.

Minesweeping is only one of the many activities of the inshore patrol. Few people know of this department of the Navy and of the important coastal protection work it performs. Small power boats that patrol our harbors, on guard against possible sabotage, are members of the inshore patrol.

Ex-Coast Guard cutters, running without lights after dark and with depth charges stacked on their sterns, prowl along the coasts. These too are members of the inshore patrol.

The sailors who operate the vessels of this branch of the service are picked men.

Mostly recruited from civilian life, they have been chosen because of their experience with small boats. Most of them are as familiar with their home waters as they are with their own back yards. They know the way the current runs behind a certain reef, the direction to steer to make a narrow entrance channel after dark, and they need no charts to help them work their boats past hidden rocks. Many of them can navigate in their home waters after dark or in fog as well as they can on clear days. They need such ability now, because all the usual aids to navigation have been discontinued. Even the clappers on the bell buoys have been tied down for the duration of the war.

If you have done any commercial fishing or have operated a small boat there is a chance that you can join the inshore patrol. Even yachting experience, sail or

(Continued to page 178)

*British Combene Photos Ltd.
271 Madison Ave NYC*

"Dodge-'Em" Car Tows Plane on Carrier Deck



Midget car that "turns on a dime" backs into position to tow fighter plane across British carrier's deck

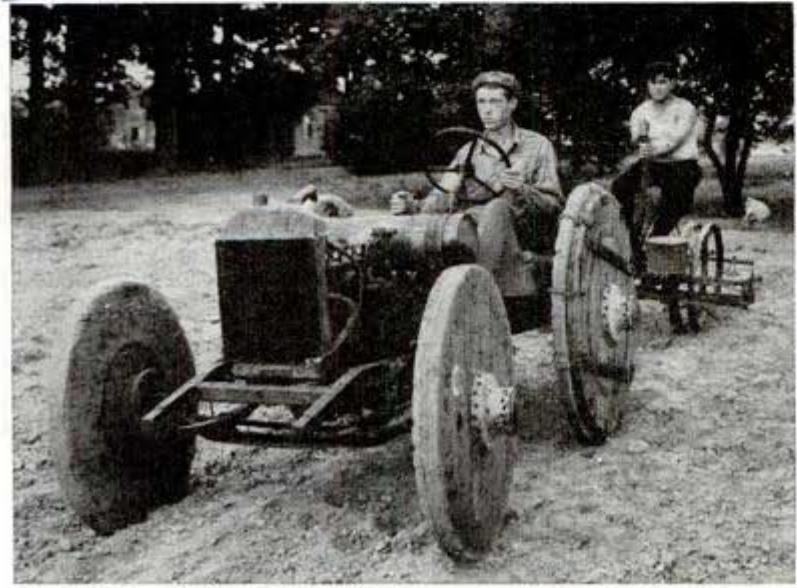
Fighter planes are towed on the deck and elevators of the British carrier H.M.S. Illustrious with a small American-built tractor. Similar to the carnival "dodge-

'ems," the tractor has three wheels and is maneuvered easily in close quarters. The tractor speeds operations by the deck crew when split seconds mean life or death.

Wire Spools Serve as Wheels for a Homemade Tractor

Lack of standard tires ^{built by} did not seriously handicap John H. Sauter, Essex, Md., in completing his homemade

tractor for his spare-time farm. In place of ordinary wheels he has substituted the round ends of big spools used for handling and transporting telephone wire. They are strongly made of wood, are inexpensive, punctureproof, and give excellent mileage. The rear wheels, slightly larger in diameter than the front ones, gain increased traction from short chains fastened at right angle to the tread. Consisting primarily of a discarded automobile, the homespun tractor represents only a small cash outlay but has proved to be an efficient substitute for a costly power plant in operating a small farm.



These tractor wheels came from big spools that carried telephone cable

CS 11
Andy Arnold
68
Stacy, Brooklyn NY
I Bo
Pe Elmer R
Stull, Elizabeth NJ

The BACKBONE of the ARMY



The infantry soldier knows that no matter how many tons of bombs are dropped on enemy territory the battle isn't won until he takes possession. Doughboys of mechanized warfare take blitz, guerilla and commando tactics in stride, fight in groups or single handed. Top left, tank commander with tommy gun in hand hops out to engage foe at close range. Above, camouflaging a mortar with brush. Note machete



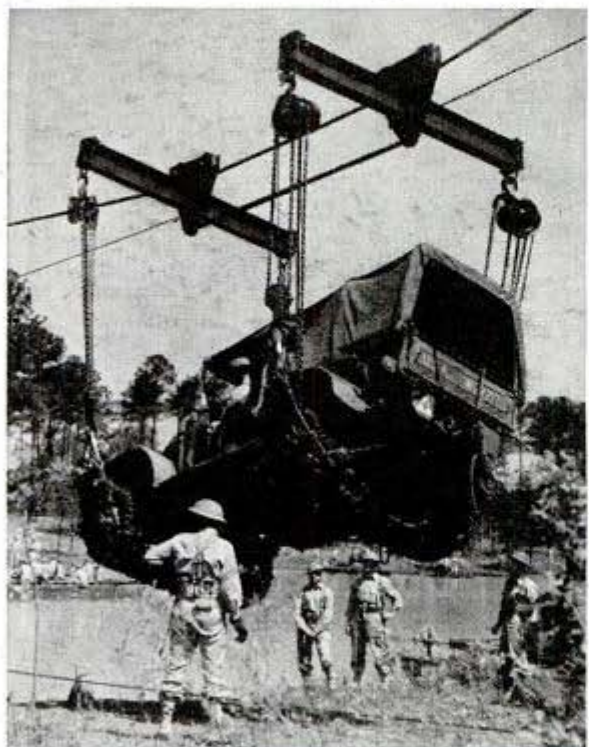
Three-man radio reconnaissance team in jeep (above) pauses to receive message from headquarters. Aerial observers reported something suspicious near by and these scouts are told to investigate. Left, observer-scout attached to intelligence unit climbs tree to get good look at enemy position

Pe Char & Meyers

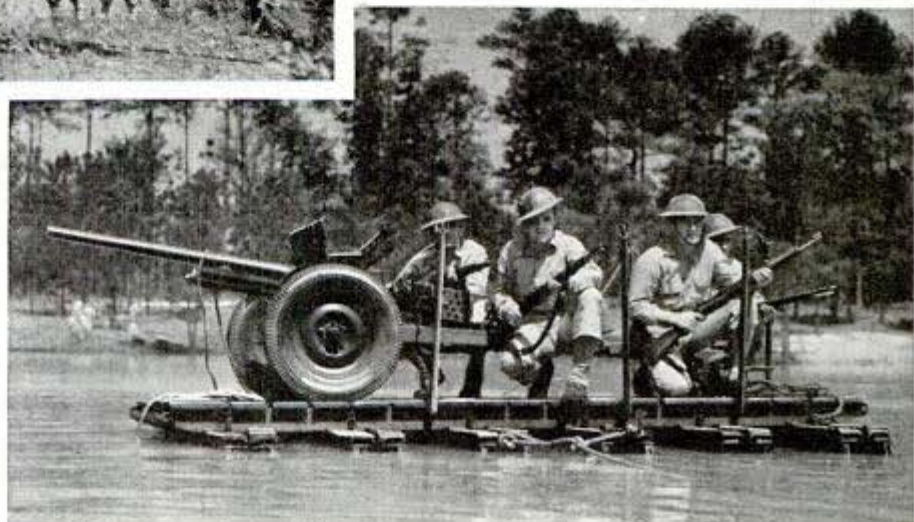


This hard-hitting infantry unit closes in on "enemy" during maneuvers after foe's position has been battered with big guns: The soldiers will capture men still resisting and attack will be over quickly. Right, soldier training for invasion is making a dash through shallow water after landing with his buddies of the infantry engineers in rubber boats

Life. Fred W. Werner



↑ Ferrying big truck across river on aerial cable is one way to save rubber—also time. The driver can stay right in seat and when truck lands on other side of the stream he just steps on starter and keeps rolling. Right, engineers moving 37mm. antitank gun across river on lightweight raft. They follow behind infantry units



*Mr. Leon K. Rykken
M 931*

Deflated Tire Gives Alarm With Wire Banging Fender

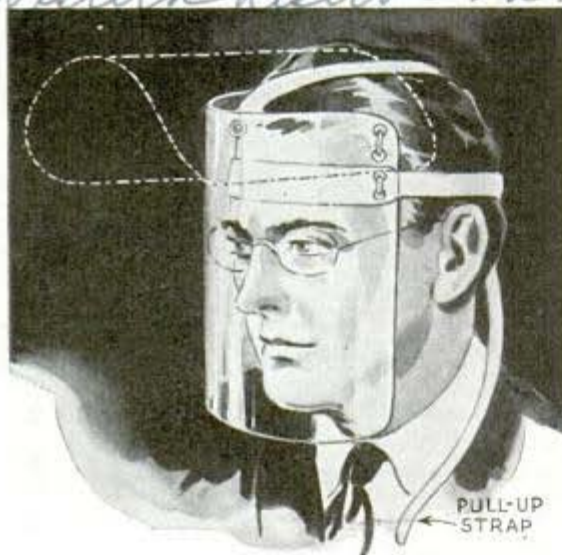


Special lock releases wire when air in tire is low

Warning of a dangerously deflated tire is given by a wire rim that fastens around the wheel with a special lock. When air in the tire is low the lock springs one end of the wire loose so it can bang the fender.

Pull-Up Strap Lifts Face Shield So Hands Won't Soil It

In lifting it away from the face, hands need not touch an all-transparent face shield equipped with a tape by which it may be raised. Attached to the top of the acetate plastic shield, the tape extends over



Pull strap and up goes shield away from the face

80

*24 Cleve Bldg
Cleveland Ohio*

the top of the head and down the back. A jerk of the tape swings the shield upward to a horizontal position where it may be carried until ready to use it again, thus avoiding the nuisance of dirtying or smearing the shield each time it is adjusted.

Shelf to Support a Typewriter Fits Flat-Top Desks

Flat-top standard office desks may be converted quickly into typewriter desks by installing a strong, roomy platform that gives smooth operation to the typewriter because of its rigidity. Without the use of screws or bolts, metal expansion grips are



Installing shelf converts desk to hold typewriter

spread easily by screwdriver or coin to secure the board in the shelf slide. It may be attached on either side of the desk. Since no holes need to be drilled, the desk does not become marred by its installation.

Aluminum Barges for River Use Reported Built in Germany

Germany is building barges of aluminum for canal and river transport, according to a naval journal in Argentina. The boats not only have a shallower draft than iron barges, but carry greater loads in proportion to their weight. A 200-ton aluminum barge can carry about 1,500 tons more cargo annually than a corresponding ship built of iron, it is reported by German technical experts.

Naval Mech Sept 42
POPULAR MECHANICS

1329

U.S. Army - H61-100, Sup.

Motorcycle "Hybrid" Tows Axis Guns in Africa

M 801

Resembling a cross between a motorcycle and a tractor, an enemy vehicle captured during desert fighting in Africa is being studied by the British. The front, with single wheel and handle bars, is built like a motorcycle and the rear like a tractor. It is somewhat similar to U. S. Army scout cars that run on half-track and rubber-tired wheels. The Axis forces used the motorcycle-tractor to tow small guns and carry soldiers.



This captured Nazi vehicle for desert warfare is combination motorcycle-tractor

"Eye Shades" Hide Floodlights From Subs Along Coast



Lawrence Bondin, electrician

Floodlights in the yards of the Federal Shipbuilding Dry Dock Company at Kearny, N. J., are equipped with visors, similar to eye shades, that bend the light beams below the horizon. This reduces the sky glow that silhouettes ships for lurking submarines along the coast. At the same time, the dimmed lights permit night production to go ahead at full speed.

Attaching visor to a floodlight in shipbuilding yard on coast hides the glow from subs and permits night workmen to "keep 'em rolling"

Ragweed Seeds Help in the War Effort by Yielding Valuable Fats

Oil closely resembling that obtained from soybeans, and superior to some oils formerly imported, can now be obtained from ragweed, generally known as the main source of discomfort for hay fever victims. The discovery was made by G. F. Roedel and M. T. Thornton, chemists at Purdue University. No new machinery is needed,

the ordinary grain combine harvesting the ragweed and commercial extractors taking the oil from the seeds. Extracted oils have immediate value as fatty oils now scarce due to increased war needs and the dearth of imports. It is believed the ragweed product would have slightly better drying properties in paints than soybean oil.

Lafayette Ind

12,000,000 MEALS A DAY



"Now you're cookin' with gasoline," say the doughboys inspecting field range that can be transported easily. Left, a typical supper for soldier includes soup, meat, salad and bread



of today is streamlined and mechanized, but it rides, flies, parachutes, skis and hurtles "on its stomach" just as it marched in the days of Washington and Grant.

The exact number of men in uniform, of course, is a military secret. There is talk that the Army will be increased to 7,000,000 or 8,000,000 men. The War Department, how-

IF THERE are any members of the Quartermaster Corps who have studied astronomy, it would come in handy these days for the corps is dealing in astronomical boxcar figures that stagger the imagination of most civilians.

Its biggest job is feeding the army. If you have any doubts about that just ask any soldier from private to general. The army

ever, let it be known last summer that there would "soon" be more than 4,000,000 in training. To the Quartermaster Corps, an army of 4,000,000 means 12,000,000 meals a day (4,380,000,000 a year) and the daily purchase of some 20,000,000 pounds of food to be served in camps, posts and stations, as as field or emergency rations wherever United States troops may be on the far-



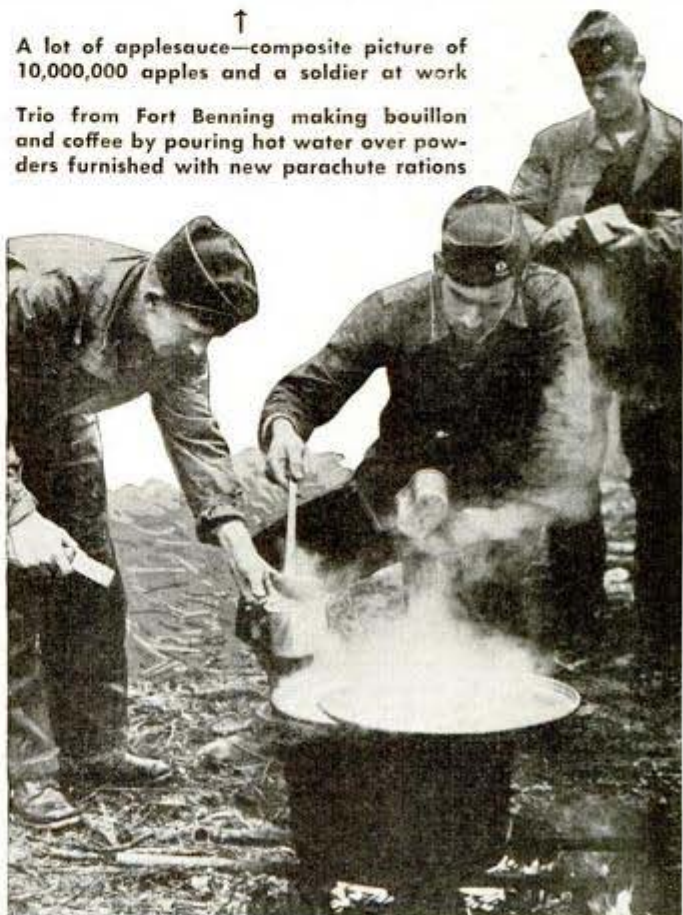
flung battlefronts of World War II.

This has been called a "quartermaster's war." The business of maintaining supply lines carrying mountains of nourishing food to soldiers in home camps and 12,000 miles away, in desert and jungle and Arctic regions, is a giant task. It has been taken in stride by the Quartermaster Corps under the direction of Major General Edmund B. Gregory. Purchase and distribution are only part of the picture. Meals by the million are balanced with an eagle eye on vitamin content and the corps has developed revolutionary methods of processing foods, including dehydration.

The army eats more meat than any other single food item. Each soldier consumes nearly one pound a day. That means 4,000,000 pounds of meat for the daily mess and 1,460,000,000 pounds for one year. A year's supply would fill 36,500 refrigerator cars that would reach from Chicago to Louisville.

↑
A lot of applesauce—composite picture of 10,000,000 apples and a soldier at work

Trio from Fort Benning making bouillon and coffee by pouring hot water over powders furnished with new parachute rations





The smiles on the faces of these recruits lined up for chow testify that they know what's coming up will be plenty tasty



Long columns of supply trucks (above) of Quartermaster Corps carrying tons of food. It takes 720,000 pounds of bacon when an army of 4,000,000 sits down to breakfast. Below, roasting coffee for half of army at Chicago Quartermaster Depot where special blends are prepared—men in South like more chicory



When the army sits down to a breakfast of bacon and eggs, the cooks (one for every 50 men) have dished out 720,000 pounds of bacon and 8,160,000 eggs. It takes more than a billion pounds of potatoes to feed the men in khaki for a year and 584,000,000 loaves of bread. Food items such as salt and pepper, which are hardly worth listing in family budgets, soar into the millions in the quartermaster's books. A year's supply of salt is 29,200,000 pounds, and 9,600,000 four-ounce boxes of pepper are required. These computations for an army of 4,000,000 are based on official figures for the needs of units of 100 men.

Feeding the army starts with the preparation of a master 30-day menu in the offices of the quartermaster general in Washington. There is no guesswork about this menu. It is prepared by the best dieticians that can be had and provides the proper vitamins in quantity and variety and the required amount of calories. Recommendations of the Nutrition Committee of the National Research Council have been adopted as a minimum standard.

The master menus are sent out, usually three months in advance, to the quartermasters in the nine corps areas. They make up the menus for their own areas in accordance with local supplies, but never falling below the standards of the master menu.

A typical menu for one day consists of a breakfast of oranges, assorted cereals, fresh milk, bacon and eggs, fried potatoes, muffins, bread, butter, jam and coffee; a dinner (always served at noon) of barley soup, breaded veal cutlet, gravy, au gratin potatoes, buttered asparagus, sliced tomato salad with mayonnaise, bread, butter, ice cream, cookies and tea; a supper of baked beans with thick

Army bakers turning out just a few of the 584,000,000 loaves of bread eaten by our soldiers in a year—they like white best

sliced bacon, hot cole slaw, buttered beets, bread, butter, strawberries, beverage.

One quartermaster jokingly remarked that the meals are so well balanced the only complaint he hears is "not enough beans"—a far cry from 1917.

Foods purchased by the army fall into two general classifications: nonperishable and perishable. Nonperishable foods are purchased by three central procurement agencies, or depots, in Jersey City, Chicago and San Francisco. Perishable foods (about 65 percent) are purchased in some 30 quartermaster market centers that are scattered strategically from coast to coast. The purchase order for most foods calls for delivery direct to the camp or station where they are to be used.

When the food arrives at the camp it is placed in storerooms or huge refrigerators, some of the latter being large enough to hold a 10-day supply of perishable foods for 15,000 men.

Three distinct types of rations are served to the armed forces—garrison, field and emergency. Garrison and field rations are called A and B, respectively, and the emergency rations are C, D and K. The garrison ration of



The chocolate bar above, officially known as Ration D, weighs only four ounces, has 600 calories. Left, huge steam vats assure well-cooked soldier fare

peacetime has generally been supplanted today by the regular army field ration as set up in the master menu.

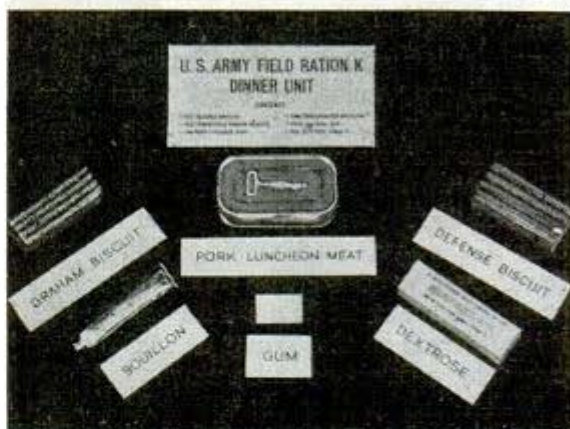
The newest and most widely acclaimed emergency ration was originally called the "parachute ration" and is now simply known as Ration K. It was developed in the Subsistence Research

Laboratory of the Chicago Quartermaster Depot, the only laboratory of its kind in the country. The K ration is packed in three separate boxes containing breakfast, dinner and supper. It contains two kinds of biscuit, canned meats, coffee tablets, concentrated bouillon, lemon juice powder, chocolate bar and chewing gum. The gum isn't there just to satisfy an American habit. Chewing reduces consumption of water, an important factor in combat areas.

The K ration is packed in a special box developed in the Chicago laboratory. The container has a waxlike coating that resists a temperature of 135 degrees Fahrenheit and will not crack or chip if the mercury falls to 20 below zero. It is also resistant to vermin, moisture and poison gases and will stand rough treatment.

This ration, once intended for paratroops only, was adopted as regular emergency chow after exhaustive tests at Fort Benning and on Mount Rainier. Three hundred ski troops participated in the experiment on Mount Rainier conducted by the Mountain and Winter Warfare Board from Fort Lewis. The five-day test included every type of mountain maneuver simulating war conditions. The men were accom-

Developed as special ration for paratroops, Ration K has been adopted as a regular field ration. Here are shown breakfast, lunch and dinner which men in action find is satisfying. Below, a trooper opening compact field ration



panied by doctors, biochemists, physiologists, technical experts and high ranking officers.

The ski troops were split into three groups. One was fed the K ration, another the K ration supplemented by dehydrated soups, fruits, cereals and beverages; the third group was fed the regular Army C ration consisting of six tins (two for each meal) filled with stew, hash, meat and beans, crackers, biscuits, hard candies and soluble coffee.

The men were carefully examined before and after the experiment and it was found that those on the K ration retained the required amount of sugar and protein content in their blood and were able to meet the demands of fast-moving combat. The men also said it tasted good, was satisfying, and ideal for carrying in a pack. It's the most popular emergency ration today.

Another emergency fare, known as D, is a concentrated chocolate bar. The principal ingredients are cocoa fat, oat flour, artificial thiamin chloride (vitamin B₁), skim milk powder, sugar and chocolate.

The creation of the K and D rations, as well as improvements on the others, are just a few of the accomplishments of the Chicago Subsistence Laboratory headed by Col. Rohland A. Isker. Into this spotless laboratory manned by a staff of experts come food samples from all over the world. The foods are tested for their keeping qualities (temperature and humidity cabinets reproduce almost any climate), for purity, for nutrition and taste. The motto of the laboratory is:

"If it doesn't look right and taste right, no matter how many vitamins or calories the food contains, we will not serve it to the soldiers."

The staff is not content with testing foods developed elsewhere. Recently, one of the specialists decided that the soldier in the desert or tropics deserved something better than a sloppy piece of butter for his bread. Melted butter, he argued, makes anybody irritated. He set to work with some research workers from a private concern and the result is a butter that will not melt under a heat of 110 degrees.

The staff refuses to talk about any experiments that are under way. To the visitor who asks a bacteriologist or chemist what he is doing, the reply is:

"The enemy probably would like to know, too. What we are working on is a military secret. The type of experiment we are conducting might give Hitler or the Japs a clue to where the army will strike."

Canned bacon that has resisted a three-year test, frozen beef that has all bones removed and lightens work in mess kitchens are two comparatively recent developments. The big emphasis in the laboratory, however, is on dehydrated foods.

The dehydration of foods—removal of water—is just in its infancy and the army

(Continued to page 162)

FEBRUARY, 1943

Time-Saving Electro-Brain Checks Plane's Wiring



"Magic eye" points out flaws in electrical hookup

Checking and double-checking the maze of electrical installations in Lockheed planes, a task heretofore requiring 16 to 20 hours, is now accomplished in 15 minutes with an electro-brain tester developed by John E. Browne, aviation engineer. On the control board a "magic eye" flashes a warning light to the shorted or broken wire, solving the continuity of the hundreds of circuits where there are as many as 36 pins to one plug, or 100 or more loose wire ends which pass through various conduits to fuse panels and equipment.

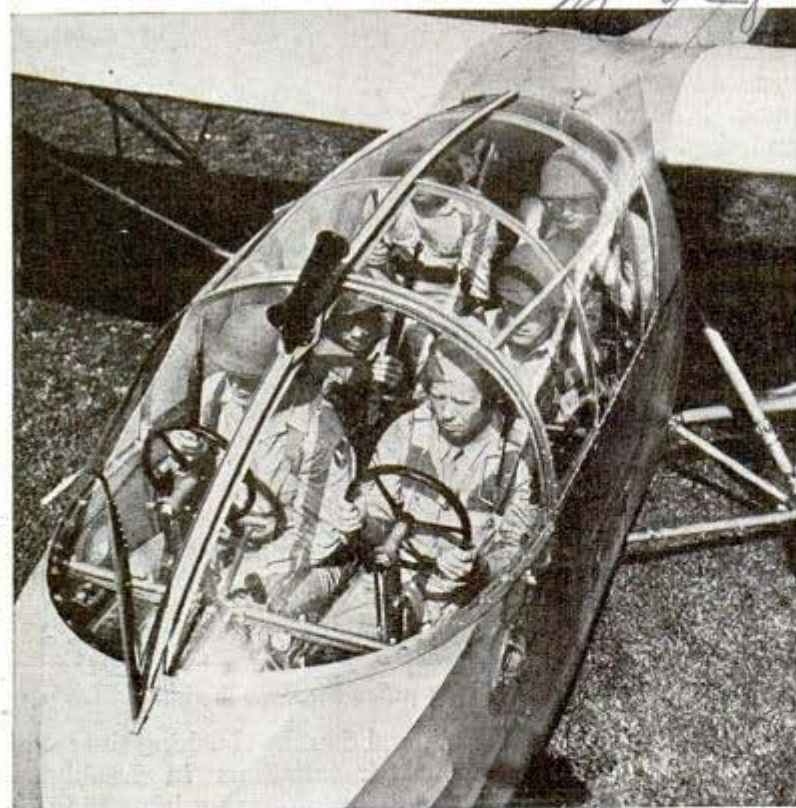
Army Matches in a Floating Box Light After Month in Water

Troops will be able to strike a light in the most adverse weather conditions when they carry a floating match box developed by the War Department. The box, holding 20 matches and equipped with striking bars, is made of a strong synthetic resin. Cylindrical in shape, it is three inches long and $\frac{3}{4}$ inch in diameter, having a small emergency compass at one end. After soaking in water for more than a month, its interior and contents remain undamaged, and no matter how wet the box may be the matches can be struck by friction from the striking bars.

87

Acme 461-8 avo, m.c.

Glass-Topped Training Glider Built With Dual Control



Instructor and student sit side by side in nine-place training glider

Glider pilots and crews are trained by the U. S. Army Air Corps in a nine-place glider equipped with dual control and a fuselage with a transparent top. After preliminary training in this craft, the men graduate to the new 15-man gliders which are now in mass production. The larger glider will be our first line of offense in invading enemy territory.

"Black Light" Tests Mask For Leaks by "Gas Glow"

Leaks in gas masks are detected quickly with fluorescent chemicals that glow under ultraviolet light. Finely powdered anthracene is one of the fluorescent chemicals used in tests conducted by Jack De Ment, Portland, Ore., originator of the process. The powder is filtered into the test chamber and leaks in fabric, mechanism or edges of the mask are revealed by

a bright green glow under "black light." Liquids and vapors may be used instead of powder, depending on the type of gas, smoke or fog for which the mask is intended. It is claimed that this method of testing may eliminate one of the serious bottlenecks in the mass production of masks.

U. S. Hospital Train For Soldier Sick Holds 65 Men

Equipped to fill every medical need of soldier patients in transit, a new five-car army hospital train has accommodations for more than 65 men. The three center cars are wards with double-deck beds and the end cars are commissary and operating room. The rolling hospital is staffed with a score of nurses and medical officers.

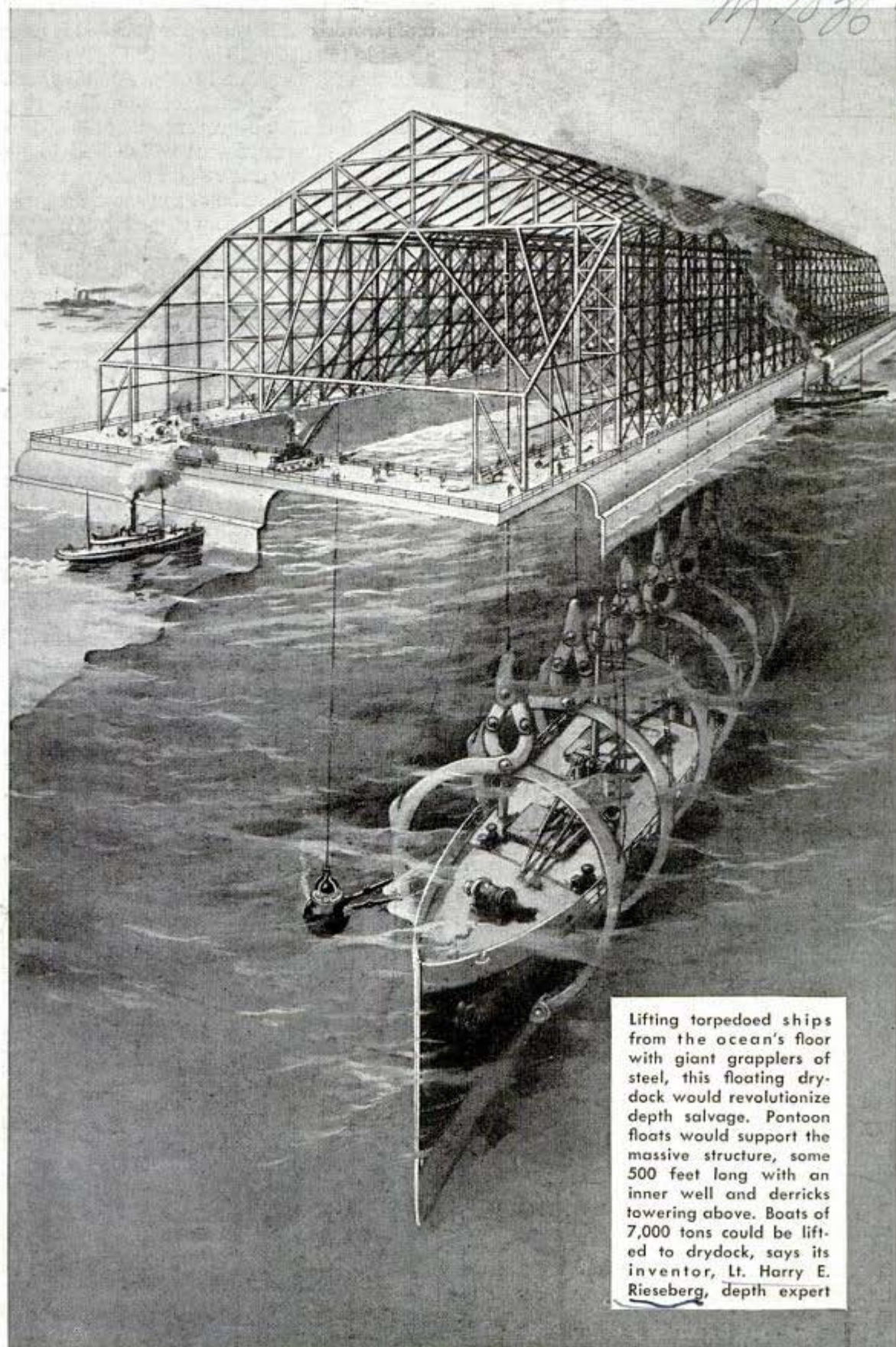


Army's five-car hospital train has wards and operating room

*Lt. Harry E. Rieseberg -
5127 Fountain Av. Hollywood*

Floating Drydock Would Hoist Sunken Vessels

M 1036 Caly



Lifting torpedoed ships from the ocean's floor with giant grappers of steel, this floating drydock would revolutionize depth salvage. Pontoon floats would support the massive structure, some 500 feet long with an inner well and derricks towering above. Boats of 7,000 tons could be lifted to drydock, says its inventor, Lt. Harry E. Rieseberg, depth expert

*Planters Supply Co.
Portsmouth Va.*

Folding Barrel Saves Space When Shipped Empty

M 740



Unpacking barrel, top; flat, it takes little space

Valuable wartime shipping space on railroads, wasted when empty barrels are returned to their owners, can be saved with a collapsible barrel of fir plywood which separates into flat sections when knocked down. It is put together and taken apart easily by means of removable pins that lock the hoops together.

Precision Grinding Adds Life To Cutting Tools

M 990

Precision grinding of cutting tools, which means a new tool shape with a highly polished, mirrored finish, is adding life to tools used in war industries, with a saving in high-grade tool steel as well as man hours formerly lost in frequent regrinding. Specially designed fixtures now hold 18 tools at a time for automatic grinding, and additional fixtures hold them one at a time for a slight final grind on a very fine stone, followed by an ultra-fine polishing operation. This new form of tool reduces friction and decreases wear since it breaks up chips quickly into short, small pieces so

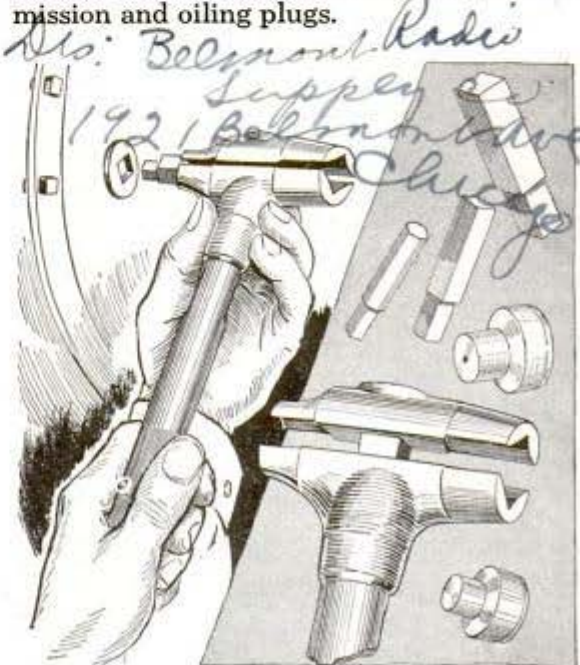
there is no long contact between the hot chips and the tool, with consequent cooler cutting. In one case where hand-ground tools would cut 13 gears per grind, it is now possible to cut 200 to 500 of the same gears with precision-ground tools. Another tool needed regrinding after cutting 30 shafts, while the machine-ground tool cuts 200 to 300 shafts. A third tool which had to be reground after each cut on a large engine part now machines 28 of the same forgings before regrinding. Developed by Wright Aeronautical Corporation of Paterson, N. J., precision grinding is applicable to all high-speed lathe tools, and full details are being released by the Wright company to other manufacturers.

30 Rockefeller Plaza, N.Y.C.

"Hammer Head" Socket Wrench Adjusts to Any Size

M 835

With a grip shaped to take either square or hexagonal nuts, an adjustable socket wrench opens and closes its jaws for various size nuts when the handle is twisted. It provides good leverage and a firm hold on nuts with "burred" corners. The head is shaped like a hammer and actually can be used as a hammer by inserting a special fitting in its jaws. Two hammer heads are supplied, one of solid steel and the other of resilient plastic for work on piston pins, auto bodies and fenders. Attachment bars also may be inserted to turn nuts having recessed heads, such as differential, transmission and oiling plugs.



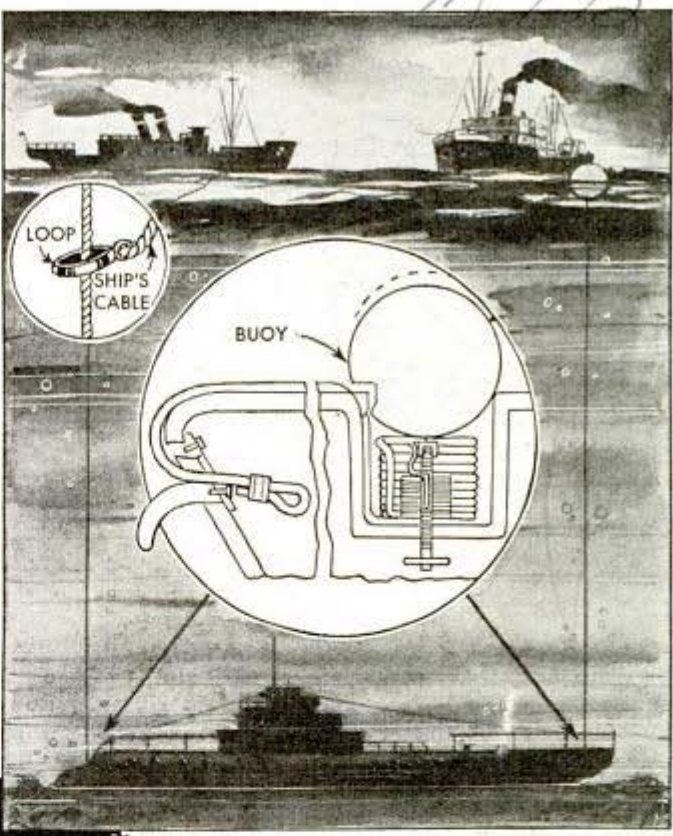
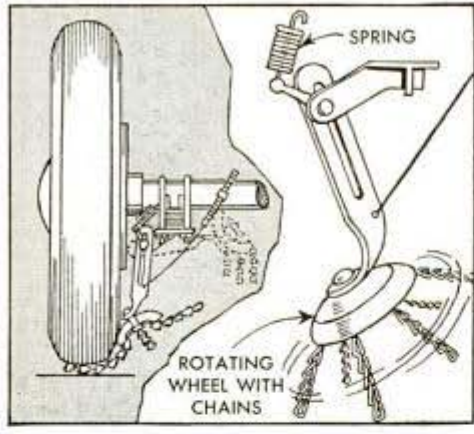
Wrench turns nuts or uses illustrated attachments

Cable Unit to Raise Sub Is Among New Patents

*Francis P. Chaussee
Missoula, Mont.*

The antiskid device, below, has a rotating wheel that flings chains beneath the tire when the controlling rod is released

M 7 93



Two ships would be able to raise a sub horizontally with a recently patented cable unit. Buoys attached to the stern and bow of the sunken sub could be released from within. They would rise to the surface carrying lines for guiding heavy cables from each ship to hooks at each end of the sub. With their winches the rescue ships can then haul the craft horizontally to the surface

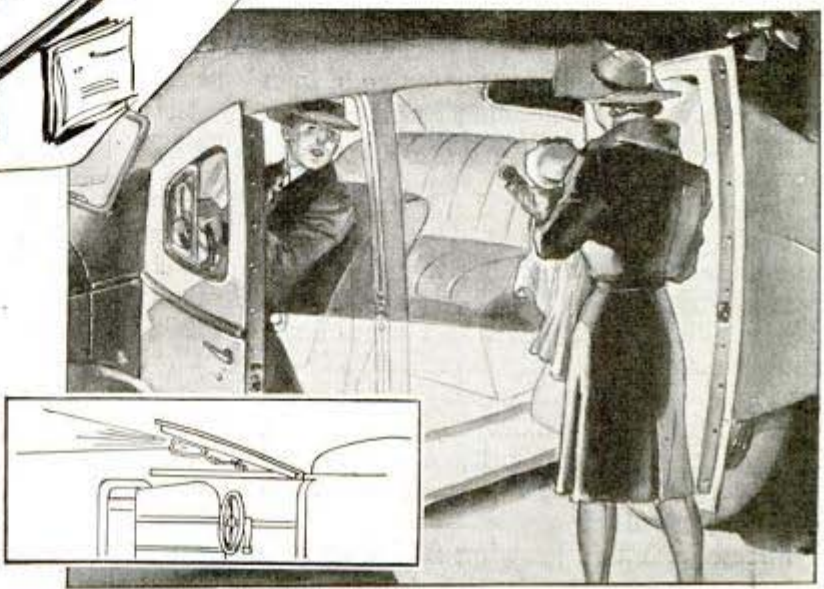
*George Earl Kneel
Los Angeles, Calif.*



The date indicator, above, is adjusted to any average sized calendar. A rod with ring on the end swings back and forth or slides upward

*John Chelster
Sharon, Pa.*

The armrest for automobile doors, in sketch, has a light in one end that goes on when the door is opened. Articles on this page were among patents recently granted, but no other information is available for prospective buyers

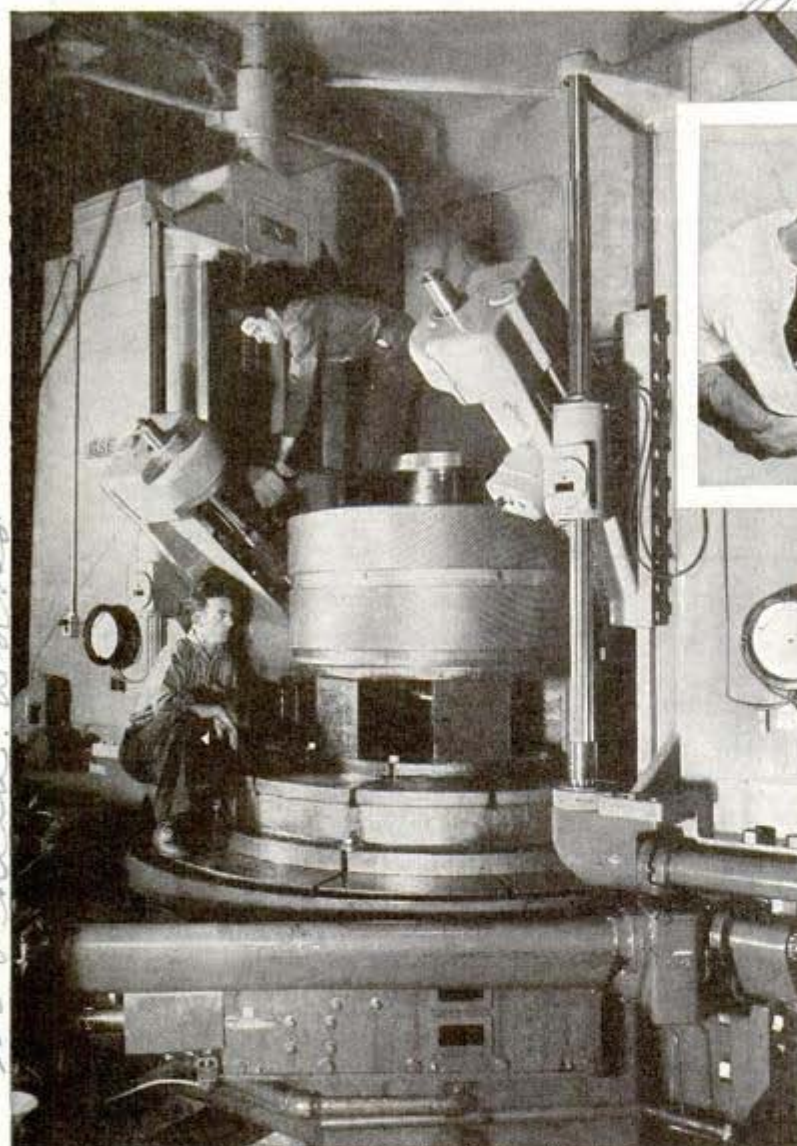


Con: *Willis ...* *Illcat 7*
Parbo or ...

FIGHTING *that* TIRED FEELING

M. 6. 42

*Western Elec & Mfg Co
So. Cal. works*



Lack of sunshine is a cause of fatigue which ultraviolet lamps can remove. Above, Westinghouse men "meter" solar rays

There's no "heat fag" in this sealed room, left, where marine gears are cut for seven days at a constant temperature

hospitals, colleges and research laboratories are starting a far-reaching investigation of this puzzle of modern civilization. If you do feel abnormally tired on the job, it may interest you to know that investigators in one organization alone, the National Safety Council, have already found thirty reasons for your fatigue. Other re-

UNCLE SAM needs every ounce of man power at the machine that can be exerted at home in behalf of the armed forces abroad.

The metal machine is doing its war job with its usual efficiency. But too many human machines tire under the stress of a normal day of toil. The body should replenish and repair itself and should not show serious daily fatigue until it is thoroughly worn out and aged. But it often does—right in its prime. Too frequently, loss of output, accidents, illness, labor turnover, lack of morale and general inefficiency result.

Faced with this growing factor as war pressure increases, scientists in factories,

search experts have added more to the list.

Some scientists divide fatigue into three categories. One is ordinary physical fatigue which results from muscular exertion without enough replenishment, rest and relaxation. Another is that lassitude which grows in an ailing body. Still another is nervous fatigue.

Most of us who have manual jobs think daily muscular fatigue is normal, but the experts believe it is not unless we are past the prime years or have an especially hard task. A whole plant, or even a department cannot be overworked without a jump in accident rates, an increase in rejected workmanship or a drop in output. These would stop production in a hurry.

Westinghouse

The truth is that the average body, like the average gasoline motor, uses only about a quarter of the energy obtained from burning the fuel which is the food eaten, wasting the rest in the form of heat. As in the gasoline motor we must carry around a cooling system to get rid of the excess heat which could be turned into energy. Still we feel fatigue.

One reason many of us tire toward the end of the day is that we gear our bodies to do a certain amount of work, like the milkman's horse which is ready to head for the barn when the customary route has been covered. We can step this ratio up by a regular after-hour session of sports like baseball, bowling or tennis unless we are past 35. Then a walk or a game of billiards might be more like it. This leaves us ready for more exertion when the whistle blows at the plant. The theory is that we tire on the job because we need extra exercise, particularly that which tones up muscles not used in our work. On the other hand, over-exertion at sports is a reason for much fatigue on the job.

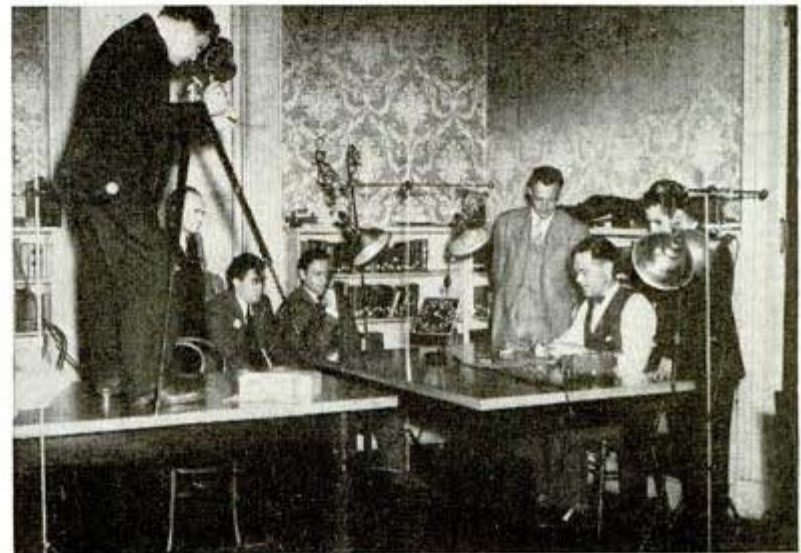
Another idea which has swept through large industrial plants recently is that workers should forget the old adage about digging their graves with their teeth. The new order is to eat four or five times a day and take the extra food in the form of

Experimenters make a time-motion study to determine how a manual task can be performed more efficiently and less tiringly



X-ray unit making a picture a minute detects lung troubles causing fatigue

A worker in a transformer plant takes candy pill containing vitamins A and D



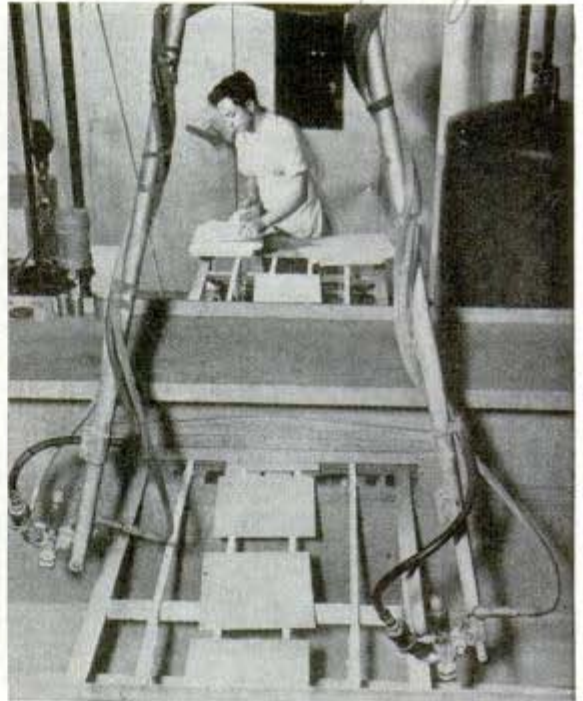
Westinghouse
Newark, N. J.



Aptitude test at General Electric plant prevents misplacing workers who tire rapidly if unfitted for task

snacks, even if it is only a piece of candy. Rolling snack bars are becoming a familiar part of the American industrial scene. Soldiers are fed a hard candy with high citric acid content. The inference is that we have been letting human boiler pressure die down at intervals when the throttle is wide open.

Plant managers who would have been surprised a year ago to have an employee ask for time out for a glass of milk, cup of coffee or tea now send such drinks around, particularly on the night shifts when toilers seem to tire more easily. Management has



Worker is protected from fatigue-producing fumes as automatic spray guns apply plastic paint to aluminum

learned that a mid-morning and mid-afternoon pause to give the body a chance to relax and recoup increases output.

Even when drinks and snacks are not passed around, in many cases a rest period with music is provided twice a day. The idea is that you get tired on the job because you work too steadily, even though not too hard. The body needs an interval to clear the muscles of toxins set up by exertion.

Another reason why you get tired on the job even if you do eat five times a day may be that you do not eat enough vitamins and minerals. Many companies recognize the importance of in-plant feeding and are trying to oust the time-worn dinner pail with its doughnuts and sandwiches in favor of hot meals with plenty of vegetables and fruits. Cafeterias are running on three shifts in many war plants.

Vitamins in pill form are furnished free to workers in some plants. One recent union contract included a provision for the daily supply of vitamins. A pioneer in this field was the Westinghouse organization which began to feed



Westinghouse
E. Pittsburgh plant

Handy material trays, electric screwdrivers suspended overhead, and conveyors eliminate waste motion and save effort

*Westinghouse
News, n. j.*

its electric appliance plant employees vitamin A to furnish visual purple and relieve eye strain.

Another late development is a campaign by the Wisconsin Alumni Research Foundation to acquaint factory physicians with the discovery that compounds of copper and iron fed to workers will lessen fatigue and boost production. Addition of calcium and phosphorous elements is also advocated by scientists. Salt helps prevent heat fag, so sodium chloride tablets are provided in many plants.

Tufts College scientists, searching for an anti-gray hair chemical, found it in para-amino-benzoic acid. They also found a brand new pep-giving substance in the same acid.

These discoveries apply mostly to physical fatigue of the muscular variety. But it appears also that there is a long list of factors under the heading of nervous fatigue.

One is the fitting of the right man into the wrong job—or into a job which belongs to a woman. General Electric Company discovered by aptitude tests that in dozens of jobs a woman could out-produce a man without becoming tired. The men were shifted to spots where they were better suited and their productive activity increased, too.

Experiments have shown that dislike for the job will actually produce fatigue—as will dislike for the foreman and the fellow worker.

Monotony, which is necessary if man must be geared to a machine, is another cause of fatigue. The necessity for repeated uniform movements inhibits the fulfillment of personal desires and the exercise of personal ability so that the worker becomes bored, particularly if he is of the nervous, alert type.

Westinghouse was a leader in the movement to relieve monotony and nervous tension. War work has been set to music at the

(Continued to page 162)



Music played over loudspeakers helps speed agile fingers
A "handcuff" prevents accidents that fatigue might cause



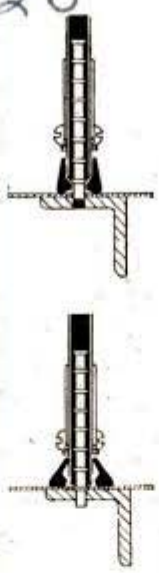
Dirt and fumes in the eyes, ears, nose and pulmonary tract would wear down and slow down the worker, so this American Airlines man is masked as he cleans motor parts with air gun



*Murray Corp. of America
7700 Rushmore St.
Detroit, Mich.*

"Pencil" Tool Ejects Rivets One at a Time in Holes

711 825



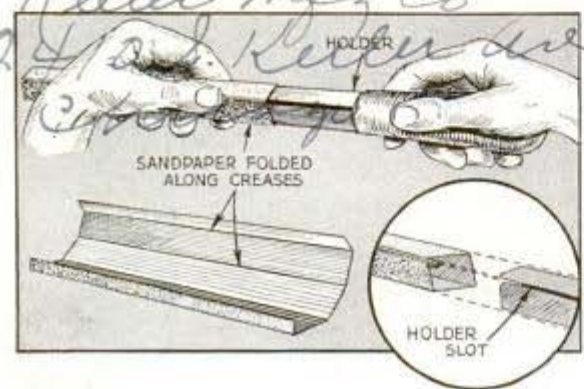
Lorraine Mc Finch

Automatic feeder prevents dropping of small rivets

Fumbling and dropping of rivets is eliminated with an automatic pencil-shaped injector that feeds one rivet at a time. It holds approximately 65 rivets. To operate, the jaws of the tool are placed over the hole and a slight downward pressure shoots a rivet into place. The feeder can be handled easily with one hand and war workers report that it has speeded riveting by as much as 25 percent.

Square-Shank Tool for Sandpaper Operates Like a File

Sanding inside corners and other hard-to-reach places can be accomplished easily with a long, square-shaped sandpaper holder now available. Handled like a file, the holder consists of a square, hollow

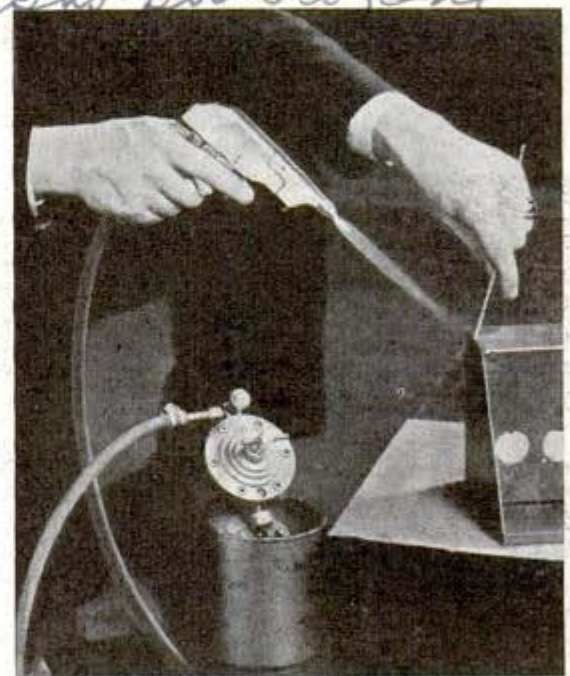


Sandpaper fitted to square shank is rubbed like file

metal tube, slit along one edge for gripping the paper. Sandpaper cut and creased ready for insertion is furnished, although the user may prepare his own refills without difficulty. Properly installed, the sandpaper holds firmly and may be rubbed vigorously without being dislodged.

Automatic Acetylene Gas "Gun" Lights at Pull of Trigger

Equipped with a "self-starter," a pistol-shaped acetylene torch blazes as soon as the trigger is pulled. Like an automobile engine, it is dormant when not in use, but a spark from a flint starts it instantly. Weighing 20 ounces, and being 6½ inches long and 5½ inches high, the "gun" is handy for lead and silver soldering, sweating terminals on electric cables, leading



Pull of trigger automatically lights acetylene torch

joints in plumbing, aluminum soldering in aviation plants, and many other uses. Acetylene gas from a tank keeps flowing as long as the trigger is held back, and there is a trigger lock for use on long-time jobs. A slight pressure against the trigger releases the lock to extinguish the flame.

Names and addresses of makers or sellers of commercial products described in this magazine are listed in the Where-to-Buy-It index. Write to them for additional information and be sure to Say You Saw It in Popular Mechanics.



The CRAFTSMAN

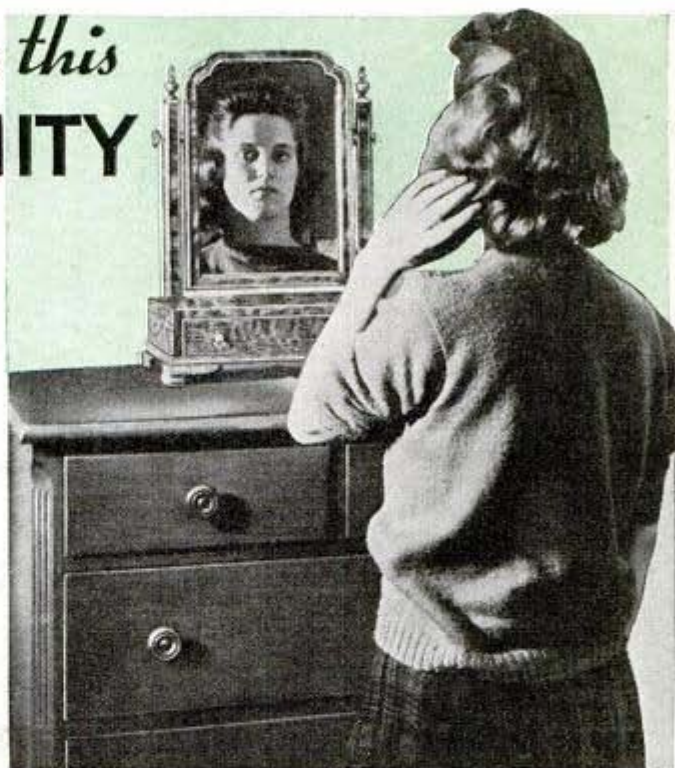
You can make this CHEST VANITY

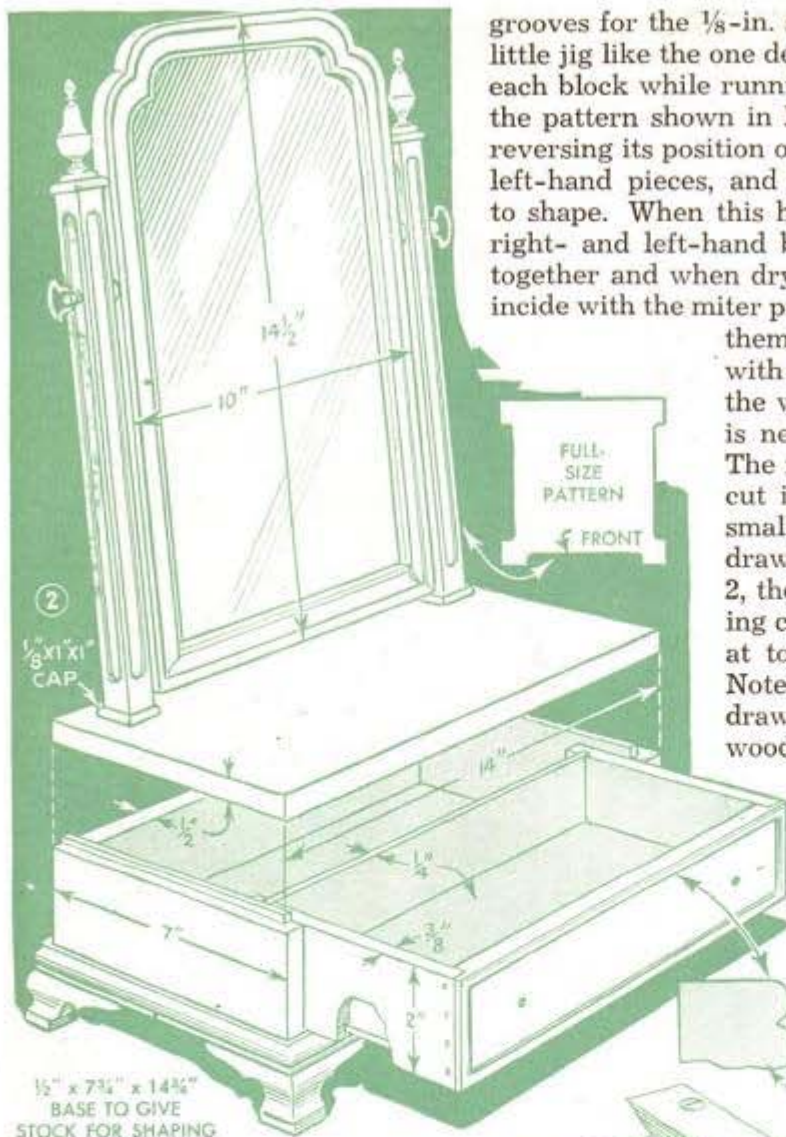
Beautiful little companion piece for chest or highboy. Combines an easel-type mirror with a convenient drawer in which to keep jewelry or handkerchiefs

By D. W. Martin

CHIPPENDALE in motif, this little vanity goes best with period furniture, yet it need not match the style of chest on which it is set to look appropriate. Beauty of grain shows to excellent advantage as can be seen in Fig. 1, which pictures the chest made of curly cherry. Assemble the lower part containing the drawer first. Fig. 2 shows this as a simple box measuring 3 by 7 by 14 in. Note that the bottom of it extends $\frac{3}{8}$ in. all around to provide sufficient stock for shaping the edges. If a shaper is not at hand, you can gain practically the same effect by using stock molding, mitering it at the corners and nailing it to the edges. Also, dowels may be substituted for the blind mortise-and-tenon joints.

Each foot can be bandsawed from a single block or made up of two separate pieces. The former method is typical in cutting the cabriole (Queen Anne) leg, where one profile is cut and the waste tacked back on before cutting the second profile. For this, blocks $1\frac{1}{4}$ by $2\frac{1}{2}$ by $2\frac{1}{2}$ in., with the grain running the short way, are required. Lacking a bandsaw, you can follow the mitering method detailed to the right of Fig. 3. Here $1\frac{1}{4}$ -in. square stock is cut into 3-in. blocks, after which one end of each block is mitered 45 degrees before running the





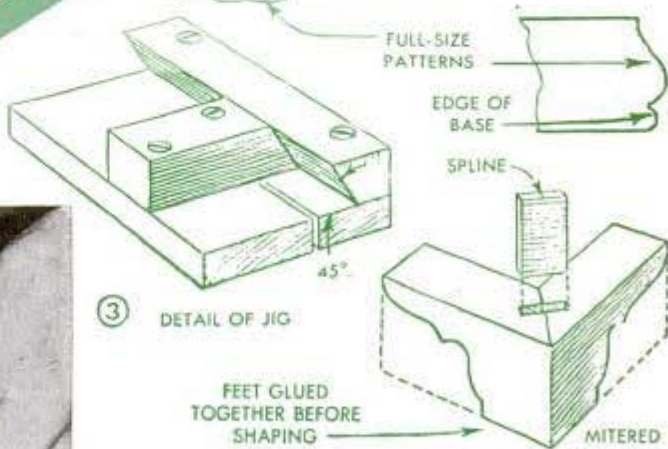
1/2" x 7 3/4" x 14 3/4"
BASE TO GIVE
STOCK FOR SHAPING

The edges of the base should be shaped before locating the position of the end mortises

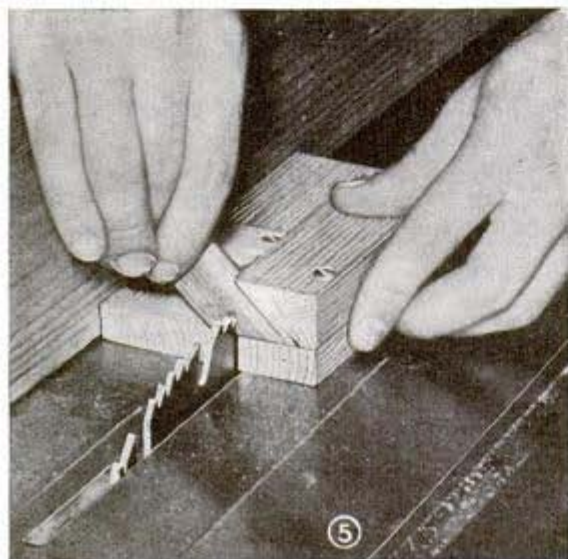
grooves for the 1/8-in. splines as shown in Fig. 5. A little jig like the one detailed in Fig. 3 will help hold each block while running it through the saw. Now, the pattern shown in Fig. 4 is traced on the work, reversing its position on four of the blocks to obtain left-hand pieces, and the blocks are scroll-sawed to shape. When this has been done, corresponding right- and left-hand blocks are splined and glued together and when dry, the faces are carved to coincide with the miter profile of the pattern. To carve

them, start rounding the top edge with a small block plane, planing the wood away until each surface is nearly flush at the miter line. The reverse curve of the profile is cut in a similar manner, using a small gouge or round file. The drawer is made according to Fig. 2, the overall size of the front being cut to allow a 1/16-in. clearance at top and sides of the opening. Note that the bead encircling the drawer front is cut right in the wood. Running the sharp nail point of a marking gauge back and forth along the edge of the work carefully will score the inner line of the bead, leaving the outer edge simply to be rounded with a file or sandpaper.

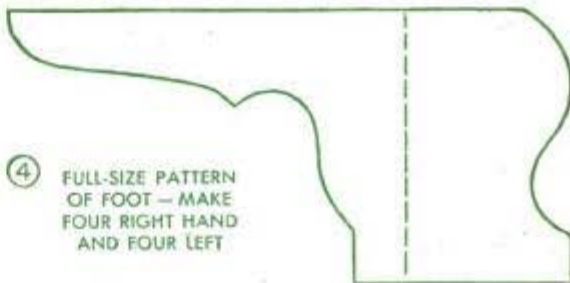
Now to make the mirror frame: The top corners

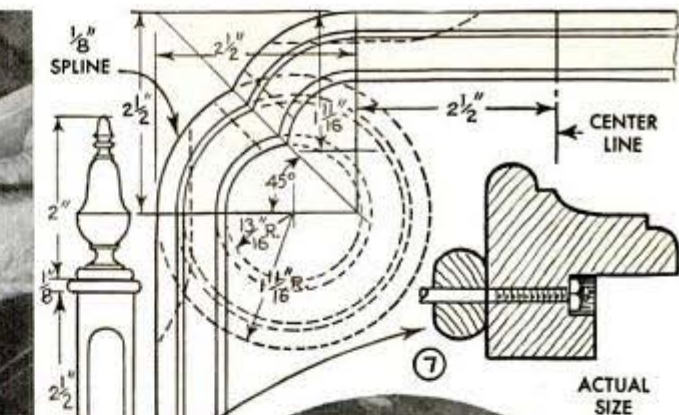
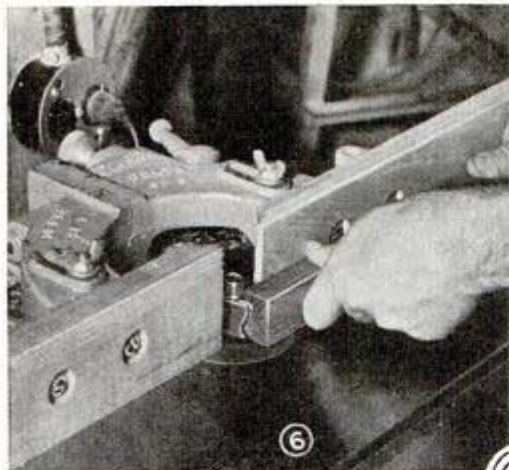


③ DETAIL OF JIG

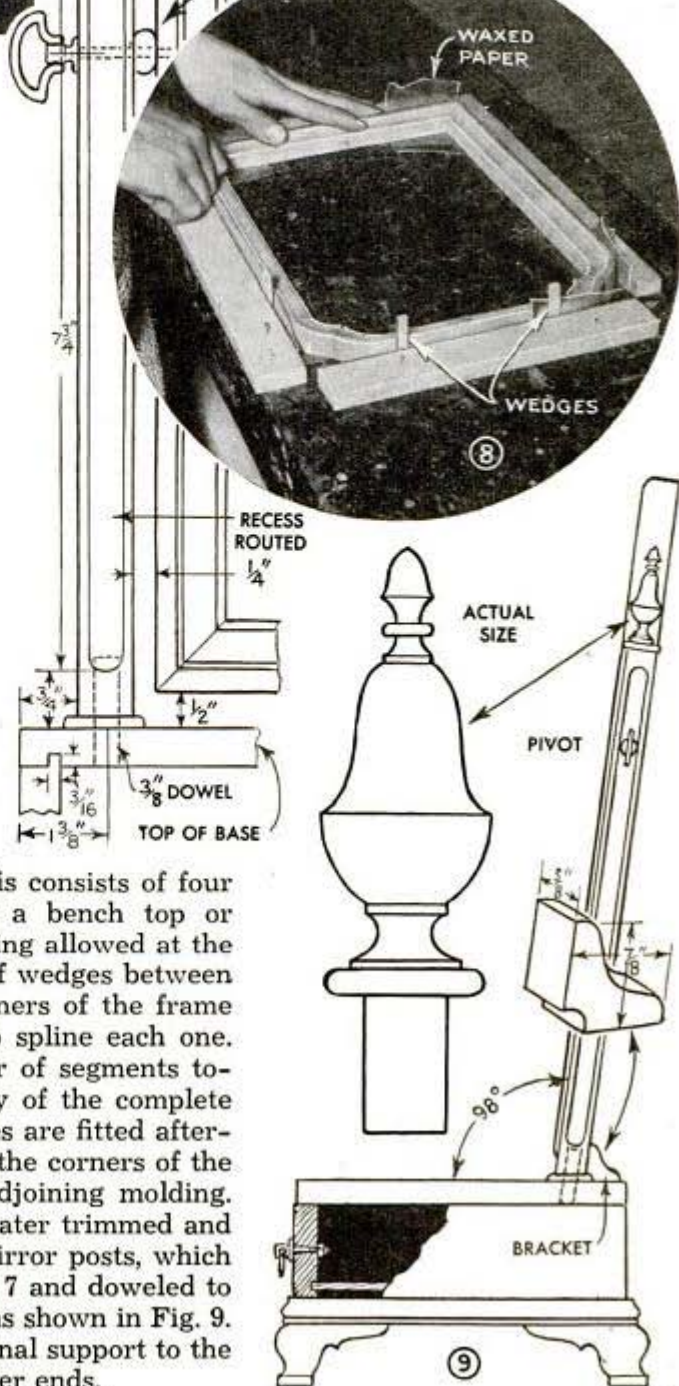
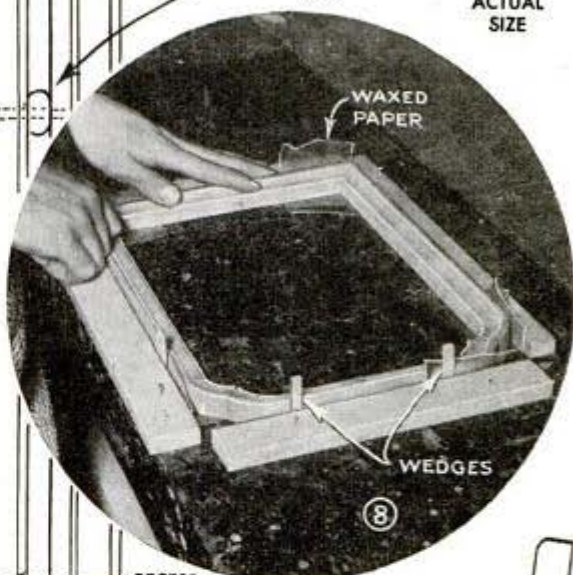


④ FULL-SIZE PATTERN OF FOOT — MAKE FOUR RIGHT HAND AND FOUR LEFT





consist of two segments cut from a wood ring, which is turned to coincide exactly with the shape of the adjoining molding. Run the molding first as in Fig. 6. Next, proceed to turn the ring, first cutting the mirror rabbet in the back, then reversing the work to shape the face. The latter requires the use of a simple wooden chuck to hold the centerless disk to the faceplate. The chuck, which consists of a block attached to the faceplate, should be recessed at a slight angle so that the disk can be pressed squarely in place. A template of the pattern given in Fig. 7, or better still of the molding itself after shaping, will help in turning the ring to line up exactly with the shoulder cuts of the adjoining molding. Careful cutting will enable you to get the four segments required from one ring. A set-up similar to the one shown in Fig. 8 will do to clamp the frame in gluing it together. This consists of four wooden cleats nailed squarely to a bench top or other flat surface with clearance being allowed at the top and one side for the insertion of wedges between cleat and frame. As the upper corners of the frame cannot be nailed, it is necessary to spline each one. The center spline holding each pair of segments together is inserted prior to assembly of the complete frame, but those in the top and sides are fitted afterward by running saw cuts through the corners of the segments and part way into the adjoining molding. The splines are left extending and later trimmed and sanded flush. Remaining are the mirror posts, which are shaped according to Figs. 2 and 7 and doweled to the base at a slight backward slant as shown in Fig. 9. Two little glue brackets give additional support to the posts, and turned finials top the upper ends.



Handy Stop on End of Sawhorse Supports Board for Planing



The usefulness of an ordinary sawhorse is increased considerably by fitting it with a stop which can be slid out of the way when not in use. Such a stop consists of a short piece of wood beveled on each side to fit snugly between two similarly beveled hardwood blocks attached to the sawhorse. In use, the stop is driven up and the work to be planed fastened to it with a C-clamp.

Clamp Protects Scratch Brush When Stored in Toolbox

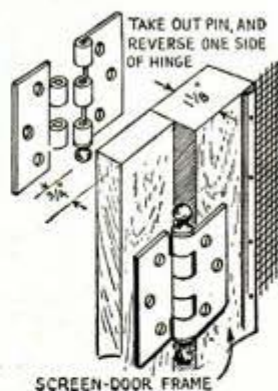
When a wire scratch brush is carried in a box with other tools, the bristles can be protected by putting the brush in this clamp. The clamp also is helpful in straightening the bristles after they have been bent in use. The two wood disks have a diameter a little larger than that of the



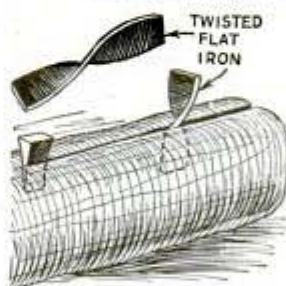
brush. On the inner surfaces of the disks are fastened plywood rings, which are cut out in their centers to take the flanges of the brush. This permits the bristles to be squeezed tightly.

Easy Way to Hang Thick Door On Thin Frame

Instead of blocking out the hinges when hanging a screen or other door that is thicker than the frame, try reversing the hinges as shown. Just remove the hinge pin and turn one half of the hinge over and insert the pin. This will offset the hinge sufficiently to make the use of blocks unnecessary.



Twisted Leaf of Auto Spring Makes Splitting Wedge



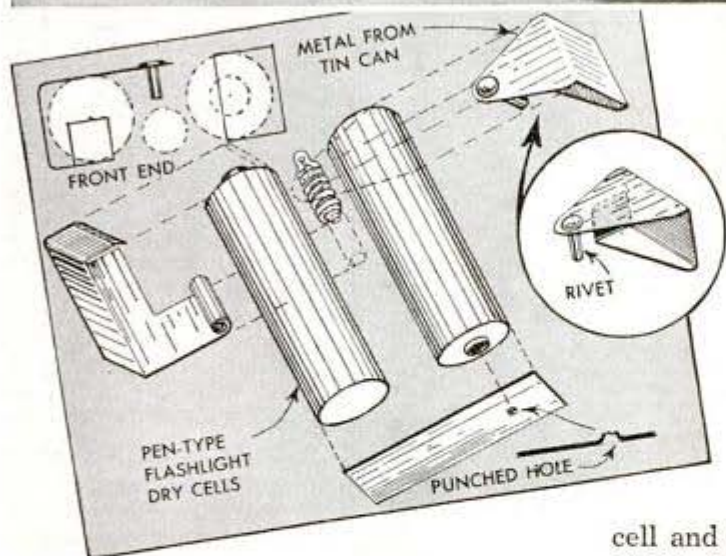
Light, efficient wedges with which to follow up a regular metal wedge when splitting logs can be made from lengths of auto-spring leaves. These are heated and twisted in the manner indicated. The thin ends of the wedges make it easy to start them.

Grass Sickle Is Carried Safely Under Wheelbarrow Body

To keep small children from picking up his grass sickle and possibly injuring themselves with it, one gardener carries the tool on the underside of his wheelbarrow. A broom clamp attached to the bottom serves as a holder for the handle, while the end of the blade is slipped under a leather strap.



Miniature Flashlight Is Improvised in Matchbox

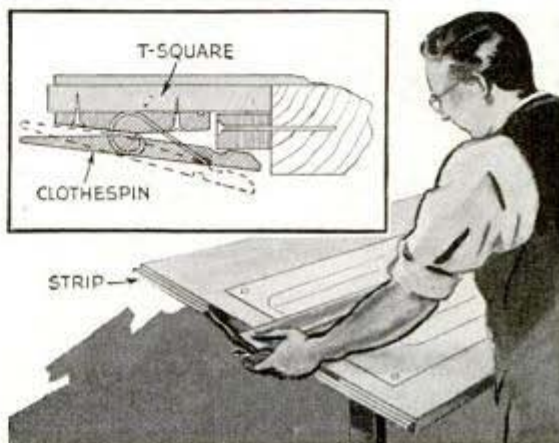


Contained inside of a penny matchbox, a couple of pen-type flashlight cells, a bulb and three sheet-metal contacts will provide you with a serviceable, vest-pocket flashlight. The bulb should be the kind designed to light on two cells, and should be one that has a tiny lens cast right in the glass so that it throws a narrow, concen-

trated beam of light. Punch a small hole in the drawer of the matchbox to take the tip of the bulb and reinforce the edges of the hole with fingernail polish. The straight piece of metal at the lower end of the drawer must make contact with the center or positive pole of one cell and the shell or negative pole of the other. The two bent contacts at the other end of the box connect the cells to the bulb, the rivet on the end of one serving the purpose of a switch when it is depressed against the screw portion of the bulb. A hole is cut in the side of the box to provide clearance for the head of the rivet. The matchbox housing can be replaced easily if it should become worn or broken.

T-Square Held on Drawing Board With Clothespin Clamp

To keep a T-square in position on a tilted drawing board, I use a clamp made from a spring-type clothespin. The square can be removed from the board or slid to any position on it instantly by merely squeezing the clamp to release its grip on a wood strip, which is nailed to the edge of the board as shown. After cutting off one jaw of the pin, it is screwed to the head of the T-square.—C. F. Winn, Washington, D. C.

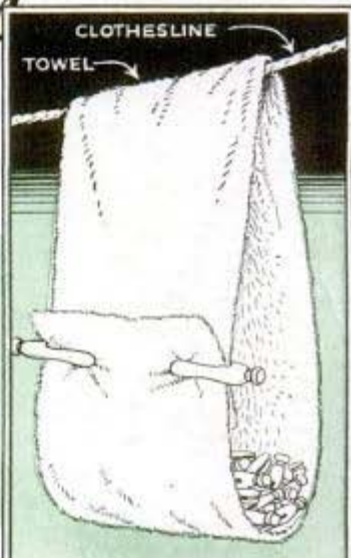


☞ To hull peas easily, pour boiling water over the pods, then put them through the clothes wringer.

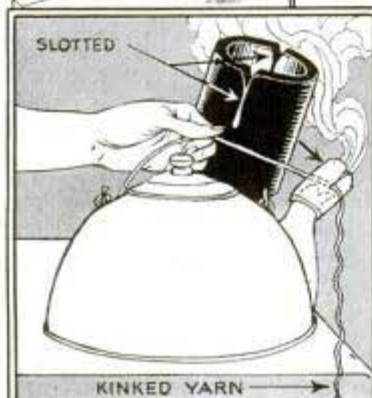
Solving HOME



Long wire hooks prevent folding screen from collapsing when bumped against or pushed by children



An emergency bag to keep clothespins handy on a clothesline can be made by pinning the ends of a large towel together over the line as indicated



Straightening used yarn is easy if it is steamed by pulling it through a slotted hose, which is slipped over the end of a teakettle spout



Left: The job of waxing floors, table tops, etc., is simplified by polishing with a cloth wrapped around a small sandbag to add weight. Below: Wires tied horizontally to cords, which are fastened to a window-shade roller, provide an indoor drying rack that can be raised and lowered



Impressions formed in a meat loaf with a wire potato masher help hold moisture to prevent the crust from drying out. The impressions also add a decorative touch and provide guide lines that aid in slicing the loaf uniformly



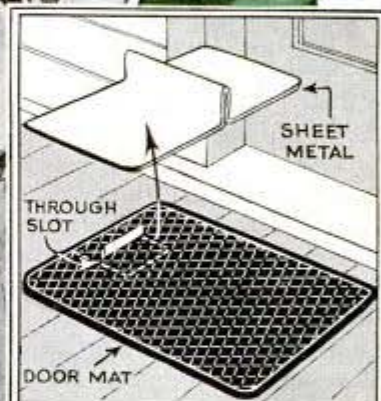
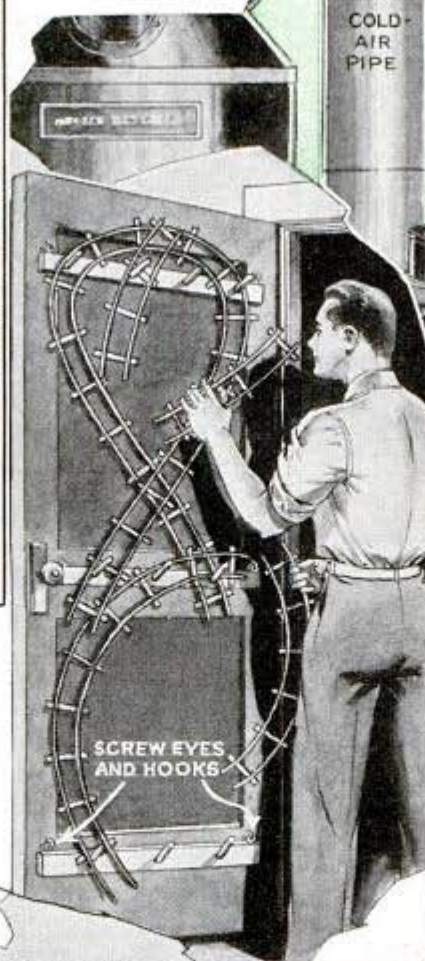
PROBLEMS



Marring of a window casing when raising or lowering a venetian blind can be avoided by pieces of felt glued to the ends of the bottom crosspiece

Storing a toy-train track without dismantling it completely is no problem if it is hung on pegs on the back of a closet door as at the right. Below, a mirror mounted at the inspection door of a gas hot-water heater will enable you to adjust the flame without kneeling

Linoleum tacked across joists is a good substitute for metal in making furnace cold-air returns

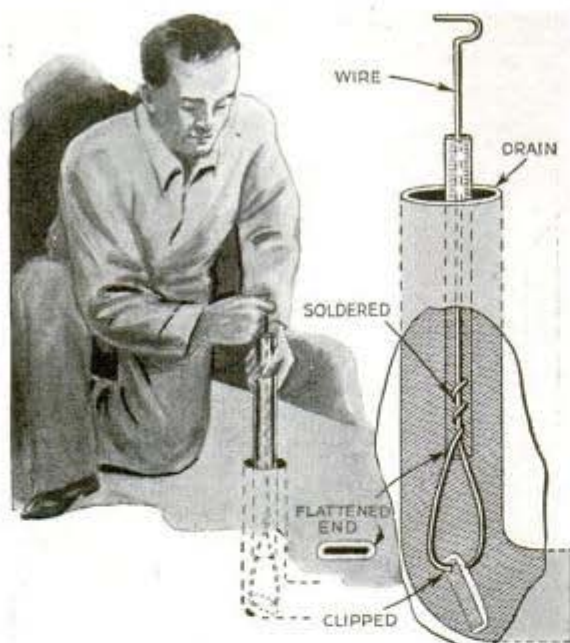


Bent as indicated above and inserted through a slot in a doormat, a strip of sheet metal provides a safe, handy foot scraper right on the mat



If a vacuum cup of suitable size is available, it can be used to clean clogged holes in a salt shaker by moving the cup up and down over them as above

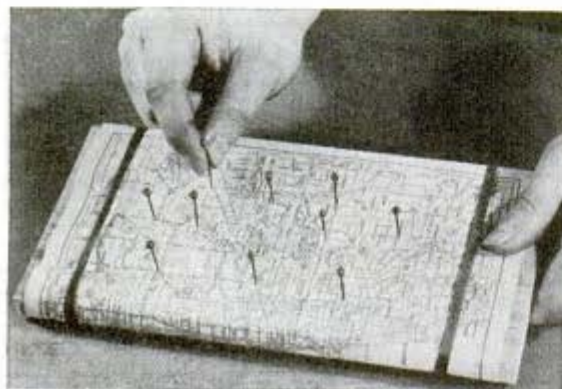
Gripper Removes Small Articles From Hard-to-Reach Places



Small articles that have been dropped in inaccessible places such as drains can be retrieved with this simple gripper. It is made from a length of heavy wire inserted into a pipe or tube. Jaws are formed on one end of the wire as indicated to fit into the flattened end of the tube. In use, pushing the wire down so that the jaws extend well out of the tube allows them to open, and pulling up on the wire closes them.

Record of Salesman's Calls Kept With Auto Road Map

Salesmen who travel in unfamiliar territory can plan their calls and keep a record of them on their road map by simply placing the map on a piece of softwood and then slipping rubber bands over the ends. After planning stops in a certain community, these are indicated by pushing



straight pins through the map and into the wood at the desired positions. When a call has been made, a visual record of it can also be kept by substituting pins with different colored heads. In selecting a piece of wood for the purpose, it's a good idea to get one that will slip into the glove compartment of the car.

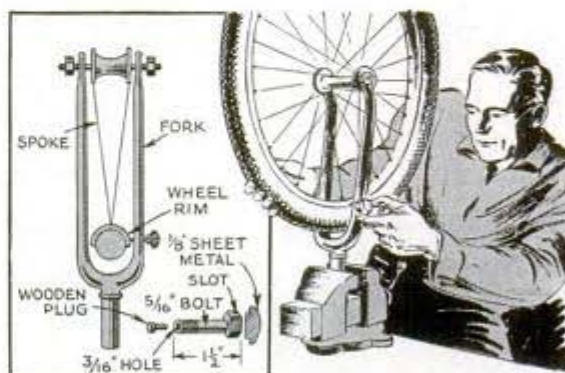
Reducing Holes in Salt Shaker

If you have a shaker that delivers salt too fast, it is a simple matter to plug some of the holes. First, wash the shaker to remove all the salt and dry thoroughly. Then merely stop up the desired number of holes with fingernail polish, applying it from the inside of the shaker.

—Kenneth Murray, Colon, Mich.



Bicycle Wheels Trued on Stand Assembled From Old Fork

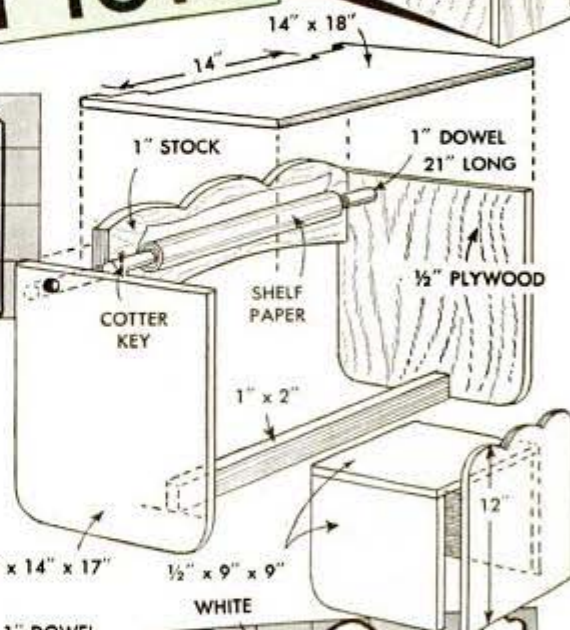
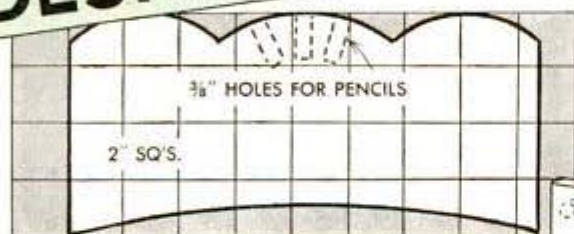


Bicycle owners who do their own repair work can true wheels that get out of line if a stand of the type shown is assembled from a discarded fork. One side is drilled and tapped to receive a bolt, the end of which is also drilled to accommodate a small wooden plug. The latter can be shaped from a piece of softwood as its purpose is to provide a tip on the bolt or gauge that will not scratch wheel rims. Adjustment of the gauge is made easy by soldering a small piece of sheet metal to the bolt head which permits turning it without a wrench. When in use, the stand is held rigid by clamping it in a vise.

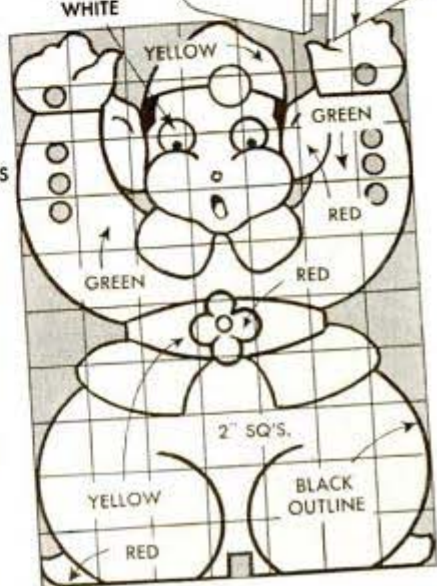
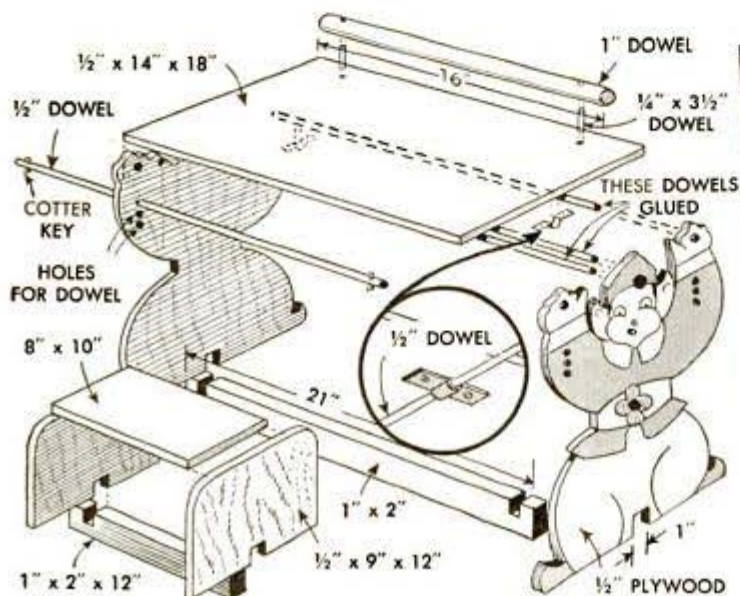
—Ivan J. Stretten, Detroit, Mich.



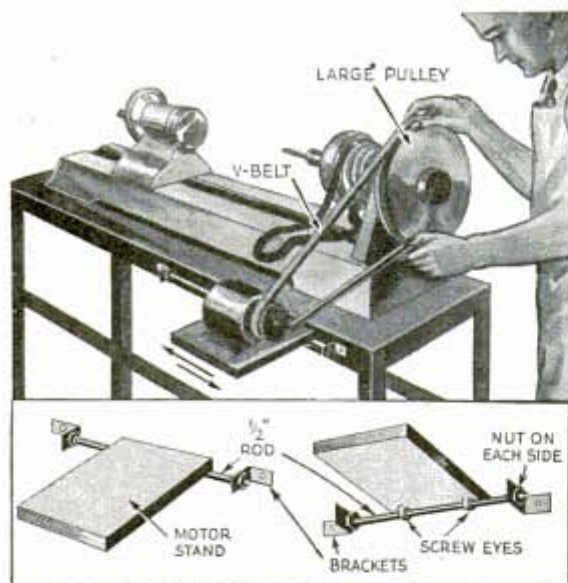
DESKS for TINY TOTS



Either of these desks will delight your youngster. Both have rolls of paper for writing and drawing, and are built inexpensively of plywood. As shown above, one is of boxlike construction, while the other has jigsawed figures for the ends. Chairs to match are given for both desks



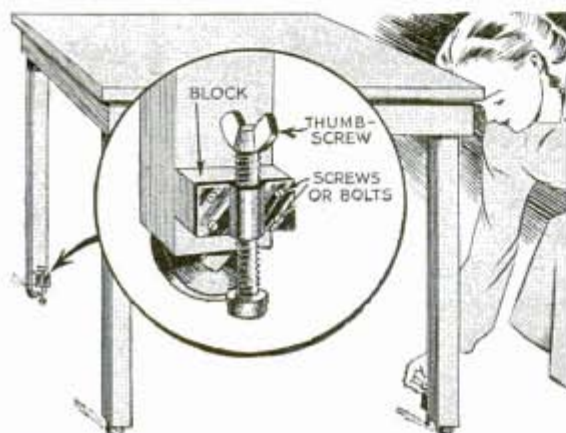
Reducing Speed of Wood Lathe To Use It for Drilling



The problem of reducing the speed of a woodturning lathe to use it for drilling was solved by one home workshop owner as shown. A large wooden pulley was placed on the outboard end of the lathe spindle, and the motor was put on a sliding mount. With this arrangement, the motor could be moved sideways easily to drive either the wooden pulley or the step pulley on the lathe. The motor mount was made as shown, using a couple of brackets to support a long iron rod to which the motor stand was attached with a couple of heavy screw eyes. The motor mount "floats" to keep the belt tight.

Kitchen Table Anchored Securely By Window Antirattlers

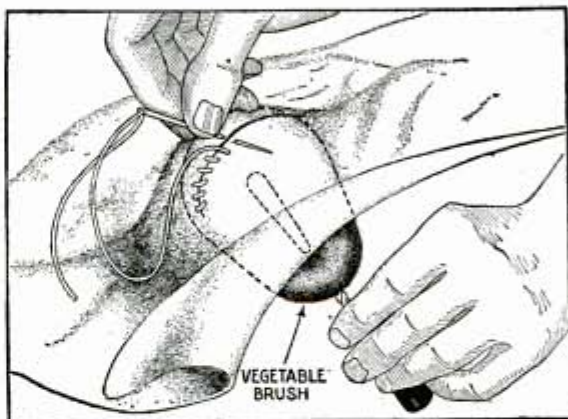
If your kitchen worktable is on casters, which permit it to move when rolling pie dough, etc., just attach window antirattlers



of the type shown to two of the legs. These are screwed to wooden blocks, which are fastened directly to the legs with long screws or bolts. To anchor the table in one position turn the thumbscrews down until the rubber tips rest on the floor. With this arrangement, no damage is done to the linoleum and the holding devices are hardly noticeable as they are mounted on the inside of the legs.

Brush Serves as Darning Egg When Mending Sweater

To hold together the torn edges of a sweater, or other loosely knit garment, in a handy position for mending, try a small vegetable brush, or hair brush, instead of



the usual darning egg. The bristles of the brush will penetrate the knit fabric to hold it so that a darning needle can be worked through the material without interference from any solid surface.

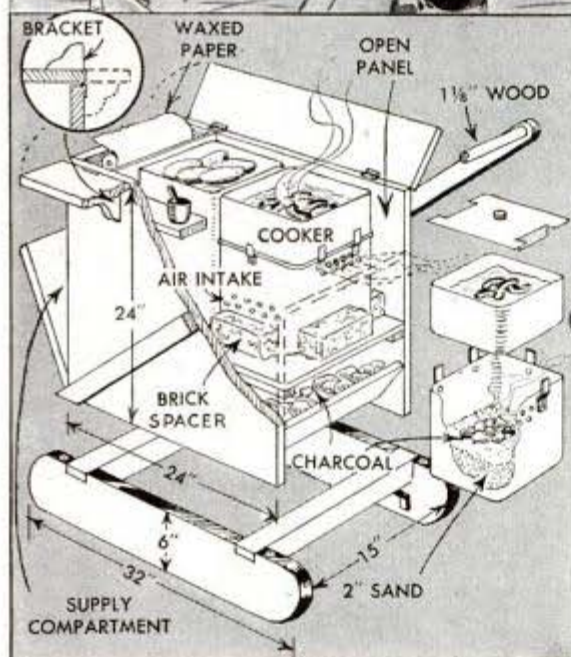
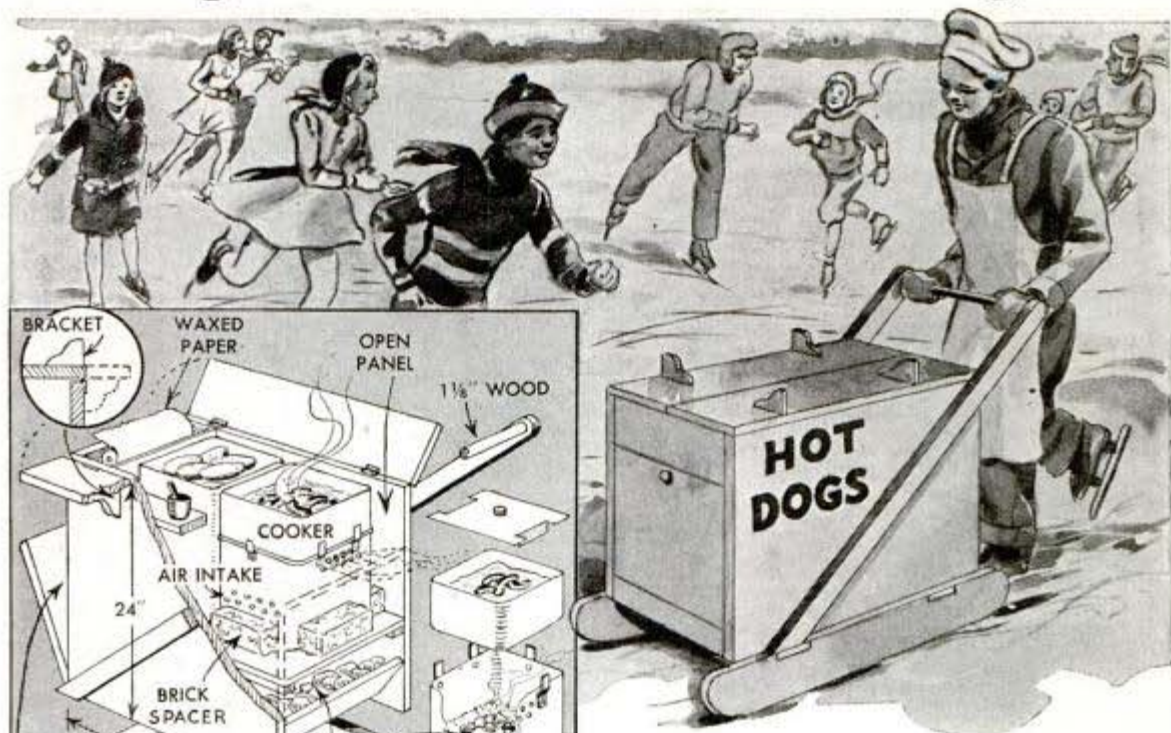
Interior Wood Trim Removed Without Marring Finish

When you have to remove interior wood trim from doors and windows, just drive the nails on through the wood with a nailset or straight punch. This avoids splitting the wood or splintering the edges with a pry bar.



At the same time, it gets rid of the nails and permits the wood to be removed without the surface being marred by dents and scratches.

Hot Dogs Served From Sled on Skating Pond



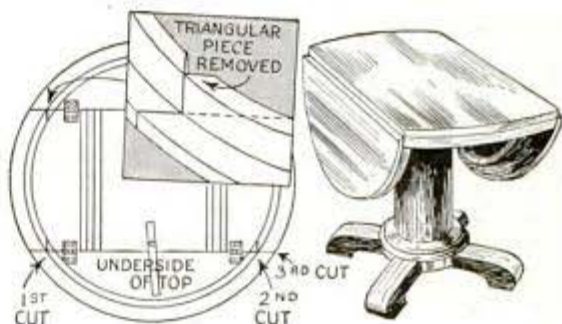
With this sled you can go right out on the ice to serve sizzling hot dogs to skaters. The body of the sled is nothing more than a box screwed to a pair of runners, which are assembled and braced as shown in the detail above. The top of the box is in two parts, which are hinged to swing outward and form service counters, brackets being screwed to the counters to rest against the sides of the box and support them in a horizontal position. Cooking equipment consists of a firepot to burn charcoal, a cook-

er, and an oven to keep buns warm. The equipment can be made from square or rectangular cans. In the original sled, empty gasoline tins were cleaned and used. The firepot has 2 in. of sand in the bottom on which the fire is built, and vent holes are provided near the top and bottom for air inlets and outlets. Tabs are riveted to the upper edges of the pot to support the cooker, the entire cooking assembly resting on bricks, which are placed on a shelf located high enough above the bottom of the box to raise the cooker flush with the oven top. A trough under this shelf stores charcoal. A compartment at the rear end of the box holds knives, paper and other accessories, and a narrow shelf between the oven and side of the box takes care of mustard and relishes.

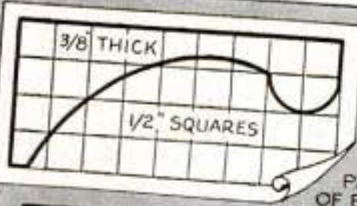
Old Round-Top Table Converted Into Drop-Leaf Table

Here is an easy way to convert a round-top dining table into a drop-leaf table. Cut the top to form two leaves, and then remove four triangular pieces from the curved apron at each point where it is cut, so the leaves may fold. Next, screw the hinges in place. Two hardwood leaf supports should be pivoted as shown to swing back when the leaves drop.

—R. F. Gomoll, Chicago.



PHONOGRAPH RECORDS



PATTERN OF BRACKETS

MATERIAL LIST

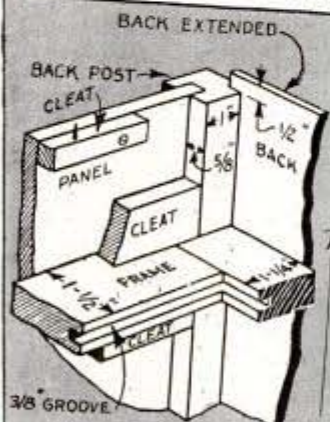
- 1 pc.— $\frac{3}{4}$ x $14\frac{1}{4}$ x $17\frac{1}{2}$ in.—Top
- 2 pcs.— $\frac{11}{16}$ x $\frac{3}{4}$ x 15 in.—Molding
- 1 pc.— $\frac{11}{16}$ x $\frac{3}{4}$ x 19 in.—Molding
- 2 pcs.— $\frac{1}{2}$ x 2 x $13\frac{3}{8}$ in.—Frame
- 1 pc.— $\frac{1}{2}$ x $1\frac{1}{4}$ x $18\frac{1}{2}$ in.—Frame
- 1 pc.— $\frac{1}{2}$ x $1\frac{1}{4}$ x $15\frac{1}{4}$ in.—Frame
- 2 pcs.— $\frac{3}{4}$ x $1\frac{1}{4}$ x $16\frac{3}{4}$ in.—Drawer frame
- 2 pcs.— $\frac{3}{4}$ x $1\frac{1}{2}$ x $12\frac{1}{2}$ in.—Drawer frame
- 1 pc.— $\frac{1}{4}$ x $12\frac{1}{2}$ x $14\frac{1}{2}$ in.—Dust bottom
- 2 pcs.— $\frac{5}{8}$ x $\frac{3}{4}$ x 12 in.—Cleats
- 6 pcs.— $\frac{5}{8}$ x $1\frac{1}{2}$ x 12 in.—Cleats
- 2 pcs.— $\frac{3}{4}$ x $1\frac{3}{8}$ x $13\frac{5}{8}$ in.—Tri. cleats
- 2 pcs.— $\frac{3}{8}$ x 2 x $4\frac{1}{2}$ in.—Brackets
- 1 pc.— $\frac{3}{4}$ x $13\frac{7}{8}$ x $16\frac{3}{4}$ in.—Shelf
- 1 pc.— $\frac{3}{8}$ x $\frac{3}{4}$ x $15\frac{1}{2}$ in.—Facing strip
- 4 pcs.— $1\frac{1}{4}$ x $1\frac{1}{4}$ x $26\frac{3}{4}$ in.—Posts
- 2 pcs.— $\frac{3}{8}$ x $12\frac{3}{4}$ x 19 in.—Panels
- 2 pcs.— $\frac{1}{4}$ x $\frac{3}{4}$ x 12 in.—Bottom mold
- 1 pc.— $\frac{1}{4}$ x 16 x $19\frac{1}{2}$ in.—Back
- 2 pcs.— $\frac{1}{2}$ x $3\frac{1}{2}$ x $13\frac{3}{4}$ in.—Drawer sides
- 1 pc.— $\frac{1}{2}$ x 3 x 15 in.—Drawer back
- 1 pc.— $\frac{3}{4}$ x $3\frac{1}{2}$ x $15\frac{1}{2}$ in.—Drawer front
- 1 pc.— $\frac{1}{4}$ x $13\frac{1}{4}$ x 15 in.—Drawer bottom



SHelf ACCOMMODATES 8 TWELVE-RECORD OR 20 THREE-RECORD ALBUMS. DRAWER IS FOR CATALOGS AND ACCESSORIES

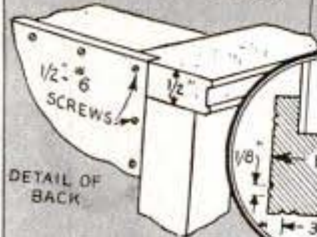


SPADE FOOT AND TAPER ARE FORMED WITH A CHISEL

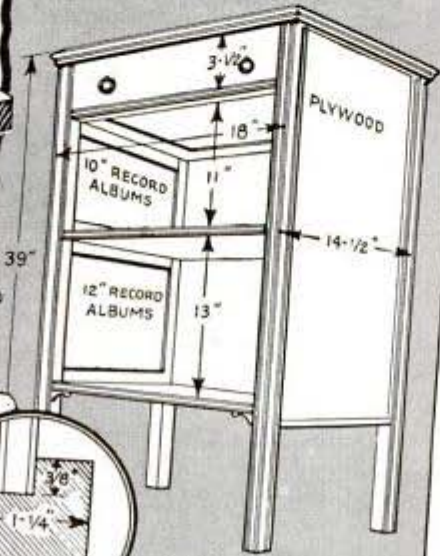


DUST BOTTOM OMITTED CORNER OF FRAME IS NOTCHED TO FIT AROUND POST

DETAIL OF REAR CORNER



DETAIL OF BACK



TWO-SHELF CABINET NOTE-CONSTRUCTION & SIZES IDENTICAL EXCEPT HEIGHT



THE TOP ASSEMBLY IS SECURED WITH SCREWS

REEDED CORNER POSTS MAY BE SUBSTITUTED FOR SPADE-FOOT TYPE FOR EITHER SIZE CABINET

Linoleum Scored With Ice Pick Is Easy to Cut



The difficulty of cutting thick linoleum, even with a sharp knife, can be overcome by first scoring the surface with the sharp point of an ice pick or similar tool. The pick point grooves the material so there is less for the knife to cut through, making it easier to keep the blade on the mark and pull it through the sticky center portion.

Small Labels Held in Typewriter By Creased Sheet of Paper

When you have a number of small labels to address on a typewriter, considerable time can be saved by inserting a creased sheet of paper in the machine to hold them, making it unnecessary to run each label under the platen. In use, the paper is turned up until the crease is in position to receive the bottom of the label. Then, it is



turned back to bring the label into position for typing. If the crease is perfectly horizontal, each label will be squared automatically when it is inserted.

Sash Lock on Side of Stepladder Keeps It Closed for Carrying

Instead of using a screen-door hook to keep a stepladder in a closed position when in storage or while you carry it, install an ordinary sash lock where the legs come together. Locks of this type do not open easily if the ladder is turned upside down and there are no pointed ends to catch on your clothing.



Flattened Monkey-Wrench Screw Provides Quick Adjustment



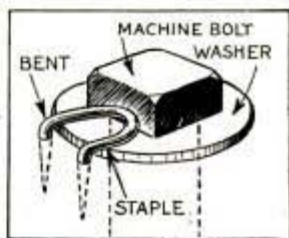
Time lost in adjusting a monkey wrench, when tightening nuts of different sizes led one workman to grind off the threads on one side of the adjusting screw. This was done so that the movable jaw

could be released and slid to the desired position quickly, after which it is locked in place by giving the screw a half turn.

Machine Bolt Kept From Turning By Fence Staple

If you have to use an ordinary machine bolt instead of a carriage bolt in wood, you can keep it from turning by driving a fence staple at the edge of the washer.

The staple is then bent over so that it presses against one side of the bolt head as shown.



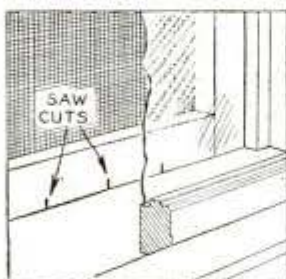
Creased Book Leaf Holds Cards While Typing Data From Them



To hold postcards or file cards conveniently for reading while copying data from them, one stenographer folds and creases a page of her note book. The book, opened to stand in the usual position, supports the cards at a convenient height.

Saw Cuts in Lower Screen Rail Provide Drainage Openings

During heavy rainstorms, tight-fitting screens often trap water between them and the sash in such quantities that it works under the sill and runs down the wall inside the house. The best remedy for this is not to loosen the screen, but rather to saw several shallow slots in the lower rail of the screen frame to provide for escape of the trapped water.



Rubber Tip Secured to Crutch By Large Tacks



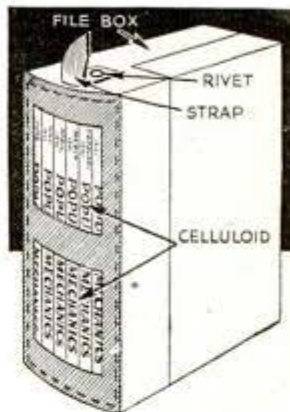
If rubber crutch tips have a tendency to slip off, especially when using crutches on soft ground, drive three rubber-headed tacks into the crutch where the tip slips onto it. The tack heads

enlarge the crutch so that the tip fits tightly. If tacks are not available, you can use small brads, which are driven into the crutch at an angle to serve the same purpose, although they will not be as satisfactory as the tacks.

Windows Are Cut in File Boxes For Storing Magazines

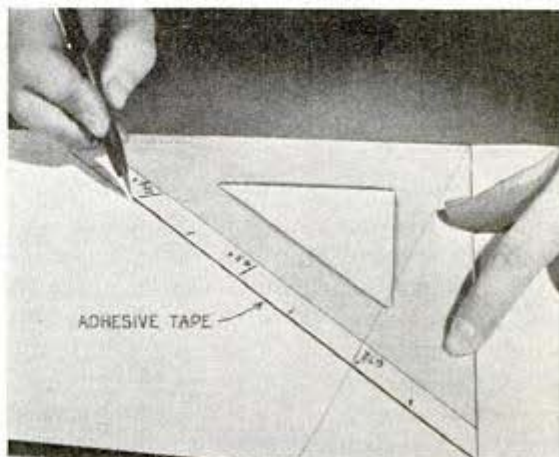
File boxes with windows cut in them provide handy containers in which to store magazines that you want to keep.

A given number of issues can be kept in each file, the windows permitting the data on the edges of the magazines to be read easily. Celluloid or Cellophane should be glued or stitched over the window openings to keep out dust. If a short cloth or leather strap is riveted to the top of the file near the front edge, it will be easy to remove from between other file boxes.



Triangle Serves as Protractor

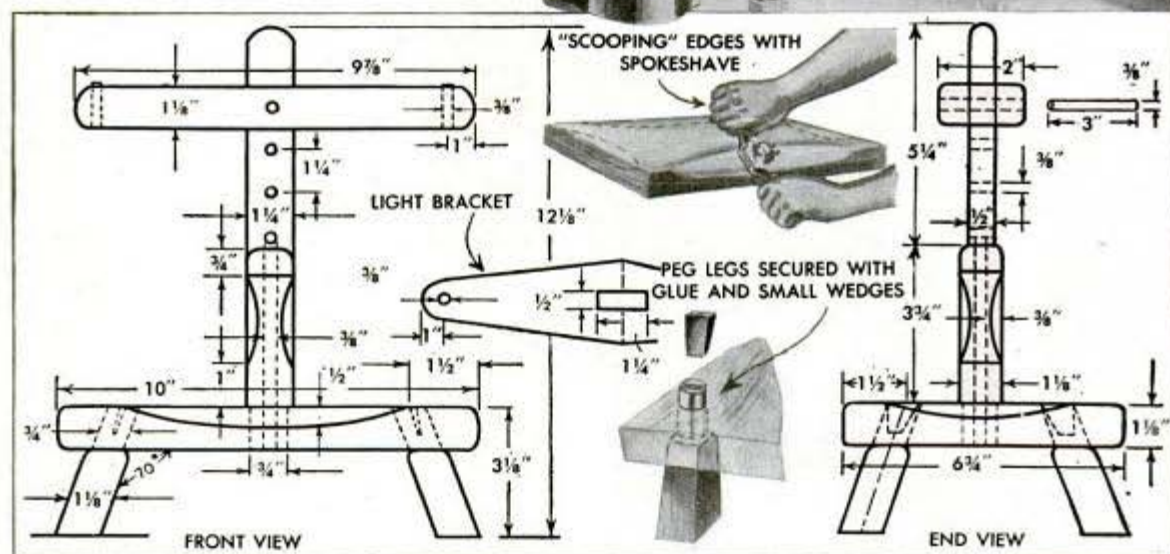
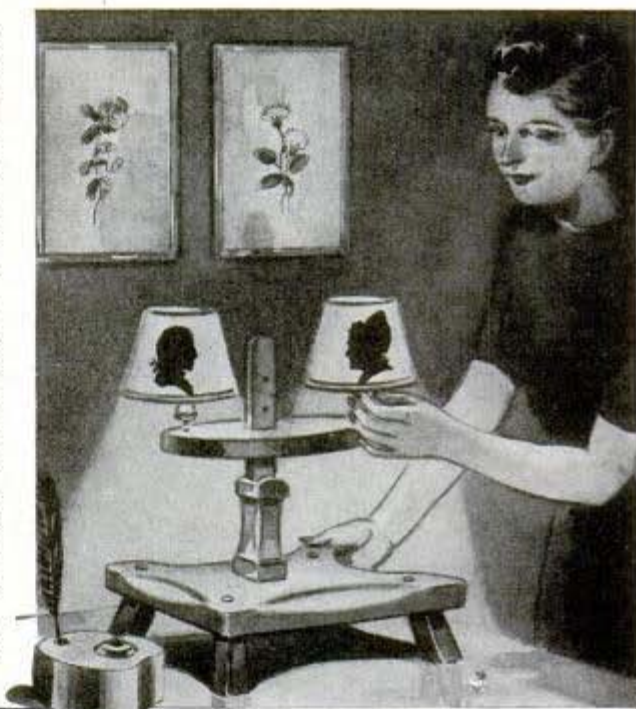
By putting degree markings on a 45-degree triangle, it can be used as a protractor. The figures can be scored in the celluloid or they can be inked on a strip



of adhesive tape, which is then applied to the edge of the triangle as shown. The readings are taken from the lower point of the triangle through the line marking at the top.

Colonial Table Lamp to Match Your Pine Room

Made of either pine or maple wood, this quaint table lamp really comes into its own in Colonial surroundings. A piece of $1\frac{1}{8}$ by 7 by 24-in. wood will provide sufficient stock for the lamp. Begin with the base, which has the top surface scooped out along all four sides. This work can be done best with a sharp knife or a spokeshave. Holes for the peg legs are drilled into the base at angles of 70 degrees. It's best to use a jig or guide for this to assure uniformity. The legs are whittled to shape and have tenons on the upper ends, which are slotted for wedges to lock them securely in the base. A piece $1\frac{1}{8}$ by $1\frac{1}{4}$ by 10 in. will do for the standard, which is shaped as shown. It is attached to the base with a mortise-and-tenon joint. To provide for a lampcord, a hole is drilled vertically through the standard, coming out



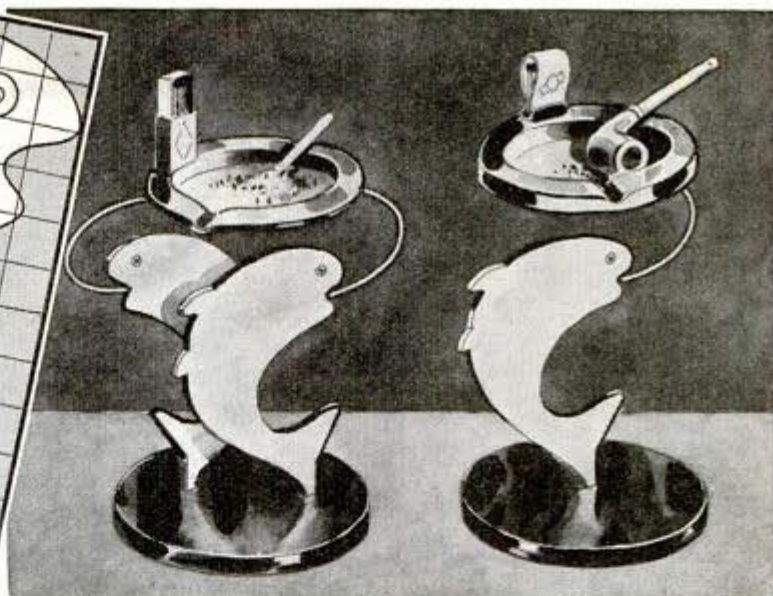
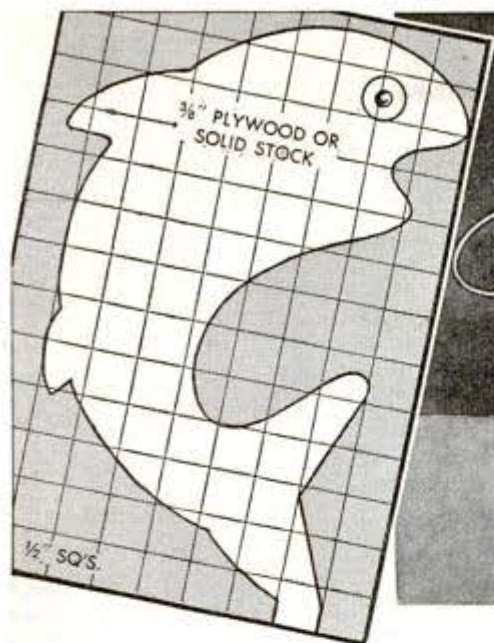
at the upper part of the shouldered portion. The lamps are supported on a bracket, which is mortised to slide on the standard. The latter is drilled at intervals for a pin, which passes through the bracket to provide height adjustment for the lamp. Short $\frac{1}{8}$ -in. pipe nipples, screwed into holes near the bracket ends, take the lamp sockets. The finished work should be well sanded, dulling all sharp edges carefully and rubbing the surface parts thoroughly. Sand with the grain at all times. If the lamp is made of pine, finish it with a solution consisting of orange shellac, 1 part, white shellac, 1 part, and alcohol, $\frac{1}{3}$ part.

Three coats will do. Allow about 6 hrs. drying time between coats and rub thoroughly between coats with fine steel wool. Then polish with furniture wax.

Straightening Paintbrush Bristles

If the bristles of a paintbrush become crooked from neglect, often they can be straightened by dipping them in melted paraffin. Allow the brush to remain untouched for about 24 hrs., then straighten the bristles by smoothing them with the fingers. A few hours later, wash out the wax with turpentine.

Marine Ash Trays for the Fisherman's Den



Suitable for a sportsman's den, or a play room furnished in marine style, these ash trays can be made of either plywood or solid stock. Fish cutouts are used for standards and are the same for both trays, except that two of them are required for making the double standard. Tenons are formed on the lower ends of the fishes' tails and are mortised and glued into the bases. Lengths of looped wire inserted into holes in the mouths of the fishes support the trays on the standards. Finishing the trays is a matter of choice as they can be painted or stained and varnished. If you like, they can be given a realistic appearance by painting scales and fins on the fish.—M. G. Winterton, Fort Lewis, Wash.



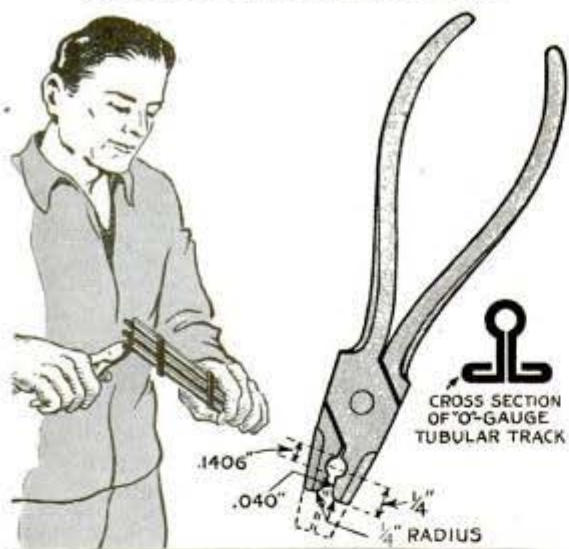
Starch Coating Makes Old Whitewash Easy to Sweep Off



If you have a surface from which you want to remove old whitewash, try the following method, which is much simpler and easier than washing it off with water. First, apply a thin wash coat consisting of starch, alum and glue. Allow this to dry thoroughly, which causes the whitewash to curl up so it can be brushed off.

Old phonograph needles may be used instead of brads to hold the cardboard backing in place in picture frames. The sharp points are more easily pushed into the wood, and the tapering ends tend to keep the cardboard flat against the picture.

Forming Tool For O-Gauge Track Made From Pair of Pliers



After tubular track has been connected and disconnected several times, the ends become enlarged so that the connecting pins fit loosely. To assure tight connections and good contacts, a pair of small pliers can be altered to reform the track ends. First, grind off the ends of the plier jaws. Then clamp the jaws in a vise and drill a $\frac{1}{16}$ -in. hole between them. After this has been done, run a hack-saw blade from the jaw ends to the hole. This provides clearance for the rail flange, and the hole fits around the upper part of the track.

Loss of Billfold Is Prevented By Attaching It to Chain

If you are in the habit of carrying a billfold in your hip pocket, here's a good way to guard against the possibility of losing it. Just take the billfold to a local shoe repair man and have him put an eyelet in one



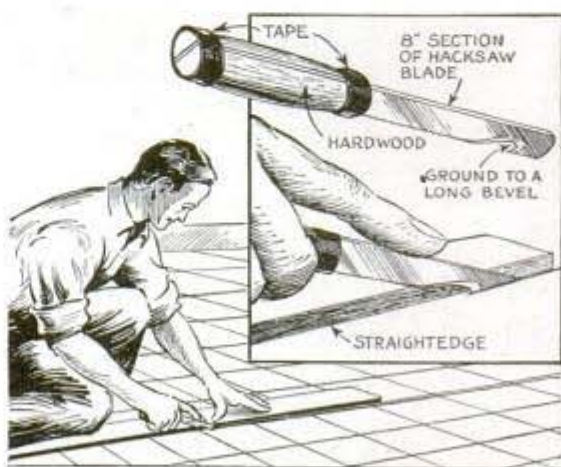
corner so that it can be attached to the end of a key chain. Most chains of this type are long enough to reach around to the hip pocket and also permit free access to the contents of the billfold.

Fresh Paint Removed From Trim With Steel Wool in Holder

Here is an effective tool for removing fresh paint from the trim of doors and windows after decorating the walls. If paint gets into the grain of hardwoods, even when they have been finished, it is very difficult to remove. To make the tool, first flatten one end of a short length of metal tubing, and then force steel wool into the open end, forcing it down until it projects from the flattened end. Now dip the holder in turpentine and you can remove paint smears without leaving a trace.

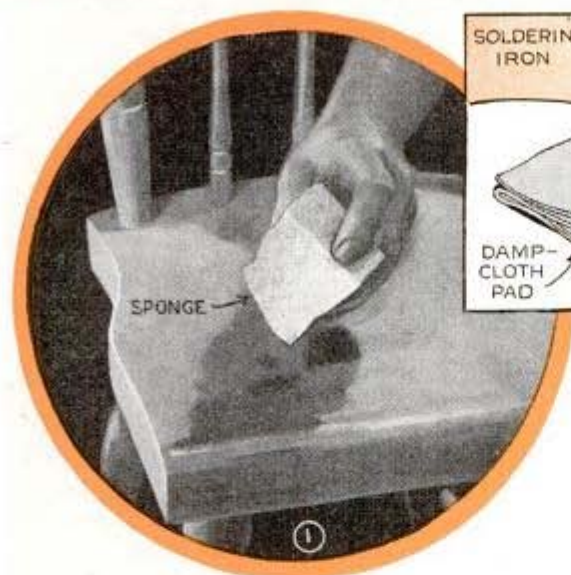


"Drawknife" Assures Neat Edges When Laying Linoleum



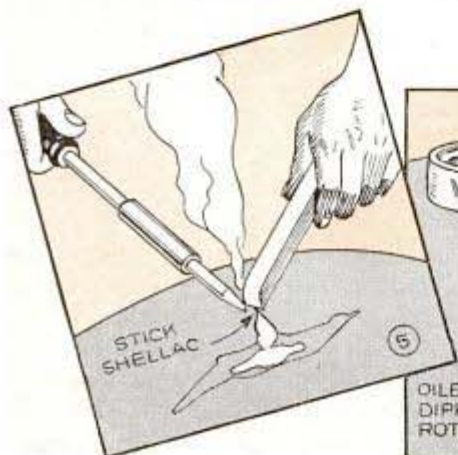
Made from a discarded hacksaw blade, this "drawknife" cuts through linoleum easily without tearing or tedious trimming. Because it is sharpened with only one bevel it hugs a straightedge tightly, yet, due to the thinness of the blade, you can follow a curved line accurately. Just break a hacksaw blade to a length of about 8 in., grind off the teeth and then grind an edged notch near one end. Tape rounded pieces of hardwood to the blade to form a handle.

Plastic Surgery on OLD FURNITURE



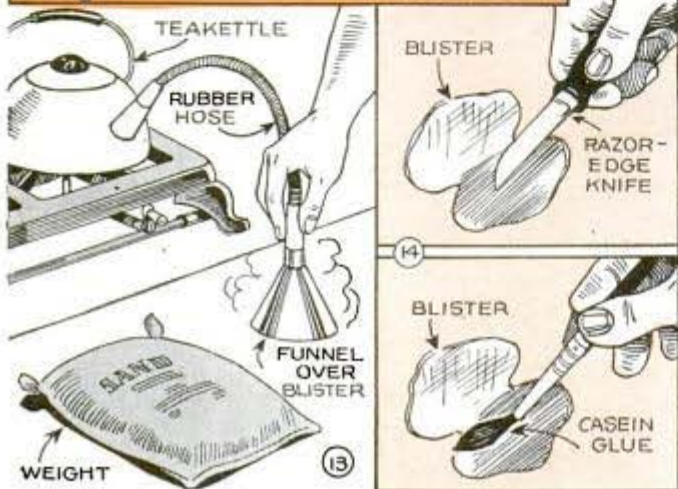
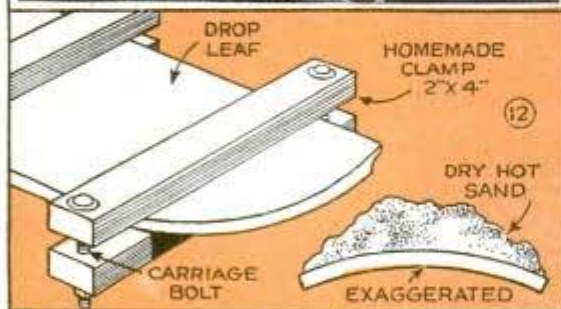
MANY pieces of fine furniture, abandoned because of being broken, seemingly beyond the possibilities of repair, or so badly checked and marred that they need a complete refinishing job, can be brought back to "life" and usefulness by the average home mechanic.

Scratches and checked finishes: Varnished finishes, especially those on table tops, Fig. 3, suffer considerably from everyday usage. If there is only superficial damage such as light scratches, water marks and checking, you can do wonders in renewing the old finish with a liquid called amalgamator which can be obtained at some well-stocked painting supply houses. This liquid applied to the surface softens the old varnish or enamel, causing





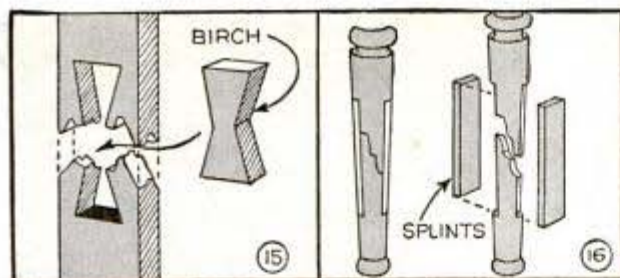
Checks in wood are first filled with wood putty, then top-dressed with stick shellac to match the finish, Fig. 9. Knotholes are filled with nonshrinking paste crack filler, Fig. 10. For sealing seams as at drawer bottoms, use caulking compound, Fig. 11



it to flow and level itself, after which it hardens again. Checked surfaces are thoroughly scrubbed with mild soap, using a stiff-bristle brush to remove all dirt from the cracks, and when dry, the amalgamator is flowed on like thin varnish. After this has dried, the renewed surface can be waxed and polished.

Removing dents: If there are shallow dents in the wood, the varnish of the dented surface is removed carefully to bare the wood. Then a few drops of water are applied to the wood as in Fig. 1. The water swells the compressed wood fibers so that they will return to their original position. If simple soaking does not remove a dent, try the heat process. Moisten the wood as before and after the water has penetrated the fibers, put a pad over the dent and hold a hot soldering iron or flatiron on the pad as in Fig. 2. Expansion of the wet wood fibers under the influence of heat should do the trick. Then stain to match and varnish where the finish was scraped off. When dry apply amalgamator to blend the edges of new and old varnish.

Scars and gashes: Ugly scars and gashes are filled with wood cement commonly known as stick shellac. A stick of appropriate color to match the finish—or cement from different sticks blended together—is softened by means of a soldering iron as in Fig. 5 so that it drops into the gash. Do not heat the cement too much or it will char. Heat should be just enough to flow it without bubbling. After filling the gash flush with the surrounding surface, smooth the ce-



Fractures of legs may be repaired with a double wedge as shown in Fig. 15, but if the legs are too slender you can apply splints as in Fig. 16. Repair pieces should be same kind of wood. Often, corner blocks, glued and screwed in place will hold legs rigidly, Fig. 17

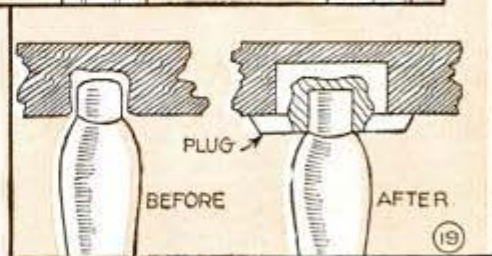
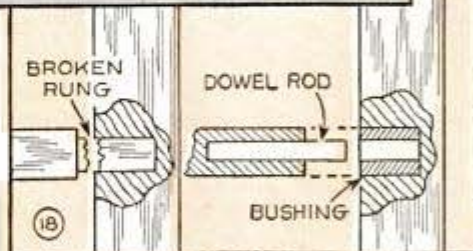
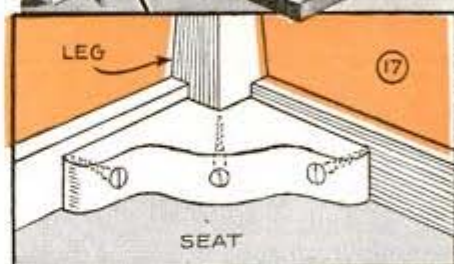
ment with a spatula as in Fig. 4, which should be heated over an alcohol burner, Fig. 7, but do not use a candle or other flame as it contains soot which will ruin the cement. After the latter has hardened, rub the surfaces with an oiled felt pad dipped in rottenstone to remove the glaze as in Fig. 6.

Checks, cracks and knotholes: Checks in the wood are unsightly but do not seriously weaken the wood. First fill them to slightly below the finish level, Fig. 9, with fresh plastic wood or sawdust mixed with casein glue. When dry, apply stick shellac to match the finish. Cracks and knotholes not in highly-polished surfaces can best be filled with a non-shrinking paste crack filler applied with a spatula as in Fig. 10.

Regluing and filling seams: On a job involving extensive repairs, pieces should be reglued and clamped as in Fig. 8. The edges should be scraped clean of old glue before applying fresh glue. Caulking compound settles the old problem of shrunken drawer backs, Fig. 11, as it never gets hard but remains elastic, yet keeps the gap well plugged.

Warping: Curved pieces of wood such as found on drum tables and circular-table aprons can be returned to their original shape if you make use of the natural tendency of the wood to warp. As shown in the photo above Fig. 12 a piece of carpet is laid on the convex side and hot water is applied, while the other side is kept dry, allowing free circulation of air. When the wood has reached the desired curvature, place it in clamps or forms to hold it in position until dry. The same method works in reverse to take the warp out of table leaves, Fig. 12. Here a wet pad is put on the concave surface so that wood fibers on this side will absorb moisture and expand. Watch the progress and clamp the leaf when it is straight, leaving it clamped overnight. Should

WEAK LEG JOINTS CAN BE REINFORCED WITH CORNER BLOCKS GLUED AND SCREWED TO THE LEG AND RAILS



the leaf be bent too far so that it is warped in the opposite direction, hot, dry sand will bring it back as shown in the detail of Fig. 12.

Blisters on veneer: Old veneer is very brittle. If loose or blistered, the wood must be steamed to a pliable state before it can be worked, taking care not to soften the glue that is still holding. A simple steamer can be improvised as shown in Fig. 13. Then a sharp knife is used to cut the blister open as in Fig. 14, after which

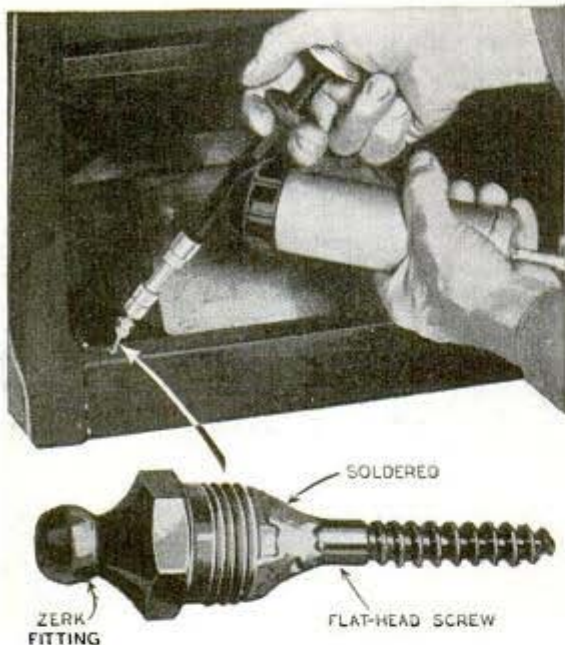


Fig. 20: Simple fitting on grease gun permits glue to be forced into loose joints after drilling small hole

glue is applied and the wood pressed down in place again, working fast to get the job done before the wood dries out and breaks. Excess glue squeezed out at the edges is wiped away and a bag of sand is placed on the spot as a weight. When dry, sand, stain and revarnish the surface.

Repairing fractures: Fractures sometimes require reinforcing pieces when repairs are made. In Fig. 15, a double wedge of hardwood such as birch, is glued in a mortise cut out to make a snug fit. After applying glue liberally, press the wedge in

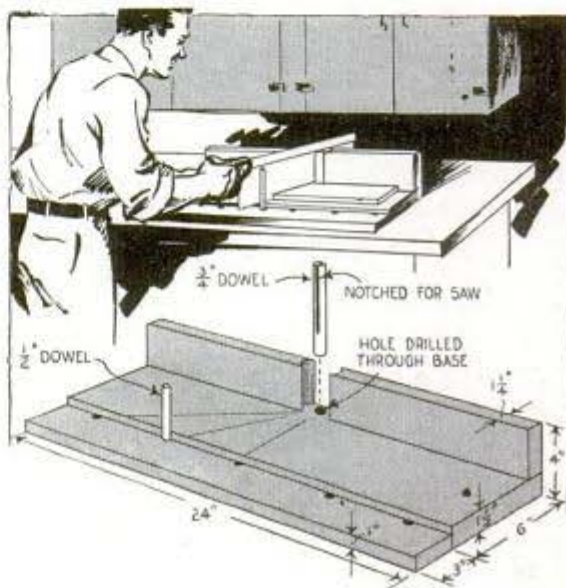
place and clamp securely. Dress down when dry. Splints such as shown in Fig. 16 are set in pieces that are too slender for a double wedge.

Leg joints and chair rungs: When a leg of a chair or table is weak and needs reinforcement, corner blocks glued and screwed in place, Fig. 17, are sometimes the best solution. If the chair has a rung broken at the tenon, the socket is bored out to a size a little larger than it was originally and a snug-fitting bushing is glued in place. The bushing is bored to receive a dowel which is also fitted into a hole bored in the rung after the tenon has been cut off flush, as in Fig. 18. Then glue is applied and the dowel pressed or driven home. A hopelessly enlarged socket in a chair seat can be restored by boring out the socket and installing a plug, which is bored to take the leg tenon, the latter being turned down to fit as shown in Fig. 19. In some cases where the glue in the joints has loosened but it is not advisable to take the piece apart for regluing, glue can be forced into the joint. First a small hole is bored at some inconspicuous point to break into the loose joint. Then, with a simple fitting on a grease gun, as shown in Fig. 20, glue can be forced into the hole. The fitting consists of a wood screw with a small hole drilled through it lengthwise, which is soldered to the regular grease fitting. The screw is turned partly into the passage hole after which pressure is applied to the gun to force out the glue.

Inexpensive Miter Box of Wood Has Pivoted Saw Guide

With this homemade miter box the saw is swung either left or right to get the different angles. The base of the box is made of $1\frac{1}{2}$ -in. stock and the back is made of $1\frac{1}{4}$ -in. wood. A $\frac{3}{4}$ -in. dowel notched to take the saw is pivoted into a hole at the back. The notch should be of a depth to permit the saw teeth to just barely touch the base. Holes are drilled near the front edge of the base at various angles from the notched dowel to take a $\frac{1}{2}$ -in. dowel, which serves as a stop for the side of the saw. In use, the stop is set in the hole representing the angle at which the work is to be cut and the saw is placed in the notched pivot pin, after which the saw is held against the stop while making the cut.

—Morris Birge, Rochester, Minn.



Cabinet Folds Down to Provide Breakfast Table



Owners of kitchens that are too small to accommodate breakfast tables will find this combination table and cupboard a solution to the problem of serving breakfasts and light lunches. Instead of the usual doors on the cabinet, the entire front opens downward to a horizontal position where it serves as a table supported by a folding leg at the outer end. The table consists of

a wooden frame hinged to the cabinet base and covered with $\frac{1}{2}$ -in. plywood or two thicknesses of hard-pressed board glued together. Two false cross strips divide the frame into three panels. The table leg is hinged at the top of the center panel and folds against it to simulate a decorative overlay when the cabinet is closed.

—Harry Robinson, Lansing, Mich.

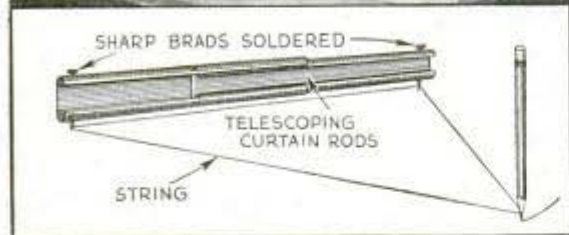
“Bread-Knife” Edge on Back of Saw Cuts Insulating Bats

Difficulty in cutting insulation of the bat type was overcome by one carpenter who found that the work could be done easily with an old handsaw that had the back edge ground to resemble a bread knife. On some kinds of bats, the saw will cut better if the edge is left a little rough.

☐ Pads to protect the knees of small children while using roller skates will avoid many bruised knees and torn stockings. The pads are made by stitching several thicknesses of cloth together and sewing elastic to the upper and lower corners so the pads can be slipped over the legs.

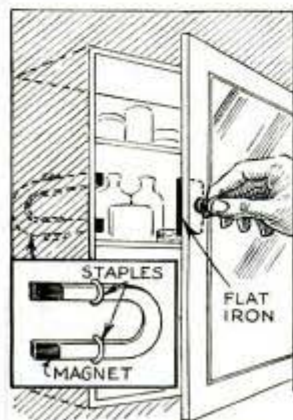


Telescoping Curtain Rod Aids In Drawing Various Ellipses



You'll find a length of telescoping curtain rod and a piece of string handy in drawing ellipses, as the rod can be adjusted instantly to make an ellipse of almost any desired size. As an aid in holding the rod firmly on the work, sharp pointed brads or nails are soldered to the ends. In use, the rod is adjusted to the desired length, after which a pencil is used inside the string loop to draw an ellipse in the usual way. If ellipses of various sizes are duplicated frequently, time can be saved by marking the adjustment on the rod for each size.

Magnet Holds Cabinet Door Shut When Latch Is Worn



Where cabinet doors have a tendency to swing open after the latches are worn slightly, small horseshoe magnets, available at ten-cent stores, provide a good means of holding them shut. All you need to do is fasten the magnet inside the cabinet and then screw a piece of flat iron to the door directly opposite the magnet. In this way, the trouble can be corrected without installing new latches, which sometimes involves the drilling of

new holes, leaving the old ones exposed in a position where they cannot be covered or plugged easily.

—Will F. Kelley, Michigan City, Ind.

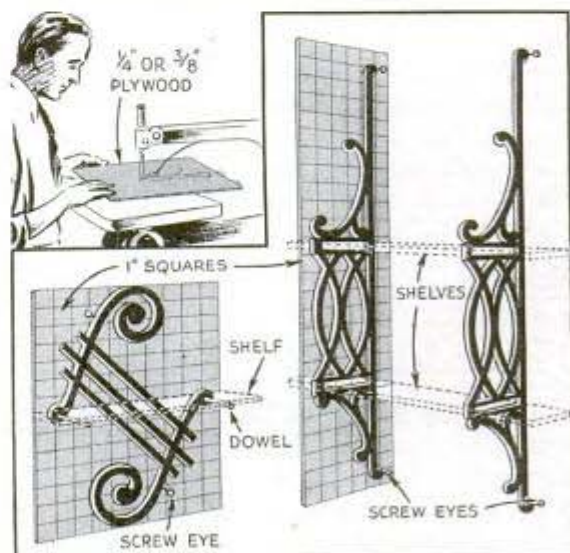
Fishing Rod Hung Safely on Wall With Window-Shade Bracket

A handy bracket for hanging a fishing rod on a wall can be had by utilizing a window-shade bracket. This is nailed to the wall, and the rod is slipped, is enlarged and the edges are smoothed with fine abrasive paper to avoid marring the finish on the rod tip.



Attractive Shelves of Fretwork Made of Glass and Wood

Sawed from plywood or other suitable material, these shelves are just the thing to help break up a plain wall. After enlarging the design on paper laid off in 1-in.



squares, cut it out and use the paper as a full-size pattern to transfer the design to wood. The small pieces of plate glass for the shelves usually can be obtained inexpensively in the form of scrap from your local glass dealer.

☛ A quick way to chop walnuts or other nut meats is to place them in a paper bag and roll with a rolling pin.

NEST of TABLES



EACH TABLE IS A COMPLETE UNIT

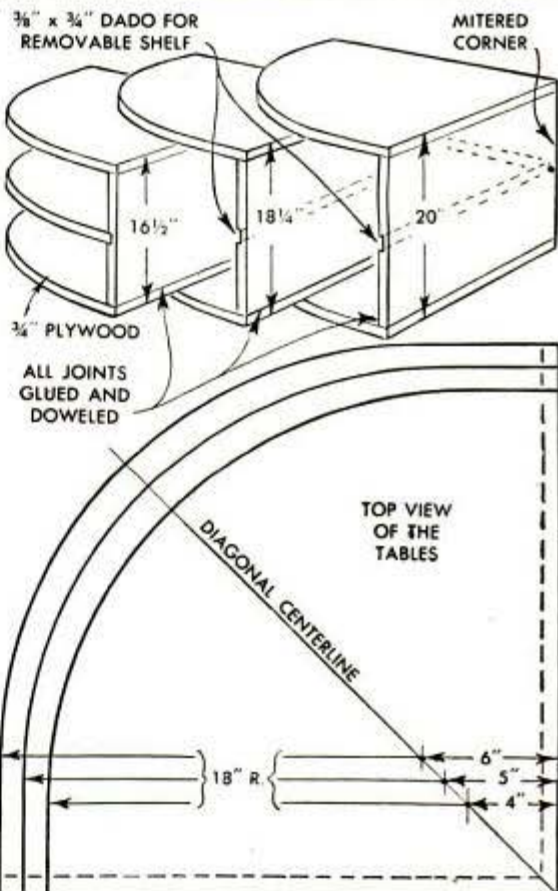


PYRAMIDED FOR CORNER WHATNOT

THERE is a place in almost every home for three multi-purpose tables which, in addition to the arrangements shown, can be hung on walls individually as whatnot shelves. Each table has two closed sides at right angles to each other and an open front, rounded at an 18-in. radius. As the curved edges must be flush when the tables are nested, the tables are of different sizes as shown in the lower detail. The arcs for the three sets of curved edges are struck from pivot points located on the diagonal center line, 4, 5 and 6 in. from either straight edge of the largest table top.



ALL THREE TABLES NESTED AS ONE



Cloth on Pool Table Repaired So That Tape Is Invisible

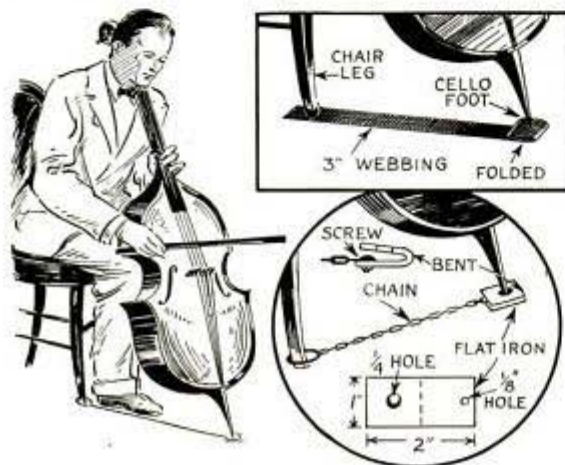


If the cloth on the cushions of a pool table becomes torn, it can be repaired with tape so that the latter does not show. First cut the tape to size, then work it under the cloth as shown with the adhesive side toward the cloth. Next carefully pull the torn edges of the cloth together and press them firmly against the tape.

—Leo D. Salmon, Chillicothe, Ohio.

Slipping of Cello on the Floor Avoided by Supports

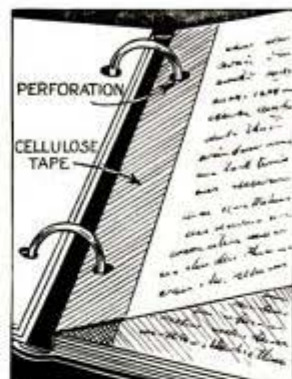
If you play a cello or other string instrument that rests on the floor in front of you, a support like one of those above will be helpful in keeping the instrument in place. The support in the upper detail is merely a length of webbing rolled at one end to provide a pad for the foot of the cello to rest on, the other end being inserted under a chair leg to hold it. The support in the lower detail works on the same principle, and consists of a length of small chain hav-



ing a large link at one end to fit over a chair leg and a folded piece of thin flat iron at the other end, which is drilled for insertion of the cello foot. If desired, a wooden block could be substituted for the flat iron.

Torn Pages in Loose-Leaf Book Reinforced With Tape

A student prevented the loose leaves of his note book from tearing out by applying a strip of cellulose tape along the back edge of each sheet before perforating it. The tape serves as a reinforcement for the punched holes



in the paper, strengthening them so that they will not tear out under ordinary use.

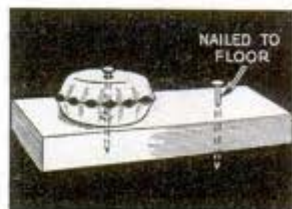
Sandpaper Inside Pencil Eraser Provides Good Lead Pointer



Artists and others who work with sharply pointed pencils will find that a good pointer for the lead can be made by cutting a strip of sandpaper and rolling it into the open end of a slip-on eraser. In use, the end of the pencil is inserted into the eraser and rotated to point the lead.

Safe Containers for Ant Poison

Simple containers for ant poison that will protect pets and small children are improvised quickly from discarded

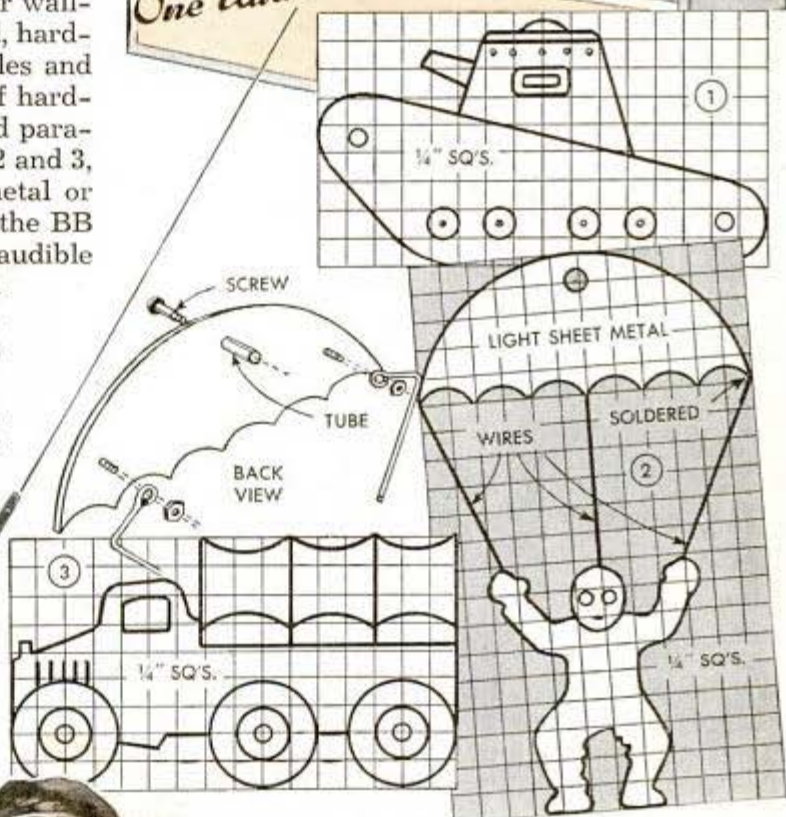
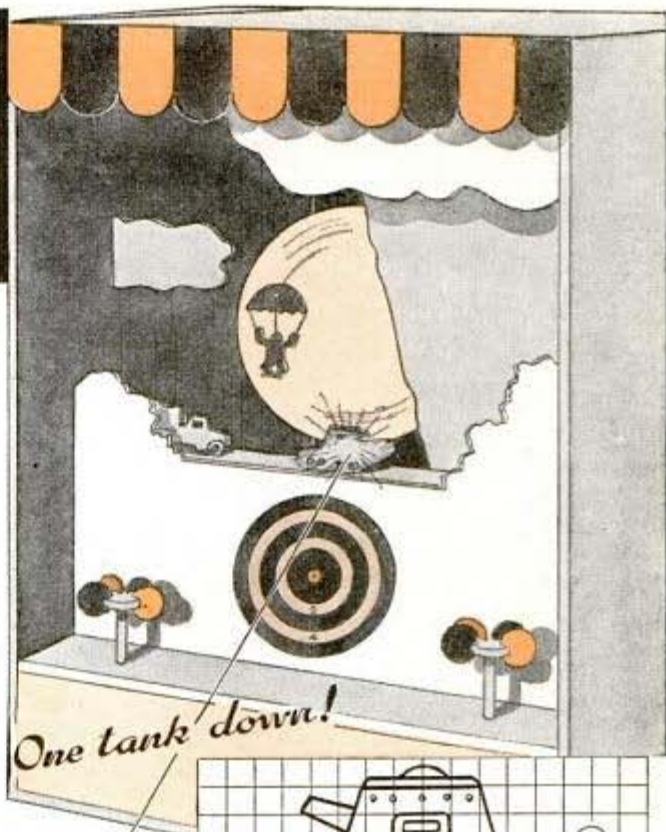


bottle caps, small blocks of wood and a few nails. All you need to do is punch a hole in the center of each cap, fill half of them with poison and assemble in pairs as shown. Being small, they can be nailed to the floor in out-of-the-way places.

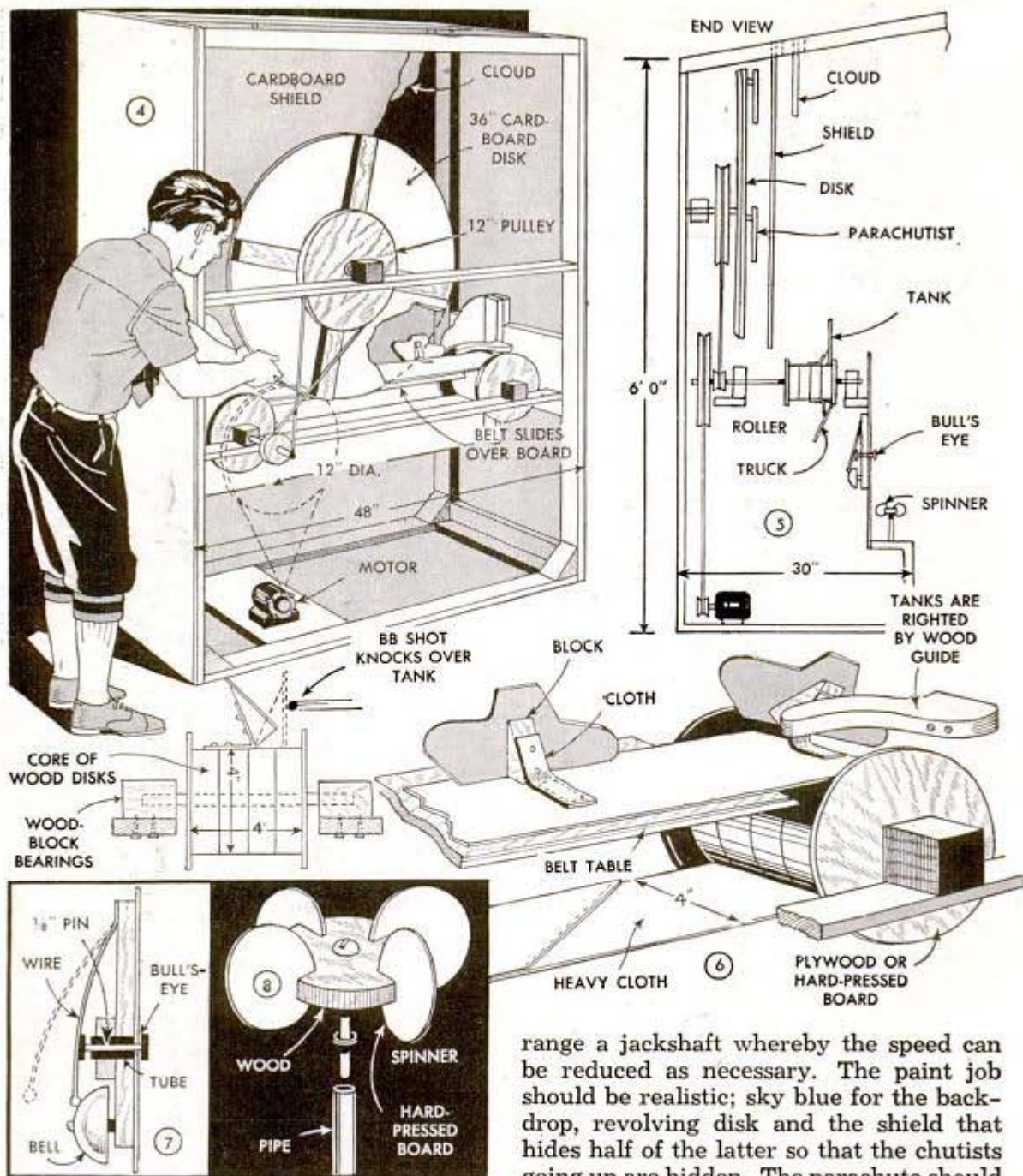
War-game SHOOTING TARGET

WITH this up-to-date shooting gallery for the basement range, parachutes float down from the sky as an endless motor convoy of trucks and tanks moves past, providing lively, interesting targets for the airgun marksman. The simple mechanism is powered by a small motor and the speed of the figures can be regulated by the size of the pulleys. Old lumber is suitable for the framework or enclosure. The backdrop, clouds and revolving disk can be of heavy cardboard or wallboard. To conserve on metal, hardwood dowels will do for axles and the bearings may even be of hardwood. The trucks, tanks and parachutists, detailed in Figs. 1, 2 and 3, should be made of sheet metal or hard-pressed board so that the BB shot will register a hit by an audible "ping," in contrast to the dull "spat" it makes when striking the wallboard backdrops or disk.

As shown in Figs. 4 and 5, a wooden spider supports the



large center disk. To it the parachutists are pivoted, one near the end of each arm. Tanks and trucks are tacked to hinged wooden blocks—preferably of balsa—and these must be arranged carefully so that the impact of the shot will knock them over. The blocks may have to be consid-



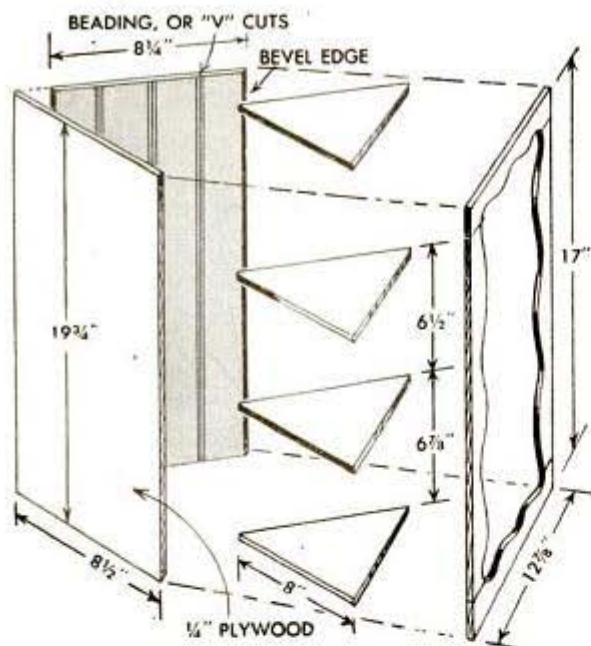
erably smaller than shown in Fig. 6. The cloth or leather hinges are glued or riveted to a heavy cloth belt, which is carried on two wooden rollers flanged at their ends. Coming up over the roller, the tanks and trucks are righted by means of a curved wooden guide or "brush."

A lathe is not necessary to make the pulleys, although a turned job is best. You can cut them with a compass saw and form a groove for a cord belt with a rasp. Use as small a pulley as possible on the motor and if the convoy still travels too fast ar-

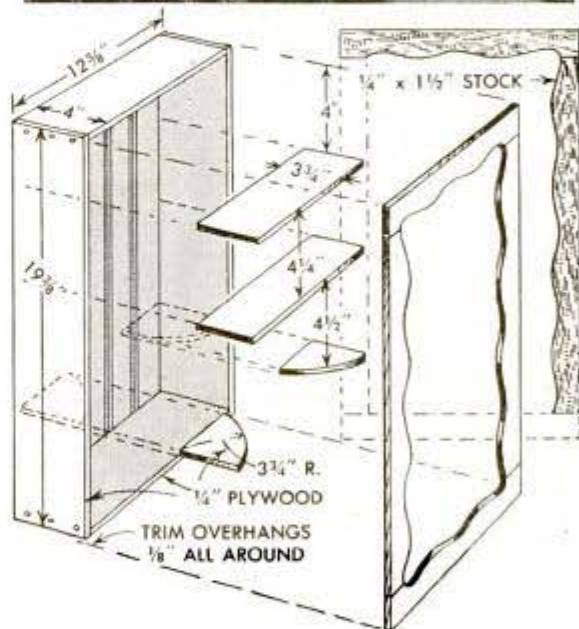
range a jackshaft whereby the speed can be reduced as necessary. The paint job should be realistic; sky blue for the backdrop, revolving disk and the shield that hides half of the latter so that the chutists going up are hidden. The parachute should be white, the chutist gray or drab and the foliage green. The bull's-eye target, which rings a bell as detailed in Fig. 7, should be red and white, while the four spinner disks, made as shown in Fig. 8, can be red, white, blue and yellow. A suitable back wall should be provided whether the gallery is used in the basement or outdoors.

ⓘ Before painting new concrete floors, the alkali in the concrete must be neutralized by applying a solution consisting of zinc sulphate, 4 lbs., and water, 1 gal. Wash with hot water after 4 hrs.; paint when dry.

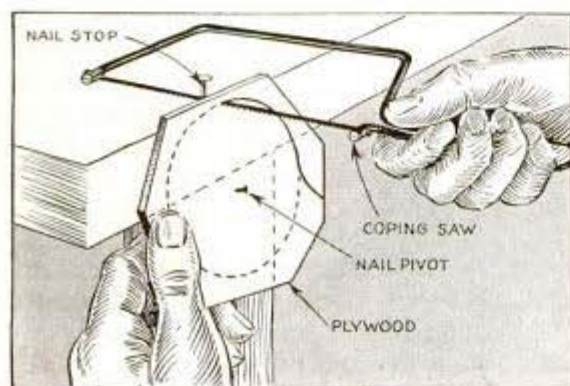
Two Bric-a-Brac Cabinets for Wall or Corner



These decorative wall cabinets provide ample protection for bric-a-brac displayed within them. The sides, backs, tops and bottoms of the cabinets are made from 1/4-in. plywood, and the shelves and front trim may be maple, walnut, mahogany or other cabinet woods suitable for a stained-and-varnished finish. Notice that the backs are beaded to help carry out the colonial effect of the scrolled front trim. The cabinet interiors are painted flat white. After drying, this is followed with a thin wash of Van Dyke brown oil color reduced in turpentine. Before this is dry, it is wiped with a soft cloth, leaving brown in depressions and on part of the surface areas to produce an antique bone-white effect that sets off curios to excellent advantage.



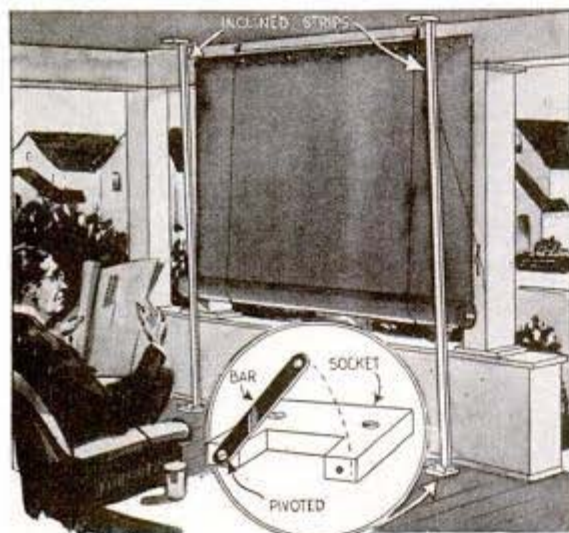
Disks Cut From Plywood Accurately With a Coping Saw



To cut a disk accurately from plywood with a coping saw, scribe the circle with a compass, start the saw blade into the wood, and then pivot the work vertically to the workbench so that the saw blade rests horizontally on the bench top. A nail is driven into the bench against the back of the blade and the work is rotated against the blade while the saw is operated.

☐ A new clothesline should be boiled for about 1/2 hr. before using it. This helps prevent stretching and tangling.

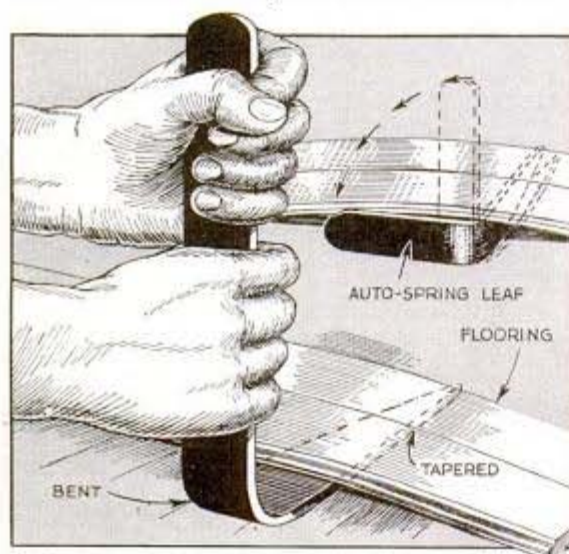
Life of Porch Curtains Increased By Guide Strips Behind Them



To prevent porch curtains of the drop-roll type from being torn by the wind, one home owner assembled removable guides to hold them in place. These consist of inclined strips that are held by wooden sockets made as shown in the circular detail. Before screwing the sockets to the porch floor and ceiling, care should be taken in measuring so that the strips slant toward the top enough to allow room for the curtain roll as it increases in size when pulled up.—L. B. Robbins, Harwich, Mass.

Auto-Spring Leaf Serves as Tool To Loosen Old Flooring

A handy tool for removing old flooring can be made from a section of auto-spring leaf by bending and tapering one end of it as shown. In use, the tool is driven un-



der the flooring with the handle in a vertical position, after which it is pushed down to loosen and raise the boards.

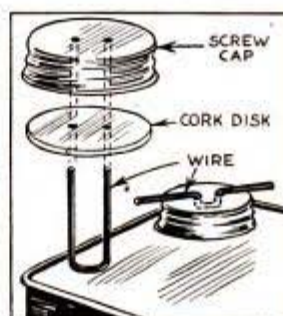
Simple Latch for Partition Door

Needing a number of latches for the swinging doors in poultry-house partitions, one poultryman made them from short lengths of heavy wire. These were bent to the shape indicated and stapled to the inside face of the



door frame. A nail driven part way into the door stile serves as a stop to keep the latch in a horizontal position.

"Wrench" Loosens Screw Caps



Bent to the shape shown, a length of wire is handy for opening and closing screw caps on cans that are used frequently. The wire is attached to the cap by bending it to a U-shape, after

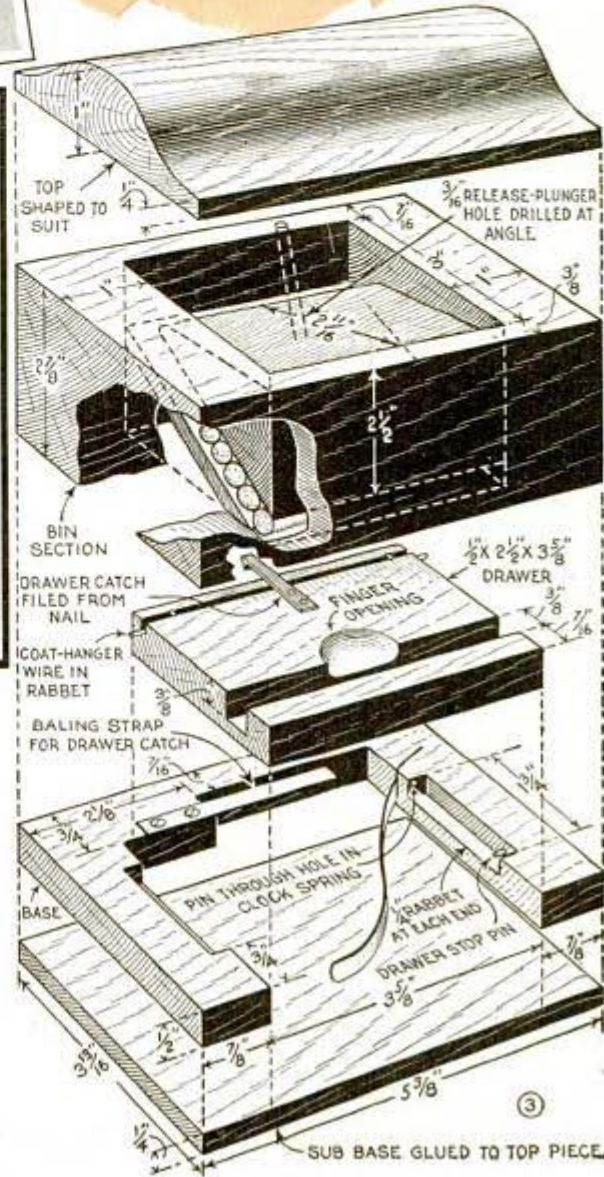
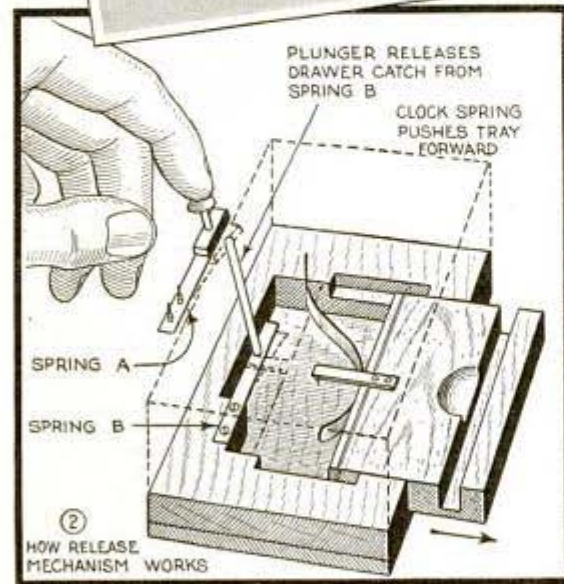
which two holes are punched or drilled in the cap to receive the ends of the wire. When in place, the ends are bent outward in opposite directions to provide convenient handles for turning the cap.

Linoleum "Flagstones" on Roof Protect the Covering

If you have a flat roof that is walked on occasionally, 2-ft. squares of old linoleum applied to the roof about 6 in. apart will protect the covering. The linoleum can be applied with asphalt asbestos roofing cement, and the top surface of the squares can be painted to preserve the finish. You will find that linoleum squares are better for this purpose than boards, as water will run off in any direction without collecting in pockets and eventually causing the covering to decay.

—Benjamin Goldberg, Brooklyn, N. Y.

Pirate-Chest CIGARETTE DISPENSER



PRESS a button and out slides a little tray containing a cigarette—that's all there is to getting a cigarette from this dispenser. The completed dispenser is shown in Fig. 1, while the various parts in their correct relation of assembly are shown in Fig. 3.

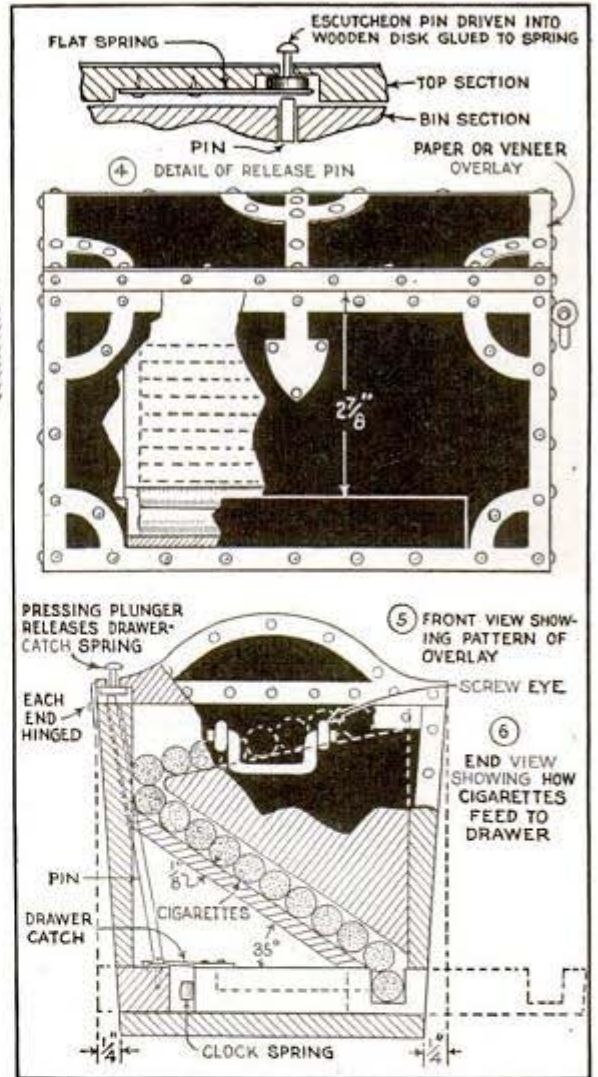
To begin construction, first make the bin section from a solid block. Tapering the sides of the chest is done as in Fig. 6 when all the parts have been glued together. After the bin block is cut as indicated, glue in a triangular piece. Under this set in a thin piece at an angle to provide a channel down which the cig-



aretttes move. Next is the sliding tray and base, the tray being moved forward by a spring when the release mechanism is operated by pressing the button in the dispenser lid. As the spring and release mechanisms are installed before assembling the various parts, it is well to study Fig. 2, which shows the working arrangement of the mechanism.

Both the tray and the base are made of $\frac{1}{2}$ -in. stock, but the tray must be sanded down about $\frac{1}{32}$ in. in thickness so that it can slide freely between the bin and base. Groove the tray near the front to hold a cigarette and near the back to take a wire, such as that from a coat hanger. The wire is held loosely in the groove by two brads, which are driven from the back end of the tray through the groove and above the wire. The latter projects at both ends to fit in rabbets made in the base ends. This arrangement serves as a tray guide and also provides a bearing so the tray will slide easily. Stop pins near the front ends of the rabbet prevent the tray from sliding out too far.

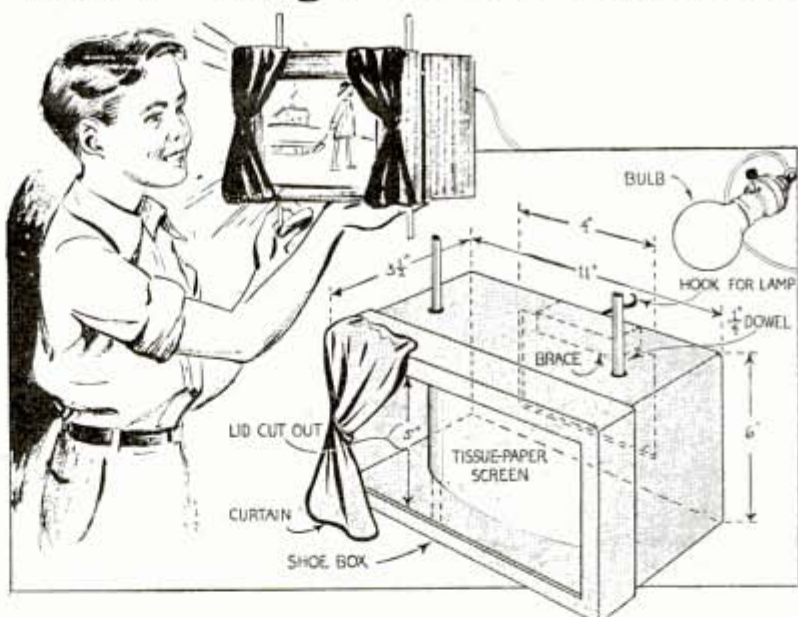
Now attach a piece of clock spring to one side of the base as indicated so that it presses firmly against the tray when the latter is in the closed position. Also, screw a piece of spring metal, such as a piece of baling strap, to the back of the base as indicated to engage a catch, which is filed from a nail and attached to the rear part of the tray. Glue the base to the sub base, put the tray in place and then glue this assembly to the bin section.



Before shaping the lid, drill down vertically and at an angle through the rear side of the bin section for a plunger, which must rest on the release spring for the tray catch. The plunger projects slightly above the bin section where it engages a release pin. This is assembled by using an escutcheon pin driven into a wooden disk, which rests on a flat spring as in Fig. 4, the assembly being set into a recess in the underside of the lid at the rear side. Now, complete the lid and hinge it to the bin section. Finish the chest to suit and apply the decorative trim as in Fig. 5. Thin brass or copper is the best trim, but if this is unavailable, paper or veneer will do. After polishing the trim and nailing it in place, give it a coat of transparent lacquer. This will prevent the metal from rusting or tarnishing. Attaching the handles completes the job. These are shaped from wire and are fastened in place with tiny screw eyes.

Child's Home "Movie" Stage From a Shoe Box

Children can make their own movies with this stage, which consists of a shoe box containing a lamp and a tissue-paper screen. Pictures are sketched on the paper or traced on it from catalogues and magazines, and are colored lightly to suit. Then the paper is wound on a large spool and slipped over a dowel running through the box from top to bottom near one end. To show the movies, the paper is unwound slowly onto another spool and dowel located near the opposite end of the box. The lamp is located at the rear, and light from it is diffused through the screen, making the pictures stand out in color as they pass



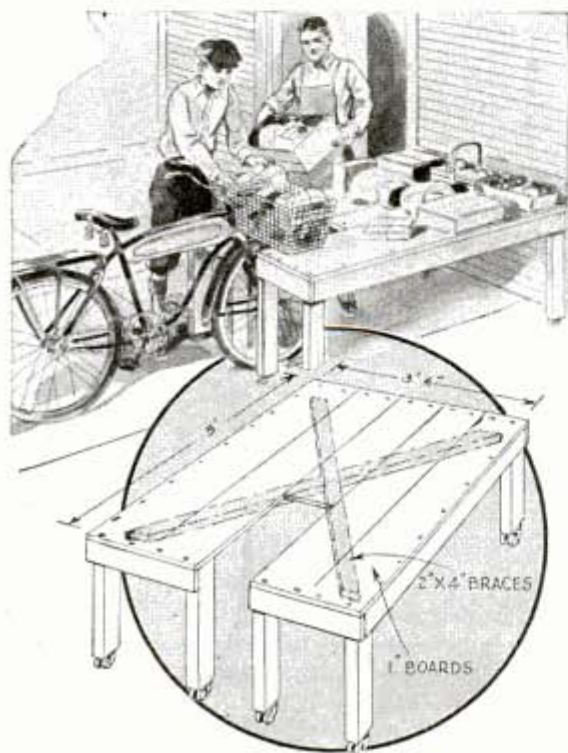
an opening cut in the lid of the box. Curtains on each side of the opening help to produce the stage effect.

—Myrtle Ekelund, Chicago.

Bicycle Loading Platform Speeds Up Delivery Boy's Work

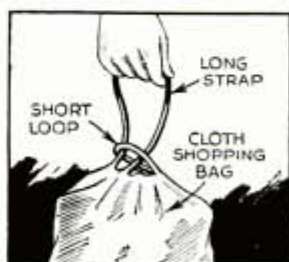
Owners of grocery stores and other establishments using bicycles to make deliveries will find this simple loading platform handy. It provides a place to store the orders as they are filled, and it supports

the bike while loading the basket. Construction is simple, as the platform is made of 1-in. lumber and is supported by six short legs of 2 by 4-in. stock. An X-brace on the underside, also of 2 by 4-in. stock, provides rigidity. If desired, the legs can be fitted with casters so that the platform can be moved about easily.

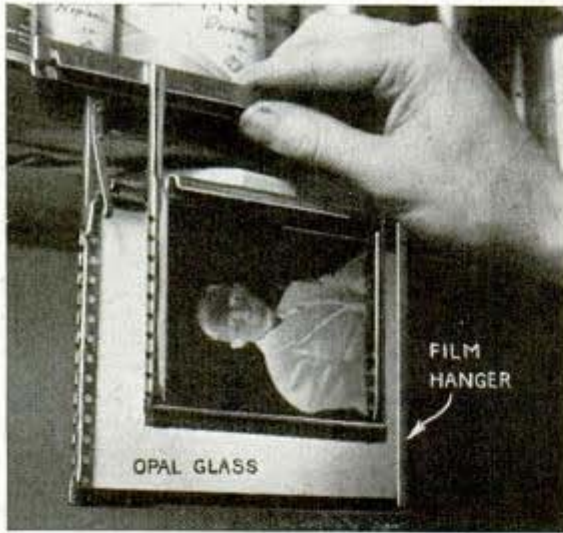


How to Carry Shopping Bag

As curtailment of deliveries for the duration has made it necessary for many of us to carry our purchases from stores, a durable cloth shopping bag is needed. When this is made or purchased, have one of the handles longer than the other. In this way, the long handle can be pulled through the short one to close the top of the bag and prevent loss of the contents. Also, the hand can be slipped through the looped handle so that most of the weight is on the wrist thus making the bag easier to carry.



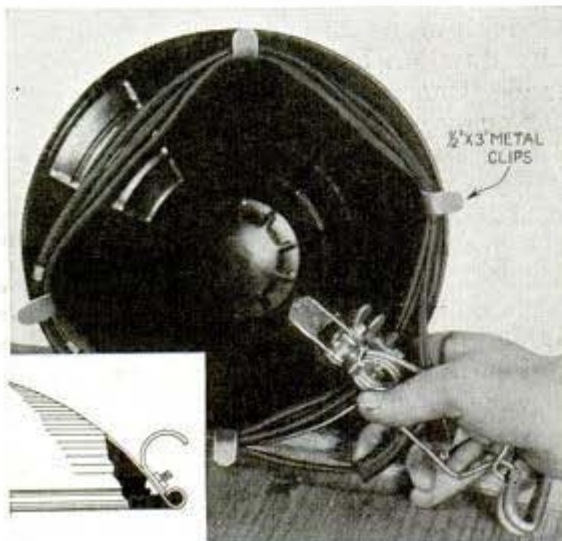
Negative Viewer Is Made Quickly From an Old Film Hanger



Mounted on the edge of a shelf over the darkroom sink, this negative viewer can be used without dripping water and solutions on the floor. It consists of an old film hanger and a piece of opal or ground glass hung in front of a light bulb. All wiring, sockets and switches mounted near the sink should be insulated carefully.

Lampcord Wound on Reflector Is Always at Hand

You will always have a convenient place to wrap the cord of a photoflood light if you attach four small metal clips to the edge of the reflector. The strips are about $\frac{1}{2}$ by 3 in. Only one screw is needed in each strip, as one edge bears against the reflector rim and prevents twisting.



Photographer's Edge Printer

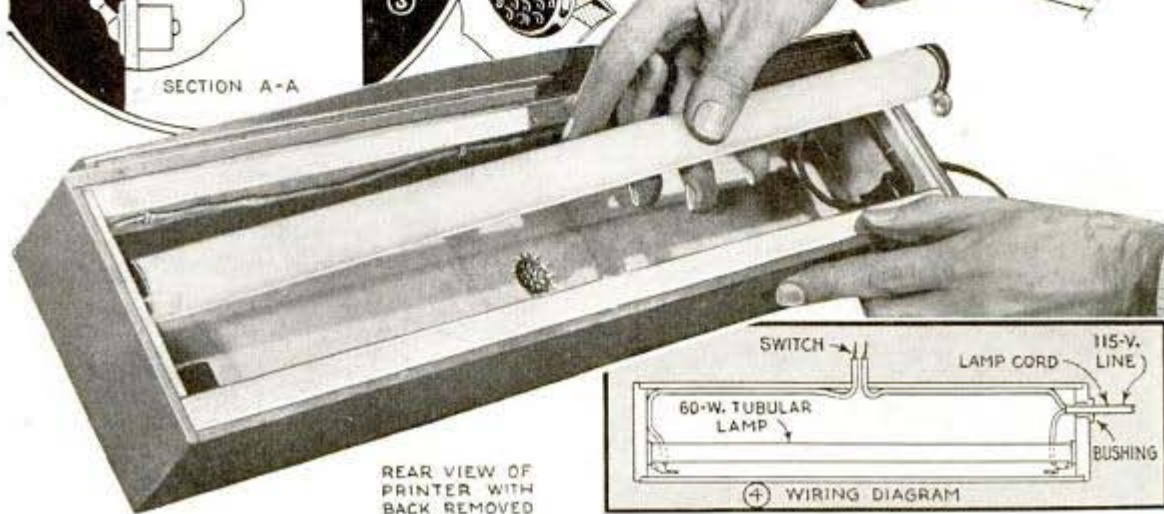
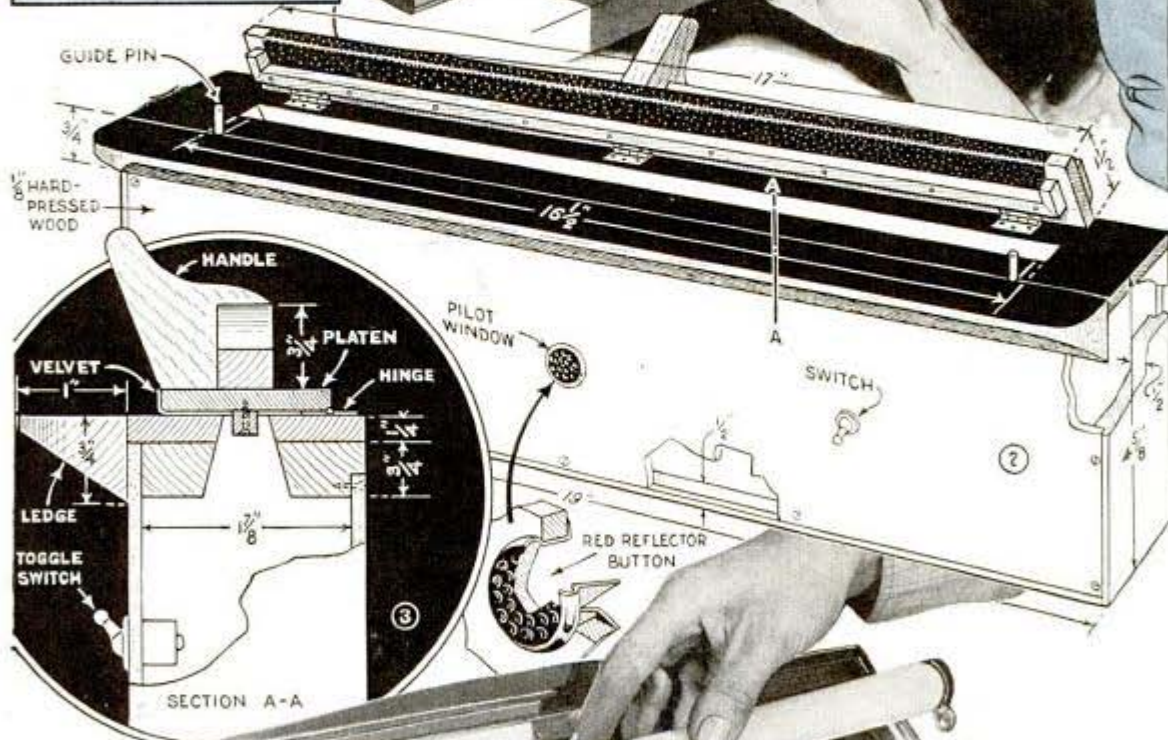
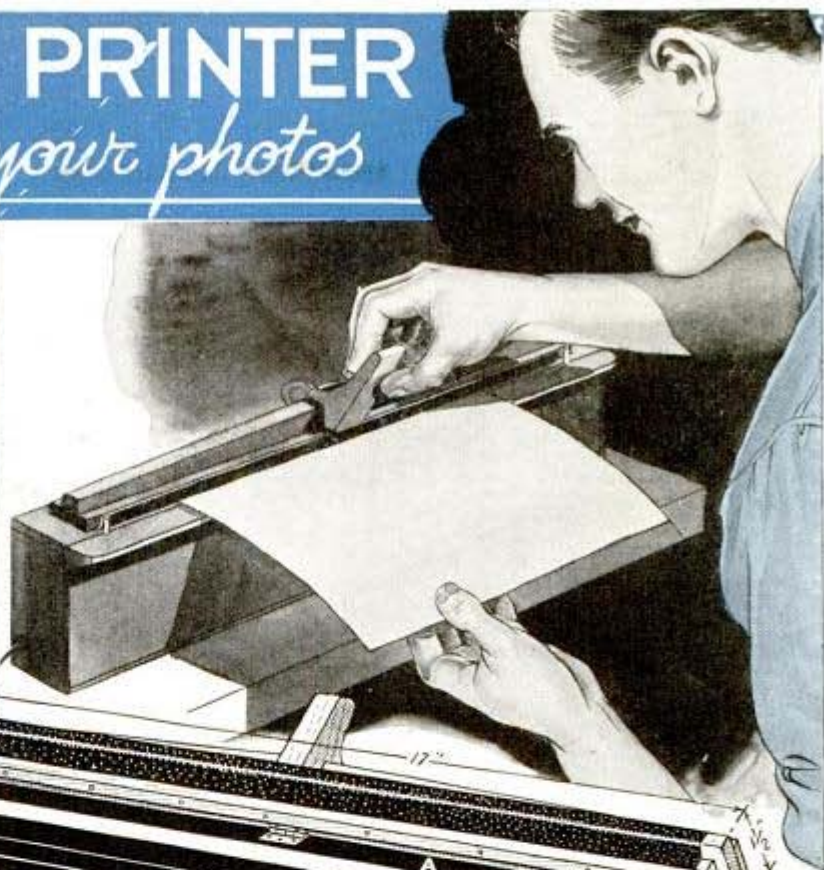
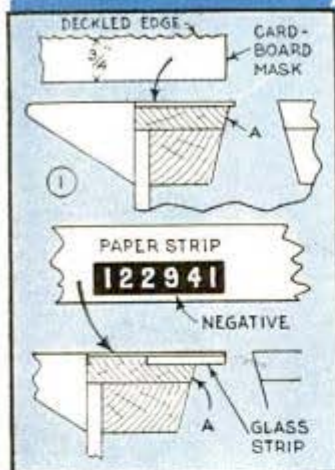
Plain or decorative borders on photos are produced easily with the edge printer shown on the opposite page. To make them, the photographer simply inserts the prints, pulls the handle of the platen down a fraction of an inch and closes a switch for the necessary exposure. Normally, black borders are satisfactory, but by making a portion of the printer top removable—piece A in Fig. 1—and providing various inserts, you can produce different effects. Deckle-edge borders are produced by a sheet-metal mask having a wavy edge extending slightly over the front portion of the slit. Dots to locate ring holes on prints that may be filed in loose-leaf binders, can be printed with an opaque mask that covers all of the light opening except where the holes are located. If one of the inserts is fitted with a piece of glass extending over the opening, you can use strip negatives to print your name and address, file numbers, or other matter on the edges of the prints. A small piece of cellulose tape will hold such a negative in place on the printer top.

The printer contains a 60-watt tubular lamp, the light passing through a slit in the top. Inside length of the box should not be less than $18\frac{1}{4}$ in. to provide enough space for the lamp and sockets, and the distance from the top surface of the lamp to the upper surface of the slit should be about 2 in. No danger exists from enclosing the lamp in such a small space as the lamp will be on intermittently only for a moment at a time. Paint the top surface a dull black—other parts may be any color. A wood stop is provided on the platen as detailed in Fig. 3. If desired, the stop can be made adjustable for various widths of borders. When no pressure is being exerted on the handle, the platen should rest so that its front edge is about $\frac{1}{8}$ in. above the top surface of the box to permit insertion of the print. To keep the platen raised, a strip of springy sheet metal is mounted under the edge. Velvet or other soft cloth on the underside of the platen provides even pressure and assures a light seal. A red pilot window that indicates when the lamp is on, and a small switch are mounted on the front of the box as shown in Fig. 2. A diagram of electrical connections is given in Fig. 4.

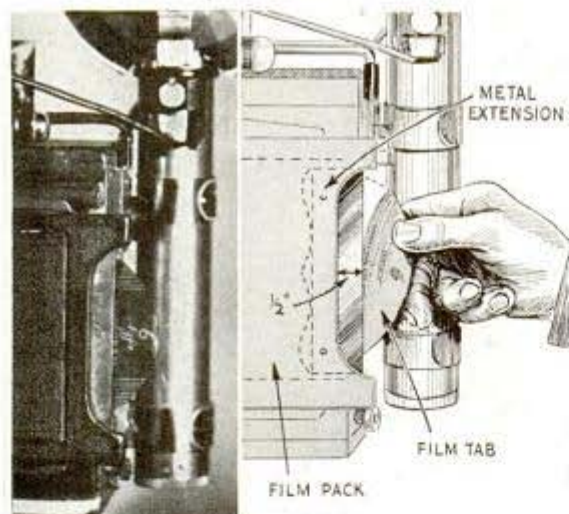
—Walter E. Burton, Akron, Ohio.

EDGE PRINTER

borders your photos



Metal Extension on Pack Adapter Tears Tabs Off Straight



Before attaching the extension shown to my film-pack adapter, the tabs of the pack contacted the rounded edge of the spring back of the camera when they were torn off, causing them to tear with ragged edges. To avoid this, I riveted a small piece of sheet metal on the adapter to extend $\frac{1}{2}$ in. beyond the edge of the spring back. Now the tabs can be torn off straight and without the risk of the paper "bunching up" and causing light leaks.

—E. W. Odom, Dallas, Texas.

Scatched Color Film Salvaged With Soapy Solution

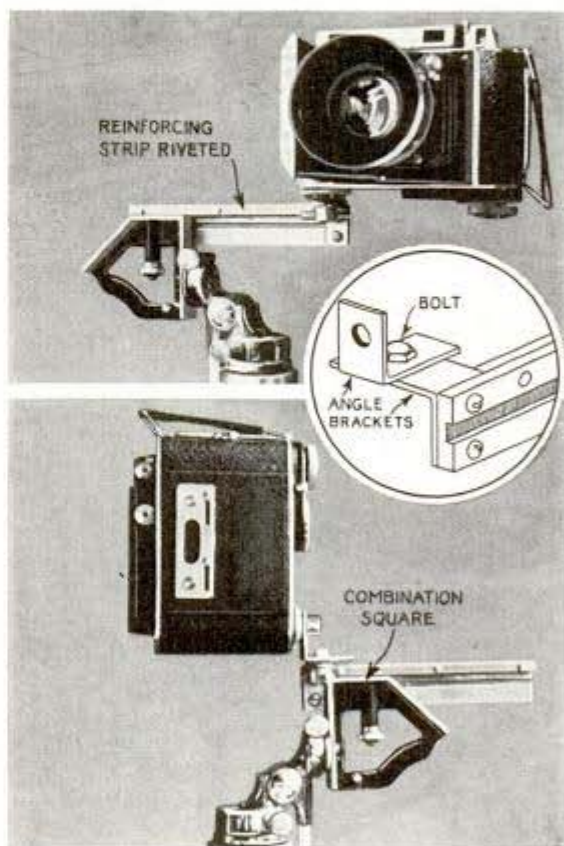
A color transparency, made virtually useless by a large finger mark or a maze of tiny scratches, often can be restored to usable condition by the application of a mild soap-and-water solution or a lens cleaner of the soapy type. Flow cleaner on gently with a sable brush. Instantly the gelatin will curdle and become pebbly in texture.



Do not touch it again, but place the film in gently running water until the soap has been washed out. Hang the transparency up to dry and, as the gelatin returns to its normal condition, the blemishes will have vanished. Deep scratches will remain, as will those on the celluloid side. The treatment can be applied only once, as the soap removes the protective lacquer coating. To prevent further injury, mount the film between cover glasses at once.

Sliding Camera Mount for Stereos Made From Combination Square

An inexpensive combination square, altered as shown, provides a means of moving the camera horizontally for taking stereoscopic photographs. The steel rule is shortened to $5\frac{1}{2}$ in. and the piece holding



the clamp is drilled and tapped for the tripod screw. The camera is held on the end of the rule by an angle bracket and a short tripod screw. A $\frac{1}{4}$ -in. steel reinforcing strip riveted along the top edge of the rule reduces the chance of vibration. This arrangement makes it easy to move the camera the exact distance required while keeping it perfectly horizontal.

—T. R. Wiley, Piqua, Ohio.

Reticulated Negatives Make Unusual Pictures



Reticulation—the swelling and cracking of the emulsion on a photographic film caused by dipping it in a solution or water that is too warm—is carefully avoided by photographers, but it can be controlled and used to make novel pictures. Only negatives that are not wanted for any other purpose can be used, as once they are reticulated they cannot be used again for making a straight print. Dip the film alternately in hot water, 140 to 200 degrees,

F., and in cold water, observing the effect. The longer the dipping is continued, the more pronounced will be the effect. Care must be used not to continue the soaking too long in the hot water or the emulsion will loosen from the film base and slide off. Use a clothespin on one corner of the film to hold it during the dipping process. The two prints reproduced above were made from the same negative before and after reticulation.—Fred G. Korth, Chicago.

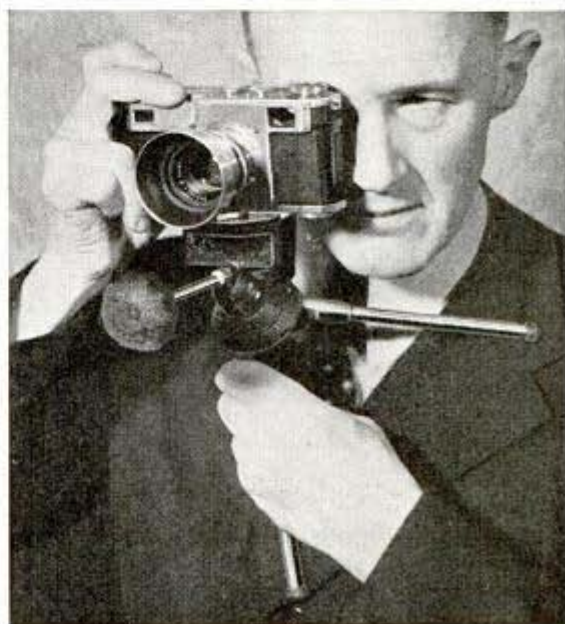
Small Tripod Held on Chest Steadies Miniature Camera

A lightweight miniature camera can be held with minimum movement by mounting it on a table-top tripod and placing the legs of the tripod against the chest, as shown. The three-point support gives the camera almost unbelievable steadiness, permitting long exposures when necessary.

—P. M. Bruner, Sausalito, Calif.

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through the medium of Popular Mechanics just how you solved that little tricky problem encountered in your home, work or hobby. Money and labor-saving ideas, shortcuts to do things quickly and more efficiently, wrinkles that others will appreciate knowing—that is the kind of information we try to pass along on these pages. Just send us a clear sketch or photo with a brief description giving the essentials. For those ideas that are suitable we will send you a check. Those we cannot use will be returned. Address Homecraft Editor.



Hinged Jar Tray on Artist's Table Swings Out for Access to Jars



One artist keeps his jars of water colors and similar equipment in a tray hinged to the side of his table. In this way, the tray can be swung out within easy reach so that

he can work directly from the jars without picking them up and setting them on the table or drawing board.

Rods Held in Auger-Brace Chuck While Pointing Ends With File

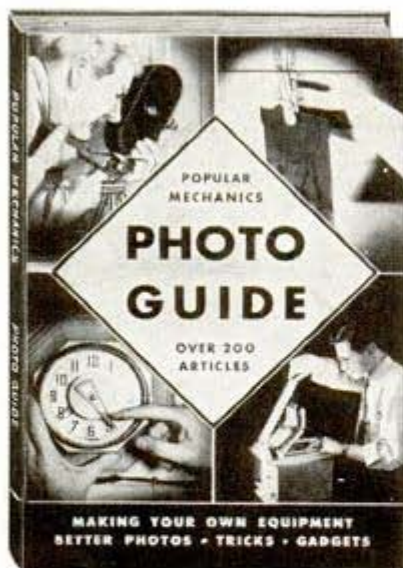
Having several short brass rods to point with a file, and not wishing to mar them in the jaws of a vise, I fastened an auger brace in the vise so that the chuck extended horizontally. With the brace in this position, a rod could be held firmly in the chuck to point the end with a file. The same arrangement can be used in holding screws, bolts, etc., thus permitting them to be gripped and removed quickly.



—G. E. Hendrickson, Argyle, Wis.

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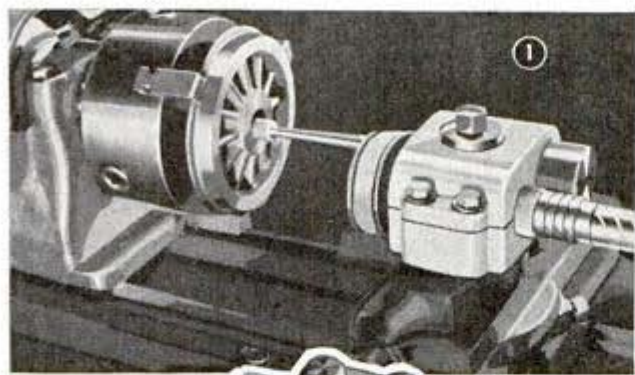
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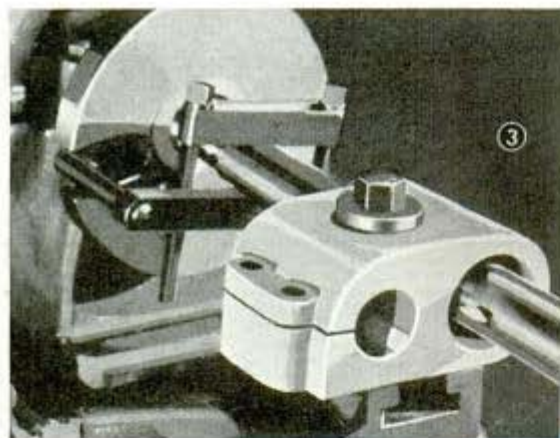


High-Speed **FLEXIBLE-SHAFT GRINDER** *fits compound rest on lathe*

SMALL shops that do not have and cannot purchase a regular lathe toolpost grinder will find that this flexible-shaft grinder, which is comparatively easy to make, is useful for most small jobs as shown in Fig. 1. Mounted on the compound rest of a lathe, the unit can be adjusted on its pivot to work at any angle. Provided with a long spindle and small grinding wheel, it will get at places that are deep and difficult to reach. It operates at approximately 15,000 r.p.m., which is satisfactory for most work.

A standard flexible shaft is used so that you have to make only the base, spindle, spindle housing, pulley, belt and mounting clamp. A closeup view of the unit is shown

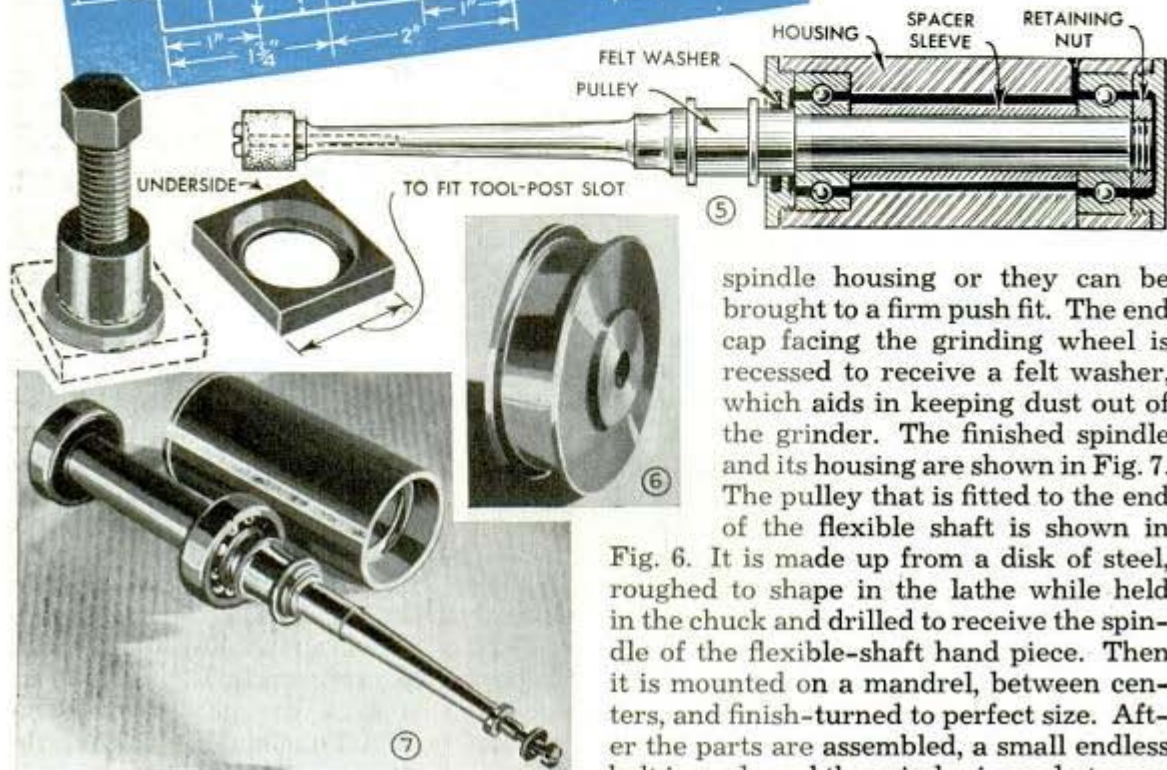
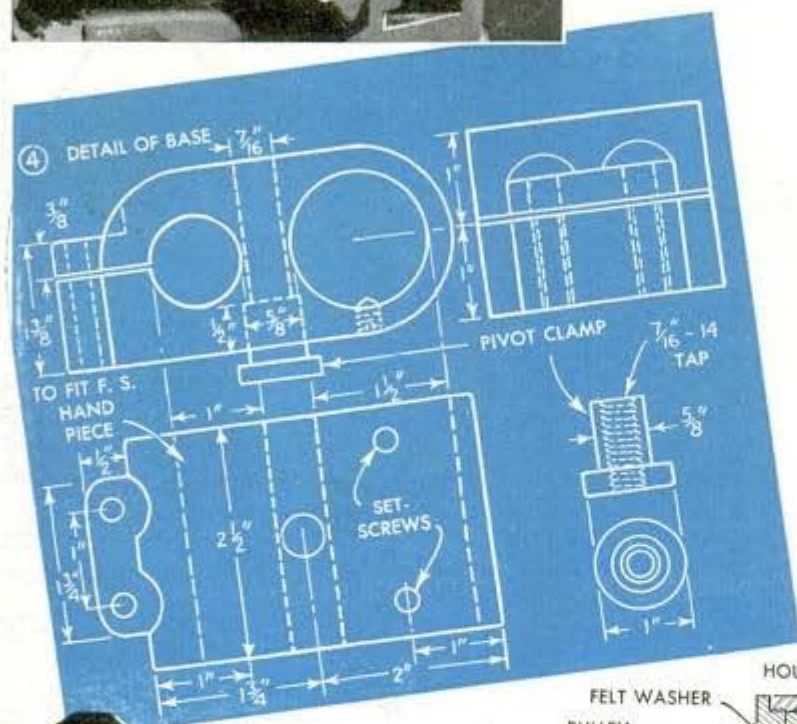
in Fig. 2. The base can be cast or it can be built from a solid piece of cold-rolled steel. In the latter case the ends can be left square instead of being rounded. Fig. 4 gives the dimensions of the unit. In making yours, some of the dimensions may have to be altered, depending on the size of the flexible shaft available and on the bearings that you may have at hand. The holes are bored in the lathe. The large hole for the spindle can be machined accurately with a boring bar held between centers while the base is mounted on the lathe toolpost slide as shown in Fig. 3. It is in this position that the grinder will be mounted in actual use, and boring the hole as just explained assures that the center



line of the spindle will be at the exact center height of the lathe.

To mount the base on the toolpost slide, it will be necessary to drill a hole vertically through the base to take the pivot bolt, which screws into a flanged bushing. This, in turn, fits a counterbored square plate that slides in the toolpost slot. Details of the pivot clamp are given in Fig. 4 and the three parts comprising it are shown in the photo above Fig. 7. The spindle housing is

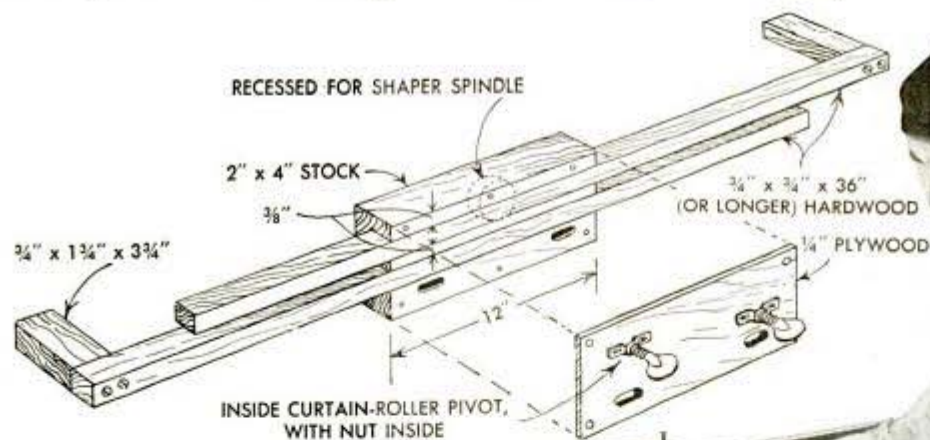
made up of cold-rolled steel cut to length and having a center hole drilled lengthwise as indicated in Fig. 5. The recess at each end is bored to receive the ball bearings, which are used as plug gauges to obtain a firm push fit on the spindle. The spindle, including the small pulley on it, is turned from a solid rod of tough, hard steel. Here again the bearings are used, this time as ring gauges, to bring the shaft to a light drive fit in the bearings. The end caps are made from thin steel disks, which may be threaded to screw into the



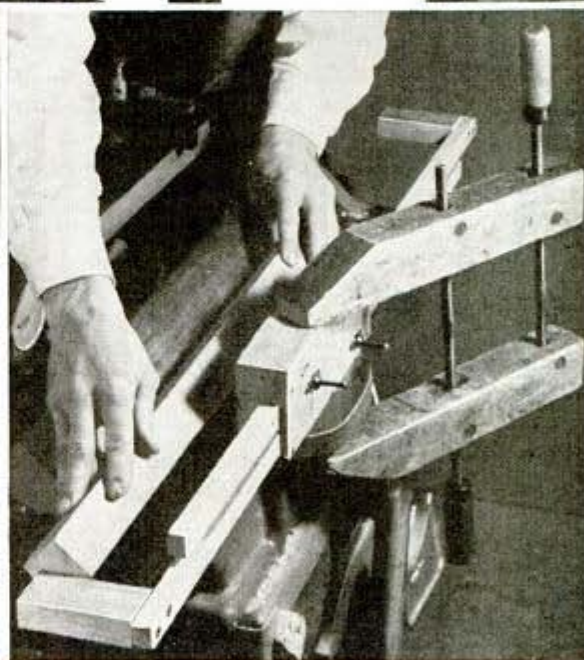
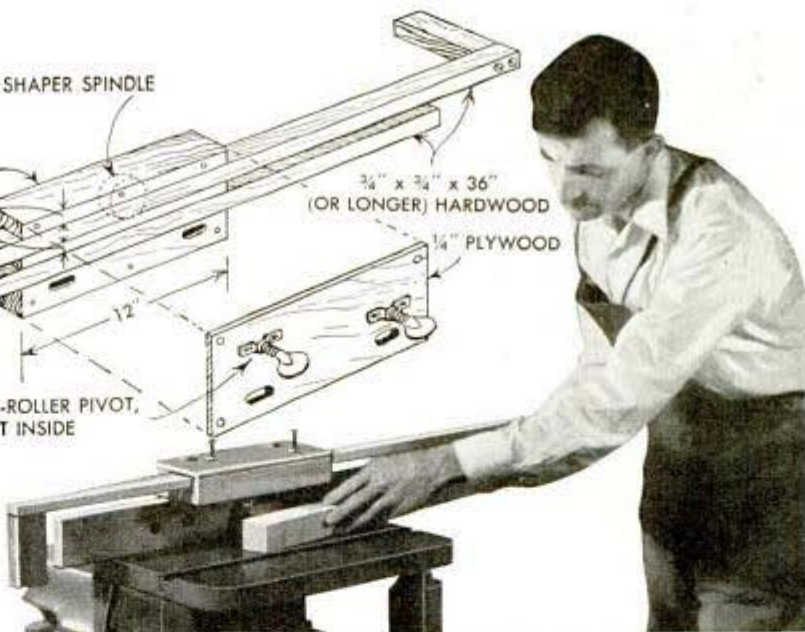
spindle housing or they can be brought to a firm push fit. The end cap facing the grinding wheel is recessed to receive a felt washer, which aids in keeping dust out of the grinder. The finished spindle and its housing are shown in Fig. 7. The pulley that is fitted to the end of the flexible shaft is shown in

Fig. 6. It is made up from a disk of steel, roughed to shape in the lathe while held in the chuck and drilled to receive the spindle of the flexible-shaft hand piece. Then it is mounted on a mandrel, between centers, and finish-turned to perfect size. After the parts are assembled, a small endless belt is made and the grinder is ready to use.

Adjustable Stop Unit Fits on Shaper or Jointer



This detachable unit for use on a shaper or jointer greatly simplifies such jobs as stop-chamfering and grooving, recessing, etc., which require stops at both ends of the piece being worked. Usually such stops are improvised and, if the work is long, they must be carried by "outriggers" attached to the fence or table. The advantage of this unit is that it is adjustable for various lengths of work, and can be attached to either shaper or jointer in a few moments. It consists of two hardwood bars, provided with stops. The bars slide in grooves cut in a 2- by 4-in. block and can be locked in position with wing screws passing through a piece of plywood, which fits over the grooves and is screwed to the block. When the unit is used on a shaper as shown in the upper photo, the cutter and fence are adjusted first and then the unit is attached to the top of the fence by means of wing screws passing through slots in the block. To use the adjustable stop on a jointer, it is



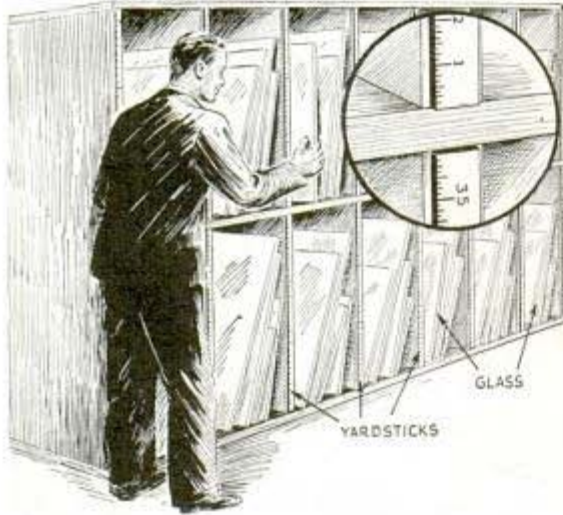
clamped in position as shown in the lower photo.—E. M. Love, Monterey Park, Calif.

Amusing Valentine Favor and Place Card Made From Marshmallows



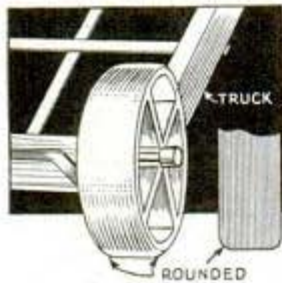
This amusing little favor gives your guests the "stop" sign and shows them where to sit. To make it, the bottoms of two marshmallows are moistened slightly and placed at the back edge of a place card. Bits of toothpick hold the marshmallow body in position. Pipe-cleaner arms are tipped with heart-shaped hands, which may be purchased already gummed or cut from red paper. A large red heart serves as a head, and one gummed reinforcement ring cut to the desired shape provides the nose, mouth and eyes.—Benj. Nielsen, Aurora, Nebr.

Partitions of Glass Storage Bin Calibrated as Aid in Selection



Merchants who stock numerous sizes of glass panes in partitioned bins will find that a desired size of pane can be selected instantly if the edges of the partitions are marked off in inches. In this way, a glance at the partition and the upper edge of the pane will show its approximate width or height. A good way of calibrating the partitions is to tack yardsticks to them.

Wheels of Push Truck Crowned To Avoid Marring Floor

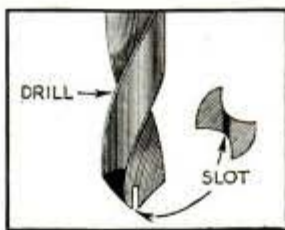


In factories and department stores where push trucks are used, marring of the floors by the truck wheels when making sharp turns can be avoided by crowning the outer surfaces of the wheel rims. This can be done by rounding the edges of the wheel rims with a file or grinding wheel.

outer surfaces of the wheel rims. This can be done by rounding the edges of the wheel rims with a file or grinding wheel.

Twist Drill Slotted at the Point Makes Holes in Marble

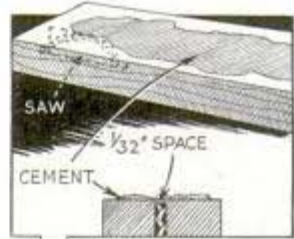
A stone cutter who frequently had to drill round, true holes in marble found that a slot ground across the point of a



high-speed twist drill enabled him to do the work quickly and accurately in a drill press. Although the drill will cut well dry, a few drops of kerosene will speed up the work and reduce wear on the drill bit.

How to Save Wear on Saw Blade When Ripping Concrete Forms

Next time you rip boards that were used for concrete forms, you can save a lot of wear on the saw by setting the blade so that it



lacks about $\frac{1}{32}$ in. of cutting through the work. In this way, the teeth of the saw blade do not come in contact with the cement, which eliminates frequent sharpening. The thin sliver left on the edge of the boards can be scraped or planed off.

Cut-Down Keg Handy Carrier For Nails on Job

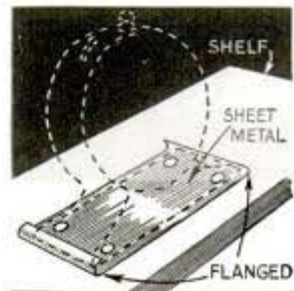


For carrying a supply of nails about on a job, one carpenter cut down an empty keg as shown in the drawing. All the staves were sawed off at the center of the keg except two, which

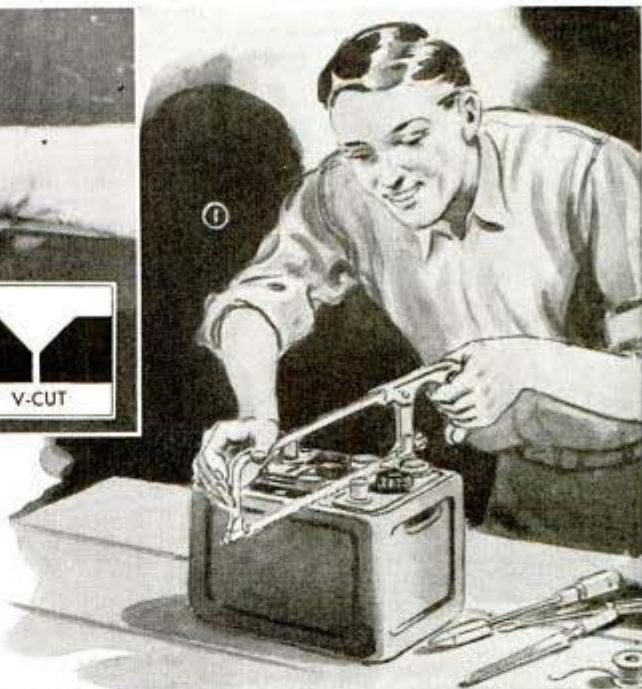
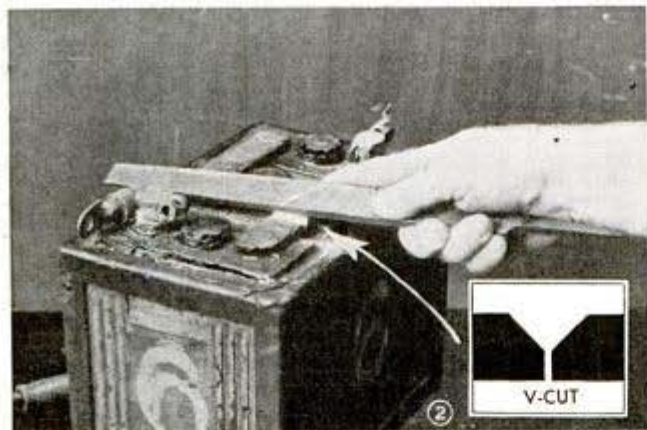
were left full length opposite each other. A hand grip, shaped from wood, was nailed to the upper ends of the long staves.

Clip Holds Alarm Clock on Shelf

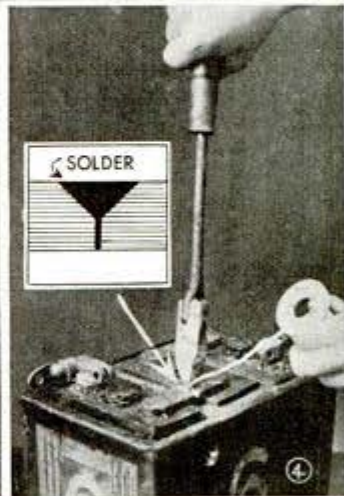
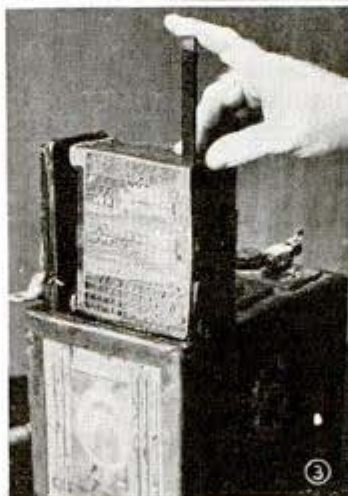
To keep an alarm clock from being worked off a shelf by vibration of machinery in his shop, one workman bent flanges on a scrap piece of sheet metal to fit over the base of the clock and tacked it to the shelf. The clip keeps the clock securely in place, yet allows it to be removed easily.



Simple Storage-Battery Repair You Can Make

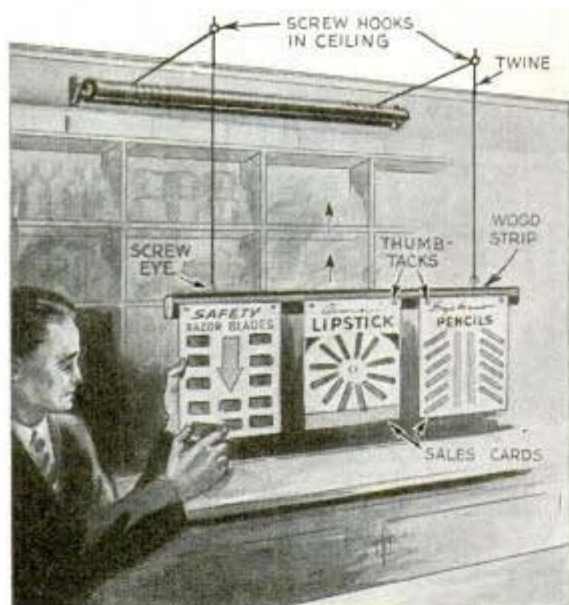


In many cases of failure of one cell in a storage battery, the trouble is nothing more than a short circuit caused by broken insulation between the plates, or by inactive material from the plates being deposited in the bottom of the cell case to a height sufficient to reach the bottoms of the plates and "short" them. In such instances, anyone can make a repair that will prolong the life of the battery many months. Naturally, the repaired battery will not be equal to one that has been rebuilt, but the repair costs nothing to make and will help in material conservation. First, determine which cell is faulty by using a voltmeter, or by connecting a 2-volt flashlight bulb across the posts to each cell in turn. The one that lights the bulb the least brilliantly is the one at fault. Then cut the connecting straps with a hack saw, Fig. 1, and groove the upper edges of the saw cuts with a file as in Fig. 2. Now, remove the sealing compound around the edge of the cell, saving the compound for later use. Lift the cell and prop it in a position for the acid to drain into the case. Avoid getting the acid on your hands or clothing. If you do, wash it off immediately with water, or neutralize it with a saturated solution of water and baking soda. Then examine the insulating separators between the plates for damage, especially near the lower ends. If a faulty separator is found, remove the damaged part and replace it with a strip cut from one of the extra separators used to wedge



the cell tightly in its case, Fig. 3. A piece of wood from a berry box will do if the battery has no extra separators. If no damaged separator is found, remove all the inactive material from the bottom of the case—do this whether or not the separators are at fault—and replace the cell. Solder the connecting straps together as in Fig. 4, and replace the sealing compound. You can do this by putting each piece on a soldering iron just hot enough to melt it so that it will flow into place. It is a good idea to run the iron around the entire battery case to close any cracks that might have been opened by vibration. Now, either have the battery charged, or put it in the car and bring it to full charge with the generator.

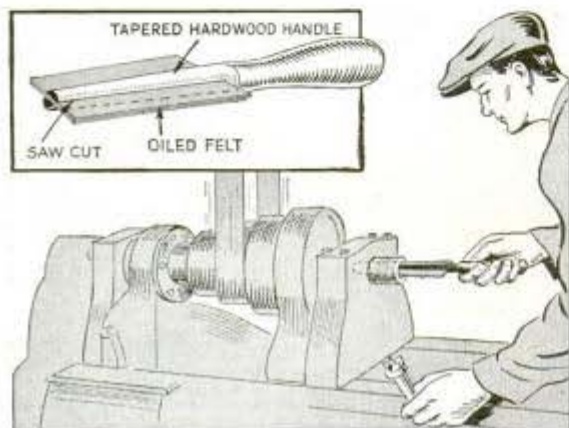
Sales Cards Supported by Roller Easily Lowered for Removal



To keep sales cards of safety-razor blades and other small articles conveniently at hand above the counter and out of the way, one merchant fastened two lengths of stout twine to a shade roller mounted on the wall near the ceiling. The twine passed through screw hooks in the ceiling and supported a wood strip horizontally on which the cards were attached with thumbtacks. In use, the cards are pulled down for easy selection of the desired articles, then raised out of the way.

Hollow Lathe Spindles Cleaned With Piece of Oiled Felt

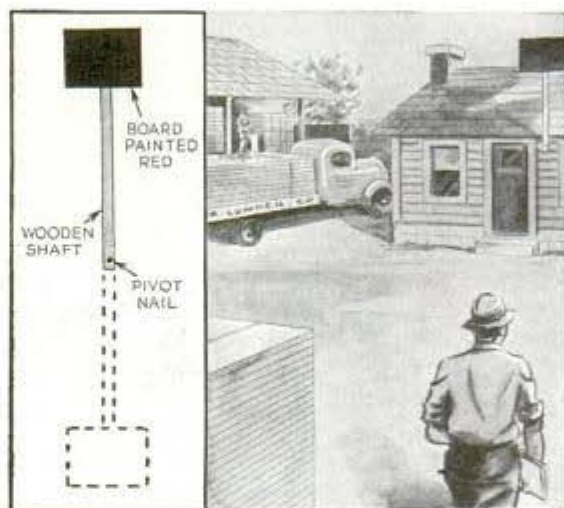
When turning precision work in your lathe, it is possible that a chip or rust spot in one of the hollow spindles might throw a center out of alignment and damage a



costly piece of work. To guard against this, assemble a two-sided brush to clean the spindles before inserting tapered centers. It is made by turning a hardwood handle to the shape indicated after which a piece of oiled felt is slipped into a slot cut in the tapered end. When cleaning the headstock spindle, it is only necessary to hold the brush in place while the lathe is running. However, when using it in the tailstock spindle, it is turned by hand.

Red Signal Summons Foreman On Construction Job

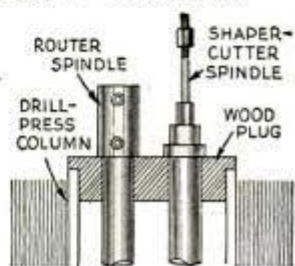
Instead of calling to the foreman when he is needed in the office for consultation, one engineer on a large construction job uses a red signal for the purpose. This



consists of a wooden board or red flag attached to the end of a long shaft which is pivoted near the office door. Stops just above the pivot point serve to keep the signal in a vertical position when raised.

Two Extra Drill-Press Spindles Stored in Hollow Column

If your drill press has a hollow standard or column, you can store in it the interchangeable spindles used for holding router bits, mortising chisels, shaper cutters, etc. Simply drill a wooden plug to take the spindles and force it tightly into the top end of the standard.



JIGS *for sharpening* CIRCULAR SAWS

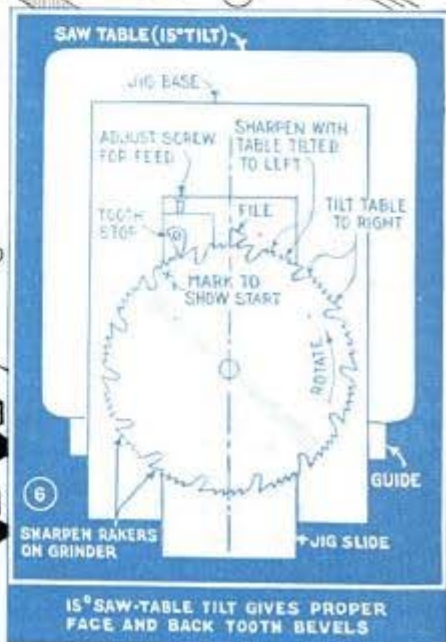
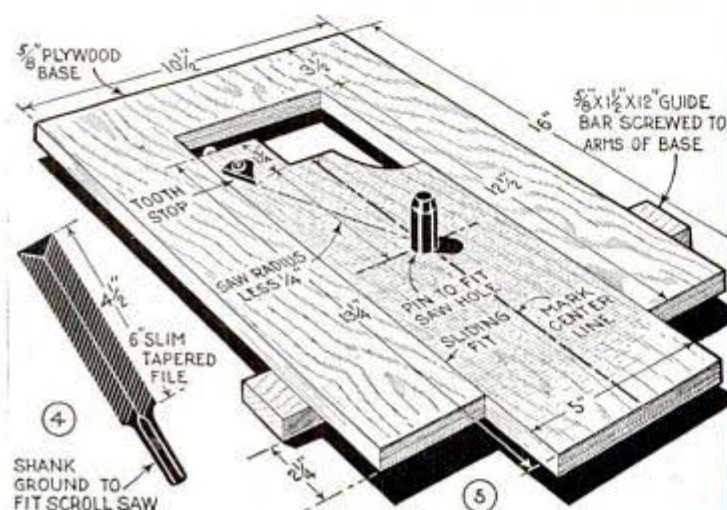
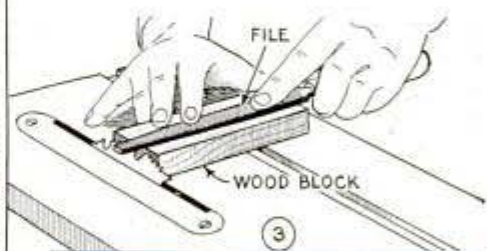
SHARPENING circular saws accurately becomes a simple matter if you have access to a lathe and scroll saw on which the job is done with the aid of easily made wooden jigs. Pictures on this page show the steps in sharpening a hollow-ground blade. Before sharpening, the blade must be jointed and cleaned. Jointing of the cutting teeth is done while the saw is being run, the table having been raised so that an abrasive stone on the table can be brought directly over the rotating blade as shown in Fig. 2, to remove the least possible amount of metal from the edge in order to bring the saw to a perfect circle. Jointing of the raker teeth is done by filing them as shown in Fig. 3, using a block of hardwood to guide the file horizontally. Naturally the saw is at rest while this is being done. The table should be adjusted so that the raker teeth will be filed $\frac{1}{64}$ in. shorter than the cutting teeth. Cleaning can be done with an old toothbrush, dipped in alcohol or lacquer thinner. All traces of resinous pitch must be removed.

Filing the teeth of a hollow-ground blade is done on a scroll saw as shown in Fig. 1, using an auxiliary wood table to hold and guide the



① HOLLOW-GROUND BLADE IS EASILY SHARPENED BY FILING ON SCROLL SAW

blade, the table having a center part that slides as indicated in Fig. 5. The table shown was dimensioned for a 14 by 14-in. scroll-saw table. For saws of other makes you may have to alter the size and the location of the slide. One or two C-clamps are used to hold the table in place securely.



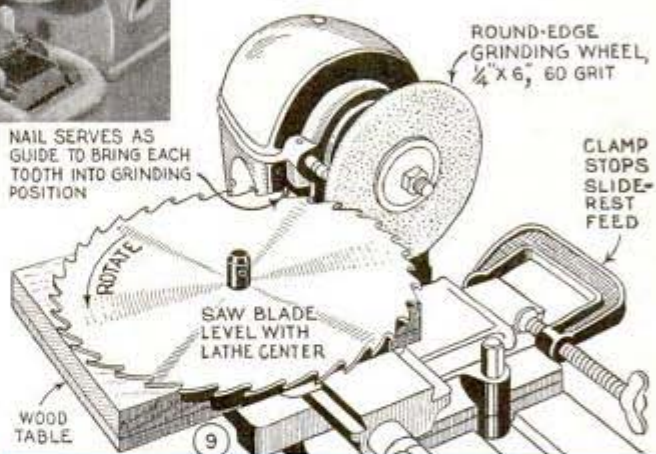


THE SLIDE REST ON LATHE PROVIDES A QUICK AND ACCURATE MEANS OF SHARPENING RIP AND COMBINATION SAWS

The scroll-saw table is tilted at a 15-degree angle to the left, and the wood table is clamped in place so that the centerline on the slide will line up with the edge of a 6-in. slim, taper file, Fig. 4, which is held in the saw chuck. In this position, two teeth in each group can be filed as shown in Fig. 6. Then, with the saw table tilted to the right, also 15 degrees, the jig is re-clamped to bring the centerline of the slide again in line with the edge of the file. In this position, the remaining teeth of each group are filed. The file, tooth spacer and screw controlling infeed are not changed. Rakers are ground across squarely, the job being done freehand on a bench grinder, watching carefully to remove just the highlight caused by jointing.

A lathe provides the means of sharpening rip and combination saws, the general method being shown in Figs. 7, 8 and 9. A wood table to hold the saw in a horizontal position, level with the center of the grinding wheel, is bolted to the slide rest of the lathe. The table has a pin or stud that fits snugly in the arbor hole of the blade, to keep the blade in the same position as the work progresses. You can use a C-clamp on the slide to

serve as a depth stop for grinding as shown in Fig. 9. A 1/4 by 6-in., 60-grit wheel is the right size to use for grinding saw blades. The angle on the first tooth should be set for 1/4 pitch as indicated in Fig. 10. A nail driven into the wood table serves as a tooth stop, the saw blade being raised and moved over toward the left to grind the faces of the teeth and toward the right when grinding the backs of the teeth. See Figs. 10 and 12. Backs of rip-saw teeth are ground squarely across or with a 5-degree bevel as shown in Fig. 11. The clearance angle for the backs of rip-saw teeth is ascertained by



holding a straightedge against the side of the wheel and adjusting the position of the blade so that the side of the wheel is on a straight line from the tip of one tooth to the tip of the fifth following tooth. Adjustments for this purpose are made with the slide rest as shown in Fig. 13. Combination saws are ground similar to rip saws except that the teeth are slightly smaller and the teeth backs are always beveled about 10 degrees. Some saws also have a 10-degree bevel on the tooth face. For the angle grinding, the set-up is the same as before except that a block must be slipped under the wood table in order to obtain the required bevel.

Name and Number on Paint Can Protected for Reference



As most paint has the name and number printed on the outside surface of the can, it is a good idea to protect this lettering so that it can be used for reference if necessary to re-order. A good way to protect the lettering is to cover it with cellulose tape before opening the can. Then if the outside of the can becomes smeared, the tape can be stripped off to reveal the information.

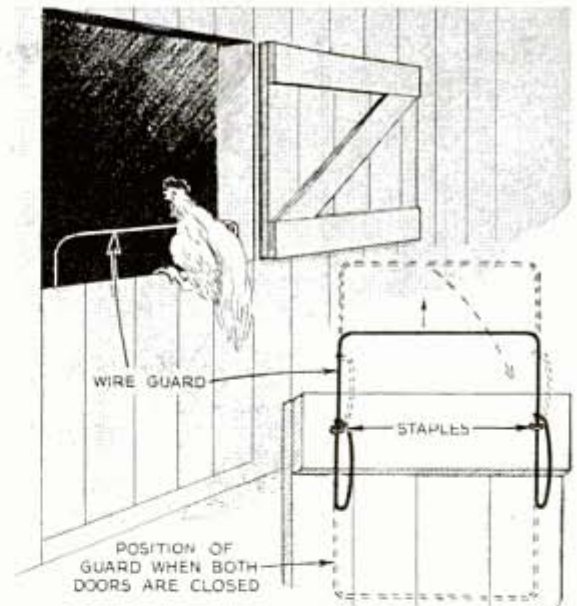
Neat Type-Case Label Holders Cut From Curtain Rod

Instead of gluing identification labels to his type cases, one printer made neat holders for them by screwing short lengths of telescoping curtain rod to the fronts of the cases. This enables him to print the labels on cardboard strips and slip them into the holders so that they can be changed from one case to another quickly without making new ones.



FEBRUARY, 1943

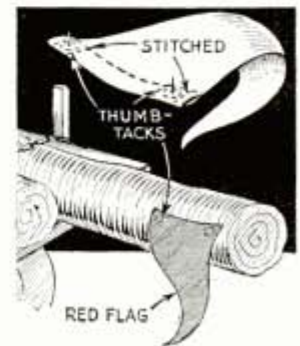
"Invisible" Guard on Barn Door Keeps Chickens Out



Where it is advisable to leave the top half of a barn door open, chickens can be kept from flying over the lower half by use of a wire guard. This consists of a length of wire bent as shown and fastened to the inside of the door with two staples. In use, the guard is merely lifted to vertical position so that the loops drop down on their staple supports to hold it erect, with the center portion about 4 in. above the top of the door. Chickens attempting to enter the barn will aim their flight toward the top edge of the door where they will hit the guard and fall back.

Tacks Stitched in Hem of Red Flag For Attaching to Long Poles

Attaching a red flag to the end of a long telephone pole when hauling it is done quickly by one line-crew foreman who uses a couple of large thumbtacks for the purpose. To prevent loss of the tacks, they are stitched permanently in the hem along the top of the flag as shown.



Many accidents caused by children falling on polished floors can be avoided by coating the shoe soles with rubber cement.

143

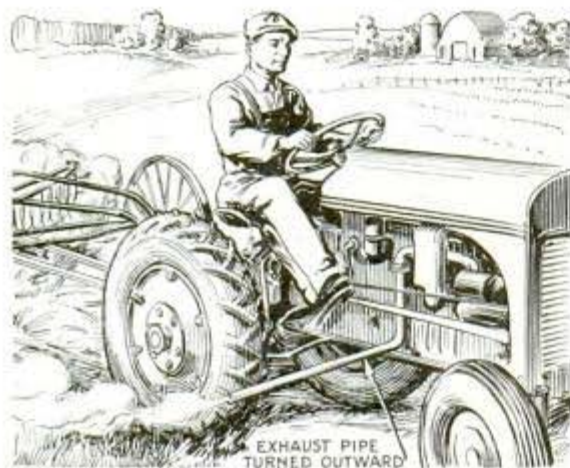
Auto-Spring Leaf Provides Cradle To Hold Oil Drums on Bench



The problem of holding oil drums and similar containers on his workbench for welding, cutting and soldering was solved by one mechanic who used the short leaf of an auto spring to make a simple cradle. The leaf is adapted by welding a pivot bolt in the center of it, after which a hole is drilled in the bench top to take the bolt. With this arrangement, the work can be rotated or turned end for end quickly without danger of it rolling off the bench.

Altered Exhaust Pipe of Tractor Prevents Fire in Hayfields

With tractors having low-mounted horizontal exhaust pipes there is often danger of fire when the machine is driven astride dry windrowed hay, as in pulling a loader



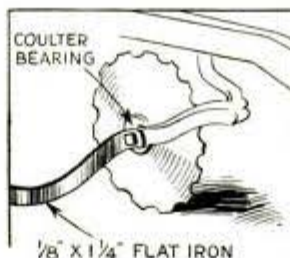
or side-delivery rake. To offset this hazard, one farmer removed the regular exhaust pipe assembly and substituted a shorter pipe which he bolted to the manifold at an angle so that the hot exhaust gases were conducted to the side of the tractor, outside the line of the drivewheel.

Tap Wrench Used as Substitute For Drill-Press Vise

In an emergency you can use a tap wrench as a drill-press vise to grip small pieces of rod or bar stock. If necessary, the wrench can be clamped by using hook bolts through the slots of the drill-press table.



Plow Coulter Attachment Aids In Covering Trash



Confronted with the problem of plowing under vegetable roots and short lengths of cornstalks that lie loosely on top of the ground, one farmer attached a short wing of flat iron to each coulter bearing as shown. This was bent back at an angle and adjusted to about 1 in. above the ground.—W. C. Lammey, Sandwich, Ill.

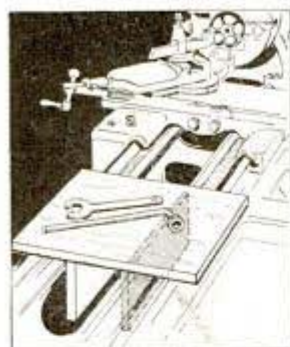
Swinging Sign Locked on Hooks By Auto-Valve Springs

Difficulty in keeping a swinging sign from being blown off its supporting hooks led one workman to use a couple of discarded auto-valve springs to correct the trouble. These were slipped over the screw hooks of the sign and compressed so that the hooks could be



slipped through the eyes. When released, the springs snap into the position shown, keeping a slight tension on the hooks which prevents them from slipping out.

Tool Shelf on Ways of Lathe



Made to fit between the ways of your lathe, this shelf provides a handy place to lay tools and small parts where they are within easy reach. The shelf is removed or replaced instantly, and consists of a

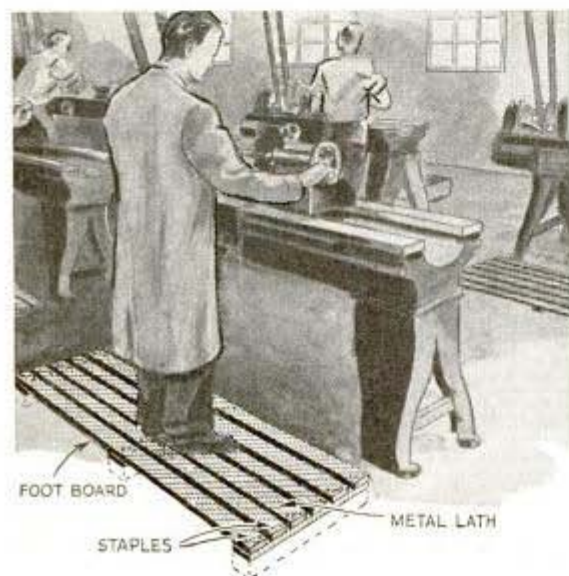
plywood top to which two blocks are attached on edge to fit between the lathe ways. In this way, the shelf can be moved back and forth as desired.

—Wm. N. Clements, Geneva, N. Y.

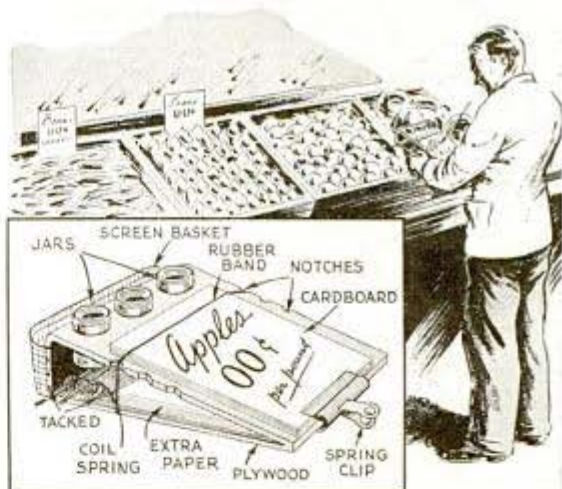
Metal Lath Stapled on Foot Board Provides Nonskid Surface

After working in a number of machine shops where foot boards are used in front of machines, I assembled a nonskid one which is especially useful where considerable oil and grease gets on the floor. The covering consists of a strip of metal lath, stapled at the ends to hold it in place securely. This provides a surface for the platform to keep the workman's feet from slipping on oil-soaked boards.

—Charles H. Miller, Oakland, Calif.



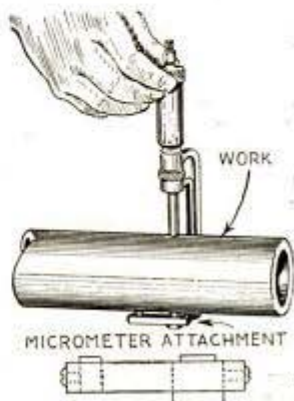
Portable Unit Holds All Supplies For Lettering Price Tags



Price tags and signs for items in grocery stores and fruit markets are lettered quickly with this portable unit, which includes all of the supplies needed. It is made by cutting three holes near the bottom of an ordinary clip board for show-card color jars after which the board is attached to a wooden base. A coil spring serves as a handy place to keep brushes, and an improvised wire basket holds the jar caps when they are removed. Room is also provided for extra paper as shown. In use, the cards are held securely by the clip and rubber band which can be adjusted easily to permit lettering near the top of the card.

Auxiliary Anvil on Micrometer To Get Accurate Readings

If you experience difficulty in getting accurate readings with a large micrometer because of a tendency of the micrometer to incline from the perpendicular of the axis of the work, this auxiliary anvil will help avoid the trouble. Also, the anvil facilitates applying the micrometer and removing it from the work. Dimensions of the anvil are optional and it can be made to suit the user. Care must be taken in its construction if accuracy in its readings is to be obtained.





Shortcuts in DIE MAKING

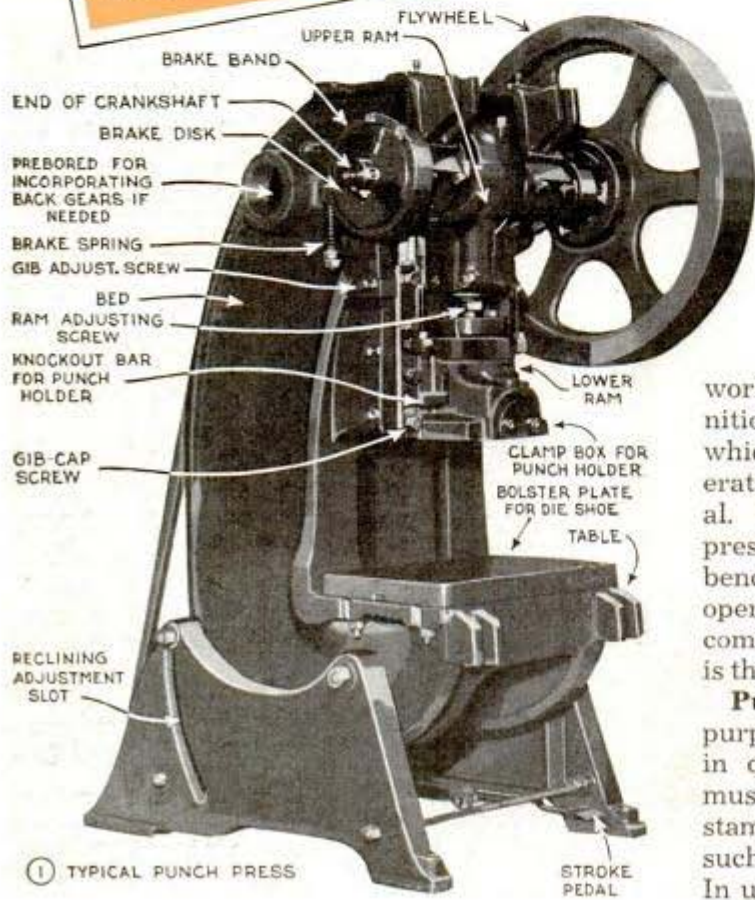
Some of the essentials all prospective punch-press operators should know. Also includes basic data on making dies, including modern methods that save both time and material.

By H. J. Chamberland

MANY parts of household appliances, kitchen pots and pans, parts of your car and even of your shoes are products of a machine known as a press. In its operation one downward stroke of the ram brings a punch down on sheet stock placed on a die, and the stamping that results is formed according to the shape of the punch and die. This one-stroke operation applies to press work in general, but an exception is the so-called drawing-press

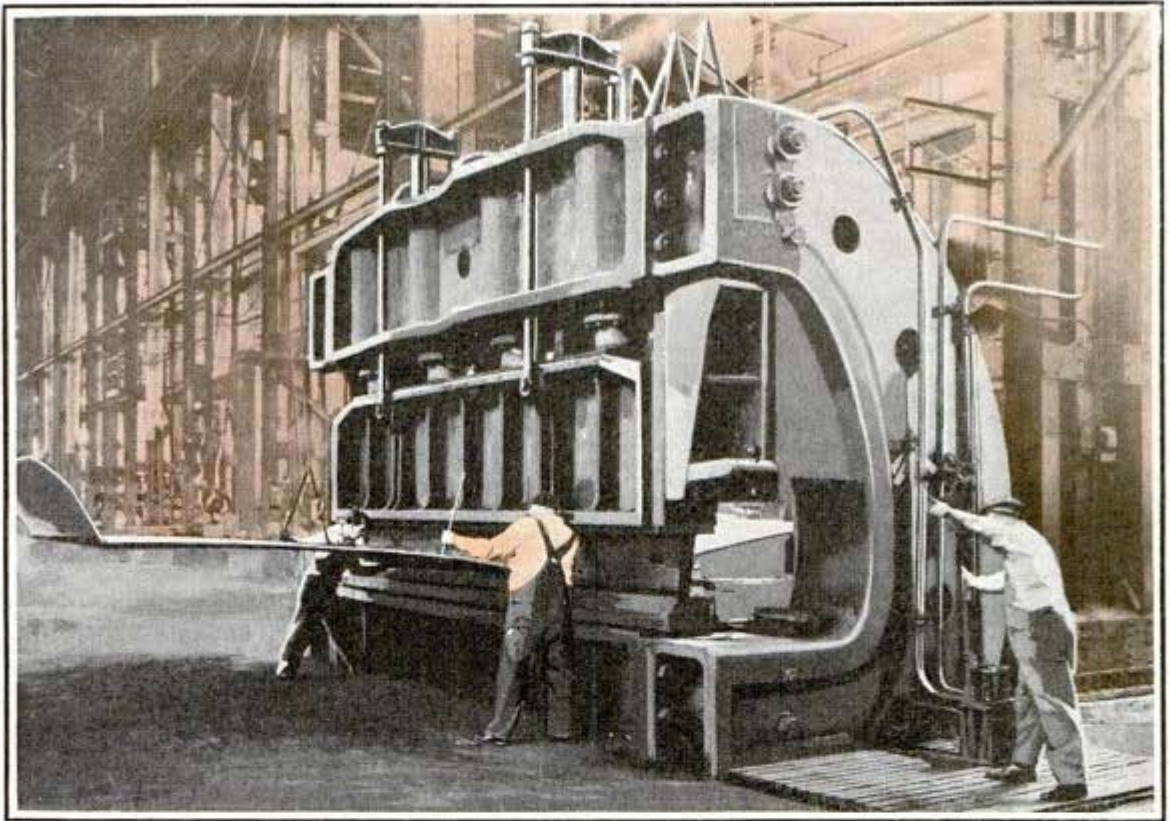
work in the manufacture of ammunition shells, pans and kettles, etc., which are shaped by a series of operations to prevent tearing the metal. There are many designs of presses ranging in size from small bench models to monsters that are operated hydraulically. The most commonly used type of punch press is the inclinable type shown in Fig. 1.

Punches and dies: As the basic purpose is to punch identical pieces in quantity, a punch-and-die set must be made up specially for each stamping job. The work of making such sets is known as die making. In use, a punch is fitted to a holder



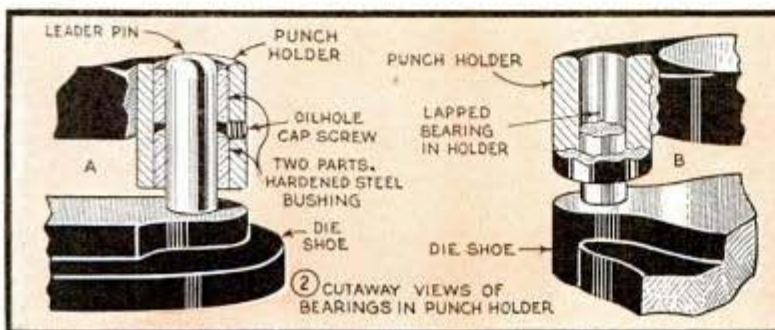
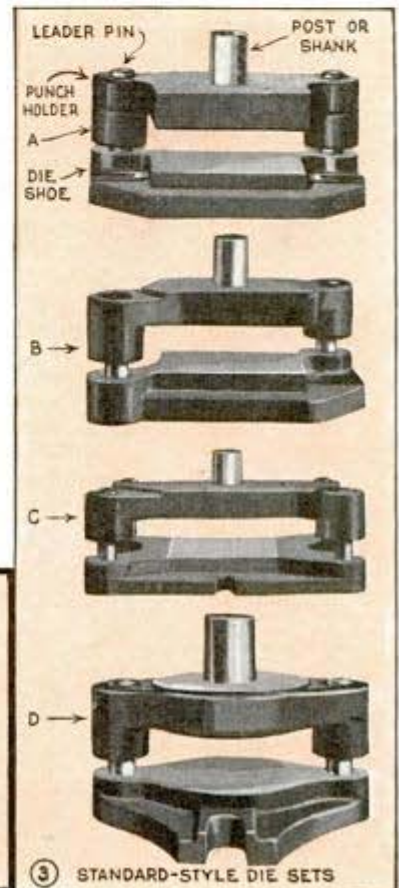
① TYPICAL PUNCH PRESS

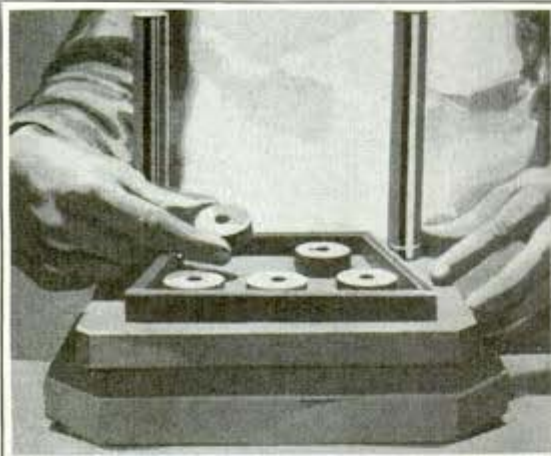
STROKE PEDAL



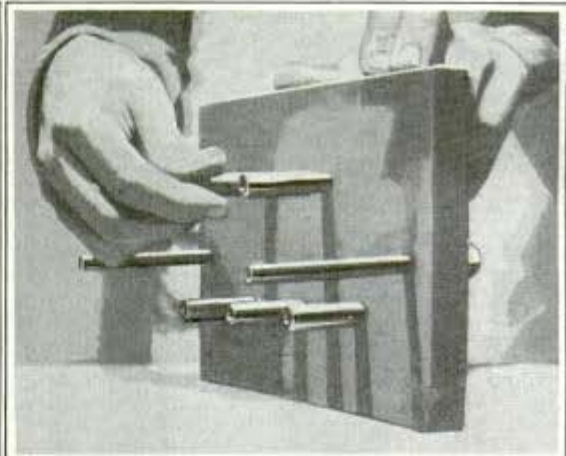
secured in the clamp box on the ram by means of its post or shank. The corresponding die is fitted to a shoe, which is bolted to the bolster of the machine table. Blanking punch-and-die sets consist of solid plates of die steel, machined internally as dies and externally as punches. Piercing punches are fitted to a punch plate, which is attached to the punch holder, while dies are made in the form of disks fitted to a die plate, which is fastened to the die shoe. Alignment between a punch and die is obtained by means of two or four leader pins. Usually, these are attached to the die shoe, but occasionally they are fitted to the punch holder to compensate for misalignment due to excessive wear in the ram mechanism. It is claimed that this reversed procedure greatly lessens the chances of stripping the cutting edges of a punch and die. Fig. 3 shows four standard sets of punch holders and die shoes. Type A has two leader pins, both at the rear. Type B has one leader pin at the front and another one diagonally across at the back, and is recommended for feeding work from the front. Type C has four

Punch presses vary in size from small bench models to monsters such as the one above

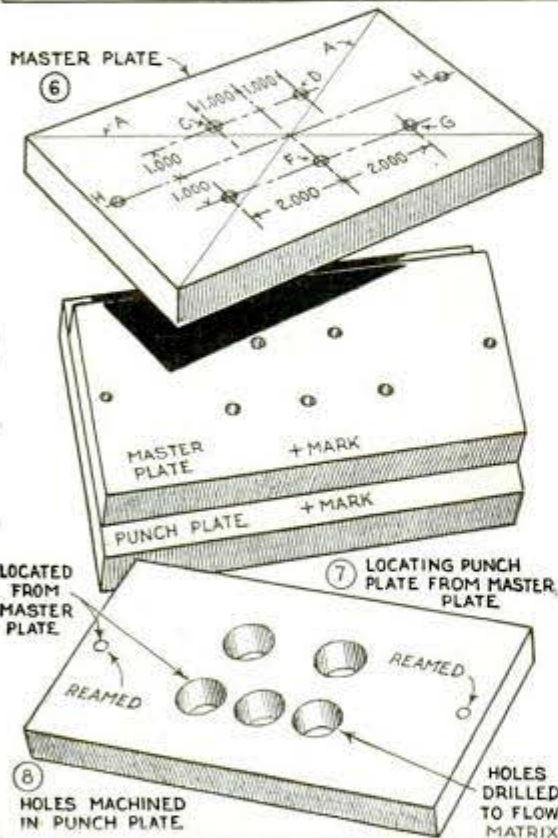




④ HEIGHT OF FENCE ON DIE PLATE IS THE SAME THICKNESS OF DIE DISKS

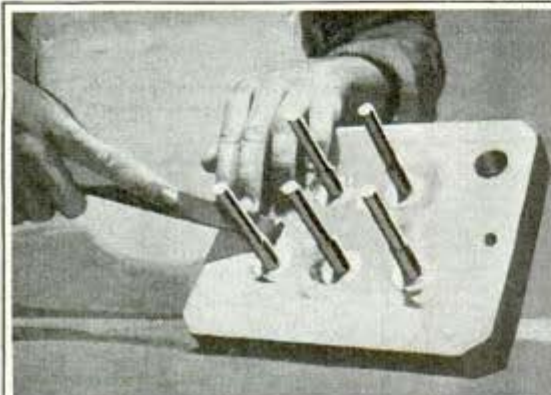


⑤ HARDENED AND GROUND PUNCHES ARE LOCATED IN MASTER PLATE

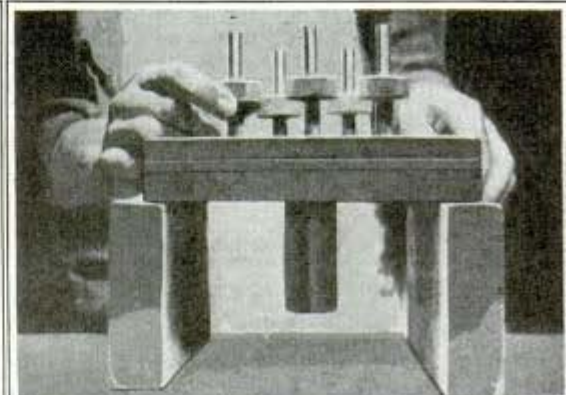


leader pins and is well adapted for heavy work, while type D, having two heavy leader pins, is especially convenient for circular or oval-shaped punches and dies. A perfect sliding fit must exist between the leader pins and their bearings in the punch holder. Punch holders having two-part, hardened-steel bushings as shown in Fig. 2-A, can be lubricated well, and the bushings can be replaced when they are worn. However, many punch holders do not have such bushings, as for example the one shown in detail B. In this case the bearings are bored in the punch holder and are given a highly lapped finish to avoid premature wear and to hold a film of oil.

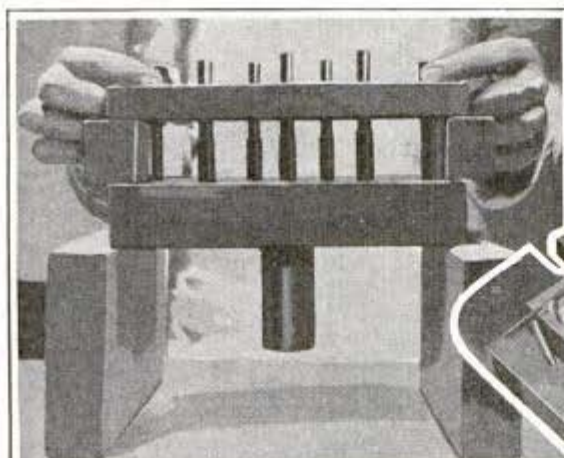
Making a piercing punch-and-die set: A master layout plate such as the one shown in Fig. 6, is made by a skilled die maker. After squaring and surfacing the master plate, he proceeds to lay out the exact locations of the holes from a center point at the intersection of lines A. All five holes C, D, E, F, and G are bored next in a milling machine or jig borer. Then holes H are



⑨ SCRAPING OFF EXCESS MATRIX FROM HOLDER PLATE AFTER SECURING PUNCHES



⑩ HARDENED AND INTERNALLY-GROUND DIE DISKS ARE PLACED ON PUNCHES



11 ALIGNING PUNCH-HOLDER ASSEMBLY WITH MASTER PLATE SET-UP

located, drilled and reamed, these being required for future alignment purposes.

After this has been done, the average machinist who has a bench lathe, drill press and a metal-cutting band saw, can proceed in making the set by following carefully the steps of a simplified modern method: First, centralize the master plate with the punch plate as shown in Fig. 7, the latter having been squared and surfaced. Mark both the master and the punch plate as indicated so that they will not be reversed or turned end for end later. Clamp both plates together and drill all seven holes through the punch plate with correctly ground drills the same size as the holes, which, for example, are all $\frac{3}{8}$ in. in size. Then insert pieces of $\frac{3}{8}$ -in. drill rod as alignment pins in holes H, after which you remove the clamps. The next step is to drill the five punch holes three to four times larger than the shanks of the punches, as shown in Fig. 8.

Assuming that hardened and ground punches and die disks have been made up previously, the punches are secured temporarily to the punch



12 Band-sawed punch and die at top mounted on punch holder and die shoe in center

13

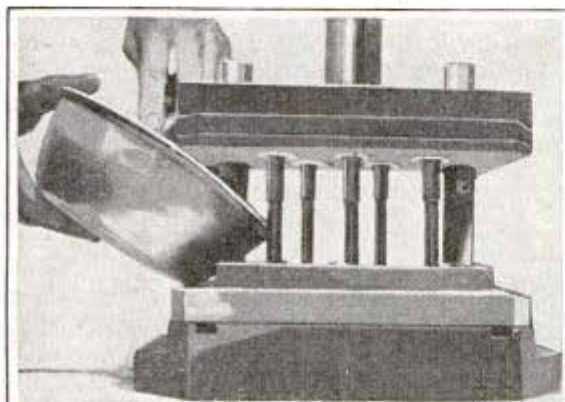
Approximate capacity of crankshaft at bottom of stroke of well-designed punch press

Crankshaft diameter		Tons
in inches		
$1\frac{1}{8}$		6
$1\frac{1}{2}$		$7\frac{1}{2}$
$1\frac{3}{8}$		9
$1\frac{3}{4}$		$10\frac{1}{2}$
$1\frac{7}{8}$		12
2		14
$2\frac{1}{8}$		16
$2\frac{1}{4}$		18

14

Approximate pressure to punch a 1" dia. hole in soft steel, high-carbon steel and brass

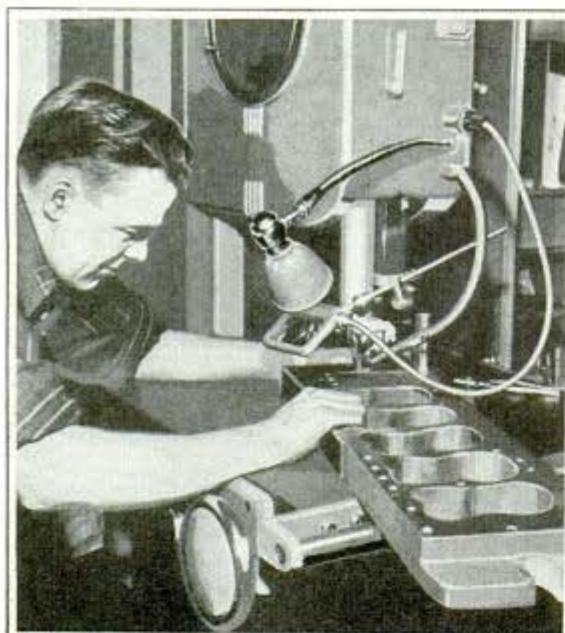
Thickness of Stock	Pressure in pounds		
	Soft steel	High carbon	Brass
$\frac{1}{32}$ "	5890	8835	4123
$\frac{1}{16}$ "	10768	16198	7559
$\frac{1}{8}$ "	20532	30924	14432
$\frac{1}{4}$ "	39270	58905	27489
$\frac{3}{8}$ "	58905	88357	41233
$\frac{1}{2}$ "	78540	117810	59978



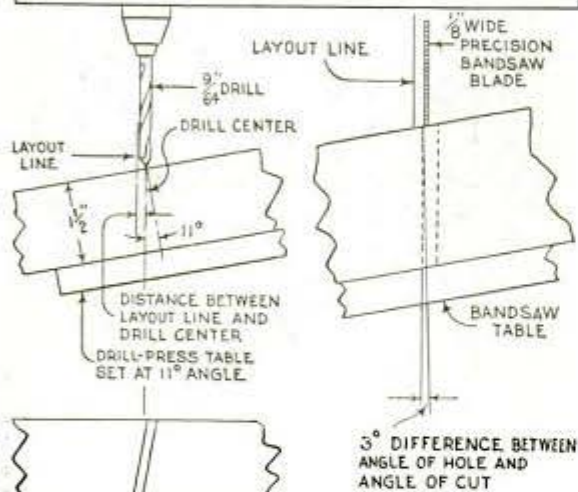
15 LOCATED DIE DISKS ARE SECURED BY FLOWING MATRIX INTO FENCE



16 COMPLETED PUNCH AND DIE READY FOR SURFACE GRINDING ENDS OF PUNCHES AND DIE PLATE

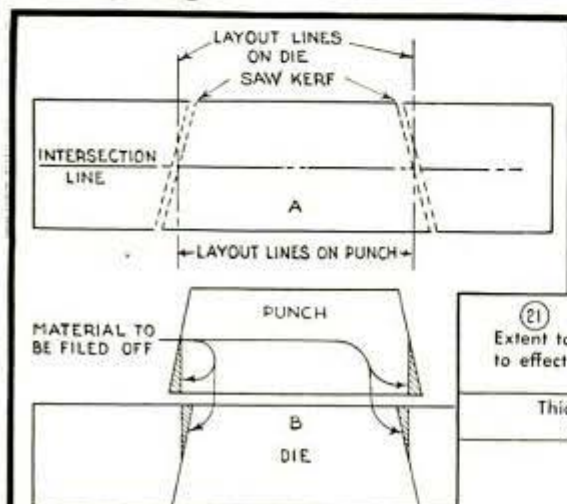


17 BAND-SAWING OPENINGS IN DIE SHOE USED FOR BLANKING SIX-CYLINDER HEAD GASKETS



18 HOW STARTING HOLE IS DRILLED IN RELATION TO LAYOUT LINE

19 HOW SAWING IS DONE IN RELATION TO STARTING HOLE



20 HOW PUNCH AND DIE APPEAR AFTER SAWING OPERATION

21 Extent to which the punch has to penetrate to effect complete severance of the slug in soft steel

Thickness of Stock	Percentage of Penetration
1/2"	.87
3/16"	.75
1/8"	.62
1/4"	.50
3/8"	.44
1/2"	.37

holder with a quick-setting paste consisting of sal ammoniac, 1 part, sulphur, 2 parts, and fine steel filings, 8 parts, mixed with water to a suitable consistency. Insert the punches in the holes of the master die plate as shown in Fig. 5. Then place the punch holder on two supports as shown in Fig. 11, to clear the shank or post. If the job is just an experimental one and the set is not to be used, fill the enlarged holes entirely with the paste at this time. However, on a working set, the paste is put in the enlarged holes only to a depth of about 1/4 in., as the rest of the space is to be filled with a special copper-alloy matrix metal, which melts at 250 degrees Fahr. Invert the master plate carefully so that the punches will not drop out, and locate it on the punch holder by means of the locating pins. Press the punches down to the bottom of the enlarged holes and allow the mixture to harden, after which the master plate is removed. Then the melted copper-alloy matrix is poured into the remaining space above the dried paste that holds the punches. When the matrix metal—or the paste if you are using the latter entirely—has hardened, the excess is scraped off as shown in Fig. 9.

Before locating the die disks and pouring the matrix around them, you make up a metal fence as shown in Fig. 4. This should be as high as the thickness of the die disks. Use solder to close the corners of the fence. After the fence has been placed on the die shoe, slip the die disks on the punches as shown in Fig. 10. Again invert the assembly carefully to retain the disks while aligning the punch holder with the die shoe by means of the leader pins. There should be a clearance of at least 1/2 in. between the disks and the fence. To secure the disks temporarily, you need the same paste used to hold the punches, but this time it is thinned so that it can be poured easily from a pan as shown in Fig. 15, to a depth of about 1/8 in. around the disks and between them and the fence. After the paste has

hardened, remove the punch holder and fill up the space between the disks with the copper-alloy matrix for a working set, but only with

22 Data for sawing die steel to make punch and die from same piece of stock

Thickness of die steel	Angle of starting hole	Angle of cut	Distance from die layout line to center of saw kerf	Distance from die layout line to center of starting hole	Diameter of drill	Width of saw	Resulting amount of straight side on punch and die
1	14°	11°	3/32	1/8	9/64	1/8	3/8
1 1/4	12°	9°	3/32	1/8	9/64	1/8	15/32
1 1/2	11°	8°	7/64	9/64	9/64	1/8	9/16
2	10°	7°	1/8	3/16	13/64	3/16	13/16

(all dimensions given in inches)

the paste or even plaster of paris for an experimental job. Fig. 16 shows the completed punch-and-die set. The last operation is to surface-grind the die plate and the ends of the punches.

As a matter of information concerning punch presses, Fig. 13 gives a table from which you can estimate the tons of pressure that a press produces in relation to its crankshaft size. Fig. 14 gives the approximate pressures in pounds required to punch a 1-in. hole in sheets of soft steel, high-carbon steel and brass of various thicknesses. The extent that a punch must penetrate soft-steel sheets of various thickness is given in Fig. 21.

Blanking punch and die: Another modern development is that of making a blanking punch-and-die set from one piece of steel. The work is done on a metal-cutting band saw as shown in Fig. 17, and the method saves both time and material. Fig. 12 and also the photos at the top of the first page of this article show punches and dies produced by this method. The upper details in Fig. 12 show a punch and die separately, the center details show them attached to the punch holder and die shoe, and the lower detail shows a number of stampings produced with the set. The first part of the job in making such a set is done by an expert die maker; he squares and surfaces the blank and then outlines the shape of the cut which is located accurately with measuring tools or from a template. Depending on the thickness of the die steel, a starting hole is drilled at a predetermined size and angle. See Fig. 22. The size of the drill hole determines the width of the saw. Fig. 18 shows a hole being drilled at an angle in 1 1/4-in. stock. In this case a 9/64-in. drill was used and the distance between the layout line and the drill center was also 9/64 in. When band-sawing, the band-saw table is tilted a few degrees less than the drill-



25 Scrap allowances for blanking

Thickness of stock	Diameter of blanks	Scrap allowed on the side	Scrap allowed between blanks
.013 to .057	Up to 10	1/8	1/16
	10 to 20	3/16	3/32
	20 to 30	1/4	1/8
	and over		
.057 to .081	Up to 10	5/32	3/32
	10 to 20	7/32	1/8
	20 to 30	5/16	5/32
	and over		
.081 to .128	Up to 10	3/16	1/8
	10 to 20	1/4	5/32
	20 to 30	3/8	3/16
	and over		

(all dimensions in inches)

ing angle, as shown in Fig. 19. In this case, the difference in angle was 3 degrees. From Fig. 20-A, showing the cut completed, you will note that the layout line intersects the die layout line at the center of the plate, the die layout line is also the punch layout line as can be seen when the punch and die are placed in the position shown in Fig. 20-B. An equal amount

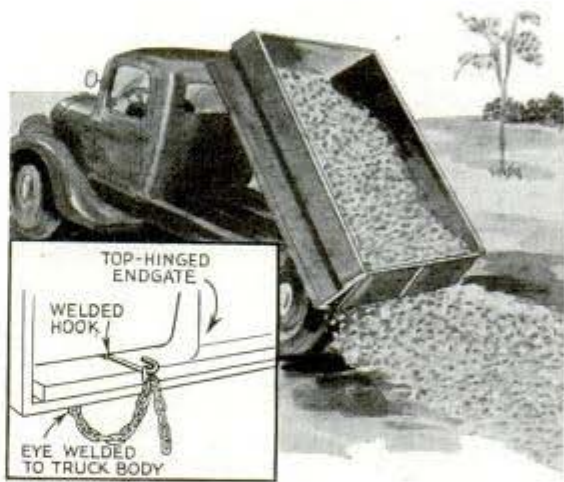


of stock remains on both punch and die to be filed off to complete the work. Fig. 23 shows a band-filing machine being used for this purpose, while Fig. 25 gives scrap allowances usually permitted for blanking.

When resharpening die plates on a surface grinder as in Fig. 24, they need not be removed from the die shoes. Use plenty of coolant so excessive heat will not be generated. Grinding dies dry is likely to invite so-called wheel cracks, which damage costly dies beyond repair. Piercing punches are never removed from a punch holder for resharpening; the holder is held on a magnetic chuck as in Fig. 26 when resurfacing the tops of the punches.

Chain Stop on Truck Endgate to Spread Gravel Uniformly

Although dump-truck bodies are regularly fitted with a fixture for adjusting the endgate to a given opening, the chain tends to slip out of the locking slots, especially after the latter become worn. One truckman, who specializes in road work and graveling driveways, fitted the endgate of his truck with a special chain latch as shown. To spread gravel or crushed stone to any desired depth on a driveway, he drops a given number of links in the chain, then places the last link over the hook welded to the endgate. Then he raises the body, releases the endgate and drives forward. Since the endgate is held at a given opening the material is spread uniformly.



Sign Kept in Vertical Position on Sidewalk by Sand-Weighted Base

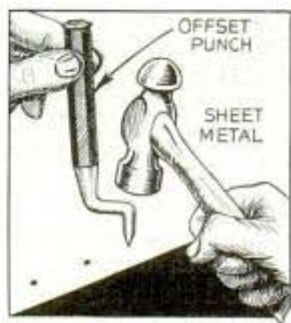
Difficulty in preventing his sidewalk sign from being tipped over by the wind led one filling station owner to fit a trough between

the sign uprights as shown. This was then filled with sand which provided sufficient weight to hold the sign in place.



Offset Prick Punch Is Safer

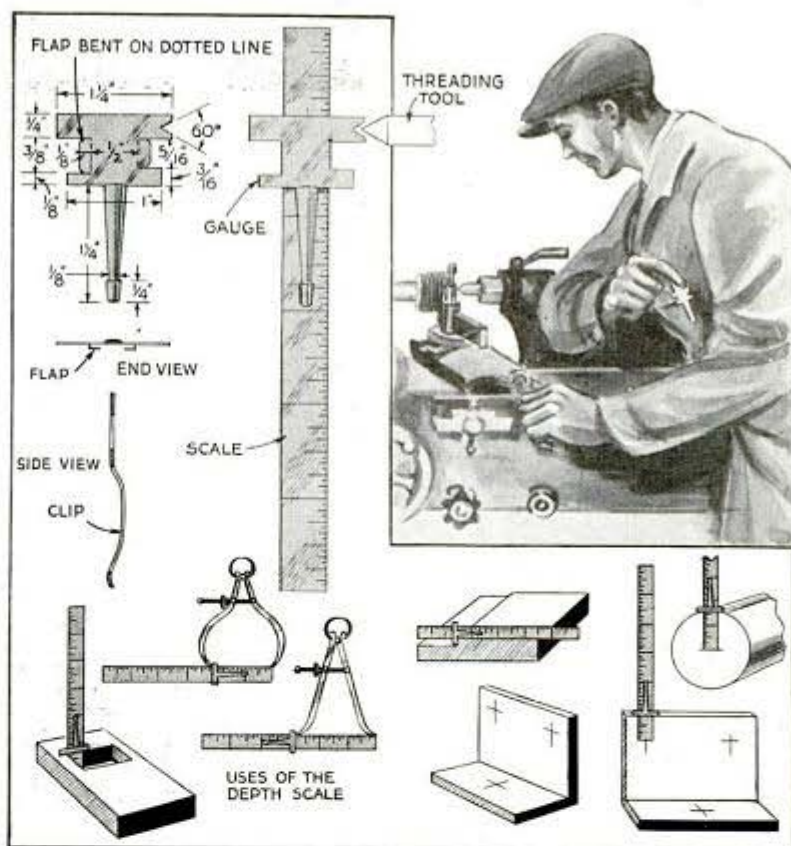
In rapid production work where a number of holes must be marked in sheet metal with a prick punch, one is less likely to injure the fingers when striking the punch with a hammer if



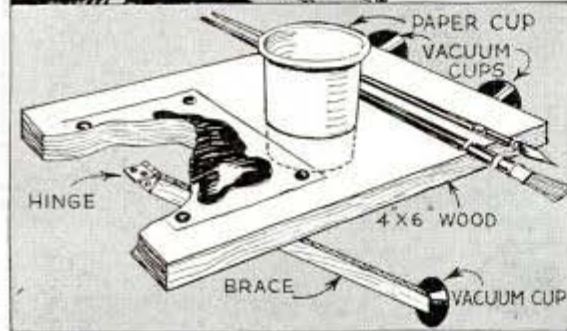
a punch of the type shown is used. There is less chance of such a punch flying out of the hands if struck a glancing blow.

Clip on Mechanic's Scale Triples Its Usefulness

Greatly increasing the usefulness of a machinist's steel pocket scale, this little sliding clip, serves a threefold purpose: First, it holds the scale securely in a pocket within easy reach so that it is not likely to be lost or misplaced. Second, the clip, which has tabs bent to fit snugly on the scale, will remain in any adjusted position, enabling the clip and scale to be used as a convenient depth gauge. Third, the edges of the clip may be ground to serve as gauges, as indicated in the upper left-hand detail, and a 60° notch provides a handy guide for grinding thread-cutting tools.—Will. F. Kelley, Michigan City, Ind.



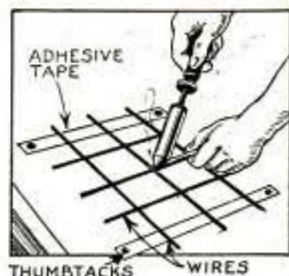
Sign Painter's Accessory Shelf Sticks to Window Glass



Fitted with three vacuum cups so that it can be stuck to a window in any desired position, this shelf keeps a sign painter's materials conveniently at hand. Two of the cups are fastened at the rear edge of the shelf and the third to a hinged brace, which keeps the shelf horizontal.

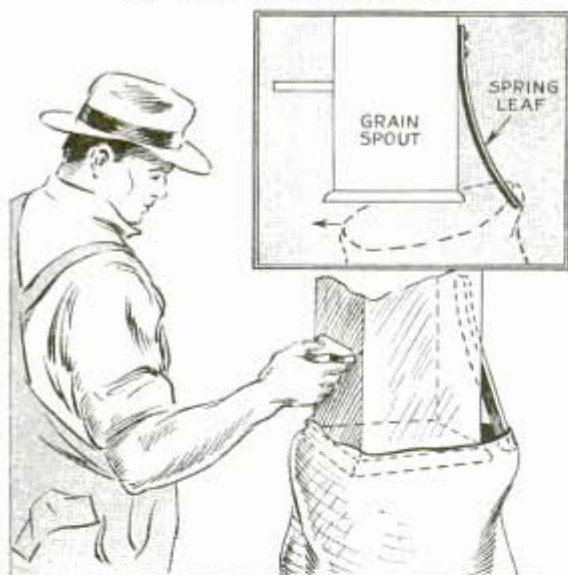
Tape Holds Wires in Position To Make Grills

If you want to make a grill by soldering wires or small rods together, a couple of strips of adhesive tape will be found handy for keeping them in position while using the



soldering iron. The tape strips are thumb-tacked to a smooth, flat surface and the rods spaced on them, the adhesive surface of the tape keeping them securely in place.

Sacks Held Under Grain Spout By Auto-Spring Leaf

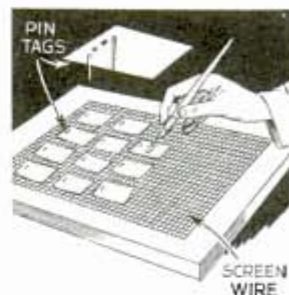


When filling a number of sacks from a large grain spout, they can be held securely by attaching half of an auto-spring leaf

to the back or side of the spout. In use, a sack is slipped over the projecting spring end after which it is pulled back and hooked over the opposite side of the spout. To prevent slipping, it's a good idea to tack strips of quarter-round molding around the end of the spout.

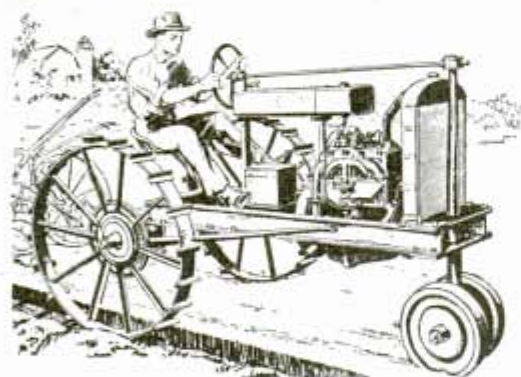
Wire Screen Holds Pin Tags For Price Writing

Difficulty of holding sharp-pointed pin tags conveniently for marking them led one merchant to employ a section of screen wire to hold them safely. The wire is tacked



to a wooden frame for ease in handling, and the pins of the tags are inserted through the mesh of the wire.

How to Build a Farm Tractor in Your Spare Time



Having plenty of power to pull a two-bottom plow and other implements, this farm tractor, built from old car parts, includes a Ford model-A motor and twin transmissions giving six speeds forward. Wrenches, hacksaw and drill are about the only tools needed—welding can be done at your local machine shop. Set of three 17 by 22-in. plans, Nos. 1024 to 1026 incl., containing construction details and material list will be sent postpaid upon receipt of 75c.

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RADIO

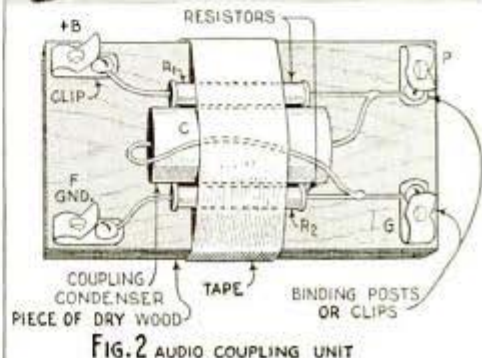
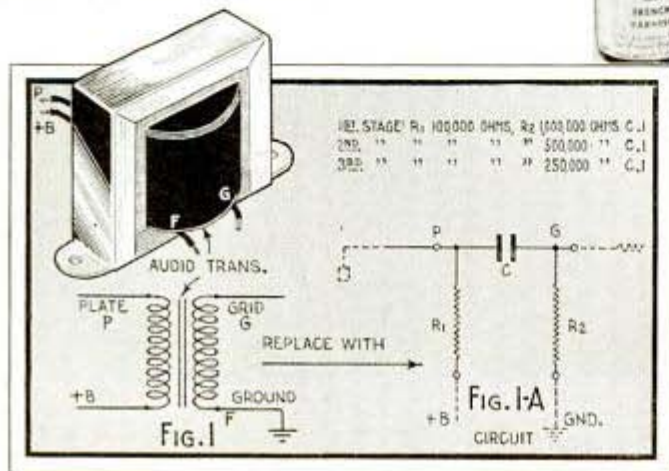


First Aid for Home Sets

PART IX

AS CONSOLE receivers usually are placed in the living room of the home, the cabinet should be kept polished and free from scratches so that it does not detract from other room furnishings. In most cases it is an expensive and highly finished piece of furniture that is in constant use. Most servicemen are equipped with a touch-up kit similar to the one in the photo; this consists of a scratch filler stick; French varnish and emulsion; scratch remover and polish; white, walnut and ivory enamel; dark walnut stain; fine sandpaper and steel wool, in the numbered order shown. Many of these items are available from your paint or hardware stores, and right now your local radio serviceman is too busy with more important repair jobs.

Diagrams Figs. 1 and 2 illustrate a first aid hint for radio students and experimenters who are capable of locating trouble and repairing defective stages in their receivers. Defective audio transformers are easily replaced with emergency resistance-coupled stages for which all resistor and condenser values are given in Fig. 1. Condensers (C) are 600-volt paper types, resistors (R) are $\frac{1}{4}$ watt. They may be pre-assembled as shown in Fig. 2.



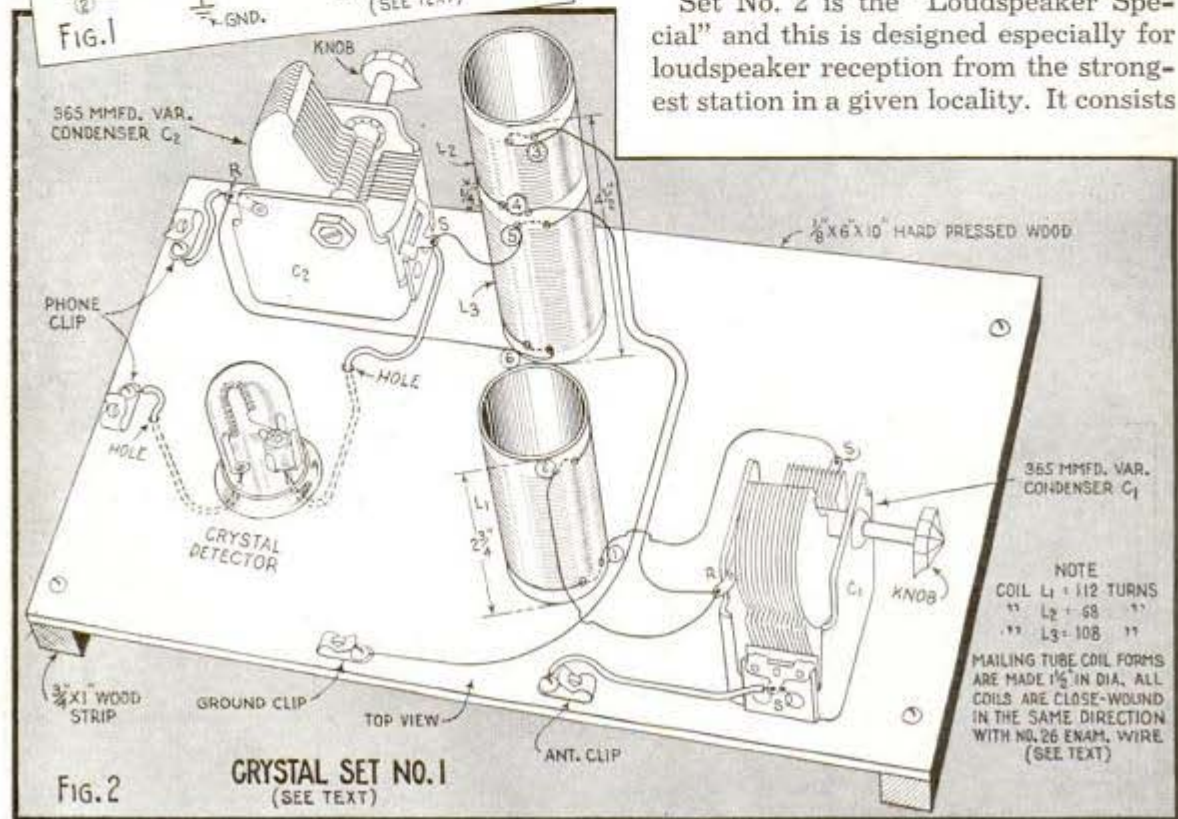
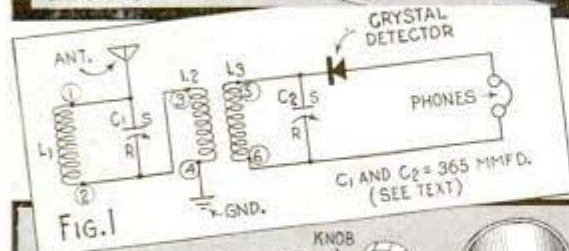
TWO MODERN CRYSTAL SETS



CRYSTAL sets have always been "naturals" for the beginner because they are extremely easy to build and require only a few inexpensive materials. Many more advanced students like to experiment with them, for the same reason that an expert trout fisherman will penalize himself by using a 4½-pound line. There is a real thrill to pulling in signals with a receiver which depends entirely upon power it picks up from the air.

The first set to be described, No. 1, is designed especially for use in cities where there are several broadcasting stations. This set, shown in photo A, we will call the "Big Town" Selector. Thanks to the use of 3 hand-wound coils and two noncritical tuning condensers it is more selective than the average crystal receiver. The original model, tested in a large city where there were five local stations, brought in all five with good strong signals and no interference. An ordinary crystal set brings in only two of the strongest ones and those on top of each other. The simplified and schematic diagrams for this set are given in Figs. 1 and 2.

Set No. 2 is the "Loudspeaker Special" and this is designed especially for loudspeaker reception from the strongest station in a given locality. It consists

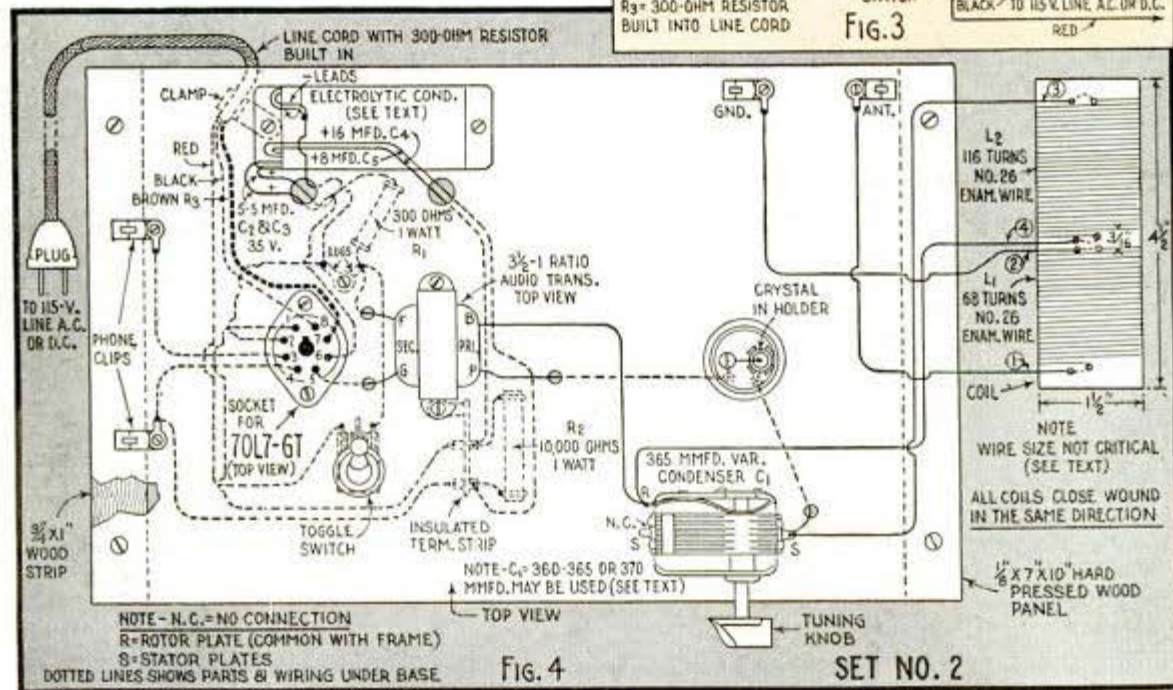
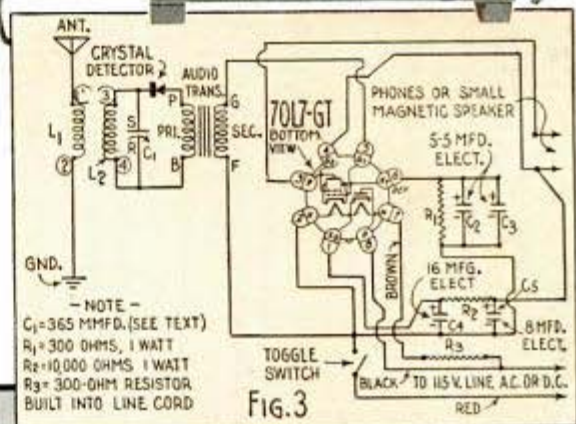


for BEGINNERS

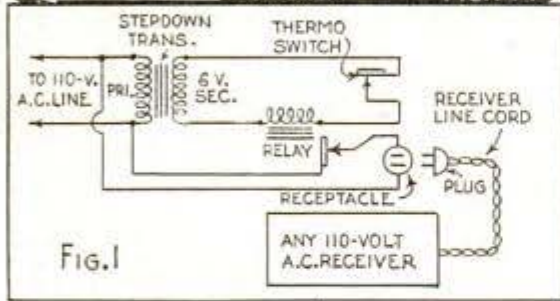
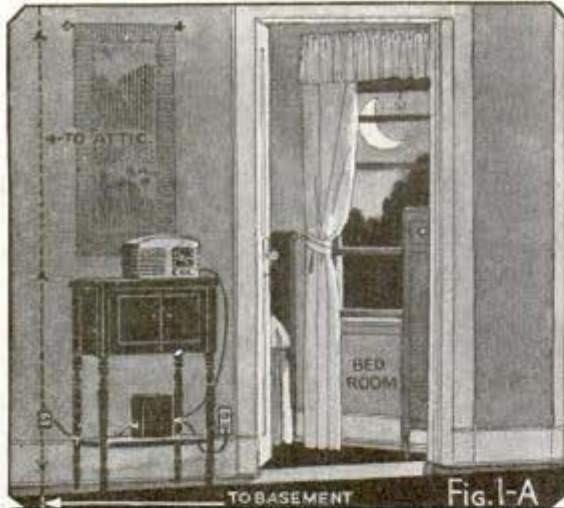
of a simple crystal detector circuit coupled by means of an audio transformer to a 1-tube a.c.-d.c. amplifier. This audio stage merely amplifies the signal picked up by the crystal detector. Headphones may be used instead of the speaker without any changes in the circuit. The schematic circuit diagram for set No. 2 appears in Fig. 3, and the simplified wiring diagram is shown in Fig. 4.

Starting with set No. 1, the first step is to wind the coils. Noncritical "junk-box" parts are employed; the wire may be any gauge of salvaged wire from No. 22 to No. 30 and may have any type of covering, enamel, double or single cotton, or silk covered. The coils are wound on ordinary mailing tubes approximately 1½ in. in diameter, the length varying slightly depending upon the type of wire used. Punch two holes with an ice pick to anchor the starting end and thread the wire through the holes; then, with someone holding the spool of wire you are winding from, rotate the coil and wind the wire on evenly, counting each full turn. When the necessary number of turns have been wound on punch two more holes in the form and anchor the wire. Leave several inches of wire at the beginning and end of each coil

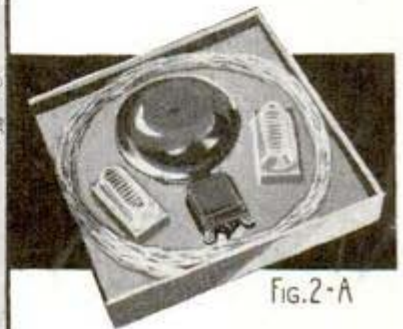
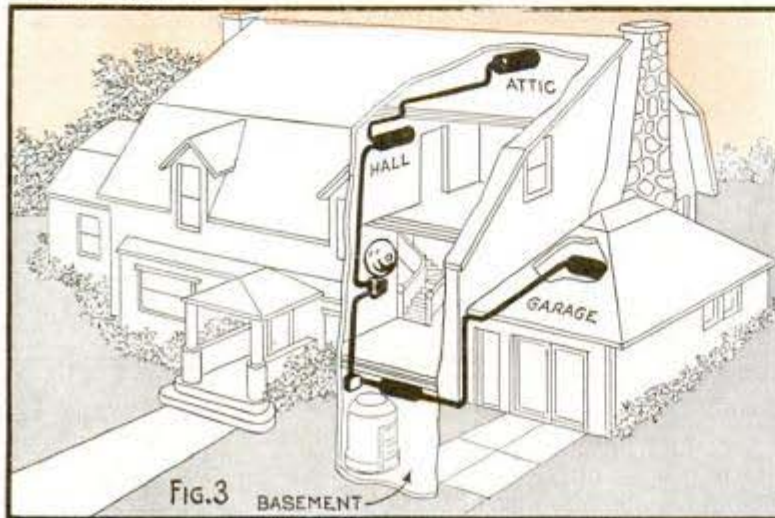
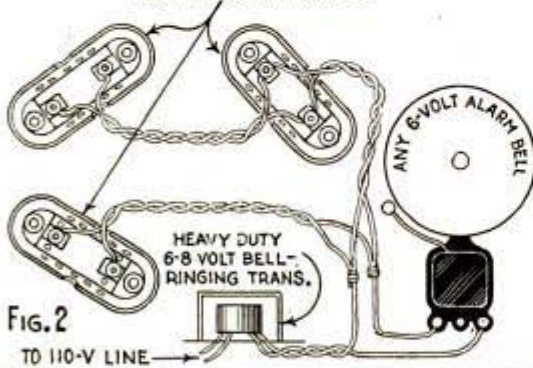
(Continued to page 172)



Radio Receiver Acts as Automatic Fire Warden



THREE DETECTOR HEADS (THERMO SWITCHES) CONNECTED IN PARALLEL



FIRE, dangerous at any time and now a powerful tool of enemy saboteurs, should be held to a minimum by employing fire-detection apparatus of any available type. A radio receiver tuned to a powerful 24-hour local station with volume turned "full on" provides an effective automatic alarm when power to the set is controlled by thermal switches and a relay connected as in Fig. 1. A number of these "thermo" switches may be connected in parallel and located in various parts of the home as indicated in a similar alarm bell system shown in Figs. 2, 2-A and 3.

Both systems are based on thermal switches of simple types. Each switch or "detector head" contains a bi-metallic strip which curls and closes its contacts when temperature rises above a certain point. These sensitive units should be located high up on the walls of the various rooms, attic and basement wherever fire is likely to occur. The arrangement shown in Figs. 1 and 1-A employs a 6-volt stepdown transformer operating on the 110-volt a.c. house-lighting circuit to energize the relay that closes the power circuit to operate the radio receiver that is plugged into the robot fire warden receptacle. Sketch, Fig. 1-A, shows the relay and transformer housed in a small case placed near the radio receiver, and plugged into the wall outlet for the 110-volt primary connections. An ordinary wall outlet box and receptacle is provided for the extended "thermo" switch circuit which is run in standard conduit.

Where a very loud alarm is required in large homes or shops, the bell system illustrated in Figs. 2, 2-A and 3 is effective. The "Fyre-Scout" thermostatic switches, Fig. 2-A, are enclosed in neat and compact enameled housings.

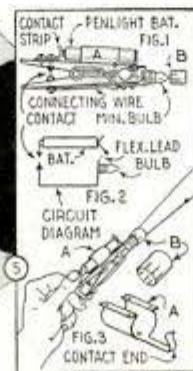
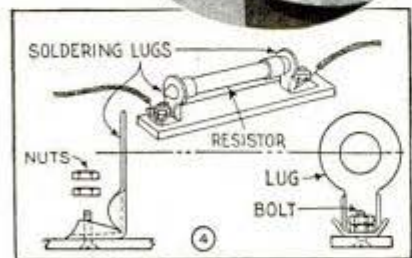
Practical RADIO HINTS

(1) Two ordinary 3-in. powder puffs act as soft cushions or pads for headphones worn by short-wave listeners and radio operators who stand long watches. In addition to relieving uncomfortable pressure, they also help to exclude outside noise. Holes $\frac{3}{4}$ in. in diameter are cut in the center which is then stitched as indicated in the photo to prevent the filler from creeping out

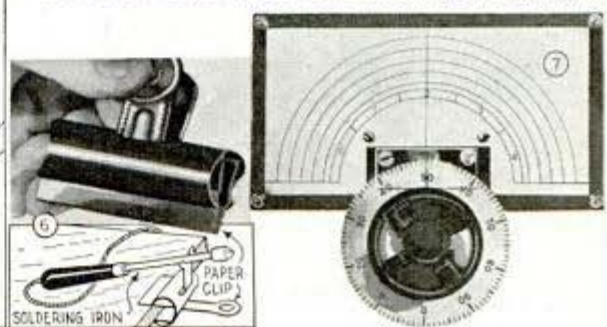


Powder puff centers over diaphragm opening in phone cap

(2) Calibration marks on Bakelite panels made by drilling shallow holes with a $\frac{1}{8}$ -in. drill; rub white crayon into the holes and wipe panel clean. (3) Additional holes in speaker baffle for bass reflex effect. (4) Resistor or r.f. choke holder made from large round-hole soldering lugs; mount the lugs on a small strip of Bakelite, countersinking the screw heads on the underside as shown. (5) Student's "firefly" code blinker made from a spring clothespin, penlight battery and a miniature penlight bulb mounted in a radio dial bulb socket. The spring-metal battery mounting unit A provides the negative contact at front; another contact strip at rear bears against the positive end. All connections are shown in Figs. 1, 2 and 3. The metal hood B is painted black inside and out, and is slit at one end for a snug fit to direct all light in a forward beam. Contacts are made with machine screws, spring tension should be eased for free opening and closing to "blink" dots and dashes



(6) Large paper clamp altered to make soldering iron support for bench. (7) Precision gear-driven dial for instruments requiring extreme accuracy of calibration



Showerlike F-M Radio Antenna



Looking something like a new type of shower ring, this frequency-modulation antenna at station W47NY radiates energy of practically uniform pattern in all directions without resorting to additional and costly arrangements previously required to gain the same results. It consists of upper and lower circular elements each being a quarter wavelength long. It is easily mounted on a pole of suitable diameter and grounded to that pole so there is protection from lightning. It is said to cover a wide frequency range with one physical structure. The design of this unusual F-M transmitting antenna also provides for sleet melting, if desired.

Radio and Clock in Desk Drawer



Part of a complete bedroom ensemble in an unusual aviation motif, this desk was designed to house a standard 5-tube a.c.-d.c. receiver and an electric clock in one of the drawers. The set occupies only part of the drawer

space. All necessary ventilation is provided for, and the receiver plugs in with the clock at the rear of the desk. The same general idea is often employed by radio experimenters and servicemen who install an old radio chassis in a drawer of the workbench in order to get the receiver out of the way and still have it available when a program of special interest is on.

Portable Resistance Limit Bridge

Operated by self-contained batteries, this direct-reading resistance limit bridge speeds up precision resistance tests to meet exact specifications of allowable percentage variation for so many of the resistors used in military equipment. No skill is required to operate the instrument beyond



accurate observation of the scale reading. Four dry batteries, carried within the case, furnish the tube filament current and the operating voltages. In addition to the on-off switch at the right, there is a safety switch above the meter, that opens the filament circuit when the cover is closed.

Blueprints covering simplified radio construction articles in this and past issues are available for 25c each. Many popular tested circuits for beginners, students and experimenters may be built with used parts. Detailed material lists can be obtained from Popular Mechanics Radio Department upon receipt of postage.

NEXT MONTH—Little Giant Three for Beginners. Hand-wound coils and non-critical parts are used in the 1943 student model of this popular a.c.-d.c. broadcast receiver. Truly a "wartime" student project that shows what can be done with a simple T.R.F. circuit. Also—**Code Practice Receiver and First Aid for Home Sets.**

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Fighting That Tired Feeling

(Continued from page 95)

Lamp Division of Westinghouse to boost morale and prevent fatigue. Loudspeakers play marches, tangos and swing for five and a half hours a day while hundreds of the plant's men and women employes turn out communications equipment for the armed forces. Band music, intended as a "musical pep cocktail," greets the workers arriving for the various shifts and continues for 15 minutes. Five half-hour periods of music are scheduled during the eight-hour shift, one at lunch time and the rest timed to coincide with periods of "let-down" or fatigue. Music during the fatigue periods acts as a stimulant, reports show. Popular music is the favorite in the Meter Division, partly because the tempo of modern tunes seems to fit the rhythm of operators assembling small parts. In one instrument testing section where there is less noise and no machinery, workers prefer waltzes, Hawaiian melodies and light classics. Women workers find music more helpful in their work than men.

Outside influences which cause lack of sleep and physical exhaustion are another cause of fatigue. The honky-tonk dance halls which have sprung up near defense plants are being offset with high class recreational activities by huge war contract

plants such as Federal Shipbuilding and Drydock Company and Electric Boat Company where fatigue on the job would hamper the war at sea.

Systemic poisoning from noxious fumes is a common cause of that tired feeling, but it is fast disappearing with the advent of air conditioning. Worry is another factor that makes you tired on the job. Bad health, bad habits, bad housing conditions, noise, vibration, waste motion, improper and inefficient methods of picking up and carrying heavy objects, close protracted mental concentration, eye strain, posture, workbenches set at wrong heights, lack of illumination, working rooms which are too hot or too cold, lack of pleasant outside interests such as a hobby, insufficient fresh air and misfit clothing all contribute to that exhausted feeling.

One corporation even discovered that replacing concrete floors with springy asphalt stepped up production.

Little by little the scientists employed by the industrial giants of America are whittling away at these causes of fatigue because it helps you, it helps them and most of all right now that extra ounce of energy helps back up the fighting men of the nation.

12,000,000 Meals a Day

(Continued from page 87)

experts predict that their experiments will have some revolutionary effects on civilian food processing after the war.

The process isn't so simple as it sounds, for almost every food requires different treatment to retain an attractive appearance and flavor as well as nutritive value.

Dehydrated vegetables lose about nine-tenths of their weight. This is a vital factor in supplying food to an overseas army when ships are at a premium. For example, 27,000,000 pounds of potatoes can be reduced to 3,000,000 pounds and save at least 500,000 cubic feet of cargo space. This amounts to more than the capacity of two cargo ships. Dehydrated foods also lend themselves to air transport for bolstering supply lines during an emergency.

The army guards figures on the amounts of dehydrated foods now being produced

for overseas consumption. The Agriculture Marketing Administration, however, announced that lease-lend distribution up until last July 1 included 169,703,950 pounds of dried skim milk and 184,168,495 pounds of dried eggs. One pound of dehydrated eggs is equivalent to three dozen liquid eggs.

The Quartermaster Corps estimates that a soldier eats 1,800 pounds of food a year, compared with the average civilian consumption of 1,400 pounds. This costs the army \$190 a year per man, or 52 cents a day. When Uncle Sam reaches for the check for a year's rations for 4,000,000 men, the figure is \$760,000,000.

That's one bill the taxpayers aren't kicking about. They want the American soldier to be the best fed in the world.

The Quartermaster Corps says that he is.



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Jungle Mechanics

(Continued from page 71)

He chisels and chips away at the L shaped wood until one arm of it becomes a sort of cylindrical, long neck surmounted, purely for art's sake, by a roughly carved head. In this neck he burns five holes, tightly fitting in each a short section of the stick, as the register of one of the five chords—the creepers which he will fasten with a knot beneath the lizard skin. The other arm of the L is carved and hollowed to form a sort of spoon, over which the lizard skin, softened in water, is tightly stretched by another piece of creeper, passed, like a shoe string, through small holes punched around the skin's contour, then bound around the base of the neck and the guitar is ready for a tune.

Look at the Azande's cousins, the Mangbetus. Their huts are made of poles planted in the ground, mud crammed between the poles, and a thatched roof. The Mangbetu decorates his walls with a method so simple, with such gay effect, that you might use it yourself, to beautify some small building in your backyard.

All the Mangbetus—or you—need is some chalk, powdered charcoal, some orange, red, purple, brown ochras and plenty of imagination and free hand. Each of these colors is mixed with water in a separate container. Each is applied with a brush made of an antelope's tail. The tracings may represent animals, waves, crosses, triangles, straight or curved or zigzagging stripes. The final effect is as modernistic, exotic and pleasing as could be desired.

The deeper one penetrates the equatorial jungle the harder Nature fights back.

Biting ants are as long as a toe. Stinging beetles as big as a fist. Venomous spiders half as big as this page. Wild hogs are five feet at the shoulder, crocodiles 26 feet long, baboons weighing hundreds of pounds, leopards ten feet from nose to tail-tip.

Worst of all, here lives the giant gorilla, the most belligerent of apes. It is a colossus of formidable might and almost human cunning, often heavier than 600 pounds, topping six feet six inches in stature.

And what race of supermen can withstand the dangers of such a world? What extraordinary weapons do they possess to fight off the monsters prowling through their land? Those "supermen" are the

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FUSES



MOTORS



OUTLETS

dwarfs, 4 feet 6 inches high, not 90 pounds in weight. Their weapons are bows with a creeper for cord, little arrows smeared with vegetable poison, small spears cut from a straight branch.

The elephant, the buffalo, the okapi, the giant hog, would smash and crush the dwarf hunter daring to approach them. But each of these can be killed easily, once it is imprisoned in a deep hole. The dwarfs dig hundreds of such pits. Light sticks cover the pit, leaves are spread over this trel-lis, then dead leaves and branches, manure, antheaps, clods of moss until not even the most suspicious eyes can detect a difference from the surrounding ground.

If the dwarf must cross a stream in which crocodiles abound, he ties some long lianas together, climbs up a convenient tree and fastens the liana to a solid branch. At the hanging end he makes a rough seat.

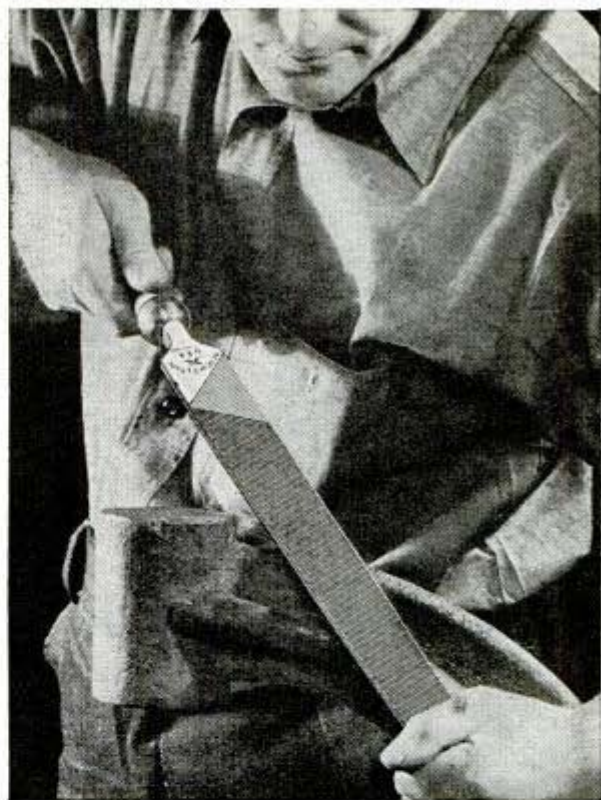
The rest of the tribe, from another tree, pull him high with another liana, then they let go. At dizzy speed the flying dwarf swings down toward the water, soars up toward the treetops on the opposite shore. He grasps a branch, fastens to the seat a heavy piece of wood and lets the whole contraption swing back to the starting point for another passenger.

Next month, I will tell you how the African native wins over the "tank" of the jungle, the rhino. I will tell you of the "grand piano" of the veldt, and of the six-legged ostrich.

But first listen to the furious roars of a giant gorilla, who has just discovered a lonely hunter. The dwarf is running for his life. The gorilla lunges ahead, crashing through every obstacle. What chance has the poor little dwarf? He hesitates a second. Swiftly he has planted his spear-handle in the ground, stone point angled toward the approaching gorilla. It's hidden in the vegetation. The ape rushes ahead, stretches his long arms—and lets out a scream of agony. He is impaled on the unnoticed spear. The poison on the stone point works instantly.

The dwarf, panting, halts. His tribe is already running to share the meat of the gorilla. And to celebrate his victory, he picks two red flowers of the mukho tree, rakishly sticks them through the hole across the cartilage of his nose!

(Concluded next month)



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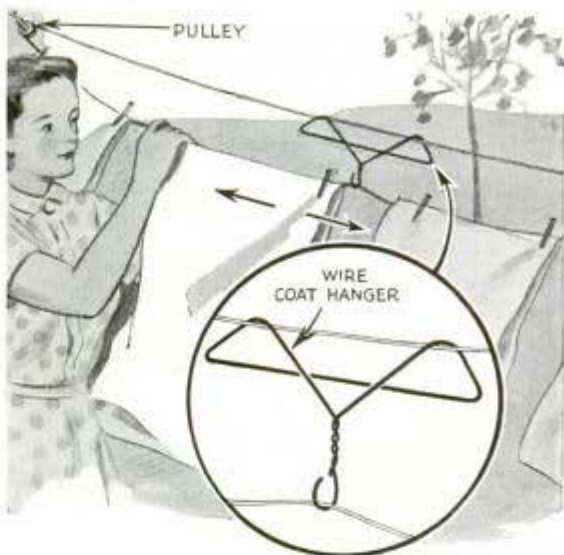
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Where it is necessary to use a double clothesline that runs on pulleys between upper porches of apartments, sagging of the lower line can be prevented by using a sliding support bent from a wire coat hanger. The double loop of wire over the upper line slides along while the lower section is pulled in or out, thus making both sections carry the weight.

Strips of Tape on Glass Graduate Prevent Fingers Slipping



To guard against accidentally dropping a glass graduate when your fingers are wet or greasy, merely attach two strips of wide adhesive tape on opposite sides of the graduate. These will provide just enough friction to prevent slipping and they can be removed quickly whenever desired.

—William Swallow, Brooklyn, N. Y.

"Mustang" Admirals in the Making

(Continued from page 37)

Naval R. O. T. C., a cadet usually attends two summer training periods. When he gets his sheepskin from his university, he also gets a commission as an Ensign in the United States Naval Reserve. He is called into service immediately and paid approximately \$216 per month if single, \$252 per month if married.

The V-1 program is slightly different from R. O. T. C. Students aged 17 to 19 who are in an accredited college or university, or who are about to enter one, are eligible. These V-1 students will be freshmen and sophomores and will study what they want—as if they were regular college students. However, they will be strongly urged to take mathematics, history, natural sciences, and physical education.

In March these students take a qualifying examination. The Navy has set a goal of 80,000 students to be enrolled under this program. If the goal of 80,000 enrollees is attained, thousands of additional college men will be available for officer training—above the minimum needs of the navy at present. But as the course and duration of the war cannot be predicted, these minimum figures probably will be revised upward. Taking no chances, the navy is seeking to train sufficient officers to meet any eventuality.

The V-1 program will permit students to remain in college while being trained as future naval officers. But the Navy's program does not call for a commission gratuitously given to any student enrolled in this program. Navy standards are high, and those that fail to measure up will be called to active service immediately as enlisted men. With their college training, however, they should advance to petty officer ratings in a very short time.

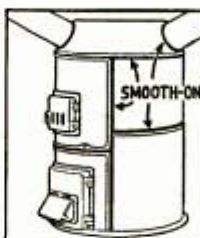
Under the V-7 program, college graduates, 19 to 27 years of age who have the required amount of mathematics, are given training leading to ensign's commissions at special schools at Annapolis, Chicago, and New York City.

After a preliminary conditioning period of 30 days, V-7 cadets are put through a stiff three-month program of officer training. They are called "90 day wonders"—

(Continued to page 169)

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not in disparagement, but in genuine respect.

How high will these non-Annapolis officers go? Since 1900 there have been only a few non-Annapolis admirals in the Navy. But Vice Admiral Chester Nimitz (himself a former Naval R. O. T. C. instructor at the University of California) predicted not long ago before the House Naval Affairs Committee:

"Probably many of the admirals of the future American Navy will never have been to Annapolis." They'll come from the "mustang" ranks now in training in our colleges and universities.

Riding the Fast Mail

(Continued from page 59)

Railway post office cars served as the model for the new highway postal service between Washington, D. C., and Harrisonburg, Va., in which regular mail distribution is carried on inside large postal trucks while traveling along the highway. Picking up railroad mail on the fly was the origin of a similar idea used by an east coast feeder air line before war started. Instead of landing at a field to pick up a small amount of air mail, the mail plane swooped down to pick up with a grapnel hook a mail sack attached to a line that was suspended between two poles.

Conveyor-belt systems are used in most large cities for sorting and stacking the mail, and in New York and Boston much of the mail moves between branch post offices through pneumatic tube systems. The main New York post office, for instance, is tied in with 21 of its larger branches with a double line of 8-inch pneumatic tubes. Bundles of letters are placed in carriers that resemble small milk cans and these move at 35 miles per hour through the tube system, being relayed from one station to the next until each carrier reaches its destination.

Every day, the New York post office receives, dispatches and delivers upwards of 14,500,000 pieces of ordinary mail, 132,000 registered pieces, 72,000 parcel post packages, and 260,000 pounds of newspapers and magazines. Canceling machines that handle 600 letters per minute are one of the many mechanical devices used to handle the daily mountains of postal matter.

(Continued to page 170)

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better arts and crafts-

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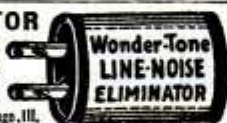
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In all, the 250,000 employees of the nation's post office department moved 29 billion pieces of mail totaling 3,125,000 tons through its 44,095 post offices and 6,553 branches during the fiscal year ended June 30, 1941. This was a great increase over 1940 and the volume of mail since last year has likewise increased considerably. First class mail makes up about half the total. Air mail accounts for less than one percent although air mail is increasing to such a volume that the air lines are establishing special air mail and express departments.

War has complicated the handling of the mails, first by the unprecedented amounts of material that must now be handled. Too, the post office department and the railroads have the task of trying to maintain normal mail schedules even though emergency troop trains disrupt ordinary train movements. Mail trains are the last to be tied up when schedules must be changed temporarily.

Another complication is the military camps and training establishments that spring up almost overnight. These must all be provided with efficient mail service. Mail volume at a small town may jump from hundreds of letters to hundreds of thousands of letters a day when an army camp is built nearby. Usually the post office department is warned ahead of time when such mass movements occur with the result that postal facilities literally follow the troops around.

Delays are often unavoidable in handling navy mail. All large navy ships have a small post office on board and even carry ordinary post boxes in which outgoing mail may be deposited. For administrative purposes all such ships are classed as branches of the New York post office, no matter in what part of the world they may be and even if such ships have never visited New York. All navy mail is handled in and out of the nearest shore station. Mail from ships at sea and abroad is brought to the United States by naval transport and supply vessels.

"Neither snow, nor rain, nor heat nor gloom of night stays these swift couriers from their appointed rounds," has been taken as its motto by the post office department. No matter where you are, the department's business is to see that mail addressed to you is delivered as rapidly and as safely as possible.

"Mummy" Foods for Victory

(Continued from page 11)

To dehydrate food in such a cabinet, select vegetables in prime condition, free of wilt, and pick them just before you are ready to proceed. Some varieties dehydrate and keep better than others, and a good rule is that the most brightly colored varieties stand dehydration best. Heavy stalks, skins, and outer leaves should be removed. First wash and then cut such vegetables as carrots, beets, potatoes, cabbage, or tomatoes into small pieces, or slices $\frac{1}{4}$ -inch thick. Corn trimmed from the cob, peas, or spinach leaves need no such cutting.

Next blanch the material by steaming it. This may be done by filling a colander or wire basket not more than half full with the material and placing this in a kettle containing an inch of water, not enough to wet the vegetables. Put on the cover and boil vigorously. This steaming continues for from 2 to 10 minutes, until each piece is heated through. Test by removing a piece from the center of the container. It should feel soft but not completely cooked.

The blanched pieces are then spread, not more than half an inch thick, on the cheesecloth of the drying trays. Stagger the trays in the dryer. The thermometer on the lower tray should be kept between 140 and 150 degrees. Complete dehydration requires 4 to 12 hours and must continue until the food becomes bone dry and brittle. The trays should be rotated every half hour or so to insure even drying. Heat should be reduced during the last stages to prevent scorching.

After cooling, the dried food must be stored in moistureproof and insectproof containers, sealed from air with cellulose tape or paraffin. A small piece of Dry Ice may be dropped in each container and allowed to evaporate completely before the food chips are poured in. This provides a carbon dioxide atmosphere in which the dry food will keep for years without deterioration. Additional information on how to build home dehydrators and use them may be found in the U. S. Department of Agriculture Farmers' Bulletin No. 984 or in the pamphlet "Drying of Vegetables and Fruits in the Home" that may be obtained from the Office of the Director of the College of Agriculture, University of California, Berkeley, Calif.

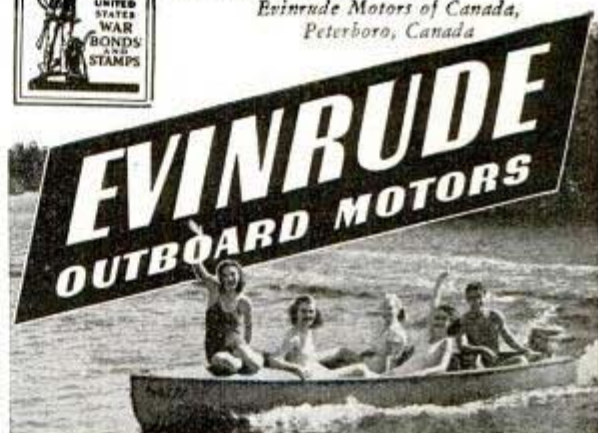


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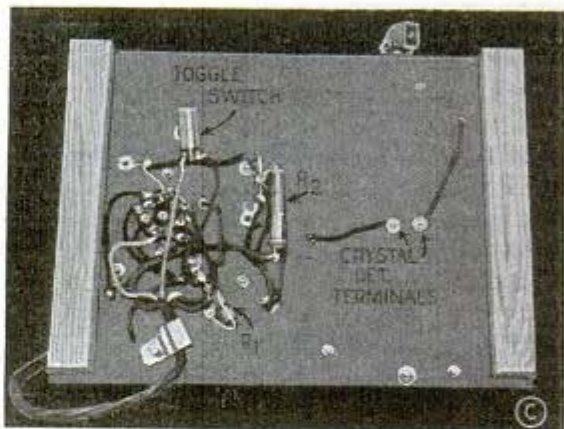
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Two Modern Crystal Sets

(Continued from page 157)

for connections to various parts of the circuit. All coils are wound in similar fashion.

The coils and other parts for the set are mounted on the simple hard pressed wood baseboard which is supported by small wood cleats, as shown in Fig. 2. Mount the variable condensers (C_1) and (C_2) in any convenient way, usually by means of a short machine screw up through the baseboard. Some types will require a small panel. The exact capacity of the variable condenser is not important, any condenser with 20 or more plates will work. The crys-



tal detector may be any adjustable type. Mount the coils on the baseboard with China cement or small angle brackets. Fahnestock clips provide connecting terminals for the antenna, ground and headphones. Follow Fig. 2 for wiring carefully and make sure that one end of coil (L_1) connects to the stationary plates (S) of the variable condenser (C_1) and the other end to the rotating plates (R). The rotating plates are common with the condenser frame and the connection may be taken at any convenient point on the frame if a soldering lug is not provided. Use rosin-core wire solder, and flexible insulated hookup wire for all circuit connections. Ordinary bell wire may be used if no other is available. To test the set, use a good outside antenna about 100 ft. long and run the ground to a clamp on the nearest cold-water pipe. Clip in the headphones, and set the two variable condensers at approximately half capacity each, and adjust the crystal detector to a sensitive point. Then tune both variables until the signal you

(Continued to page 174)



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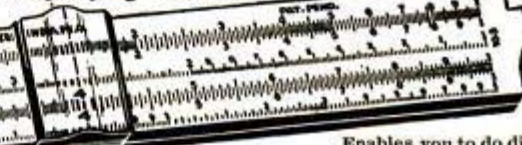
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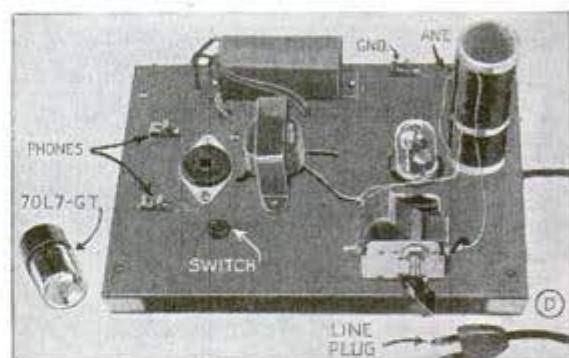


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want to hear is loudest. You will find that condenser (C₁) tunes in the stations, and (C₂) is useful for cutting out the unwanted stations. In the original model the tip end of one of the plates of condenser (C₁) was bent so that with the condenser completely closed it shorts out. This is useful when it is desired to get the strongest possible signal from the highest-powered local station. This can be done with a switch if preferred.

Set No. 2 uses a simpler detector circuit, the signal from the crystal detector being fed to a 70L7-GT amplifier tube. The same general construction details are followed for this set. All parts are noncritical; the audio transformer may be any ratio near



the one given. The electrolytic condenser block may contain two 5 mfd. or 10 mfd. low voltage condensers C₂ and C₃ which are connected in parallel; 150-200 v. C₄ and C₅ are not critical. Any electrolytic condenser block with the same voltage ratings and more capacity may be used. A common type is an a.c.-d.c. block with one 16 mfd. section and one 12 mfd. at 150-200 volts and two 10 mfd. sections at 35 volts. The line-cord resistor should be 300 ohms but 290 or 310 will work. A detailed list of the noncritical materials used in both sets is available from Popular Mechanics radio department without charge.

Wiring for set No. 2 is more complicated and will require some care if this is your first set. Photos B, C and D show the arrangement of parts above and below the base. Check every connection carefully with diagrams Figs. 3 and 4 as you wire. Use the same type of antenna and ground; any small magnetic speaker may be used. With headphones there will be some hum and the signals will be very loud from strong local stations, however slight detuning will reduce the volume. The blueprint number for these sets is R-311.

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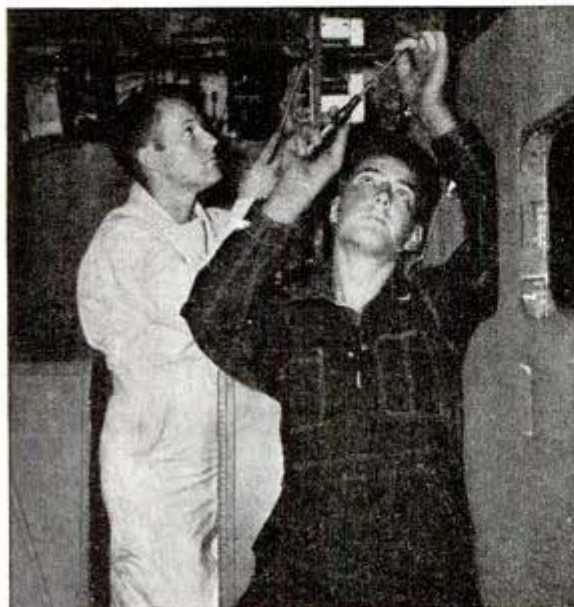
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Robot Guardians of Billions

(Continued from page 31)

Two young hoodlums in Forth Worth, Tex., recently discovered the effectiveness of the closed circuit. They climbed a pole and cut the burglar alarm wires in front of a store and before they could jimmy the door private guards and the police arrived. When wires are cut detectives know amateurs have been at work.

A pneumatic system for vaults or small rooms that are almost airtight sends an alarm when the air pressure is disturbed. This can be caused by opening a door or window or cutting a hole in the vault. A small fan set in the wall creates a partial vacuum and when the outside atmosphere rushes in the air pressure is changed, setting off the alarm.

Microphones suspended from the ceiling of vaults respond to sound waves caused by an acetylene torch or the blow of a hammer. The police, in answer to a radio call from headquarters, usually arrive on the scene before the "yegg" knows an alarm has been given.

The flame of the cutting torch, which has a theoretical temperature of 7,800 degrees Fahrenheit, activates an alarm that responds to heat. Other automatic systems release tear gas before a vault if a burglar tampers with the door.

Many vault walls of steel and reinforced concrete are strung with electric wires not more than four inches apart. These fortresses have walls from six inches to six feet thick and steel doors that frequently weigh tons. A vault in a Cleveland institution has doors that weigh 180 tons each with hinges that alone tip the scales at 40 tons.

Automatic time locks, set from 15 minutes to 72 hours, take no chances with human failure. Most of the locks begin working automatically at 10 p.m. just in case a careless employee forgets to set them when the doors are closed. The time lock was the answer of protective engineers to criminals who either blew off combination locks with explosives or forced custodians to operate them.

Before the development of automatic alarms, bankers relied on some ingenious and cumbersome means to guard their money. Vaults beneath the Bank of England in London were recessed with water-

proof enclosures so they could be flooded for protection. The burglars' tools would have had to include a diving suit.

All a burglar needed to blow up a safe in the old days was a crack 4/1,000-inch wide and a few ounces of nitroglycerin. His task today isn't so simple with a new safe composed of an outer layer of sheet steel, six inches of reinforced concrete, an inner lining of copper at least one-half inch thick, and two and a half inches of tool steel. At Underwriters' Laboratories this safe resisted an attack with tools, torch and explosives for one hour.

That may seem a comparatively short time to the average citizen, but to safe-breakers it is an eternity. Most burglaries and robberies, timed to the split second, average between three and five minutes.

When one considers a few of the hurdles a burglar faces before he gets near a vault, safe or even a storeroom, it is easy to understand why he shies away from protected premises. Some 15,000 banks, whose alarm installations are certified by Underwriters' Laboratories, haven't had a single "break" in 10 years. Even a bag carried by bank messengers is designed to foil robbers. Ten seconds after it is snatched from the hands of a messenger four blank cartridges explode and smoke billows forth.

Windows are guarded with tinfoil charged with electricity, or dowel screens lined with tiny wires. Doors and walls are wired so any disturbance breaks the current and causes an alarm. The new doors made entirely of a sheet of glass look vulnerable to attack, but if struck with a sharp instrument the glass is tempered so it "explodes" into small cubes with a terrific noise. Destruction of the door sets off an alarm.

The electric eye, used both outside and indoors, takes its toll of burglars, arsonists, saboteurs and prowlers daily. It may be located along a fence, before a bank of windows or doorway, or criss-crossed along the floors of a building to cover every few feet of space. Invisible rays developed to operate in fog are helping protect U. S. harbors against sabotage. Where and how they operate are military secrets. The rays are guarding defense plants and arsenals. Officials well remember that during World War I sabotage by German agents caused damage of \$150,000,000 in this country.



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MINUTES
WHERE
MINUTES COUNT!**

IN THE arsenals of war production, "Yankee" Fine Mechanics' Tools save time, work, trouble, and money—not only because good mechanics use them, but also because they make good mechanics *better!* Even the humdrum jobs of driving screws, drilling holes or tapping threads are speeded up because these tools are *made for speed* . . . for doing little jobs in a big way. And behind their ingenuity is more than a half century of proved performance in plants and shops and homes the nation over. We can't make "Yankee" Tools fast enough to meet war-time demand, so protect the tools you have. Use them wisely and they'll treat you well.

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Simple. Compact. Strong. A size for every purpose.

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Makers, also, of "Yankee-Handyman" Tools




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Adventures of the Inshore Patrol

(Continued from page 76)

power, on inland waters as well as at sea, counts in your favor. Right now the small boat navy is being recruited up to full strength and if you can qualify for enlistment there may be special advantages in it for you.

For one thing, you will serve in the naval district in which you enlist, where your local knowledge is the most valuable. Possibly you will continue to live in your home town. For another thing, your own past experience probably will make it unnecessary for you to spend a month at a naval training station and so you go on active duty at once. Again, you will receive a rating based on your own past experience. That means that you may be sworn in as a coxswain or a bosun's mate, instead of as an apprentice seaman, and with correspondingly larger pay.

Even if you haven't had small boat experience there may still be a place for you in the inshore patrol. The small boat navy needs well qualified amateur radio operators. All of its vessels are equipped with two-way sets and many of them in addition have special military radio-type equipment. The service is also looking for ex-seamen, Diesel engineers, electricians, plumbers, and carpenters, among other trades, for there is plenty of work to do around the boats and they must be kept in sea-going condition. To enlist in the M-2 classification, the reserve group being described here, you must be between the ages of 17 and 50.

The inshore patrol operates mine layers, mine sweepers, station vessels, net tending vessels, harbor patrol boats, dispatch boats, and coastal patrol boats. Many of these were built for their particular duties while others have been converted from fishing boat and pleasure boat hulls. Many of the mine sweepers, for instance, were tuna clippers or purse seiners rebuilt and refitted for their present duties. Pleasure boats ranging from small, fast cabin cruisers 30 feet long, that make ideal dispatch boats, to large sailing yachts 150 feet or more in length, capable of offshore duty for weeks at a time, have been donated by their owners to the Navy for the duration of the war. The Navy accepts them "as is," refits them

for their own work, maintains them in good condition, and will restore them "as is" to their owners when the war is over. It sometimes happens that the owner of such a boat volunteers both himself and his ship, in which case he is assigned in charge of his own vessel because he is well qualified to operate it.

But don't get the impression that the work of the inshore patrol is something like pleasure boating. You go to sea in foul weather as well as fair and you take a beating when the water is rough. On the stern of a mine sweeper you will be working up to your hips in water when a wave comes over the low rail.

Such duties as mine sweeping, for instance, become monotonous after you have swept the same area day after day. Yet there is always a thrill to it and an ever-present element of danger. In spite of all her protective gear a mine sweeper takes a chance on being destroyed by a mine, for it is her own hull that does part of the sweeping.

On patrol duty you go out hunting for enemy submarines and occasionally you find such a target. In such work as this the surface vessels co-operate with the blimps and the army and navy bombing planes that maintain a constant aerial watch offshore. Now and then there may be a special assignment, such as escorting a convoy, or lying close to the beach at a spot where spies may try to get ashore.

The small boat navy is seeing action today. With enemy craft operating on both coasts there are plenty of adventures, although most such stories can't be told until after we have won the war.

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3 BURD SKIRT EXPANDERS

Make your gas and oil go farther. Stretch your ration card with Burd 3-Way Reconditioning Service: (1) Have Burd Piston Rings installed. They are self-lubricating, non-scoring, requiring no run-in period. (2) At the same time put in Burd "Kureslap" Piston Expanders. They are flexible, yet force piston to conform to cylinder shape. (3) Complete the job with Burd Valve Packing. Keeps valve stem lubricated, and seals combustion chamber. For "all-out" motor economy—go all the way with Burd 3-Way Reconditioning.

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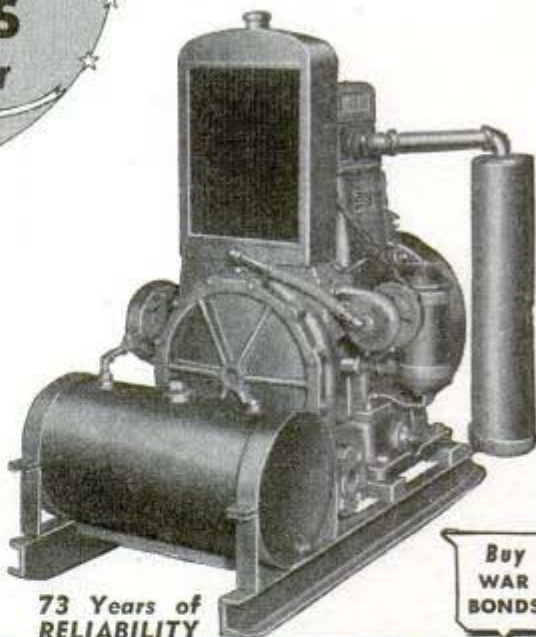
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GS TOOL CHESTS

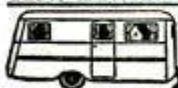
GS Tool Chests are used by thousands of mechanics to safeguard their valuable precision tools. Illustrated is Solid Oak Chest 20" x 9" x 13 1/4" with 7 drawers and TWO LOCKS for complete safety. Price \$13.50 plus shipping charges. QUICK DELIVERY to workers in war plants. Extra discounts on quantity orders. INQUIRE. SEND YOUR ORDER IN TODAY.

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No shop is complete without a small arbor press. Pressing and squeezing operations can be done better and faster on a KRW Arbor Press. Stop using vise and sledge hammer methods—they generally deliver spoiled work in the end. KRW Factory-To-You Prices give you greater value for your money. Order today.

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K. R. WILSON, 17 Lock St., BUFFALO, N. Y.

Builders of Shop Equipment for Ford Dealers Since 1916

E. J. ... The ...
New Magic From Test Tubes

(Continued from page 4)

ments to bulky sections of tanks. Oil and grease dissolve in it like sugar in water.

The Cellophane which came on your peacetime packages is now laminated to a light cotton fabric, replacing the coat of grease used in the last war to prevent rust and corrosion and keep out dirt. By wrapping a rifle or gear before shipment, hours of labor spent removing grease at the receiving end are saved.

Butacryte, the plastic layer in your automobile safety glass, is now a rubber substitute in raincoats, water bags, hospital sheeting, life rafts and belts, food carriers, waterproof and oil resistant clothing for sailors, in the sound dampening of pickup microphones and as a plywood adhesive.

While the nation has been worrying about the rubber shortage and transportation problem, Du Pont chemists, by discovering a high-strength yarn called Cordura, have increased the load capacity of American planes by cutting as much as 20 pounds off the weight of an airplane tire. The strength of this cord, a rayon product, is lopping millions of pounds from the weight of combat vehicles and permits them to roll with a smaller skin of rubber over the Cordura fabric. So strong is this fabric that a huge army car can run miles on a flat before the casing comes apart.

On the industrial war front, thousands of chemical discoveries are adding to the war effort. One is a flexible, elastic and resilient synthetic resin combination which is replacing rubber and proving more efficient. This plastic, Resistoflex, came from experiments by RCA chemists. It already has fifteen important uses, among them plastic gloves, which not only resist the action of grease and solvents, but are transparent, which improves efficiency. It stands up well in sandblasting hoses.

Chemical "balloons" are now recovering from low-grade minerals quantities of vital copper, zinc, lead, nickel, tungsten, chromium and other strategic metals. Working of low-grade deposits formerly thought of little value is made possible by so-called froth flotation. Chemicals with an affinity for the grains of ore lift them in a bath from the worthless "gangue" or residues with which ores are associated in the earth.

(Continued to page 182)

... Practice Dept
NEW GLUE holds on all fronts!



Uncle Sam approves Weldwood Waterproof Glue for use in his boats and planes*. No wonder... it welds wood and other fibrous materials permanently. Yet requires no heating, waiting or special equipment. Add tap water to powder, stir - and use. Ideal for home repairs... won't dry out in heated rooms. At hardware, chain stores, lumber yards - 10c, 25c, 50c and 85c; or send 25c with your dealer's name for sample can.

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Compare These Amazing Qualities

1. Tremendous Strength
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"Makes the glue line the SAFETY line"

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Now it's easy to have a professional job of floor refinishing without drudgery, without the inconvenience of waiting to get the job done and at small cost. The new CLARKE SANDER which you can rent from a local dealer at a small daily charge is almost as easy to operate as a vacuum cleaner. It whisks away the old finish, makes your old floor look like a newly laid floor sanded to a satin finish. Write for the name of dealer in your community who rents them.



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 this easy to operate, highly efficient sander

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FILING SAWS for FACTORY

The FOLEY SAW FILER is in use by U. S. Army, Navy, Air Force, hundreds of War and manufacturing plants.

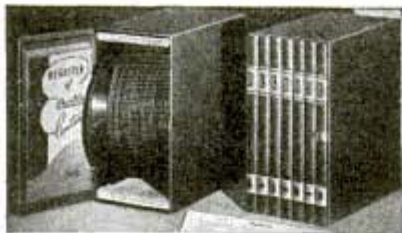


A FOLEY Automatic Saw Filer files hand, circular and hand saws better than the best hand filer. Foley filed saws cut faster, stay sharp longer. They increase sawing production 25% to 40% in plants, mills, factories. The Foley cuts down filing time, saves on files and reduces saw breakage. Write for literature.

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- ★ Holds Records Upright
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- ★ Easier to Find and Put Away



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Here's a brand new Home Sweet Home for them. You'll like this beautiful, well built cabinet that looks like a matched set of books. Each record stands upright and does not come in contact with its neighbors. Records are easy to get at—will not break, bend or become warped. The sensitive surfaces are protected against scratches and scrapes.

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Attractively finished in pin seal simulated leather. Choice of 4 colors, maroon, blue, green or black. Each cabinet is 5 1/2" wide and holds 25 records.

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Stephenson System of Foot Correction

28 Back Bay, Boston, Mass.

Copper and zinc for shells, lead for bullets, copper for wire, vanadium, nickel, tungsten and molybdenum for special steels; manganese, chromium and a host of other vital metals are now obtained by froth flotation.

Puffed-up sand has been converted into excellent insulating material. A new chemical process removes copper coatings from steel scrap without injuring the base metal. A synthetic chemical, urea, stops splitting and checking of lumber during drying.

Chemistry is working wonders on the home front, too. Du Pont has a coated fabric which glows in darkness. It may be cut into luminous strips to mark doorways, staircases, handrails, fire extinguishers, arm bands, etc. With a glue backing, it may be applied to any surface and removed just as easily.

A new type window pane which contains no glass has been developed by Monsanto Chemical Company. Made of wire mesh sandwiched between two sheets of plastic, it will withstand the explosion of a 150-pound bomb eight feet away without shattering. It can be applied by merely stapling the pane into a regular window frame.

Wood impregnated with chromated zinc chloride has been found to resist decay, termites and fire and this discovery by Du Pont is increasing the value of timber for defense housing, hangars, barracks, and armories.

The scarcity of metals has only served to increase the beauty of newly equipped bathrooms, for Lucite fixtures of transparent plastic, are now in production.

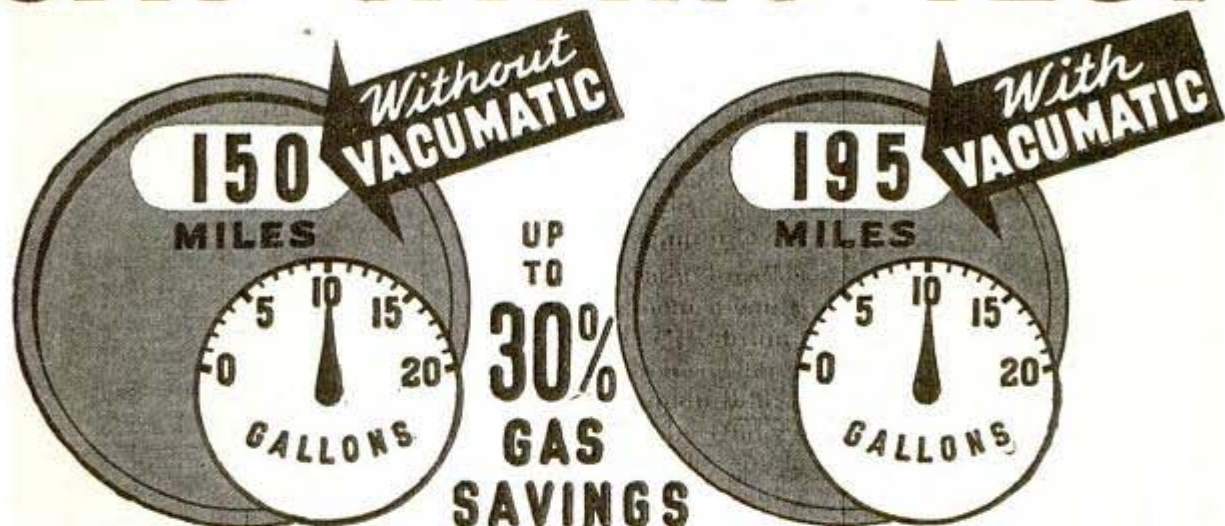
Cellophane laminated cans replace metal cans, and Cellophane bag-in-a-box containers carry heavy liquids for cooking, such as egg yolks and fluid chocolate.

Collar and cuff fabrics are stiffened and made more serviceable by being laminated with nylon sheets. Clothing, drapes, curtains, upholstery and hundreds of similar items are rendered flameproof by treatment with a Du Pont chemical which does not alter the appearance of the fabric, but in some cases actually improves its wearing qualities.

Just as the recent chemical discoveries for peaceful use have aided the nation in time of war, the remarkable discoveries which have followed Pearl Harbor will make the world a better place to live in when the troops come marching home.

MOTORISTS *Wanted!*

TO MAKE THIS *UNIQUE* ... GAS SAVING TEST



Car Owners: You are invited to make a gas saving road test with the Vacu-matic on your own car, with the absolute understanding that unless it proves to you that it will save you up to 30% on gas and improve your car performance, the test will cost you nothing. Investigate this remarkable discovery that trims dollars off gasoline bills—gives you worthwhile gas savings—more power—quicker starting—more miles on less gas.

Automatic Supercharge Principle

Vacu-matic is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely automatic and allows the motor to "breathe" at the correct time, opening and closing *automatically* to save dollars on gas costs.

Proven By Test

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 horse power increases.

Fits All Cars—Easy to Install

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 free offer coupon will bring all the facts. Mail it today!

The Vacu-matic Co., Wauwatosa, Wis.

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This certifies that I have carefully read 300 original letters received from Vacu-matic users testifying to gas savings up to 30%, many reporting added power, smoother running, and quicker pick-up. These letters are just a small part of the larger file of enthusiastic user letters that I saw at the company offices.



Signed

Marion O. Clark
Notary Public

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Please send full particulars about VACU-MATIC, also how I may obtain one for my own car FREE. This does not obligate me in any way.

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City..... State.....

Check here if interested in Agency Proposition.

HOW TO GET THE MOST OUT OF YOUR LATHES

No. 4 in a series of suggestions made by the South Bend Lathe Works in the interest of more efficient war production

Keep Your Lathes in Trim

The old proverb, "An ounce of prevention is worth a pound of cure", is as applicable today as when first expressed by some long forgotten sage. Lathes and other modern precision tools must be "kept in trim" if they are to give the long, trouble-free service that is expected of them.

Although the adjustments required to "keep the lathe in trim" are few and simple, they are important and should not be neglected. And even though the lathe is rigidly constructed and will stand some rough handling, it should be protected from unnecessary abuse.

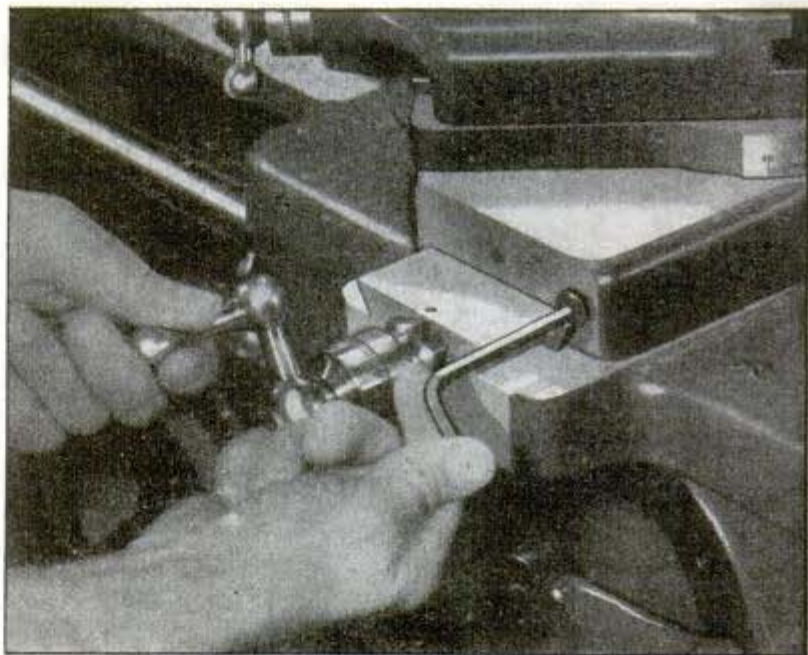
Power Transmission

Maximum efficiency as well as maximum production depends on the effective transmission of power to the lathe spindle. The motor, being the source of power for the lathe, should develop its full rated power and should operate at a uniform speed. If for any reason the line voltage drops below the rating for which the motor is constructed, the motor will not deliver full power. For this reason the current should be checked at the motor occasionally and the correct line voltage maintained.

To transmit the power from the motor to the lathe spindle efficiently, all belts must be properly adjusted. If the belts are too loose they will slip, and if they are too tight they will cause loss of power through friction. The belts should be just tight enough to transmit the required power without slipping. Precision belt tension adjustments provided on South Bend Lathes make it easy to keep the motor V-belts and flat cone pulley belts properly adjusted.

Dovetail Slide

All dovetail slides on South Bend Lathes are equipped with gibs which



Adjust the dovetail gibs to insure accurate work

may be adjusted to eliminate play. When the adjustment of the dovetail gibs is neglected, looseness of the slides may cause the tool to chatter or may result in inaccurate work.

The gibs should be tight enough to assure the necessary rigidity, but not tight enough to bind and make the dovetail slides hard to operate.

Tailstock Adjustment

The alignment of the tailstock top should be checked frequently as any misalignment will cause the lathe to turn a taper. To test alignment, place a bar of steel, 1 inch or larger in diameter, between centers and machine two collars of equal diameter not less than 4 inches apart. Then, take a very light finishing cut across both collars without changing the setting of the cutter bit. Measure both collars with a micrometer. Any difference in the diameters indicates misalignment. Correct the alignment

by turning the tailstock top set-over screws until both collars can be turned to the same diameter.

Don't Abuse the Lathe

Just because the lathe is made of iron and steel is no reason to expect it to stand abuse. Never use the lathe bed as an anvil. Don't use a crowbar to straighten a shaft between the lathe centers. Never rap chips out of a file by striking it on the lathe bed or tailstock.

Write for Bulletin H4

Bulletin H4 giving more detailed information on keeping the lathe in trim will be supplied on request. Also reprints of this and other* advertisements and bulletins in this series. State quantity wanted.

- *H1, "Keep Your Lathe Clean"
- H2, "Oiling the Lathe"
- H3, "Installation and Leveling of the Lathe"



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South Bend, Ind., U. S. A.

Lathe Builders for 36 Years



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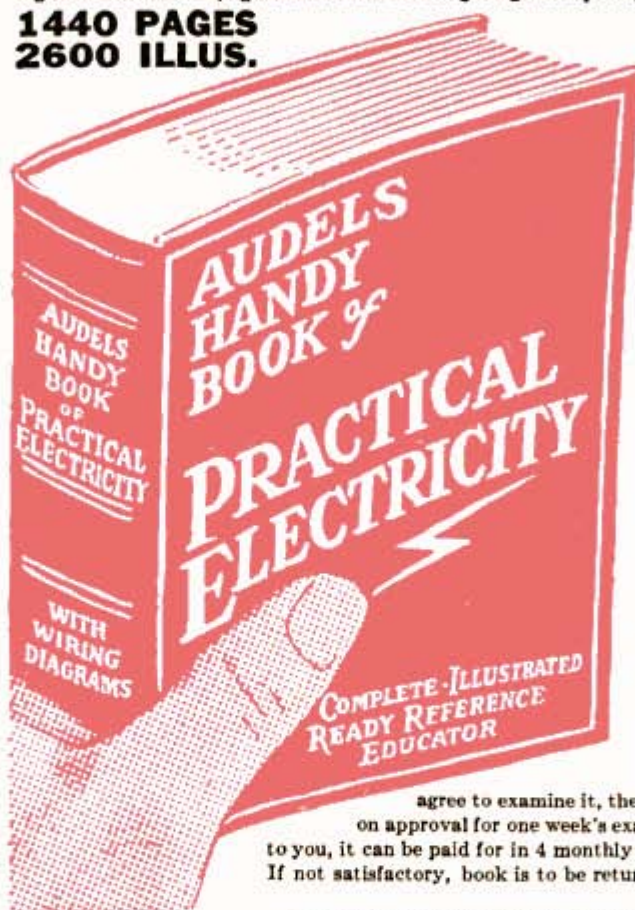
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