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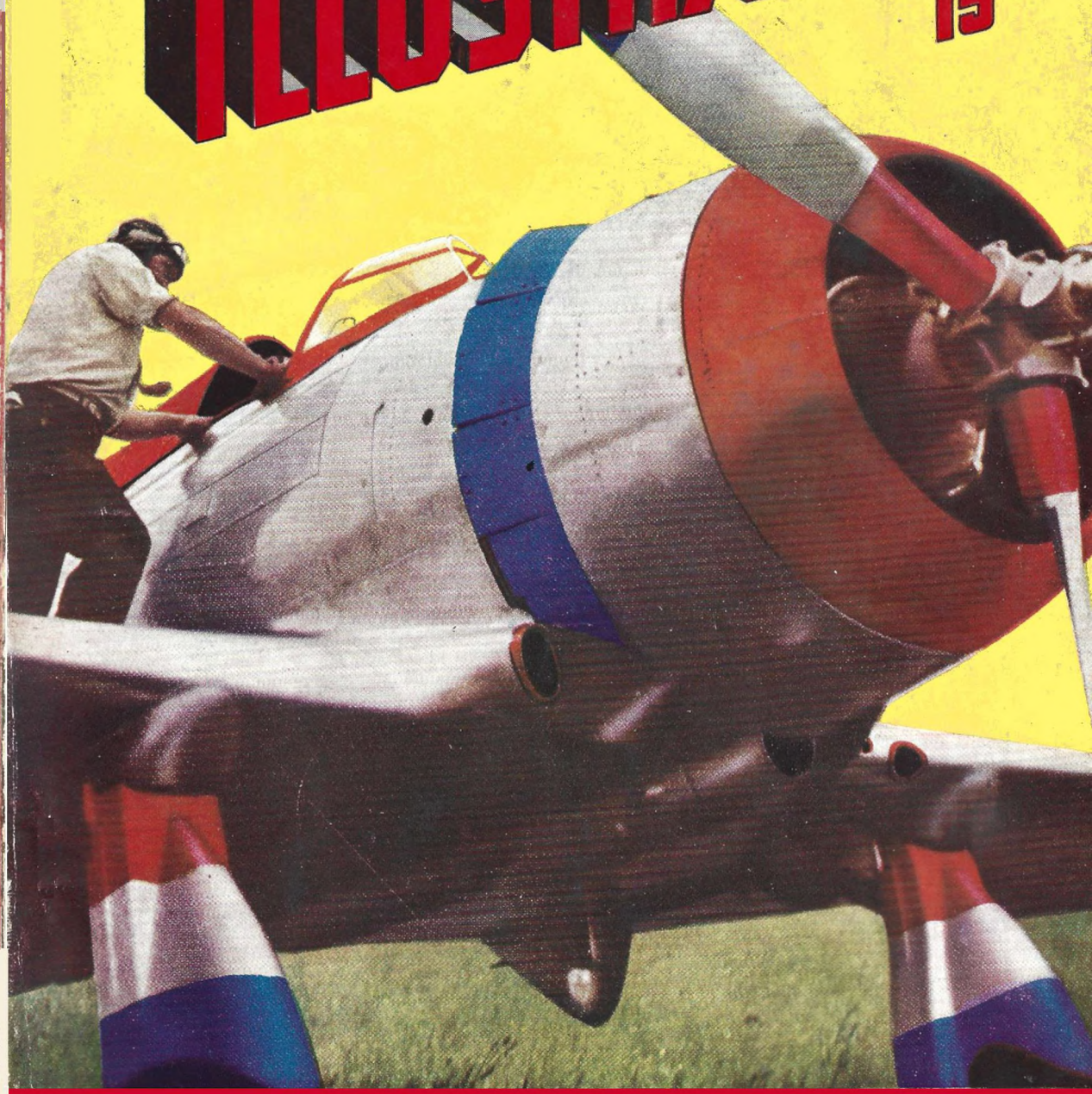

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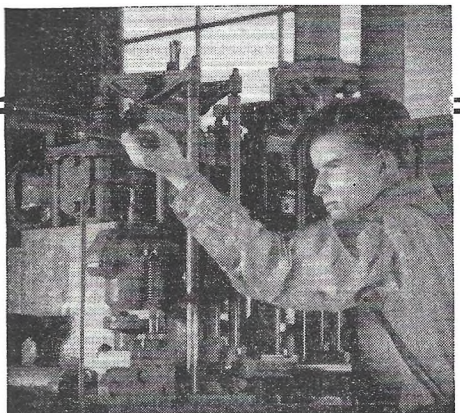

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SEPTEMBER
1938

Volume XX
Number 5

Circulation over 250,000

SPECIAL FEATURES

[*Continued on page 6*]

Front cover shows a MI staff photograph of a new Seversky pursuit plane.

SCIENCE FIGHTS CRIME says J. Edgar Hoover

IN THE crime laboratory of the Federal Bureau of Investigation scientists perform feats that would startle the imagination of a Sherlock Holmes. With microscope, spectrograph and other precision instruments science tracks down America's most vicious criminals. Bloodstains, human hairs, scrapings under fingernails, burnt letters, threads of cloth tell tales of the dead to scientists trained in crime detection.

J. EDGAR HOOVER, Director of the far-famed FBI, will tell the weird story of the Crime Laboratory's fight against the underworld exclusively for MECHANIX ILLUSTRATED next month.

Camera Section

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SHORTER FEATURES

HOW-TO-BUILD FEATURES

FOR THE WORKSHOP FAN

HOME AND GARDEN

AUTOMOTIVE

AVIATION

[*Continued on page 8*]

A Simple Recipe for Inventive Success

PROBABLY the simplest recipe for inventive success would be this: First, a practical, useful invention; second, a good, strong Patent; third, a buyer or a market. The inventor needs all three to get anywhere. Lacking any one, he is likely to get nowhere. The recipe is simple. Working it out isn't so simple. That is why inventors—and others inventively inclined—have found the two books shown here so helpful. We've gone into each part of the recipe carefully. *Exactly what is an invention?* We tell you. *What is a strong Patent?* We tell you. *How can I go about finding a buyer?* We tell you.

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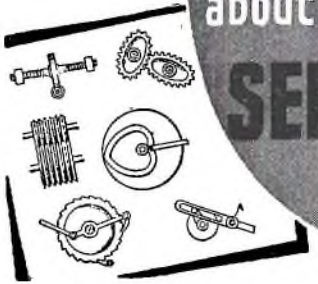

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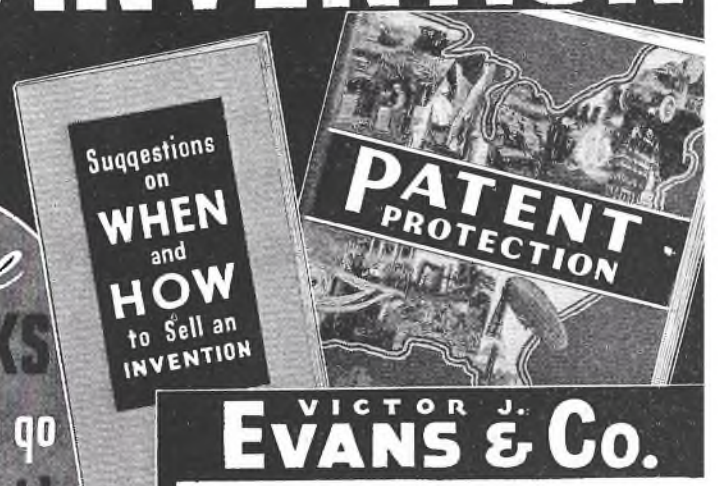

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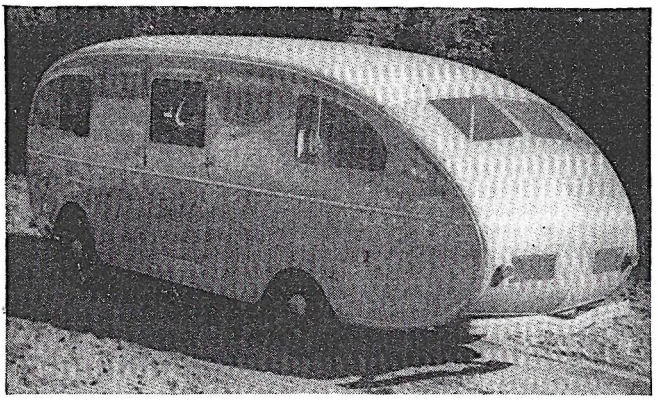
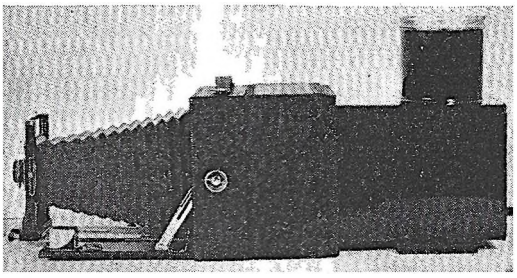
Chips from the Editor's Workbench



Resembling the "Trailmobile" cover illustration of our September 1937 issue, this auto-home was built by an MI reader.

REMEMBER the "Trailmobile" which was featured on the cover of our September 1937 issue? As you probably recall, the "Trailmobile" was an MI artist's conception of what the combination trailer-auto-home of the future would look like. Well, quite a few readers became enthused over the idea and constructed their own versions of the "Trailmobile," sending in photos of their projects for judging in the Workbench. Best of the lot received so far is the photo above, which was sent in by Tommy Spear, of Los Angeles, Calif. Tommy says his Dad built the auto-home on the chassis of a 1935 Ford. It's a REAL home, too, being equipped with a stove, icebox, running water and beds for four persons. Okay, Tommy, I'm sending you a $5 award so you can "gas up" the traveling home and journey along part of the open road at the expense of MECHANIX ILLUSTRATED.



Rivaling a professional model in performance, this tin can photo enlarger was built from MI plans by Frank R. Adams.

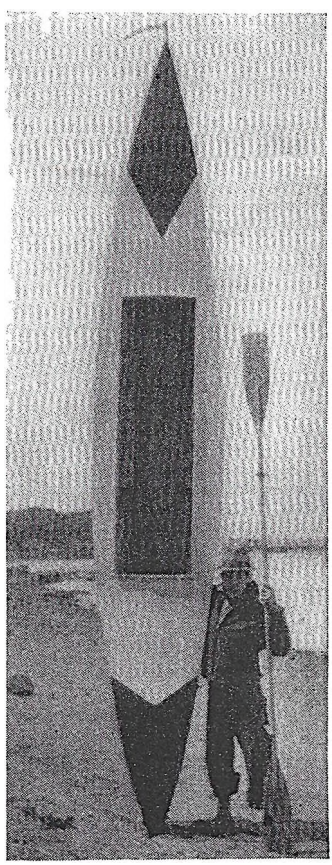
***

How do you like the "Tin Can Enlarger" shown above? Frank R. Adams, of Newmarket, Ontario, Canada, built it from plans that appeared in the May 1938 issue and reports that it gives excellent results. Frank's friends have complimented him on the construction of the enlarger, saying that it rivals a professional job in appearance and performance. He sent in several sample enlargements to prove how good the enlarger works and after seeing them I agree with the comments of his friends. Just to prove it, Frank, I'm sending you a $3 award.

***

Kayaks are becoming very popular lately and, as usual, MI fans are right up in the forefront of the activity, as is proved by the photo of Nicky Stark, of New York, N.Y., and his home-built kayak. Nicky built his kayak from MI plans, using a light wooden framework and covering it with a good grade of canvas coated with shellac and paint. The kayak is 16 feet long and two and one-half feet wide. Looks good, Nicky, and I'm sending you a $3 award for a job well done. If any of you other readers care to build a kayak like Nicky's, you will find plans and construction details in the 1938 edition of HOW TO BUILD 20 BOATS. Copies can be obtained

[*Continued on page 12*]



Nicky Stark proudly poses with the 16-foot kayak he built from MI plans.

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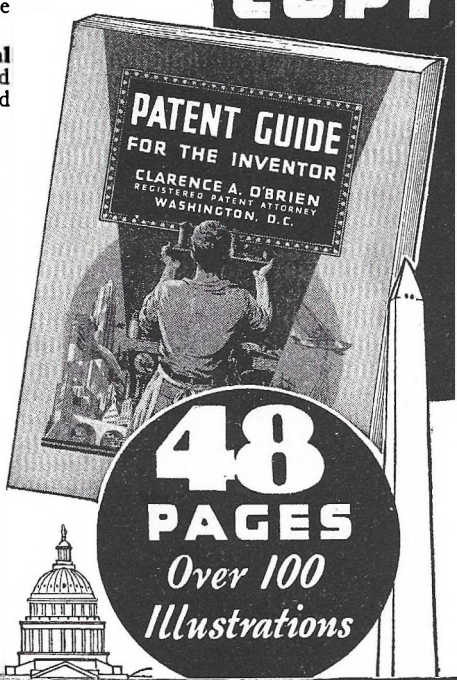

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Editor's Workbench Chips

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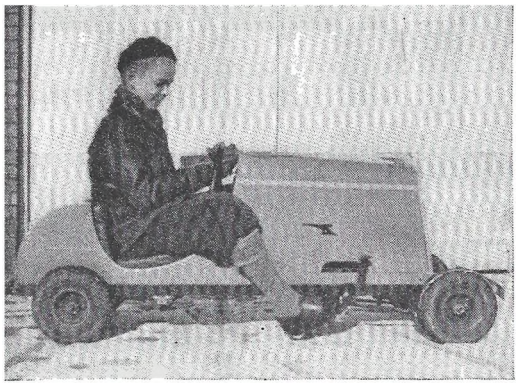


Powered by a ¾-horsepower gasoline engine, this home-built midget racer provides thrills for the son of W. H. Ekberg.

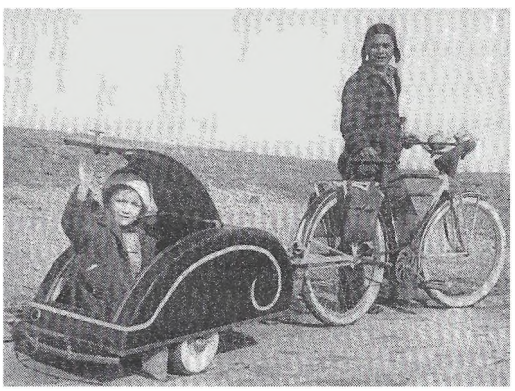
for 50c at your local newsdealer or direct from the MI office in Greenwich, Conn.

***

Building a midget automobile is one way to reap in a double measure of satisfaction. There's the pride and satisfaction that comes from building the little "putt-putt," which serves to proclaim the skill of the craftsman. Then there's the thrill and satisfaction of making some youngster happy when you turn the little gas buggy over to him. W. H. Ekberg, of Detroit, Mich., has experienced this double satisfaction for he built the midget car shown above for his son. It's powered by a ¾-horsepower gasoline engine which provides mileage of 100 miles per gallon and a speed of 20 m.p.h. The rear wheels are driven from the countershaft by sprockets and chains. Watch for the mailman, W. H., as he'll soon be bringing you an MI check for $3.

***

I hope that you home-built airplane fans read the article—"Can Amateur Flying Come Back"—which appeared last month and that you'll voice your support of modified regulations governing the construction and flying of amateur-built airplanes. Something should be done so that fellows like Gil Fisher, of Denver, Colo., who built the trim looking plane shown below, can get their planes licensed *after they have proved their airworthiness,* as his reportedly has done. Gil's home-built plane is powered by a 40-horsepower engine, climbs 600 feet per minute and speeds along at 100 m.p.h. In 100 hours of flying, it has performed loops, spins, barrel rolls, etc., yet the government will not grant him a license. It's small consolation, Gil, but I'm sending you a $3 award for good craftsmanship.



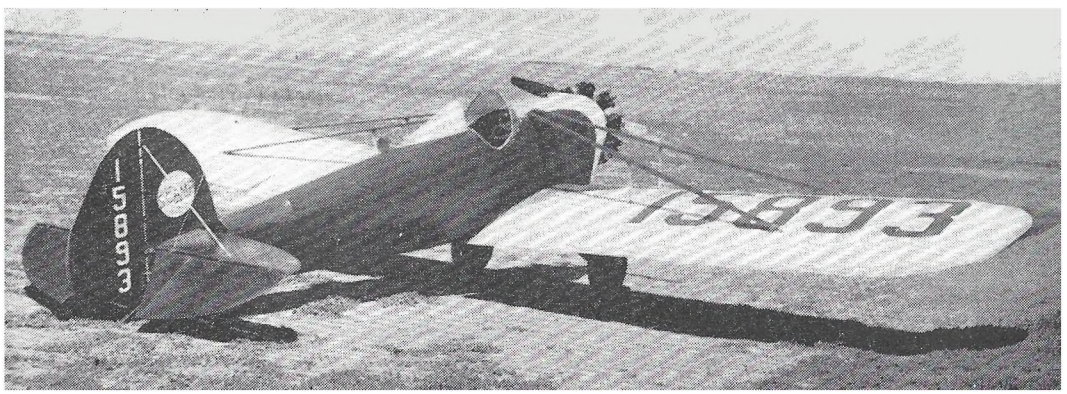
Jack Miller takes a friend for a ride in his bicycle trailer.

Even bike owners can use trailers to advantage, judging from the photo sent in by Jack Miller, of Montrose, Colo. Jack's flea-size trailer has balloon tires, bumper, tail light, and a ball and socket hitch just like the full-size trailers do. Pretty novel, Jack, so I'm sending you a $3 award. (Don't forget to treat your passenger.)

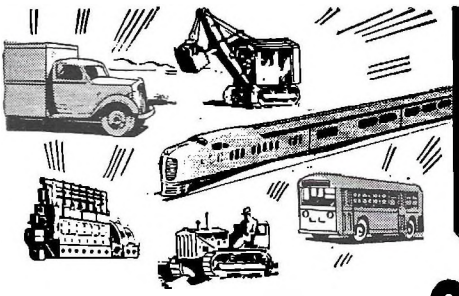
***

I've seen plenty of home-built power scooters, but the one constructed by Albert Miller, of

[*Continued on page* 14]

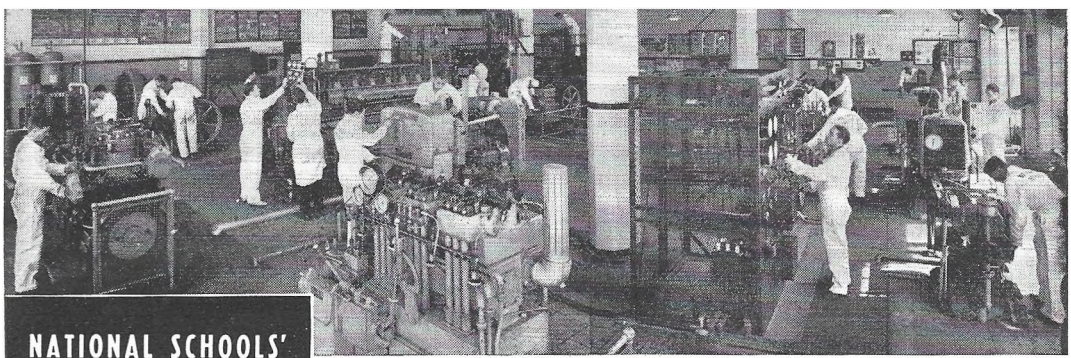


Built by Gil Fisher, this trim airplane has been flown successfully for more than 100 hours, yet government regulations prevent him from having it licensed. Powered by a 40 horsepower engine, Gil's plane can climb at a rate of 600 feet per minute.



DIESELS

THE NEXT GREAT INDUSTRY



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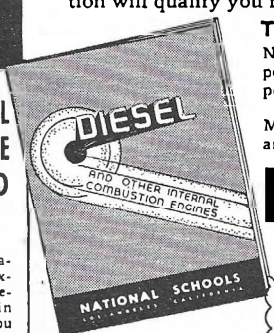

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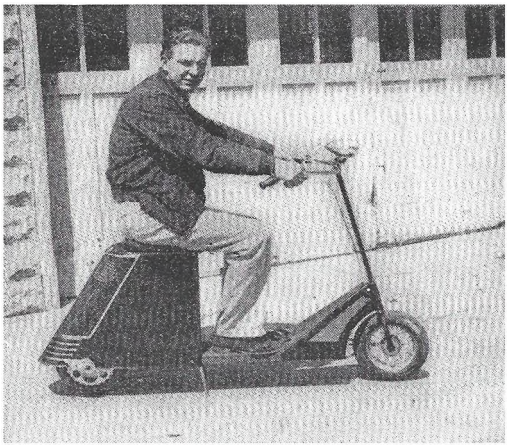
Editor's Workbench Chips

[*Continued from page* 12]

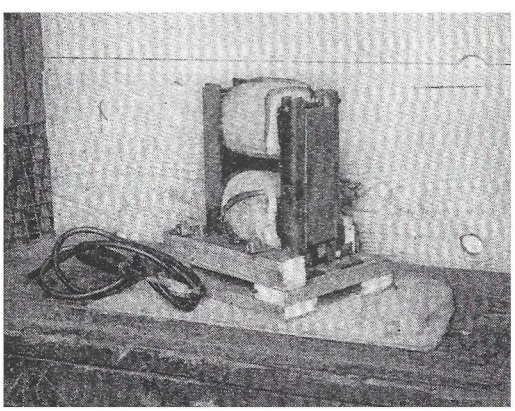


Using salvaged auto and motorcycle parts, Albert Miller built this power-scooter at a cost of only $10. It goes 24 m.p.h.

Dundalk, Md., is the nearest approach to a professional job that has come to my attention. Al built the scooter at a cost of only $10, using parts salvaged from an old motor wheel, midget autos and an old motorcycle. The scooter features a hand-operated clutch, foot brake, battery compartment and an electrically welded tubular steel chassis. Carrying a 170-pound passenger, the scooter travels at a speed of 20-24 m.p.h., according to Al. Nice work, young fellow, and well worthy of the $3 award I'm sending you.

***

I knew it wouldn't be long before some reader sent in a photo of an arc welder built to plans that appeared in our June issue. It's a very useful device and one that every craftsman can build to advantage. First to send in a photo of a home-built welder was Elmas Lamberth, of Birmingham, Ala., so I awarded him a $3 prize. Lamberth says the welder cost only $6.06 to build and gives excellent results on light jobs. He warns other MI craftsmen who want to build the welder to be sure and use the proper size carbon electrodes (3/16") as larger ones cool off too quickly and smaller ones burn like a sparkler.



A handy workshop appliance, this arc welder was built by Elmas Lamberth from plans that appeared in our June issue.

***

These outdoor days naturally turn one's mind to boats and make you wish you had spent the winter building some type of craft on which you could now travel over some nearby lake or river. That's what Richard Rhodes, of San Jose, Calif., did and the result was the MI boat-Gannett—shown below. He did a good job of it, too, powering the craft with a converted automobile engine which provides a speed of 10 m.p.h. The framing features extra-heavy construction and more than 10,000 brass screws were used in assembling the boat. My hat is off to you, Rhodes, and I'm sending you a $3 award.

Featuring extra-heavy frames and powered by a converted auto engine, this Gannett cruiser was built by Richard Rhodes.

From far away Melbourne, Australia, I received another letter praising our photography section. William Rea sent in the letter and he says that MI's articles on photography are the best he has ever read. Being an enthusiastic amateur photographer, Bill would like to correspond with other MI readers who are interested in the hobby. His address is: 74 Rosemont Ave., Caulfield S.E.7, Melbourne, Australia, if you care to write to him.

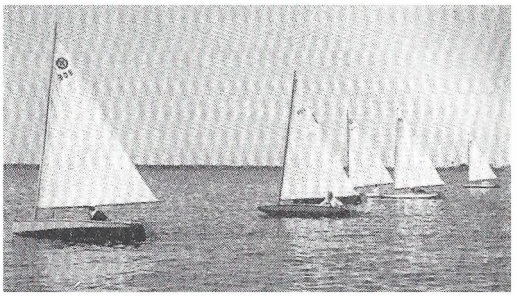
***

I received a very interesting letter recently from C. O. Cook, of Shreveport, La., who is vice-president of the International Moth Class Association, enclosing a photograph of a fleet of Moths. Cook says the local Moth fleet boasts 21 boats, ***13 of which were built from MI plans.*** If that doesn't prove that MI boat plans have "it," I don't know my ABC's. According to Cook, the Moth sailboat is the most successful small boat

[*Continued on page* 16]

Editor's Workbench Chips

[*Continued from page* 14]



C. O. Cook sent in this photo showing part of a fleet of 13 Moth sailboats which were built from plans in MI boat book.

ever designed and he claims he has proved this contention in competition with boats of larger size and greater sail area. Thanks for the "dope", Cook, and I'm pleased to inform you that your photo has been awarded a $3 prize.

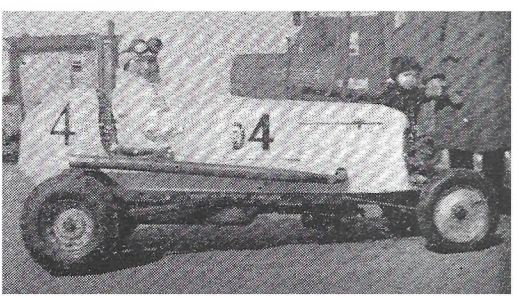
***

If you have an old outboard motor plus some mechanical ability you'll probably "itch" when you look at the midget racer shown below. It was built by J. Halley, of Philadelphia, Pa., and is powered by an outboard motor hooked up to a gear-driven differential. You can get an idea of the size of the racer from a comparison with its four-year-old driver, but if you crave figures it is 70 inches long, 26 inches high and has a 30-inch tread. Pretty snappy, Halley, so I'm sending you a $3 award.

***

For years, Mayor La Guardia of New York has been fighting with the airlines and the Post Office to make Floyd Bennett Field the major Eastern air terminal. He has not been successful, because Newark Airport, now enjoying the business, is more accessible from Manhattan. However, the

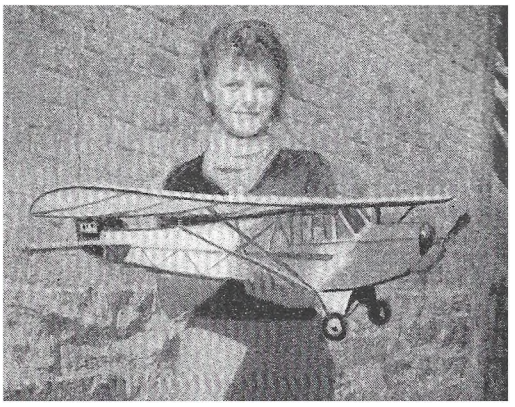
[*Continued on page* 18]



An old outboard motor powers this midget racer which was built by J. Halley. It is 70 inches long and 26 inches high.

Editor's Workbench Chips

[*Continued from page* 16]



Lillie Gunderson sent in this photo just to prove that girls can build good model airplanes, too. Model is a Taylor Cub.

new North Beach Airport described on pages 42 and 43 will finally give him a mighty weapon in that fight, because it's almost within walking distance of Times Square!

***

I think there's a touch of the "just to show you" attitude in the letter sent in by Lillie Gunderson, of Brooklyn, N. Y. Apparently this pretty miss (see photo) wants to let MI readers know that girls can build model airplanes as well as boys, so she sent in a photo to prove it. Okay, Lillie—you win, so I'm sending you $3.

***

If you lack confidence in your ability to tackle the building of a boat, take heart from the experience of Edward R. Johnson, of Key West, Florida. Ed's first attempt at boat-building was devoted to the construction of Tiny, a midget outboard racer. As you can see from the photo, he turned out a very creditable job. He used plans that appeared in the MI book—HOW TO BUILD 20 BOATS—which, if you are interested, can be obtained from your newsdealer or direct from the MI office in Greenwich, Conn., at 50c per copy. I've sent you a $3 award, Ed.

[*Continued on page* 21]

Representing his first efforts in boat building, this fast outboard racer was built from MI plans by Edward Johnson.

How To Use An Electric Fan

Any advice on how to use an electric fan seems at first glance to be a trifle superfluous—falling in the same category as advice on how to use a safety pin or a pair of shoes or a broom. But E. G. Young, commercial engineer of the General Electric Company whose sole responsibility is fans, has a different idea. He thinks, from his experience in studying the use of this veteran electric appliance by the public, that it might be profitable for a user to check his fan practice and see if he is really getting his money's worth in service and comfort.

For instance, he says, there is the matter of fan noise, which seems to have the same comfort for certain individuals as does the sight of an open fire on the hearth. The more flames they can see, or the more noise they can hear, the hotter or cooler they think they are becoming, as the case may be. Yet the psychological effect of a noisy fan is actually just the opposite during extremely hot weather, for it drums into the listener's ears the message that he is uncomfortable and nothing more can be done about it.

Mr. Young recommends that where an older and less quiet type of fan is in service, perhaps the second or third speed adjustment will produce all-around better results. That is the reason why variable speed adjustments are made available, he points out, adding that a quieter, slower fan adjustment, with the breeze creating a general circulation in a room, is better by far than a high speed gale blowing directly on the user. A lower speed will also lessen the disturbance of magazines and papers in a room, which is in itself a chronic cause of irritation.

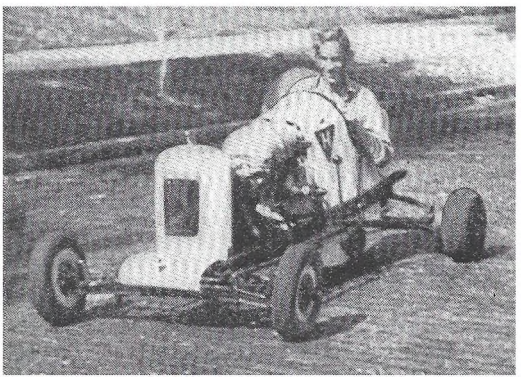
Too few users appreciate that a fan's value does not lie in a direct blast of air, but in a constantly maintained circulation. It is good practice to place the fan on the floor, when this can be safely done, in order that it may stir up cooler air, always found nearer the floor. It is good hot weather practice to place the fan in or near an open window at night, with windows across the room also open, so that stale air may constantly be exhausted.

Photographers today can carry enough "man-made sunlight" in their pockets to make eighteen pictures. A well known electrical products manufacturing company has announced a photo-flash lamp so small that a dozen and a half will fit into a man's coat pocket. The metal foil and wire in this vest-pocket bulb burn longer than the former types of lamp filaments, permitting closer synchronization of the flash and the camera shutter.

Every issue of MECHANIX ILLUSTRATED contains how-to-build articles on a variety of subjects. Why not place a standing order with your news dealer?

Editor's Workbench Chips

[*Continued from page* 18]



Coming right at you in his home-built midget racer is Edward Hoffman, MI craftsman. The car can speed at 60 m.p.h.

Summer time is camera time and if you want to get maximum enjoyment from the hobby, secure a copy of the new MI book—GOOD PHOTOGRAPHY—from your newsdealer or direct from the MI office in Greenwich, Conn. Priced at only 50c per copy, the book has 144 pages crammed with practical, money-saving information.

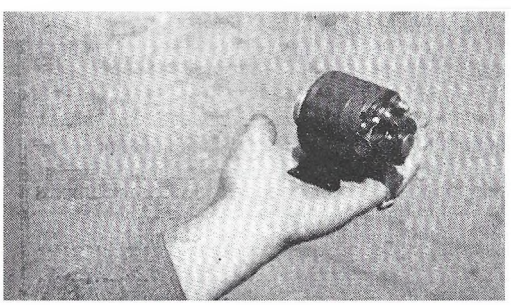
***

Another midget racer fan who scored a $3 award this month is Edward Hoffman, of St. Petersburg, Fla., who sent in the above photo. Ed built the racer last summer, powering it with an old motorcycle engine which enables the car to hit a speed of 60 m.p.h. The clutch is operated by hand. Ed says he will be glad to answer inquiries about his racer from MI readers so I think he will be earning the award I sent him. His address is: 632 Sixth St. Be sure and enclose a stamped, return envelope if you write to him.

***

Something unusual in home craftsman projects is shown in the photo below. It's nothing less than

[*Continued on page* 23]



So compact that it can be completely covered by one hand, this midget electric generator was constructed by Herbert Eltz.

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Editor's Workbench Chips

[*Continued from page 21*]

Presenting a picture that is sure to win the admiration of boating enthusiasts, this Olympic sailboat was built by George Zummer. It out-sailed other boats of equal size.

a complete miniature electric generator, which was built by Herbert Eltz, of Juniata, Neb. The generator has a diameter of only two and five-eighths inches, but weighs two pounds, the shell being made of cast iron. My compliments on completing a novel job, Herb, and I'm sending you $3.

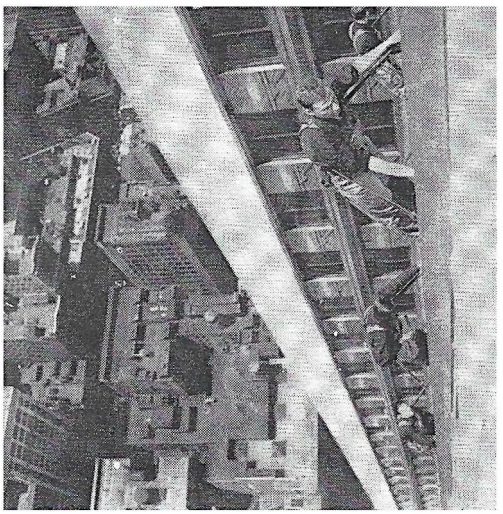
***

Sailboat enthusiasts will like the photo sent in by George Zummer, Jr., of Hartford, Conn. It shows the Olympic sailboat that George built from plans in the MI boat book. The craft is very easy to handle, according to George, and its performance is right up with the best of professionally-built jobs, as is proved by the fact that it beat all the other sailboats on a nearby Connecticut lake. The Olympic is the second boat that George has built from MI plans and looks like a good piece of craftsmanship, so I'm awarding George $3.

***

The "heart" of the outdoor season is now here and if you want to make sure that your fishing or camping trip is a success, study the kinks in the MI book—SPORTSMEN'S ANNUAL. The price is only 50c.—*The Editor.*

Window Cleaners Pose For Photo "On The Job"



The unusual photograph above shows a group of men working at what is considered by many as one of the most hazardous occupations—cleaning the windows of a "skyscraper" building. The photograph was taken from the 86th floor of the 102-story Empire State Building in New York, N. Y. As can be seen from the photo, the window cleaners trust their lives to stout leather belts which pass through rings in a leather girdle strapped around their bodies, the hooked ends of the belts being attached to metal lugs protruding from the window frames.

Engineers Conduct Erosion Tests On Metals

Seeking to cut down the rate of wear of steam turbine blades, which rotate at high speed under the impact of a steam jet, engineers of a well known electric manufacturing firm have been subjecting bits of metal to a novel erosion test that duplicates in a few minutes the wear of years.

The enginers have been directing a stream of water at the same pressure as water running from a kitchen tap against bits of metal whirling at a speed of 13 miles a minute.

Three minutes of such treatment cuts a deep, jagged notch into the metal, an effect a dripping faucet might take years to duplicate. The study is a part of a research program aimed at strengthening metals by analyzing their wearing and fatigue characteristics.

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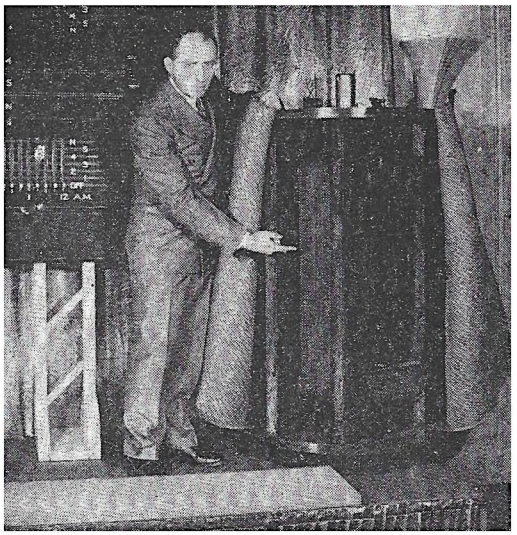

Correlated with the design of the receiver in which it is installed, a newly developed "beamascope" radio antenna is said to receive only the electromagnetic portion of a radio signal, eliminating interference ordinarily carried to a receiver by the electrostatic portion of the signal. The new type of antenna is concealed inside the radio cabinet, as shown above, and has no outside connections. Use of the new antenna eliminates the need for an unsightly indoor or outdoor antenna and provides improved performance and reception.

Soil Studies Reveal Data On Plant Poisoning

New studies by scientists at the Bureau of Chemistry and Soils in Washington, D. C., show that not all soils containing the dangerous, toxic element selenium produce plants showing comparable toxicity. Tests on soils of Hawaii and Puerto Rico disclose that in some localities a high selenium soil content is not picked up by the plants of the region.

In one research, millet was grown on soil from Hawaii which contains 12 parts per million of selenium. No selenium was found in the millet. At the same time millet grown in Wabash silt loam to which had been added selenium to the amount of only two parts per million, showed a high concentration of the selenium in the plant, amounting to 1,300 parts per million.

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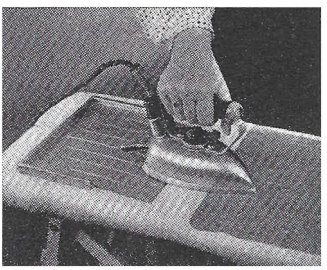

This iron holder eliminates the necessity of lifting an iron on or off its stand during use, thus reducing the amount of work required on ironing day. When the iron is removed from the material on the board, only a "slide-off" motion is required.

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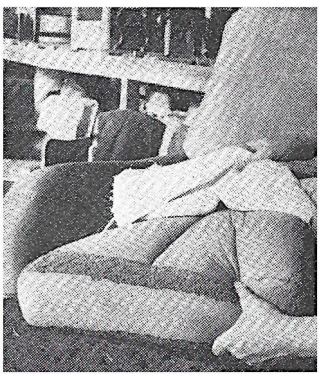

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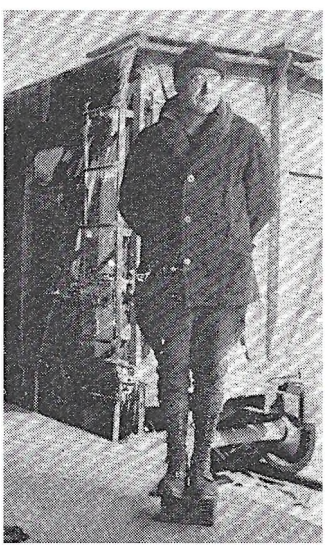

Made by a new process, this lightweight "honeycomb" or cellular face brick is said to have many advantages. The standard size weighs ⅓ less than the solid type, despite the facts that it contains the usual amount of clay. This is caused by the use of a "dearing" process by which the air is squeezed out of the clay, closely compacting it and leaving room for 65 square and symetrically arranged vertical air shafts through the brick.

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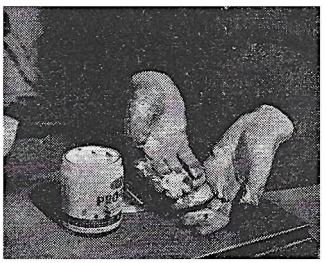

This protective cream is made for men who work with their hands. Before starting a paint job or any work that will dirty the hands, smear the hands well with the cream, especially under and around fingernails. Rub hands together until cream disappears. The hands do not feel greasy. One application is good for several hours. For whole-day job, renew after lunch. To clean the hands, simply wash under warm water, and grease, grime, paint, etc., comes off quickly, leaving skin clean. Eliminates need for washing hands in turpentine or gasoline, which is bad for skin because these solvents take out natural body oil.

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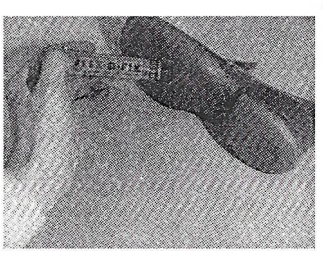

This new plastic material combines in itself the elements of both patch and cement. It can be thinned with water, as it comes from the tube, yet it dries tough and elastic—waterproof, acid proof and electrical resistant.

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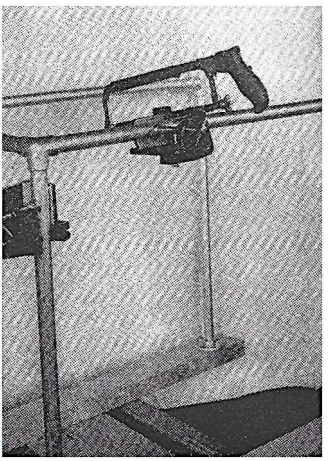

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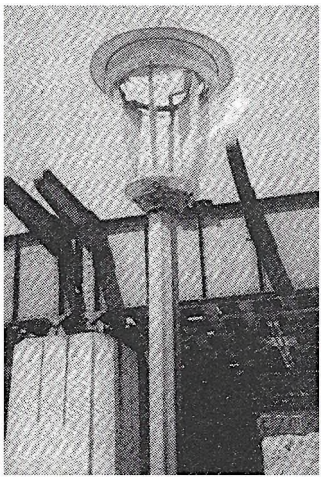
New Lights Use Blades Instead Of Globes



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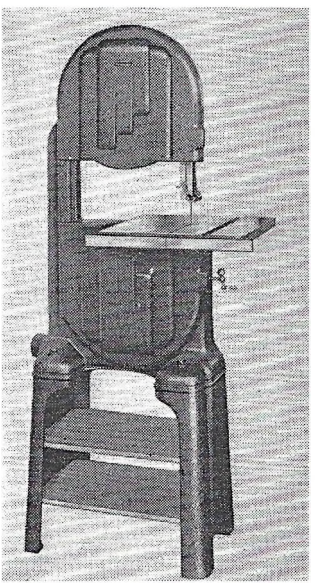

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ATLAS Window Sign letters. Large Sizes, Penny Each. Beautiful Free Samples. Atlas, 7941-G Halsted, Chicago.

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SOLAR Spectroscope $1. Chemical and ore spectroscope $2.50. Spectrometer $5. Cudding Sons, Campbell, California.

TATTOOING SUPPLIES

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FREE 32-Page Catalog. New Ideas. Bargains galore. Everything for every speciman. Taxidermic Manufacturers, Memphis, Tenn.

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FASCINATING wonders through your microscope! Excellent preparations at twenty-five cents per slide, five for one dollar, prepaid. Apply for list. Diatom Slide Service, P. O. Box 286, Kankakee, Illinois.

LENS KIT—Makes 3" diameter 25-50-100 power astronomical telescope $1.00 postpaid. Ready to mount. Instruction circular free. Optical Works, MI9D, Milton, Pa.

ACHROMATIC Microscopes and Objectives. High power. Clear definition. Low cost. Free Optical Catalog. Pfleeger Laboratories, M19E, Milton, Pa.

EXPERIMENTS—Assortment 18 unmounted lenses. Suitable telescopes, microscopes, etc., $1.00 Postpaid. Optical Works, MI9A, Milton, Pa.

CHEMISTRY, Mineralogy, Microscopes, Telescopes. Binoculars. Catalog Free. Tracey Laboratories, Evanston, Illinois.

BUILD reflecting telescope 6" kit $3.50. Instructions 10c, catalog free. Optical Development Corp., 1560 Broadway, New York.

TELESCOPES, Microscopes. Binoculars; 1938 bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

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VENTRILOQUISM

LEARN Ventriloquism by mail; small cost, 3c stamp brings particulars. Geo. W. Smith, 125 North Jefferson, Room 8721, Peoria, Ill.

VIOLET RAY LAMP

ULTRA Violet—Infra red. Dual ray health lamp. Two separate units in one. Promotes sun tan—vitamin "D." Automatic control. AC-DC current $3.90 postpaid. Details free. Beyer Mfg. Co., 4515-M Cottage Grove, Chicago.

WELDING

CLUB Plans: $1.00 each. Arc-welder 25-200 amperes from North-east (Dodge) generators. Arc-welder 25-600 amperes from d.c. motors. Welders Club of America, BB-3432 M-Mart, Chicago. Working model on display; Public invited.

Souvenir Stamps Tell Story Of World's Happenings

Special stamps sheets are what are known as "miniature sheets," or "souvenir sheets." The miniature sheets are sheets of stamps which may be broken up, sold and used, but the souvenir sheet is designed to be retained in its entirety.

When Luxemburg issued the first souvenir sheet in 1906, the country set the fashion for a line of stamps which has today become extremely popular and widely followed. The sheet in question paid deference to Wilhelm IV, the Grand Duke, and the stamps bear his likeness. Since then, many countries have issued souvenir sheets of commemorative importance.

The miniature sheets, distinct from the souvenirs, are generally philatelic in aspect (as are all the U. S. examples). Philatelic events have not, actually, as wide a national significance as the souvenir commemorative sheets, marking wider happenings. Australia was the second country to issue a souvenir sheet of a commemorative nature, honoring Ross-Smith, the great aviator. During the 1920's three commemorative souvenir sheets appeared: Luxemburg again in 1920 paying deference to Grand Duchess Charlotte; Luxemburg a third time in 1923 for the birth of a princess; and in 1928 Uruguay, celebrating the General Garzon monument then dedicated. The rest of the souvenir sheets of a commemorative value have appeared in the 1930's—and these years, the present decade, it is interesting to note, have been prolific in such sheets.

The average stamp collector may still obtain a number of these commemorative souvenir sheets at reasonable prices, though they are bound to rise in value. Other sheets already command good prices.

The events commemorated by souvenir sheets are many, some quite unique. A 1937 souvenir sheet from Belgium was issued for a musician's fund. A Bulgarian sheet was brought out for a royal wedding. Czechoslovakia has a sheet for the hundredth year of the national hymn.

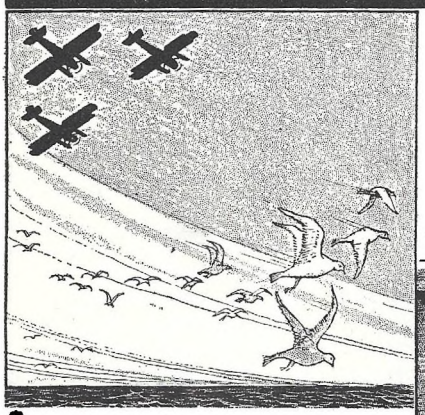
The eleventh Olympic Games are honored by a German sheet, while another of the same country pays deference to Dictator Hitler upon his birthday. Nicaragua issued two sheets for the Rivas Railroad. And Uruguay produced one postage, and a second airmail souvenir sheet for the seventh Pan-American conference.

These sheets are quite attractive; the stamp, or stamps in the center are usually surrounded by inscriptions explaining the reason for the sheet. The Czech national hymn sheet for example, contains even the music, with words, of that anthem, above and below the stamps of the sheet!

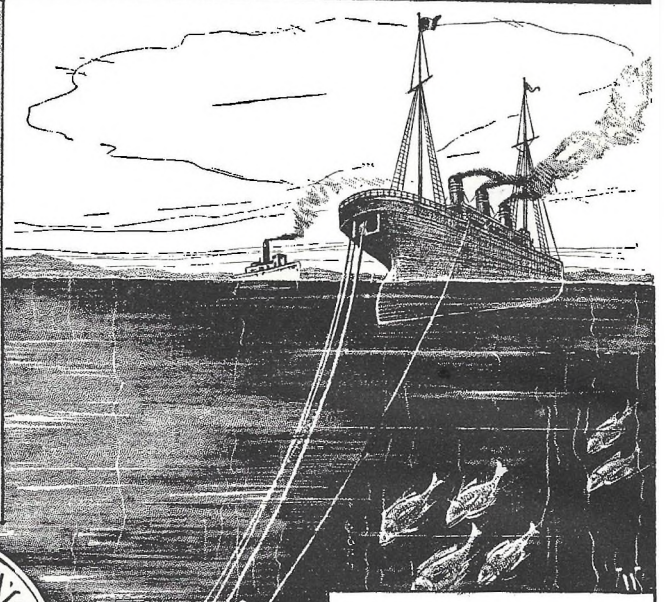
These sheets have various numbers of stamps; sometimes one stamp to a wide-margined sheet, sometimes several stamps. Japan's commemorative souvenir sheet for the 1935 New Year contains twenty stamps. These sheets are most fascinating, and of substantial values too, which should satisfy all classes of collectors.

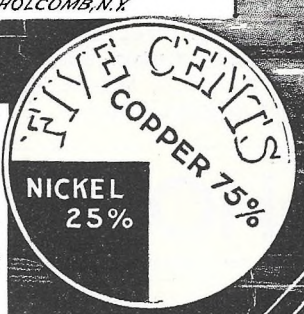
SEA-GOING PLOW DIGS UP OCEAN BOTTOM

Nic Sprank Offers $5.00 For Best Oddity



SEA GULLS SUBSTITUTE FOR WIND SOCK! BECAUSE SEA GULLS FOLLOW STANDARD AIR-PLANE FLIGHT PRACTICE BY ALWAYS LANDING INTO THE WIND, THEY OFTEN SUBSTITUTE FOR A WIND SOCK FOR NAVAL PLANE FLIGHTS.—
—FRED EGBERT, HOLCOMB, N. Y.

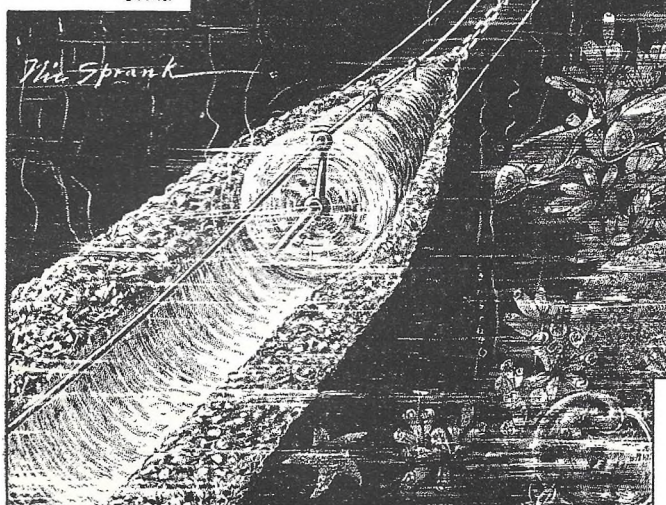




A NICKEL IS NOT NICKEL!—A FIVE-CENT PIECE, COMMONLY CALLED A NICKEL, IS MADE UP OF BUT 25 PER CENT NICKEL WHILE THE OTHER 75 PER CENT IS COPPER.
—J. Jackson, Hartford, Conn.

GOLD BRICKS OF PLATINUM!—BECAUSE THE VALUE OF PLATINUM WAS NOT UNDERSTOOD WHEN FIRST DISCOVERED IN RUSSIA, BRICKS OF THE PRECIOUS METAL WERE PLATED AND SOLD TO THE UNWARY AS GOLD BRICKS.——
— Hans Christiansen, Claysville, Pa.

Nic Sprank



UNDER-WATER PLOW! A SEA-GOING PLOW IS BEING USED FOR PLANTING TRANS-ATLANTIC CABLES IN THE OCEAN FLOOR, WHERE FISHERMEN CANNOT DRAG THEM UP.——

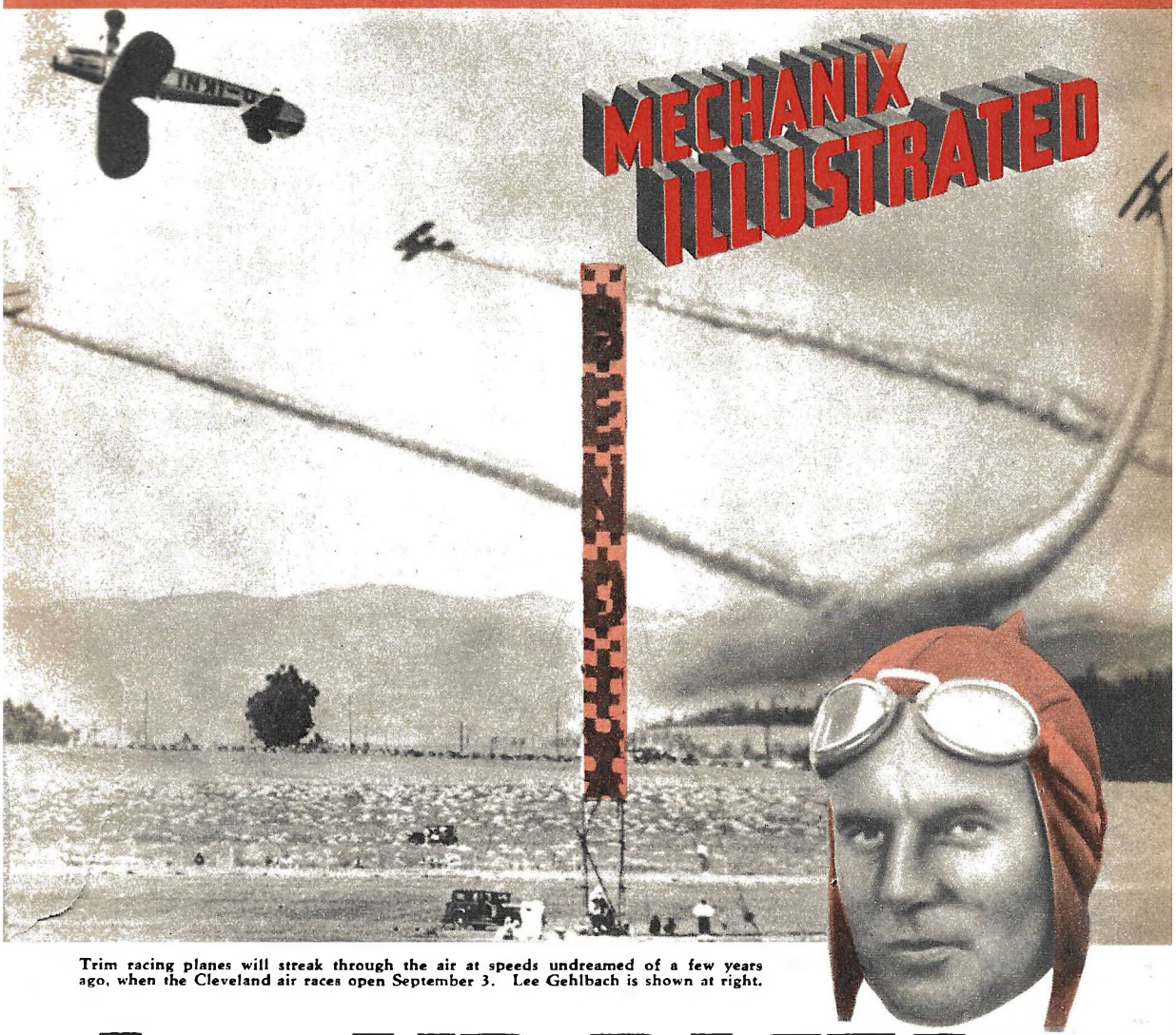
SCIENCE SERVICE

Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Editorial Office, Mechanix Illustrated, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

W. H. FAWCETT
Publisher

Vol. XX No. 5

September, 1938



Trim racing planes will streak through the air at speeds undreamed of a few years ago, when the Cleveland air races open September 3. Lee Gehlbach is shown at right.

Are AIR RACES the Bunk?

LEE GEHLBACH
Says "NO!"

"Probably no one single factor has contributed more to the design and development of military and commercial flying than airplane racing."

IN 1910, the American pioneer, Claude Graham White and that great French pilot Louis Paulhan raced from London to Manchester, England, a distance of 185 miles for a prize of $50,000. Paulhan won in 4 hours and 20 minutes. Today our modern transports can make that flight in less than 40 minutes.

From that day to this, airplane racing has been contributing to the design and development of planes and engines and probably no one single factor has meant more to commercial as well as to military flying than the air races held throughout this country every year. There is no bunk to air racing. Sound engineering achievements have been the result.

Our trim racing planes today streak through the air at speeds undreamed of only a few years ago, and like the modern racing cars that develop and prove many of the mechanical improvements in an automobile, design features worked out by racing planes are later incorporated in commercial and military machines. But there is this difference: racing speeds of today can become our airline speeds of tomorrow because the higher and faster you fly, the safer you are.

One of the most important problems in the development of the airplane has been engines and to this end air racing has contributed considerably. The Wright brothers started going places when they built their 12 hp. affair. Like them, the first thing a racing pilot thinks of is how to get more power from his engine, then how to cool it and how to keep it together until the race is over.

The American Cirrus four-cylinder in line aircooled engine was originally rated at 90 hp. With a supercharger, high compression ratio and special fuel, it could be raced at 150 hp. This speed ruins cylinder heads or blows out gaskets between cylinder heads and barrels. A similar engine, the Menasco, was rated at 90 hp. but for racing, it has been used above 200 hp. At this speed, the crankcase would weave enough to crack or ruin main bearings because they were out of line. The rear cylinders ran cold and the others hot. The answer for both engines was a tapered air intake scoop so all would run the same. Wrapping the cylinders with sheet aluminum, that is "tight baffling," forced air between the cooling fins instead of through wide open spaces between the cylinders. Cowling behind the engine was designed to draw cooling air, then let it go back smoothly around the fuselage.

The racers first put tight baffling on radial aircooled engines. Without it, the modern twin row radials could not be cooled. In 1932, the Wasp Jr. engine was rated 300 hp. and the Pratt & Whitney Company was horrified to see the racers operate them at 600 hp. Now you can have a Wasp Jr. 600 hp. for normal use. It took some of our biggest manufacturers a long time to learn that a complete long skirted cowl around the engine would cool it better, also make the airplane faster.

The last Italian Schneider Cup Racer had the most ingenious cooling and expensive engine arrangement yet devised by man. It had two Fiat engines of about 1,600 hp. each with the rear one driving through the front one to turn a separate propeller in an opposite direction. These engines were installed

Stunts that fearless pilots perform at the races (above) keep thousands of spectators enthralled in open-mouthed wonder (below, opposite page) as birdmen swoop, turn and rise.

in a Macchi-Castoldi, which was a low wing, wire braced monoplane. The wings, fuselage and pontoons were almost covered with skin type radiators to cool the engines. With this combination, Francisco Agello set the speed record of 440.681 m.p.h. at Desenzano, Italy, on October 23, 1934. Give those people credit for their work for no one since has come closer than 70 m.p.h. of that mark.

Our military and commercial airplanes used to resemble nothing quite so much as a collection of spare parts tied together with a forest of struts and wires so they would fly along in formation. Today, the new jobs are just enlarged editions of the racers of only a few short years ago.

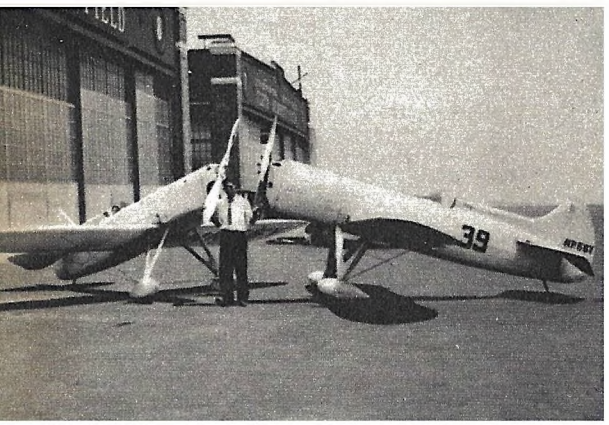
There have been instances when the Army and Navy were slow in profiting from the experience of racing pilots. In 1930, I won a 6,000 mile race with a 90 hp. Cirrus engine which I had doped up. The Army showed a lot of interest, but still thought that they would stick to biplanes for every class of plane except for transports. Even Frank Hawks' record of 12 hours, 21 minutes across country had not made much impression. But eventually the military came around.

Some time after the late Z. D. Granville and I calculated a new way to put a landing gear on a low wing wire-braced monoplane, the Army began acquiring a few hundred direct copies of its design. These include the Boeing P26 pursuit, the Curtiss Shrike Attack and the Kinner Envoy transport. Commercial copies with the identical landing gear are the Ryan St, Cunningham-Hall GA-36, two Kinner designs, and the Pasped Skylark. In 1932 Jimmy Doolittle, using one of Granville's later models, set a new land plane record of 294 m.p.h.

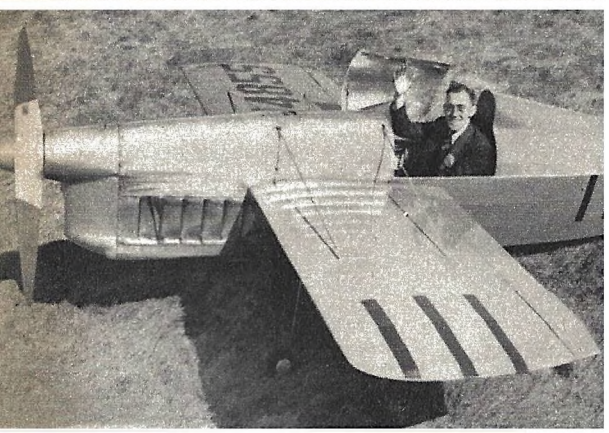
With a similar low wing monoplane, Jimmy Wedell raised this record to 305 m.p.h. Then he built himself another plane with a cantilever wing (that is without external bracing) and a special type of retracting landing gear which equaled this performance on the same nine-cylinder Wasp Sr. engine.

The design of one of Jimmy's last airplanes was copied in Howard Hughes' job, which set a later record of 352 m.p.h., the Vultee Transport, Vultee Attack, Spartan Transport. Spartan Attack, Vought Fighter and the North American Fighter not to mention a

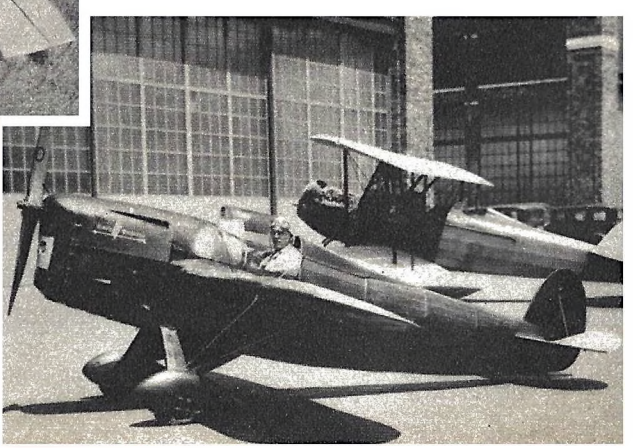
"Mister Mulligan" built for the races by Ben Howard, later found its way into regular commercial aviation.



Race-pilot H. E. Neumann with "Mike" (left) and "Ike" (right), two famous home built Howard midget racers.



Steve Wittman is shown in the cockpit of his home built racer in which he won the 1937 Cleveland air races at an average speed of 233 m.p.h. He also shattered three world's records last year in Detroit. (Commercial designers please copy.)



Clarence McArthur is shown at right in a Heath midwing racer, also home built.

large number of foreign ships. Beechcraft and Stinson have both used a similar landing gear.

The racing pilots built themselves quite a collection of midwing airplanes that were unbelievably fast. S. J. Whitman from Oshkoosh, Wisconsin made 205 m.p.h. with a 100 hp. engine. Art Chester made 240 m.p.h. with 200 hp. The Cessna Special was good for 245 m.p.h. with a 145 hp. engine, the Folkert Special hit 275 m.p.h. on 200 hp., and with 300 hp. was good enough to do over 300 m.p.h. and win the Thompson Trophy race last year. Recent mid-wing racers are Frank Hawks' "Time Flies" and Roscoe Turner's latest pet. Unfortunately, the mid-wing monoplane idea works out to best advantage only in racers and in very large airplanes.

The members of the racing fraternity have known for the last ten years, that at high speeds, it helps a lot to have wings and tail surfaces so smooth that a fly would skid off them. At slow speeds of around 100 m.p.h. any roughness, protruding rivet heads, or even corrugated metal surfaces make little difference. Most of the aircraft industry is now waking up to the idea, and going to the expense, of using countersunk flush rivets on their metal wings. Even that old well known government bureau, the National Advisory Committee for Aeronautics finally got around to double checking the matter in their high speed wind tunnel.

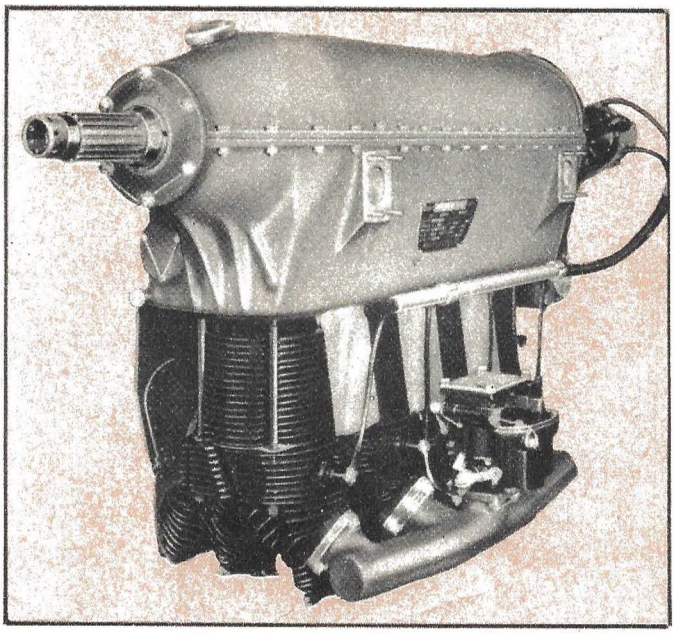
The racers were using transparent covers to eliminate the air drag of open cockpits, years before the military services adopted this method of gaining a few more miles per hour.

As the speed goes up, there are many radical changes in the airflow past an airplane. A turbulent airflow back from the wings can blanket the tail surfaces sufficient to make

the plane uncontrollable or hammer hard enough to smash those surfaces completely off the airplane. Certain design precautions must be taken to avoid disastrous wing and control surface flutter. These concern rigidity as well as strength of parts, various periods of vibration and dynamic and static balancing.

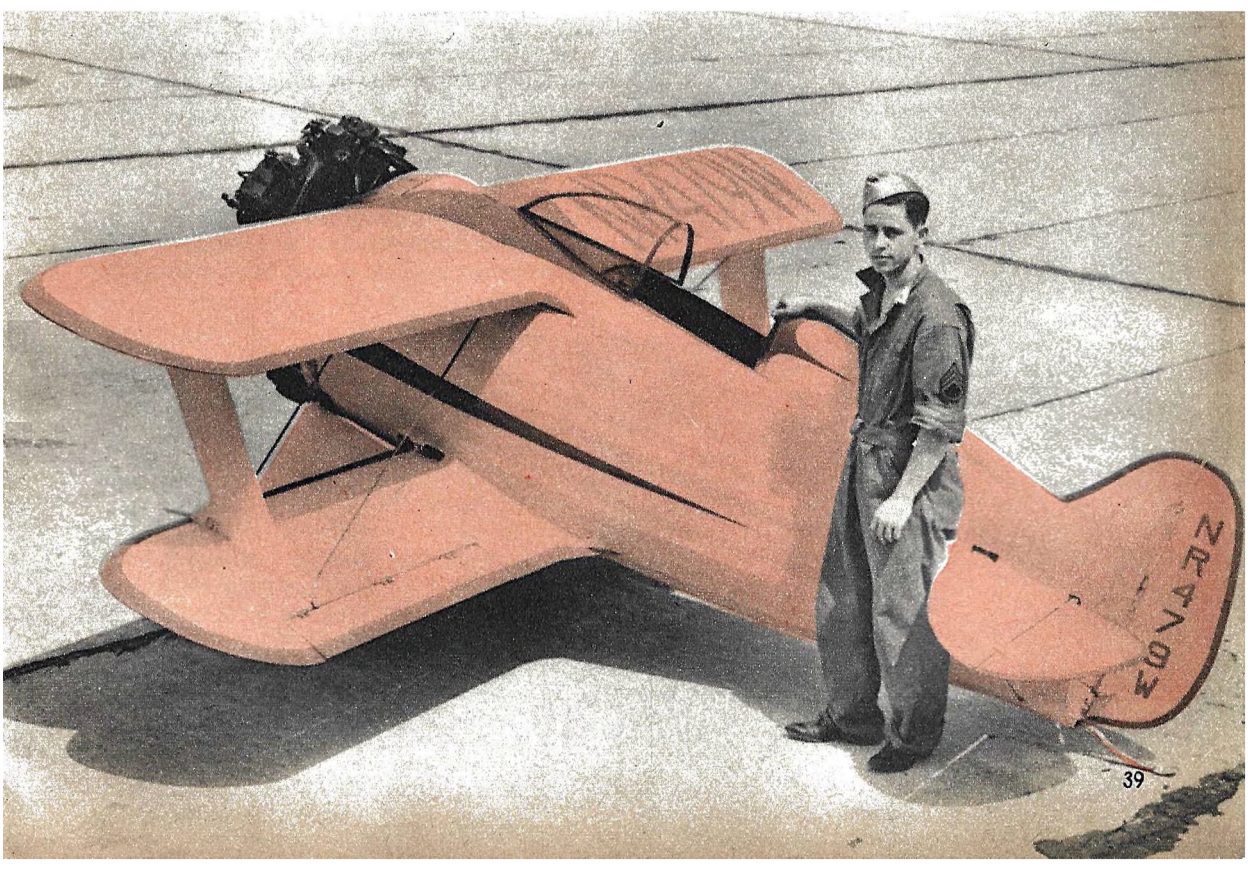
In "bumpy" air, any fast plane will pound like an outboard motorboat in a choppy sea. Racing planes must be built to withstand this punishment and transports should either be flown above such rough air or else slowed down. Rain can hit like so much buckshot. Wood or fabric wings should have the dead center of their leading edges protected with a strip of ordinary adhesive tape or metal, otherwise they will be slowly ground away as if by sandpaper.

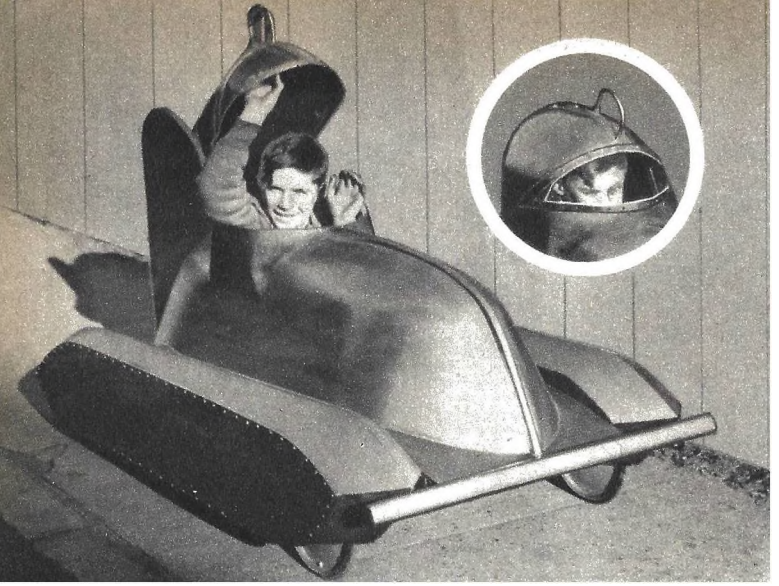
Some pilots make air racing a Roman holiday. But the net result of the sport of racing airplanes is safer, faster travel for commercial aviation.



When the racers found that metal plates on the side of an engine helped keep it cool, engine manufacturers grasped the idea. This Menasco C4 125 hp. engine illustrates how these plates serve as an aid in cooling.

The tiny racing plane below was built by Vincent Linberg, Sergeant in the 35th Aviation Division, Missouri National Guard, to be entered in the Cleveland air races. It has a wing spread of 13 feet and is 12 feet long and took two years to build at a cost of $1200. Its top speed is estimated at 250 m.p.h.





Builds Turret-Type Midget Racing Car

BELIEVED to be the smallest electric-powered type in the world, a streamlined midget racing auto built by William Dube, of Worcester, Mass., is 31 inches high, 36 inches wide and six feet long. The novel car features a turret compartment for the driver and is said to be capable of a speed of 55 m.p.h. Four springs on each wheel provide knee-action riding.

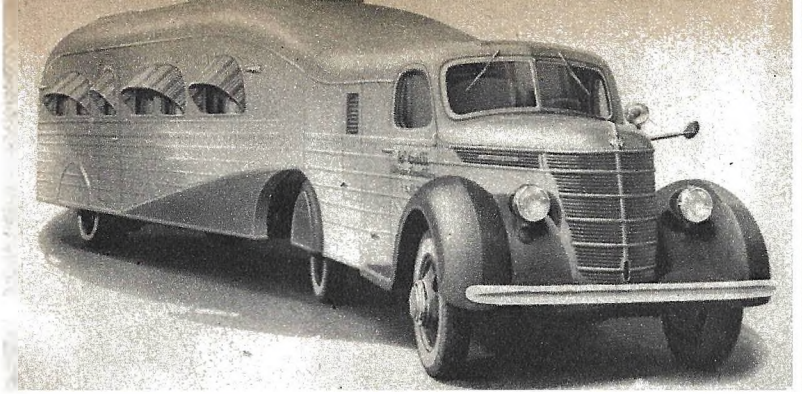
Gasoline-Powered Model Speedboat Sets Record

SHATTERING all records for its class, a model speedboat attained a speed of 38.2 m.p.h. on a pond near Glendale, Calif., recently. A Class C craft, the model is 26 inches long, 11 inches wide and powered by a two-cycle miniature gasoline engine, fitted with twin rotary valve carburetors and twin exhaust manifolds.

Designed by W. A. Atwood and Mel Anderson, two pioneers of model airplane gasoline engine development, the speedboat is constructed entirely of balsa wood. To insure highest efficiency, the propeller shaft connects with a ball bearing universal joint just forward of the propeller so that the thrust of the boat and the thrust of the propeller coincide. The engine is air-cooled, the finned cylinder protruding above the boat, as shown at left.

Copyholder Made Of Cardboard

MADE of durable cardboard, a new copyholder for typists accommodates letter and legal size paper and holds as many as 40 sheets at one time. A lever enables the typist to change from single to double spacing when desired. When not in use, the holder folds flat.



Modern Trailer Design Gives Deluxe Exploring Facilities

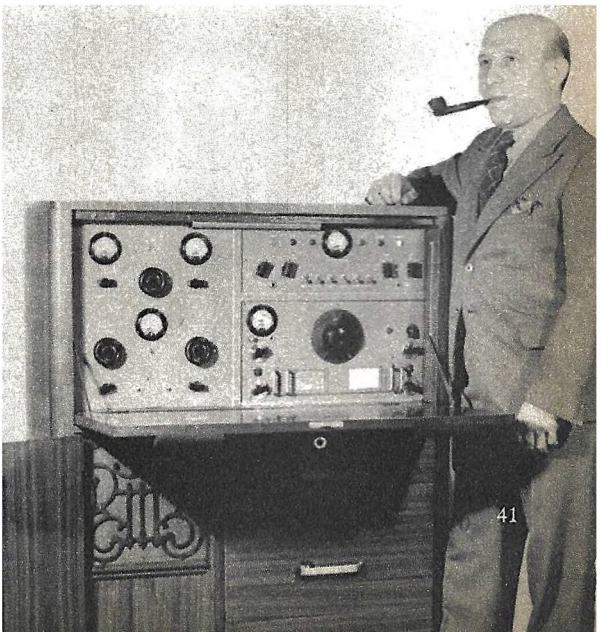
AN ELECTRIC kitchen, a modern tiled bath, electrically heated blankets for cold nights, and an attractively decorated drawing room are a few of the innovations which Commander Attilio Gatti will take with him through the heart of the African jungle during an eighteen-month exploration trip. Probably unparalleled in the history of tropical exploration are the "jungle yachts" in which the expedition will follow jungle trails. Five vehicles in all comprise the group —a station wagon, two supply trucks, and two trailers of welded stainless steel.

Novel Burglar Alarm Can Be Used On Door Or Window

THE novel burglar alarm shown at the right combines the alarm part of an alarm clock and a door stop to prevent the door from being opened more than a few inches when the alarm is set. The device can be fastened to the floor near a door or onto a window frame to prevent the window being opened more than an inch or so. Actuated by a spring motor, the bell will ring for a minute and a half when set off.

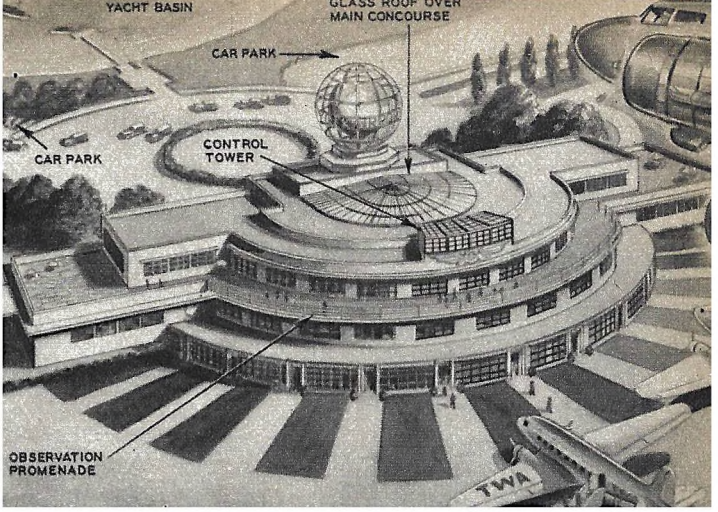
Complete Amateur Station Fits In Rebuilt Desk

A COMPLETE medium-powered amateur radiophone station housed in a remodeled desk was designed for use by an amateur living in a New York city apartment. The ingenious and compact layout makes use of a total of twenty-seven tubes, nine of which are employed by a commercially built short-wave receiver.

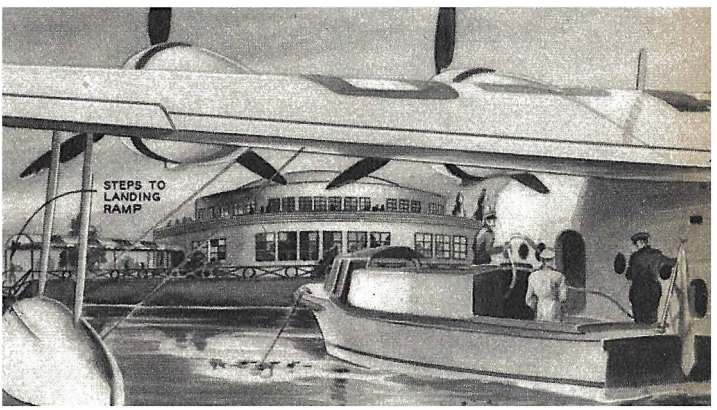


New York Builds Big for Land and Sea Plane

Airport Service



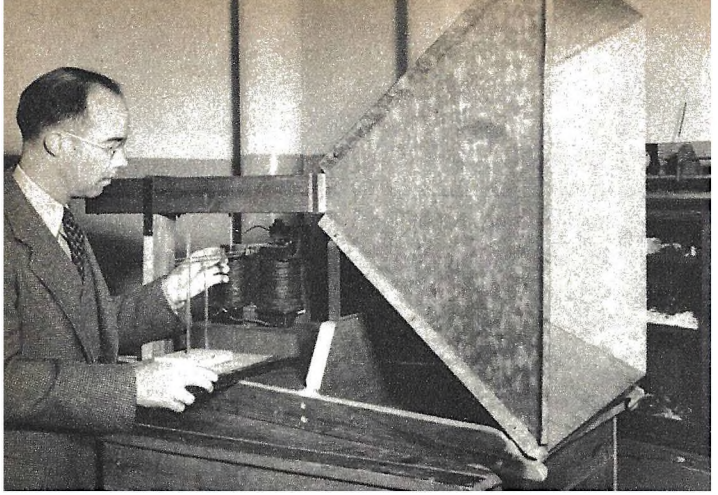
Above—Artist's sketch of the proposed North Beach Airport landplane administration building, which will be 304 feet long and 175 feet wide at center.



In the sketch above, an MI artist has depicted the seaplane base administration building as it might appear from beneath a flying clipper's wing as it rides at anchor in the landing basin. The building will be circular in shape with a diameter of 136 feet. The landplane and seaplane hangars will feature electrically-operated doors. Construction of the airport is a WPA project.

REACHED from the heart of the metropolis by a 28-minute drive over a route which crosses the famous Triborough Bridge and leads to the site of the 1939 World's Fair, North Beach Airport in the Queens section of New York, N. Y., is being enlarged in area from 105 acres to 429 acres and will be provided with every facility for the handling of giant transcontinental and transoceanic air liners. Exclusive of land, the construction cost of the enlarged airport will represent a cost of about 12 million dollars.

The completed airport, as shown in the artist's sketch at left, will feature four main runways, one of which will be 4,160 feet long, to accommodate land planes while a vast seaplane basin will provide landing and takeoff facilities for flying "clippers." Plans for the reconstruction of the airport were prepared by engineers of the Works Progress Administration in co-operation with the city's Department of Docks. The airport's hangars and administration buildings will represent the latest ideas in airport architecture.



Horn "Antenna" Is New Radio Aid

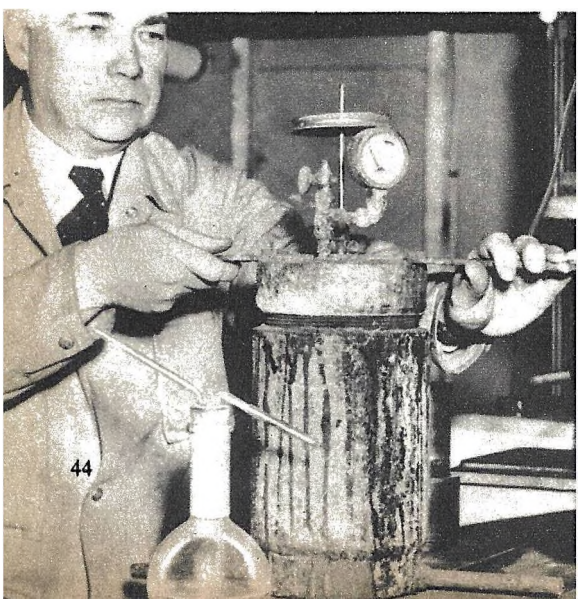
AN ELECTRO-MAGNETIC horn "antenna" developed by Dr. Wilmer L. Barrow, of Massachusetts Institute of Technology, is said to make possible micro-ray communication over a narrow pencil-like beam at wavelengths only a few inches long. An adaptation of the device, now being experimented with, may aid airplane navigation, it is claimed.

Electrically-Operated Device Humidifies Air In Home

OPERATED by simply plugging into any convenient electrical outlet, a newly developed humidifier device washes and circulates the air within a room, automatically maintaining a correctly balanced humidity in relation to the temperature. Available in a streamlined cabinet, which also serves as a decorative end-table, the humidifier is equipped with a device to infuse the air with disinfectants or perfumes.

Fish Used In Making "Wool"

A "WOOL" fabric, consisting of 80% cellulose fiber and 20% fiber derived from fish albumin, has recently been developed by a foreign chemist. The new fiber is durable and does not tear easily, it is claimed, and ordinary cellulose textile dyes can be used effectively to color it.

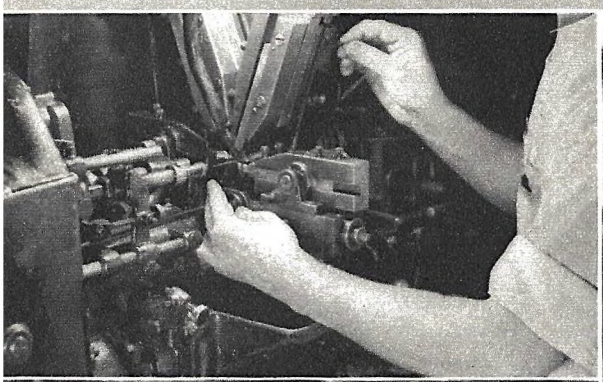


Chemist Invents Process To Make Plastics From Milk

A PROCESS by means of which solids of milk can be converted into a plastic has been developed by William S. Murray, a research chemist in Utica, N. Y. The process involves the mixing of wood flour, asbestos powder, shredded paper, a weak solution of resin acid and fresh, skimmed milk. The mixture is then placed in a steam-jacketed kettle for about half an hour after which it is removed and dried in steam tubes, emerging as a fine powder which is placed in a die.

MAKING An ELECTRIC METER

Built with all the precision that goes into a fine watch, yet so ruggedly constructed it lasts a lifetime, the modern electric house current meter contains 275 parts. The photo above shows a few of the two million hand-picked sapphires used annually as bearings for meters. Below—Each sapphire is examined with a microscope. Lower left—A special lathe is used to cut thread screws, some of which are only seventeen-thousandths of an inch in diameter. Upper left—This machine cuts wires used in meters to a tolerance of one-thousandth of an inch. To prevent corrosion, the delicate gears and wheels of meters are gold-plated. The electric meter was invented 50 years ago by O. B. Shallenberger, a Westinghouse engineer.



FIREMEN

Our modern fire-fighter is a young husky about whose exploits under fire little has been written. This story tells how he is trained; what he does.

[*Fireman Training Photos by Stanley Gerstin*]

IN 1871 a cow kicked over a lamp and started a fire that reduced Chicago to ashes, and a bucket of water started a fire that leveled Seattle 18 years later. The water was thrown over burning glue causing it to spread, and Seattle, like San Francisco a few years later, burnt to the ground. There have been other great fires throughout the history of the world but in all the records of fires little is ever written of the heroes who fought them. I am thinking of the fire-fighters whose exploits under fire rival those of the famous G-Men of the Federal Bureau of Investigation. These are heroes of the flames, smoke-eaters all, fire-fighters who know how to hem in a big city fire; they can stalk fugitive fires in walls and between floors —track them down with hose and axe and when they meet the fire demon, blast it with water. These are the 20th century minute-men of America; they are off with the crack of the gong hell-bent for the nearest fire hydrant. They are heroes of a thousand-and-one-nights, protectors of peoples and property from the ravishes of the flames.

These modern fire-fighters believe literally that where there is smoke there is fire. They battle thousands of fires yearly, large and small—waging war against hundreds of millions of dollars worth of conflagration which claims 10,000 lives annually. Figuratively speaking, they watch this money go up in smoke. But to watch it is no Roman holiday for our fire-fighters. To combat it they must learn to climb like monkeys, tie knots like sailors, jump into life nets (like the man on the flying trapeze) with the greatest of ease. They must be life-savers and man-

NEVER FIDDLE!

by Stanley Gerstin

handlers, building inspectors and first-aid men. They learn to penetrate smoke-filled rooms wearing gas masks, operate smoke ejectors and cutting tools, pulmotor and inhalator, provide artificial respiration and even operate refrigerating systems.

In New York, Detroit and Chicago; Atlanta, Omaha and San Francisco, they are trained for their role of fire-fighting. One of the best examples of the schools that teach them their tricks is the New York training college—largest in the country. More than 1,000 men a year are trained here as fire-fighters for New York city and men from all over the world, to the tune of 50 to 60 a year, come to learn how it is done and then return to their homes to establish training schools modeled after the one in New York.

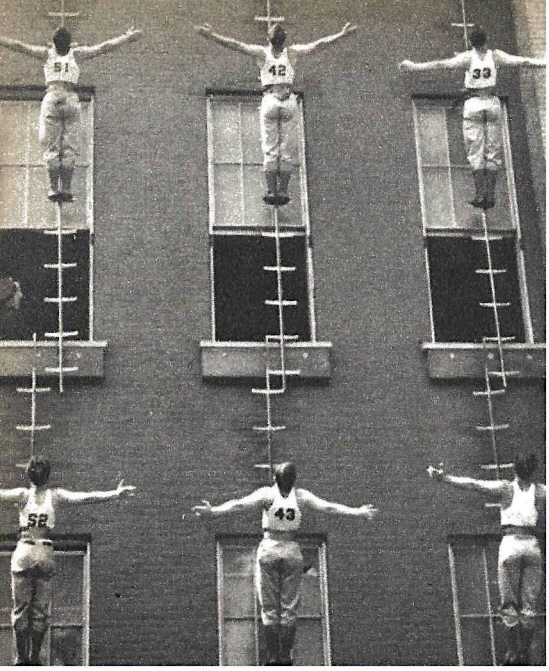
Those who train here are typical of fire-fighters all over the country. They are usually men like Henry Miller, a mechanic, 26 years of age, a husky fellow who took the fireman's exam because it offered him a secure future. Like Henry, the rookies who enter the school are between 21 and 29 years of age and include engineers lawyers, mechanics, button-hole makers and metal workers, toy makers and bridge workers. Many of the men are college graduates. Average age of the rookie is 24½.

A class of rookies at the New York school averages about 250 men appointed for a probationary training period of 90 days. Before entering the school the rookie is subjected to a rigid physical examination (his second) which must include blood tests. If he makes the grade, salary begins immediately at $2,000 a year and all the benefits of medical care, sick leave, insurance and pension become effective.

The rookie supplies his own training uniform at a cost of $11; spends about $125 for a fireman's outfit about once every four years.

The rookie fireman goes to school 5 days a week, 8 hours daily and leads a busy life from the day he enters. He spends 24 hours on Saturday assigned alternately to the hook and ladder station, pumping station, rescue station and fireboat. Key to the training routine is to crowd in as much outdoor activity as possible. The beginner receives a liberal education in the use of tools and equipment. He learns to handle the small 1½-inch hose for small fires, the larger 2½-inch hose for general fires and the deluge hose (3 inches) for special fires. He learns to scale ladders from 10 to 85 feet in length.

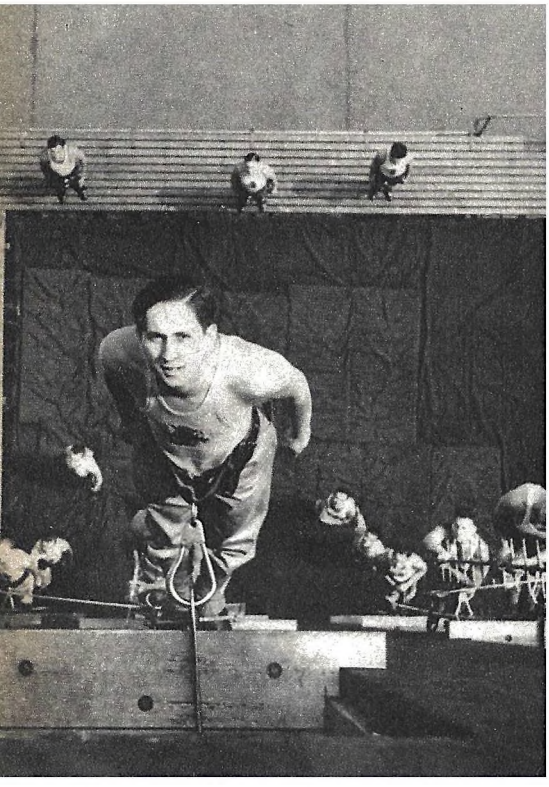
Firemen know that where there is smoke there is fire and they are trained to tackle the worst of them. At right, firemen are crashing windows for another of their thrilling rescues. On opposite page they are using modern equipment to pour tons of water into a blazing inferno.



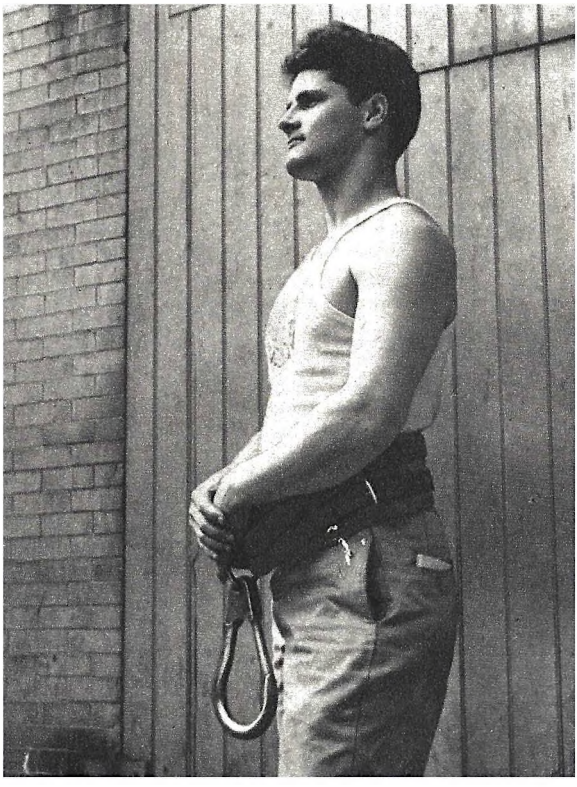
The rookie climbs a 100-foot wall with a scaling ladder; hangs from it by his belt with arms spread.

Like a real scholar, the rookie learns about ladder construction (to give him confidence in what he hangs on to 85 feet in the air). All portable ladders are made by the department's own carpenters so that there is no question of quality and workmanship. Average life of a ladder is 3 to 4 years but under extremely hard usage, ladders have been discarded after 6 hours.

In one week of training the average rookie does more calisthenics than in all the previous years of his life. Fireman Henry Miller, for instance, after a weeks training has worked up a perpetual sweat and melted away any excessive fat he may have had. He has limbered up his muscles in leaping and climbing. He must swing himself across a 40-foot ladder 50 feet in the air and walk across one at the same height, and if he thinks he has done his part for his country, wait until he is required to leap into a life net from the third or fourth story window! Not only has he become an expert trapeze-man but he can now handle a fire hose under pressure so that the back pressure won't throw the nozzle and brain him. Normal fire hose pressure is 35



It takes nerve—and faith in a safety belt to do this. Either you do it or you quit! Few give up.



A typical rookie fireman, young and husky. Your life is in his hands at a fire. Note safety belt.

Probationary firemen learn to leap into life nets from 50-foot heights. Six-story leaps are not uncommon. An unsung hero once leaped 10 stories—and lived.

pounds, enough for 3-story work. Pumping trucks can raise enough pressure to shoot a stream of water over a 15-story building.

But by this time fireman Henry's headaches have only just begun. Battalion Chief David J. Oliver, in charge of the training school, decides to introduce the rookie to the scaling ladder and does it very mildly by requiring him to climb a 12-foot ladder to the first-story window. These scaling ladders vary from 12 to 18 feet in length and are made from second growth hickory. Each of its rungs will sustain a weight of 600 pounds and the ladder will safely sustain the combined weights of a man on each rung. They are made by the fire department carpenters and weigh 1½ pounds per foot. They are re-enforced with wrought iron and an iron hook at the top serves to grab a window-sill so that a man may safely climb to any height with one ladder simply by passing it up from floor to floor. Rookies learn to climb a story a day until they reach a height of 90 to 100 feet from which they are required to dangle by their safety belts with arms outstretched —and if you think that's nothing, just try it. This little feat is accomplished in 2½ to 3 minutes climbing time after a rookie is sufficiently toughened to it. To make the trick harder, Chief Oliver requires each man to

carry a 140-pound dummy down a scaling ladder and so efficient are the men becoming that those in the service are increasing scaling ladder rescues yearly. Firemen now average one to two rescues a week.

Compared to a scaling ladder, an 85-foot aerial ladder looks easy until a rookie must do the trick with a heavy fire hose and hold it in position under pressure. Either he holds it or gets thrown for a power dive into kingdom come.

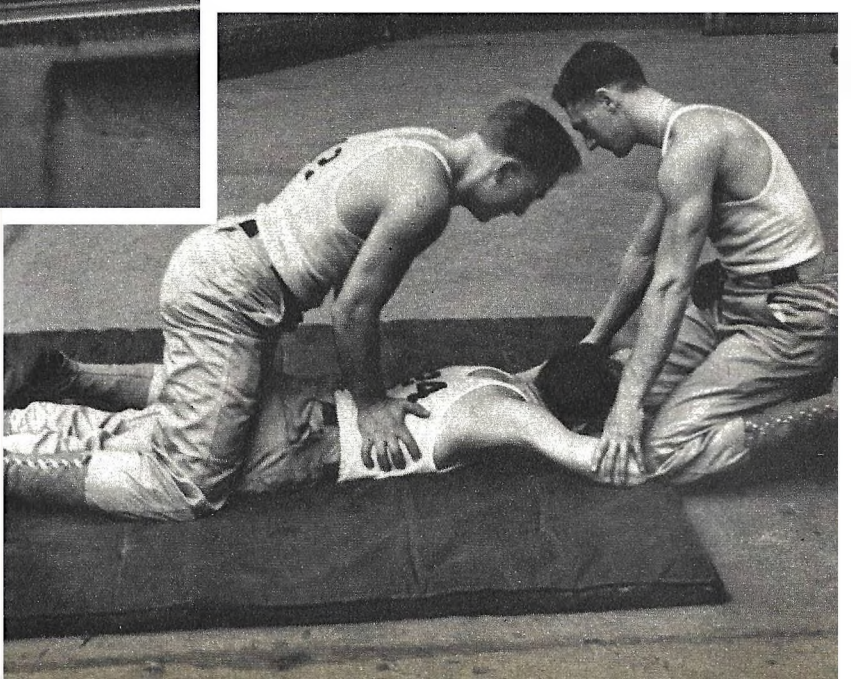
A fireman is a son of the sea when it comes to making pretzels with a rope. The rookie must learn to splice ropes, make special knots and bows designed for rescue work so that victims may be trussed up and lowered without slipping from the rope or suffer broken ribs.

Life with a life net is not an easy one for the aspiring fireman. The net jumper's problem is to gauge his distance and land correctly because if he misses or lands badly, he may never live to tell his children about it. Leaps are usually made from 35 to 40 feet, but graduate firemen must be qualified to jump from 50-foot heights. Highest jump on record was made a few years ago by an unsung hero who catapulted from a 10th-story window—and lived. However, six-story jumps have frequently been made.

The rookie fireman does not lead a strictly outdoor life. There are classroom periods when he is expected to use less brawn and more brain, when lectures are the order of the day. Classroom work consists of lectures on safety and discipline, fire rules and regulations, duties of building inspectors, how to track down fires, etc. By the time a rookie completes his 90-day probationary training, he is qualified to "general" a fire from the first spark to the last wisp of smoke. Men who fail to make the grade are given additional training; are never dropped. Those who can't make the grade usually see the handwriting on the wall and drop out of their own volition.

Men who are assigned to fire boats are usually seamen with exceptionally fine records in the merchant marine and navy. After being trained at the regular training college they receive an additional period of training at the marine school.

Assignments to fire houses are on the basis



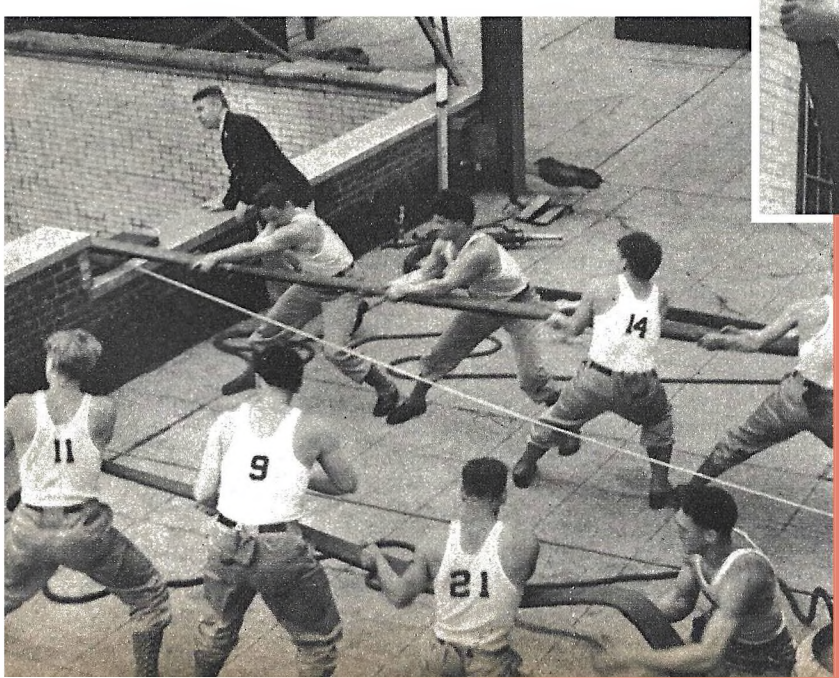
The fireman in training has to walk across a 40-foot ladder 50 feet in the air and when he reaches safety, he swings himself back by the hands—like a monkey. He must not only fight fires but he must fight death also and, as shown at right, give artificial respiration to victims overcome by smoke or water.

of 8 men to a shift, three shifts to a fire house and their responsibilities include checking property and fire boxes, checking businesses using combustibles, checking water mains and stand-pipes. Men chosen as inspectors are first grade firemen who receive an additional 6 weeks training.

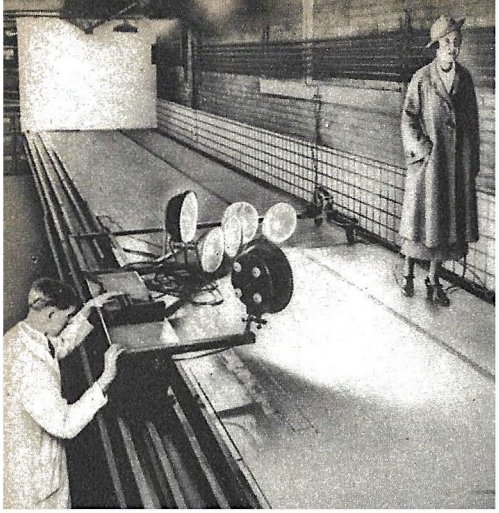
On an average, the New York smoke-eater answers 39,000 alarms yearly of which 28,000 are fires and the remainder false alarms or unnecessary. He combats $7,700,000 worth of fires at a per capita cost of $1.05 (1936 estimates). He squirts 50,000,000 gallons of water through all kinds of hoses. He guards 674,000 buildings spread over an area of 315 square miles. By 1939 New York will have 11,300 men assigned to 369 fire houses which garage about 800 pieces of fire-fighting equipment. And the city spends over $22,000,000 annually to keep this force in trim.

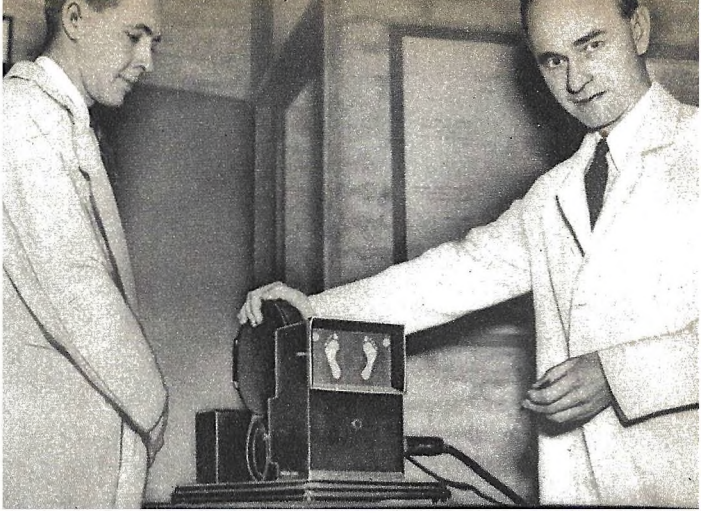
To live this life, a New York fireman receives $2,000 the first year, $2,500 the second year and $3,000 the third year after which he is rated a first grade fireman. Thereafter increases depend on promotions. He is eligible to take the lieutenant's exam, after receiving his first grade rating, at a salary of $3,900. Captains receive $4,500; battalion chiefs get $5,300 and deputy chiefs, $6,300. Commissioner is tops—and there is only one of those. He is John J. McElligott. He came up from the ranks and in any batch of rookies, there may be a potential commissioner—future headman of the smoke-eaters.

There is no telling what fires these men may have to battle from year to year throughout the country. In 1879 the country suffered $77,000,000 worth of fire losses. Worst year was 1926 when fire losses totalled $562,000,000. In recent years losses have been well below $300,000,000.



Top—Unless bow knots are properly made, victims slip out of them or suffer crushed ribs. Training Chief Oliver designed this one. Above: Carrying a victim to safety down an 85-foot aerial ladder is part of the training. Left: Handling of hose is also important. This crew is shown raising a hose line over the top of an 8-story building.



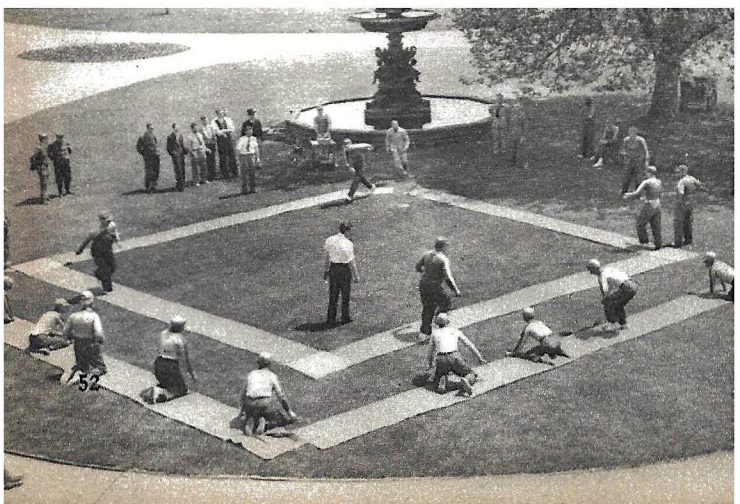


Device Records Foot Strain, Aids Shoe Manufacturers

CONNECTED to metal discs attached to the heels, outside and inner edges of test shoes by means of wires, a device developed by Dr. R. Plato Schwartz of the University of Rochester (N. Y.), makes a continuous record of a person's foot strain while walking over a metal flooring. The "electro-foot-prints" indicate how long each foot muscle is strained or pressed, thus aiding in the development of better shoes by manufacturers.

Radio Receiver Straps On Airplane's Control Stick

DESIGNED for use by civilian airplane pilots, a compact beacon-beam airways radio receiver developed by John T. Lee, Chief Radioman, U. S. C. G., weighs only seven pounds and can be strapped to the control stick of an airplane without restricting its movement. The receiver operates in the airways 200-400 kilocycle band.

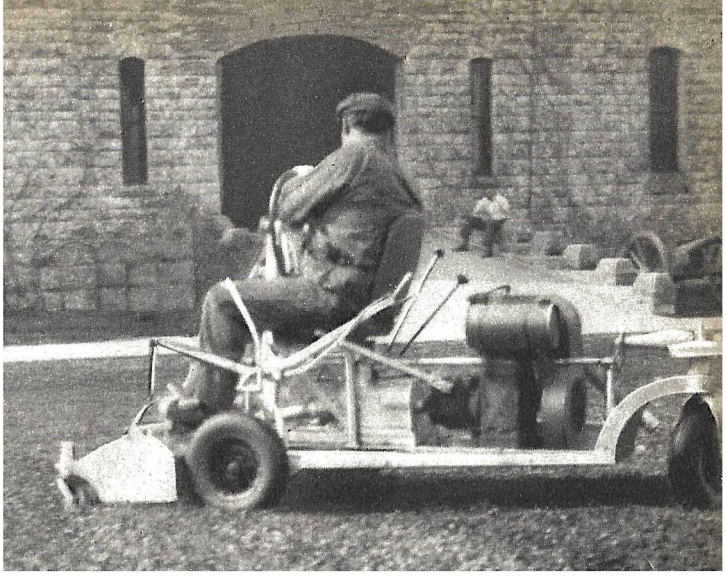


"Sound Baseball" Played By Blind

A BASEBALL diamond equipped with webbed carpet "paths" leading to the bases and a special ball with a small bell built into it enable blind residents of an Oakland, Calif., home to enjoy all the thrills of America's leading sport, as shown in photo.

Rear Wheel Steers Novel Lawn Mower

BUILT in the shops of Kansas State College, this sturdy mower runs on one-half gallon of gasoline an hour using a six-horsepower engine. The main features of the machine are rear wheel steering, floating cutter head and suction blade-type cutters. The cutting blade can be operated at speeds ranging from 1,800 to 5,000 r.p.m. It is particularly valuable for cutting large lawns.

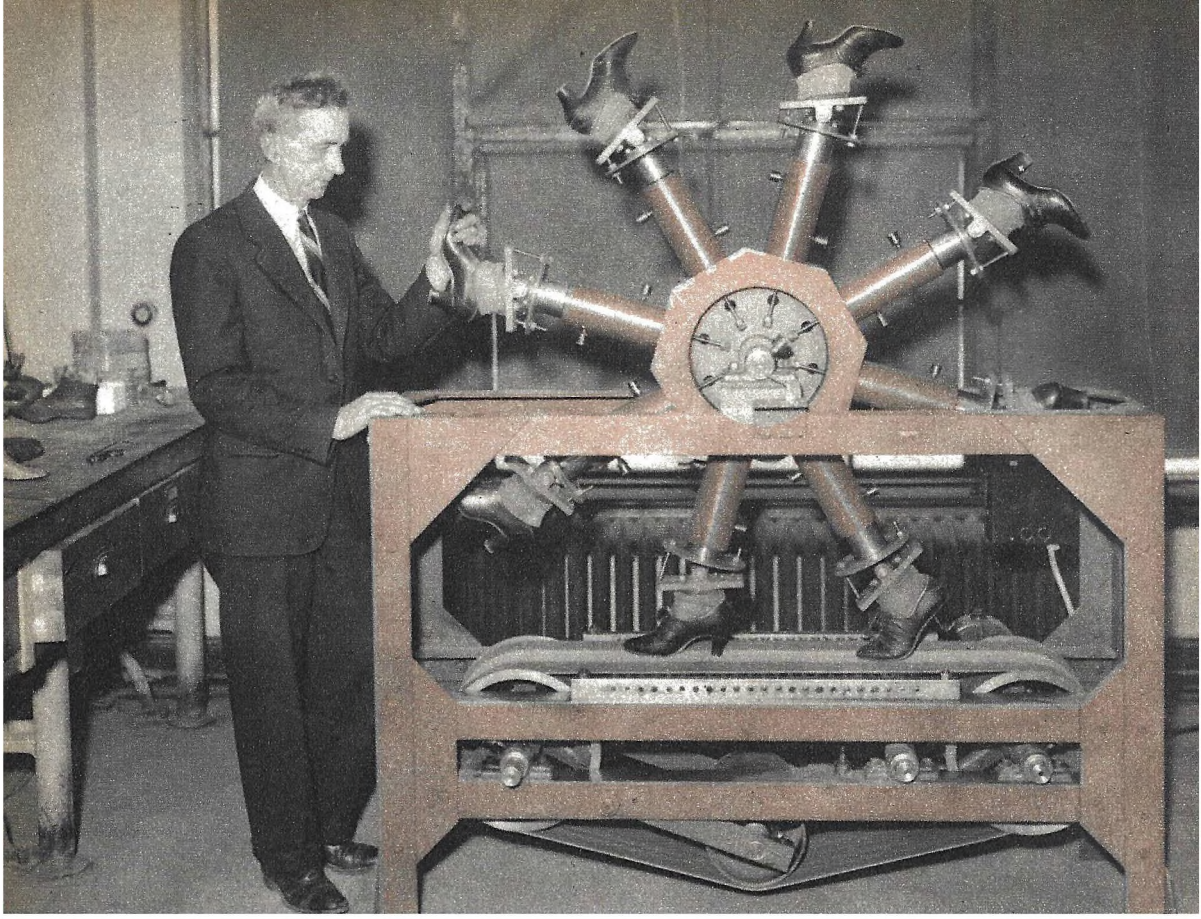


New Dredge Brings Up Deep Sea Bottom

A TEN-TON deep sea dredge, developed at a cost of more than $500,000 and twenty years of experimentation, plunged 700 feet into the ocean off Monterey, Calif., and brought up the first appreciable amount of sea bottom ever taken from such a depth. The demonstration was held before representatives of the U. S. Navy and the Coast and Geodetic Survey, who expressed the belief that the invention will have a far reaching effect in its application to industry in submarine projects.

Huge Crystal Has Unusual Quality

THE quartz crystal shown at right, considered the finest specimen ever to enter the United States, weighs sixty-three pounds. Based on optical quality, experts believe that it surpasses any museum piece of this type in the country. This crystal came here from the Province of Minas Geraes in Brazil, where it was brought by mule pack from the Serra da Mantiqueira range.

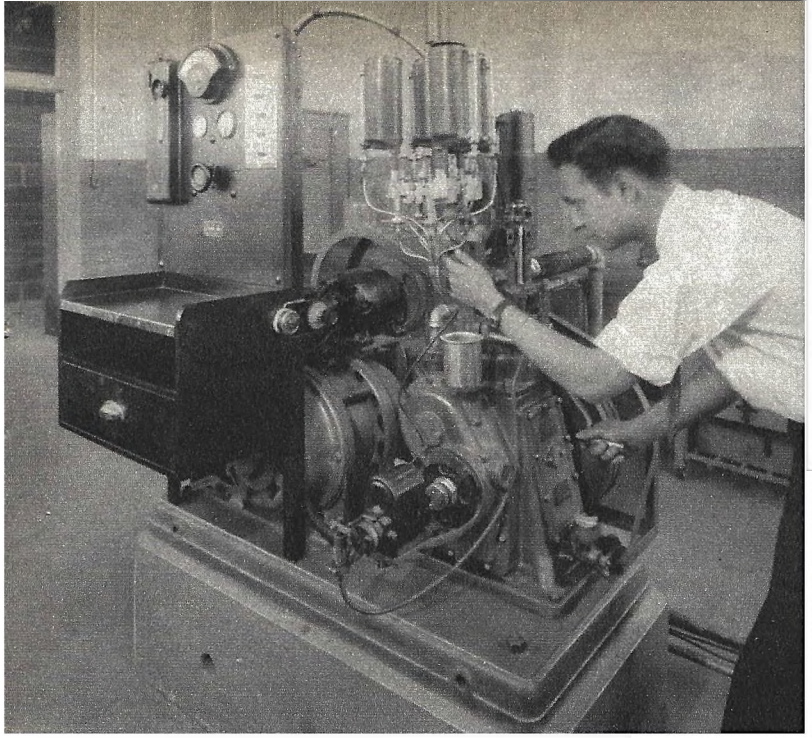


Torture Tests Tell

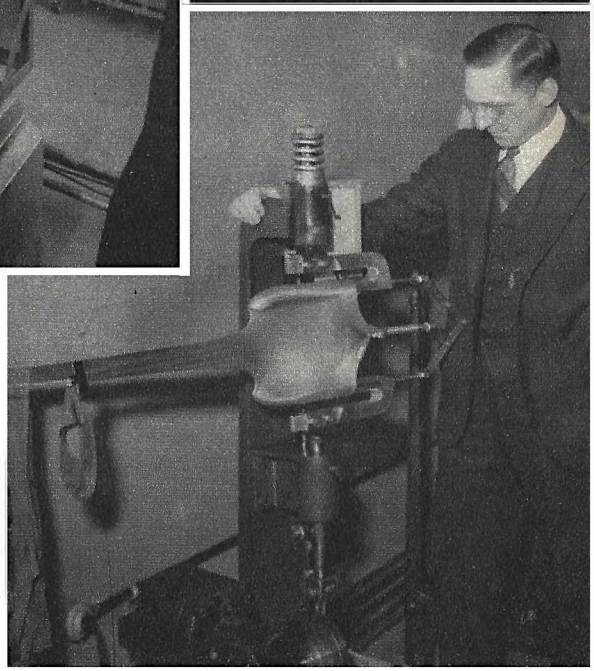
EVERY time you visit the dentist, break in a pair of new shoes, buy an electric light bulb, heat your home, drive an automobile, wind your watch or weigh your groceries, you are directly or indirectly affected by the work of scientists located in an enormous network of laboratories in an obscure section of Washington, D. C. This is the National Bureau of Standards, where a group of technical men seem to live in a complicated mechanical world that appears far afield from that of Mr. Average American Citizen. This Bureau of Standards, without the slightest exaggeration, is the nation's and probably the world's, greatest quality testing laboratory. Every day, in almost every conceivable way, it performs monumental tasks which help make life healthier, safer, happier, more comfortable and more convenient for every one of us.

Look at what the Bureau has done for the dental profession, for instance. Dental amalgam fillings have been used for more than 100 years, but it is only during the last 30 years that the dentist has been accurately advised on its two greatest defects: excessive shrinkage and flow. The dental research program at the Bureau of Standards has attacked these defects, made official ratings of manufacturers' products and because of its support, defective amalgams have practically been driven off the market.

The Bureau maintains the national standard of light. It gives technical advice on the performance characteristics to be included in Federal specifications for lamps and it tests lamps for the Federal Government, which uses them on an enormous scale. During the past fiscal year over 4,000,000 incandescent electric lamps were inspected before shipment, and more than 6,800 samples selected from these lamps were life-tested at the Bureau laboratories. Six thousand bulbs



Ingenious Machines in the National Bureau of Standards help bring to light unknown facts about peas, pants, pots and paints.



The shoe testing machine on the opposite page tests wear and tear on uppers and lowers. Within a short time a shoe "walks" many miles. Above: This machine determines the knock characteristics of motor fuel. Right: The hosiery testing machine pulls stockings crosswise and lengthwise, just as if a lady were wearing it. Poor stockings run and lose their shape.

The Truth

by James N. Miller

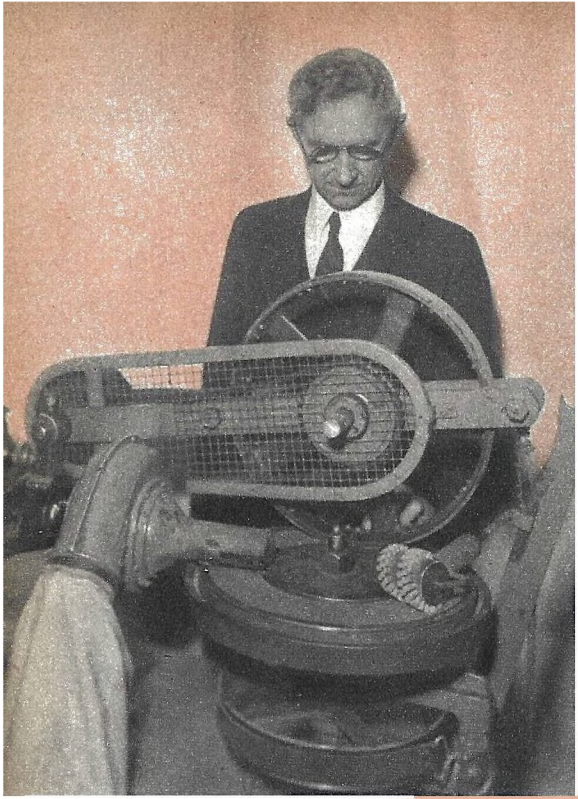
are tested annually on the "life testing" racks.

Whenever you buy a roll of wallpaper for your home or apartment, chances are that the Bureau of Standards, somewhere along the line, had a hand in the situation by establishing standards which give consumers practically all the information wanted concerning the quality of wallpaper based on weight, color fastness, grounding and printing. Detailed requirements are also set forth for printed, plain and embossed papers, including width of printed pattern and coverage of a single roll.

If your home is comfortable in winter, you should be grateful to technicians at the Bureau. From time to time studies are being made of all manner of house heating appliances including radiant gas heaters, thermostatic valves for radiators and fire hazards of domestic heating systems. One of the strange facts recently revealed is that painting of radiators has a marked effect on the amount of heat they will deliver to the room. When painted with bright metallic paint, such as aluminum and bronze, they supply less heat to the room than when painted with ordinary paints.

A remarkable machine in one of the Bureau laboratories tests the wear of carpets. This device produces the bending, slipping, twisting and compression of the pile that takes place when a carpet is walked upon. The durability of a carpet was found to be increased materially by increase in density or height of pile and by the use of underlays. Incidentally, this same type of machine is being used in a number of carpet manufacturers in improving their processes and products.

Fever thermometers are used in almost



and windows is usually either polished plate glass or so-called sheet glass. The first is characterized by its plane surfaces which do not distort reflected images and which eliminate distortion of objects when they are viewed through the glass at any angle. The second has a relatively smooth but characteristically wavy surface and objects viewed through sheet glass will be somewhat distorted, especially when the line of sight makes an acute angle with the glass surface.

It is quite probable that the quality of your raincoat depends upon tests made at the Bureau laboratories. One experiment in particular should interest you. It consists of a cycle of treatment of waterproofed fabrics, such as ducks and drills. Practically every conceivable condition of actual use is simulated, including light exposure, wetting and drying and crumpling.

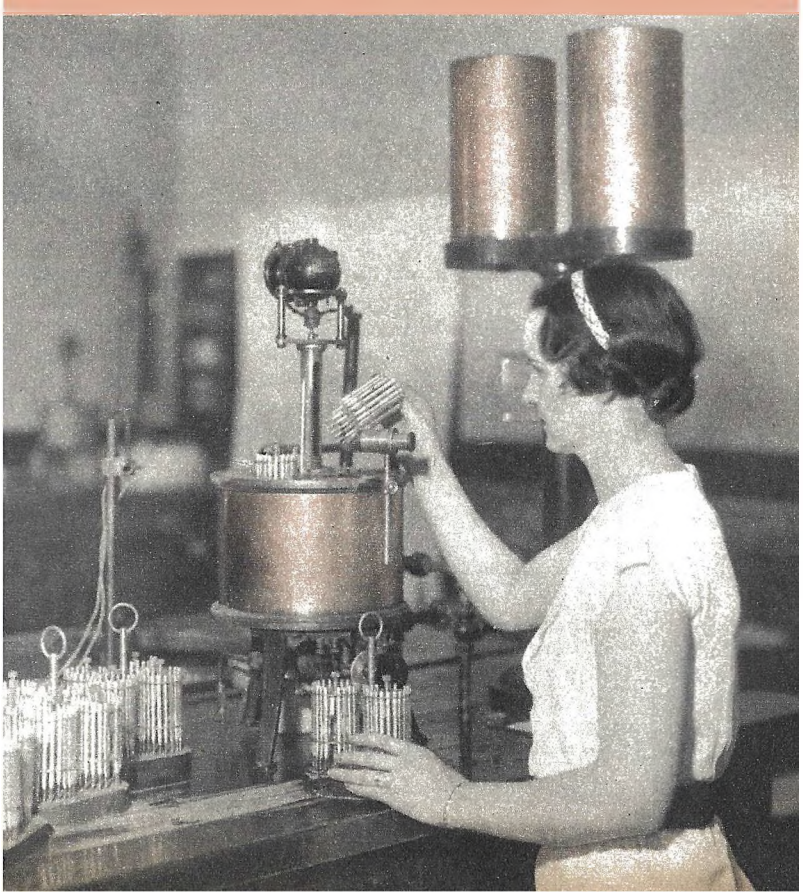
When laundered cotton fabrics are dried outdoors during the winter, particularly in New England, they frequently undergo excessive deterioration of a type called "winter

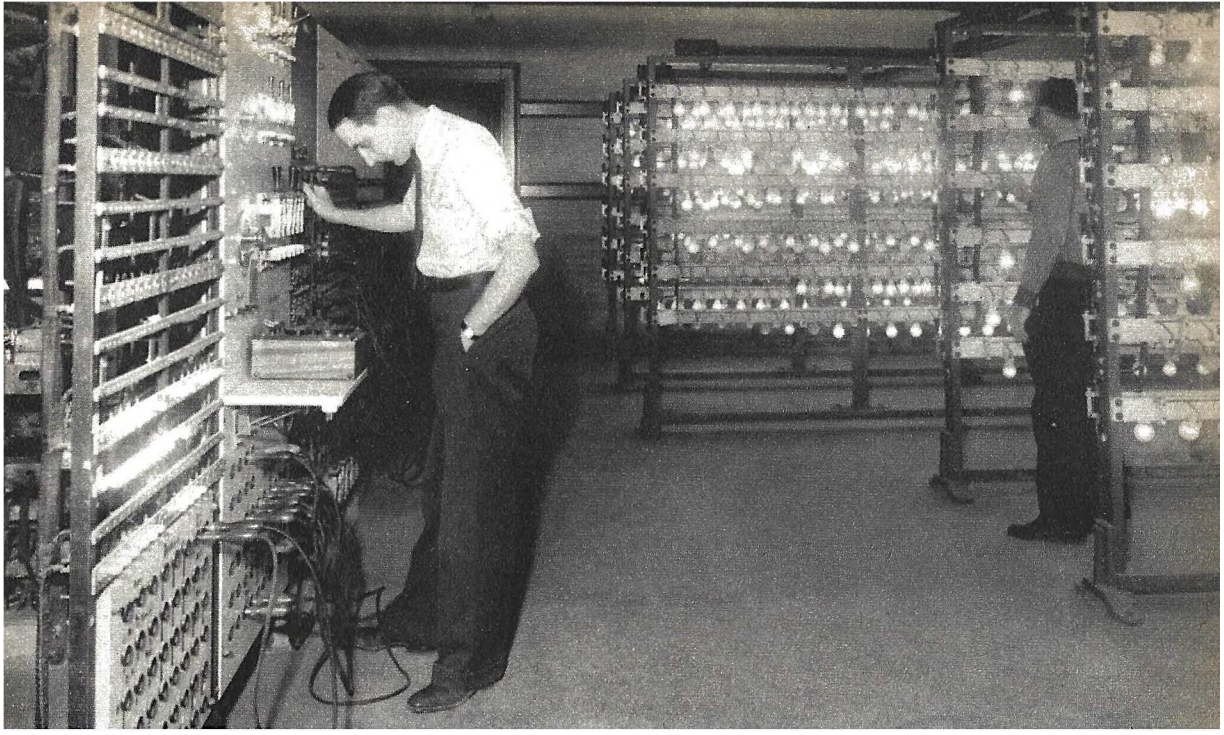
every household. The Bureau has established the official test methods and most of the specifications, and these are now incorporated in a commercial standard. Fever thermometers for household use generally are tested only by the manufacturer, but the tests are based on standards maintained for clinical thermometers used by the Federal Government.

The Bureau renders an important nation-wide service to the consumer through the direct or indirect standardization of devices used in weighing or measuring commodities purchased by over-the-counter buyers. It promotes uniform action in weights and measures administration throughout the country and serves as a clearing house for information on the subject.

Glass for glazing doors

How well does leather wear under all sorts of conditions? The above machine tells the story to the Bureau experts. Thermometers are checked in a temperature-controlled bath (below). Opposite page: Testing racks test 6,000 bulbs annually to determine their life span.





damage." An investigation of the trouble in a Bureau laboratory showed that this was due to sulphuric acid formed in the damp fabric by oxidation of atmospheric sulphur dioxide and that the damage could be remedied by using a small amount of calcium carbonate in the final rinse water.

Women's stocking have an annoying habit of wearing out or ripping at inconvenient times. Small wonder then that, at the request of the General Federation of Women's Clubs, a hosiery testing machine has been developed at the Bureau. This simulates the forces acting on a stocking at the knee and at the places where garters grip the hosiery. It alternately pulls the stocking crosswise and lengthwise, just as if a lady were wearing it. After a few pulls a poor stocking will show runs and lose its shape. A good stocking will withstand many pulls.

If ever you visit the Bureau laboratories, by all means take a look at the remarkable shoe-testing machine. As the spokes of an enormous wheel, containing six shoes, turn, a pair of shoes presses and rubs against a moving belt. This wears and strains the upper leather, linings, stitches and heels of the shoe, just as if a person were wearing it. Within a short time a shoe has "walked" many miles on this machine.

The Bureau sometimes extends its research activities into the field of sports. It recently announced, for instance, that its measurements of the liveliness of the American and National League baseballs showed no difference of any practical significance. Some National League balls are more lively than some American League balls and some are less lively. There are slight variations in liveliness of balls of either league, just as there are slight variations in weight within the official limits of 5 to 5¼ ounces and slight variations in circumference within the official limits of 9 to 9¼ inches.

The laboratory apparatus used is an adaptation of a machine developed by the Carnegie Institute of Technology for measuring the liveliness of golf balls. It consists of an air gun which fires a wooden projectile representing the bat against the ball which is "teed" like a golf ball. The ball and projectile are caught in swinging pendulums which measure their speeds.

The gun was taken to the ball park and used as a robot batter to drive out home runs. It was easily possible to knock the ball over the fence. Numerous measurements of distance were made under the same conditions in so far as possible. The average distance was the same for the American and National League balls within one foot, namely 367 feet for the conditions used. Individual shots went from 320 to 410 feet, the exact distance being largely due to the effect of variable winds.

How's the brake lining of your car? The brake testing machine automatically performs the following cycle of operations: the motor

[*Continued on page* 136]

FLOODS and Dust Storms Created in CLASSROOM

These high school students are not making mud pies, but are learning the effects of floods and erosion as graphically portrayed by miniature rivers passing between banks of sand. Alexander Brodell, instructor (glasses), explains the lesson.

Water sprayed on a sand hill from an overhead pipe serves to show how soil erosion occurs.

Sand, water and a vacuum cleaner illustrate how wind-swept ocean waves tend to eat away jettyless shorelines.

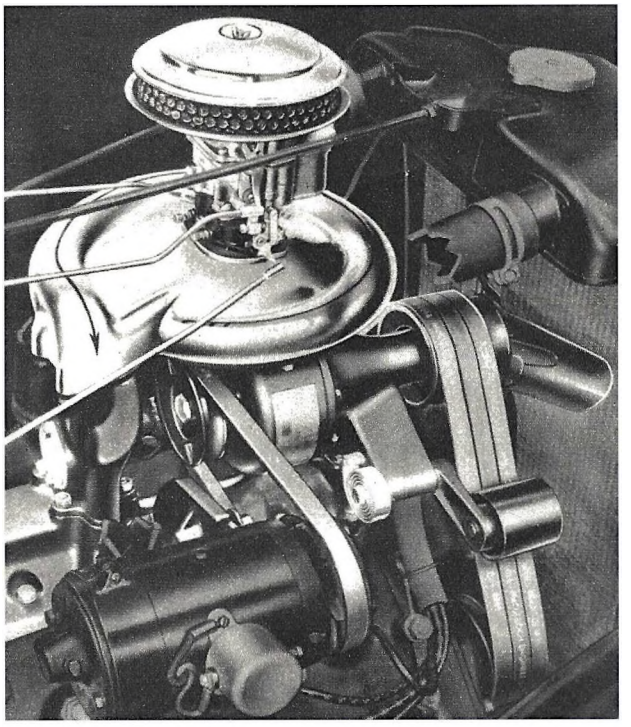
UTILIZING a sand table, a vacuum cleaner, water pipes and faucets, Alexander Brodell, physical science instructor at the Franklin K. Lane high school in the Queens section of New York, N. Y., creates miniature spectacles of nature's might to show his pupils the destructive effects of floods, erosion and dust storms. The water is used to create miniature rivers and lakes in the sand, while the vacuum cleaner creates a windstorm, the effects of which can readily be observed in the shifting shorelines. Dust storms are created by directing the blast of the vacuum cleaner on a box filled with sand.

Device Transfers Air Between Auto Tires

CONSISTING of a long rubber hose with specially designed fittings, a newly developed automotive device enables a driver to transfer air from each of the three sound tires of a car to a tire that has gone partially flat because of a slow leak, thus eliminating the need of changing the tire until a service station has been reached. The device is inexpensive.

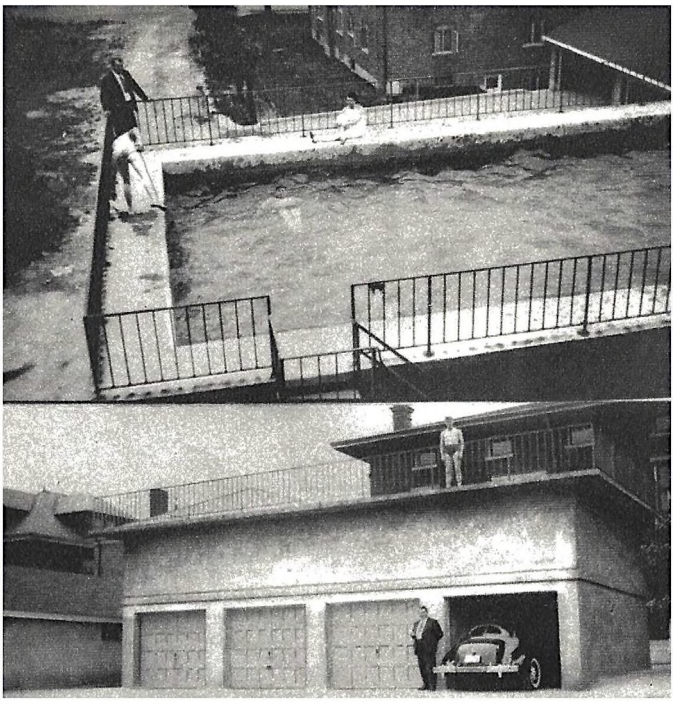
Supercharger Betters V-8 Auto Engine

FURNISHED with all necessary parts so that it can be easily installed without drilling any holes, a newly developed supercharger device for V-8 automobile engines is said to provide better gas mileage in addition to increased power. The supercharger automatically controls the temperature of the incoming gas mixture, decreasing the gas consumption by 7 to 20%. The effectiveness of the supercharger can be judged from the fact that it is claimed to "boost" the power of an 85-horsepower engine until it equals that of a 124-horsepower motor. The unit is installed directly above the engine, as shown in the photo at right.



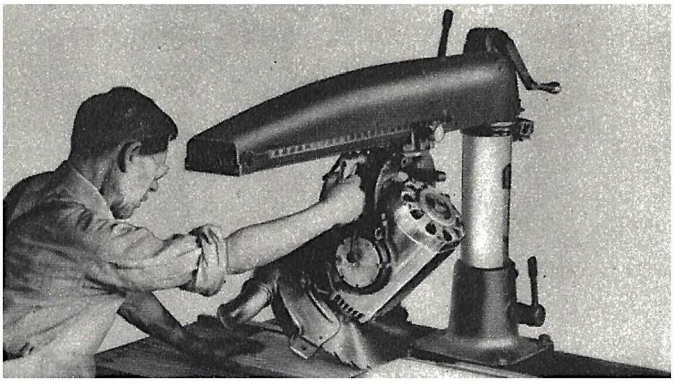
Paris Parade Attracts Novel Bicycles

A BICYCLE parade which was held in Paris, France, recently, attracted cyclists with bikes of every type and description. The photo shows one of the prize winners, a two-seater "family" bike to which is hitched a small trailer for transporting a youngster. Note the unusual three-seater bike in the background of the photo.



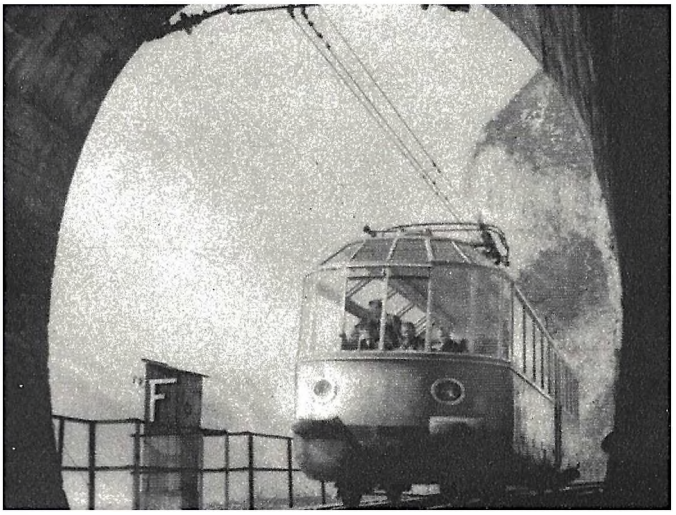
Builds Swimming Pool On Roof Of Garage

CONSTRUCTION of a swimming pool atop the roof of his four-car garage is the novel project recently completed by Henry Allendorf, of Cincinnati, Ohio. The pool features a runway surrounded by an iron fence and is 20x40 feet in size with a depth of six feet. Access to the pool, which also serves to cool the interior of the garage, is by means of an iron stairway. The photos at left show two different views of the unusual pool.



All-Purpose Machine Aids Woodworkers

PROVIDED with a variable speed control and a motor which can be revolved vertically 360 degrees, a new electrically-operated woodworking machine uses various cutting tools enabling it to handle cross-cutting, bevel cross-cutting (photo), fluting, shaping, and many other jobs.

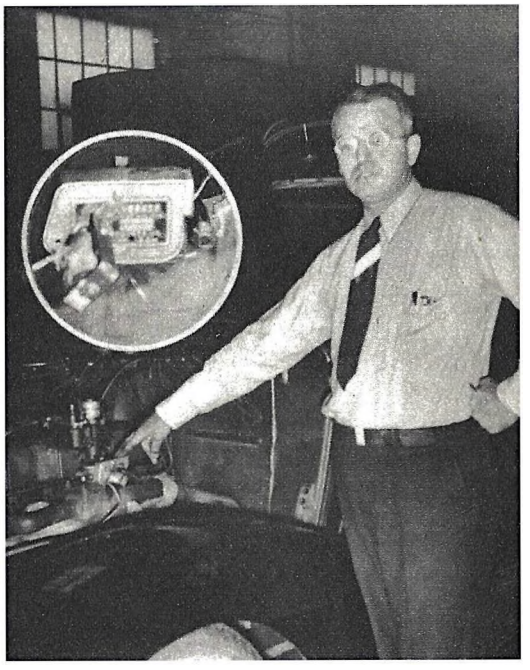


Observation Car Has Glass Roof, Sides

ONE of the latest innovations on an Austrian electric railroad system is an observation car with glass sides and roof which enable spectators to secure unrestricted views of the towering mountains in the scenic territory through which the car passes. The car is fitted with special shades which can be drawn in the event the sun becomes too warm for the passengers' comfort. The photo shows the observation car entering one of the numerous tunnels located along the route.

Ventilating Unit Serves As Kitchen Table

DESIGNED specially for apartment and bungalow dwellers who desire the advantage of attic ventilation, a new portable ventilator device fits into the doorway of a kitchen and is said to completely change the air of the rooms once every minute when the windows are open. The top of the cabinet can be used as a kitchen work table.

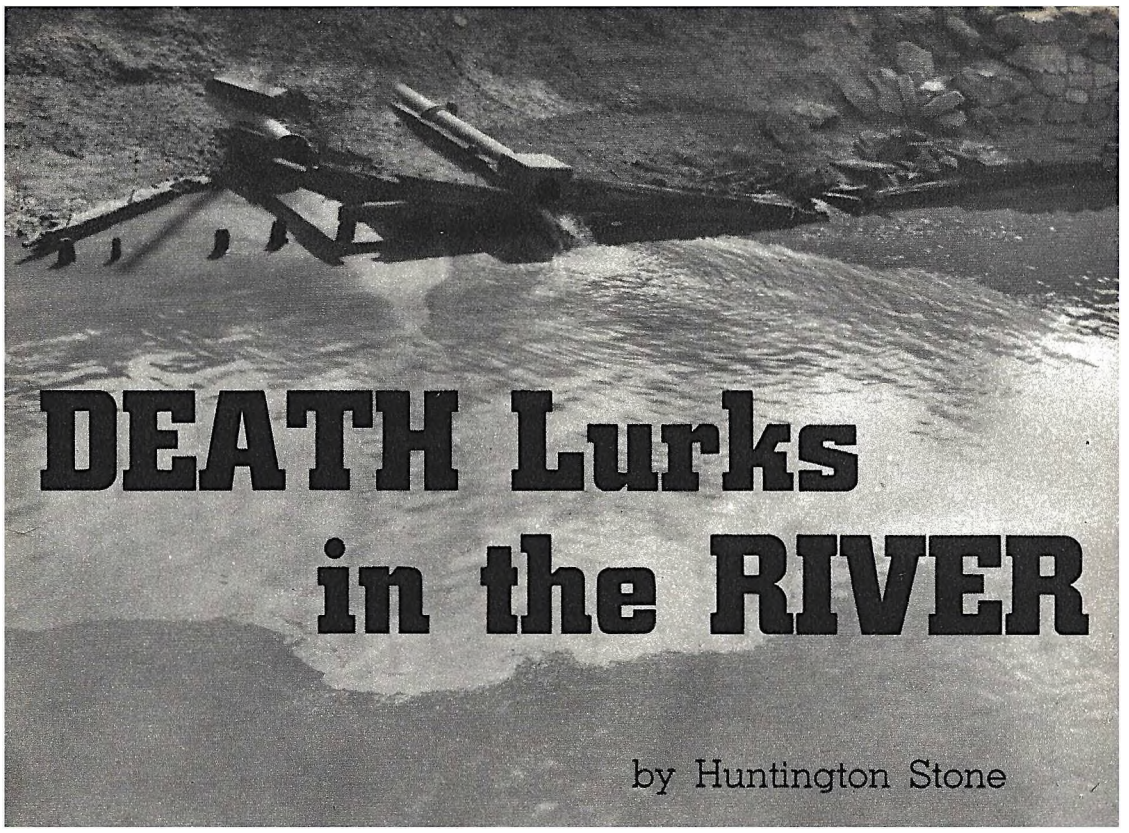


Engine Governor Controlled By Auto Headlights

AN AUTOMOBILE engine governor that operates only when the headlights of the car are turned on, thus automatically slowing up night traffic, has been invented by James D. Durgin, of Shrewsbury, Mass. Costing only a few dollars to manufacture, the governor is easily attached to the carburetor of the engine, as shown in the inset photograph.

Track Device Moves Heavy Freight Cars

INVENTED by Harold Pierce, of Pomona, Calif., a new electrically-operated railroad device weighs only 100 pounds, yet moves heavy freight cars with ease. The device consists of a small electric motor geared to an eccentric mechanism which motivates a metal shoe. When placed against the wheel of a freight car, as shown in photo, the curved shoe pushes under the wheel and moves the car.



DEATH Lurks in the RIVER

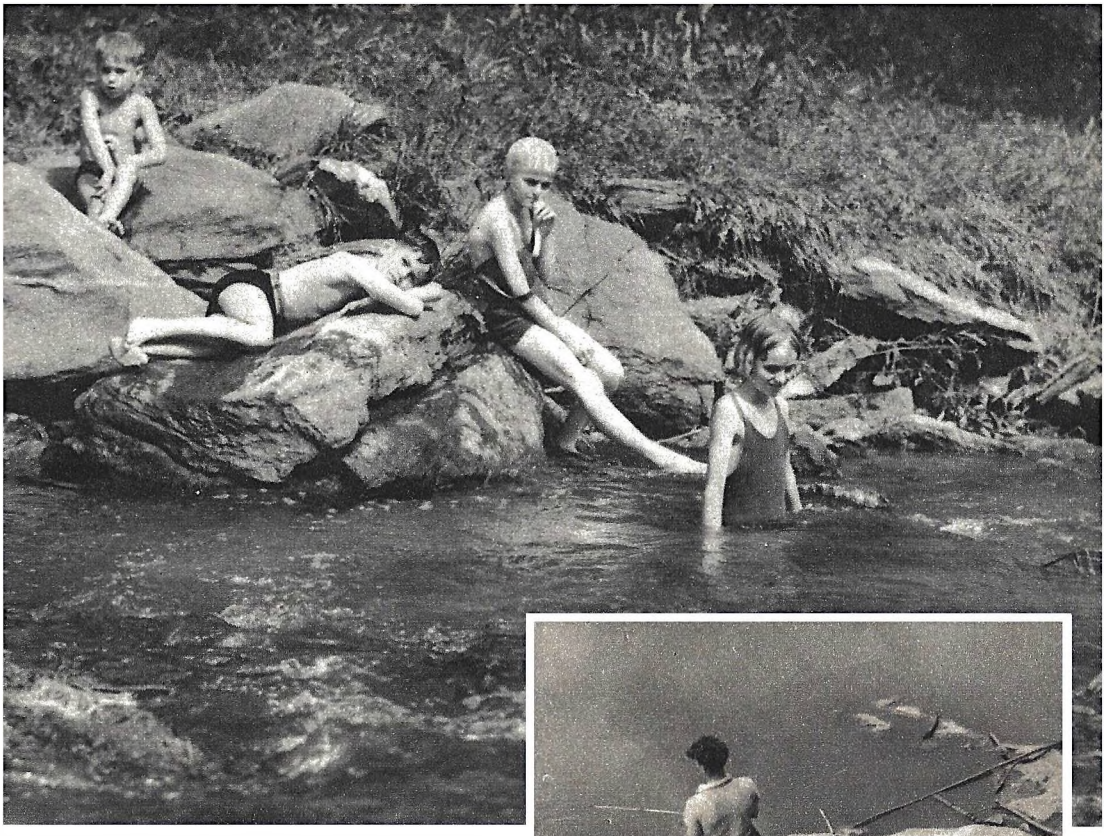
by Huntington Stone

Cellulose and sawdust pollution in the North Atlantic, acid pollution in the Middle Atlantic, malaria in the Coastal plain, soil erosion in the Piedmont plateau, unpalatable water in the South East—this is the dangerous condition of our coastal and inland waterways. This story tells what the government's special floating laboratory is doing about it.

WE HEAR much about pollution. Conservationists inform us that the defiling of our inland and coastal water is causing a serious health menace to human as well as to aquatic life at an alarming rate. The life or death of every type of American fresh water fish is involved: bass, trout, pickerel, pike, perch, crappie, catfish, carp, sturgeon, salmon, whitefish and many others. Our own health, particularly that of our children, is involved.

Factories and municipalities pour wastes into rivers at a rate that bodes ill for people being served by those waters. Experts rate the sulphuric acid drainage from bituminous coal mines as the most destructive of all forms of trade-waste pollution. The acid destroys metal boat bottoms, boiler tubes and steel waterlock equipment. It disintegrates concrete and filters into springs and wells. Flood overflow of acid-tainted water kills all but the hardiest vegetation. The amount of acid drained into the Ohio river system in one year was estimated by the Public Health Service at over 3,000,000 tons; losses resulting from this drainage exceed $10,000,000 a year. Abandoned mines in Pennsylvania, Ohio, West Virginia, Kentucky, Indiana, Maryland, Alabama and Tennessee have been responsible for much acid pollution.

New England and the North Atlantic States are suffering from excessive pollution of surface waters. The middle Atlantic States present a variety of problems including soil erosion in the Piedmont plateau, malaria in the coastal plain and a shortage of sewerage facilities in the densely populated areas. In the Southeast there is need for increased



Factories and municipalities pour wastes into rivers at an alarming rate. (See photo on opposite page.) Surface waste (right) is poison to aquatic life; makes water unpalatable. Improper sewer disposal pollutes our rivers and streams; threatens children with infantile paralysis (above).

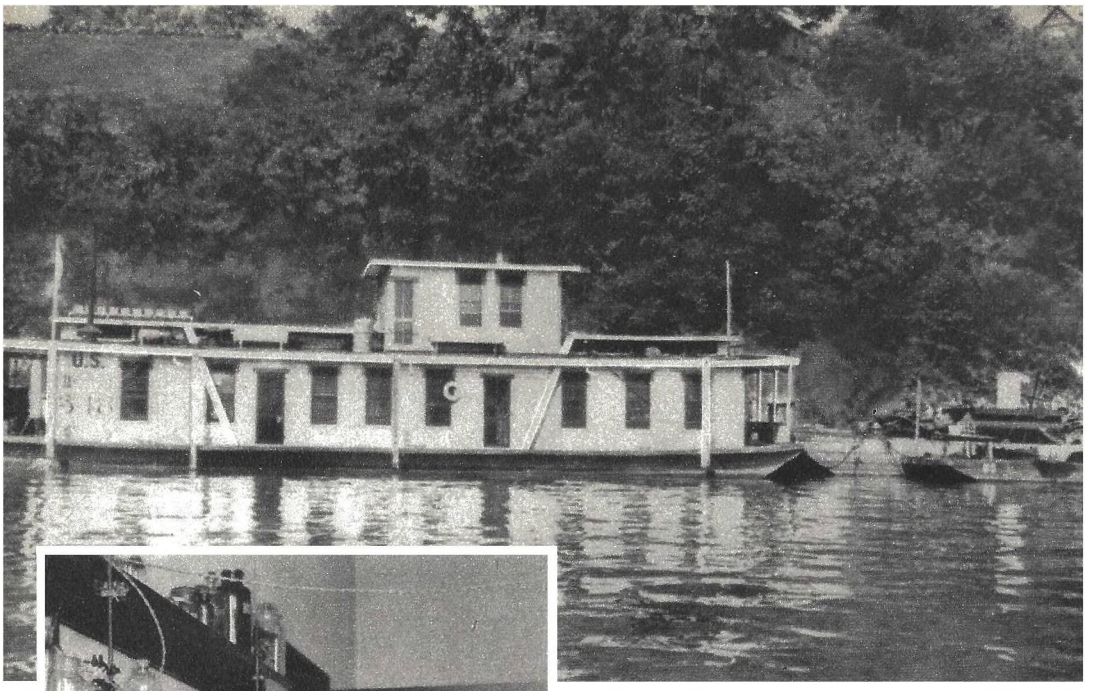
public-health protection in malaria-infested areas and of improvement of unpalatable water supplies. The Ohio basin is being used by mankind as a sewer, a source of water supply, an outlet for floods and a highway. Something, at least should be done for its polluted condition.

Is anything definite being done to curb the ravages of pollution?

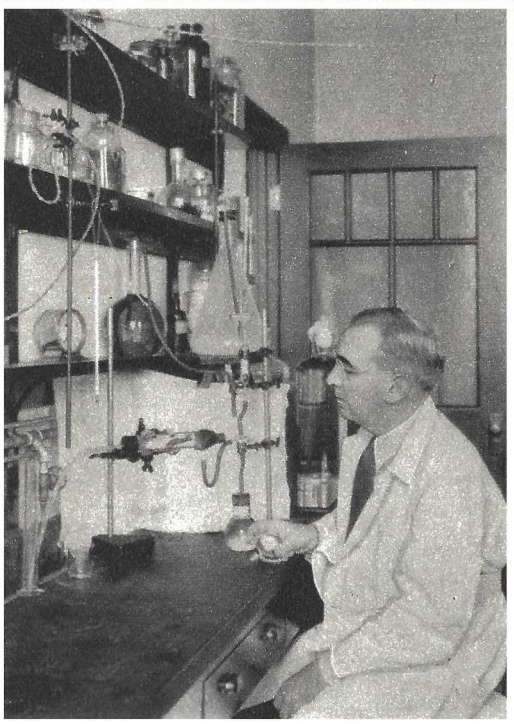
The National Resources Committee recently made a report covering our inland and coastal water conditions, which was sent to congress by President Roosevelt. It called for an expenditure of nearly 2¼ billion dollars to purify and harness our water resources. No less than $135,000,000 was recommended for the New York metropolitan area alone. The Board announces that at least $15,000,000 will be needed to clean up but a single river: the drainage area of the historic Potomac, involving Virginia, Maryland, Pennsylvania and the District of Columbia.

The government, at least, is not sitting back, taking it on the chin. Extensive experiments are being conducted to locate and check polluted areas and the best approach has proved to be through the Bureau of Fisheries. To this end, Dr. M. M. Ellis of the Federal Bureau of Fisheries conceived and brought into being one of the most amazing laboratories in the world.

Nothing much was said about the work of the "floating laboratory," as it is called, for in its experimental stage it was not known whether it would be a success. But now, after Dr. Ellis has completed some 10,000 tests



Over 10,000 tests of inland water pollution have been made in this floating government laboratory by Dr. Ellis.



Dr. Ellis is shown here testing the effect of various pollutants on live fish with a machine of his own design.

and scientific experiments on a good proportion of America's navigable waters, the story can be told.

What the scientists aboard this unique craft have learned about pollution concerns every man, woman and child in the United States. Due to this work, it is probable that the fishing in your own community is being benefited this month. Heretofore it has been practically universally believed that pollution was a necessary evil. Man simply had to get rid of the wastes he created, and dumping them into the river was the accepted method. The pollution was there and it would cost too much to eradicate it. Now, however, Dr. Ellis has discovered that man may still pour a goodly proportion of his wastes into moving bodies of water and do relatively little harm.

Let us see how Dr. Ellis operates and what he has discovered. First the laboratory itself: It resembles the average Mississippi River steamboat, flat-bottomed and of slight draft. It was developed at the research base of the Fisheries Bureau at Columbia, Missouri, and is operated in conjunction with the Missouri State University. The laboratory is filled with delicate and amazing instruments invented by Dr. Ellis and is equipped with specially designed research rooms. Naturally the first step in the huge program was to determine what the reaction would be when exposed to every conceivable kind of pollutant, including domestic sewage, waste from coal mines and acid from tanning factories.

To learn this, live fish are used as the guinea pigs. They are held captive in a glass tube which is suspended over the laboratory table. This tube has both outlet and inlet, and by means of a triple valve, water from three separate sources can be introduced into it at will.

In order to use this instrument with utmost efficiency the exact defilement of the water from the different sources is first determined and then placed in three separate containers, all connecting with the tube by means of the triple valve. Each individual fish is subjected in turn to the various waste-filled waters and the precise effect is noted by Dr. Ellis.

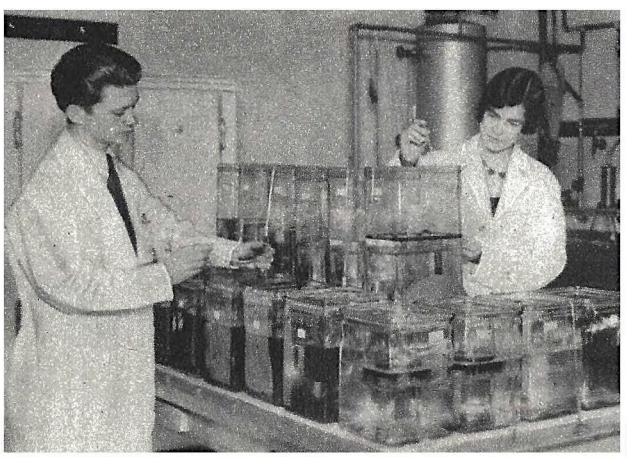
By repeatedly using this test, the scientist can name the exact location of polluted waters that are killing aquatic life and harming humans. By knowing the chemical content of the water, he also can determine what pollution agent is doing the damage.

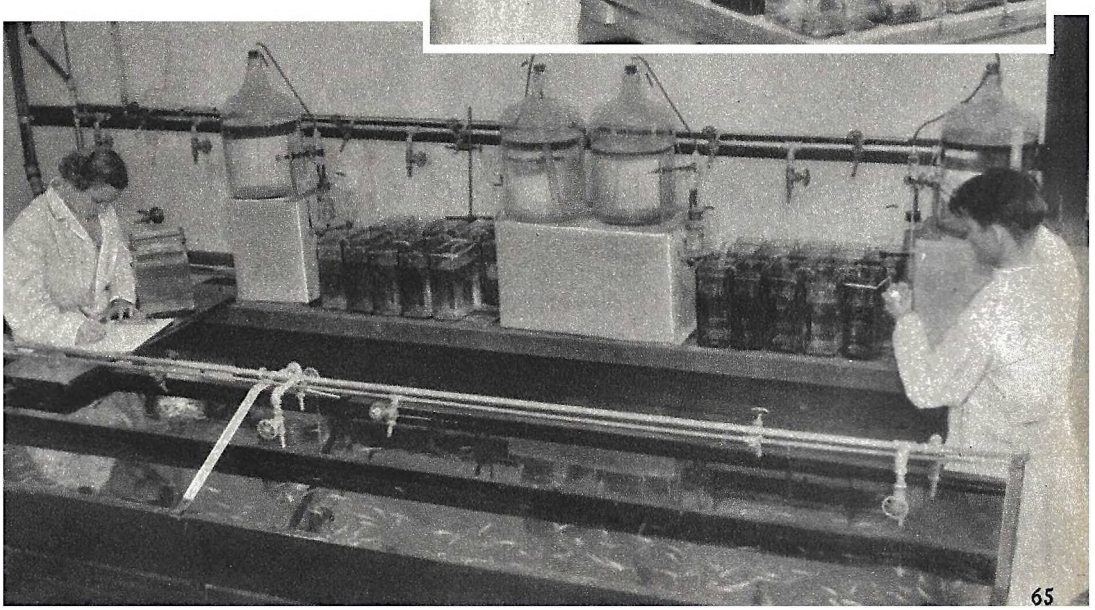
Another research room is used to study the effect of oil-polluted water on the nation's aquatic life. Live fish are kept in glass jars into which oil of various types (including fresh petroleum and drained crankcase oil) and in varying amounts, is introduced. Tests conducted here prove conclusively just how much oil in fresh water is dangerous and in what locations it does the most harm. Results of the hundreds of river trips are analyzed and calculated at the headquarters laboratory at Columbia.

One section of the main laboratory is devoted to studying the salt content of river water. This pollutant comes from waste materials of ice-cream plants, salt mines and metal mines, and foundries which throw away on a large scale, refuse materials such as lead, copper, iron, arsenic and zinc. The salt content is ascertained by determining the conductivity of the water. This is done by simply shooting an electric current through it and then picking it up with a headset. In other words, instead of using a wire to conduct the current, represented in this test by telegraphic signals, the water itself is used as a conductor. The operator, picking up the signals after they have passed through the fluid, can discover immediately, by the intensity of the signals, the exact amount of salt present.

Another section of the laboratory is devoted to one of the most unusual experiments of all, involving the measuring of a live fish's heart action! First a delicate stethoscope-like instrument is placed over the creature's

[*Continued on page* 139]

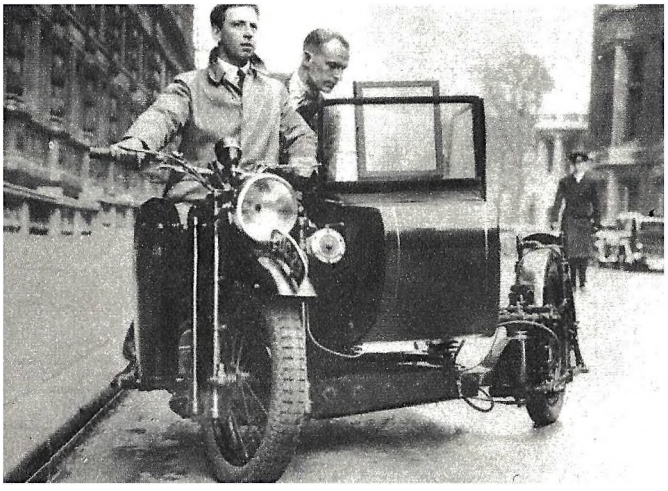




Laboratory assistants are shown testing the effects of various oil solutions on fish at right. Below: Testing for acid and metallic poison. Note fish tank in the foreground.

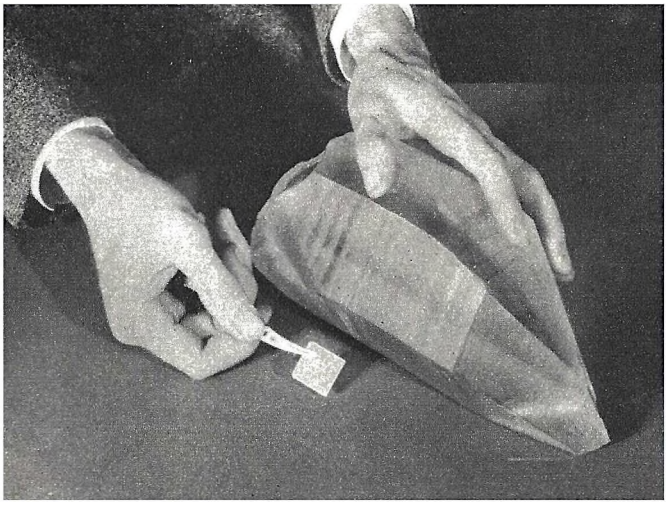
Conducts Ionosphere Radio Tests

EXTENSIVE research to determine how shifts in the ion layer, which is about 100 miles above the earth, affect variations in the strength of radio signals, is being conducted at Harvard University by Dr. Harry R. Mimno. A special radio transmitter is used to send up a continuous signal and the clarity of the signal as it is reflected by the ion layer, is then recorded on a photographic chart.



Tri-Wheel Motorcycle Tests Pavements

A FLEET of specially constructed three-wheel motorcycles enables British highway engineers to check the anti-skid qualities of new road pavements. The third wheel of each motorcycle is set at an 18-degree angle so that it is free to revolve or skid when the brake is applied, its behaviour being recorded automatically by a device carried in a sidecar.

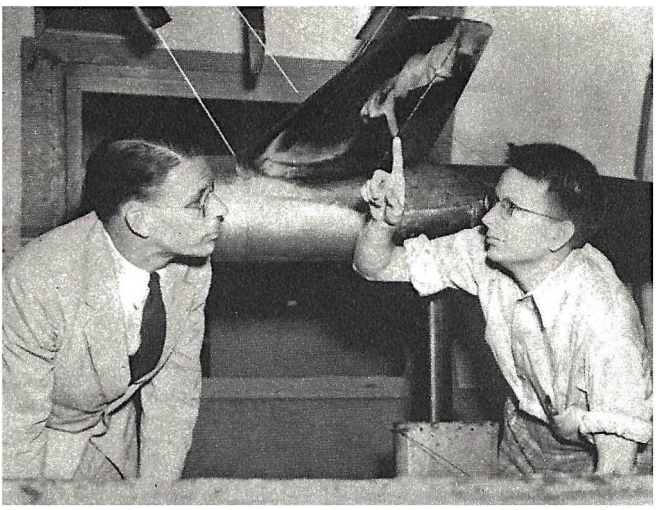


Tiny Quartz Crystal Is Ideal Oscillator

TWENTY million vibrations per second is the phenomenal mechanical speed achieved by a tiny quartz crystal used in a new oscillator developed by General Electric engineers for maintaining constant frequencies in radio transmitting. The oscillators enable radio broadcasters to hold their transmitters to assigned wave lengths. The photo shows one of the tiny crystals held beside a piece of natural quartz.

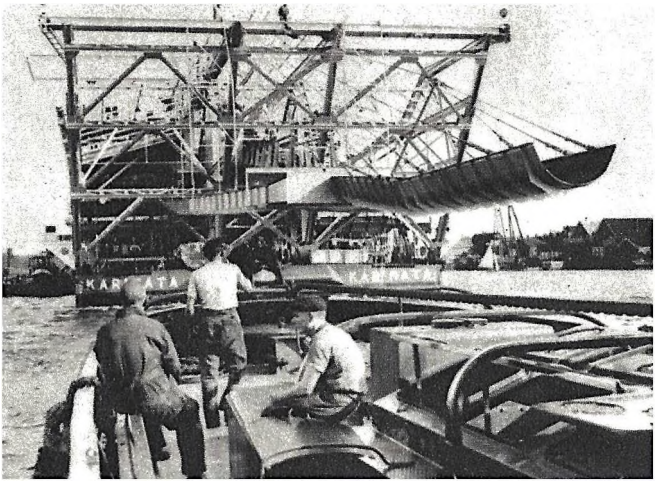
New Type Wing Slots May Improve Planes

A NEW type of wing slot which may enable airplanes to land more slowly, thus increasing the safety factor, is being experimented with by Dr. Clark B. Millikan, professor of aeronautics at California Institute of Technology. As demonstrated on the model plane in the photo, the slots are located on the lower surface of the wing and are said to increase the lifting capacity of the wing even at slow speeds.



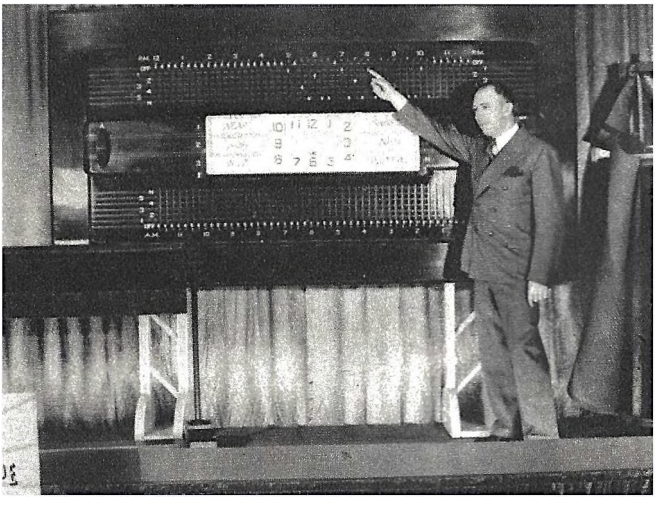
Ship With Huge Scoop Seeks Lost Treasure

EQUIPPED with a specially constructed scoop, which can be lowered to a depth of approximately 90 feet, a Dutch dredge, the *Karimata,* will soon be used in an attempt to recover part of the gold treasure which was aboard the British frigate *Lutine* which was wrecked in 1799. The gold is believed to have scattered over the ocean bottom when the sunken vessel split open.



Radio Control Device Preselects Programs

A RADIO control unit which permits the preselection of favorite programs, throughout the entire day and night on five different stations, has been developed by a well known electrical firm. The pretimer does not interfere with the normal operations of the receiver and stations may be manually tuned in if desired. The photo at right shows a demonstrator with a large-scale model of the radio control unit.

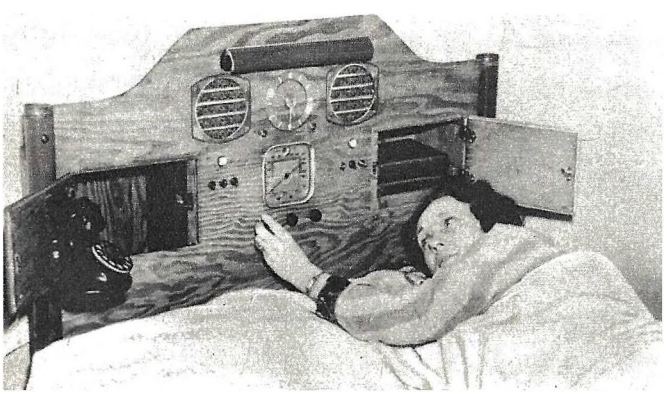


Radio Amateur Gets Award For Distinguished Service

IN RECOGNITION of distinguished service rendered during the January, 1937, Ohio River flood emergency when he co-operated with civil and military authorities in the transmission of official communications for more than 40 hours without sleep, Robert T. Anderson, of Harrisburg, Ill., was recently awarded the William S. Paley Amateur Radio Award for 1937. In the photo above, Anderson (left) is shown receiving the trophy from its donor, William S. Paley, president of the Columbia Broadcasting System.

Huge Electric Lamp Globe Covers Kneeling Girl

DEVELOPED in the laboratories of a well known electrical products manufacturer, a new incandescent electric lamp has a globe so large that it completely encloses an average size kneeling girl, as shown above. The huge lamp is rated at 100,000 watts and has filaments of about the same diameter as an ordinary lead pencil. The large glass cup shown in the hands of the man is sealed to the lamp, forming its base. Note the standard 60-watt electric bulb in the hands of the girl demonstrator.

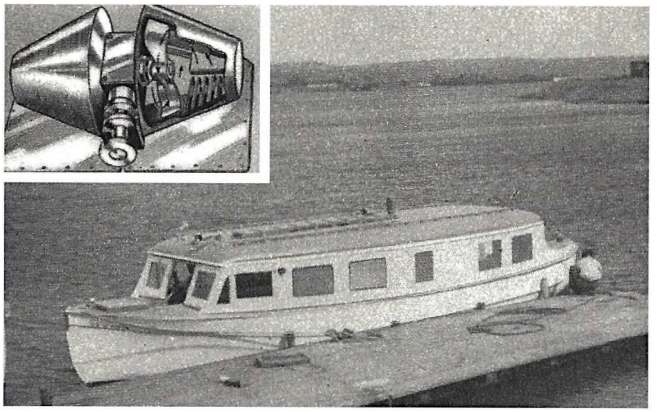


Bed Headboard Holds Many Gadgets

A BED headboard which features space and wiring for numerous electrical contrivances has been developed by Frank Hasencamp, of Chattanooga, Tenn. As shown in photo, the headboard accommodates a telephone, radio, fan, clock and thermostats for controlling room temperature.

Propellerless Cruiser Navigates Shallows

DESIGNED for use in shallow waters, a novel 40-foot propellerless boat has been constructed by Fred Dingle, of St. Paul, Minn. Instead of propellers, the craft features two 33-inch cones with motor-driven blades (inset photo), which pull in and expel the water to provide forward speed.



Delicate "Atom Sifter" Perfected By Scientist

DESCRIBED as the most delicate "atom sifter" known to science, the apparatus shown at right was perfected by Dr. Alfred O. Nier, of Harvard University in Cambridge, Mass. Technically known as a mass spectrometer, the apparatus is designed to detect the presence of rare isotopic forms and to give the most accurate measurements ever made of the relative abundance of different isotypes present in an element.

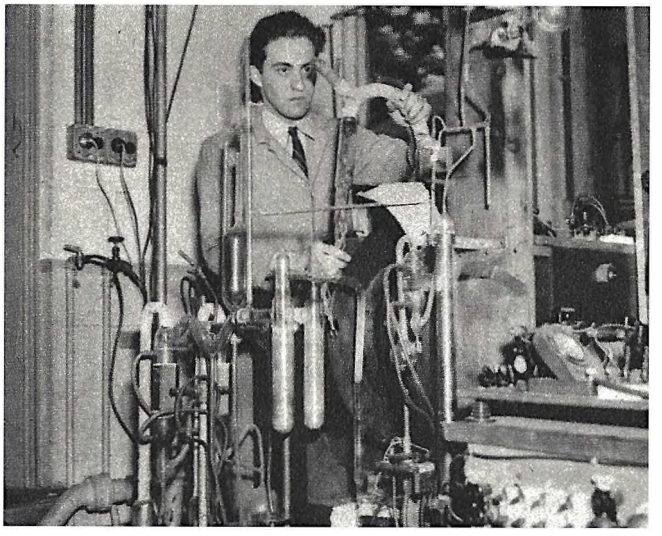
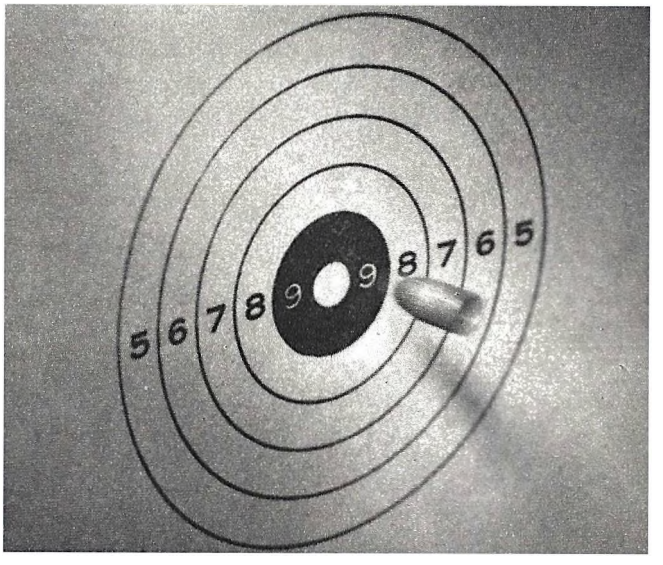


Photo Shows Bullet In Flight To Target

OF INTEREST to rifleman and photographer alike, the unusual photo at the right shows a .22 caliber bullet in flight a fraction of a second before it pierced the bull's eye of the target at which it was fired during tests in a Bridgeport, Conn., munitions factory. The bullet had a rated muzzle velocity of about 1,200 feet per second and the photo was taken by an electrically controlled camera which was wired to the rifle that fired the bullet.



RHYTHM

One electrode of the "brain writer" is fastened to the top of the patient's head with collodion. The other electrode is placed on the neck, completing the circuit for the recording machine.

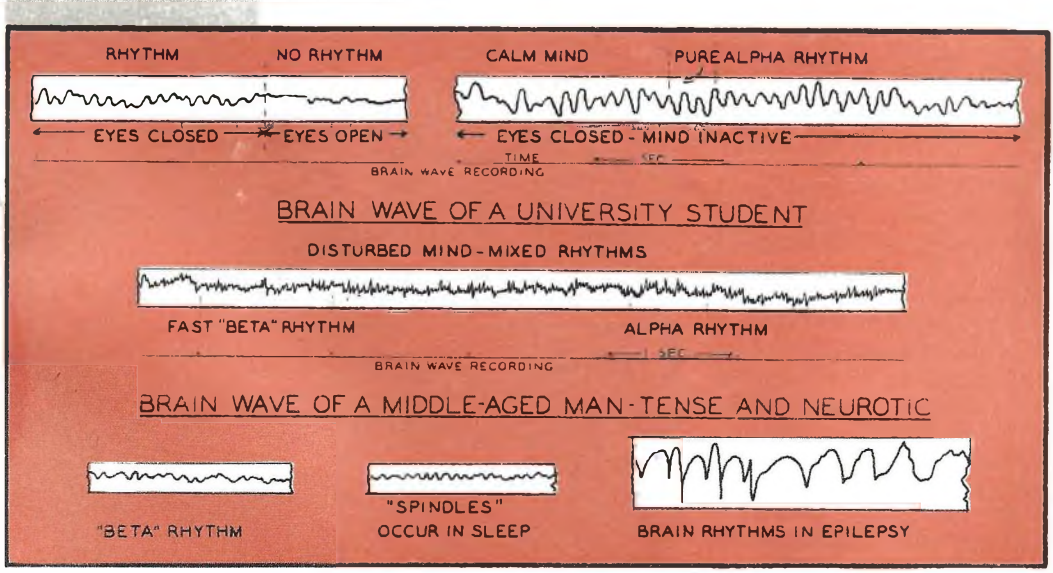
THERE is electricity in your brain, and with its help, "X-Ray" pictures of the human soul may not be more than a short step into the future, according to results shown by science's latest machine—the electro-encephalograph—more simply known as the "brain writer."

The tiny nerve cells which make up the gray matter of the brain generate electrical energy which often forms smooth, rhythmic waves. When something is wrong with the brain, these waves become distorted, sometimes the rhythm changes, running wild like an engine without a governor. Studies of these brain waves now show why the problem child misbehaves, how mental diseases may be more successfully treated, even what causes epilepsy, a problem which has baffled medical science for centuries.

Brain electricity was first discovered by Caton in England in 1875, but little was learned about it until recently. The voltages were so tiny that earlier investigators had to saw out an opening in the skull and connect their electrodes directly to the brain—a procedure which aroused no enthusiasm among prospective subjects.

Dr. Hans Berger had a better idea. With the aid of radio communication engineers, he obtained an enormously sensitive amplifier, so sensitive that these tiny brain voltages could be picked up by simply placing electrodes against the subject's head. To the amplifier he connected a recording machine, which would trace out on a rapidly-moving tape a record of these brain voltages.

He installed this apparatus in his neuro-psychiatric laboratory in Jena, Germany. He tried it out on his first subject early in 1928. In the quiet, darkened room, the vibrating pen of the recorder traced a rambling, jagged



in Your BRAIN

Tiny electric waves permit new study of mental conditions.

by John H. Potts

line indicating brain voltages like those reported by earlier scientists. Minutes passed. The subject grew bored; relaxed, closed his eyes. Instantly the recording pen traced a beautiful, smooth, rhythmic wave—one never before discovered. Dr. Berger glanced at his subject.

"Open your eyes," he said. The subject did so. The wave vanished.

"Now close them again." The wave reappeared.

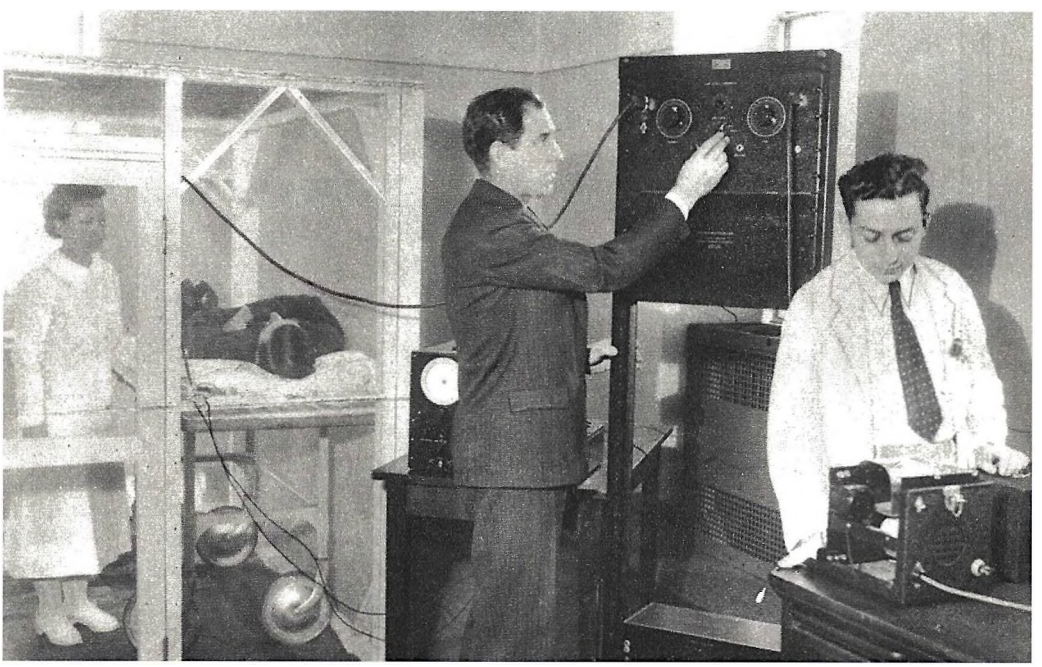
Was this wave caused by muscular movements of the eyelids or was it truly a brain wave? A simple test would show. With his eyes closed, the subject was asked to do a simple problem in mental arithmetic. While thinking about it, the wave disappeared. As soon as the problem was solved, the wave came back. It was really a brain wave! When the eyes were open, the brain was unconsciously busy registering the patterns before the eyes. When closed, and the mind was at rest, the unharnessed energy of the brain cells produced this rhythmic wave.

This brain wave, the strongest and most common normal type, Dr. Berger termed the Alpha rhythm. Its rhythmic beat occurs at the rate of 8 to 13 per second, usually about 10 in most persons. Its intensity varies in different individuals between 20 and 75 millionths of a volt, averaging about 50 normally.

A second normal rhythm of somewhat lower intensity and faster, ranging between 18 and 50 per second, Dr. Berger called the

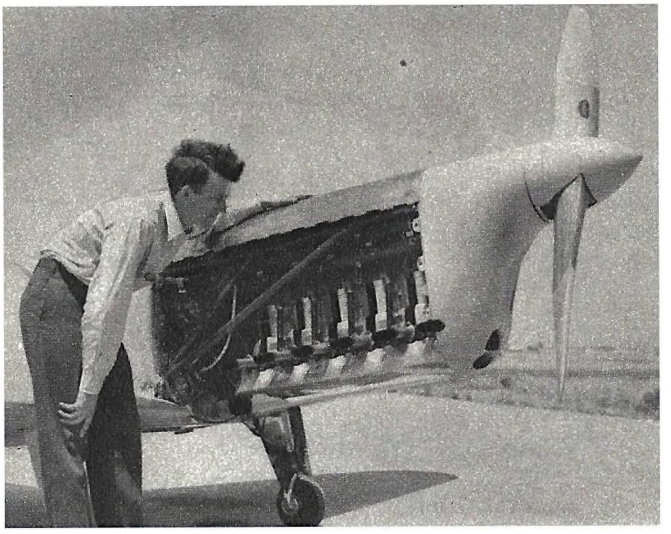
[*Continued on page* 139]

Dr. C. C. Clark is shown adjusting the electroencephalograph for amplifying the electrical energy given off by the brain. A hospital physician examines the waves being traced out on the recorder, while a nurse stands beside the subject.



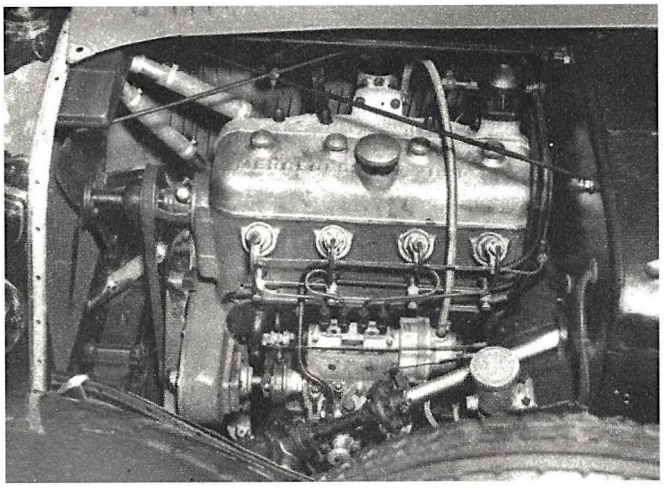
Model Boat Builders Compete In Regatta

ALL the thrills of boat racing were produced on a miniature scale at a model boat regatta held in New York, N. Y., recently. The regatta, which was held on Conservatory Lake in the city's famous Central Park, attracted hundreds of contestants and featured models powered by gasoline and steam engines as well as sailboats of various classes. The photo at right shows the prize winners.



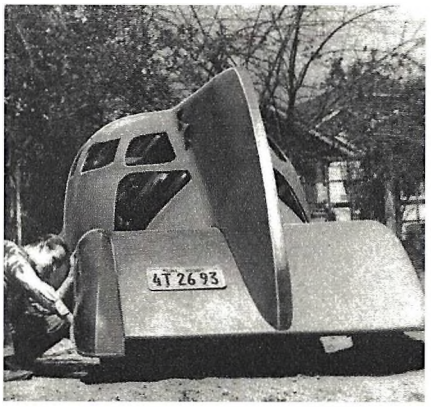
Midget Speed Plane Travels 350 M.P.H.

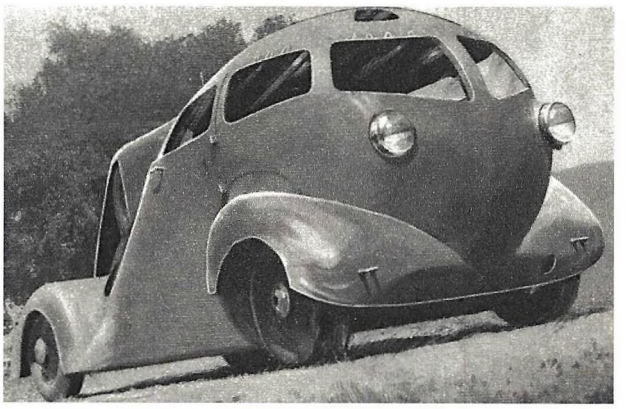
POWERED by a 500-horsepower air-cooled inverted engine, a tiny speed plane owned by William Schoenfeldt, of Los Angeles, Calif., is said to be capable of speeding at 350 m.p.h. Equipped with a retractable landing gear, the plane has a wingspan of only 18 feet and weighs 1,500 pounds. The midget racer will be flown at air meets throughout the country by Tony Le Vier, well-known racing pilot, shown in photo.



Imports Stock Model Diesel Automobile

A SEVEN-PASSENGER diesel-powered automobile recently imported from Germany by D. W. Griffith, Hollywood motion picture director, is claimed to be the first stock model car of its type ever sold in the United States. Said to travel 35 miles on a gallon of fuel costing six cents, the auto is powered by a 45-horsepower engine, as shown at right, and can attain a speed of 65 m.p.h.



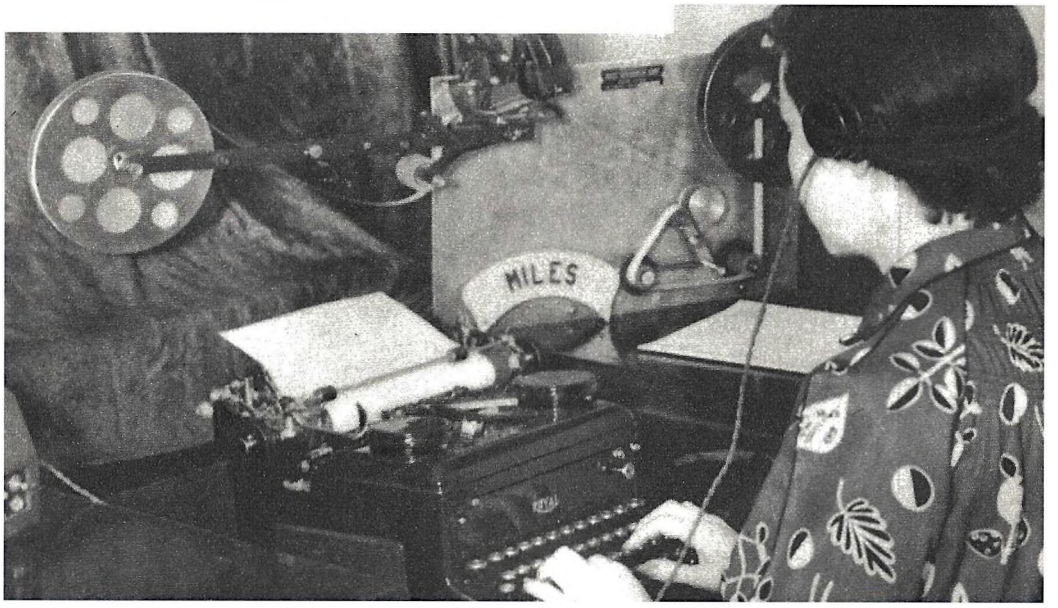


Home-Built Auto Is Real "Teardrop"

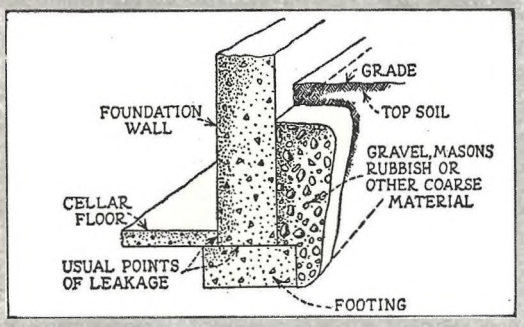
RESEMBLING in many respects the streamlined "Trailmobile" which appeared on the cover of our September, 1937 issue (right), the novel teardrop auto shown above was constructed by Charles Christman and Bill Quiggle, of Los Angeles, Calif. The home-built auto has a 35 horsepower engine which is coupled direct to the rear axle, increasing the power delivered. The vertical fin at the back of the body aids stability.

Machine Records Dictation On Film

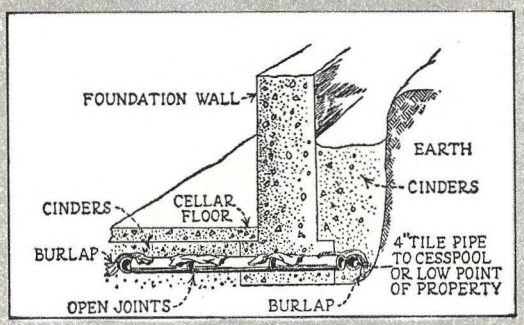
A NEW electro-mechanical device records dictation permanently on film, transcribing the message immediately after recording without processing of any kind. About 80 minutes of dictation can be recorded on a roll of film costing 80 cents.



"First Aid for the



A usual cause for wet cellars is the collecting of rain water in a loose filling of the excavation outside foundation walls.



Drain tile laid at the footing of a foundation will carry off water that would otherwise work into the cellar.

A CELLAR built at a spot where the ground water level is known to be high can be made water-tight by membrane waterproofing built in during construction. This consists of layers of felt or other material impregnated with asphalt or tar, completely lining the celler and bedded in concrete.

When a finished cellar is found to be wet from a high water level, membrane waterproofing can be applied to the floor and the inner surface of the walls. The impregnated material, which comes in rolls 32 inches or so wide, is mopped to the foundations and floor with liquid asphalt, pitch, or tar. Sheets are laid from the top of a wall, across the floor, and up the opposite wall; adjoining sheets are overlapped by more than one-half their width and mopped together. The joint between walls and floor is reinforced with one or two extra thicknesses. Two layers of sheets, giving four thicknesses, and surfaced with asphalt or tar, should be sufficient for severe conditions.

When completed, the waterproofing must be held in place by a concrete lining covering walls and floor, to give the support necessary to resist the water pressure from outside. Without a masonry lining, outside pressure might tear the waterproofing from its position.

The thickness of a cement floor lining will depend on the water pressure that must be resisted; for ordinary conditions, 3 inches should be sufficient. The concrete facing of the walls should be reinforced with metal lath. Self-furring or ribbed lath can be secured by bending the bottom edge of a sheet at a right angle and bedding it in the concrete floor; the upper edge is nailed to the wall above the waterproofing.

Membrane waterproofing is best applied by a professional, although a home owner might be able to do the work himself. The impregnated fabric, asphalt or tar, and other materials are on common sale.

When a house is built, the part of the excavation that is outside the foundation walls is usually filled not with solid earth but with stones, broken brick, chunks of cement and mortar, and other material in loose pieces. The spaces between these form a collecting place for rain water that runs down the walls of the house. The pool of water that forms is the cause of many wet cellars; the water will find its way through poorly mortared joints, through places where the cement and concrete are porous, and through cracks. Working its way under the floor, it will leak through the joint between the floor and the walls, through cracks in the floor, and through the floor itself.

This condition outside the cellar walls, and leakage through the walls and floor, can be tested. Dig a hole a foot or more deep close to the wall, and let water run into it from a hose. If the water disappears into the ground, let it continue to run for some hours, and then note from inside the cellar whether there are any signs of leakage through walls or floor. Wet spots show weak places in the masonry and indicate that water collects outside the walls.

Ailing House"

by Roger B. Whitman

To prevent water from entering the space outside the foundations, pack earth along the walls to form a sloping bank 2 feet or more high and 6 to 10 feet broad. With this bank covered with grass, water will drain away from the house instead of sinking in at the walls.

Another method, which is surer but more expensive, begins with an excavation around the foundation walls as deep as the footings. A line of drain tile is laid at the bottom, connecting with a sewer, street gutter, dry well, or other outlet at a lower level. Before the excavation is filled, the outside of the walls is coated with pitch, asphalt, or dense portland cement mortar.

The discharge from leaders and gutters should not go into the ground close to the house, but at least 10 feet away, so that the water cannot work its way back to the walls.

When a house is located on a slope, the uphill foundation wall will act as a dam; surface water will collect against it and sink into the ground along it, forming a pool outside the wall that will lead to leakage. This can be prevented by forming a ridge of grassed earth a short distance from the house to divert the surface water past either or both sides.

Poorly mixed concrete, or concrete containing too little cement, will be spongy and porous, and water will pass through it. To cure this, the inside surface of the wall can be given a coat of cement mortar, ½ inch thick, in two coats. In preparing for this the wall is scrubbed with a stiff wire brush to remove all loose particles and dirt. Grease or oil spots should be taken out with gasoline. If the wall surface is smooth, it should be roughened to give the new cement a key, or bond; this can be done with a hammer having a chisel end, or with a hammer and cold chisel. The rougher the old surface, the more secure will be the bond. The wall is then soaked with water so that it may not absorb water from the cement that will be applied.

The first coat is portland cement mixed with water to the consistency of thick paint, put on with a wide brush. This is immediately followed with mortar of 1 part cement and 3 parts sand, thoroughly mixed with water to a good stiffness for troweling. With a large mason's trowel, this is spread on the wall ¼ inch thick and worked to a rough surface. This coat should not be allowed to dry quickly; hardness and density will be increased through drying slowly. The second ¼-inch coat follows when the first is hard. The new cement should be sprinkled frequently with water and covered by hangings of wet burlap, carpet, or other heavy cloth. This should be continued for four days, and a week will be better.

Another waterproofing treatment that is effective is to coat the wall with iron cement mixed with water to the consistency of thick paint, applied with a brush. Iron cement is a fine black powder, which is made in several grades, one of them being for this particular purpose.

To close a crack in a cement wall, cut into it to form a wedge-shaped groove an inch or more deep, with rough sides to which the cement can adhere. This cutting can be done with a cold chisel or an old screwdriver. All loose particles are brushed out with a wire brush. The concrete along the groove is soaked with water and the crack filled with a stiff and well-mixed mortar of 1 part portland cement and 3 parts sand. This is packed in hard and the surface smoothed. The patch should be kept damp for several days to increase hardness and density.

MI's Book-of-the-Month

Every month several meritorious books are published which the editors believe are of special interest to readers of MECHANIX ILLUSTRATED. We know, of course, that you may not be able to read them all, and for that reason we plan to select the outstanding book of the month and present here an extract from it. The books will be chosen for their special interest in the fields of adventure, travel, sports, science, mechanics and history. The episodes selected will be of some complete dramatic or informative incident.

Readers who wish to obtain these books to be read in their entirety may order them from local book dealers or by mail from the publishers. Every volume from which we will select an extract will form a lasting, worthwhile addition to your library.

Our selection for September is "First Aid for the Ailing House", by Roger B. Whitman. Published by Whittlesey House, a division of the McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York, N. Y. Anyone who owns a house or takes care of one will find this book of great value. The price per copy is $2.50.

Airmen Test Asbestos Suits

CLAIMED to provide considerable protection against the danger of flames from an airplane afire in mid-air, asbestos flying suits are being tested by pilots of the British Royal Air Force. The suits are light in weight and, as can be seen from the photo, do not restrict physical movement.

Radio Has Remote Control

A NEWLY developed radio receiver features a remote control unit which, although not connected to the receiver by a single wire, enables the set to be tuned in or off and the volume adjusted from a position several rooms away. The control unit is compact in size and can be carried in the hand.

First Aerial Tramway In U. S. Completed

BELIEVED to be the first of its type in North America, an aerial passenger tramway was recently completed near Franconia, N. H. The tramway features 27-passenger cars which carry visitors to the summit of nearby Cannon Mountain, ascending the 4,000-foot peak in about eight minutes. The tramway was built on the construction principle used in the erection of 70 successful cable tramways located in various European countries.

Hydraulic Dolly Lifts Trailer

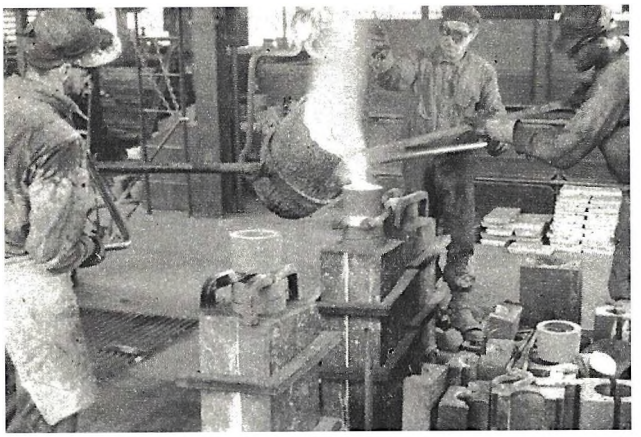
FACILITATING the job of hitching a trailer to a car, a new hydraulic dolly-hoist lifts the hitching post to the proper height for attachment. Fitted with dual wheels to assist in maneuvering the trailer, the dolly-hoist has a lifting capacity of 3,500 pounds and a lifting range of 17 inches.

Laundry Washer Run By Air

A LAUNDRY washing machine, which is operated by hooking up to the air hose of a vacuum cleaner, has been invented by a Swedish engineer. The machine consists of a rubber tub fitted with a turning arm which agitates the water in the tub when activated by the air blast of the vacuum cleaner.

Sick Python Fed With Special Rubber Hose

WHEN the throat muscles of a 22½-foot python in the St. Louis, Mo., zoo became paralyzed recently, it became necessary for the zoo officials to use force-feeding methods to keep the reptile alive. The feeding equipment developed for the job consists of a five-foot length of special rubber hose fitted with a removable plunger. Ground rabbit meat is fed into the hose and is forced into the snake's stomach by means of the plunger.

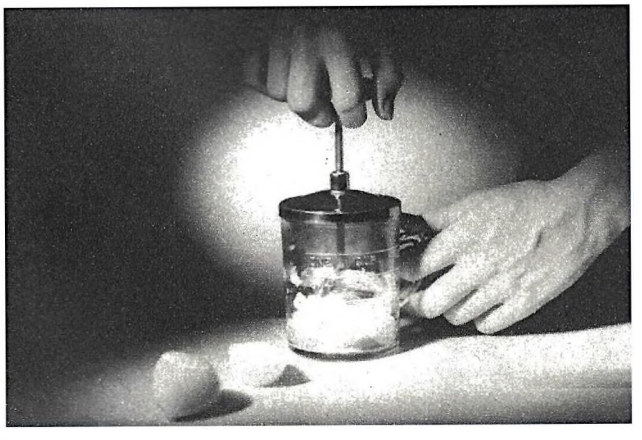


Research Engineers Develop New Metal

A NEW metal, Cupaloy, which comes close to being pure copper with the strength of steel has been developed by research engineers of a well known electrical products firm. Manufactured in the conventional process used in producing copper, the new metal is a combination of copper, chromium and silver and can withstand extreme heat.

Portable X-Ray Device Aids Express Clerks

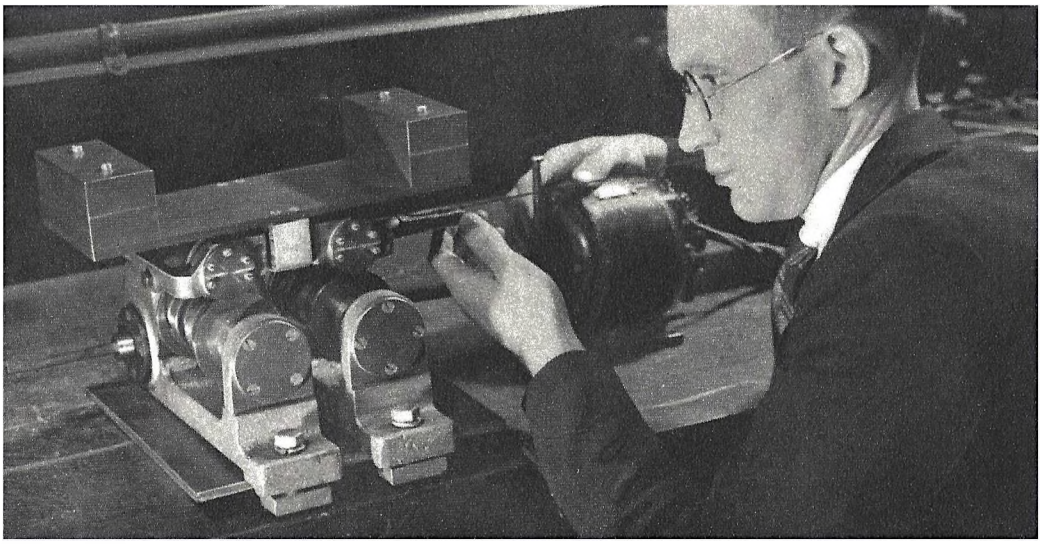
RATED at 58,000 volts and 10 milliamperes and operated by merely plugging in on any electric light circuit, a newly developed portable, shock-proof X-ray device enables express and postal clerks to speedily determine the contents of suspected packages without the need of breaking the seals. The device can also be used in industrial plants for the inspection of manufactured parts and is said to be satisfactory for medical use, providing clear radiographs of the human body. The photo at right shows the compact X-ray unit being used to examine the contents of a suspected express package.



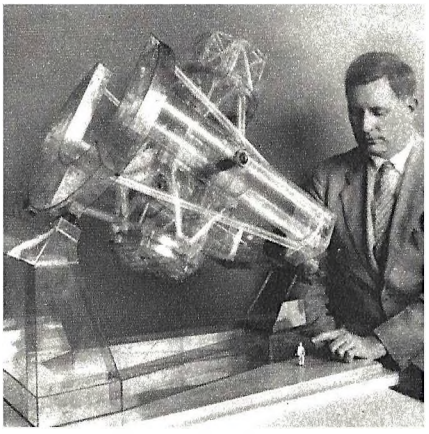
Onion Slicer Spares Housewife's Tears

EQUIPPED with an airtight cover and a close-fitting plunger, the kitchen device shown at left enables a housewife to chop or slice onions without bringing the usual tears to her eyes. The plunger has four sharp cutting blades and can be used as vigorously as necessary, a wooden disc in the bottom serving as a chopping block.

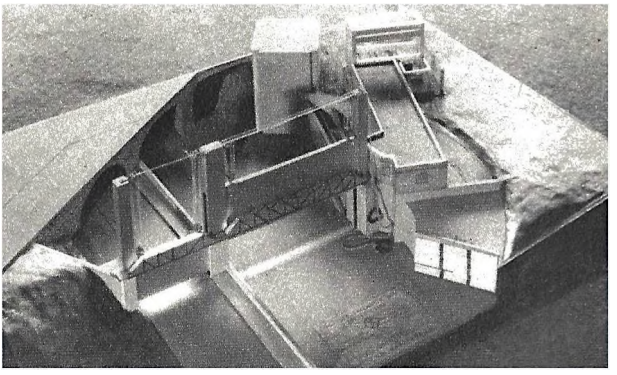
MODELS Aid RESEARCH



Above—A Westinghouse research engineer carefully studies the roller-mounted trucks of a toy electric locomotive during experiments to determine the oscillations set up by a real engine at top speed.



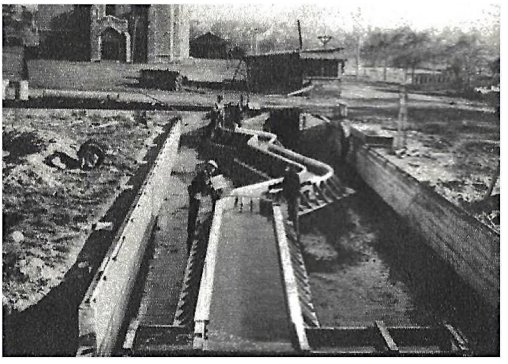
Before fabricating a steel support for the 200-inch Mount Palomar telescope, engineers built a complete miniature model (above) in celluloid.



Costing only a few cents to make, this model helped engineers to visualize how a proposed $850,000 dam would appear when constructed.

TRAINS cling to the rails, your automobile runs smoother and airplanes attain their tremendous speeds largely because of the lessons models have taught the engineer. It is readily conceded that without models engineering and scientific progress would have been retarded for years while experts learned, by the trial and error method, how well founded were their visions.

Models not only enable an engineer to put theories to actual practical test, but save thousands of dollars annually in errors which, while inconsequential in a model, would cost a considerable sum to rectify once construction of a full-size job had been started.



Constructed on the campus of the University of Washington, this 80-foot model simulates a three-mile section of Puyallup River and aids engineers in developing flood control methods.

MI Readers'

LAST month these pages carried the first announcement of MI Readers' Service Bureau. The response was all that could possibly have been hoped for—every mail demonstrates how many MI readers are taking advantage of this new service.

It had been the opinion of the editors of MECHANIX ILLUSTRATED that too many readers fail to realize the value of the advertising columns and hence miss many instructive messages and opportunities to benefit themselves. We now realize that MI readers are interested in these opportunities and wish to take advantage of this service and our mail bag shows it. Therefore we are repeating the offer for another month to give new readers an opportunity to take advantage of this time and money saving service.

Because the advertising section of a magazine is as important a part of the publication as the editorial section, MECHANIX ILLUSTRATED censors its advertising stringently for its readers' protection. Therefore you are urged to take full advantage of the advertising columns and the attractive offers made in them.

Offer No.	Firm	Type of Business	Offer Made	Charge	Ad Appears on Page
1	American School	School	Information	Free	15-20-25
2	American School of Photography	School	Booklet	Free	24
3	Allied Radio	Radio	Catalog	Free	140
4	Aurora School of Photo Engraving	School	Booklet	Free	140
5	Charles Atlas	Body Building	Book	Free	24
6	Benjamin Air Rifle	Air Pistols	Full Details & Targets	Free	24
7	Bliss Electrical School	School	Catalog	Free	24
8	Bild-Ur-Own Devices	Scooters, Kits, Motors, Wheel Sets	Book and Plans	10 Cents	134
9	Brownscope Co.	Microscopes, Binoculars	Catalog	Free	140
10	L. L. Bean	Camping and Hunting Apparel	Catalog	Free	141
11	Coyne Electrical School	School	Book and Details	Free	8-18
12	College Swedish Massage	School	Anatomy Charts and Booklet	Free	24
13	Craftsman's Wood Service	Woodworking	Catalog	10 Cents	136
14	Cushman Motor Works	Autoglide	Book	Free	142
15	Chicago Wheel Mfg. Co.	Tools	Catalog	Free	145
16	Central Camera Co.	Camera Supplies	Book	Free	142
17	Donley Publ.	Books	Specimen Pages & Catalog	Free	6
18	DuPont	Polish	Sample	6 Cents	135
19	Dodges Institute	School	Catalog	Free	24
20	Dremel Mfg. Co.	Tools	Booklet	Free	143
21	Ben Dove Garment	Clothes	Details	Free	144
22	Victor J. Evans	Patent Attorneys	Book	Free	7
23	Elite Publishing Co.	Books	Booklet	Free	17
24	Engineer Dobe	Drafting Course	Book	Free	20
25	Franklin Institute	School	Book and List of U. S. Govt. Jobs	Free	27
26	GHQ Motors	Gas Engine Kits	Catalog	3 Cents	15
27	Gunmetal Co.	Plating	Particulars & Proofs	Free	142
28	Hobart Bros.	Welding Equipment	Details, Booklets	Free	17-133
29	Hemphill Diesel Schools	School	Book	Free	26
30	Harley-Davidson	Motorcycles	Literature & Motorcycling Magazine	3 Cents	137
31	Hunter Shaver	Electric Shaver	Details	Free	143
32	International Correspondence Schools	School	Booklet	Free	20-23-26
33	Institute of Applied Science	School	Literature	Free	24
34	Kelsey Presses	Stationery	Catalog	Free	144
35	Kant-Slam Co.	Devices to stop door slamming	Details	Free	18
36	La Salle Extension	School	Booklet	Free	9-24
37	Lincoln Engineering School	School	Catalogs, Details & Student Magazines	Free	17
38	Lincoln Airplane Flying School	School	Information	Free	26
39	Carl Miller	Patent Attorneys	Book	Free	6
40	Mead Gliders	Portable Boats	Folder	10 Cents	15
41	Michigan Trade School	School	Folder	Free	17
42	Albert Mills	Tea & Coffee Routes	Facts	Free	17
43	Mechanix Universal Aviation Service	School	Information	3 Cents	20
44	Midwest Radio	Radio Equipment	Catalog	Free	134
45	New York Institute of Photography	School	Booklet	Free	138
46	National Radio Institute	School	Book and Sample Lesson	Free	5
47	National Schools	School	Book	Free	13-21
48	National Poultry Institute	School	Booklet	Free	15
49	National Potteries	Pottery Making	Color Plate & Details	Free	142

Service Bureau

To save you time and trouble, all advertising offers, with the exception of those made in the classified section, are listed on these pages, with the type of offer and the cost, if any.

Actually, the Readers' Service Bureau is a clearing house for both readers and advertisers. On this and the opposite page you will find a complete listing of all offers made by advertisers in this issue. The advertisers' names are arranged in alphabetical order and a convenient identifying number is assigned to each. To simplify your orders for books, samples, catalogues, etc., the bureau will forward promptly your requests to three or less of the firms listed. All you have to do is to print your name on the coupon at the bottom of this page, mark in the small squares the numbers of the offers you want, mail it to MI Readers' Service Bureau, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y., in an envelope or pasted to a post card, and we will do the rest.

It is recommended that you study carefully the offers themselves. In the right hand column of the tabulation you will find the page on which the offer appears. Those who prefer to write directly to the advertiser may do so, either to save time or to take advantage of more than three offers. When that is done be sure to mail your request to the exact address given in the advertisement.

If the booklets or offers you select are listed as "free," all you have to do is send in the coupon properly marked. If there is a slight charge (usually only 3 cents and rarely more than 10 cents to cover the cost of mailing bulky catalogues, booklets or samples), be sure to include the correct amount with the coupon. The most convenient way to make such small remittances is in the form of United States stamps or International Postal Coupons.

Remember that MI Readers' Service Bureau was started only as a means for helping you get more from MECHANIX ILLUSTRATED. It is maintained for your benefit only, so therefore take full advantage of it. It is your bureau—use it!

Offer No.	Firm	Type of Business	Offer Made	Charge	Ad Appears on Page
50	Clarence A. O'Brien & Hyman Berman	Patent Attorneys	Book	Free	11
51	Page-Davis School	School	Booklet	Free	6
52	Pyroil	Oil	Details	Free	19
53	Plastex Industries	Plastex	Book	Free	20
54	Parks Air College	School	Catalog	Free	144
55	Photobell	Electrical Equipment	Catalog	Post. Stamp	140
56	Royal Typewriter	Typewriters	Information	Free	C
57	L. F. Randolph	Patent Attorney	Booklet	Free	6
58	Regina School of Lettering	School	Details	Free	20
59	The Rosicrucians Order	Philosophy	Book	Free	131
60	Raye Burns School	School	Details	Free	142
61	South Bend Lathe Works	Lathes	Catalog	Free	16
62	Standard Business Training Institute	School	Details	Free	20
63	So-Lo Works	Rubber Molds	Book and List of Buyers	Free	142
64	U. S. Dental Co.	False Teeth	Impression Material, Catalog	Free	142
65	Univex	Camera	Booklet	Free	133
66	United Mushroom Co.	Mushroom Growing	Book	Free	20
67	Universal Photographers	School	Catalog	Free	138
68	Von Schrader Mfg. Co.	Machines	Booklet	Free	17
69	Warner Electrical	Electroplating Supplies	Sample	Free	136
70	Washington School of Art	School	Book & Details	Free	24
71	Wholesale Radio	Radio and Camera Supplies	Catalog	Free	24-138
72	The Way Co.	Artificial Ear Drums	Booklet	Free	144

Readers' Service Bureau
MECHANIX ILLUSTRATED,
1501 Broadway, New York, N. Y.

I am interested in the following offers:

(Put numbers in squares) ☐ ☐ ☐

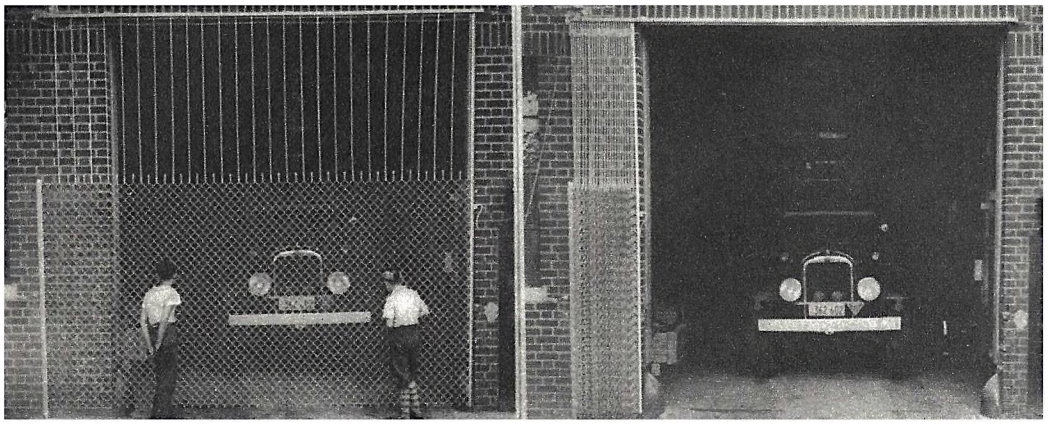
I am enclosing .....cents in stamps.
(Ignore this line if all offers are free.)

Name .....

Address

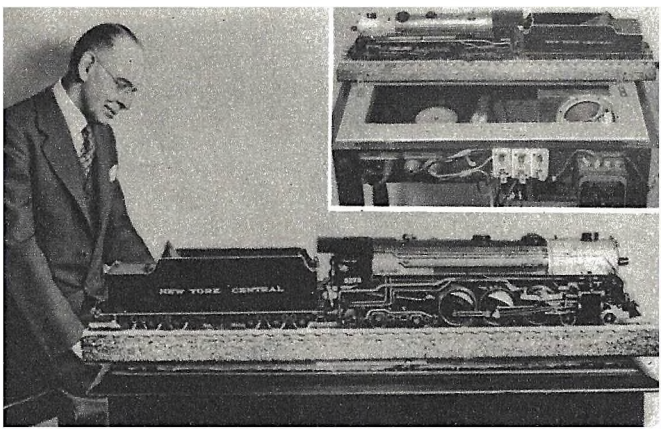
City and State .....

Note: This offer expires September 15, 1938. After this date, write directly to advertisers for offers.



Sliding Grille "Fence" Guards Factory Doorways

DESIGNED to keep intruders from factory buildings while allowing free circulation of air through large doorways, a new flexible sliding steel grille can be extended to any height and width of opening by vertical rods connected to an overhead track.

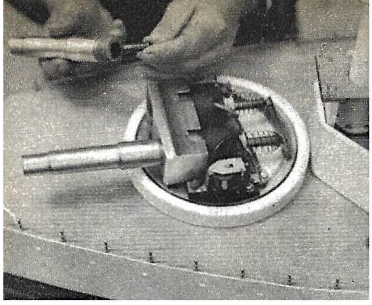


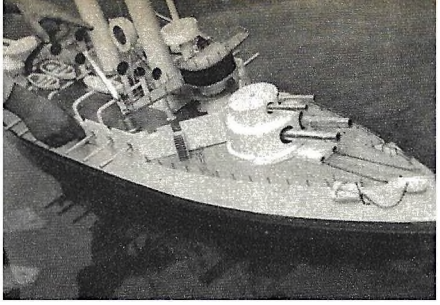
RR Model Gets Sound

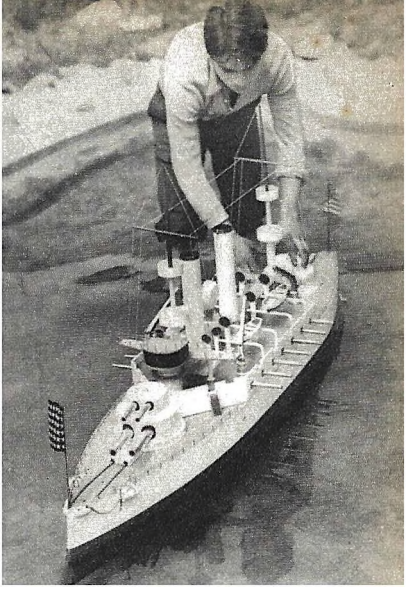
SPECIALLY mounted on a track atop a table equipped with a phonograph turntable and loudspeaker unit which plays a record featuring realistic sound effects of a speeding "iron horse," a model locomotive constructed by Walter Kohl, of Los Angeles, Calif., has attracted considerable attention. The record is timed to coincide with the model's mechanical movements.

Transmits Sound Via Beam Of Light

USING an ordinary flashlight battery and parts of a radio set, Gerald Mosteller, graduate student of the University of Southern California, is said to have found a new, inexpensive means of transmitting sound over a light beam. The invention is claimed to have unlimited possibilities in aiding planes to land in fog and as a secret means of communication by military services.





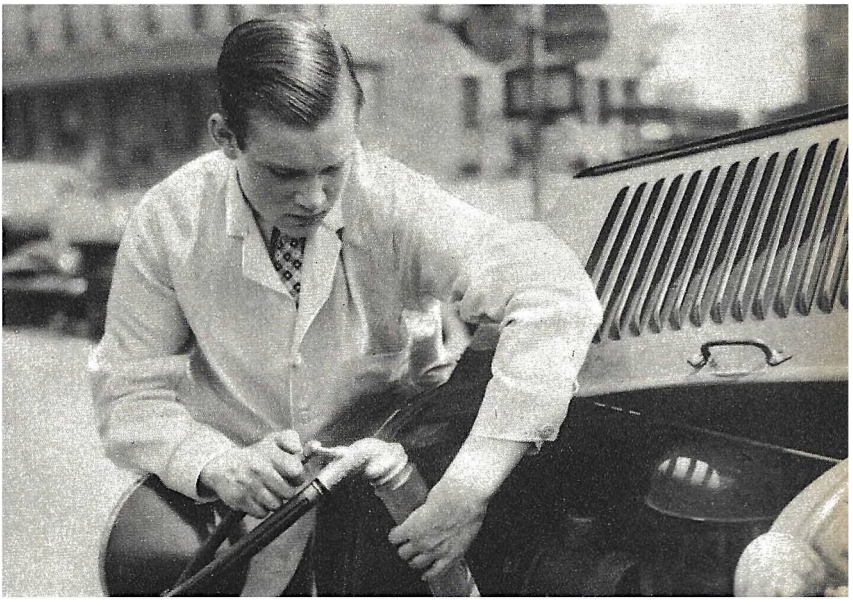


Warship Model Controlled By Sound

A FIVE-FOOT scale model of the *U.S.S. Kentucky*, which has been constructed by Howard E. Bixby, of Glendale, Calif., responds to sound impulses created by blowing a small whistle. A sensitive microphone (above, center) picks up the impulses which then actuate a series of battery-operated selector controls that cause the model to perform ten maneuvers, including the firing of small "shells" from its guns.

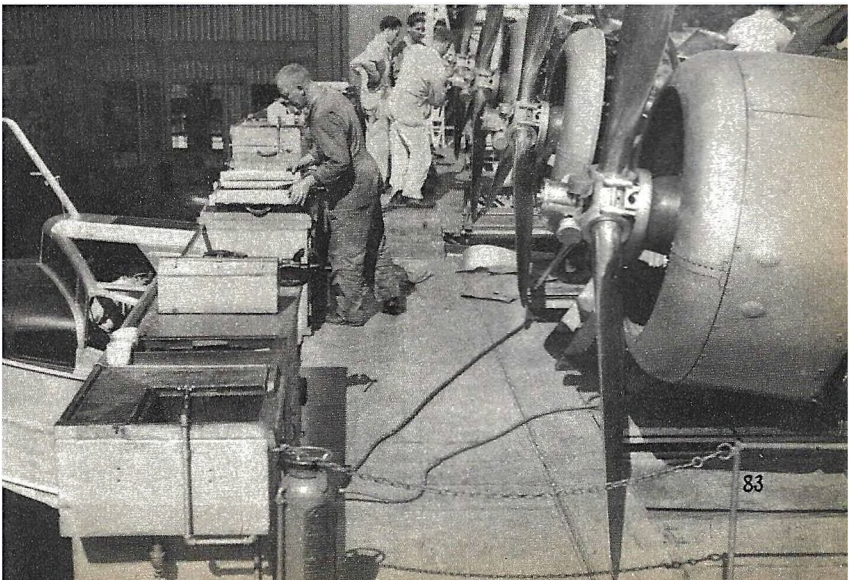
Water Device Cleans Radiator

FACILITATING the flushing of automobile cooling systems, a newly developed device enables water and compressed air to be introduced simultaneously, thus creating a force that does a first class cleaning job. The device can be attached to an ordinary garden hose and has a valve to which a compressed air hose can be applied in the manner used to inflate a tire.



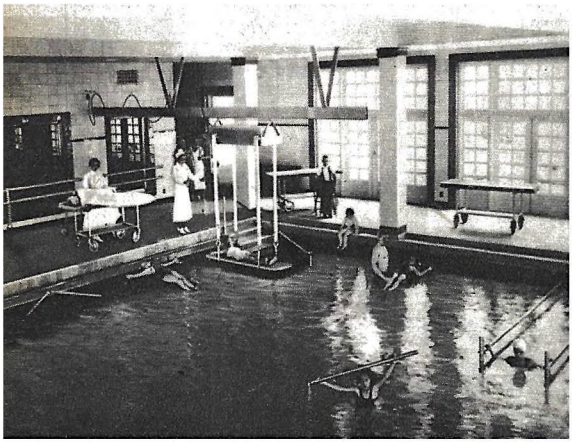
Portable "Shop" Aids Mechanics

SPECIALLY constructed portable stands enable mechanics of Pan American Airways to inspect and adjust the powerful engines of huge clipper planes without removing them from their mounts. The stands are equipped with vises, electric outlets, etc.



MECHANICAL DEVICES AID Crippled TOTS

This little lad is getting his morning exercise in a "key hole tub" filled with warm salt water, the nurse gently massaging and moving his legs.

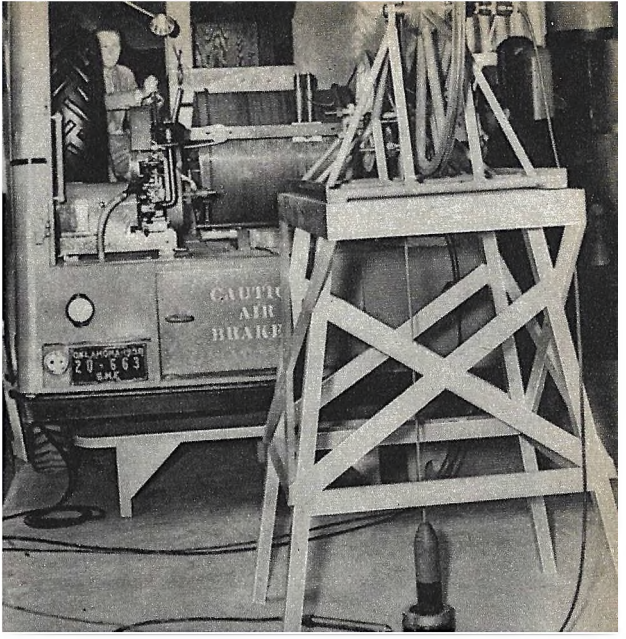


Above—A general view of the Carrie Tingley Hospital hydrotherapy pool. The levers, parallel bars and other mechanical equipment is specially designed to provide the infantile paralysis patients with moderate, controlled exercise. Below—Lowering a patient into the pool with an electric hoist.

The device shown above supports a paralysis patient's body and gently moves the arms and legs as though swimming.

DETERMINED to give every infantile paralysis victim the benefit of every known aid to recovery, the federal government, private and semi-private organizations have equipped numerous hospitals throughout the country with mechanical devices that provide moderate, controlled exercise for patients undergoing hydro-therapy treatments.

Typical of the equipment used, is that of the Carrie Tingley Hospital in Hot Springs, New Mexico. This institution features a salt water pool into which the patients are lowered by means of an electric hoist. The pool is equipped with special levers, parallel bars, etc., which gently move the patients' arms and legs in the motions of swimming.



Auto Engine Uses Coal Fuel

HENRI LORY, a Paris, France, taxi driver, with a friend, developed a device which turns anthracite, charcoal or even green wood into suitable fuel for his car.

Device Locates Hidden Oil

THIS new electric "fishing line" is used to detect hidden pools of oil miles below the earth's surface. The location of the oil is determined by the readings on a meter.

Bicycle Boat Has Great Stability

BICYCLE boat races may be scheduled for the New York World's Fair 1939 aquatic program, as the result of recent tests of this novel craft. The boats attain a fair amount of speed and with the wing-like outriggers, are sturdy enough to carry several passengers.

Electric Eel Lights Small Neon Lamp

AN ELECTRIC eel connected to electrical equipment was found to light a neon bulk and "talk" over a loudspeaker. A healthy specimen of the type which inhabits the waters of South America, it was also connected to an oscillograph so that the nature of the electric charge it generates could be seen.

Why Collect Coins?

by Montgomery Mulford

COINS, being records of the times in which they are minted, become valuable to the historian. For the biographer they are among the best evidences of the likenesses of the characters whose lives are being related. To the collector these coins hold a great deal of value: they are worthy as evidences of the past, and they are interesting souvenirs; often quite good investments too.

The various pieces of money used by different races and peoples are often unusual. From Japan, for example, comes the sapec, or "iron cash," said to equal 5,320th part of a dollar! And the ichibu, shown at the left, in the nineteenth century was equal to three for a dollar.

The designs, as well as the shapes, of coins, are often very interesting. We have early Chinese coins in the shape of razor blades; and the designs of many others are equally as unusual. From these designs stamped upon pieces of money we may read a great deal of history, much of it in symbolism.

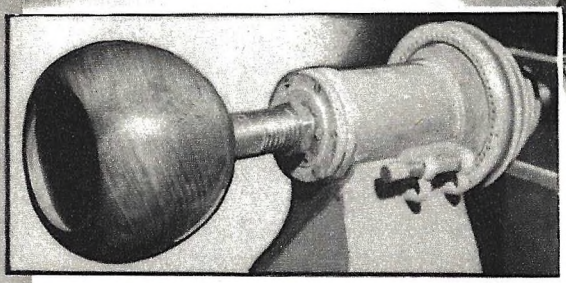
A very large percentage of them picture the rulers of the great and the small states of the world. Anytime we are in doubt as to the appearance of some person headlined by history, all we need do is locate a coin portrait. There are instances where coin portraiture has differed from other likenesses; this perhaps because other portraits may have been from paintings done after a ruler's or hero's death. To find true representations of the Roman Caesars, look to Roman coins as the most truthful.

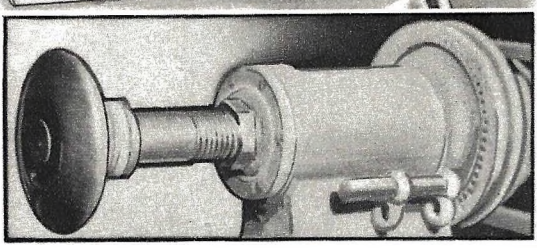
But because coins tell and picture the history of the world, they are fascinating. Trace, through them, the rise of the American colonies; the split with the mother-country; and at last the birth of a new America, independent and proud. Collect coins, then, to be able to illustrate man's history, and view his leaders, good and bad . . . the Roman Emperor Domitian as a villain, or the French King Francis I as a good leader. Coins become accurate records and captivating pieces to save!

Note, too, the trends of the times through coinage—the new United States five-cent piece, the "Jefferson nickel," replacing the up-to-now familiar "Buffalo Nickel." The latter showing the Buffalo and the head of an Indian, gives way to a nickel picturing Thomas Jefferson and his Monticello home. It is possible that had another president been in office, a different portrait and another scene would have been adopted for a new five-cent piece. Hence we may, to a large extent, notice the trend of the times through pieces of money. Which, of course, makes coins all the more interesting.

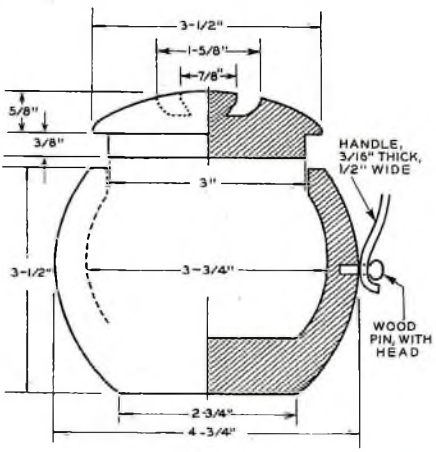
CRAFTS AND HOBBIES

Bowl, Lid AND Handle





The dimensions given below can be increased if a larger bowl is desired. Turned from a block six inches square, three two-inch pieces can be used if a single block is not available.



ALTHOUGH small, this bowl lid and handle project are of such good proportions and balance that the dimensions can be increased up to double if desired. One that large would make an excellent cookie jar, while a bowl increased by half will be large enough to hold tid-bits for late snacks.

The bowl itself was turned from a solid block of walnut. If a solid piece is not available, three blocks 2 inches thick and glued together will form the stock for the bowl. This is a face plate turning with the dead center supporting the work for the outside shaping. It is backed away only when its

[*Continued on page* 137]

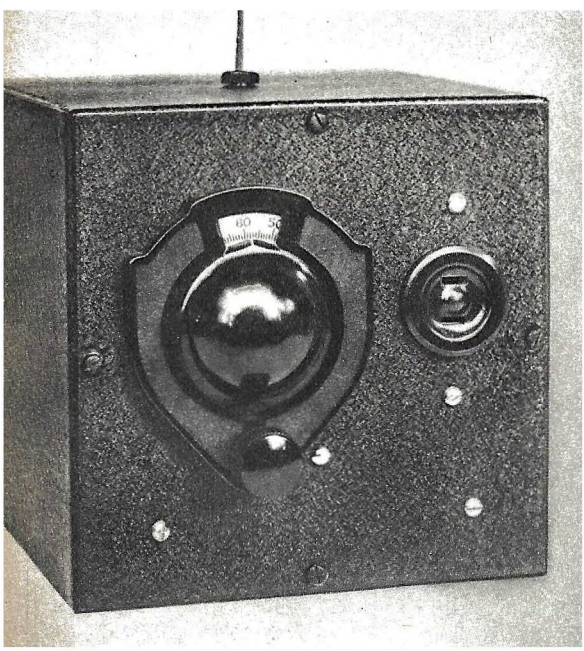
The "magic wire" can be used to make up interesting and attention-getting window displays. A small paper or metal disc fastened to the inside of the window will cause many spectators to be mystified because when a hand or finger is brought near it, lights will go on, bells may ring, or any appliance can be started easily.

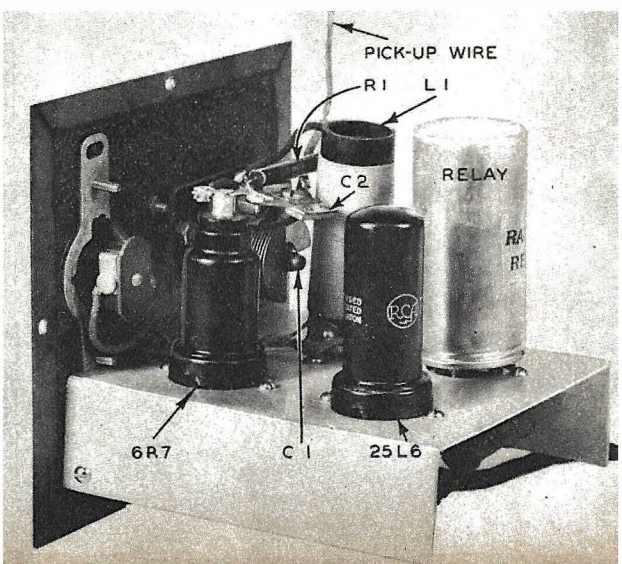
"The Magic Wire"

UNQUESTIONABLY the capacity-operated relay is one of the most fascinating and useful instruments an experimenter can build. Magical in operation, it is adaptable to an almost endless variety of applications. As a burglar alarm, in advertising displays, to open doors of garages, and in factories for counting packages and controlling safety and other devices, it works silently and effectively. In beauty parlors, it has been employed to switch on a light when a customer approaches a mirror to adjust her hat!

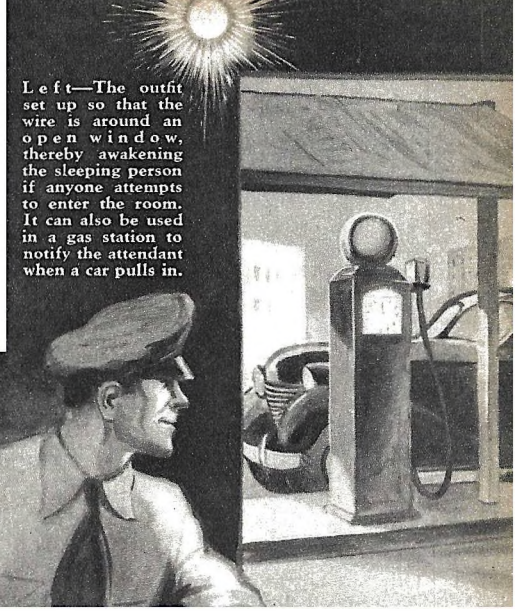
This device consists essentially of an oscillator so designed and adjusted that any slight change in capacity from grid to ground will cause a large change in the power the tube generates. If a long, insulated wire is connected to the grid of the oscillator, it forms one electrode of a condenser which has capacity to all surrounding grounded objects. If a person or any other conducting object comes near this wire, its capacity to ground is increased and this change reacts on the oscillator, causing its plate current to increase. If a very sensitive relay were connected directly in the plate circuit of the oscillator tube, its contacts would then close, switching on power to actuate any desired device, such as a bell, motor or light.

Far greater sensitivity is obtained, however, by using two tubes. In addition, by making the output tube a power type, sufficient current is obtained to operate a less sensitive, and consequently less expensive relay. In the device to be described, two





A front view of the completed relay. The dial controls the sensitivity of the magic wire. The socket mounted on the right side of the panel is for the plug connected to the alarm bell or light actuated by the relay. At the right is shown an inside view with the cabinet removed.



Left—The outfit set up so that the wire is around an open window, thereby awakening the sleeping person if anyone attempts to enter the room. It can also be used in a gas station to notify the attendant when a car pulls in.

Novel capacity relay operates electrical circuit if person comes near it.

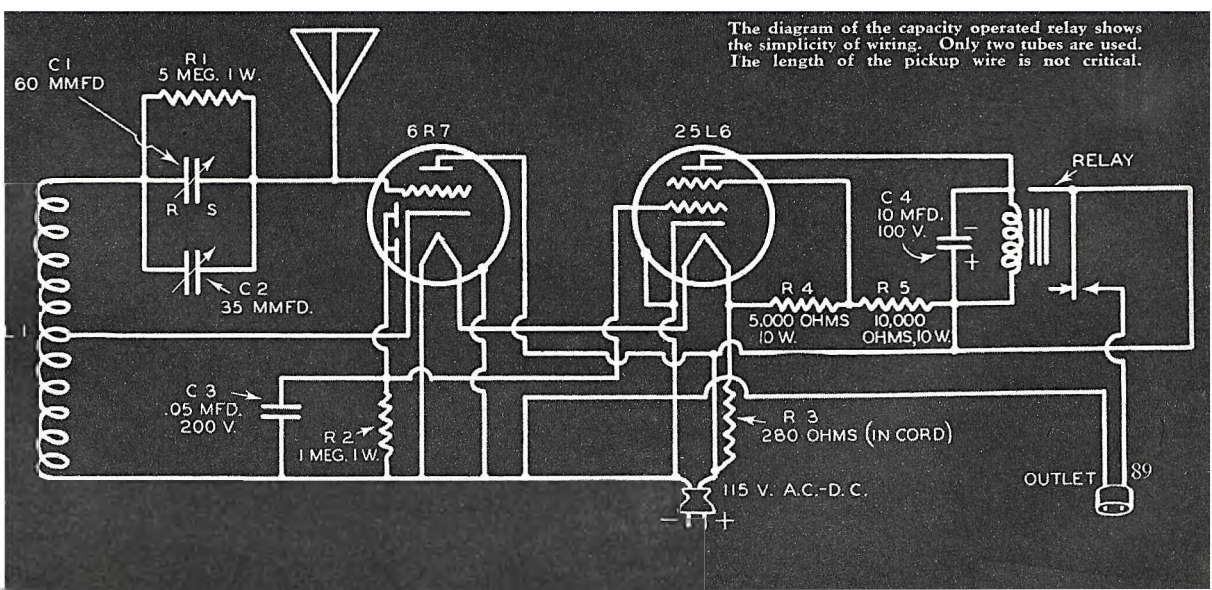
by John H. Potts

metal tubes are employed which have characteristics of outstanding value in this type of circuit.

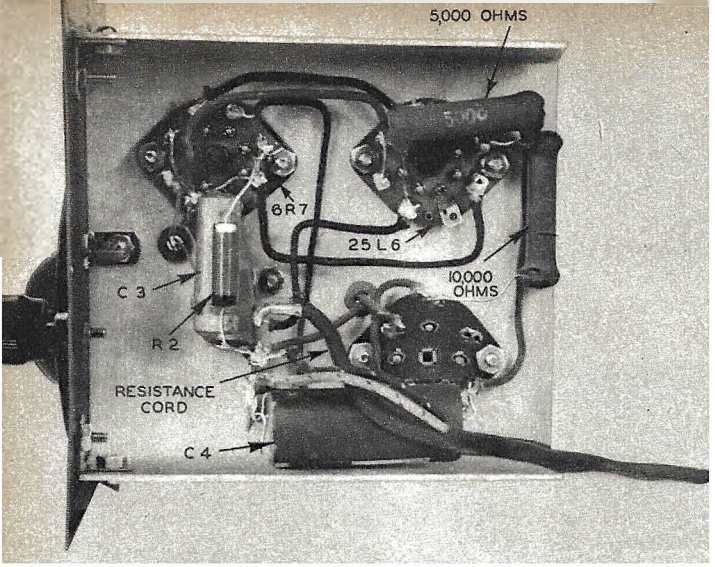
As shown in the diagram, the input tube is a type 6R7 duo-diode triode. The triode section forms the oscillator, in conjunction with the coil L1 which is center-tapped to the cathode. When the triode section is oscillating, the r.f. voltage developed from cathode to ground is impressed on the diode section, causing current to flow through R2 and making the diode plates negative with respect to ground. The control grid of the 25L6 power tube is connected to the diode plates of the 6R7 and consequently a negative bias is placed on the grid which reduces its plate current to a very low value. As soon as the triode ceases to oscillate, there is no longer any r.f. voltage applied to the diodes, the voltage drops and the 25L6 draws high plate current, causing the relay to operate.

It will be noted that no rectifier tube or filter circuit is required in this design, yet the instrument functions on either a.c. or d.c. On a.c., the 6R7 oscillates and the 25L6 draws plate current only on the positive half-cycles. This principle effects a considerable saving in construction cost and in the size of the instrument.

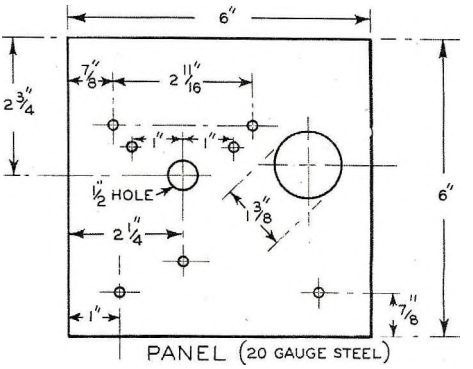
After the parts required have been obtained, the first step in building the unit is to make the chassis, which consists simply of a piece of 16-gauge aluminum or steel bent and drilled in accordance with the plan shown. The front panel, which is included with the standard 6 by 6 by 6 cabinet, is drilled and a hole and grommet are placed in the rear panel. The oscillator coil is made by winding 100 turns of No. 28 d.c.c. wire on a one-inch bakelite tube 3¼ inches long. A tap is brought out at the center of the winding. When the winding has been completed, the



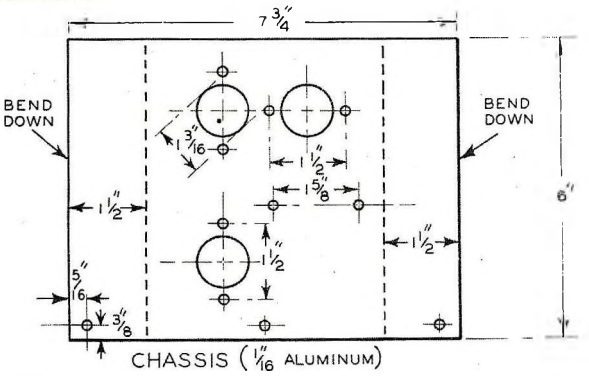
The diagram of the capacity operated relay shows the simplicity of wiring. Only two tubes are used. The length of the pickup wire is not critical.



The under view of the chassis shows the compact arrangement of the parts. Small angles are used to fasten the chassis securely to the metal panel.



The dimensions shown can be varied to suit individual parts. However, the layout given should be followed closely for best results.



entire coil is dipped in a hot half-and-half mixture of beeswax and paraffine to keep the winding in place and to exclude moisture. The sensitivity of the outfit is largely dependent upon the efficiency of the coil, so it should be carefully made. C1 is mounted on a small piece of ⅛-inch bakelite, because it must be insulated from the panel.

The sockets may now be mounted in the positions indicated in the photograph. Wire the chassis first, starting with the heater circuits. Do not connect in the power cord until all wiring has been completed. The shield of the 25L6 is connected to its cathode, the shield of the 6R7 to the heater terminal which goes directly to the line. When all the main wiring has been completed, bring the power cord through the rear panel hole, and solder the three terminals to the terminal strip. The antenna wire is brought in through a rubber-grommeted hole in the top of the cabinet and connected to the stator plate terminal of C1. A knot in the wire will relieve any strain on this connection. Stranded wire is preferable for the antenna.

The capacities of C1 and C2 are largely dependent upon the length of antenna wire desired. If only 4 or 5 feet are required, C2 may be omitted. On the other hand, if the wire exceeds 15 feet, C2 will have to be larger than the value given. If the capacity of C1 were made large, (say 150 mmfd. or more) C2 could of course be omitted but then the adjustment would become too critical.

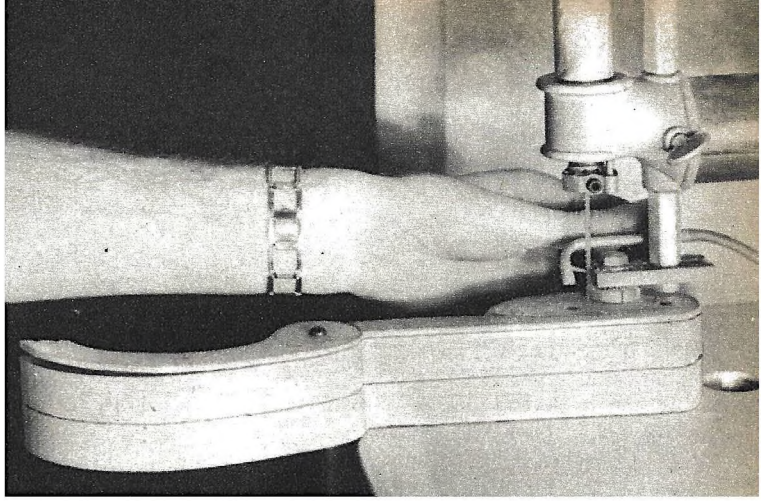
The relay employed is a 3,000-ohm plug-in type of standard manufacture. It is a double-pole model and will handle a non-inductive load of 100 watts. It is somewhat more sensitive than is required and any other good relay of 1,000 ohms or more resistance should be suitable. The condenser, C4, is shunted across the relay coil to prevent chattering. It may be advisable, in some cases, to put a .1 paper condenser across the relay contacts to stop sparking on heavy loads. It is better practise, however, to use a separate power relay when operating any but light loads.

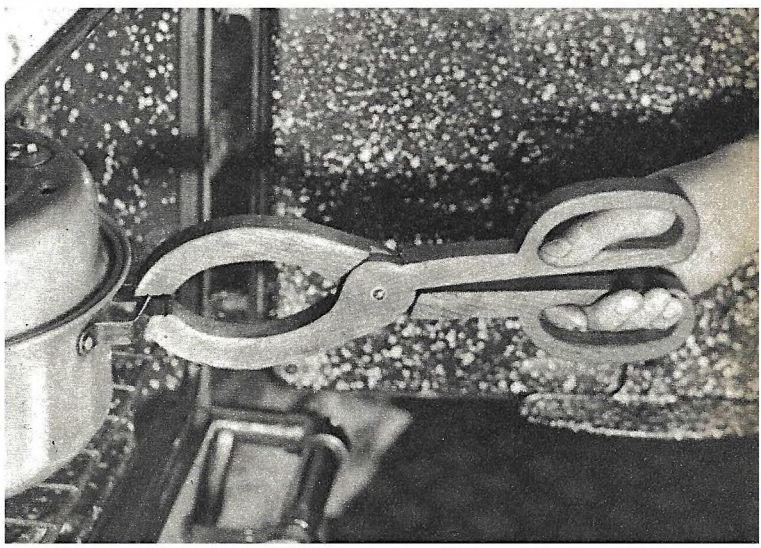
In operation, the antenna wire is strung out well away from grounded metal objects and a 110-volt lamp is plugged into the outlet on the panel. When the tubes have heated, the lamp should light when the antenna wire is touched. If it lights without touching the wire, C2 should be screwed down until the lamp goes out. This adjustment should be

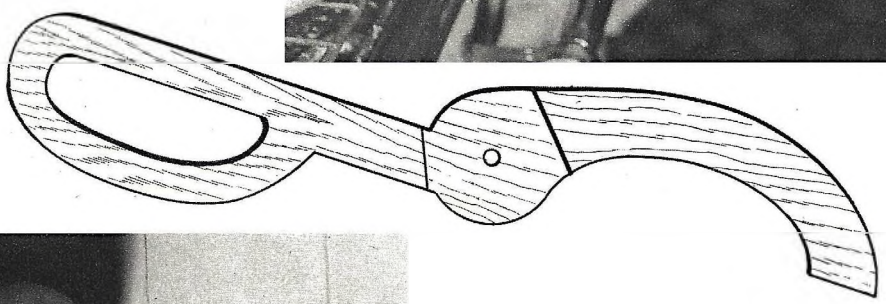
[*Continued on page* 135]

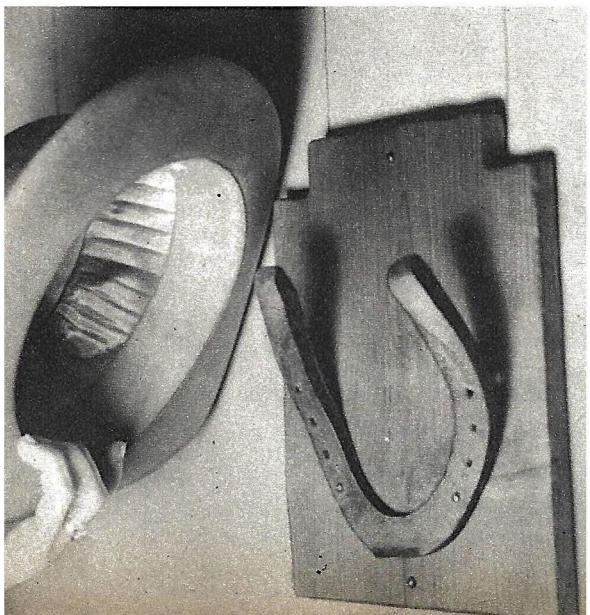
Wood Tongs Fill Kitchen Needs

WOODEN kitchen tongs resembling shears are useful for pulling hot pans from the oven, lifting lids, picking up baked potatoes and for dozens of similar operations. Trace the outline of the two parts on a piece of wood about ¾-inch thick. At the point where the two tongs cross, remove wood equal to a depth of half the thickness of each piece, so that the sections fit together like a pair of pliers. Sand the surfaces smooth, and the edges round. The end of the bolt holding the two pieces together should be flattened like a rivet to prevent the nut from coming off. The two sections can be made at the same time by fastening the pieces of wood together and cutting them with a saw as shown by the photograph at upper right. Strong wood should be used so that the tongs will withstand the strain of moving a heavy pan.



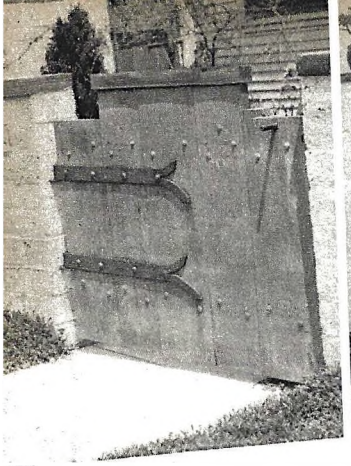






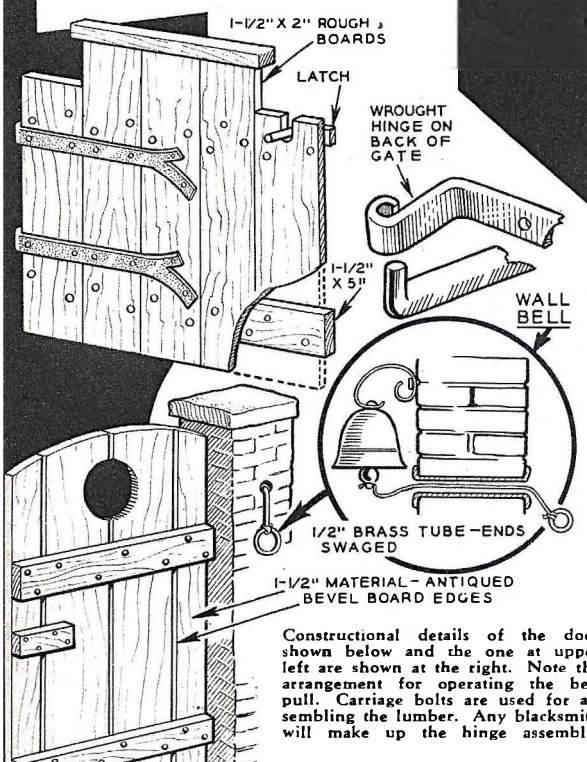
Horseshoes Become Easily Made Hat and Coat Rack

A HAT and coat rack both ornamental and useful can be made by mounting one or more horseshoes on a board fastened to the wall, or to the wall itself. The shoe should be bent at a point about ⅔ the distance from the toe. A sledge hammer and a suitable support will perform this operation easily and quickly. The surface should be cleaned and shellacked to prevent rusting. Several long screws should be used to hold this shoe in place.

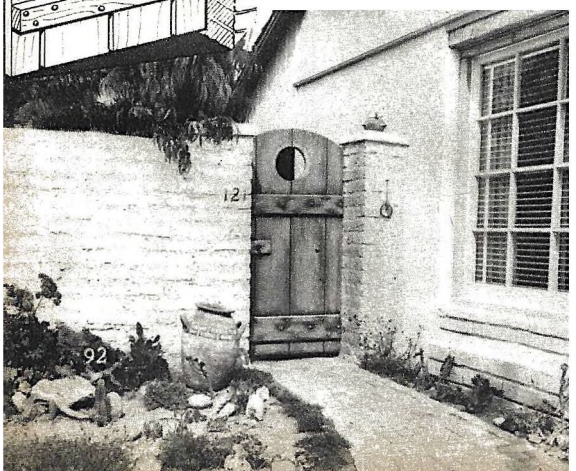


The gate shown at upper left uses unsurfaced lumber and hand-made, wrought-iron hinges. It is assembled with carriage bolts and has a simple wooden latch. At the right is a simple door for use with a high-wall fence. Before setting posts for a pergola or trellis, be sure to treat them against rotting.

GATES TRELLISES AND FENCES



Constructional details of the door shown below and the one at upper left are shown at the right. Note the arrangement for operating the bell pull. Carriage bolts are used for assembling the lumber. Any blacksmith will make up the hinge assembly.

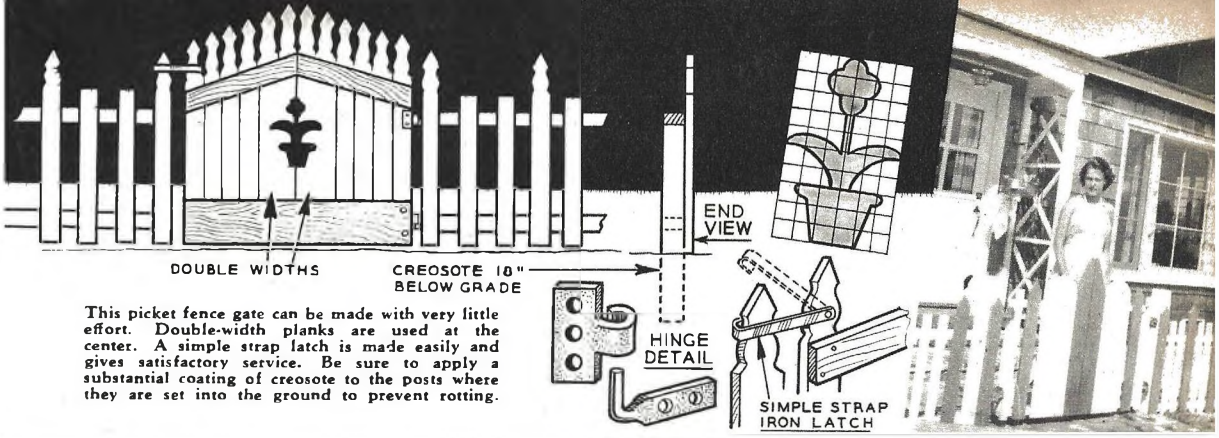


THE designs presented here were all selected for their clean-cut lines and ease of construction. The average home owner should have no difficulty in building any of these with a little help from a blacksmith.

An exceptionally attractive gate and at the same time an inexpensive one, can be made of unsurfaced lumber, with hand-made, wrought-iron hinges. It is assembled with carriage bolts and has a simple wooden latch. No paint is used, it being allowed to weather. The individual may select the wood most suited for this job in his particular locality; redwood was found satisfactory and attractive in the original. Cypress is also good, but but a heavy wood such as oak is not recommended.

A novel motif is introduced in the picket-fence gate. The decorative tops of the pickets are cut from the same pattern and assembled close together in the gate, spaced as shown in the fence. Note that the center boards of the gate are double widths to permit cutting the flower-pot design. This, of course, is an easy scroll-saw job. Battens on both sides of the pickets make a strong structure. The latch is merely a loop of strap iron pivoted so that it can be lifted off the picket.

For privacy the panel gate is not only effec-



This picket fence gate can be made with very little effort. Double-width planks are used at the center. A simple strap latch is made easily and gives satisfactory service. Be sure to apply a substantial coating of creosote to the posts where they are set into the ground to prevent rotting.

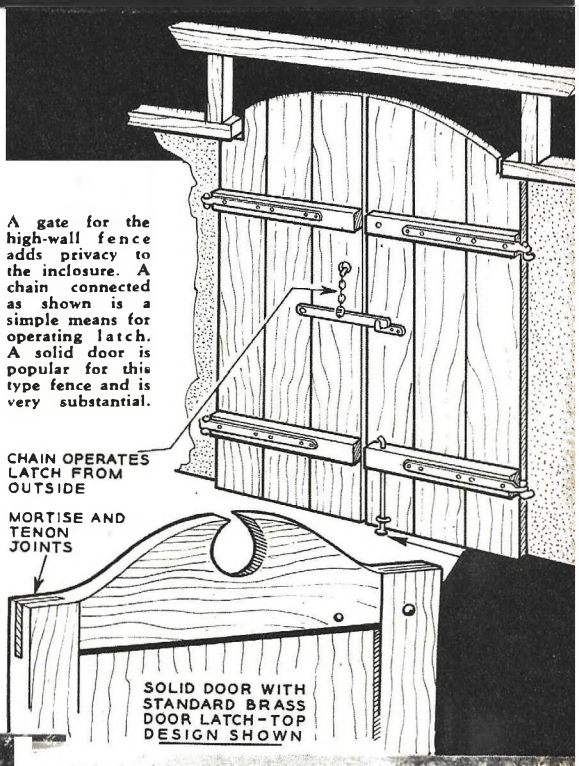
For The NEW HOME

tive but very appropriate for a high wall. As mortise-and-tenon joints enter into this project the builder will need some home workshop equipment for the purpose. A standard brass door latch with safety catch inside is used on the original.

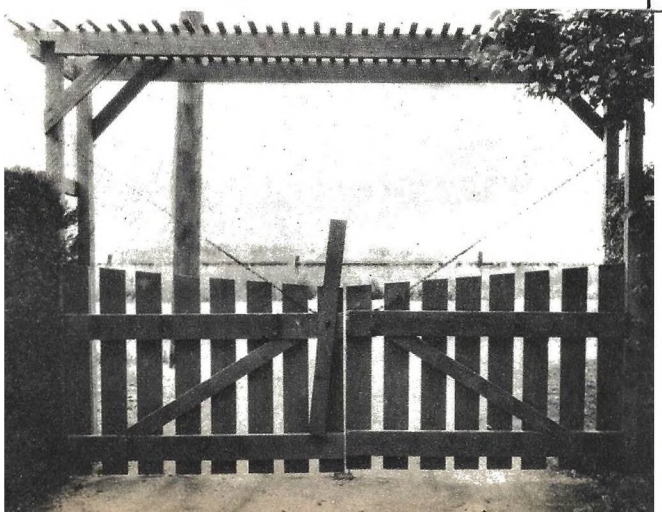
Another high-wall gate of simpler design uses board-and-batten construction with hand-made hinges, and has a latch operated from a chain hung on the outside. A stop is fitted to one-half of the gate at the bottom. Common lumber is satisfactory for the job.

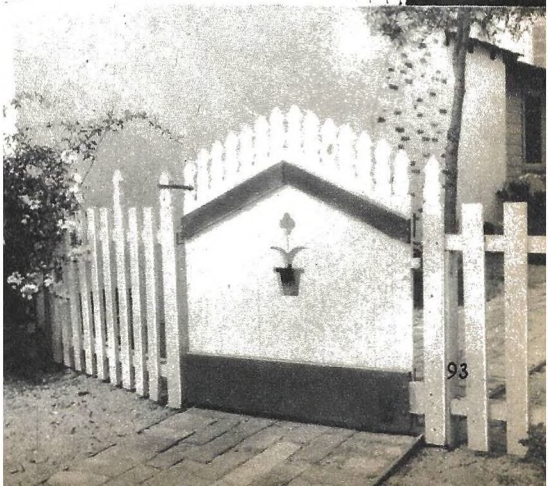
Portholes are becoming increasingly popular in town as well as at the beach. The one shown is an unusually interesting gate treatment, cleverly antiqued and assembled with carriage bolts.

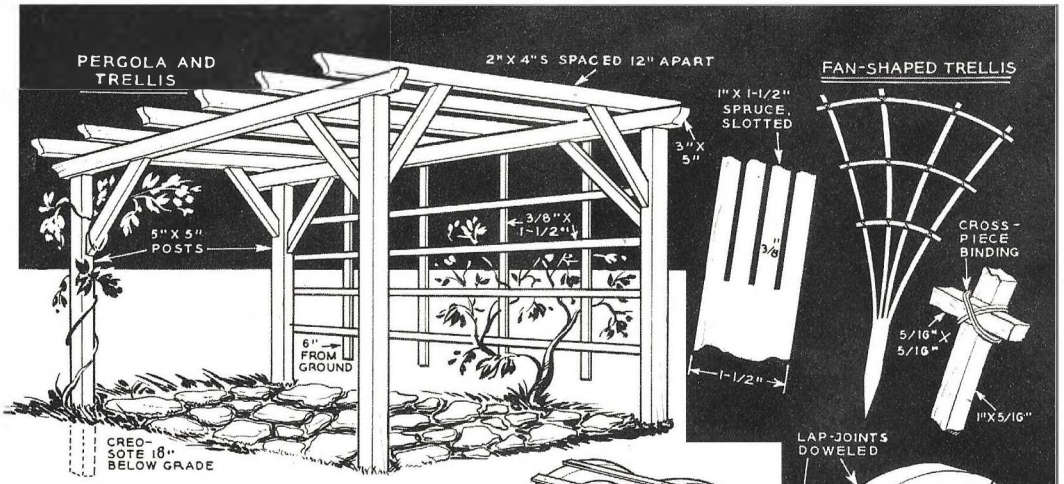
A popular and very satisfactory style of pergola and trellis is adaptable to many uses, such as a covering over a walk, a place for a picnic table, a playhouse for children, a grape arbor, and many others. It is a comparatively simple structure mounted on four sturdy posts which have been creosoted below grade



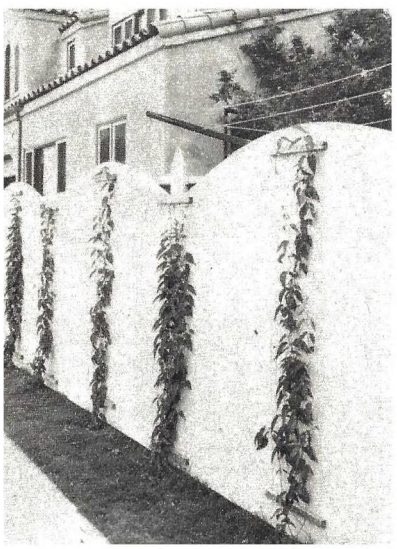
A gate for the high-wall fence adds privacy to the inclosure. A chain connected as shown is a simple means for operating latch. A solid door is popular for this type fence and is very substantial.

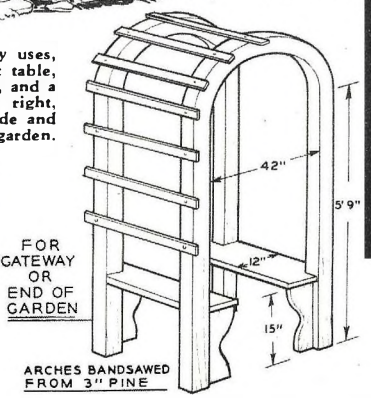


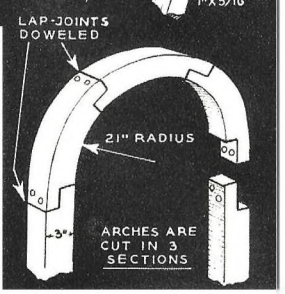




A pergola and trellis as shown above has many uses, lending itself admirably as a place for a picnic table, a playhouse for children, a covering over a walk, and a grape arbor. A fan-shaped trellis, shown at right, cut from a single piece of spruce, is easily made and can be used in almost any part of the yard or garden.





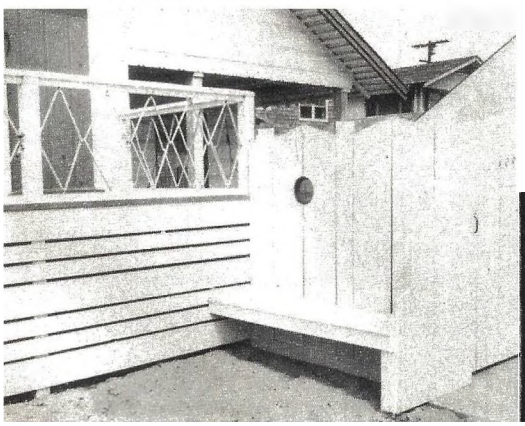


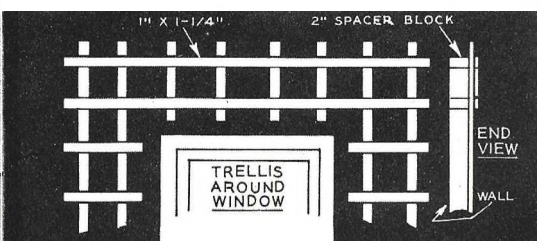
The simple arch and seat combination is a familiar sight in many gardens. The arches are made in three sections cut on a bandsaw from three-inch pine stock. Joints are dowelled through the laps. Wood filler should be used to make a smooth joint. The distance between arches can be varied to suit individual conditions.

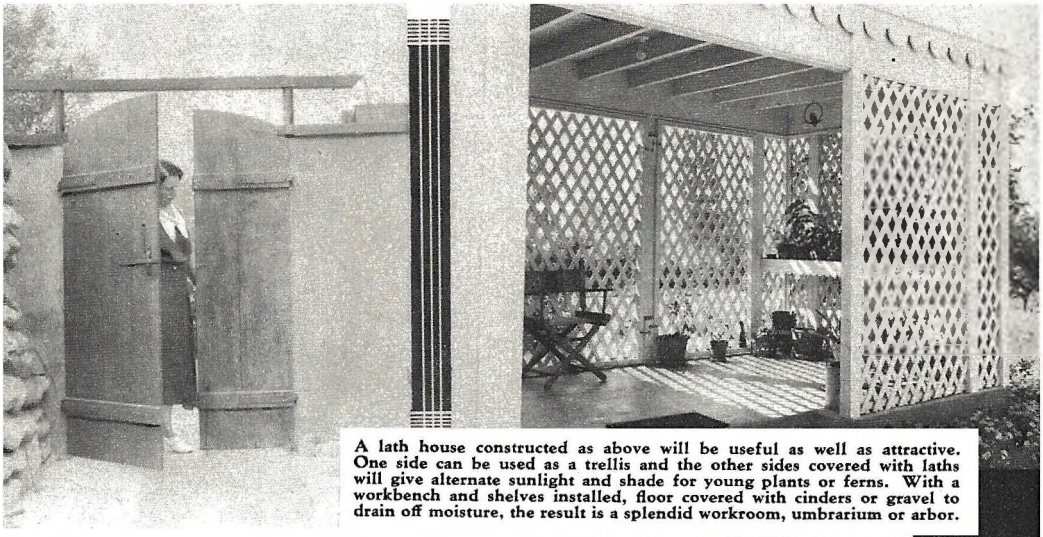
to forestall decay. It is not always good policy to set up the posts even in concrete without some treatment against rot, because if the post rots off in the concrete—which it often does—you not only must replace the post but dig up that heavy lump of concrete and replace.

This design lends itself to practically any length, and the slats on the side may be spaced as closely together as required for the particular vine it is to support.

A graceful archway with trellis at the sides is built with box-like columns using stock lumber and having open work lattice in diamond arrangement. The top arches are bandsawed from 12-inch-wide boards,







A lath house constructed as above will be useful as well as attractive. One side can be used as a trellis and the other sides covered with laths will give alternate sunlight and shade for young plants or ferns. With a workbench and shelves installed, floor covered with cinders or gravel to drain off moisture, the result is a splendid workroom, umbrarium or arbor.

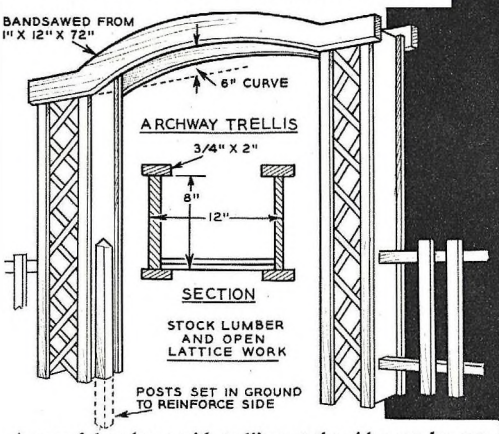
and have a curve of 6 inch radius. Posts set in the ground reinforce the side columns.

The familiar and simple arch is attractive in almost any locality, either as a front gateway or merely as a garden seat unconnected with any fence. Arches are bandsawed from 3-inch pine and assembled in three segments, the joints dowelled, through the lap. Wood filler can be used to make a smooth joint. White is the only color to use on this type of trellis.

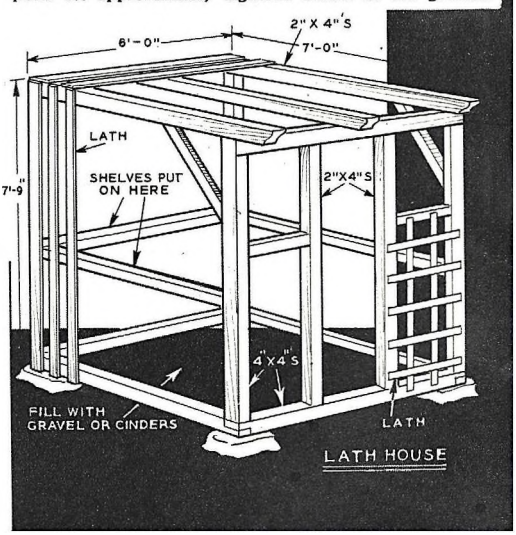
Fan trellises have long been a popular design and they are surprisingly easy to make with a circular saw. Select a piece of vertical-grain spruce 8 feet long by one inch by 1½ inch. Slot it as shown for five feet of its length, mark where the bows are to come and then assemble with copper wire to the fan shape illustrated.

A simple trellis can be placed against the house wall or around a window. It is important to have it set out at least one-inch from the wall so that the tendrils can get between battens and wall in climbing over the framework.

A lath house can be made attractive as well as useful by using the front for a trellis, with the north and west sides covered with lath to give alternate sunlight and shade for young plants or ferns. The floor should be covered with gravel or cinders to drain off moisture.

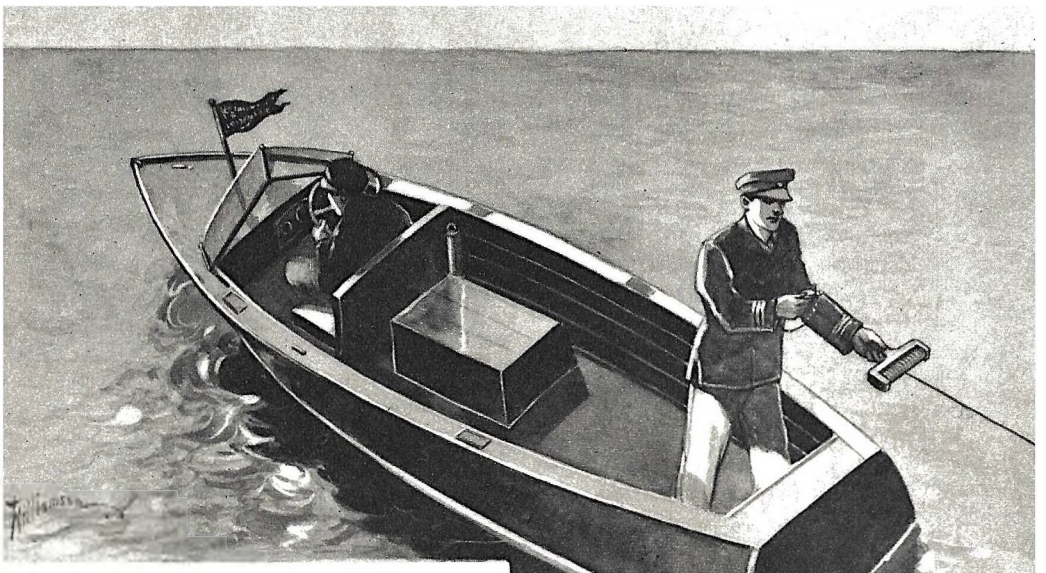


A graceful archway with trellises at the sides can be constructed with box-like columns made of stock lumber. Open work lattice arranged in a diamond pattern adds to the beauty of the trellis. Reinforce the columns with posts set approximately eighteen inches in the ground.



Every house needs a mail box, but few persons know how attractive they can be. However, in the October issue of MECHANIX ILLUSTRATED, readers will find complete instructions for building them—each one a gem—and easy to construct. Don't miss the October issue.

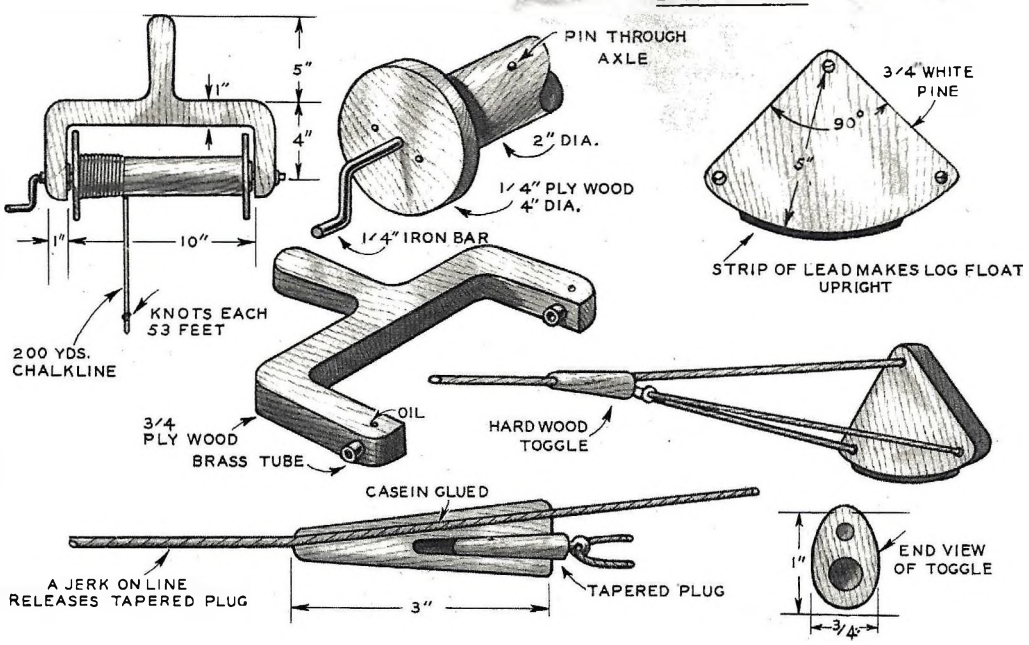
HINTS And KINKS For



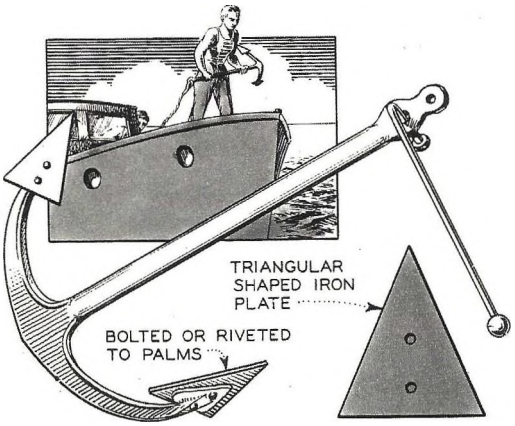
A LOG chip and reel comprise a simple means of determining the speed of a craft off-shore, and both are easy to construct. The chip is a triangular piece of wood with a lead strip on the bottom to cause it to float upright. A harness is attached through a wooden toggle; to this is connected a line knotted every 53 feet.

In operation, the chip is tossed astern and fifty feet or so, called the stray line, is run off before counting the knots. This is to allow the chip to get clear of the boat's eddy. The rest of the line, known as the log line, runs off the reel as the observer counts the knots up to, say 10, then takes the time elapsed. Thus ten knots means the craft has covered 530 feet.

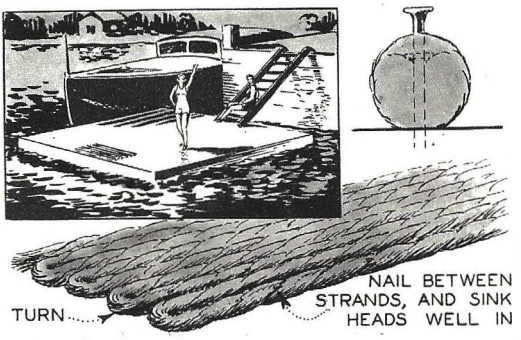
LOG-CHIP FOR DETERMINING BOAT SPEED



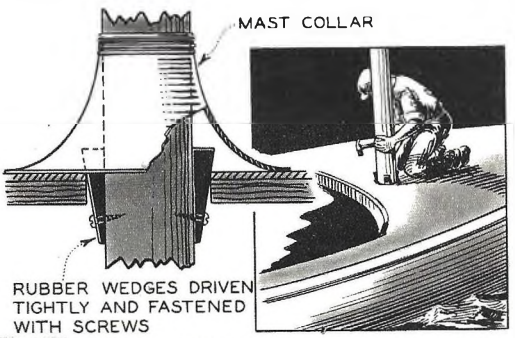
AMATEUR SAILORS



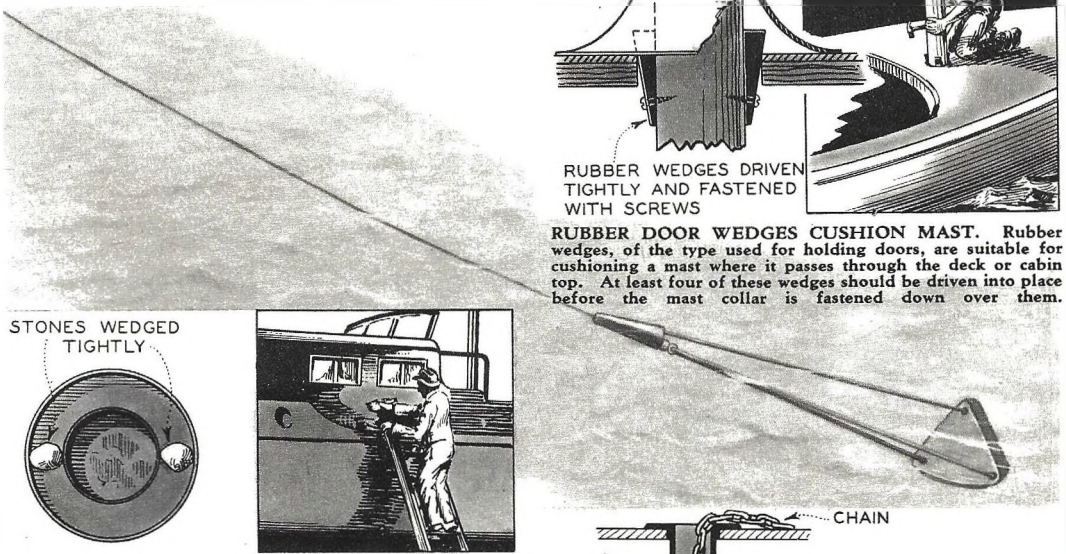
PLATES DOUBLE ANCHOR'S HOLDING POWER. By bolting or riveting large triangle-shaped plates to the palms of an anchor, its holding power will be considerably increased, especially in soft, muddy bottoms. The plates should be four or five times the size of the palms, and the thicker and heavier they are, the better. If bolts are used to hold them in place, they can be removed easily when the anchor is stowed away.

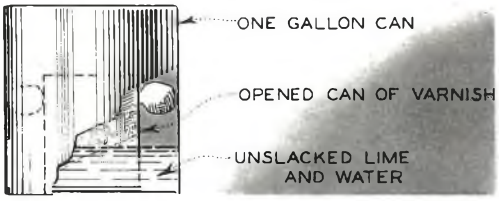


DISCARDED ROPE BECOMES FOOT MAT. An old piece of rope, an inch or more in diameter, nailed to the outer plank of a wharf makes a very satisfactory mat which will contribute considerably to the the cleanliness of boats moored alongside. The rope should be fastened down with 2-inch nails, driven between the strands and placed every six inches.

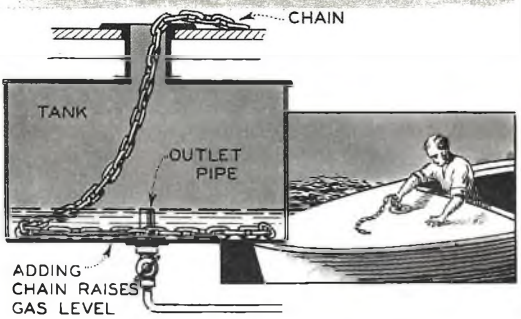


RUBBER DOOR WEDGES CUSHION MAST. Rubber wedges, of the type used for holding doors, are suitable for cushioning a mast where it passes through the deck or cabin top. At least four of these wedges should be driven into place before the mast collar is fastened down over them.





LIME KEEPS VARNISH WARM. When varnish is used in cold weather, some means usually must be provided for keeping it warm. Place the can of varnish in a larger can and wedge it securely with two or three small stones. A small quantity of unslaked lime placed in the large can, and moistened with as little water as is necessary for obtaining the correct temperature will keep the varnish at the right consistency. Add water when necessary. Treat the lime cautiously because if it touches the body, it will cause severe burns.



CHAIN AIDS FUEL TANK CLEANING. When a gas tank is drained, many times a considerable quantity of sediment is left which eventually finds its way into the gas line and causes trouble. A length of chain lowered into the tank raises the level sufficiently high to cause most of this sediment to come out through the feed line when the tank is drained.

How To Polarize

by Andrew Vena

ONE of science's latest wonders is a film-thin material, roughly 75% transparent, called Polaroid. Polaroid features the important virtue of being able to polarize light, which ability gives it many scientific and practical uses, both existing (now over 800) and potential. Three-dimension movies are an accomplished fact as a result of this material. Polaroid also makes possible the elimination of automobile headlight glare.

And now comes the polarizing microscope. Advertisements on Polaroid-equipped low-priced microscopes for the amateur have begun to appear. Polaroid attachments, which come in sets of two, the "Polarizer" and the "analyzer," for the better instruments, also are available.

Ordinary microscopic views do not look the same when viewed in polarized light. They are more beautiful and far more interesting. Polarization produces color and contrast.

Above are shown details of preparing the Polaroid eyeglasses for use on the microscope. When the nose piece is cut off, a fine file can be used to smooth the edges of the rim. When the eyepiece is fastened to the stage, it should be loose enough to be moved easily.

Your Microscope

New fields opened for microscope hobbyists by use of Polaroid.

definition is sharpened, details increase, and the color formation changes amazingly as the analyzer is rotated through a quarter turn. All of this must be seen to be appreciated. Hobbyists who already have a microscope may not want to buy another one just to obtain the Polaroid feature. Their present instruments can be polarized by the use of attachments home-made from a pair of Polaroid eyeglasses sold at most optical shops for under $4.00. Also, these "home-maders," being larger, will lend themselves to other experiments and more fun.

The glasses are cut apart at the nose piece and otherwise prepared as shown in the sketch. If the temple pieces have a heavy wire core, the celluloid covering one of them should be burnt off and the wire bent and shaped to fit around the microscope tube as shown in the photograph.

It should also be removed and replaced "wrong" as sketched so it swings properly when in place on the microscope. This will be the analyzer. The other "lens," also prepared as sketched, is loosely bolted, by a small bolt running through a hole drilled in its hinge plate, to the underside of the stage at the corner as shown in the drawing. This is the polarizer. The hole in the stage is threaded to receive the bolt without it extending through and projecting above the stage surface to interfere with the slides. Both units may be swung out of the way when not wanted.

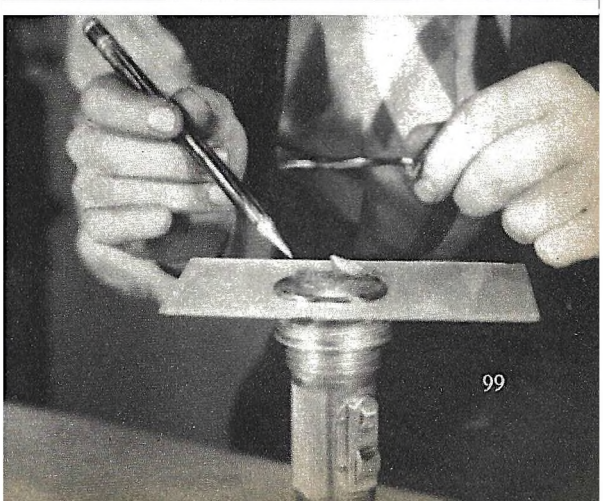
Because of the mounting used, the analyzer can also be easily rotated about the tube for "effects" while peering through it. Both units can be easily and quickly removed for experimental use.

Since Polaroid reduces the light passing through it somewhat, some experimenters may find it desirable to increase the intensity of the illumination used.

Transparent materials may be examined in

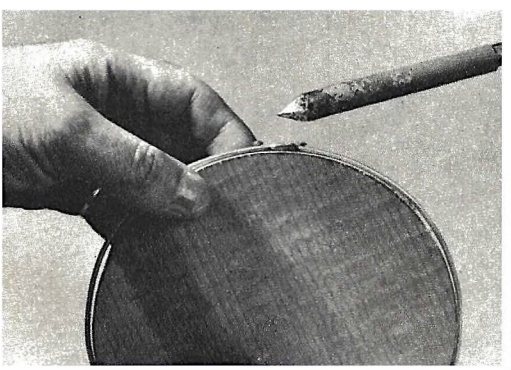
[*Continued on page* 137]

Above is shown the microscope in use after it is equipped with Polaroid. Below is shown a simple method of inspecting Cellophane under polarized light. A flashlight is stood on end, a piece of ground glass is placed on top of it, and Polaroid is placed on top of this. Commonplace materials often take on brilliant colors when subjected to polarized light.



Screen Craftwork

Coating the sides of a neat, practical ash receiver with asphalt varnish. Baking it will give a very hard and lustrous finish particularly suited to ash tray use.



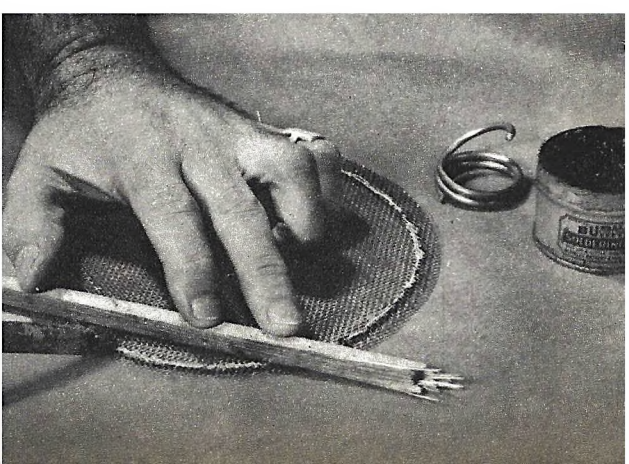
To make a fruit basket, use a 7-inch wood disc as a template for forming and soldering the stiff wire frame. Right—After soldering the screen bottom to the wire ring, trim away the excess with tin snips.

HERE is a new and unusual type of craftwork. It is unusual because if you can manage a soldering iron and tin snips or heavy scissors, you can turn out projects equal in beauty of design to work done by a skilled artist. Artistic skill is not necessary, however, as the "skill" is already built into the inexpensive material that is used. The material is ordinary copper window screening, which costs around 9c a square foot. You can also use the cheaper black enameled or galvanized screening, but it lacks the warmth and brilliance of copper.

When making projects described in this magazine in the past, you have probably noticed designs which were broken up into squares for ease in copying, enlarging or reducing. With screen craftwork, the process is reversed. First select any design, from the pages of a magazine, from a photograph or from one of the 10c drawing books which can be purchased at a department store. The latter are excellent sources of designs in great variety.

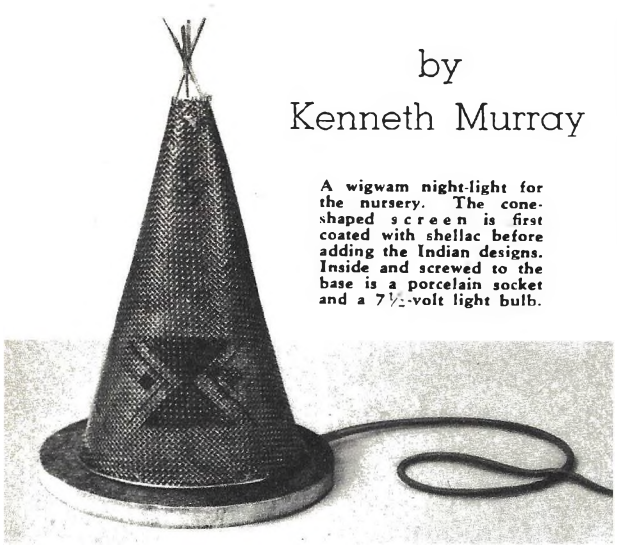
After cutting a piece of copper screen to the required dimensions (and after soldering it, if the piece is to be made into a typical project like one of those illustrated), it should be protected against dulling of the bright finish. Thin a little clear lacquer until it is but little heavier than water; place some in a shallow tray or dish, dip the screen into it, then fan the latter until the solvent has evaporated. If the lacquer should bridge across some of the openings of the screen, more thinner must be used.

Lay the screen over the design, and you will notice that the latter is broken up into small squares, much like the dots of a halftone engraving. It will, in fact, have the same



For Shop Projects

by
Kenneth Murray

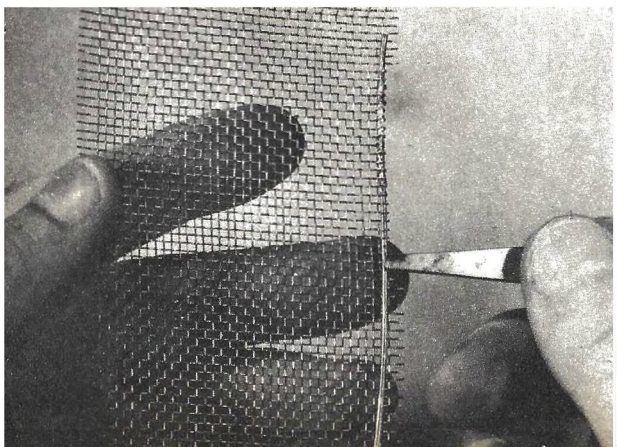


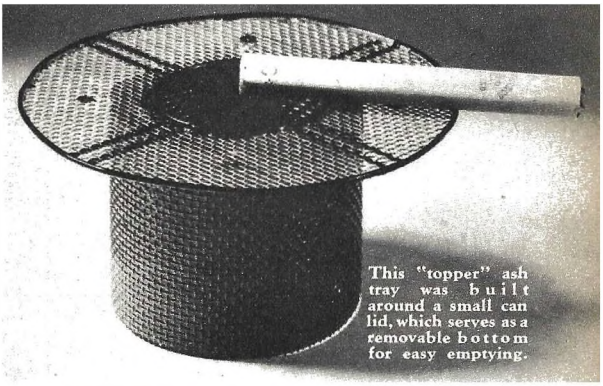
A wigwam night-light for the nursery. The cone-shaped screen is first coated with shellac before adding the Indian designs. Inside and screwed to the base is a porcelain socket and a 7½-volt light bulb.

appearance as a newspaper halftone "cut" when viewed from a short distance. All that you will have to do, to transfer the design to the screen, is to fill in the squares with a suitable material over the lines of the original.

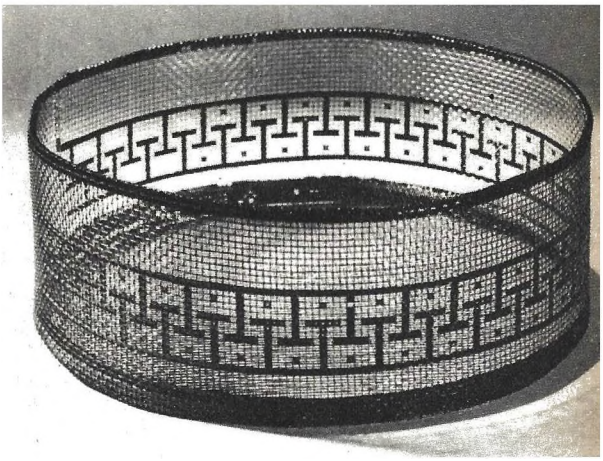
If you wish the design to be enlarged on the work, lay a finer screen over the "copy" and repeat the design, square for square, on the coarser screen. If the design is to be reduced, cover it with a coarser screen and do the same.

There is a wide choice of materials for filling in the squares. Shellac, to which coloring matter has been added, is suitable, and you can also use practically any good enamel. Best of all, however, is rather thick lacquer. The film of lacquer is much tougher

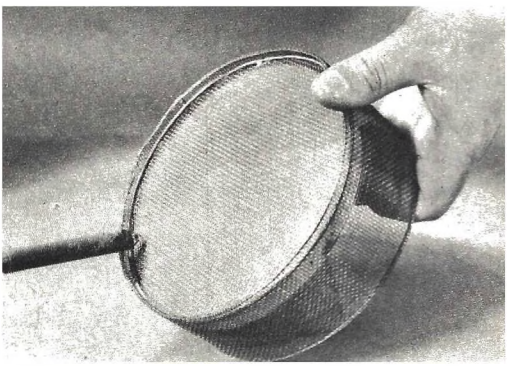




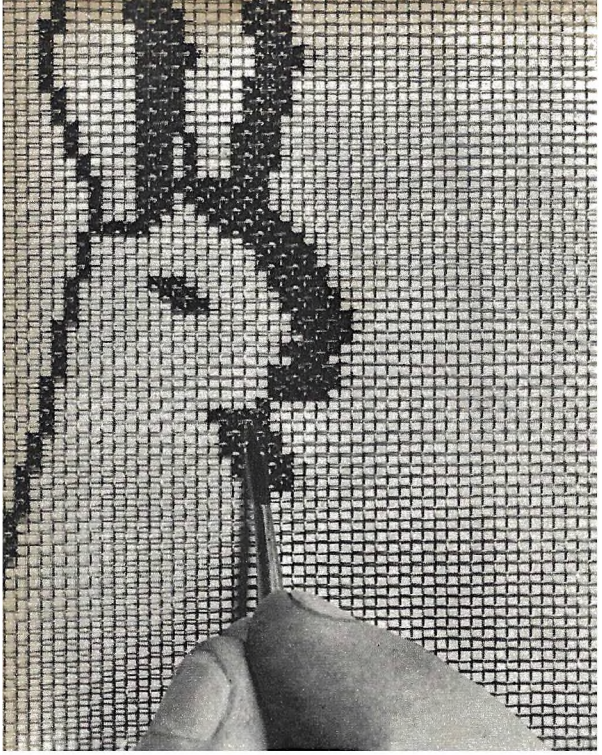
This "topper" ash tray was built around a small can lid, which serves as a removable bottom for easy emptying.

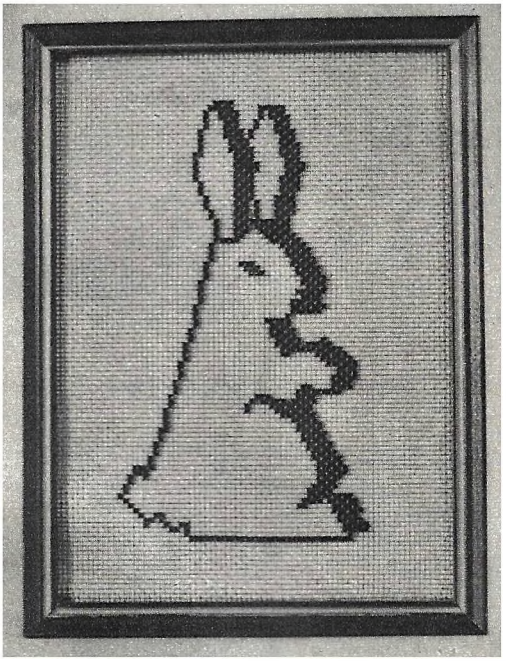


An attractive and useful basket for fruit, candy or nuts. Notice the simple but pleasing design on the sides. A wire handle can be added if desired.



Soldering the bottom of the basket in place. It is then ready for the design. Left—Free wires at the edges of the side are bent around the frame wire. After being bent, as shown, they are soldered in place.



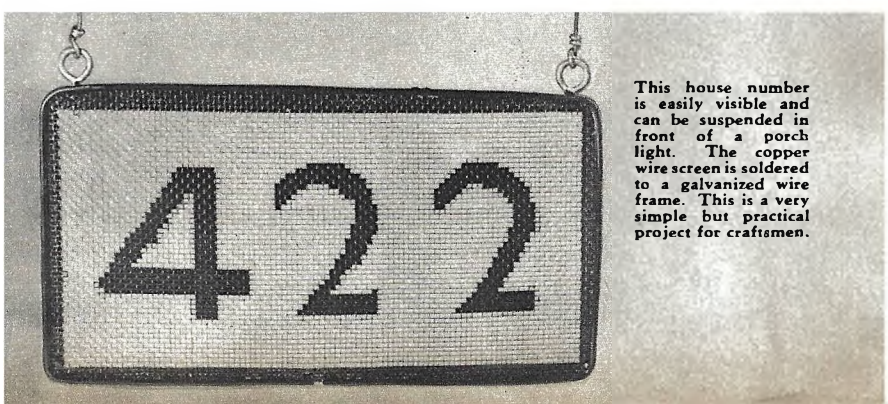


Top—The design is made by filling squares of the screen with thick lacquer, which is applied with a pointed brush. Above—This Easter rabbit is particularly suitable for a nursery. It is backed by a piece of silver foil, and both are then placed in a frame.

and more durable, and it dries quickly, which is a great advantage. When the project must be exposed to heat, as in the case of an ash receiver, a very good material is *thick* asphalt varnish. If this must be thinned at all, use a very small quantity of turpentine. Asphalt varnish may be baked, if this seems desirable, and it becomes very hard and lustrous.

Whatever material is used, apply it with a small pointed brush that is just wide enough to cover the width of one square of the copper screen. Dip the brush into the lacquer frequently so that each square will be well filled; otherwise some of the squares will have a film of lacquer that is thin in the center. If you place the screen over the design for this operation, be sure that they are not in contact. Errors can quickly be removed with a cloth moistened with lacquer thinner.

As was mentioned previously, soldering of the assembled screen parts should be done before giving the screen a protective lacquer coating and filling in the design. Steps in assembling a typical project are shown in several of the illustrations. In most instances it is desirable to shape a piece or pieces of stiff wire, which can be of copper, brass or galvanized iron, to serve as a framework. Cut a piece of wood to shape for use as a template for accurately bending the wire and for soldering it. Edges of the screen to be soldered together or to be soldered to wire should first be prepared by removing one or two of the fine wires of the screen along the edge. This will leave a series of fine wires projecting independently. Touch each one with a hot soldering iron, and some solder to tin it, before meshing them with the edge of the adjoining screen.

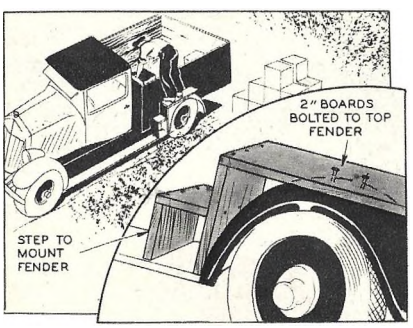


This house number is easily visible and can be suspended in front of a porch light. The copper wire screen is soldered to a galvanized wire frame. This is a very simple but practical project for craftsmen.

TIME SAVING AUTO KINKS

Air Cleans Air Cleaner

THE gauze-type air cleaner and silencer used on most of today's carburetors can be cleaned quickly and easily by using the arrangement shown at the right. An ordinary pail or grease bucket should be drilled to take a metal valve stem of the type used in inner tubes. The bottom hole should be drilled a short distance up from the bottom, and the second hole, approximately half-way between the top and the first. To clean the gauze, fill the pail slightly above the first valve with kerosene. Immerse the cleaner and connect an air hose to the valve. The agitated kerosene will remove all dirt. Then connect the air hose to the second valve, and hold the cleaner in front of it, to remove excess kerosene.—J. S. Sullivan.

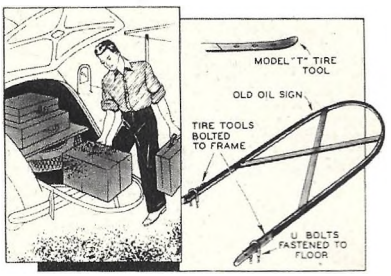


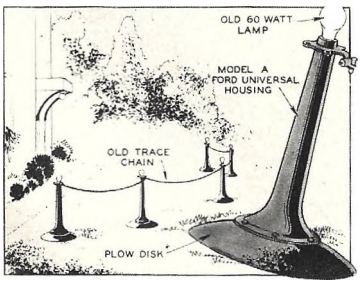
Step Speeds Truck Unloading

AN EASILY constructed and inexpensive step as shown at the left will be found useful when loading or unloading a truck. When the sides of the platform are high, the step will greatly facilitate reaching into the compartment. The step should be bolted to the top of the fender. Screws can be used to hold the bottom of the step to the fender. Use long screws so that they will hold it securely. After it has been given a coat of paint, the same color as the rest of the body, its appearance will not be unsatisfactory.—Bob Poulson.

Old Parts Become Luggage Carrier

THIS luggage carrier will support several hundred pounds and can be built entirely of junk parts. All the tools needed for construction are a hack saw, a small drill and a pair of pliers. An old oil sign frame makes a good main support. "U" bolts fastened to the floor of the compartment hold the frame in position. It can be removed easily when it is not required.—H. D. Watson.

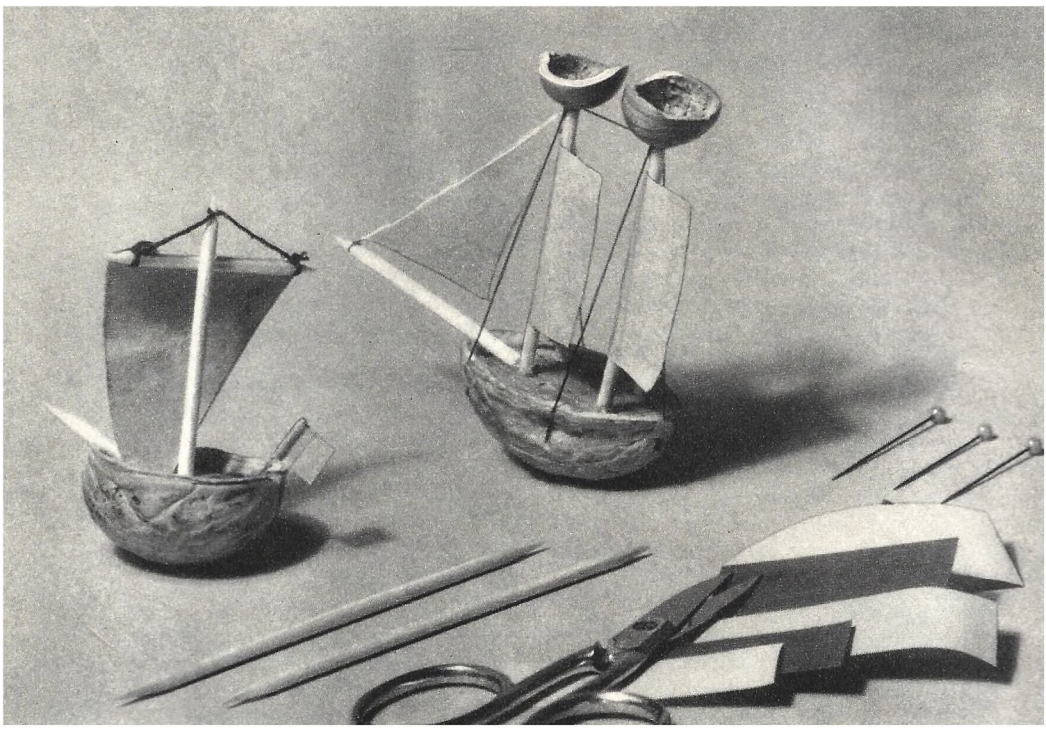




Portable Fence Is Easy To Build

A NOVEL chain fence can be constructed from a Ford A universal housings, plow discs and a length of chain. The housing should be bolted securely to the disc. The fence can be illuminated easily by running wire from the electricity source to a bulb mounted in the top of the housing. When used on a lawn, the grass can be cut very close to the base because the disc is at ground level at the outer edge.—H. D. Watson.

The Nutshell Fleet



ATTRACTIVE small boats using nut shells as the principal material can be constructed easily and quickly with a few simple tools. Walnut shells are particularly suited for use as the hull, with a toothpick or two as masts. With a pair of scissors and a few scraps of paper, sails of any size or type can be added. A pebble for ballast will improve its sailing qualities. The sails should be made of paper which is not too porous, or, they can be given a coat of very thin shellac.

Top—Two boats completed and ready to sail. Above—The deck should be cut from thin wood by using a small saw or a very sharp knife. Be sure to add a small amount of ballast before fastening the deck in place. Right—The tools and equipment necessary for the construction of a novel "nutshell fleet."

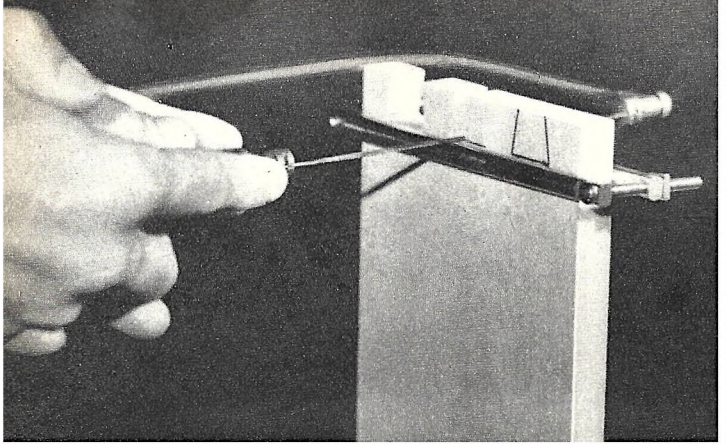
BICYCLE SHELTER AND SHOP

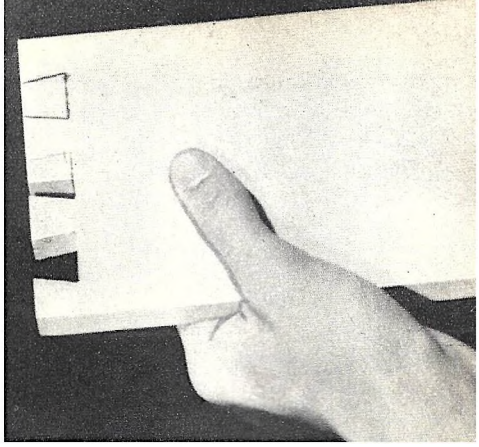
By using a little ingenuity the builder can change the plans to suit his individual requirements. Nails or bolts and nuts may be used for fastening the separate parts. If bolts are used, the structure may be taken apart for moving.

THIS neat shelter-and-shop protects the bicycle from sun and rain, and in addition, supplies a compact little workshop with a place for a small vise and padlocked compartment for tools.

To build, lay the floor on two-by-fours which have been creosoted or tarred to forestall decay, or at least set them on rocks or bricks. Level the floor and erect the workbench and wainscoating on low walls. These are panelled with ⅛-inch hard pressed board which resists moisture. A coat or two of paint will not be amiss. The roof framing is of very simple construction and the awning cloth should be fastened with copper or galvanized tacks to resist rust.

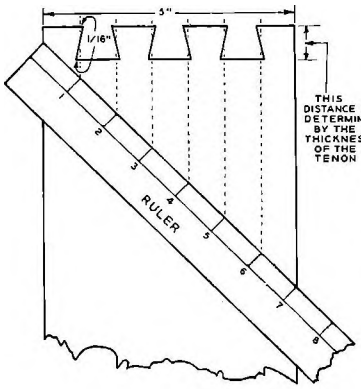
Make a yoke of flat bar iron, as shown, in which to lock the rear wheel with chain and padlock. It should be riveted to the framework so as not to be removed easily.

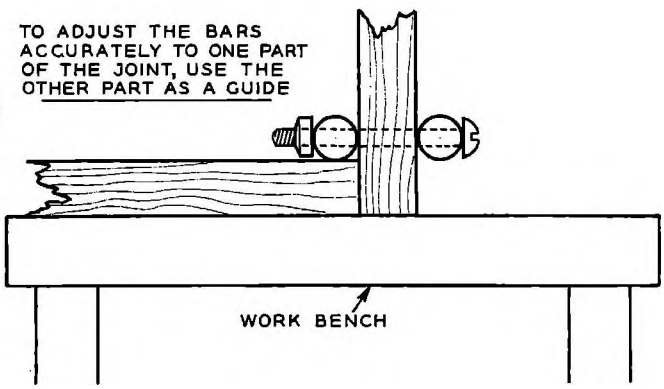




Cutting Dovetails The Easy Way

Above, left, is shown the guide rods in place and the coping saw resting on the upper edge for making the horizontal cuts. Above: The neat job produced by this method. Below left is shown the method of drawing the lines to divide the board into any number of equal sections.





THE device and the method here described for the marking and cutting of dovetail joints have proven remarkably efficient from the standpoint of speed with accuracy. The resulting joint presents an appearance of machine-made precision.

Let us assume that a board five inches wide is to be used as one side of a dovetailed box or drawer.

Let us also assume that the mortise part of the dovetail joint is to consist of four "teeth" and three openings, or a total of seven divisions.

Draw a line on the board parallel with one end. The distance between the line and the end of the board is equal to the thickness of the second board that will be used for the tenon part of the joint.

Lay a ruler diagonally across the first board so that one end is at one edge of the board and the seven-inch mark at the other. Then mark off six points across the board on the inch marks.

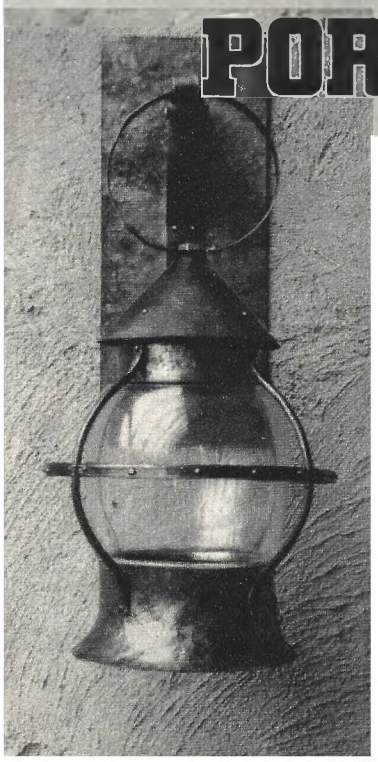
Using a square, and being guided by the six marks (which are in a diagonal row) draw six lines beginning at and at right angle to the first line and extending to the near end of the board. Then cross each of these six lines with another line whose angle is determined by a one-sixteenth-inch interval. Using a square, extend the diagonal lines across the end grain of the board and the work is ready for cutting.

The simple device shown in the top photograph obviates the necessity that some careful workmen feel for marking both sides of the board.

The contrivance illustrated consists of two cylindrical iron bars with holes drilled near both ends of each to admit machine-screws or bolts, and with nuts on the bolts. The iron bars serve as rests and guides for the blade of a fine coping saw which is used instead of the customary chisel. The saw glides over the bars and as there is a bar on

[*Continued on page* 134]

HAMMERED COPPER PORCH LANTERN



THIS attractive lantern is very simple to make, and the materials are all easily available. The globe around which the lantern is built is an ordinary short type lantern globe.

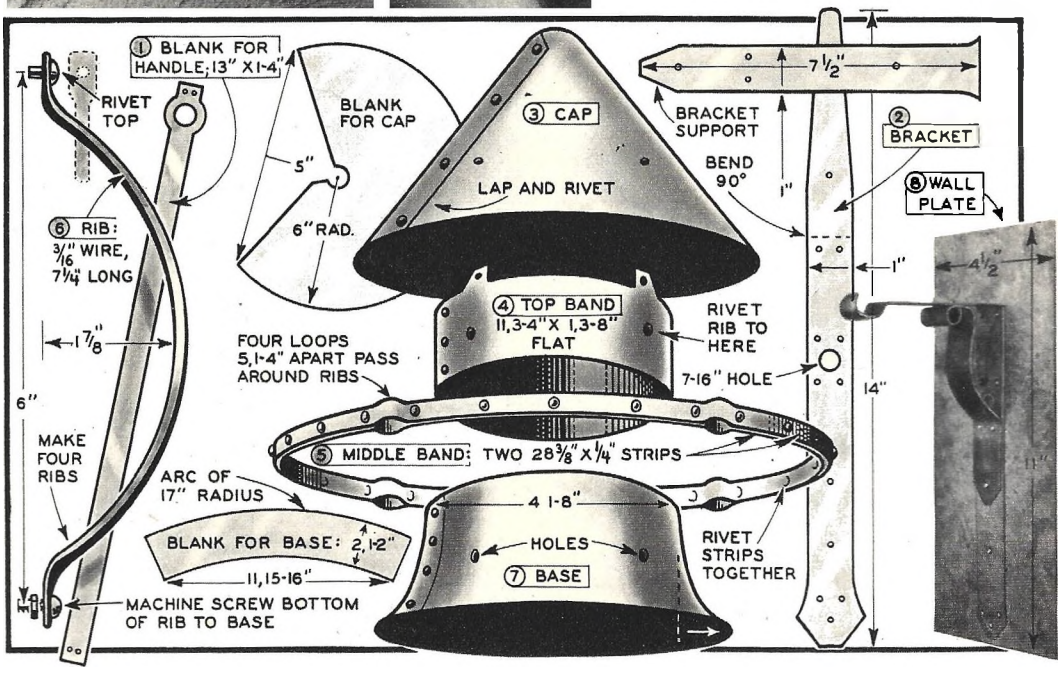
The base is laid out on 18-gauge sheet copper as shown, and is cut out and rolled into a cone-shaped band. It is lapped ¼" and riveted together, after which the outside is hammered, and the bottom flared out.

The top band is cut from the same material, and hammered, rolled and riveted together. The cap is cut out, hammered, formed, and riveted. The lugs on the top band are bent in slightly, and corresponding holes are drilled in the cap, and the cap is riveted to the band.

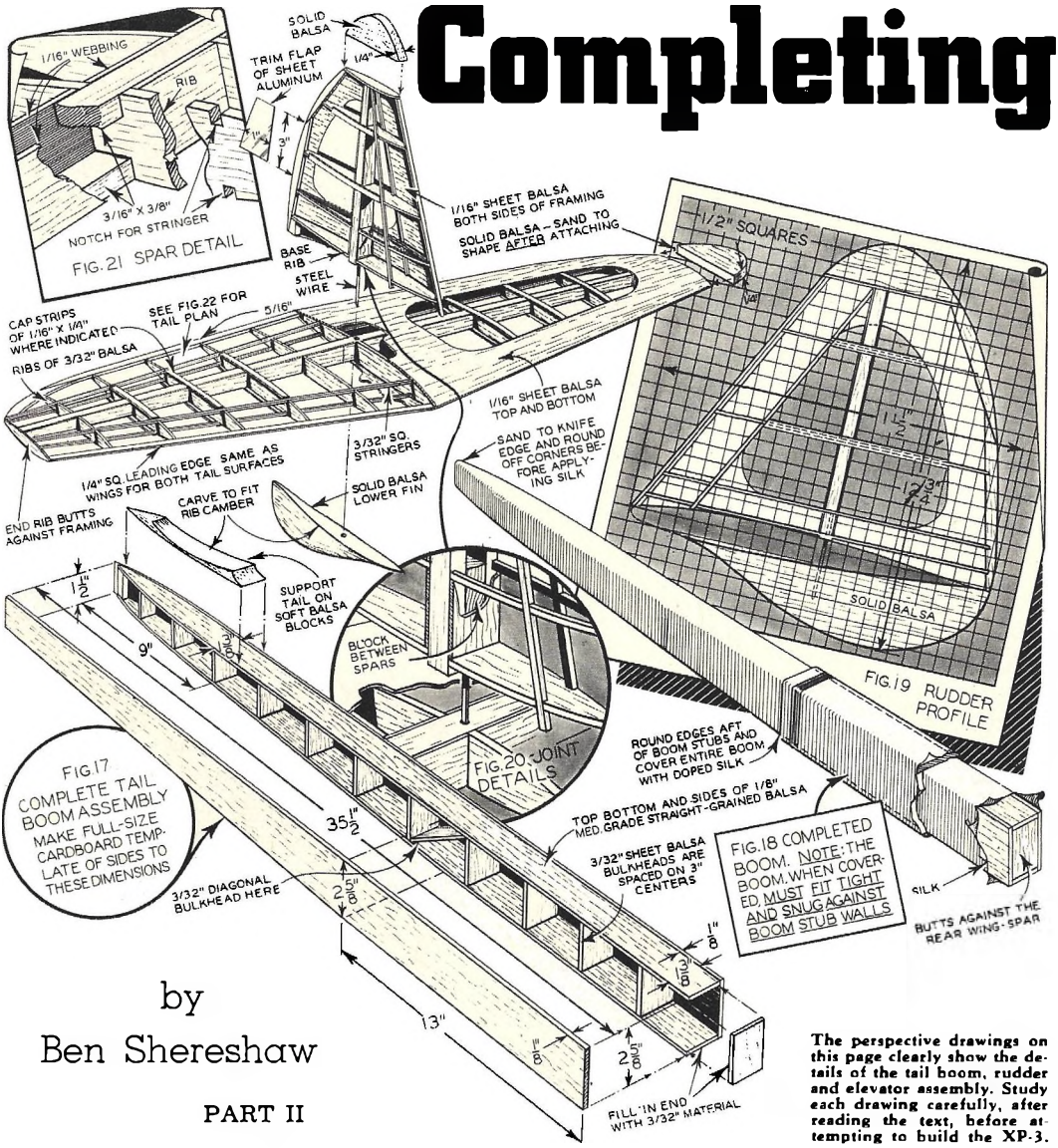
The ribs are of $\frac{3}{16}$" copper wire, and are 7¼" long. The piece is bent to shape, and the ends flattened out. Holes are drilled and the top ends of the ribs are riveted to the top band.

The center circle bands are cut,

[*Continued on page* 134]



Completing



by

Ben Shereshaw

PART II

The perspective drawings on this page clearly show the details of the tail boom, rudder and elevator assembly. Study each drawing carefully, after reading the text, before attempting to build the XP-3.

THE twin tail booms are built in very much the same manner as the boom stubs with the exception that they are strengthened by the addition of $\frac{3}{32}$-inch balsa bulkheads spaced three inches apart throughout the length. An additional diagonal bulkhead is required between stations No. 5 and No. 6 to help relieve the maximum bending loads imposed at this point in landings. The booms must be built to fit very snugly within the boom stubs as their firm anchorage depends entirely upon friction alone when completed and covered.

The construction of the booms is fully covered in the drawings and the full size pattern of the side walls can be taken from the dimensions given in the perspective drawing, Fig. 17. Use $\frac{1}{8}$-inch material for the walls. After tapering the stern to a blunt knife point as shown, sand down the edges aft of the point where the boom emerges from the stub and cover with silk and dope in the usual manner, applying three coats. During the entire construction care must be taken to insure and preserve perfect alignment of the booms and boom stubs.

The horizontal tail and rudder assembly may now be undertaken. Start with the former. Incidentally this structure is built in a very similar manner to the wings so a careful study of the construction drawing given

The XP-3

for the tail will be of considerable help when it comes to making the wings.

Lay out all the ribs needed from the basic rib pattern given in Fig. 28, plotting each rib in proportion. A light grade of balsa is recommended for the entire tail group assembly so bear this in mind when cutting out the ribs from $\frac{3}{32}$-inch sheet balsa. Lay out the main spar on a full size pattern of the tail taken from the plan, Fig. 22, starting with the lower spar then putting in the ribs and finally slipping in the top spar. The

The wing sections should be assembled in an inverted position, as shown below. Dimensions appear in wing layout plan, Fig. 23. Note scale.

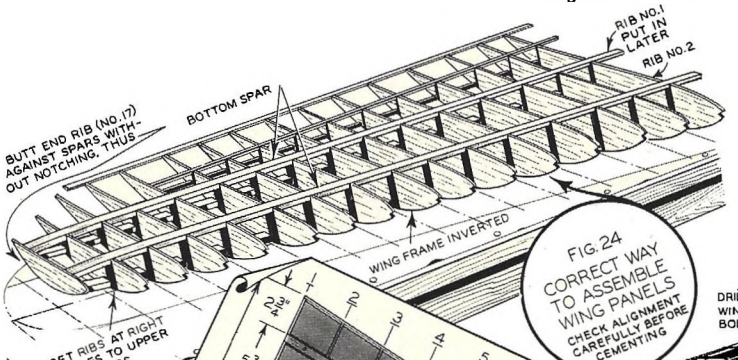


FIG. 24 CORRECT WAY TO ASSEMBLE WING PANELS CHECK ALIGNMENT CAREFULLY BEFORE CEMENTING

FIG. 25 DETAIL OF WING ROOT

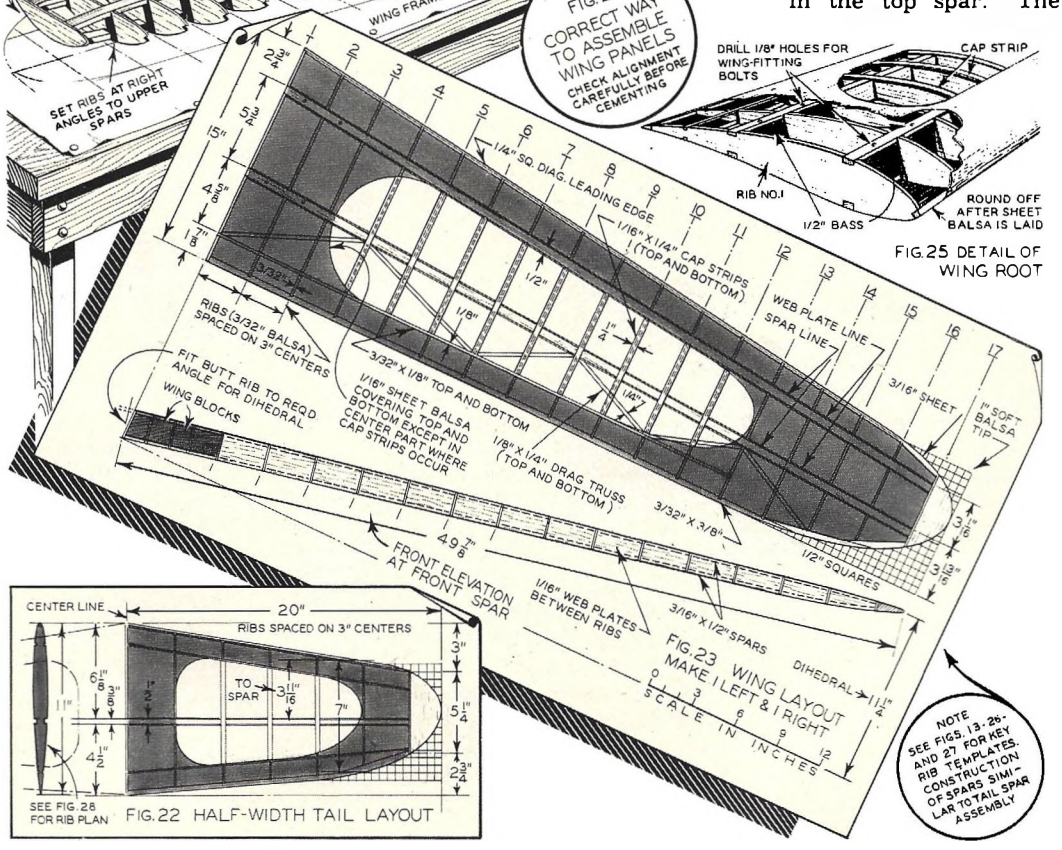
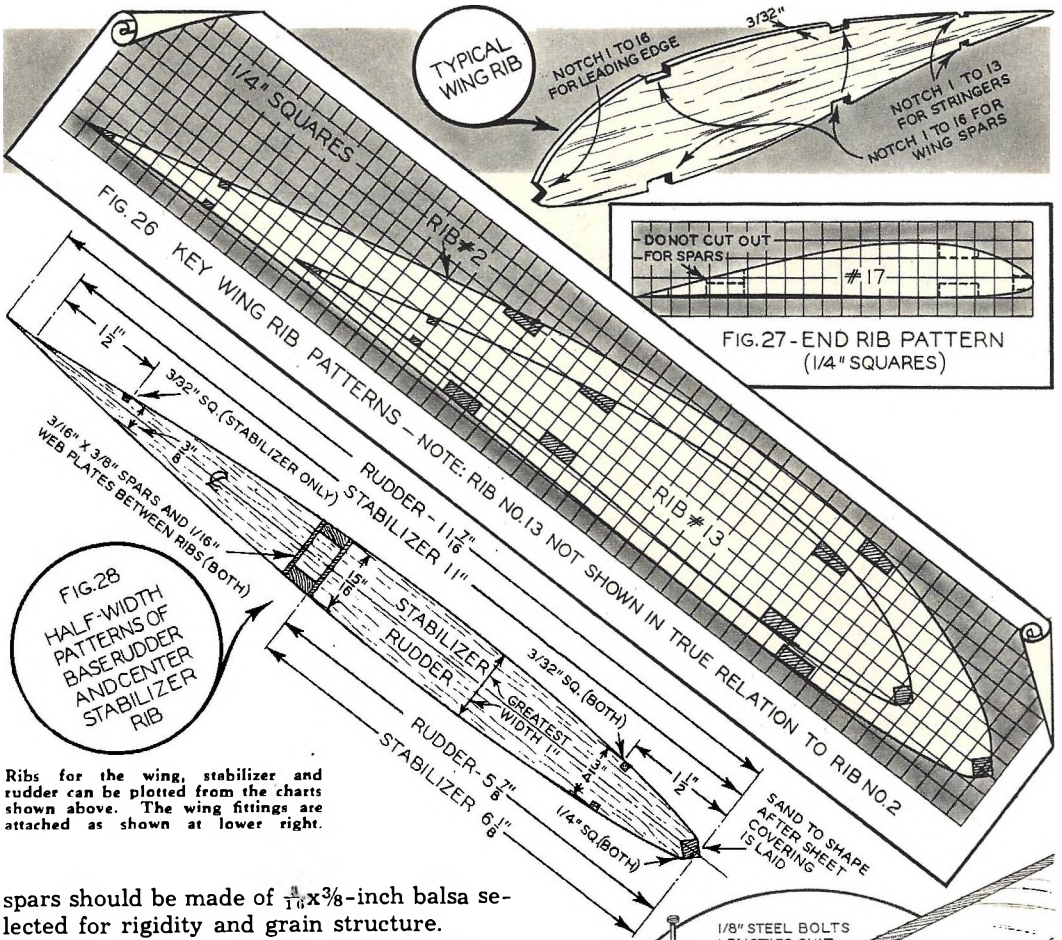


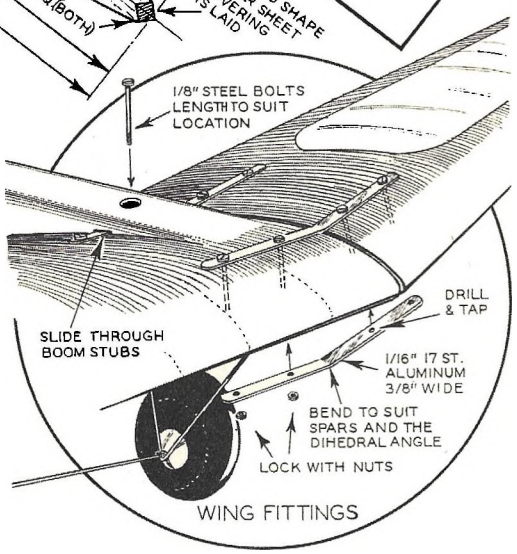
FIG. 23 WING LAYOUT MAKE 1 LEFT & 1 RIGHT

NOTE SEE FIGS. 13, 26 AND 27 FOR KEY RIB TEMPLATES. CONSTRUCTION OF SPARS SIMILAR TO TAIL SPAR ASSEMBLY

FIG. 22 HALF-WIDTH TAIL LAYOUT



Ribs for the wing, stabilizer and rudder can be plotted from the charts shown above. The wing fittings are attached as shown at lower right.



spars should be made of $\frac{3}{16}$x$\frac{3}{8}$-inch balsa selected for rigidity and grain structure.

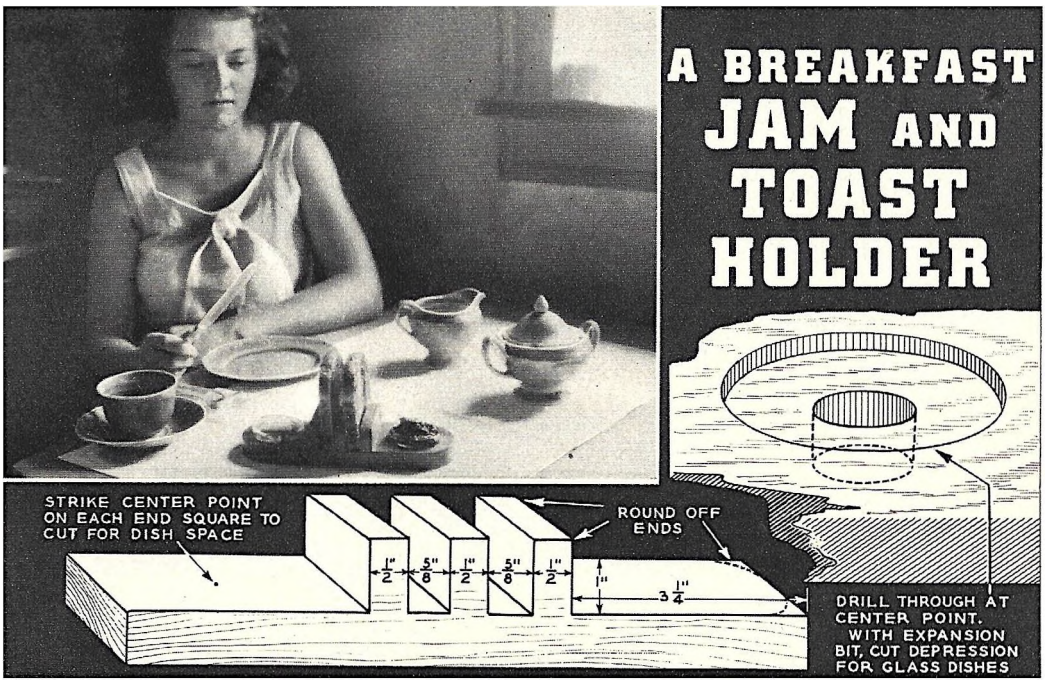
Fit the leading and trailing edges, leaving them unfinished so as to afford a gluing surface for the sheet balsa covering, and put in the stringers which act as supports for this covering. The tips, of ¼" soft balsa are attached after the $\frac{1}{16}$" sheet covering is glued in place, being carved to complete the wing tip contour. Sand down the entire piece, carefully finishing the leading and trailing edges to conform to the airfoil section, and then put in $\frac{1}{16}$x¼-inch cap strips along the top and bottom of all ribs not covered by the sheet balsa. This results in a smooth unbroken surface for the silk covering which is now applied and doped.

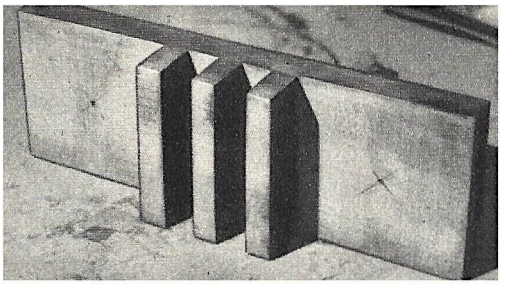
The rudder is constructed in exactly the same manner as the horizontal tail, taking the rib pattern from Fig. 28, and the layout from Fig. 19. Note that the rudder has a lower section of solid balsa. This is carved from soft balsa to fit the lower camber of the horizontal tail and glued in place after the upper main section has been attached. All spar and rib material is the same as for the tail.

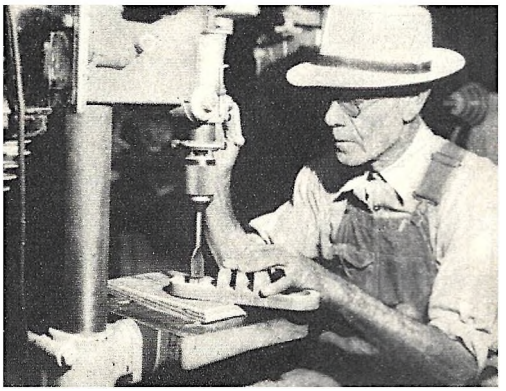
The tail group rests on the booms supported by soft balsa blocks carved to conform to the lower camber of the horizontal tail and is secured by winding strands of $\frac{3}{16}$-inch flat rubber in crisscross fashion around tail and

[*Continued on page* 136]

A BREAKFAST JAM AND TOAST HOLDER





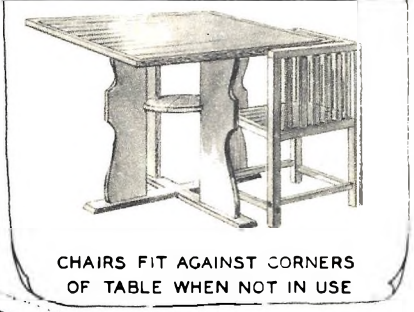


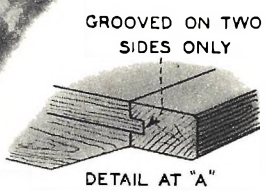
THIS single piece project is something new for the breakfast table. It holds two or more slices of toast, a square of butter and a helping of jam or preserves. While appropriate for the breakfast nook in your own home, it will also appeal to smart coffee shops and tea rooms.

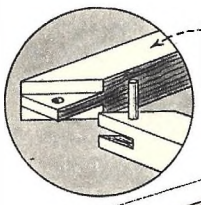
Start with a block of well-figured gum and dress it down to 3¼ inches in width, 1¾ inches in height and 9¼ inches in length. Lay out 3¼-inch squares at each end. Space off the middle portion into three sections ½-inch wide and two sections ⅝-inch wide as shown. The ⅝-inch gaps take the toast and the half-inch walls form the grooves. Mark a line ¾-inch up from the bottom along one edge until it meets the first wall. Set the band saw fence carefully, then saw out the waste along this line. Some sanding will put the grooves and the flat ends in smooth condition. Round each upper corner of each center wall at the upper edges as a photo shows.

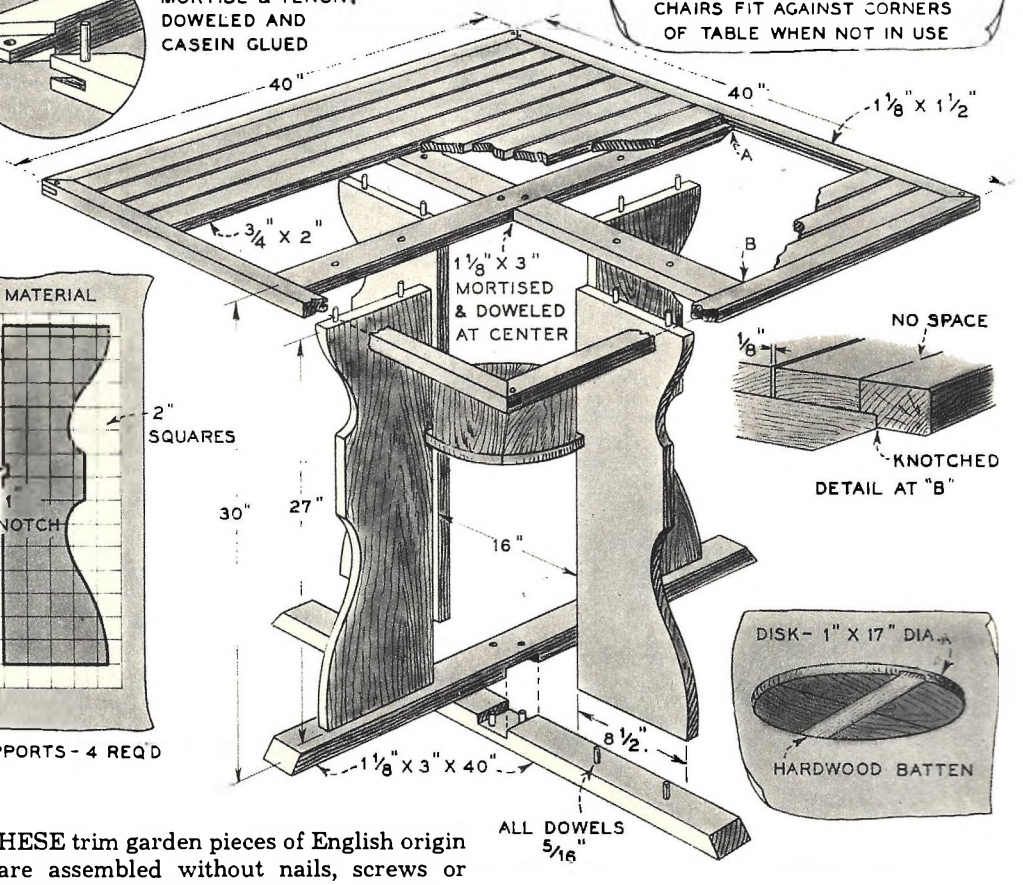
Locate the exact center of each end square and bore a hole clear through the wood on this point large enough to take the center screw of an expansion bit without engaging the threads. Fit the expansion bit in the drill press with the adjustable lip set to make a hole just large enough for the dish to be used. In the photo the glass dishes shown are caps for the new, small fruit jars obtainable in most variety stores. Butter patty dishes such as are used in restaurants also are satisfactory. In any event, have the expansion bit set to bore a hole to fit. Bore each hole to within ¼-inch of the bottom. To finish, coat holder with hot paraffin, beeswax or lacquer.

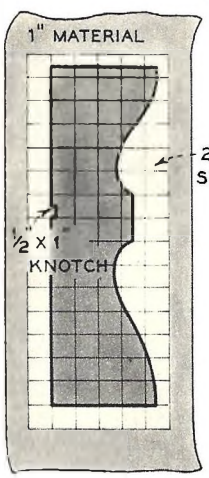
Weatherproof











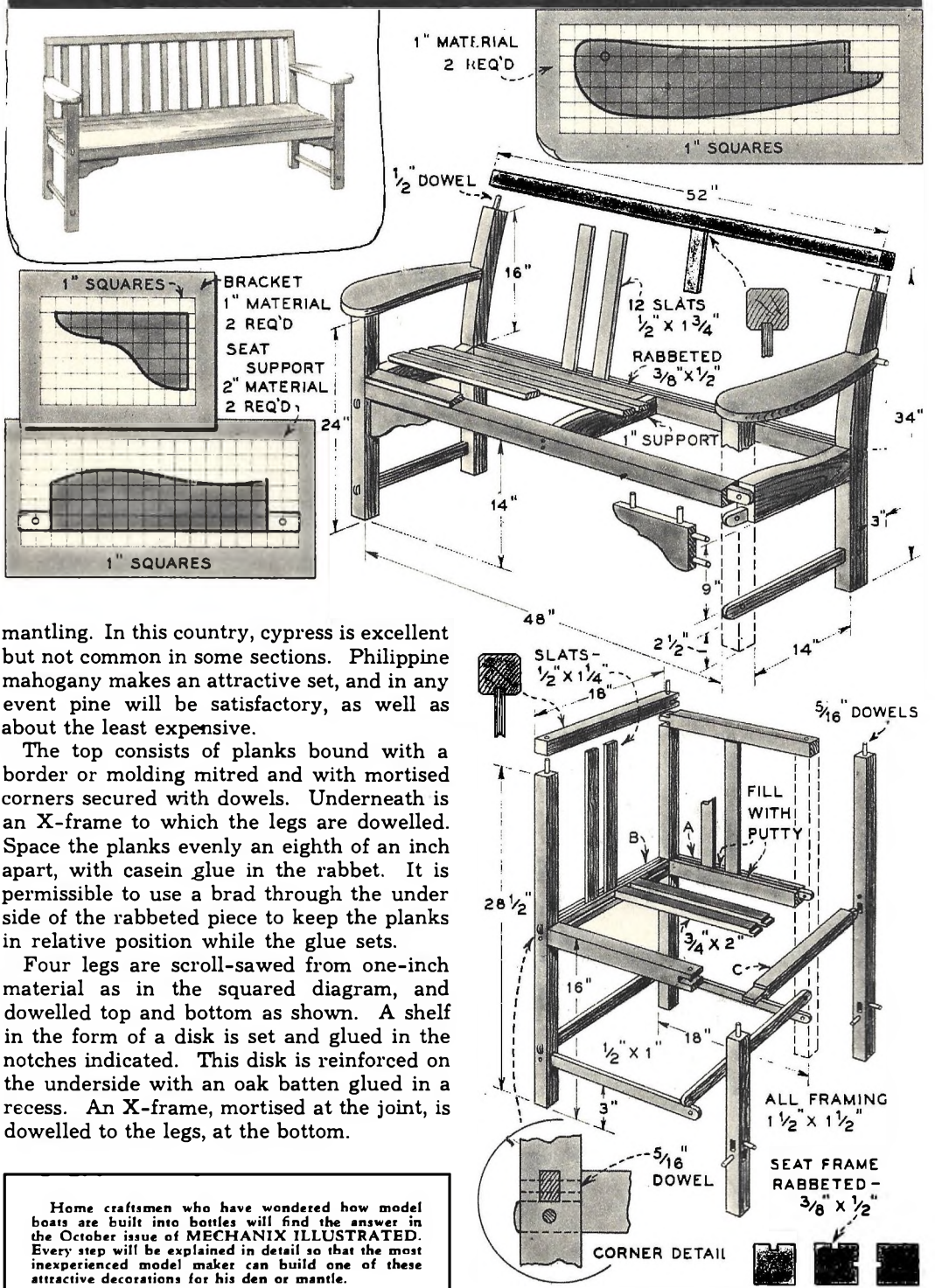
THESE trim garden pieces of English origin are assembled without nails, screws or any metal, dowels and casein glue being used instead. As a result, they will withstand sun and storm and acquire a soft weathered tint effective against greenery. Of course, they are not to be painted—a finish that requires renewal every two years, at least.

It is impossible for these pieces to come apart even under very severe usage, because the frame members terminate in tongues which pass through the legs and are dowelled in place. Properly mixed and applied, casein waterproof glue is equivalent to a "weld" at the wood joints.

A standard-height table is illustrated. This is a clean-cut design of relatively easy construction. Note that the top planks are spaced an eighth of an inch apart; this permits rainwater to drain off as fast as it falls, thus preventing pools or damp areas which would warp the wood. When not in use the four chairs fit against the corners.

Choice of material depends upon what is available in the individual locality. In England this furniture is usually made of teak taken from old ships in the process of dis-

GARDEN FURNITURE



mantling. In this country, cypress is excellent but not common in some sections. Philippine mahogany makes an attractive set, and in any event pine will be satisfactory, as well as about the least expensive.

The top consists of planks bound with a border or molding mitred and with mortised corners secured with dowels. Underneath is an X-frame to which the legs are dowelled. Space the planks evenly an eighth of an inch apart, with casein glue in the rabbet. It is permissible to use a brad through the under side of the rabbeted piece to keep the planks in relative position while the glue sets.

Four legs are scroll-sawed from one-inch material as in the squared diagram, and dowelled top and bottom as shown. A shelf in the form of a disk is set and glued in the notches indicated. This disk is reinforced on the underside with an oak batten glued in a recess. An X-frame, mortised at the joint, is dowelled to the legs, at the bottom.

Home craftsmen who have wondered how model boats are built into bottles will find the answer in the October issue of MECHANIX ILLUSTRATED. Every step will be explained in detail so that the most inexperienced model maker can build one of these attractive decorations for his den or mantle.

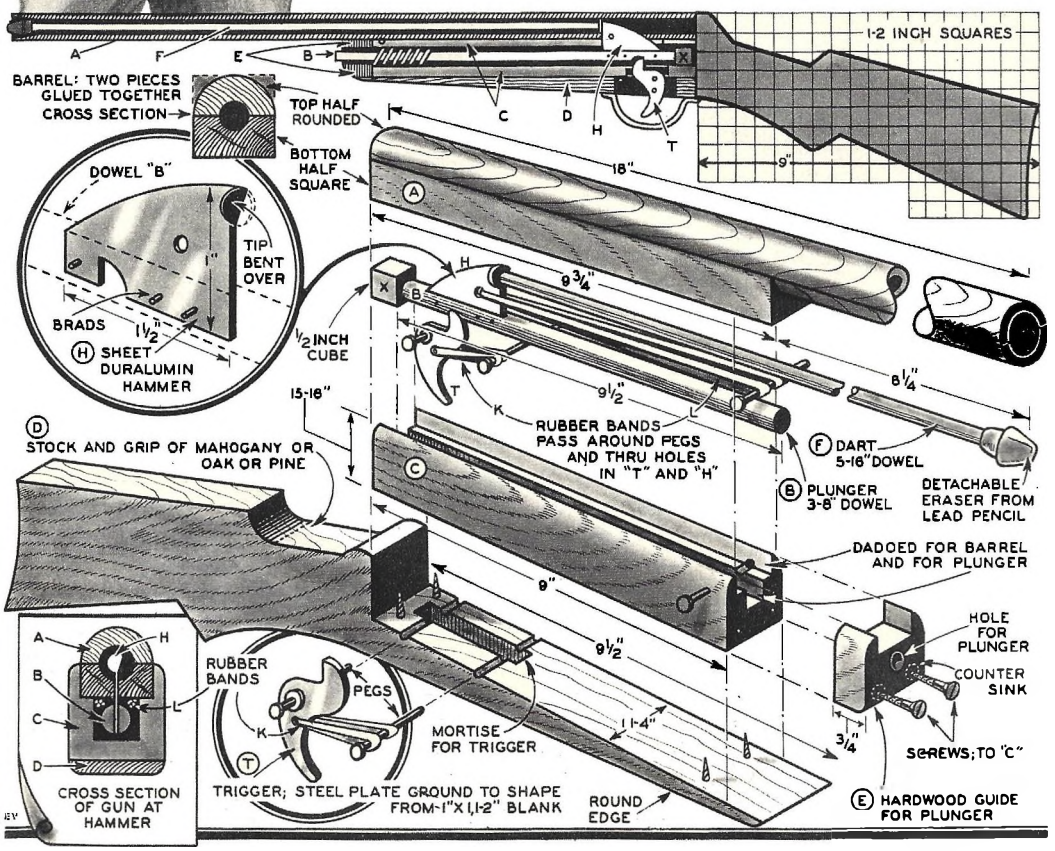
HARMLESS TARGET GUN

RESEMBLES DAD'S HAMMERLESS SHOTGUN

THIS all-wood gun has the appearance of the real article but shoots only harmless, rubber-tipped dowels. In competition shooting each marksman uses a different colored chalk on the rubber tip, which registers his mark on the target.

The barrel (A), for convenience, is made in two pieces of rectangular wood. The bore is made by grooving each half; this can be done by dado or circular-saw cuts and finished with a gouge, and a ⅜-inch dowel wrapped with sandpaper. The halves are then glued together; one end turned and part of the lower half

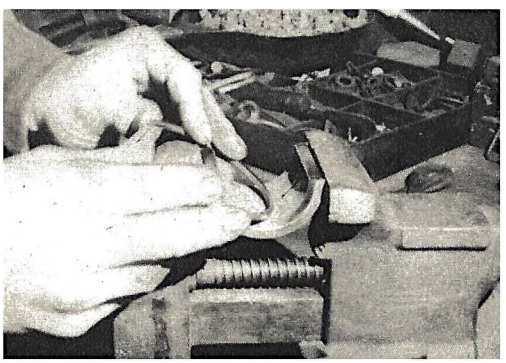
[*Continued on page* 134]



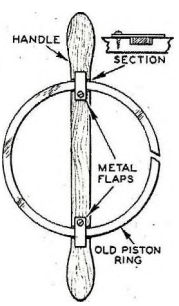
Old Skillet And Coke Become Substitute Forge

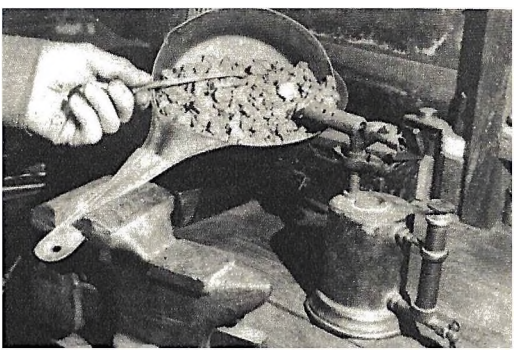
A SMALL iron skillet when prepared as shown in the photographs, becomes a satisfactory substitute for a forge. A small quantity of finely crushed coke should be placed in the bottom of the pan and the flame from a blow torch projected into it. The skillet should be held securely in position by a vise.

Old Piston Ring Is Useful For Scraping Bearings

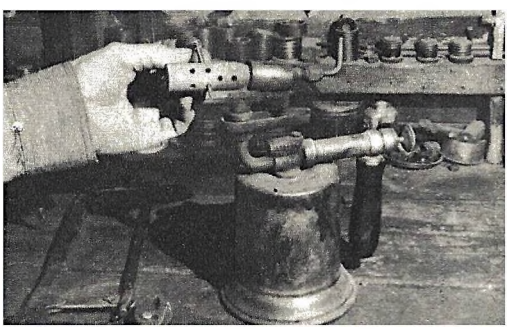


AN OLD piston ring can be used as an emergency bearing scraper when the correct tool is not available. A wood handle as shown in the drawing, can be used when considerable scraping must be done. As the edge becomes dulled, the ring is turned to a new position.





Nail In Combustion Chamber Increases Heat Of Torch

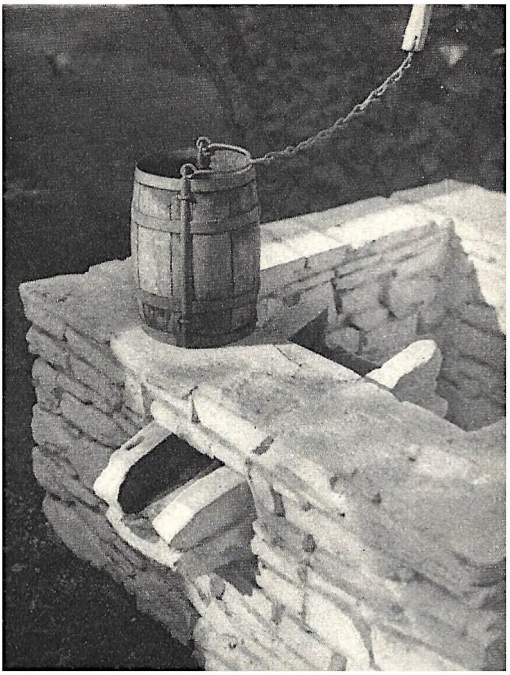


ABOVE—The performance of a blow torch may be increased considerably by inserting a nail or tapered pin through the combustion chamber as shown in the photograph. This serves to give better combustion of the fuel, thus increasing its efficiency.

Cork Strip Holds Small Tools

RIGHT—An excellent holder for tools such as drills, screw-drivers, chisels, carving implements, etc., can be made from an old piece of cork.

THE OLD OAKEN BUCKET



The appearance of any yard or garden will be improved by this old oaken bucket. If a real well is not available, a "false well" as shown in the accompanying photographs will present a pleasing appearance and will be easier to construct.

IF YOU have an old well and you are not using it, and you don't know what to do with it, here is the solution.

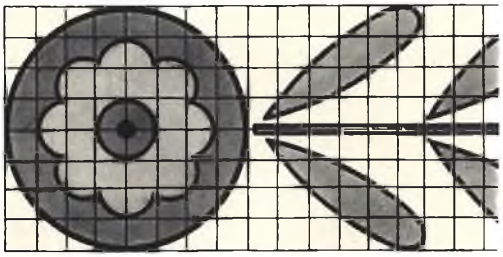
All the materials necessary to duplicate the one shown are two poles. If you have them on your own land you will save a few dollars; if not, any lumber yard will supply them and the cost should not exceed ten dollars. Any long and slim tree will do. However, hickory is preferable.

First, remove the bark, leaving knots untouched to enhance the rustic appearance. The pole to which the bucket is suspended must be from 25 to 30 feet long. Fit two pulleys for the rope, one at the extreme end and one near the middle. At the bottom end attach a weight to counterbalance the weight of the bucket. To make the weight look more primitive, attach a stone and tie it with rope in a crisscross manner. Then cut a Y-shaped tree to about 12 feet in height. Sink this in the ground at least three feet. If permanency is desired, place it in a concrete base. This should be erected ten feet from the well.

Next comes the structure around the well. Rough field stone has an attractive appearance.

This can be erected to any height desired, using cement sparingly. A crude wooden trough, or one of stone completes the picture. If you have no well, a "false well" can be used.

REJUVENATE THAT FIBRE RUG FOR $1.98



SIMPLE BORDER DESIGN. 1-2" SQUARES

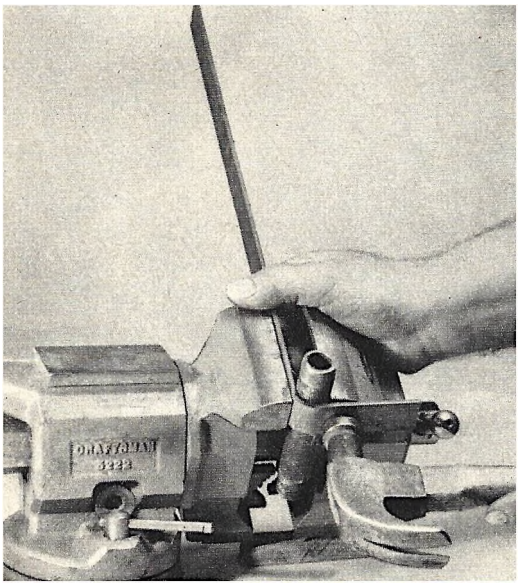
IN LESS than two hours of easy work, a full-sized 8'3"x10'6" "fibre" rug can be so successfully refreshed as to look completely new, and to be fit for much additional wear. The only requirement is that the rug be not actually torn or frayed.

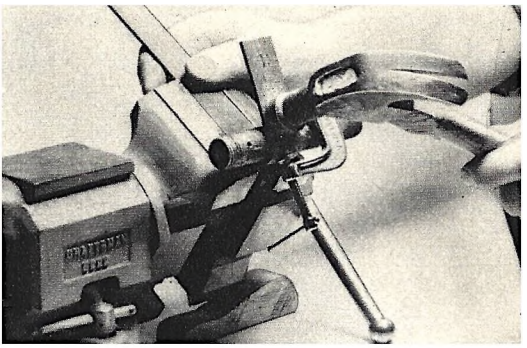
The first step is to get the rug onto the lawn on a warm and sunny morning after the dew is off the grass. The loose dust is then cleaned off fairly well by the usual means, and treatment begins.

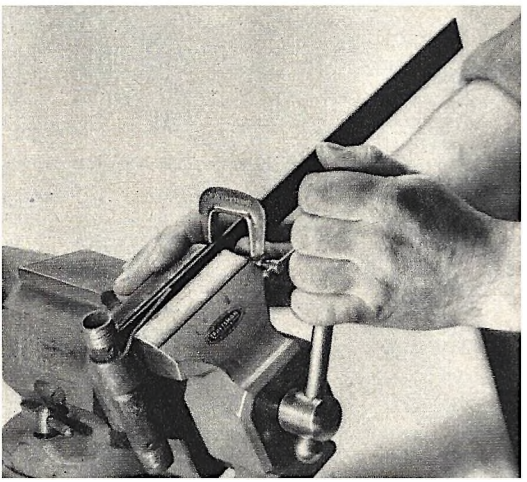
First, the rug is painted all over one side with a coat of "floor, porch and deck" paint which has been made quite thin by adding two parts of pure turpentine to each one of paint. This is to give good penetration, reinforcing the rug and avoiding "misses" between the threads. For the same reason one must work with a very wet brush, "slopping" the paint on and spreading it without brushing in. Make all errors in the direction of using too much paint, rather than too little. A 4-inch low-priced brush and a wide can with 2½" of paint in it facilitates this. Do not attempt to paint from the can in which the paint came.

[*Continued on page* 135]

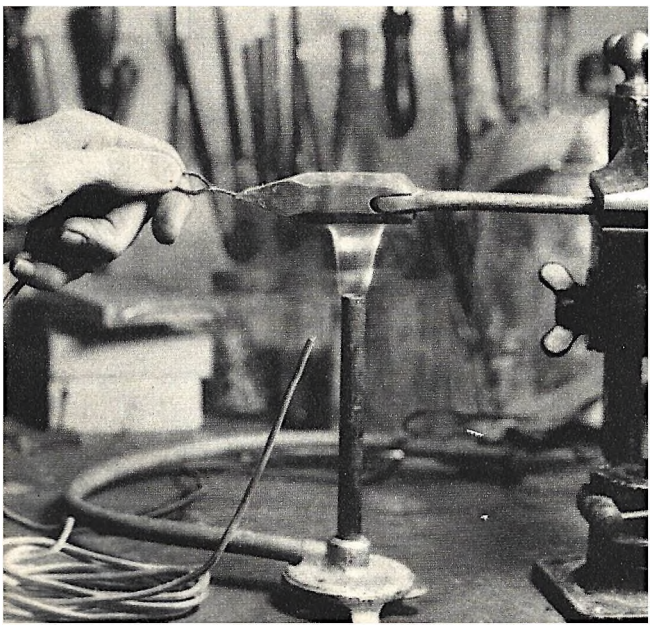
Simple Method Makes Bending Of Iron Easy







A HEAVY strap can be bent around a small rod or pipe using the following method. First place the strap in the vise, with the rod or pipe held against it at one end of the vise jaws, and bend the strap at right angles as shown above. Then hammer the strap further around and finish by using the vise to close the opening.

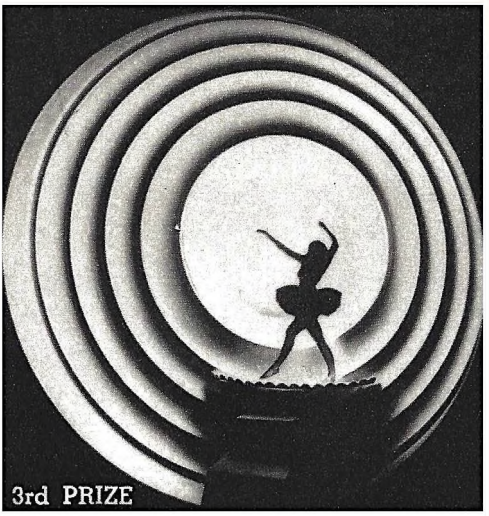


Stationary Soldering Iron Improves Work

MANY times when soldering small articles, it is easier to manipulate them than the soldering iron. By clamping a fairly large iron in a horizontal position slightly above a bunsen burner, it can be kept at the correct temperature as long as the burner is operating. It then becomes a simple matter to manipulate the article to be soldered near the point of the iron. It is advisable to keep the burner flame as near the handle end as possible, to prevent the possibility of burning the object to be soldered. The temperature of the iron can be regulated easily by the flow of gas.

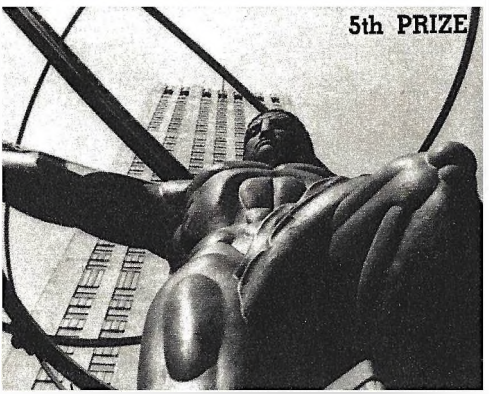
PHOTOGRAPHY

SECTION



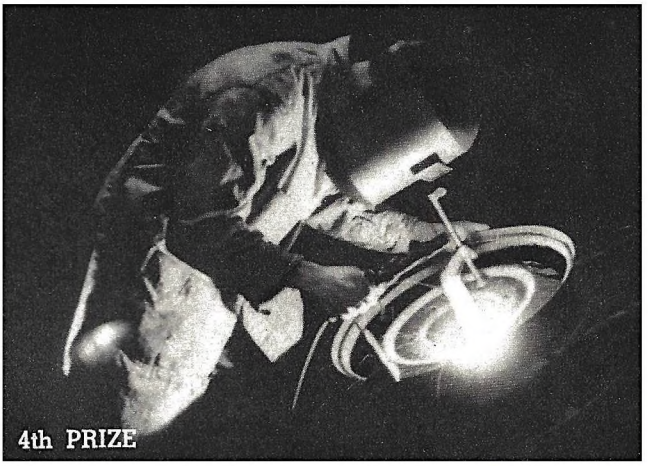
3rd PRIZE

1st PRIZE



5th PRIZE

FIRST PRIZE: "MISS-CHIEF" by Coursin Black and Fred DeLavan, Attleboro, Mass. Speed graphic, f.6.3, 1/50 sec. on Agfa S. S. pan. SECOND PRIZE: "FLAT" by Paul F. Gavin, Arlington, Mass. Taken with 120 Certix at f.22, 1/10 sec. on panatomic. THIRD PRIZE: "MOON DANCER" by Joseph A. Corbi, Philadelphia, Pa. Paper-doll dancer silhouetted against a reflector and globe. Taken with a Pony Premo, f.18 at 3 sec. FOURTH PRIZE: "WELDER" by Irving Schnetzler, Berwyn, Ill. Retina, f.3.5 at 1 sec. on 35 mm panatomic. Developed in M. P. G. FIFTH PRIZE: "MIGHT" by John Neva, New York City. Taken with Leica, at f.9, 1/50 sec. on Super X.



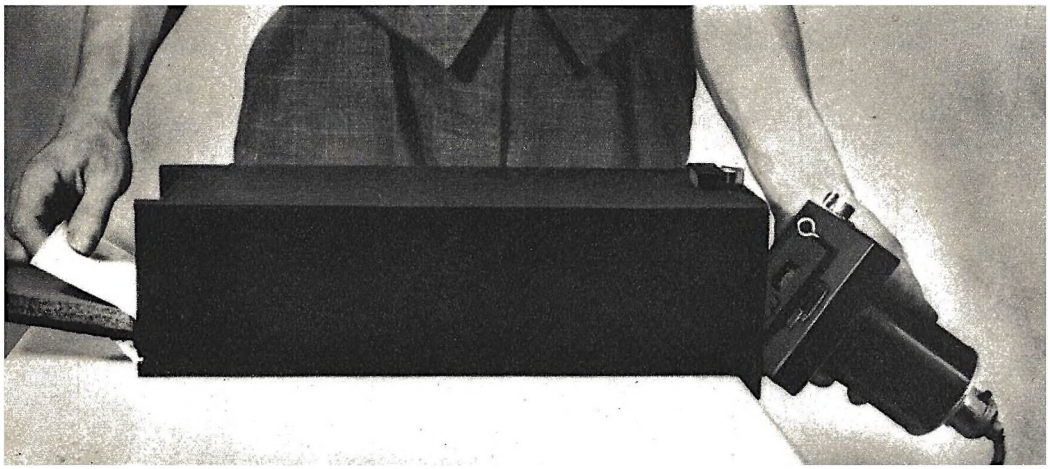
4th PRIZE

2nd PRIZE

MONEY FOR YOUR PICTURES!

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully and include postage. Address contributions to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York.

The "Album Print"

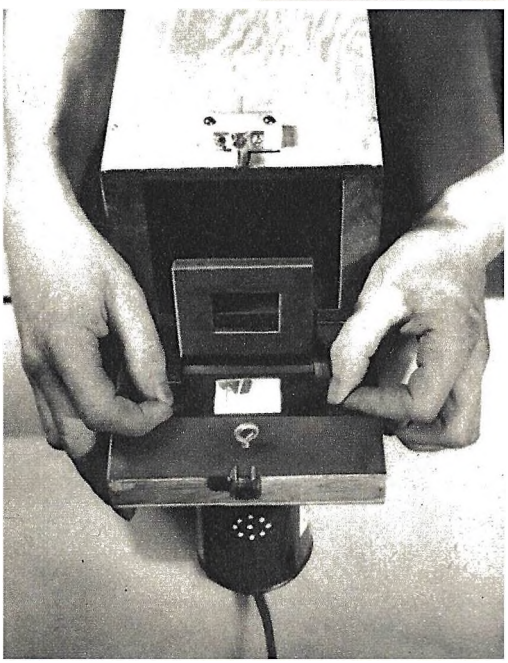


The completed enlarger above shows position for printing paper (left) and location for the negative in the light housing (right) for "fixed" enlargement.

MOST miniature-camera users, at one time or another, have wished they could get a better look at their tiny pictures before going to the time and expense of enlarging them. Contact prints are too small to be of much use and full size enlargements are expensive. The fixed-focus Album Print enlarger will print all your negatives to a set size of 3½x5 inches as rapidly and as easily as a contact printer. Enlarging paper in the standard 8x10-inch size can be cut to 3½x5 inches with just enough waste to provide a test strip for each piece, and 5x7 can be cut in two with no waste at all. The dimensions given are for standard 35mm negatives.

The box of this enlarger is built somewhat longer than necessary and exact focusing is done by hand. Once set, all parts are nailed together and the extra part sawed off and thrown away. Thereafter no more adjusting is necessary, or indeed, possible.

Illumination is provided by an ordinary 60-watt bulb, and has proved ample in actual practice. The front-end is dropped down and the negative centered with the light on. Then the light is turned off and the whole thing swung back to be held by the catch while the paper is dropped in the back-end and the exposure made. Exposures average no more than a few seconds. The lens should have a 3-inch focal length. It may be an inexpensive one.

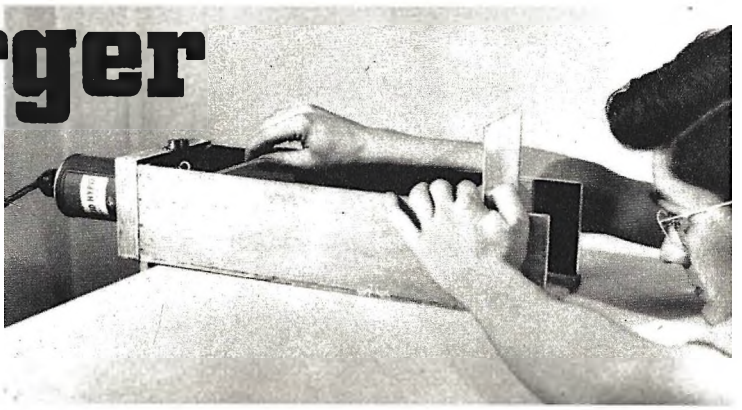


The light housing is opened and the film centered while the light is turned on, then the light is turned off and the housing closed with negative in place.

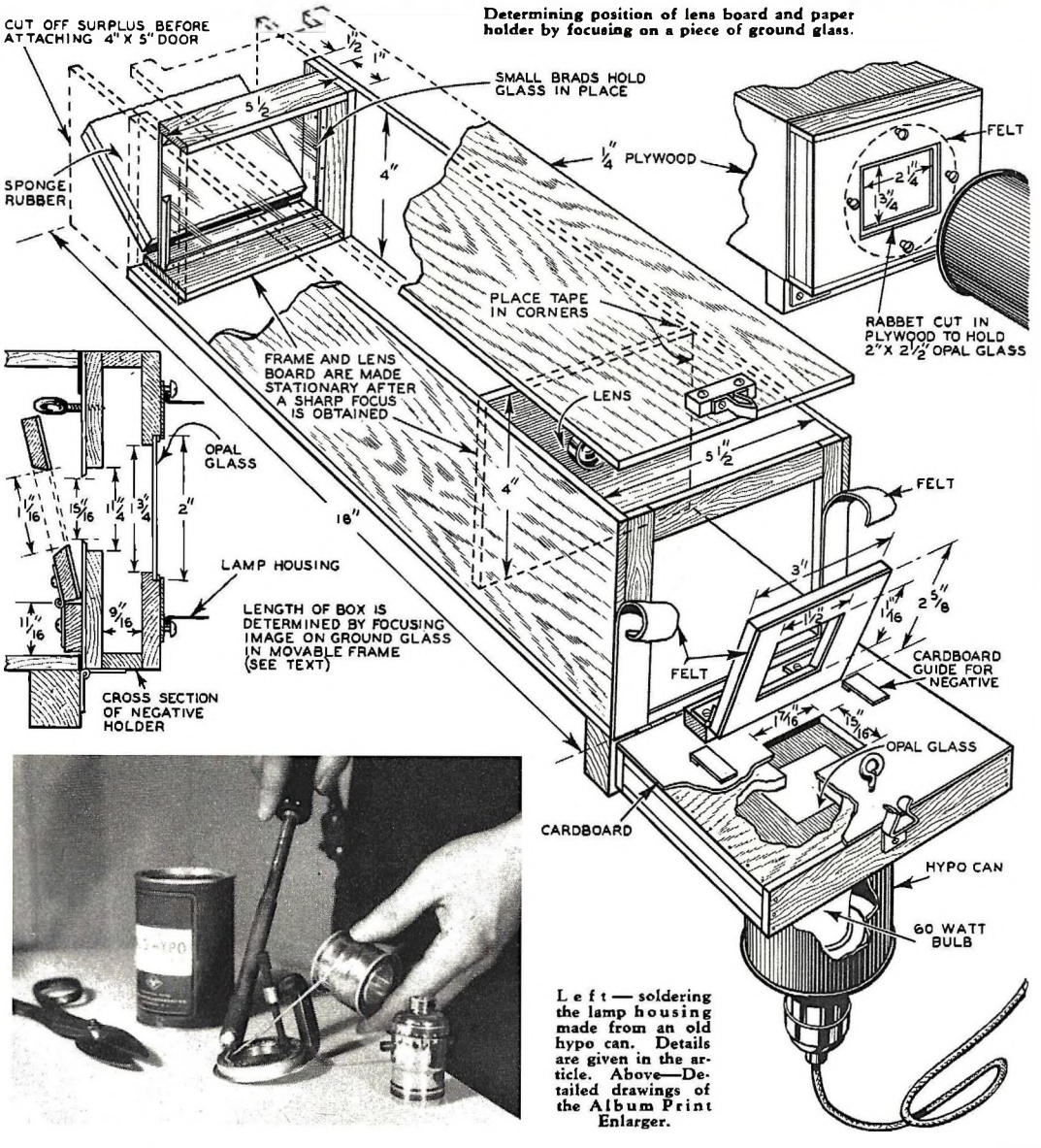
All parts are built of 3-plywood. Begin construction by cutting a base board six inches wide by 18 or 20 inches long. Nail on two sides 4 inches high and cut a piece for the top, same size as the base. Then make the rear frame 5½x4 inches outside dimensions of strips 1½ inches wide except at the top where it is only 1 inch. Glue in ¼-inch strips

Enlarger

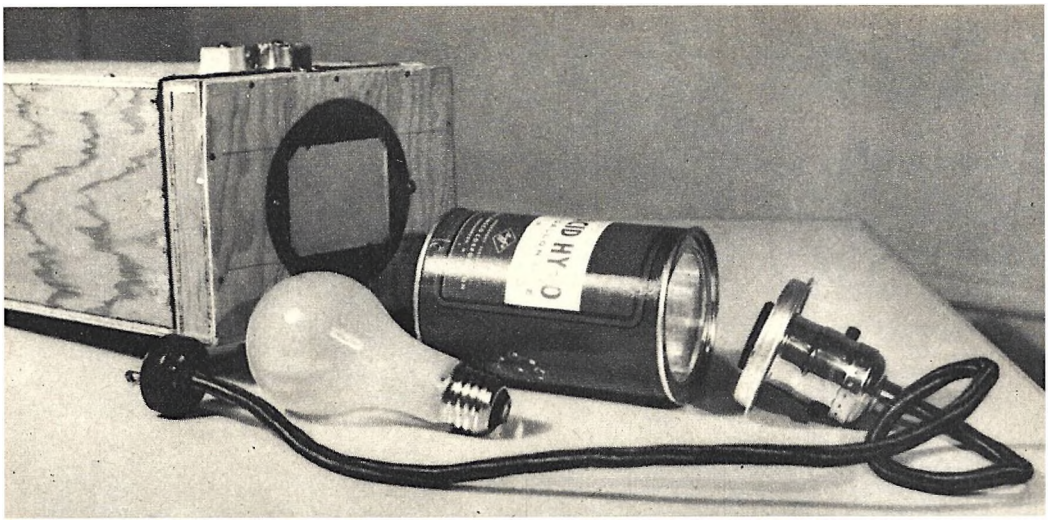
A fixed-focus enlarger for 35 mm. film that is easy and inexpensive to construct.



Determining position of lens board and paper holder by focusing on a piece of ground glass.



Left — soldering the lamp housing made from an old hypo can. Details are given in the article. Above—Detailed drawings of the Album Print Enlarger.



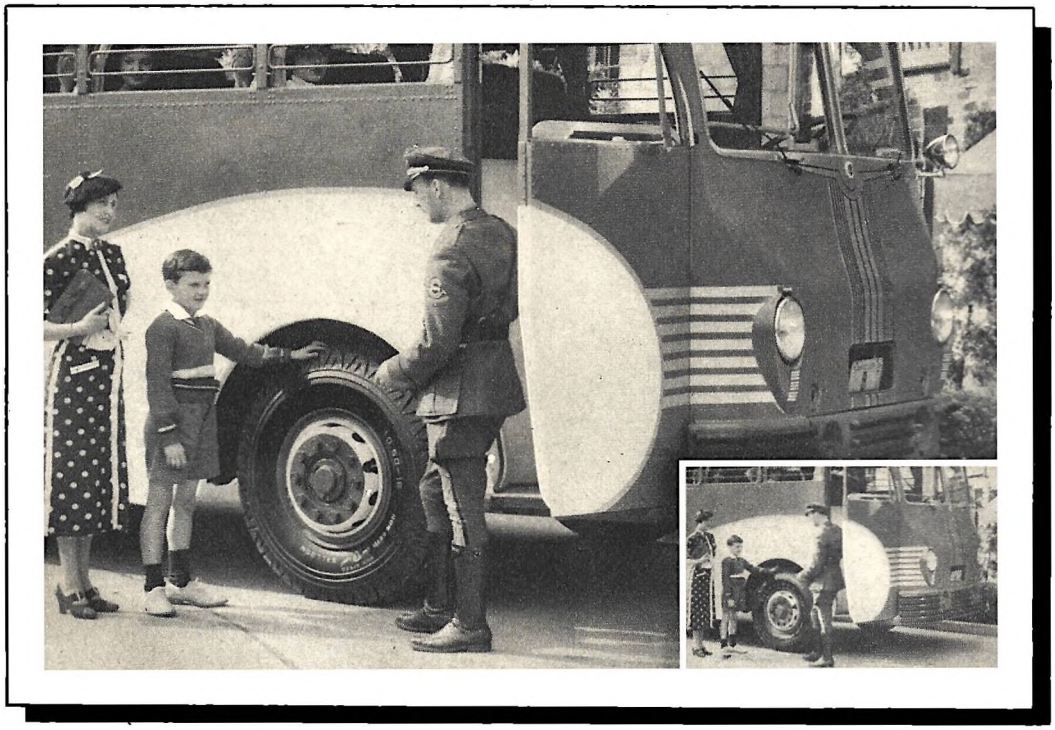
Position of the opal glass is shown at the lamp end of the enlarger. The socket fits into the tin-can reflector and the housing clamps over the glass.

which will hold a 3½x5-inch piece of glass just ½ inch from the rear. Cut a piece 4x5 inches for the back and rubber-cement a pad of ¼-inch sponge rubber to it. This can be bought in the ten-cent store or wherever bathroom supplies are sold.

Now make your lens board 5½x4 inches and mount your lens exactly in its center. You are now ready to make the front-end, including the lamp housing, diffusing glass, and negative holder.

Cut a piece 6x4½ inches with a hole 1¾x1¼ inches in its center, and another, same size, with a hole 2¼x1¾ inches in its center. Cut away two layers of plywood on the back to

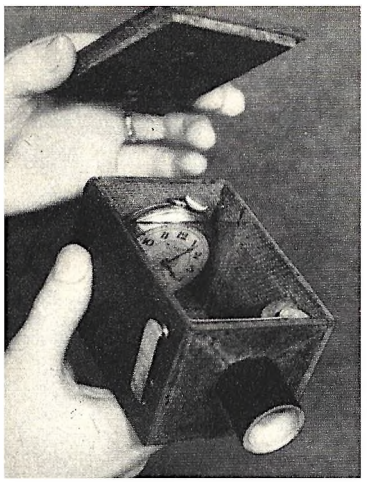
[*Continued on page* 138]

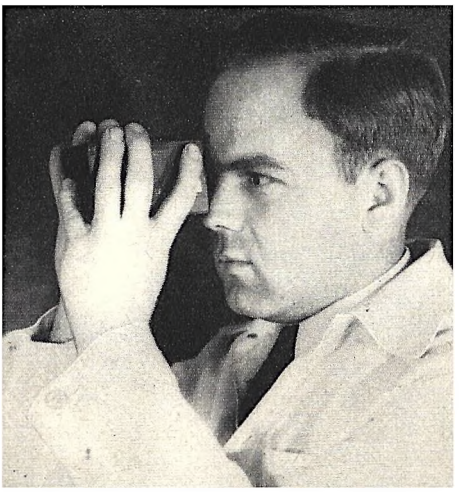


Comparison of contact print and enlargement (full size) made by the album print enlarger.

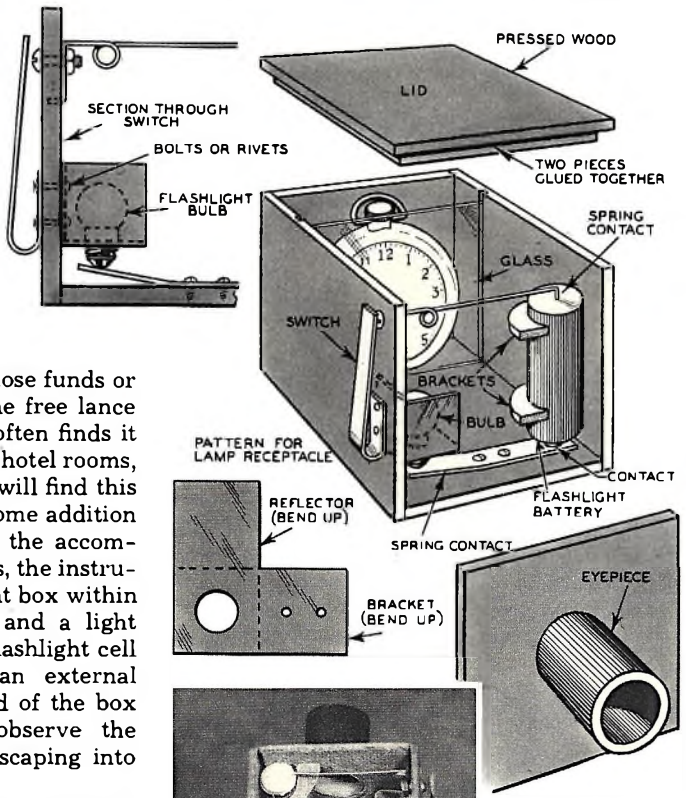
PORTABLE DARKROOM TIMER

by C. Kenneth Pearse





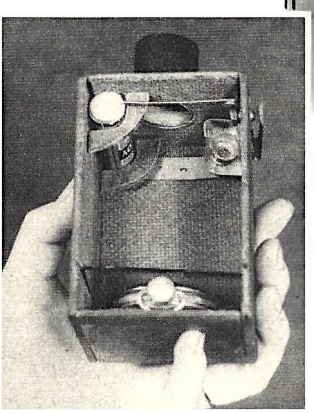
Right—In use, the darkroom timer is held to the eye. Left—Showing interior of timer with watch in place.



THE amateur photographer whose funds or space is limited, as well as the free lance or professional who travels and often finds it necessary to produce negatives in hotel rooms, closets, or makeshift darkrooms, will find this easily made timing device a welcome addition to his equipment. As shown in the accompanying photograph and drawings, the instrument consists of a small light-tight box within which is fixed a pocket watch and a light source provided by a miniature flashlight cell and lamp and controlled by an external switch. An eye piece at one end of the box permits the photographer to observe the watch with no danger of light escaping into the darkroom.

The box and cover can be made of pressed wood or cigar box wood glued and nailed together, but the internal metal parts should be fastened in place before assembly. A light sheet brass contact strip is attached to the bottom of the box by two small screws or rivets. On one side of the box the lamp socket and the switch, made from sheet brass, and the upper contact spring, made from spring brass wire such as can be taken from a large

[*Continued on page* 138]



Above—the timer may be easily constructed from these detailed working drawings. Left—Top view of timer showing position of lighting equipment.

PICTURES BY INVISIBLE LIGHT

Films and plates sensitive to "Infra-Red" rays can be used in ordinary cameras, and produce interesting and unusual results in both indoor and outdoor illumination.

THE "infra-red" is that portion of the spectrum of radiation which lies beyond the visible red. It is invisible to the human eye, and merges into the long heat waves. Infra-red radiation is emitted by all the common light sources which depend for their action on materials being raised to a high temperature, such as the sun, the arc lamp, the common tungsten filament lamp, and lamps of the photoflash type. These are all satisfactory sources of infra-red. The lamps emitting so-termed "cold-light," such as the mercury vapor tube, are not very satisfactory for the production of the infra-red.

Infra-red photographs have been made since the latter part of last century, but it was not until 1931 that sensitizing dyes were produced which enabled photographs to be taken in the infra-red with the ease with which ordinary pictures are taken. Contrary to general impression, photography by these invisible rays is very simple, requiring no more experience than ordinary photography.

The picture at the left, showing a small statue flanked by two ordinary flatirons, was taken on regular film by regular white light from flood lamps. The picture above is exactly the same set-up, taken in complete darkness on an infra-red plate, the entire "illumination" being furnished by the infra-red rays emitted by the hot flatirons! The latter are not actually white hot, but appear so because the otherwise invisible infra-red "light" registers white on the negative. The exposure time was one hour.

Kodak Infra-Red Film type IR-135 is available for Retina, Leica and Contax cameras. This material is sensitive to violet and blue light and to the extreme visible red and near infra-red. Similar 35 mm. film is marketed by Agfa-Ansco and Dupont. Infra-red sensitive *plates* in all the standard sizes from 2¼x3¼ to 8x10 inches are also obtainable from Eastman, at prices only slightly higher than those charged for ordinary negatives.

Any ordinary camera may be used for taking infra-red pictures, and any lens may be employed. Most lenses give pictures in focus in the infra-red if they are focused correctly for visible light. If good focus cannot be obtained, the camera should be focused visually through a red filter. In exceptional cases it

may be desirable to make trial exposures at various settings, the camera being focused at a point somewhat in front of the object to be photographed.

In the case of some older cameras, the bellows may transmit infra-red and fog the plate. This may also occur with some hard rubber drawslides, which are transparent to infra-red. Metal, pressboard and composition slides are perfectly satisfactory.

In making photographs by infra-red, it is necessary to prevent violet and blue light reaching the plate. This is done by using a deep yellow or red filter over the camera lens (or over the lamps). The following Wratten filters are all equally satisfactory: Wratten filter No. 15 (G), No. 25 (A), No. 70, No. 89-A, and No. 88-A.

The filter most commonly used is the Wratten No. 25, tri-color-red (A) filter. In addition to these the Wratten Filters No. 89-A, 88-A and 87 may be used. With the 88-A and 87, the exposure times should be double those required with the No. 25 filter. The exposure through the No. 89-A filter will be slightly higher than that through the No. 25 filter.

The most common use of infra-red sensitive materials is for landscape photography over long distances.

When a distant landscape is photographed on an ordinary plate, the detail of the distance is usually blurred by the haze, and the distant objects are rendered as if seen through a finely ground glass. This is because violet and blue light, to which an ordinary plate is sensitive, is scattered by atmospheric haze. The longer wave lengths of visible light, and particularly the invisible infra-red, however, are transmitted quite freely by the haze. An infra-red photograph, taken with a deep yellow or red filter on the lens to absorb the blurring violet and blue, can, therefore, render distant objects very sharply, even if the haze makes them invisible to the eye.

Suitable exposure conditions for an open landscape or closeups in bright sunlight are about 1/25 second at f/5.6 (or 1/5 second at f/11) with the Wratten No. 25 filter on the lens, and Eastman infra-red plates or film, type IR-135. Exposure meters are of no value in judging infra-red exposures out-of-doors. The actual value depends on atmospheric conditions, and must be judged by experience, but the figure given will apply in most cases.

Infra-red landscape photographs are characterized by the sky being rendered almost as black, clouds and snow are white, shadows are very dense and lack detail, and the grass and leaves of trees appear very light as if covered by snow, because chlorophyll has the property of transmitting the reflected infra-red very strongly. Photographs taken by infra-red outdoors in sunlight often have the appearance of pictures taken by moonlight.

Infra-red photographs can be taken indoors using ordinary Mazda lamps, photoflood lamps, or photoflash lamps.

Suitable conditions are: Eastman Infra-red plates or Kodak Infra-red

It is difficult to believe that these pictures, taken on Whiteface Mountains in the Adirondacks, were made by the same camera. The difference is that the view (right) was exposed on an ordinary panchromatic negative, and the one below on an Eastman infra-red plate with Wratten filter No. 25. For haze cutting and distant pictures in general, infra-red negatives have no equal.

Film, type IR-135; Wratten No. 25 filter; subject illuminated by two No. 1 Photoflood lamps at a distance of five feet; trial exposure of 1/10 second at f.8.

In portraits by infra-red, the flesh appears chalky, the red lips come out light, the eyes appear as black dots, and all lines in the face are greatly exaggerated. Some extremely interesting pictures can be made this way.

If a filter which transmits no visible light but freely lets through the infra-red is used over the lamps, pictures may be made in TOTAL DARKNESS. No filter is used over the lens, and care must be taken to insure that no white light leaks from the lamp housing. A suitable filter for the lamps is the Wratten No. 87, which is specially made in 10″x12″ and 8″x10″ sizes in the same form as safelights.

A convenient arrangement is to use two pyramid type safelight lamps screwed into ordinary desk lamps. Each safelight lamp should be fitted with one No. 1 Photoflood lamp and two thicknesses of Wratten No. 87 filter. To increase the efficiency, line the inside of the boxes with tinfoil. With these units at a distance of 3 feet from the subject, an exposure of about 1 second at f/3.5 is required. Since there is no provision for ventilation, the lamps should not be left on longer than required for the exposure.

Infra-red photographs of old documents, fabrics, etc., may yield results of interest. If the subject is illuminated by two Photoflood lamps in reflectors, placed about 30 inches apart and 30 inches from it, the exposure will be about 1 second at f.16. In the field of criminology, the infra-red has been applied to the photography of altered documents, forged checks, finger prints and blood stains. It also has interesting applications in the photography of textiles, fibres and hairs, particularly those which are dark and therefore difficult to examine visually under the microscope.

Photographs of hot bodies, such as a flatiron or soldering iron, may be made in total darkness using the invisible infra-red emitted by the object. No filter need be used on the lens if the object is not white hot. A hot electric flatiron can be photographed in this way in about one to five minutes at f.4.5. At temperatures below 400°C., the exposures are very long, about 6 hours at f.5.6 being required at 330°C. If the plates are hypersensitized the exposure is reduced to one-half or one-third.

Since all infra-red materials are sensitive to blue and blue-violet light, they may be used as ordinary non-color sensitive materials simply by leaving off the filter. It may often be desirable to do this, especially with the 36-exposure rolls made for 35 mm. miniature cameras. The proper exposure without a filter is about 1/100 second at f.8 in bright sunlight.

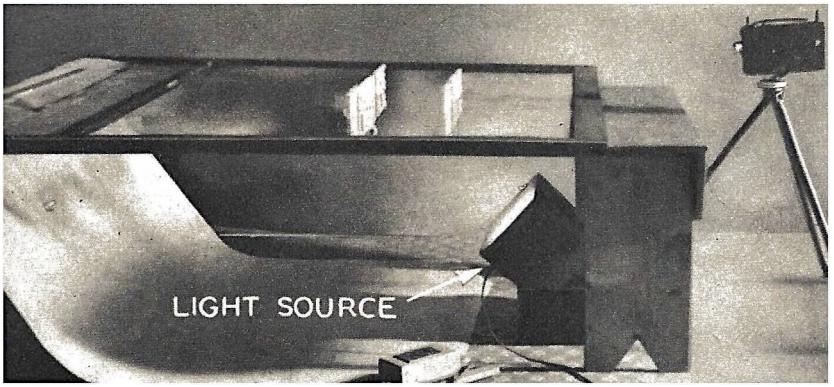
For the development of the infra-red sensitive plates, any negative developer can be used. The D-76 and the D-19 developers are specially recommended. For negatives of normal contrast the best results are obtained with D-76, developed 15 minutes at 65°F. If a shorter development time is desired, the D-19 developer can be used, normal contrast being given in 5 minutes at 65°F. by the developer diluted 1 part with 4 parts of water. For negatives of high contrast, it is used undiluted for 3 to 4 minutes at 65°F. Kodak Infra-Red Film, type IR-135, should be developed in D-76 for 10 minutes at 65°F.

Develop plates in total darkness.

The speed of infra-red sensitive plates can be increased three times by hypersensitizing. The plates should be bathed in a 4 per cent solution of ammonia made by diluting 4 parts of 28 per cent ammonia to 100 parts with water. Bathe for 1 minute at a temperature not in excess of 50°F.

This looks like a night picture taken in soft moonlight, but it isn't. Actually, it was made in full sunshine on Agfa-Ansco infra-red 35 mm. film. The effect could have been deepened even further by deliberate overprinting of the enlargement. Incidentally, infra-red film is very fine-grained and therefore lends itself to large "blow-ups."

Movie Titles on Window Pane

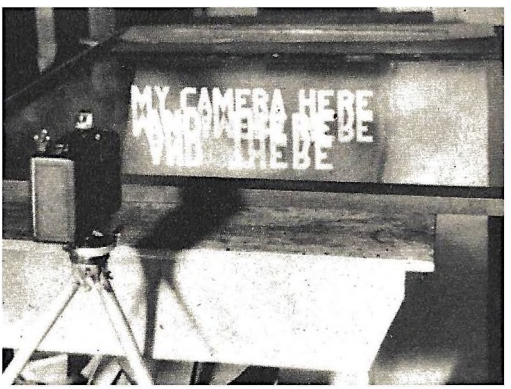


Left—Showing arrangement of equipment for making movie titles. Equipment includes a storm window, white backdrop and a light source on the floor, tilting upwards.

Below—The exact effect gained with movie titles is shown in this head-on view.

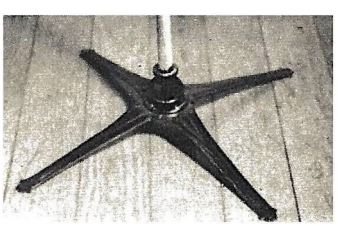
STRIKING titles may be obtained with nothing more than a storm window, some block letters and a photoflood lamp or two. Lay the polished window between two benches or saw horses and place the light box containing the photoflood illumination on the floor directed up at the title blocks through the glass. The camera is mounted on its tripod pointing down at an angle. A suitable background may be used, if desired.

To fade-in with reversal film, allow the camera motor to run for a few seconds in the darkened room before bringing up the lights, and fade-out by slowly dimming.



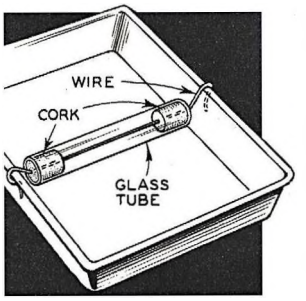
Homemade Photoflood Unit

A PHOTOFLOOD stand and reflector constructed from an old steering wheel, length of ½-inch water pipe, 3-foot iron rod and a tin funnel makes a useful unit. The 3-foot length of ½-inch water pipe is threaded to fit the hub of a steering wheel. Top of the pipe is threaded for a ½-inch reducing joint tapped and fitted with a small set screw so that the sliding rod may be raised or lowered. The sliding rod is flattened at one end and drilled to take the arms of the bracket holding the reflector. The reflector is made from a 10-inch funnel. The end of the funnel was cut off and holes drilled corresponding to screws in the lamp shade holder which screws on the socket.



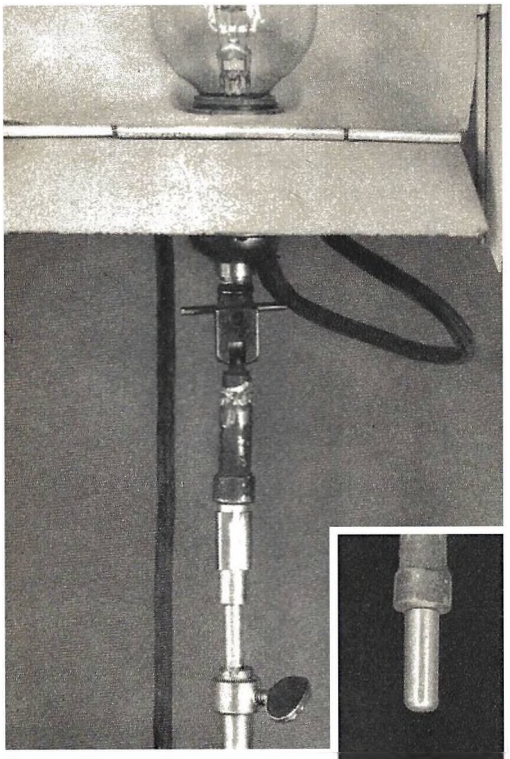
PHOTO

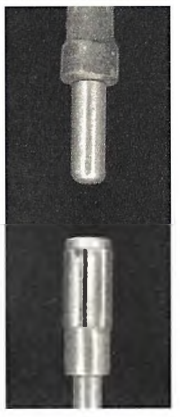
Roller Developing Tray



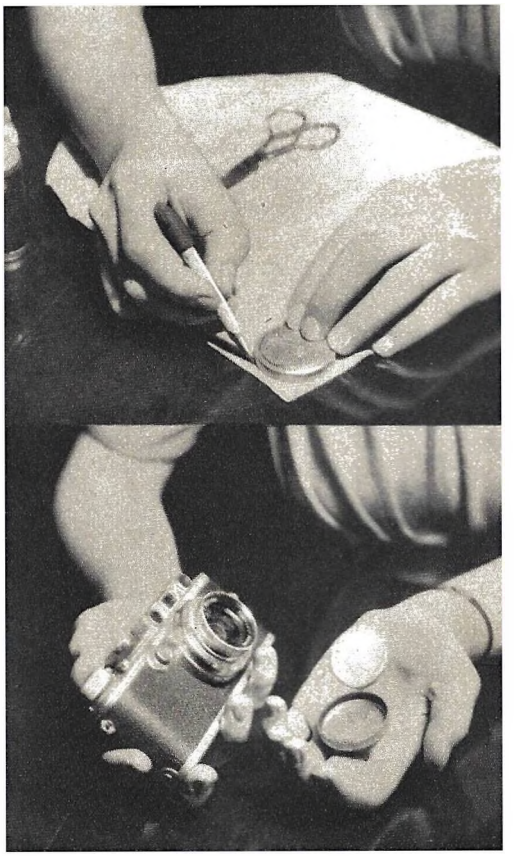
To facilitate developing, insert corks into both ends of a glass tube cut to the width of the tray. Run a wire through the tube and bend the ends to catch the edges of the tray so that the roller will be held in position. Paint tube white to show up against the dark tray. The roller should revolve freely and is used as shown at left. When processing film, hold it with emulsion side towards the tray so that the back of the film revolves around roller.

Fool-Proof Flood Lamp Support Makes A Violin Stand Rigid





Attach a jumbo plug and jack combination to a violin stand. The female portion is secured to the plunger. The male portion goes on the reflector support. File these members to make a strong forced joint. A close-up of the section is shown at right. This attachment eliminates the set screw usually used to lock the plunger in position and which frequently wears out.



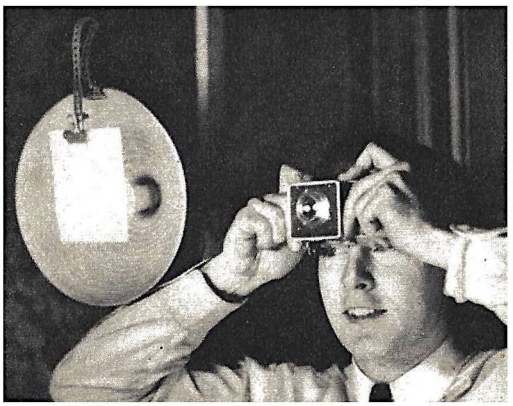
Chamois For Cleaning Lenses

The dust cap protecting lenses will also accommodate a disc of chamois. This is cut large enough to fit the bottom of the cap. Yet it may be instantly removed for wiping the lens. Use a very soft chamois and wipe the lens lightly. The chamois may be washed frequently to remove dust and dirt but after each washing it should be thoroughly softened.

KINKS

Diffusing Screen For Reflectors

Use a piece of opal glass to diffuse light from a floodlamp. The holder is made from a piece of flexible, perforated metal having bulldog clamps fastened at both ends by means of a nut and bolt. It is adjustable so that the opal glass rests lightly against the bulb. Center the glass so that it falls directly in front of the bulb. Use piece of glass 5x7 inches.

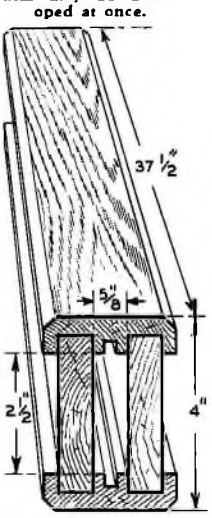


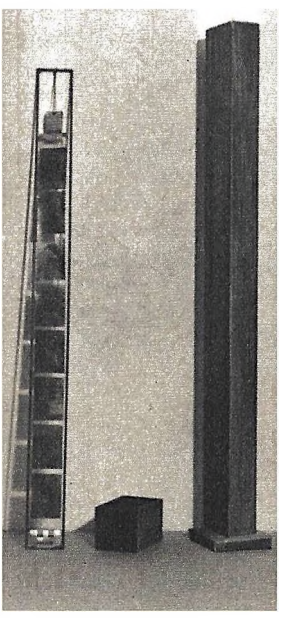
Dodging With A Flashlight

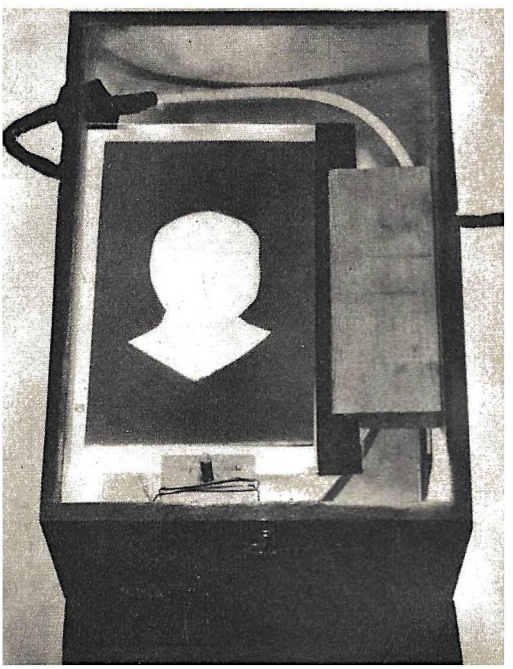
To darken areas of prints while developing, make a cone-shaped hood of opaque paper to fit over the end of a flashlight. Size of the opening of the cone may be varied. Try using the light with an opening one inch in diameter and keep light moving so that it won't burn "spots" on the print.

Deep Developing Tank

The tank is 37½ inches long, made from redwood and is glued and nailed together. It holds 32 ounces of developer. Construction details are shown below. The frame for holding the film is made from a 36-inch welding rod, $\frac{3}{16}$-inches thick. It is welded at both ends. Clips hold the film. Lacquer both tank and frame. By increasing the dimensions of the tank, more than one roll of film may be developed at once.



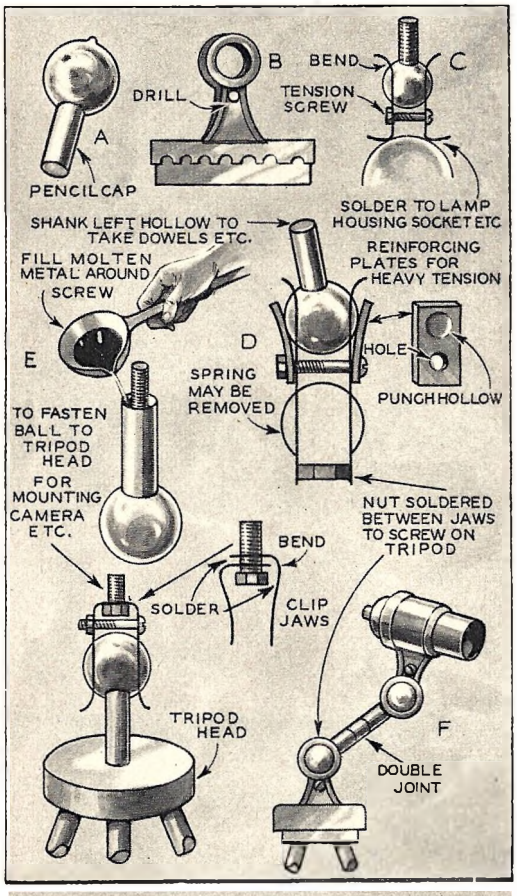


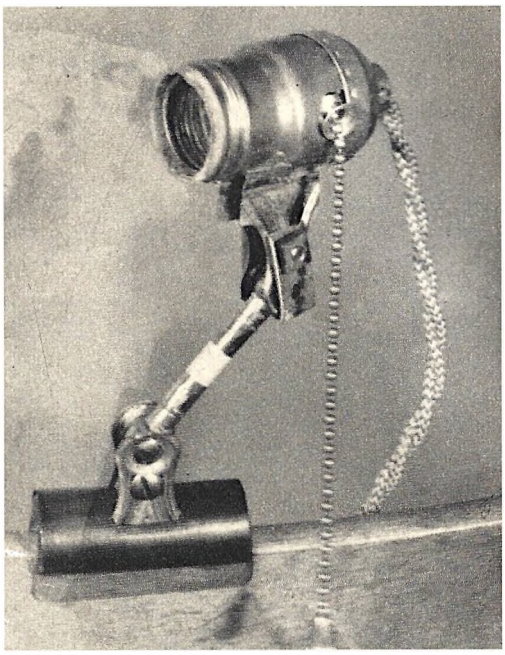


Vignetting Masks For Printing

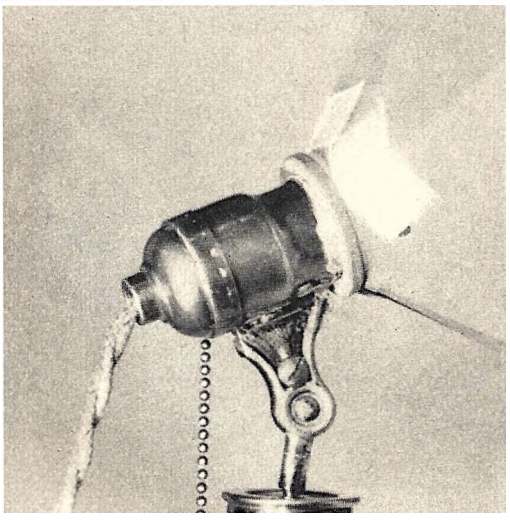
Plain glass is mounted ½-inch below regular printing glass. It is mounted on a slotted block secured to side of printing box, and is used to support the vignetting masks cut from opaque paper and outlining the subject to be vignetted.

BALL and SOCKET Mounts





The reflector may be attached to any convenient ledge by means of the paper clip holder.

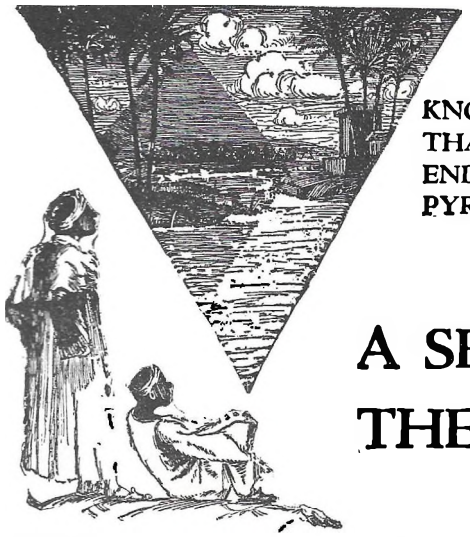


SWIVEL mounts for small cameras, lamps, and reflectors can be made cheaply from telephone dialing pencil caps and spring paper clips. These caps consist of a metal ball with a hollow shank into which a pencil is fitted. See (A) in drawing.

The paper clips are pried apart and the two legs (B) drilled about ⅛ inch below the large holes. A small bolt and nut fitted into the holes is tightened after the ball has been put into place (C). Bend the upper edge of the clip grips to allow greater movement.

Spring may be removed and the clip soldered directly to a lamp socket or wire frame for holding screens or reflectors. For tripod mounting solder a nut (having threads to fit tripod screw) between the jaws of the clip (D). For holding heavy objects stiffly reinforce clip with short pieces cut from construction toy girders or heavy sheet metal.

To attach ball to tripod-head fill with molten lead around a screw of same size and thread as tripod screw (E). To prevent sticking blacken screw in match flame before using. Turn out, and solidified metal will have threads cast in it, allowing ball to be fastened to tripod. Join two balls with short length of pencil or metal tubing for especially flexible mounting of spotlights, etc., (F). Screens and shades may be fastened to dowels and interchanged by pushing into pencil cap sockets.



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ALUM-HYPO TONING BATH

What is a good formula for an alum-hypo toning bath and how should it be used?—M. Binns, Little Rock, Ark.

The following formula is one recommended for an alum-hypo toning bath:

Solution No. 1

Boiling water	1 gal.
Hypo	16 oz.
Alum potassium	4 oz.

Dissolve hypo, then add alum, stirring constantly. Boil until sulphurized. Then allow solution No. 1 to cool and add solution No. 2.

Solution No. 2

Water	1 oz.
Silver nitrate	20 grains
Common salt	20 grains

The salt is added after the silver nitrate has been thoroughly dissolved. After the second solution is blended with the first, the bath is reheated to a temperature of 120° and is then ready for use. Prints will tone in from 15 to 30 minutes. Prints should be separated and kept in motion and though the 120° temperature should be maintained, it should not be exceeded or discoloration may result. The bath may be used indefinitely and when it weakens it may be strengthened by bringing it up to the original bulk. Prints should be rinsed in water when removed from the bath. Toning may be done when the bath is cold but requires 12 to 18 hours.

DEVELOPING COLOR FILM

Can I develop Dufaycolor and Kodachrome myself?—E. M. Baker, Weatherford, Okla.

Dufaycolor film may be developed in your own darkroom and positives made for projection. Kodachrome, however, can only be developed by the Eastman Kodak Co. at Rochester, N. Y. When you purchase Kodachrome, the purchase price includes this developing service and the transparencies are returned to you ready to be projected.

COPYING PICTURES

How do I go about copying pictures?—D. Curnow, Santa Rosa, Calif.

The process of copying is no different from that of taking a picture indoors or outdoors, except that it is best done with a ground-glass back camera. When copying a picture, place the print against a flat surface and use even lighting on both sides. Focus the picture sharply on your ground glass and then shut the lens down to at least f.22. Then gauge the intensity of your light and shoot the picture according to the speed of the film being used. Copying is best done on a contrasty film, such as "commercial" or special copying films available on the market.

FERROTYPING PRINTS

How is a gloss put on prints through ferrotyping?—S. Kohler, Vineland, N. J.

There is nothing complicated in ferrotyping prints if the work is done orderly. The prints must first be processed in the regular manner, making certain that they are thoroughly fixed and washed in running water for at least 30 minutes. When the prints are ready, the ferrotyping plates should be cleaned very carefully, preferably with a mild soap in warm water. Just before the prints are placed on the plates, rinse plates in hot water. Then place the prints face down and roll them carefully so that all water between the prints and the plates is removed and all edges of the prints are absolutely flat against the plate. When the prints dry they will peel off the plates with an even gloss. In this process be sure that the plates are not scratched, as scratches will show up on the pictures.

RETOUCHING GLOSSY PRINTS

I have been trying to retouch glossy prints but the india ink dries flat on the prints. Is there anything I can use to give this black a gloss?—P. Newbold, Omaha, Neb.

When retouching glossy prints with a stick of india ink, gum arabic should be used to give the ink a gloss so that it will not dry flat on a glossy surface. Gum arabic is a crystal-like substance which dissolves easily. To use it, dip your retouching brush in water and brush it across the gum arabic, then pick up the desired ink tone and apply it to the print.

STAIN ON PRINTS

I have been printing pictures for several years but recently my prints have produced stain. What is the trouble?—C. H. Goddard, Cleveland, Ohio.

Staining of prints may be caused by too little sulphite, which ordinarily prevents oxygen from the air from decomposing the developing agent brought over from the developing solution. An oxidized developer turns the solution brown, staining the prints. Staining may also result from insufficient washing of prints. Washing eliminates most of the developer and alkali brought over from the developing solution. Unless washing in running water removes the alkali, stain may result.

DETERMINING FOCAL LENGTH OF LENSES

What is an easy formula for determining the local length of a lens when used with an extension camera?—T. Curtiss, Pittsburgh, Pa.

An easy method for determining the focal length of any lens is that in which you focus a given object exactly the same size and divide the distance between the object and the ground glass by 4. Using a long extension camera, focus on a foot rule until the image on the ground glass is exactly the size of the rule. Exact size of image can be easily measured. Then measure the distance between the object and the ground glass which may be, say 72 inches. Seventy-two divided by 4 will give a focal length of 18 inches.

PAPER NEGATIVES

What is the procedure for making pictures directly on paper without using the negative as an intermediate?—C. T. Deer, Memphis, Tenn.

Pictures on a paper base instead of glass or celluloid may be made in the camera by using special sensitized paper marketed for this purpose. The cut paper is merely exposed exactly as the film is exposed and it is then developed, fixed and washed as when processing film. A non-staining metol-hydroquinone developer should be used, however, in developing the paper.

MECHANIX ILLUSTRATED AWARDS $40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of MECHANIX ILLUSTRATED distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the MECHANIX ILLUSTRATED Photography section. Full particulars regarding these awards will be found in this issue on page 119.

Copper Porch Lantern

[*Continued from page* 107]

as shown in sketch. While doubtless many finishes such as lacquering or coloring could be given the finished lantern the writer preferred only to polish the project thoroughly with fine steel-wool and let nature do the eventual aging. Needless to say should the lamp be used for an interior hall lantern a lacquer finish, to preserve the copper color, would be advisable.

Since the method of hanging will vary with taste and necessity, no details of the bracket have been offered. It could however be easily reproduced from the photo, in which case the following dimensions would offer a starting point. The vertical side of the right angle of the bracket is 18" and the horizontal side 36" O.A. The wiring is brought down the top of the long side, which is then capped with an inverted channel of sheet iron to hide and protect it.

The entire lantern may be made from a piece of sheet copper eighteen inches by twenty-six inches. The copper used for the original was about 26-gauge.

Harmless Target Gun

[*Continued from page* 114]

left square, as shown. This is slotted for the aluminum dog—which impells the dart.

The squared section of the barrel fits in C which also has a dadoed slot for the plunger (B). The latter is a ⅜-inch dowel slotted at one end for the dog (H), and having a square hardwood block secured to the end as a guide. The forward end of the plunger (B) slides in the hole in the end piece (E), and should protrude about ¼-inch when cocked. Multiple rubber bands are passed through a hole in the dog (H) and over a peg at the forward end of the stock.

Make the trigger (T) from a steel plate, ground, sawed and filed to the shape shown. This is held forward by a rubber band assembled as indicated. A coil compression spring at the forward end of Z absorbs the shock when firing.

Cutting Dovetails Easy Way

[*Continued from page* 106]

cither side of the board, the "floor" of the aperture is smooth, free of ridges, and is square with the surfaces of the board, and all apertures are automatically of uniform depth. The six diagonal cuts are made with a fine-tooth back-saw. They should be made before the coping saw is used.

The iron bars are bolted in position with no loss of time for accurate adjustment simply by using the other or tenon board to measure the distance the bars must be from the end of the mortise board.

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Rejuvenate That Fibre Rug

[*Continued from page* 117]

At this stage the result looks bad. The paint is probably blobby, the whole thing looks soggy, and the original pattern shows through. This is normal, and everything should come out well.

Between the turpentine and the sun the first coat should dry in about three hours, when tested by pushing the flat of the hand as hard as possible against the rug. A second coat is then applied, this time diluting the paint only 1 to 1 with turpentine, and brushing out enough to get an even appearance. Again do not try to "work in" the paint. Much less paint is absorbed this time and the job goes faster. The rug's pattern now disappears and as the second coat dries the rug acquires the desired appearance.

If a pattern is desired, do not attempt to use the stencil process with this wear-resisting paint, as "run-unders" are almost certain without much hope of removing the mistakes. Outline very lightly with chalk, follow this outline with a small brush and then fill in with the larger brush.

This process does not apply to those loose-jointed unsubstantial affairs called "grass" rugs, but it may be used on the backs of some sorts of fabric rugs and carpets, which are thereafter used "butter-side-down." It is important that the paint used be "deck paint." Ordinary house paint is dull and wears easily, while the so-called "floor enamel" is much too brittle and costly. Before painting look at both sides of the rug, and choose the better one.

For the rug-size originally mentioned the required equipment is a cheap 4" brush, three quarts of turpentine and one-half gallon of deck paint, all of which fits nicely into the $1.98 appropriation. The only other item is a few newspapers to spread under the rug so the grass does not turn yellow.

"The Magic Wire"

[*Continued from page* 90]

made with C1 about one-half meshed. The panel may then be screwed on the cabinet and final adjustment made. This is done by gradually adjusting the vernier knob of the dial until the light remains lit when adjusting but goes out when the hand is removed from the dial. This may be carried to a point where the light will flash as soon as one approaches within 3 feet of the wire or instrument. It is better not to aim for such sensitivity, though, since it will vary somewhat with line voltage. A good, practical and stable point is about six inches for operation. In any case, it will take fifteen minutes or so for the instrument to acquire a stable point of operation owing to its sensitivity.

A few of the many applications for this instrument were outlined in the first paragraph. For advertising work, string a piece of thin enameled

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Torture Tests Tell The Truth

[*Continued from page* 57]

starts and accelerates the shaft, flywheel and brake drums to any desired speed up to 600 revolutions per minute (representing 60 miles an hour, car speed); the current is shut off and one of the brakes is applied, bringing the shaft to a stop in a certain time which is recorded automatically on a chart; a small motor turns a valve, cutting out the brake that has just functioned and connects the other to the line; the main motor starts again, accelerates the shaft as before, the current is shut off, the second brake is applied and the time to stop is recorded as before. This cycle is repeated automatically at any desired interval (usually once a minute) for as long as necessary.

Within the past three years X-ray voltages have been more than doubled, there being several dozen X-ray plants in this country operating at 400,000 volts and some half dozen at voltages from 600,000 to 1,200,000. With this increase in voltage, entirely new measurement problems have arisen, the solution of which is awaited before these new radiations can be safely utilized to their ultimate limit. To meet this demand the Bureau has recently installed a 500,000-volt X-ray plant to provide a starting point on the problem, although it is generally recognized that they must ulti-

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Completing The XP-3

[*Continued from page* 110]

booms. The tail should be set at zero incidence. (See Fig. 17 for details of the mounting.)

A small sheet aluminum trimming tab should be provided and fitted to the rudder, slitting the trailing edge as required and cementing the tab in place. A very light guage aluminum will do for this surface. Cover both tail surfaces with silk and apply three coats of heavy nitrate dope.

The wings should be built in an inverted position as shown in Fig. 24. This results in a built-in dihedral. Study the wing layout, Fig. 23, carefully before proceeding with the construction. The entire performance of this model depends upon well-built accurate wings and no slipshod methods can pass here. The Gottingen 549 airfoil has been chosen for its fairly stable center of pressure and for its low moment co-efficients. It also lends itself well to cantilever structures.

Basic rib patterns are provided (see Figs. 13, 26 & 27) and the remaining ribs should be carefully plotted to conform to these lines in correct proportion. The ribs are cut from 3/32-inch sheet balsa and cap-stripped on top and bottom between the sheet covering as in the tail surfaces. The butt rib is not put in until all other ribs are secured at right angles to the upper wing spar. The butt rib is fitted to the angle required by the dihedral to form a close vertical junction with the end rib of the centersection. (See Fig. 23).

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Crafts And Hobbies

[*Continued from page 87*]

presence interferes with the deep inside cutting. Some warping may occur in any large piece of solid wood when the inside is cut away. Therefore, the final turning of the outside should be done after most of the interior has been shaped. Follow the lines shown, then sand well, rub with steel wool, fill and finish with clear lacquer, and shellac or varnish. When dry, rub with No. 000 steel wool lightly, and wax.

Turn the lid by cutting to fit and rounding the whole top so when it is in place, the lines of the bowl continue over the lid. Then cut the knob by making a depression around it. Finish in the same manner.

There are three different ways to make the handle. One is to cut a straight strip of smooth grain to size; steam it thoroughly and bend it to shape around a form, holding it in place until it has dried out. Another method is to cut three strips whose combined thickness is 3/16-inch. Steam and bend these in the same manner. After they are dry, they are glued together as one piece, then finished and fastened with the small turned knobs. A simple method of making the sharp curves at the bottom ends of the handle is by laying out the design on wood ½-inch thick and jig saw it out, then sand and finish.

Or, if a touch of metal is preferred, use a brass strip not more than ½-inch wide and 1/16-inch or less in thickness shaped as desired. Hammer marks upon its entire length will be appropriate.

How To Polarize Microscope

[*Continued from page 99*]

polarized light using a flashlight or other suitable light source. To study cellophane, a very simple arrangement can be used: a source of light, an optional piece of ground glass merely to diffuse the light, the polarizer, the material being examined, and the analyzer. As the analyzer is moved the color scheme varies. Changes also occur if the material being examined is moved instead. Opaque materials also show up nicely if they are clear or thin enough to let some light through, such as an onion skin, feathers, thin, stretched rubber, etc. Stresses and strains in transparent materials are visible when examined in transmitted polarized light. For example a lens too tightly clamped in its frame, or a bottle or other glass object improperly annealed during manufacturing, will show up colorfully along the lines of strain. Thick celluloid models of bridge girders under strain or "load" condition show the direction and intensity of stresses. A well mounted lens or strainless material will show no colors.

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"Album Print" Enlarger

[*Continued from page 122*]

make a hole 2½x2 inches to hold the opal glass. The glass is held in place by gluing in four little corner pieces of wood. Now put in sides which will separate the front and back by exactly $\frac{5}{16}$ inch and paint the whole interior dead black before assembling.

In a piece of cardboard cut a hole exactly the size of the negative you are using. For 35mm film this is $\frac{13}{16}$x1$\frac{7}{16}$ inches. Bevel the sides of the hole and glue it in position over the 1¼x1¾-inch hole. Cut a piece of plywood or thinner wood 2⅝x3 inches with a hole 1½x1$\frac{1}{16}$ inches in its center, cover one side with felt or velvet, and hinge it to hold the negative.

The reflector is made from a hypo can, which just fits over a 60-watt bulb. Cut the bottom out of the can, leaving the rolled edge intact. Take the cover from the can and with an old knife cut a hole in it and solder on a threaded ring cut from an old lamp-shade or a lamp-shade holder. A circle of felt with a hole for the opal glass insures a good fit when the can is held to the box with four small screws. You will probably need to drill a few holes in the reflector for cooling purposes.

Now hinge the whole unit to one end of the long box. A little more felt packing glued to the long box insures a good contact here, but you will not be able to put on the cupboard catch until you have the top on. Slip a piece of ground glass in the rear frame with the frosted side against the glass already there, and with a negative in the holder and the lamp lit you can turn out the room lights and slide the lens board and the rear frame back and forth until exact focus is established. Then nail and glue everything fast and seal up all cracks with paper tape, paint the whole inside a flat black, and you can saw off the extra inches and put the top in place. Put on your catch and put the back on with spring hinges.

Portable Darkroom Timer

[*Continued from page 123*]

safety pin, should be fastened in place as indicated in the drawing. Slots to serve as guides for the glass which holds the watch in place should be cut about half way through both side pieces. The box may now be glued and nailed together and the eye piece glued in place. A short piece of mailing tube will serve as an eye piece.

Wood brackets should be cut and nailed in place to hold the miniature dry cell. The glass to form the watch compartment may be cut from a discarded lantern slide. The friction lid can be made of two pieces of wood glued or nailed together.

Rhythm In Your Brain

[*Continued from page* 71]

Beta rhythm. It is frequently found in high-strung persons and seldom disappears during thought. Sometimes the Alpha and Beta rhythms occur together. Many scientists now refer to these as "Berger rhythms."

Others, both here and abroad, have taken up detailed investigations of these and other brain rhythms. Somewhat similar "brain-writers" (the apparatus is technically known as the electro-encephalograph) are in use in the Mayo Clinic, the Harvard Medical School, New York University and the University of Chicago, in addition to other colleges, hospitals and private medical research laboratories.

In Babies Hospital, New York City, it has been discovered that these brain waves start at birth but do not acquire a steady rate until the infant is six months old. Then the rhythm is slow, about 4 per second. The rate gradually increases until at the age of 10 or 12 years the normal adult rhythm of 10 per second is reached.

No two persons have identical brain waves. Just like finger-prints, there are little differences which experts can detect at a glance. But there is a great similarity between the brain waves of identical twins. Just because one happens to have a beautiful, rhythmic brain wave is no proof of superior intelligence. Similarly fine waves have been found in mongoloid children, animals and even in water-beetles.

The Alpha rhythm is present in light sleep. but it vanishes in deep slumber. Then "spindles," a faster rhythm of 13 or 14 per second, often take the place of the Alpha rhythm. However, a slight noise such as a cough, which apparently does not disturb the subject, will cause the Alpha rhythm to flash forth, alert, poised, ready for action.

The normal brain rhythms reproduced here were made by Dr. C. C. Clark, head of the Science Department of New York University School of Commerce. The photographs show the "brain-

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Death Lurks In The River

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heart. This connects with a stencil which in turn is lightly placed on a revolving drum. While the fish is being subjected to waters of known pollution content, his throbbing heart reflects his reactions through the "stethoscope" to the stencil, which translates these reactions in writing on the revolving drum!

One of Dr. Ellis' main objectives in making these tests is to reduce his pollution findings down to "standards" which may be applied to any waters not in immediate reach of the floating laboratory. These standards, when reduced to chemical formulae, can, and are being used in determining

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"The Magic Wire"

[*Continued from page* 135]

wire from the oscillator to a small circular piece of paper or metal pasted on the inside of a store show window with a card below it inviting passersby to touch the glass and see what happens. When this is done, a fan or a special display is immediately illuminated. Another stunt, which requires an additional power relay, operates in the same manner but switches on all the window display lights.

In filling stations, a wire strung near the gas pump will announce the approach of a car and an attendant is called. In the summer, when store doors are open, a wire may be strung around the door frame so when a customer walks in a clerk in the back of a store will be notified. In jewelry stores, a clerk may leave a customer but he will be warned if merchandise is touched. This is done by placing the wire under the velvet cover on the display shelf. Cash registers may be protected in like manner. In banks, the burglar's command, "Hands up!" may be willingly complied with if the fine wire is strung well above the teller's compartment. In homes, private safes may be similarly protected by stringing the wire near the safe.

While this simple design gives but a single warning when a moving object passes, it may be connected to an intermittent relay which will leave the warning on until switched off, or to a time-relay circuit which will operate for any desired period and then shut off automatically.

This is believed to be the simplest device of its type yet described. For industrial control purposes, of course, much more elaborate apparatus is required. But for an infinitely large number of other purposes, this gadget will do the trick.

PARTS REQUIRED

C1—Midget variable condenser, 60 mmfd., (see text)
C2—Trimmer condenser, 35 mmfd., or more, (see text)
C3—Tubular paper condenser, .05 mfd., 200 v.
C4—Electrolytic Condenser, 10 mfd., 100 v.
R1—Carbon resistor, 5 meg., 1 watt
R2—Carbon resistor, 1 meg., 1 watt
R4—5,000 ohms, 10 watts, wire-wound resistor
R5—10,000 ohms, 10 watts, wire-wound resistor
1—Steel cabinet 6x6x6 inches, front and back panels removable
1—Piece 16-gauge aluminum, for chassis, 5½x7¾ inches
1—Piece bakelite tubing, 1-inch dia., 3¼ inches long
1—Piece bakelite, 1½x1½, ⅛-inch thick, for C1
2—Octal wafer sockets, 1½-inch center for mounting holes
1—5-prong wafer socket, 1½-inch center for mounting holes
1—Utah type RAC-110, 3000-ohm relay
1—6R7 metal tube
1—25L6 metal tube
1—Kurz-Kasch verniet dial, small
1—Resistor line cord, 280 ohms (R3)
1—Single outlet receptacle
Miscellaneous screws, nuts, mounting bracket and grommets

Optical lenses made of a clear plastic material are said to be unbreakable, scratch-proof, and quickly and cheaply produced.

Craftsman or just a casual reader, you'll find MECHANIX ILLUSTRATED entertaining and instructive EVERY issue.

Completing The XP-3

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The spars are boxed between ribs with 1/16-inch sheet balsa web plates to add to the rigidity of the structure and the end rib is not notched to fit the spars but is butted directly against them. The tips are fitted the same as in the tail.

Fit the wing truss of ⅛x¼-inch hard balsa top and bottom while the wing is still in the jig and check carefully for alignment during the entire procedure until the wing is ready to be lifted from the jig. (See Fig.23).

The leading edge and trailing edge finishing is left until the sheet covering is in place and dry. The wing blocks are fitted between the two butt ribs of each spar in precisely the same manner as the centersection. They should be of ½-inch bass wood. (See Fig. 25).

Sand down the whole wing carefully and complete the airfoil section leading and trailing edges. The entire panel is then covered with silk and three coats of regular aircraft dope applied. Don't forget to make one right and one left wing.

The wing fittings are cut from 1/16-inch, 17-ST aluminum stock to fit the sweep-back of the spars. They are then bent to suit the dihedral and drilled for ⅛-inch steel bolts. The wing fitting holes should be drilled with care with the wings in place so as to create perfect alignment when bolted to the centersection.

This completes the model except for installing the motor to be used. A 14-inch diameter, 8-inch pitch propeller coupled to a ⅕ h. p. motor provides excellent performance. With all flight equipment in place the model should balance on your finger-tips at a point about 40% of the chord at the half-way mark along the wing.

About 75% full throttle on a ⅕ h. p. motor is required to get this model into the air. If the ship has a tendency to dive or stall, correct with the necessary incidence at the tail blocks. *Happy Landings!*

Highest and longest electric stairway in the United States is being built by a well known electrical products manufacturer for the Theme Building of the 1939 New York World's Fair. Overall length will be just under 104 feet, with a vertical rise of 60 feet—it would just about carry one to the top of the Egyptian Sphinx's head, or from the ground to the fifth floor of the average department store without stopping. Previous longest electric stairway is that in the Lexington Avenue station of the Queens subway, in New York City, which has a vertical rise of 56 feet 3 inches.

California orange growers say that X-ray testing machines show a good deal of fruit to be sound which human inspectors would reject.

Craftsman or just a casual reader, you'll find MECHANIX ILLUSTRATED entertaining and instructive EVERY issue.

Rhythm In Your Brain

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writer" set up in the Psychiatric Division of Bellevue Hospital, New York City, as a modern aid to the study and treatment of the mentally sick, in an investigation by Dr. Clark and Dr. D. E. Schneider of the Hospital staff, under the direction of Dr. K. M. Bowman.

In making such investigations, two small copper discs are held in place against the head of the subject by applying collodion around each disc. Wires from these disc electrodes then connect to a switch and cable within the wire-screened booth. The subject lies on the cot, closes his eyes and tries not to think of anything. The recorder is then turned on and the waves are registered.

Most attention is now given to abnormal waves and rhythms. When something goes wrong with the unknown governor which controls the speed of the brain wave rhythm, it runs wild. Then it suddenly drops to a very slow rate, about 3 per second, with high voltage surges. The unfortunate victim struggles to free himself from these high, pent-up voltages and convulsions result.

With the "brain-writer," the onset of an apoplectic attack can be predicted twenty-four hours before it occurs and by proper treatment can be stopped before it starts. Doctors Gibbs and Lennox, of Harvard Medical School, who recently made this revolutionary discovery, have given a new name to epilepsy. This is the custom, they point out, when the cause of a disease is located. And epilepsy is now "Alpha dysrhythmia."

In the Emma Pendleton Home in Providence, Dr. Salomon and his associates have discovered large, slow brain waves in children with behavior problems. These waves range from 2½ to 7 per second. The method of treatment is as yet undisclosed.

This new "brain-writer" seems destined to become indispensable to psychiatrists. Properly used, it indicates immediately the effect of various types of treatment in a field where results are otherwise difficult to determine. Many are now using such apparatus to gauge the action of insulin treatment in the type of insanity known as schizophrenia.

Aside from its medical applications, the apparatus has other interesting uses. In one test for extra-sensory perception, the subject was found to be particularly successful when the brain rhythm was present but was no better than average when he concentrated his mind on the problem. In such tests, which are not the same as mental telepathy, five cards with various designs are used and the subject tries to tell which is which when neither he nor the one running the test can see the cards.

Certain broad, general types of personality can now be identified by brain-wave test. When the apparatus becomes better understood, and perhaps further developed, it is likely to become an "X-Ray of the human soul."

Death Lurks In The River

[*Continued from page* 139]

type and pollutant content of any fresh water stream in the nation.

In the case of most of our large industrial cities like Chicago, Detroit, Pittsburgh and St. Louis, abrasive wastes are thrown wholesale into the rivers or lakes on which they are located. Such refuse comes from asbestos factories, coal mines, stone and limestone quarries, steel and iron foundries and blast furnaces.

What is the remedy for this condition? Really, it is very simple: If these abrasive wastes were finely pulverized, to pass through 1,000 mesh screens, so that flowing water may carry them off, they could be introduced into our rivers without material destructive effects.

The most dangerous of all the water "poisoners" is domestic sewage because it is practised on a practically universal scale. For example, throughout the entire length of the Mississippi, Missouri and other large rivers, every town and city uses them as its private septic tank.

To remedy this situation the Federal scientists have found that all forms of city and domestic sewage should first be reduced to a harmless ash by the latest methods in use by modern sewage disposal plants. If this is done properly, the residue may be poured into the nation's rivers and streams with little or no harm. Untreated sewage promotes the growth of typhoid bacteria and other dangerous germs that threaten human health.

New England naturalists are greatly disturbed about the enormous quantities of cellulose waste and sawdust being dumped into rivers alongside their great paper mills and furniture factories. Latest tests by the Bureau of Fisheries show that cullulose pulp and sawdust cannot be assimilated by a river, with the result that they go floating down to the bottom in minute chunks. In time this destructive waste will cover the entire stream bed and rot, and while doing so, it liberates marsh gas which is a deadly killer to everything in the water. There is only one remedy for the menace of cellulose pulp and sawdust. Keep them out of the water.

At any rate, your chances of good fishing and clear bathing will be better this year due to the work of the floating laboratory. And if even a part of the 2¼ billion asked of Congress would be appropriated, a long step could be taken towards the improvement of our water systems to the benefit of the entire country.

In building a subway under city streets, engineers may have to deal with telephone and telegraph wires, water, gas and steam mains, and sewage systems.

Torture Tests Tell The Truth

[*Continued from page* 136]

mately have at least twice that voltage to keep abreast of the clinical demand for X-ray standards. Bureau measurements up to 400,000 volts have been carried out and it appears possible for the first time in history to standardize accurate dosage up to these limits.

Recently the Bureau announced an improvement in the system of radio airplane landing aids first introduced by the Bureau to aviation back in 1931. This improvement brings the system in line with modern requirements and greatly increases its flexibility. The Bureau's system differs from other instrument landing systems in that it provides positive guidance of the airplane in the vertical as well as in the horizontal plane down to the point of contact with the airport runway. Guidance in the vertical plane is accomplished by means of a radio landing beam, produced by an ultrashort wave transmitter located at one end of the airport. The airplane, approaching from beyond the other end of the airport, follows a curved beam to the airport surface.

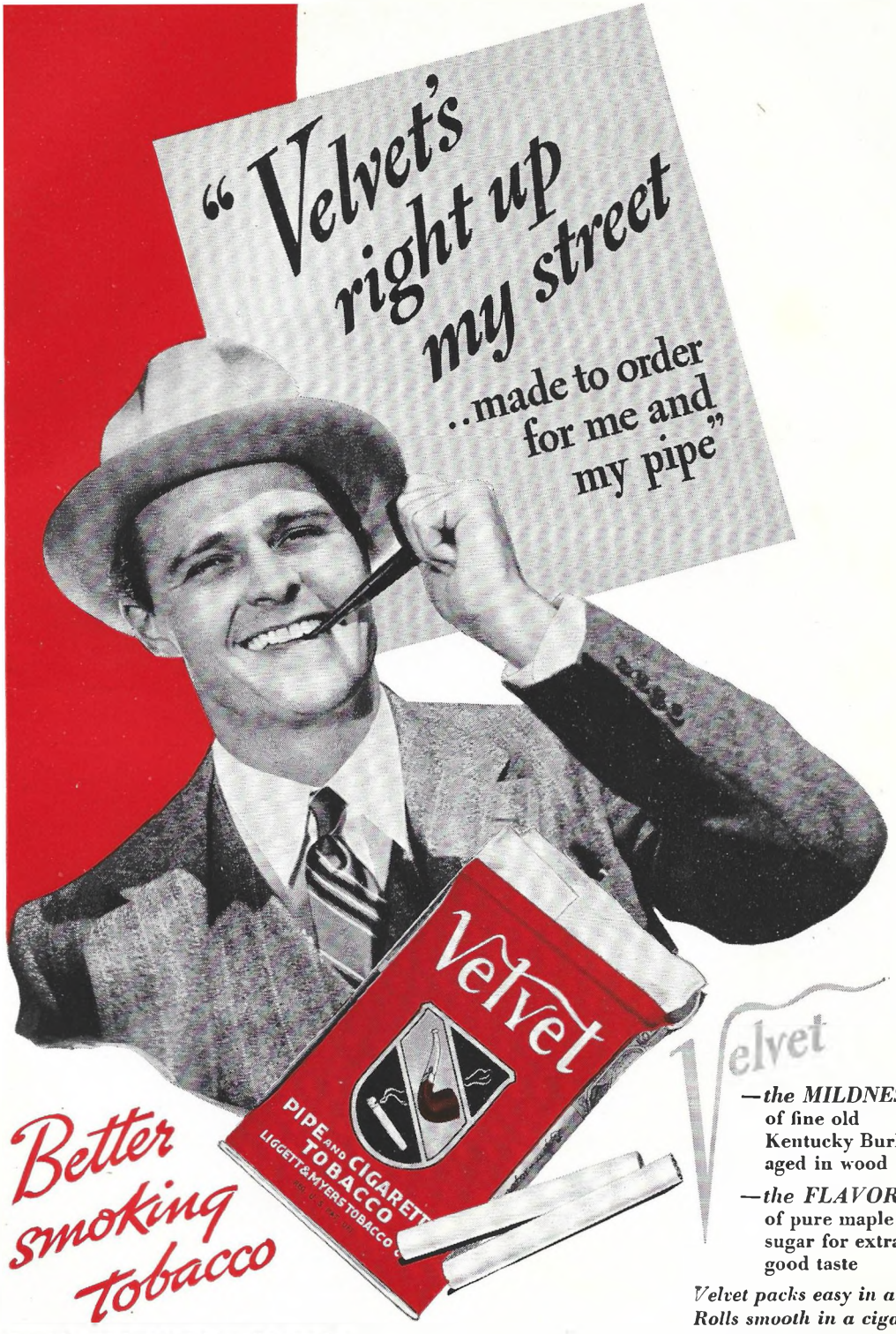
In this country experimental installations made at College Park, Md., Newark, N. J., and Oakland, Calif., have demonstrated the possibilities of the system. Literally thousands of "blind" landings in airplanes provided with hooded cockpits have been made. Two of the nation's leading airplanes are today studying improvements in the system with a view to fitting it to the needs of large passenger planes.

Microfilm Reading Machine Patented By Surgeon

The compact, portable reading machine for reading books and documents recorded on microfilm developed under the auspices of Science Service, the non-profit institution for the popularization of science, was patented in Washington, D. C., recently. Covering several basic features of the machine, Patent No. 2,113,578 was granted to Lt. Rupert H. Draeger, United States Navy surgeon.

The reading machine was developed as part of Science Service's sponsorship of the movement to spread use of microphotographic methods of document and book recording and reproduction, which resulted in the formation of the American Documentation Institute. In use in many libraries throughout the world, microfilm permits recording of an entire book, for example, on but a few frames of motion picture film. Its advantages are extreme compactness—an advantage much to be desired as library after library finds bulky periodical and book files piling up faster than space can be found for them.

The machine is essentially a projector which enlarges and throws on a translucent screen an image of the film.



Better smoking tobacco

Velvet

—*the MILDNESS* of fine old Kentucky Burley aged in wood

—*the FLAVOR* of pure maple sugar for extra good taste

Velvet packs easy in a pipe
Rolls smooth in a cigarette
Draws right in both

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So CHARLES BELVIN Smokes Luckies, the 2 to 1 Favorite of America's Independent Tobacco Experts

Tobaccoland has many independent experts—auctioneers, buyers and warehousemen. These men do not work for any cigarette company. Here's what one of them—Charles Belvin—says:

"At auction after auction for over 19 years, I've seen Luckies buy the best grades of tobacco—the 'Cream of the Crop'!" Sworn records show that, among Mr. Belvin's fellow experts, Luckies have over twice as many exclusive smokers as have all other cigarettes combined.

Luckies also give you throat protection. The "Toasting" process takes out certain harsh irritants found in all tobacco. So Luckies are a light smoke—easy on your throat.

Sworn Records Show That - WITH MEN WHO KNOW TOBACCO BEST - IT'S LUCKIES 2 TO 1