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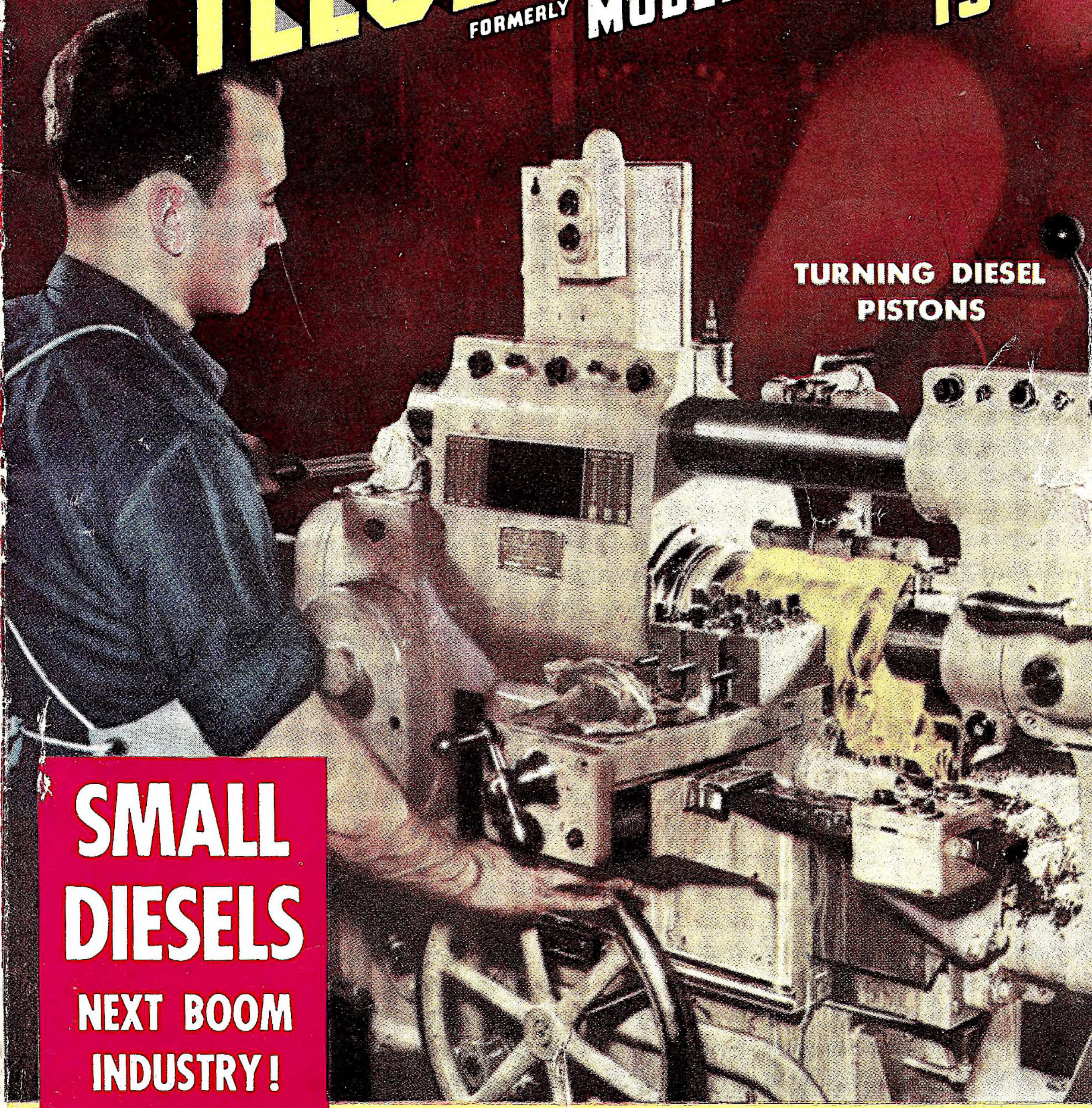
JULY
NSC

MECHANIX ILLUSTRATED

FORMERLY MODERN MECHANIX

15c



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SMALL DIESELS NEXT BOOM INDUSTRY!

SPECIAL PHOTOGRAPHY SECTION • Page 119

JULY 1938 MECHANIX ILLUSTRATED 15 CENTS

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IN EVERY wet road emergency you need a tire that will turn the road under your car into a *dry* track. And now, thanks to the new Goodrich Safety Silvertown with Life-Saver Tread, you can have a *road-drying* tire that works *like a whole battery of windshield wipers*...sweeps away the water right and left . . . gives you the safest, quickest stops on wet roads you've ever seen!

Remember, this new skid-protected Silvertown also gives you the famous blow-out protection of the Goodrich Golden Ply. Thus the lives of yourself and your family are protected against *both* skids and blow-outs.

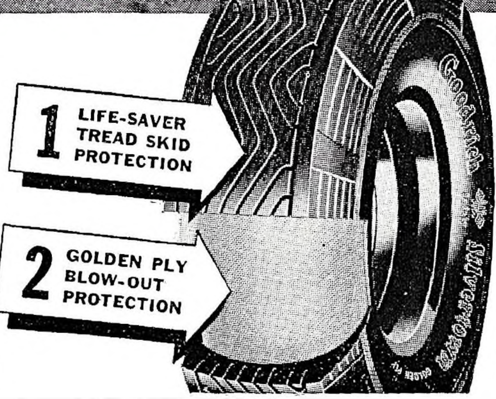
Your Goodrich dealer or Goodrich Silvertown store wants to give you a free demonstration of this new kind of tire in action. So why not go in and get first-hand the thrilling experience of a SILVERTOWN STOP? And, for safety's sake, make your next tires Goodrich Safety Silvertowns.

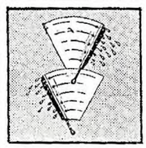
PROOF! from America's Largest Independent Testing Laboratory

"BOTH regular, and also the premium-priced tires of America's six largest tire manufacturers were submitted to a series of exhaustive road tests by us, with the following result:

"NON-SKID—The new Goodrich Silvertown with the Life-Saver Tread gave greater skid resistance than any other tire tested, including those tires listed at from 40% to 70% higher in price."

PITTSBURGH TESTING LABORATORY





Life-saver tread dries road like a battery of windshield wipers. Sweeps the water right and left—forces it out through the *deep* drainage grooves.

The new Goodrich SAFETY Silvertown

SKID PROTECTION OF LIFE-SAVER TREAD ◆ GOLDEN PLY BLOW-OUT PROTECTION

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IT takes brain to earn money—<u>trained brain!</u> The man without training is usually the man without cash. You can train your brain! Thousands of men have done it through spare-time study of I. C. S. Courses. Be a cash man—be a trained man—mail this coupon!

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MECHANIX ILLUSTRATED
FORMERLY MODERN MECHANIX

JULY
1938

Volume XX
Number 3

Circulation over 250,000

SPECIAL FEATURES

(Continued on page 8)

MECHANIX ILLUSTRATED is not a new magazine. It is the former MODERN MECHANIX in new dress, with more pages, more and bigger pictures, more human-interest articles, more craft and hobby projects than ever before. New readers will quickly see that MECHANIX ILLUSTRATED is fresh, lively, entertaining. Old readers already know that it is accurate, authoritative, inspiring.

Show this copy of MECHANIX ILLUSTRATED to your friends and tell them to look for future issues on their local newsstands. Be sure to say MECHANIX ILLUSTRATED to your newsdealer, and you will get the biggest 15 cents worth of magazine on the market!

Camera Section

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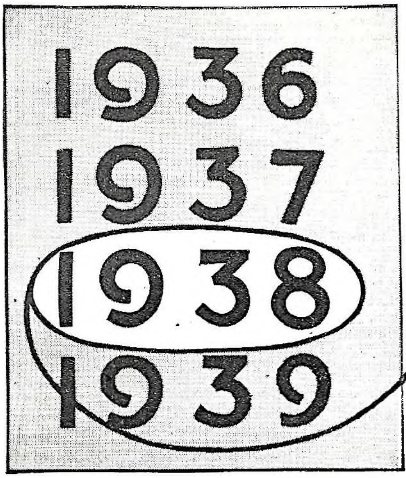

Now is the time!

Business is Searching

. . . . for YOU, if . . . .

RIGHT now, in many lines, there is a search for really *good* men—managers, leaders—men who can take charge of departments, businesses, branch offices, and get things humming.

As always, there are not enough ordinary jobs to go 'round—but rarely before, in the history of American business, has there been so much room at the *top!* New jobs are being created by the business pick-up in almost all lines—jobs that pay splendidly and that open the way to lifetime success.

Ordinarily, there would be plenty of men to fill these jobs—men in junior positions who had been studying in spare time. But most men have been letting their training slide during these dark years of depression . . . "What's the use?"—You have heard them say. Perhaps there has been some excuse for sticking to any old kind of a job one could get the past few years—but the door is wide open for the man with ambition and ability *NOW!*

And don't let anyone tell you that "Opportunity Only Knocks Once"—that's one of the most untruthful sayings ever circulated. Opportunities flourish for *every* American every day of his life.

Far more to the point is to be ready—to be *prepared*—to make yourself *interesting* to the big-time employer—and LaSalle offers you a short-cut method of qualifying for opportunity jobs in accounting, law, traffic, executive management, and kindred occupations.

LaSalle Extension is 30 years old—averages 40,000 enrollments a year—60 American firms each employ 500 or more LaSalle-trained men—surveys show that LaSalle students attain 40% average salary increase after graduation—10% of all C. P. A.'s in the U. S. A. are LaSalle-alumni.

Why not find out what LaSalle has done and is doing for men in *your* position? Send and get the facts; see what LaSalle can do for you, personally!

There's no question about it—business is picking up—jobs are looking for *men*—the time has come for you to *qualify* for prosperity. Mail this coupon today!

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LASALLE EXTENSION

Ask for one of these booklets—or a similar one on your own field of business. They are free!

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SHORTER FEATURES

HOW-TO-BUILD FEATURES

FOR THE WORKSHOP FAN

CAMPING AND OUTDOORS

AUTOMOTIVE

AVIATION

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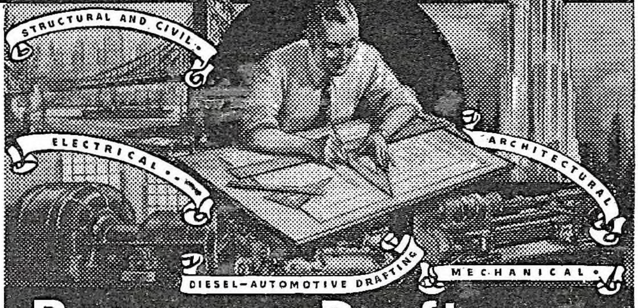
Enjoy a Real Job in Industry



Steady Work

As nearly all manufacturing and building starts on the drafting table, the draftsman is one of the first to be hired, last to be laid off. His blueprints, his specifications, give the final word in what the workmen are to do.

Good Pay

The draftsman has been called the Junior Engineer, which accurately describes his work, position and pay. He combines knowledge of principles, mechanism and construction details with ability to draw plans and indicate methods. Usually his salary is considerably above the wages of the mechanic and, of course, less than that of the engineer.

Chance for Promotion

Helping design new buildings, machines or construction methods, the draftsman knows what his firm is planning or considering. It may be the superintendent—engineer—even the prospective buyer with whom he consults. These contacts, plus his experience, place him in an excellent position for promotion when next there is a good opening.

Young at 40

Athletes, farmers, factory and shop workers — all who rely on muscle often are old at 40. Office workers — executives, teachers, professional men, *draftsmen*—just approach their prime at 40 to 50. Training increases your value AT ONCE and *continues* to help boost your earning power as you mature.

Become a Draftsman

Don't Be Just Average

What happens to the average man? Not having thorough training for a worth-while job, he goes along year after year, wishing he had a good job, but wishing was never a substitute for training. $40 a week is about his top, usually never that high. Grows old on the job, starts down at 40, finds himself slipping in speed and salary.

Security for Yourself and Family

Even if you are now only 18, 25 or 30, you should *look ahead* —begin training TODAY for the job you want at 50. Training helps you to be independent—self-supporting. It helps you to enjoy associations denied to untrained men. Training helps you to offer your family advantages far in excess of what you could give them as an untrained man. Investigate NOW.

American School, Dept. DDB 28, Drexel at 58th, Chicago

Auto-Glide

Make Thrilling Trips -or Cheap Deliveries

Keen fun for the whole family—at amazingly low cost! Picnics, trips—100 miles for 50c! Great delivery rig, too—cuts costs, increases delivery volume. Gives you most downright ruggedness and carefree service for lowest cost—powerful 1½ or 2 H.P. engine, strong frame, 2-speed transmission, clutch, brake, balloon tires. Trunk has removable cover, lock. Side-Kar and 3rd wheel on or off quickly. Other models.

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BUY potatoes for 2¢ a lb. Make sensational new "Greaseless" Potato Chips and sell for 35¢ a lb. Ideal business for men or women in spare or full time. Small investment buys complete equipment. No experience needed. I show you how to get stores to sell all you make; tell you how to make profit first day. All information, pictures, prices and terms sent free. Send a postal card for Free Facts on this big "Home Business" Opportunity.

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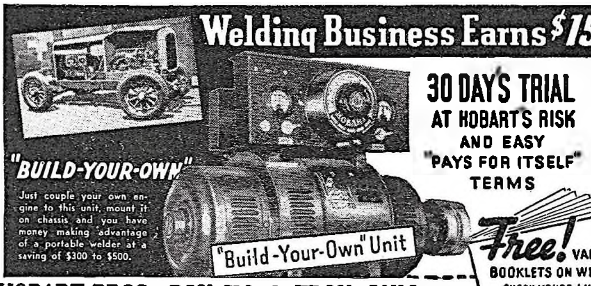

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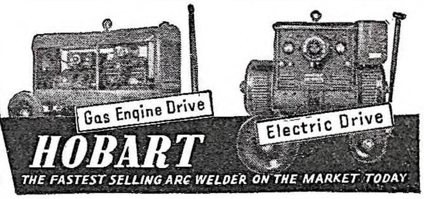

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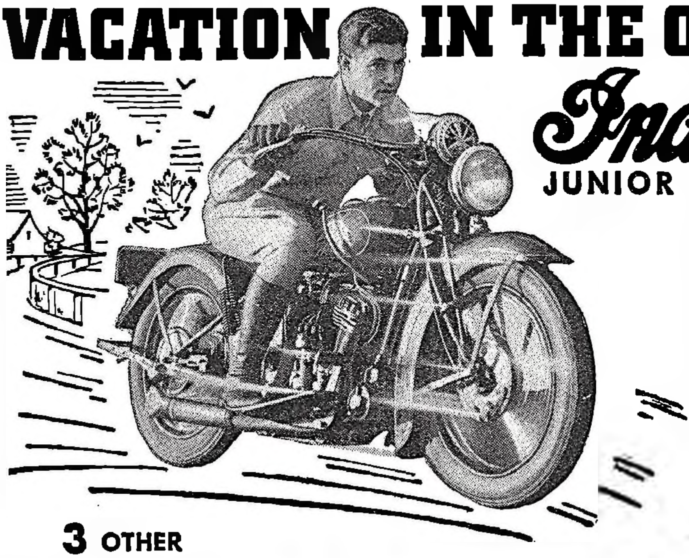
NEW MECHANICAL DEVICES

RADIO AND ELECTRICITY

DEPARTMENTS

MISCELLANEOUS

VACATION IN THE OPEN



Indian JUNIOR SCOUT

F.O.B. FACTORY **$215.** FULLY EQUIPPED

Get out in the open this summer! Explore highways and byways! All outdoors is yours—for fun, excitement, adventure—when you ride a *twin-cylinder* Indian Junior Scout—the biggest "buy" in all motorcycledom.

EASY TO OWN AN INDIAN

The new 1938 Indians are as easy to buy as they are to handle, and you can't beat 'em for economy and smooth, dependable operation. Ask your Indian dealer to demonstrate an Indian—explain Indian's easy pay-as-you-ride plan.

3 OTHER NEW 1938 MODELS

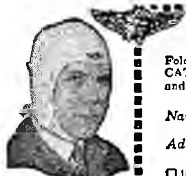
DE LUXE 4—the only American-made 4-cylinder motorcycle.

CHIEF 74—a peerless "top speed" performer.

SPORT SCOUT—a winner all around.

FREE! Get this RIDER'S HELMET and INDIAN PIN

MAIL COUPON TODAY!



INDIAN MOTOCYCLE CO., Springfield, Mass.

Please send me at once, without obligation, your illustrated Folder showing the new 1938 Indian Motocycles, and CERTIFICATE of VALUE entitling me to FREE RIDER'S HELMET and INDIAN PIN, as illustrated, when I place my order.

Name..

Address...

Please be sure to check your age group: MI78

☐ 16-19 years ☐ 20-30 years ☐ 31 years and up ☐ under 16 years

---

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FAWCETT BUILDING
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Large blueprints of many of the construction projects described in MECHANIX ILLUSTRATED are available at low prices. Because they greatly simplify work in the shop they are popular with MI readers the world over. A booklet describing all of these plans in detail is free for the asking; write today for your copy.

How to remodel and improve guns in your own home

THE AMATEUR GUNCRAFTSMAN

BY JAMES V. HOWE
Illus., $4.00. (By mail, $4.18)
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Dept. 1876, 354 Fourth Ave.
New York, N.Y.

An invaluable book for beginners. It tells step by step how to temper, anneal, and blue metals; how to form, decorate, and condition parts; how to install new sights, stocks, actions, guards for rifle, shot gun, and pistol. 301 pages, complete with directory of dealers in gunsmithing supplies.

Chips from the Editor's Workbench

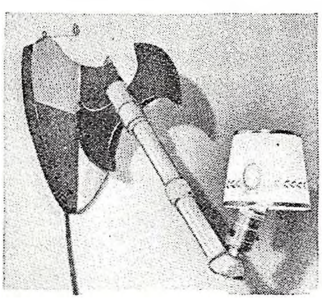
Built to MI plans by A. L. Chase and powered by a converted auto engine, this 25-foot cabin cruiser travels 14 m. p. h.

SOME fellows claim that a converted automobile engine won't work out well as a power plant for fairly large home-built boats, but A. L. Chase, of Coconut Grove, Florida, who built the 25-foot version of the MI Boat-GANNET—shown above, sent in a letter that knocks holes in that theory.

Chase built his cabin cruiser one foot longer than called for in the MI plans to allow use of an inboard rudder and reports that the craft clocks off at 14 m.p.h., powered by a converted Model A Ford engine, which is good speed on the water in anybody's language. For his interesting letter and photo I awarded Chase a $5 prize and I think every MI boat fan will agree that his trim-looking cruiser is a "knockout."

***

In the September, 1937 issue, we ran plans for building a battle axe lamp and James M. Conkey, of Rochester, N. Y., proved himself to be a good business man as well as a craftsman by sending in a letter and photo of the lamp he built from those plans. I know Conkey is a good craftsman because of the fine appearance of the lamp and his business acumen rates high since he says the lamp only cost him $1.70 to build and he sent the photo in feeling that it would score a $3 award, which it did, giving him a substantial profit on the project. That's what I call being a darn good business man!



Realistic in its appearance, this battle axe lamp was built by James M. Conkey at a cost of $1.70.

***

Another MI photo fan who built the enlarger described in our March issue is John Wilhelm, of Youngstown, Ohio. John sent in the photo shown below, nicking the MI bank account for a $3 award. He says MI proved to be a "life saver" to him, inasmuch as he couldn't afford to buy a commercially-made enlarger, but was able to build one from our plans at a cost of only $3.81. Incidentally, the home-built enlarger was used to enlarge the photo shown below from a 35 mm. negative.

***

Thanks for the many kind words on the new name and make-up of MI, fellows. I am certainly pleased to learn that you like the old mag in her new dress. We will do our best to "keep

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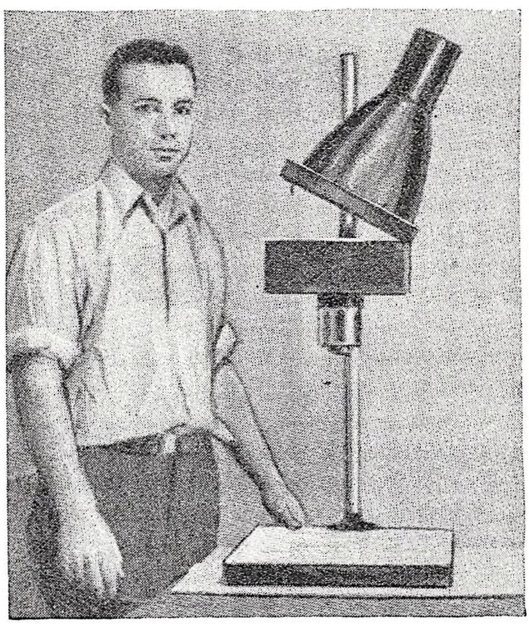

Proving the practicability of his home-built enlarger, John Wilhelm sent this photo which was enlarged from 35mm size.

Editor's Workbench Chips

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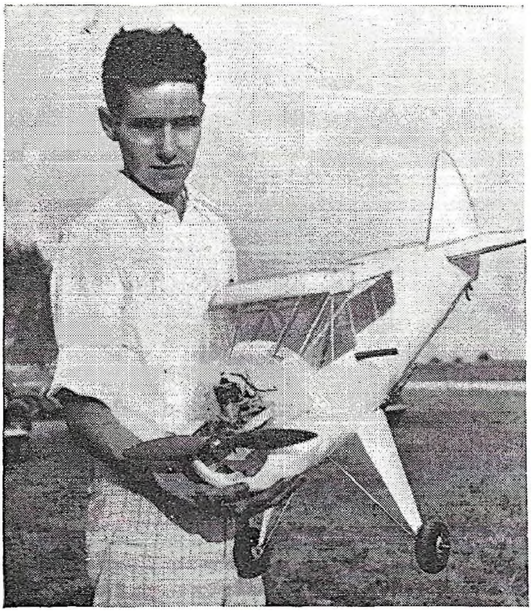


Shown without its wings, this model airplane was built by Paul Gass. It is powered by a 1/5-horsepower "gas" engine.

up the good work," as you urged in your numerous letters.

***

Being a pilot, I just couldn't pass up the photo of Paul Gass, of Decatur, Ill., and his model plane, which is powered by a miniature gasoline engine. Paul must be a bashful chap, for the photo was sent in by a friend, Glen Courtwright, who reports that the model has pursuit plane performance, climbs steeply in large circles and makes fast landings. Too bad that Paul didn't have the wings on the model plane when the photo was taken, but its easy enough to see that the "crate" is well built and has nice lines, so I'm sending a $3 award to be split between him and his friend, Glen. Happy Landings!

***

Rex West, of 517 Forest Road, Hurstville, New South Wales, Sydney, Australia, wants to correspond with other MI readers who are interested in aviation, motoring, home movies and other hobbies, so add his name to your list of Pen-Pals if you want to swap information with him.

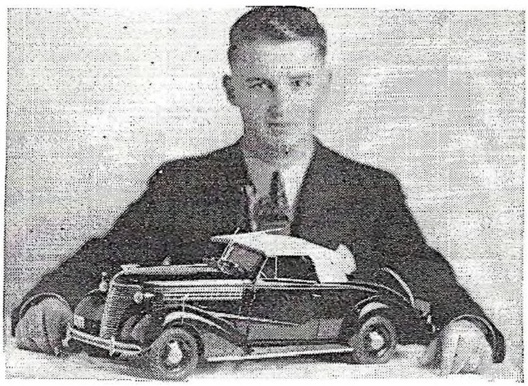
***

How do you like the model automobile shown in one of the photos on this page? The photo was sent in by Paul Jones, Jr., of Winters, Texas, who built the model from wood and metal, using only a knife, saw, file and sandpaper for tools.

Paul's model is an exact replica of a 1938 Chevrolet Cabriolet and its perfect detail and finish are all the more amazing because he says he has never had any training in wood work or the use of tools. (Just shows what a fellow can do when he makes up his mind!) The body consists of 426 separate pieces and the seats are upholstered with imitation leather. The model was built entirely from photos of the car, no patterns being used. You certainly deserve the $3 award I'm sending you, Paul.

***

Riding to a $3 award on a home-built "Putt-Put" is what Harley Peterson, of Waukegan, Ill., did when he sent in the photo of the midget racer he built. Powered by a ⅝-horsepower motor, the mechanical "doodle-bug" has a combination chain and belt drive, which serves as a clutch, too, according to Harley's letter. The racer has a rebuilt brake taken from an old bicycle, showing that Harley knows how to make a mechanical gadget to double duty.



Perfect in every respect, this tiny automobile was built by Paul Jones, Jr., using only a knife, saw, file and sandpaper.

Gas-powered model planes are certainly becoming popular and MI fans are right up in the front ranks of the growing army of hobbyists who

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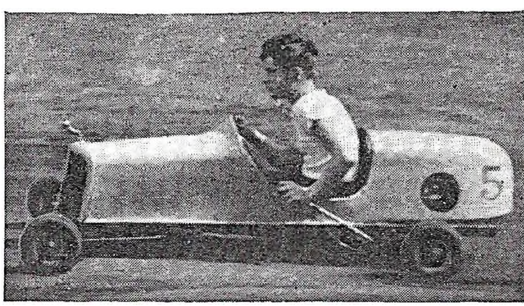

This action photo shows Harley Peterson piloting his home-built midget racer down the "home stretch" in Waukegan, Ill.

Television Spotting Of Planes Is Possible, Scientists Say

"Entirely possible" is the scientific verdict of radio engineers at the National Bureau of Standards in Washington, D. C., to British dispatches citing the use of television receivers as "spotters" of airplanes. While Army officials would not confirm reports that similar methods are being worked out for the military uses of the United States, it was admitted that secret research is underway to test other ways of spotting airplanes than by the present sound detection methods.

Since television broadcasts have been in progress in London it has been noted that when airplanes are flying in the vicinity "ghost" images are produced in the television receivers. These "ghosts" are caused by reflection of the television waves from the metal airplane surface. Thus the reflected waves arrive at the television receivers at a slightly different time than the ordinary waves. The result is a dual image of the scene being transmitted. The image of the plane itself is not received.

According to British reports the displacement of the "ghost" image has been correlated with the distance of the plane away from the television receivers. A system has been worked out whereby television receivers on England's eastern coast could thus serve as "spotters" for approaching enemy aircraft in time of war.

Whether the plan can be worked out in complete detail and serve a valuable military use is for the future to decide, but in principle the method is an almost exact counterpart of the system of determining airplane altitude by having the plane send down to the ground a beam of radio waves and then having the plane pick up the signals of the reflected waves. This method was announced by Dr. E. F. W. Alexanderson of the General Electric Company in 1928.

First Glass Cornerstone Set At World's Fair Site

The cornerstone for the Egyptian pavilion of the New York World Fair, laid at the Flushing Meadows fair site, is the first glass cornerstone to be laid in the history of the building construction industry, fair officials declared.

Laid in place amid a colorful setting, the glass cornerstone contains a copper chest in which are mementoes of the occasion. The chest is visible through the glass blocks.

Wolframite, an ore yielding tungsten, is found in Greenland.

An air-conditioned bed has been patented.

Editor's Workbench Chips

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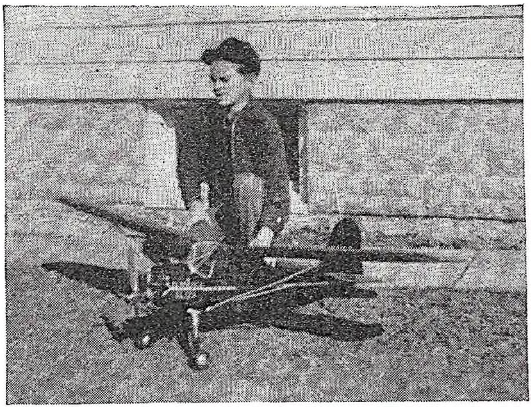


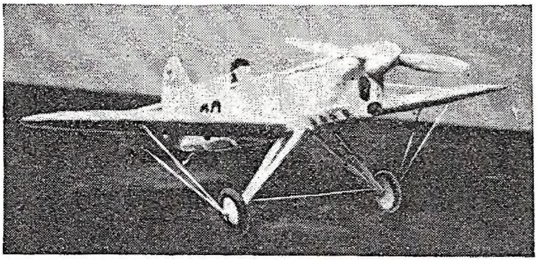
James Lyons poses with the six-foot gas model plane he built.

are slapping balsa wood together and turning out miniature flying jobs that rival real airplanes in beauty of finish and design, as typified by the photo shown above. James Lyon, of Sherman, Ill., sent in the photo and he'll be three dollars richer when he receives the award I sent him.

James says his plane has a wingspan of six feet, two inches and is powered by a miniature gasoline engine of 1/5-horsepower. Better watch out, Jim, or Uncle Sam will be invoking his home-built airplane law. Come to think of it, though, I have seen model planes with a 14-foot wingspan, so I guess you are okay at that.

***

Here's another model plane photo to cast your eyes over. This one is a rubber-powered "Miss Los Angeles" model, which George Vlahakes, of Birmingham, Ala., built from plans that appeared in MI. George says he is now working on a model of the "Cloud Hooker" endurance plane, which appeared in the MI book—HOW TO BUILD IT, so maybe the $3 award I sent him will soon sprout wings—figuratively and literally—for you can buy a lot of balsa wood for that sum.

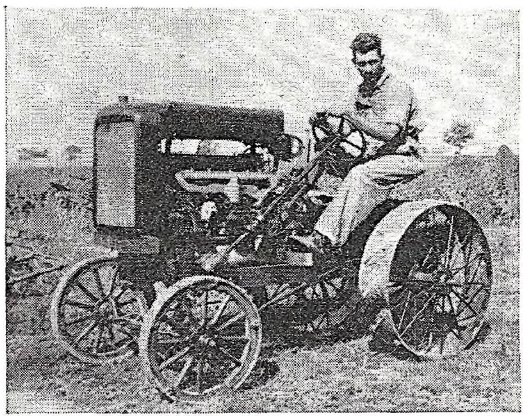


George Vlahakes built this rubber-powered "Miss Los Angeles" airplane model from plans that appeared in MI during 1936.

Maybe some of you fans think I am giving too much space to airplane models this month, but don't forget that MI plays no favorites. In our May issue I gave most of the Workbench space to boats built by MI readers; in June, to midget racers, and so it was just about time for the model plane bugs to have their inning. Next month I'll play up—but wait and see. (Order your August copy now!)

***

What goes into the making of a good home-built tractor? Well, Herbert H. Grooms, of West Union, Ohio, ought to know, for he constructed the nine-speed (five forward, four reverse) job shown below. Herb used an engine from an old motor truck, and parts salvaged from three old tractors to build his "special." The speeds range from one-quarter to six miles per hour and the tractor has enough power to pull a six-foot binder in heavy wheat. Okay, Herb, I'm sending you a $3 award in the next mail.



Constructed from old auto and tractor parts by Herbert H. Groom, this tractor boasts five forward and four reverse speeds.

***

You probably have noticed that the Workbench Department has been enlarged during the past few months and that more photos of projects built by readers are being featured. That means more prizes are being awarded, so be sure and send in a photo and description of your completed project for your chances of winning are better than ever.

***

When a model plane makes 40 flights without cracking up it proves that the builder "knows his stuff." That's why I sent a $3 award to John Targas, of New York, N. Y., for the photo and

[*Continued on page* 20]

Machine Records Voice For Verbal Postal Messages

Sending a verbal postal message to friends instead of a postcard or letter is a new service available to residents of Amsterdam, Holland. A coin-operated machine installed in one of the city's post offices is fitted with a small microphone into which the customer speaks, limiting the message to about 100 words. Within a few minutes time, the machine ejects a metal phonograph record on which the message has been recorded. The customer then mails the record to a friend who, upon its receipt, can play it on a phonograph.

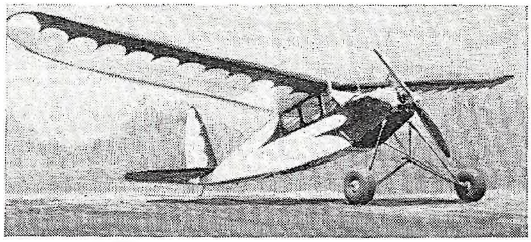
Scientist Describes "Perfect" Vacuum's Pressure

The most nearly complete vacuum ever achieved under laboratory conditions, states Prof. C. Ramsauer of Berlin, is represented by a pressure of one five-billionth of a millimeter of mercury. (Ordinary atmospheric pressure is about 300 millimeters.) Yet even this almost imperceptible trace of air still contains about 1,640,000,000 molecules of gas per cubic inch, as against an estimated 1 to 5 molecules per cubic inch in interstellar space.

Highest laboratory pressures have amounted to as much as 50,000 atmospheres, as against pressures in billions of atmospheres believed to exist at the centers of the more massive stars.

Editor's Workbench Chips

[*Continued from page* 18]



A real flyer is this gas-powered model built by John Targas. Weighing only 3 1/4 pounds, it has made 40 successful flights.

letter he sent in describing his model. John's gas-model has a wingspan of five feet, seven inches and is powered by a one-fifth horsepower miniature gasoline engine, the entire craft weighing only 3¼ pounds. More than 40 flights have been made, John claims, without a single crack up. That, my friends, is what aviators would call "one sweet flying job."

***

By the way, you gas model fans want to be sure and reserve a copy of the August issue of MI, for I'm running plans of one of the most novel "buzzers" ever presented in any magazine—a tried and proven experimental pusher that will tempt you to restock your workshop with model building essentials and "get going."

***

Camera days are here and if you want to get maximum enjoyment from the hobby, secure a copy of the MI PHOTOGRAPHY HANDBOOK from your news dealer or direct from our office in Greenwich, Conn. It's only 50c per copy and crammed full of practical, money-saving information. You'll never know how much fun photography is until you read this 144-page book.

***

Did you ever stop to consider the opportunity that MI advertisers offer you to learn about new products, home-study courses that will help prepare you for a better job, tools that will develop your skill in handling workshop jobs, etc.? Just look over the advertisements and you will see coupon after coupon that can be clipped and mailed to bring you free booklets on a variety of subjects. As the coupons state, there is no obligation on your part, so don't hesitate.

—*The Editor.*

Naval Officer Urges U. S. To Build Airships

Calling for construction of four Zeppelin-type airships, two for commercial and two for naval purposes, Commander Charles E. Rosendahl, United States Navy, outlines a program for revival of the airship in the United States in a new book, "What About The Airship?" published in New York, N. Y.

New types of ships and one rigid and several non-rigid ships in addition should be built and tried by the U. S. Navy, he urges. The "Los Angeles," lighter-than-air craft built in Germany for the United States following the World War, should be recommissioned, he declares, if found suitable after careful examination.

Comdr. Rosendahl, who once skippered the Los Angeles, is noted as America's outstanding authority on airships. He is commander of the Lakehurst (N. J.) Naval Air Station, most important airship base in the United States, and was on duty at the time of the Hindenburg disaster a year ago.

"The greatest stumbling block in the path of the airship is lack of understanding," he asserts in his defense of the airship. "America won't give up the airship, I am sure. But when are we going to do something serious about it?" he asks.

Finding the Zeppelin-type of ship of potentially great use as a scout and as a high-speed plane carrier for national defense, he also believes it commercially justified for long distance non-stop flights at intermediate speeds. He quotes operation figures recorded by the ill-fated Hindenburg in its first year of operation as proof that a transoceanic airship line operating on a frequent schedule can be made to pay. The Hindenburg's passenger and freight revenue covered 75 per cent of the cost of operating, including terminal expenses and other overhead that would not be materially increased by a greater number of airships.

Practice Air Bomb Invented

A patent has been granted to Sargent P. Huff of Chevy Chase, Md., and Arthur Adelman of Chesaning, Mich., on a practice bomb for army airmen.

Filled with sand or some other inert material, the neck of the bomb contains a small amount of black powder whose explosion when the bomb strikes disperses a dense cloud of talc. The talc cloud, the inventors claim, is easily visible to the men aloft. Terms of the patent entitle the U. S. government to use of the invention without payment of any royalty.

Sun glasses made of a recently developed glass product that polarizes light are finding favor with fishermen because the glasses eliminate sky reflections on smooth water, so they can more clearly see the fish and stream bottom.

New Air Bureau Section To Promote Private Flying

A private flying section has been established in the Safety and Planning Division of the Bureau of Air Commerce in Washington, D. C. This section will be devoted to the encouragement and stimulation of all phases of private flying, according to a recent Air Commerce Bulletin report.

The new section was formed in order that the Bureau might more effectively discharge its duties in connection with the fostering of private flying (as distinguished from airline operations), including flying for sport and pleasure, personal business, student instruction, fixed base operations and other types of flying in this category.

The private flying section will determine and analyze the problems of the private flyer and will guide the Bureau in its regulations and actions affecting this branch of aviation. It is further intended that the conclusions reached by this section will serve to influence Federal national policies governing the regulation and fostering of private flying. One of the first duties of the section will be to survey and analyze the existing situation in order to recommend specific projects which should be initiated by the Bureau.

For the purpose of furnishing an additional means of contact with those engaged in private flying, the Bureau is organizing a private flying advisory committee to be composed of 20 members, representative of all aspects of nonscheduled operations. This committee will work through the private flying section and will also serve as an advisory council to the entire Bureau on all matters affecting flyers in the nonscheduled classification.

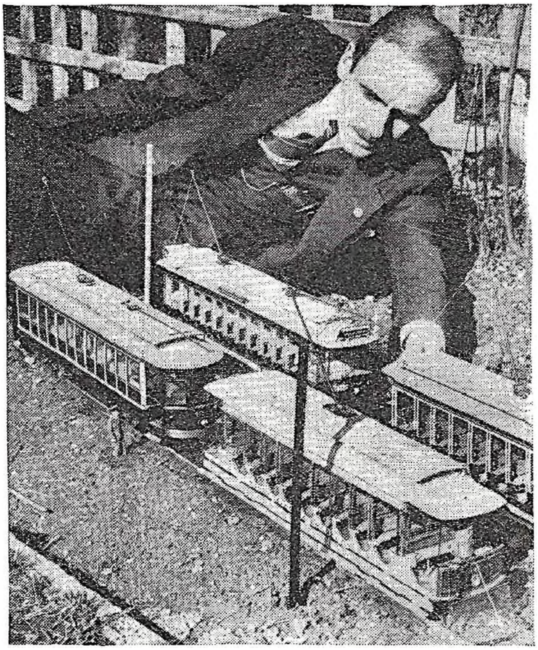
Sterilized Nails Produced By Steel Industry

Sterilized steel nails are now a regular product of the steel industry so that the nation's carpenters may continue to hold nails in their mouths while they work without fear of contracting disease, the American Iron and Steel Institute reports.

Lathing nails, plasterboard nails, metal-lath staples and tacks are the nails most frequently sterilized before being packed in kegs lined with sterilized paper.

Sterilization is accomplished by first tumbling the nails in a sawdust-filled drum to polish them and remove any adhering oil. They are then heated to 500 to 600 degrees Fahrenheit, a temperature sufficient to kill any bacteria and also to give them a thin oxide coating with a blue color. The blue color has been found incidentally to have a strong sales appeal.

Builds True-Scale Models Of Trolley Cars As Hobby

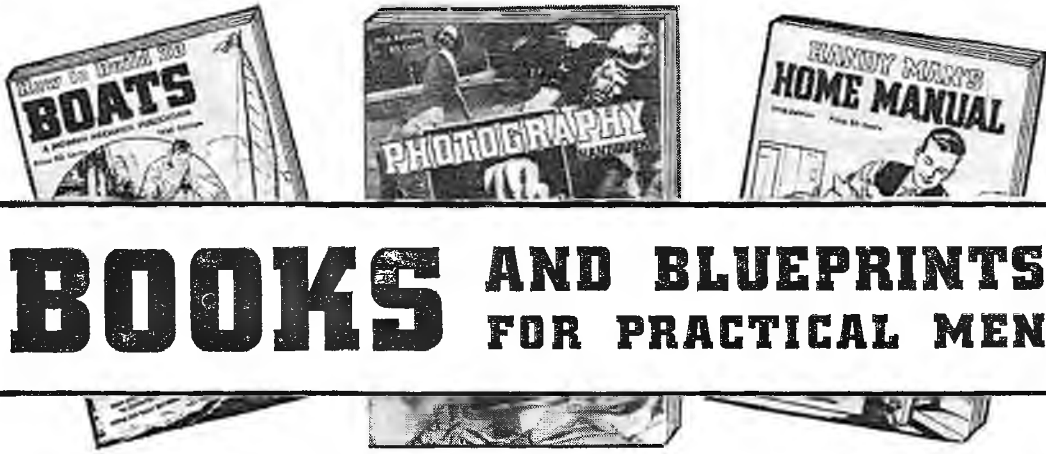


Building, operating and collecting all types of model trolley cars in the cellar of his Brooklyn, N. Y., home is the novel hobby of Robert Graham, an auditor. An outgrowth of his boyhood ambition to become a conductor, the collection features working models which are exact scale duplicates of prototypes in operation on the transit lines of many cities.

River Carries Away Valuable Radioactive Materials

Hot River, draining Mammoth Hot Springs, famed thermal region in Yellowstone, carries away radioactive materials equivalent to 40 grams of radium a year, (worth about $800,000 if extracted) Drs. Herman Schlundt and Gerald F. Breckenridge, University of Missouri geologists, report.

Draining the deeply buried rocks of some of their heat-producing radium content, these hot spring waters, of unknown origin, do not contain much radium per quart, but over a year's time the amount of radon, a radium by-product, removed is very great. Other hot springs, outside of Yellowstone Park, also contain radium, suggesting that chemical changes deep in the earth are substantially the same wherever hot springs occur.



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Experts Predict Diesel Era In Aviation Field

"The public will some day be no more required to fly in gasoline-fueled airplanes than in hydrogen filled airships," predicted government aviation scientists at a meeting of the Society of Automotive Engineers held in Detroit, Mich., recently.

Ernest G. Whitney and Hampton H. Foster of the Langley Field laboratories of the National Advisory Committee for Aeronautics based this forecast of aviation's future on their study of Diesel engines for airplanes as a potential replacement for present gasoline-fueled motors. The almost negligible ability of Diesel fuels to burn except under the special high pressure and temperature conditions within a Diesel engine is the reason for their startling statement.

The use of super-gasolines of 100 octane, anti-knock rating will bring an improvement in gasoline-fueled airplanes, state the N. A. C. A. experts, but the Diesel engines used in German airplanes today are accomplishing what enthusiastic engineers are only predicting for gasoline motors five years hence.

"Well qualified authorities," they state, "predict for the 100 octane gasoline engine in the next five years specific fuel consumptions no better than 0.38 pound of fuel per brake horsepower hour and specific engine weights in a 2,000 horsepower unit no less than one pound per horsepower, whereas, the Junkers Juno engines are operating today at specific fuel consumptions as low as 0.36; and a 2,000 horsepower engine developement is in progress to weigh less than one pound per horsepower."

Forgetting about the technical terms used, the scientists are saying that five years from now gasoline fuel engines advocates predict a certain fuel consumption (0.38) with engines weighing 2,000 pounds that can create 2,000 horsepower. And they add that present-day Diesel engines are already operating with a lower fuel consumption (0.36) and that there is now being built a Diesel engine generating 2,000 horsepower which will weigh less than 2,000 pounds.

Germans Succeed In Plating Iron With Steel Alloy

A German firm is said to have succeeded in plating iron with acid-resisting chrome nickel or chrome-nickel-molybdenum steels, necessary alloy in the prevention of corrosion in acid tanks.

Only 10 to 20 per cent of the relative expensive corrosion-proof alloy is used to cover the iron base. Tanks have previously had to be made entirely of acid-resisting alloys. The alloy coating is intimately fused with the base metal, it is stated.

Working Model Of Mammoth Telescope Exhibited

Operating in a manner similar to that of the original, a working model of the 200-inch astronomical reflecting telescope, which is being erected atop Mt. Palomar in California, was recently placed on exhibition at the 27th annual scientific display of the California Institute of Technology in Pasadena. The model, built to a 1/10th scale, is shown being examined by Dr. John Anderson, executive officer at Mt. Palomar Observatory.

Patent Method For Removing Oil Coating From Egg Shells

A new and improved method of removing from egg shells the oil coating with which they are covered to prevent evaporation of water inside the shell during shipment has been patented by Clinton H. Parsons and Leon D. Mink of Chicago, Ill., according to a recent report.

Dipping the eggs in a solution containing acid chemicals and a wetting agent accomplishes the removal of the oil more effectively and with less risk of breakage or contamination than sandblasting, the method heretofore used, the inventors report.

Coating eggs with hot mineral oil is practiced commonly on the Pacific coast, where the eggs are white and have thinner shells than usual and must be shipped long distances. If such a method is not used, evaporation leads to shrinkage of the contents.

Velocity Of Artillery Shells Measured With Light Beams

An artillery shell crashing through invisible curtains of light is the newest means of determining the speed of projectiles developed by scientists at the National Research Laboratories of Canada in Ottawa. Particular merit of the system is its portability which enables it to be used in the field and bring added accuracy to computations of range in actual combat.

Light beams, mirrors, photoelectric cells and sensitive recording mechanism are the equipment which makes possible the new development of Dr. D. C. Rose, physicist in the division of physics and electrical engineering of the Canadian NRL.

In effect the artillery shell passes down a narrow tunnel and every 50 feet intersects a beam of light falling on a photocell. Momentarily the shell blocks off the light beam and this decrease in light intensity cuts down the electrical output of the cell. By an amplifying system this electrical change produces a permanent record on photographic film.

Robot Device Reduces Cost Of Teleprinter Service

A telegraphic robot which grabs words up from a number of separate teleprinters, counts and records them and then sends them in mixed-up order over main trunk telegraph lines has been developed for speedier and cheaper communication. At the other end of the line an auxiliary mechanism sorts the words out into their respective messages and speeds them to their separate destination. The object is to use, at all times, the full capacity of the multi-channeled telegraph lines and so permit lower costs to the users.

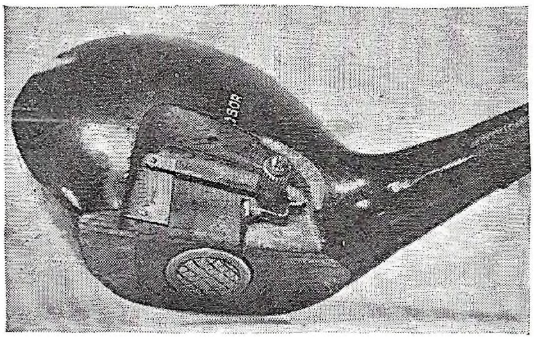
Subscribers to the new system, in effect, pay for their telegraph tolls, by metering the volume of business they have. Where many subscribers are using the channels together the charge for the total carrying capacity of the circuit is split between them.

The system, developed and now in use by the Western Union Company, was the answer to those busy businesses who carry on much of their vital matters by linking teleprinters in their offices in widely separated cities and asking and answering questions back and forth in practically instantaneous communication.

There is much less moisture in the air in winter than in summer.

Over half the families in the United States own an automobile.

Golf Club Measures Force Of Player's Stroke



The photograph above is a close-up of a new golf club fitted with an impact indicator device which enables a golfer to gauge the force behind his stroke. The disc on the side of the club is the head of a piston which absorbs the impact of a golf ball against the club and causes the pointer to move across the calibrated scale. The device was invented by Dr. Michael J. Plese, a dentist in Amityville, L. I.

Road's "Fingerprints" Show If Pavement Is Slippery

A "fingerprint" method reminiscent of Scotland Yard technique has been devised by Ministry of Transport officials in London, England, to track down slippery road surfaces.

A section of road is inked over, and a smooth tire rolled along it. The tire is then transferred to a sheet of white paper, where an exact record of the surface texture is imprinted.

A perfectly smooth road becomes dangerously slippery when wet because the water, instead of being squeezed into interstices present when the pavement is of comparatively rough texture, forms a liquid film between tire and road. Tire treads are designed to provide space for some of this water, but when treads are worn smooth and the surface is fairly slick, sudden stops mean almost certain skid.

In the road surface "fingerprint" tests, a slippery road is detected when the inky tire makes a full impression on the paper over the entire area of contact, whereas a comparatively "non-skid" surface, having numerous individual points of contact separated by channels through which water can escape, shows a speckled print.

Imprints taken at various intervals of time also are being used as a record of the wearing qualities of pavement, showing changes in texture due to the abrasive action of traffic.

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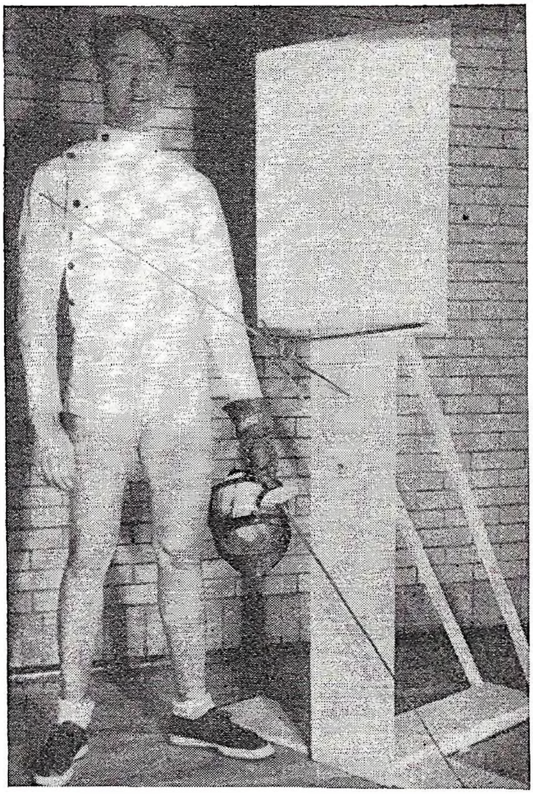
Mechanical Target Provides Practice For Fencers



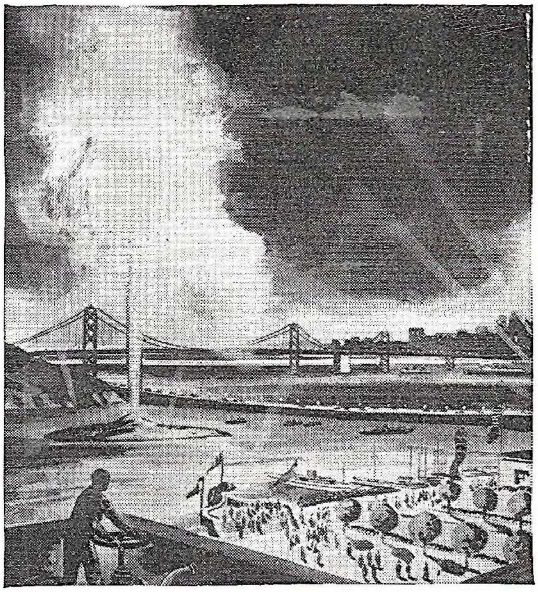
Developed by Hubert Pirotte, coach of the Rutgers University fencing team, a new mechanical target is said to provide fencers with a satisfactory practice opponent. The target consists of a backboard mounted on an upright wooden stand from which a fencing foil is suspended by springs, as shown in the photo. The target device can be used with a sabre, foil, or epee, and Coach Pirotte has devised about 100 exercises that can be indulged in while using the target as an opponent.

Did you ever long for a real sun room in your home? If you want to bask in old Sol's rays in perfect comfort and privacy, you'll welcome the sun room how-to-build article which will appear in the August issue of MECHANIX ILLUSTRATED.

Thirty-two of the 92 known chemical elements have been found in meteorites.

Ancient glass makers made imitation opals so well that they fooled experts.

Golden Gate Exposition Will Reproduce Famous Geyser



"Old Faithful," famous Yellowstone National Park geyser, transplanted to San Francisco Bay, promises to be one of the most amazing sights of the 1939 Golden Gate International Exposition.

This replica of the famous old geyser will be located in the yacht harbor adjoining Treasure Island. Controlled by electric valves from the island, the artificial geyser will gush to a height of 200 feet with all the awe-inspiring grandeur of the Yellowstone original.

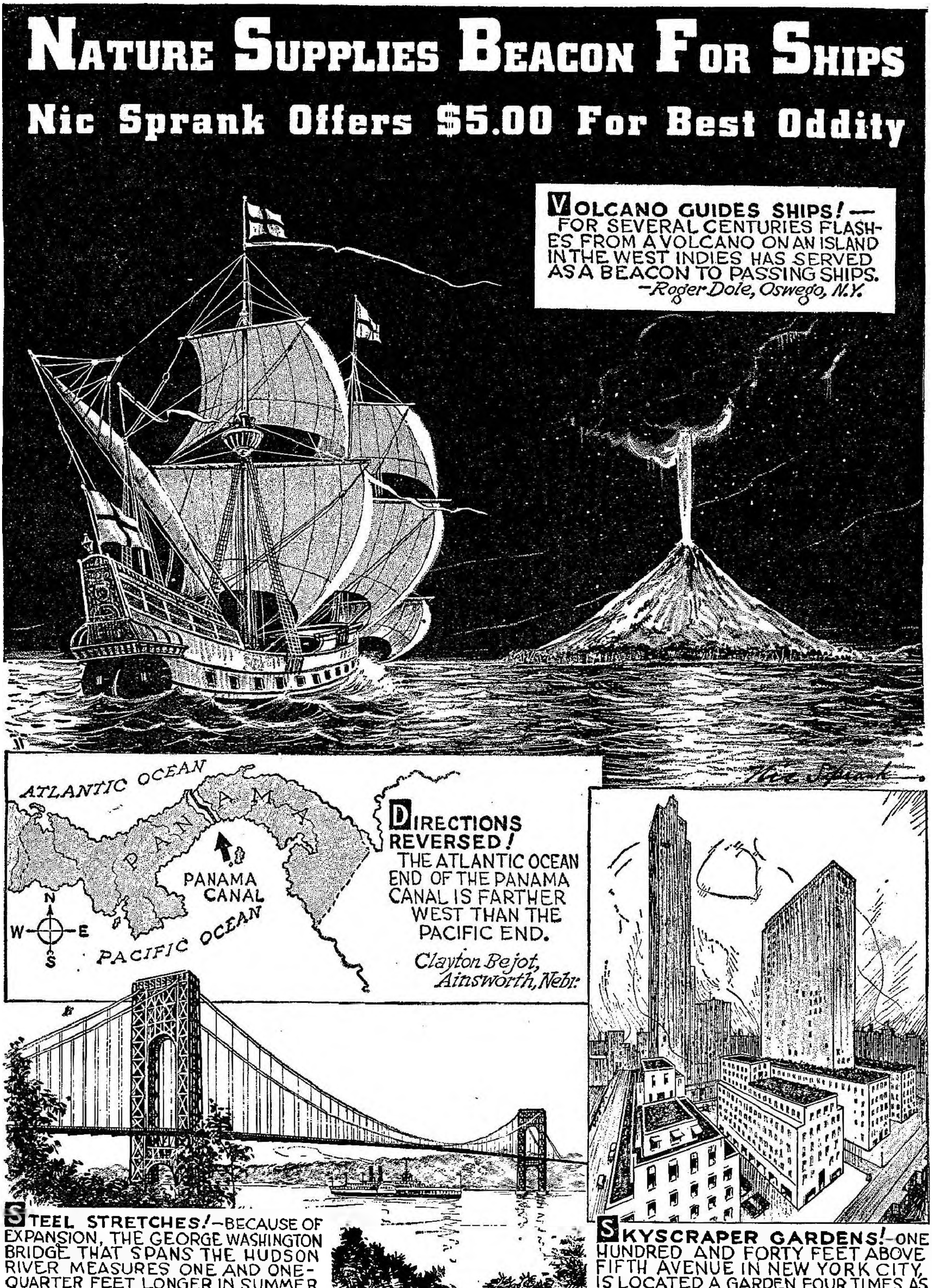
The crater of "Old Faithful" will be simulated on the rock covered hull of a barge anchored some 500 feet off the shoreline in Treasure Cove. Spouting every 20 minutes, the geyser will eject a volume of 5,000 gallons of water per minute from multiple jets. A series of smaller jets around the outside of the crater will pulverize the water spray to give the effect of live steam.

On the shore bleacher seats will be provided for thousands of spectators and small craft will give other visitors to the $50,000,000 Pageant of the Pacific a view of the spectacle from the harbor. Batteries of powerful colored searchlights playing on the column of water will be visible for thirty to forty miles.

Electrical installations and illumination effects will be under the direction of General Electric Company engineers.

One patent in five granted in this country is a chemical patent.

Italians have found that they can use the cellulose from hemp to make explosives.



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.

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Publisher

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July, 1938

This machine cuts grooves in the diesel cylinder block.

SMALL DIESELS Next BOOM Industry!

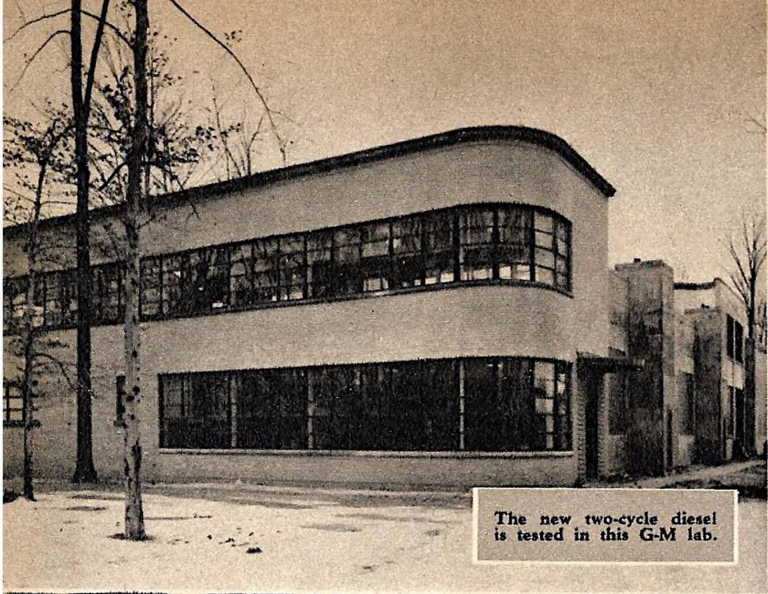
"... chances for employment lie in the fact that power will be used where none has been used before."

by Stanley Gerstin

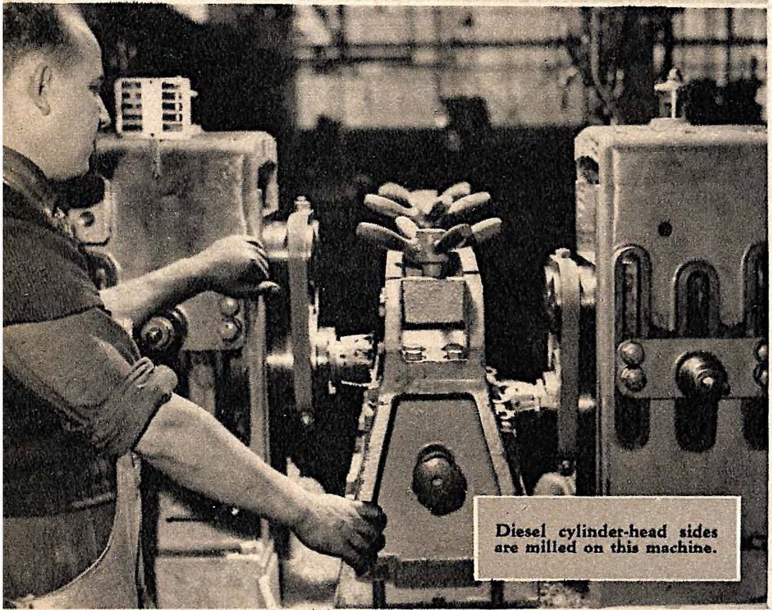
THAT the battle for recovery is being fought by industry on its home grounds is well illustrated by the recent announcement by General Motors that it would soon begin the mass production and sale of two-cycle diesel engines for all purposes, ranging in size from 3,200 horsepower giants down to small, lightweight, one-cylinder, 22-horsepower models!

What will this mean to the rural home? What will it mean to the farmer without electric power? What will it mean to the man with mechanical ability? What, for instance, will it mean to a man like Mike Foley who lives three miles out of La Grange, Ill., with a brood of children and a sickly wife, who has only a hazy understanding of the terms economists use to measure the economic pulse of the country?

It means power for farm equipment and



The new two-cycle diesel is tested in this G-M lab.

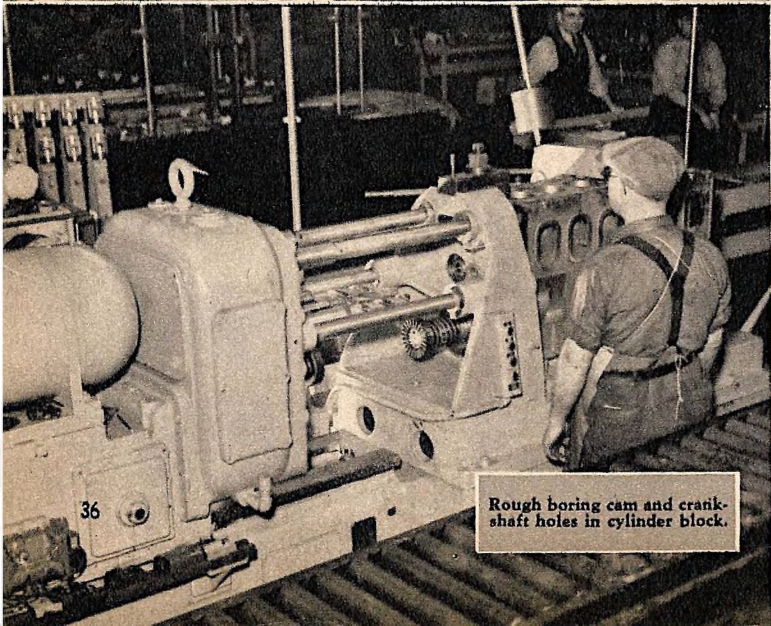


Diesel cylinder-head sides are milled on this machine.

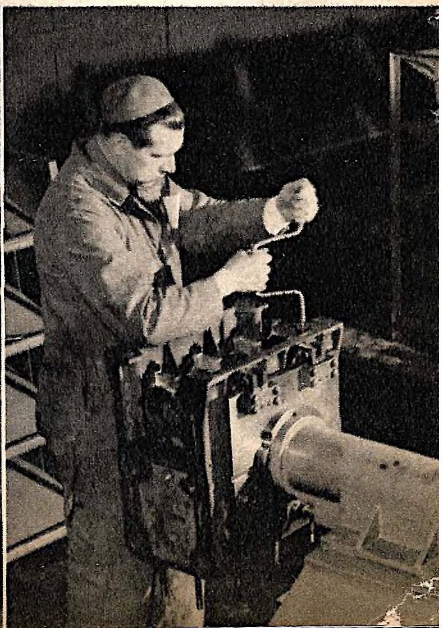
light for the rural home. It means increased employment in engine plants and re-employment of thousands of machinists, production equipment operators, tool and parts makers and designers, and a vast organization of distributors, installation and maintenance men.. It means a chance for employment in a new field for the man with mechanical ability. To Mike Foley, who is a mechanic in an engine factory and who works only eight months a year, it will mean longer periods of work; more food in the pantry; more credit at the grocer. It means cheap power for industry.

It means cheap power for the automobile and truck. Manufacturers have been experimenting with diesels for automobile power for years with varying results. Trucks requiring engines of 200 to 250-horsepower have had better success with diesels, and today there are some 2,500 to 3,000 trucks operating over our highways under diesel power at 45 to 60% of the fuel cost of gasoline.

The new diesel promises to change materially the unbalance in the distribution of



Rough boring cam and crankshaft holes in cylinder block.



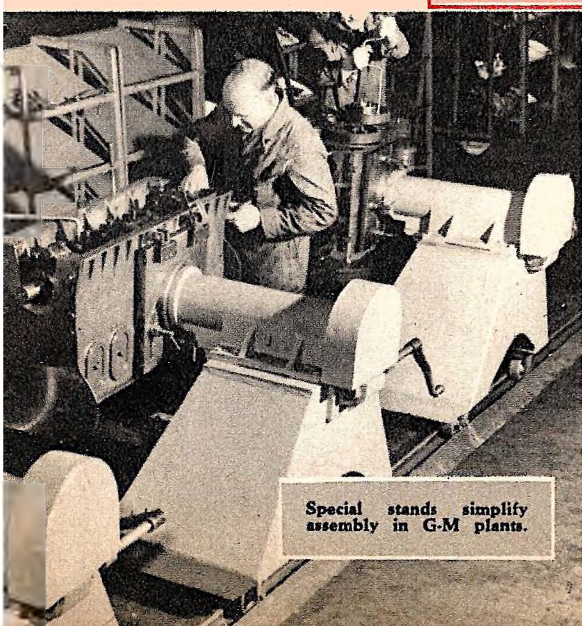
mechanical power as an aid to man. It settles the problems of bulk, efficiency, and economy that steam and gasoline could not hurdle. One-third of America's 130 million people live on 4,000,000 farms in the United States. Only 10% have electric power. The new diesel will provide power for the remaining 90%. The diesel will be of particular value in the dairy industry, for marine application, mills, theatres, manufacturing plants, oil fields, mining, lumbering, cotton mills, refrigeration plants, for pumping, as general-contractor equipment and in quarrying —just to mention a few prospective fields.

It is not difficult to speculate on the effect the new diesel package will have on the employment problem and, consequently, on purchasing power. Engineers and economists are not prone to hazard guesses on the employment possibilities resulting from diesel production, sale and maintenance on a national scale. Sane and sober estimates of the employment potentialties are best advanced by diesel production men themselves who unanimously say that "improvements that make diesel engine production and application useful as one of the nation's prime movers (*towards recovery*) have been made, and the chances for extension of employment and contribution to the general national economy lie in the fact that power will now be used where none has been used before and that cheaper, more reliable power will replace many existing, inefficient power plants of other types."

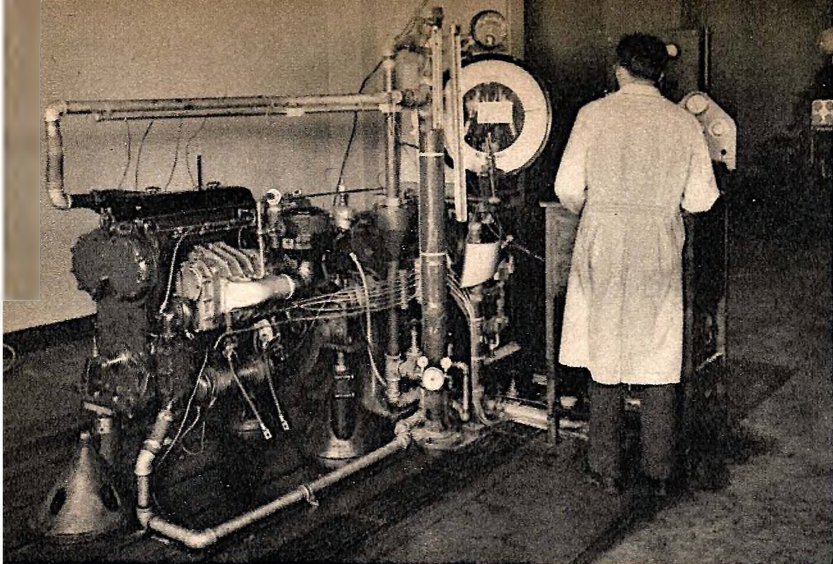
What concrete evidence have we of this? Getting down to facts, W. S. Knudsen, president of G. M. at a congressional hearing in Washington a few months ago, said that his company has $21,000,000 invested in its various diesel enterprises. Major operations

The following is a list of possible applications for the small diesel engine:

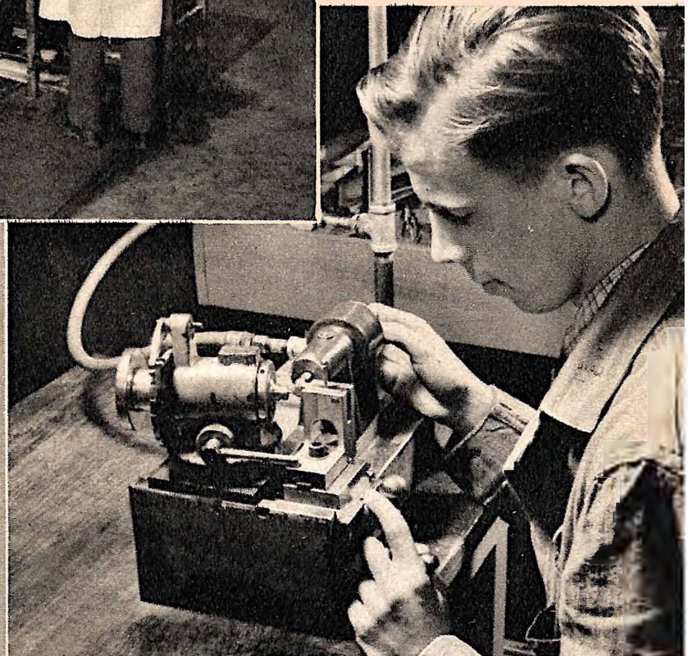
1. Dairy Industry
   - a. Creameries
   - b. Ice Cream Plants
2. Marine Application
   - a. Pumps
   - b. Hoists and Winches
   - c. Electric Generators
   - d. River Boats and Ferries
3. Mills
   - a. Hammer and Attrition Mills
   - b. Flour and Feed Mills
   - c. Peanut and Soybean Mills
4. Theatres
   - a. Electric Generation
   - b. Power for Blowers and Pumps
   - c. Air Conditioning
5. Manufacturing Plants
   - a. Direct Mechanical Drive
   - b. Electric Generator
   - c. Compressors
6. Oil Fields
   - a. Pumping
   - b. Compressors
   - c. Drilling
   - d. Lighting
7. Mining
   - a. Air Compressors
   - b. Hoists
   - c. Mills
   - d. Pumps
   - e. Generators
   - f. Locomotives
8. Lumbering
   - a. Sawmills
   - b. Excelsior Mills
   - c. Shingle Mills
   - d. Stave Mills
   - e. Winches
   - f. Planers
9. Cotton Mills
   - a. Gins
   - b. Cottonseed Oil and Feltilizer Mills
10. Refrigeration Plants
    - a. Cold Storage Plants
    - b. Ice Making
    - c. Milk and Meat Cooling Plants
    - d. Air Conditioning
11. Rock Crushing and Screening
    - a. Road Building
    - b. Construction
    - c. Building
12. Pumping
    - a. Municipal
    - b. Irrigation
    - c. Drainage
    - d. Dredging
    - e. Gravel Washing
    - f. Road Building
13. General Contractor's Equipment
    - a. Shovels and Draglines
    - b. Locomotives
    - c. Hoists
    - d. Pumps
    - e. Compressors
    - f. Electric Generation
14. Quarries
    - a. Air Compressors
    - b. Crushers
    - c. Drills
    - d. Hoists
    - e. Electric Generation



Special stands simplify assembly in G-M plants.



Left—This dynamometer in General Motor's new Detroit laboratory makes fuel economy tests on the new four-cylinder diesels. Below—Drilling the six tiny holes in the tip of the fuel injector is a delicate operation.

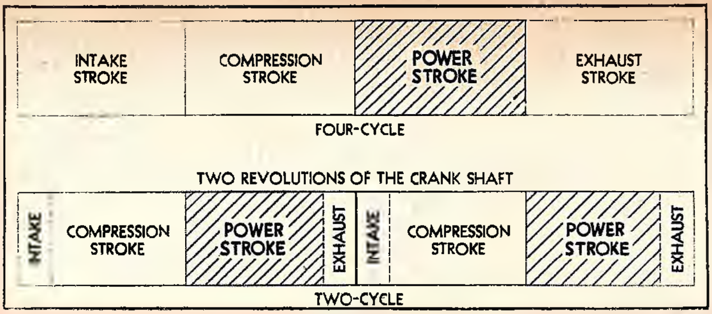


are carried on at three plants: the Detroit diesel plant which makes the smaller series of engines; the Cleveland plant which makes the intermediate engine sizes—special engines for marine use and the "packaged power" units (electric generation sets ready to go with base, switchboards, fuel tanks and all other necessary accoutrements wrapped up in a highly attractive metal cover); the electro-motive plant at LaGrange, Ill., which makes complete diesel passenger and switching locomotives as well as the larger sizes of diesel engines. These three plants now employ over 2,300 men. There are other manufacturers also on the diesel firing-line against the recession. No newcomers to the business are Hercules, Waukesha, Cummins and Buda who have been making diesels for industrial as well as automotive use for years, and like G. M. they have been experimenting with small engines with considerable success. Their investment in production facilitates amounts to millions of dollars.

The wide-spread use of the small diesel will also open up a potentially large field for diesel maintenance men, just as the advent of the automobile engine created the service men, the garage and numerous related activities. The present garage mechanic must learn how the diesel fuel system operates to become a competent diesel maintenance man and the beginner would do well to learn a-new the principle of the two-cycle engine. Mike Foley, for instance, who is an engine plant employee, could use this training to improve his position—get a better job. The major sources for his training are diesel schools, schools conducted by diesel manufacturers, and by practical experience gained in repair shops now servicing diesels.

The principle of the two-cycle engine is not a new one. It made its exit 25 years ago as a carbureted gasoline passenger car powerplant and now it returns to industry as an engine using solid injection furnace oil as fuel. The reason for developing the two-cycle diesel engine was to reduce its weight. The operation of the diesel engine calls for high pressures and the only way of making parts to withstand such pressures was to put enough metal in the engine parts—more than what was required for gasoline engines. Naturally, a four-cycle diesel engine comparable to a four-cycle gasoline engine had a tremendous weight and was relatively larger in size, uneconomically so.

Development of the two-cycle diesel makes possible a reduction in weight by the fact that every downward stroke of the piston is a power stroke instead of every other down-



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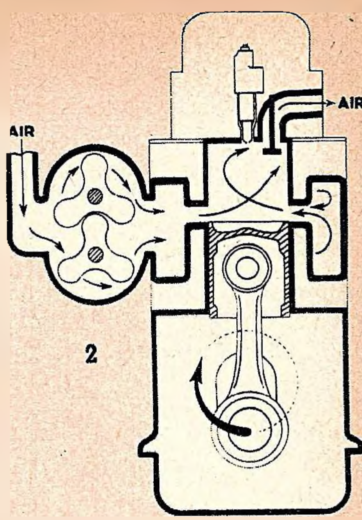

ward stroke as in a four-cycle engine. Thus if the power stroke in a two-cycle engine is made as efficient as the power-stroke in the four-cycle engine, only half as many cylinders are required for the same result. By operating on the two-stroke cycle it is not possible to reduce the weight of the various parts but it is possible to reduce the number of them by getting the desired horsepower and torque from half the number of cylinders and thereby reducing the total weight and size.

The new two-cycle diesel must not be confused with the old type two-cycle engine which admits the mixed air and fuel from the carburetor to the crankcase. The piston moving upward creates a partial vacuum in the crankcase and when the piston has traveled upward sufficiently, the mixture enters the crankcase. During the following downward stroke of the piston the mixture in the crankcase is compressed. As the piston starts on its upward stroke it closes the outlet to the crankcase and therefore in the remainder of the stroke the mixture is compressed in the cylinder. When the piston reaches top

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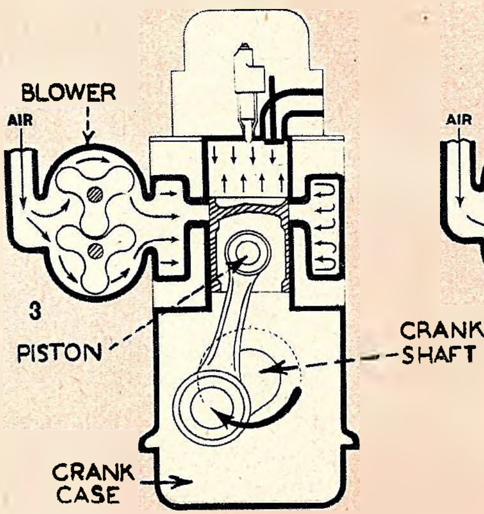
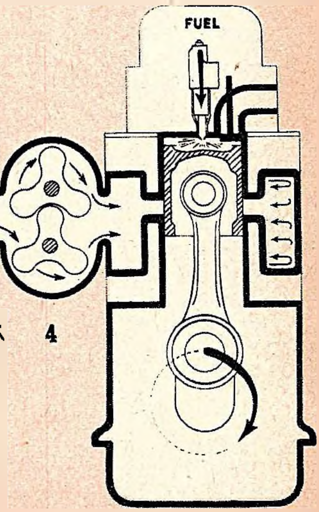
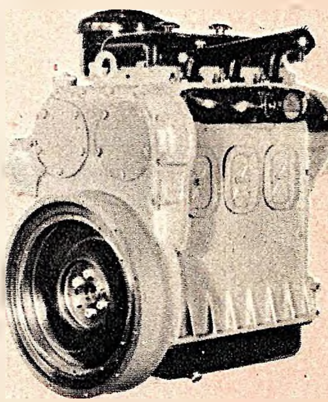
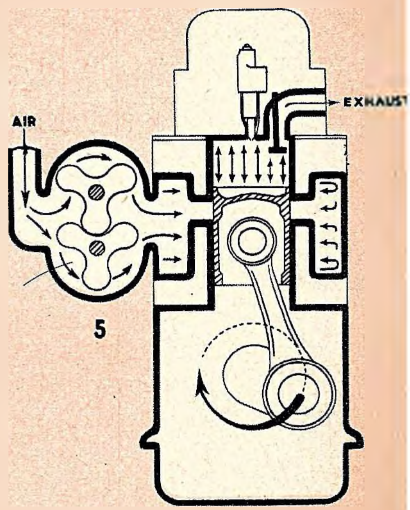
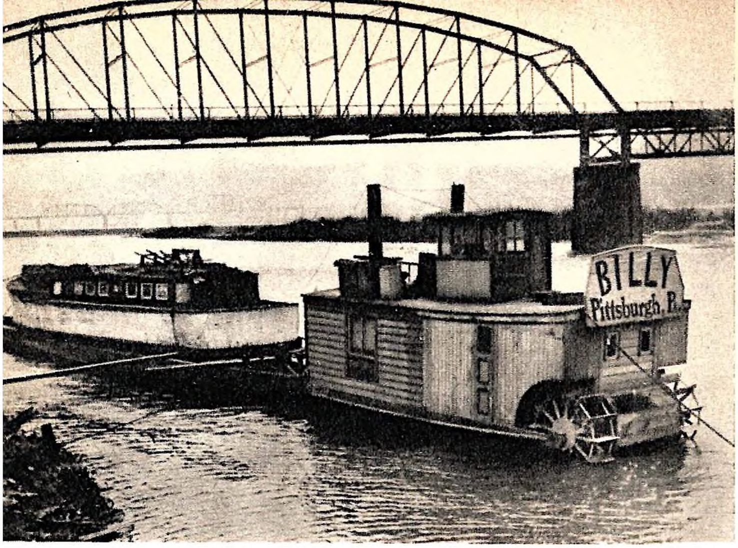








1. The two-cycle engine has twice the power of the four-cycle engine as illustrated by this chart. 2. Ports in the cylinder walls admit pre-compressed air from the blower. 3. The upward stroke of the piston closes the ports giving the pre-compressed air final compression. 4. Atomized fuel enters the chamber before the piston completes the stroke. High compression of air ignites this fuel and combustion begins. 5. Burned gases escape into manifold and fresh air cleans cylinder of the small diesel shown above.



Plans River Voyage In Home-Built Craft

A HOME-BUILT stern-wheeled boat, in which he hopes to voyage up and down the Mississippi River, has been constructed by 58-year-old A. O. Engel, of Pittsburgh, Pa. Costing about $1,000 to build, the novel boat is powered by a converted automobile engine and is said to be the only gasoline-powered stern-wheeler in existence today.

Builds Automatic Lard Ladling Device

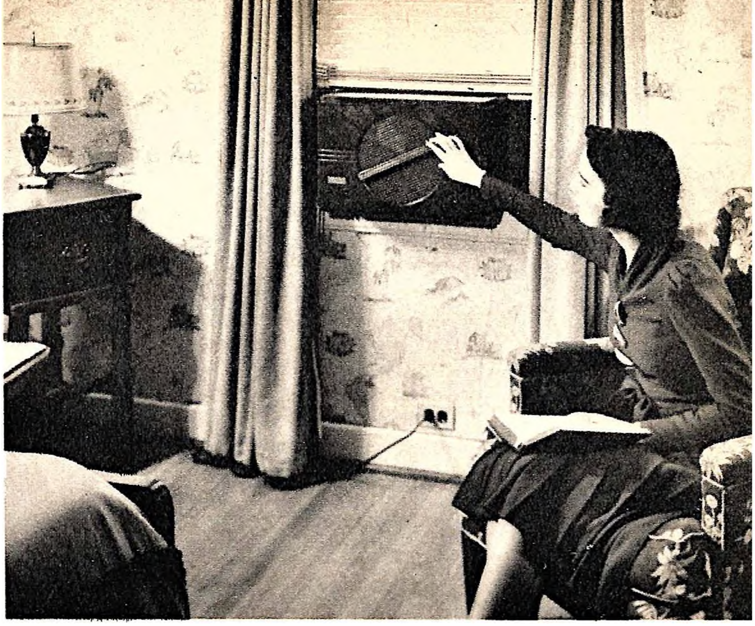
A DISPENSING device that enables him to measure out any amount of lard in about one-fifth of the time required by the usual hand-dip method has been developed by Martin L. Jackson, a store operator in Winston-Salem, N. C. The home-built dispenser features a small handle which, when turned, ejects the lard from a special spout in the form of a thick ribbon, as shown in the photo. The "secret" of the automatic ladling unit is a rubber diaphragm and a small jack which apply a constant pressure against the supply of lard, forcing it out of the spout when the handle is slowly turned.

Typewriter Attachment Draws Ruled Lines

NOISELESS in operation, a new typewriter ruling device enables straight lines to be made on paper by merely depressing a key and sliding the carriage from left to right. The device consists of a small roller with a fine non-cutting ruling edge and is available in single or two-line sizes. The photo inset shows the roller.

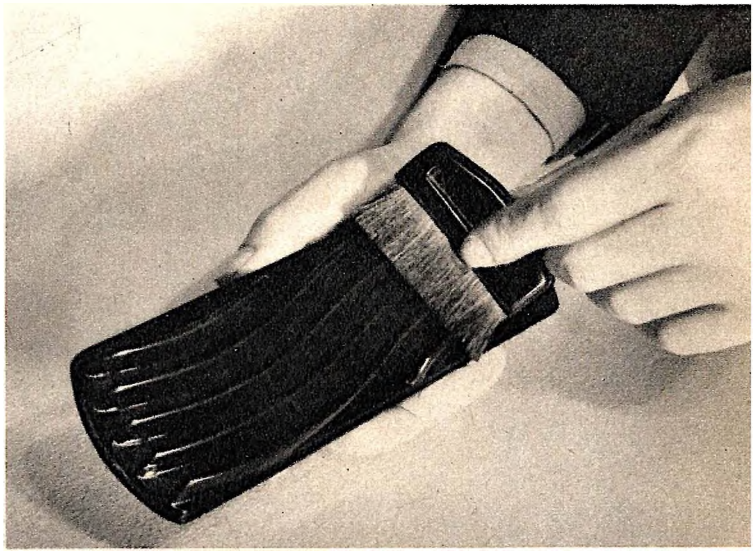
Window Unit Filters, Recirculates Air

EASILY installed within any window frame, a newly developed filter-fan device is said to remove dirt and plant pollen from the air, filtering and recirculating it at a rate of about 250 cubic feet per minute. The volume of air is controlled by a revolving bar mounted in the center of a grille disc. The installation does not interfere with opening, closing or locking the window. In appearance, the unit resembles a compact radio receiver.



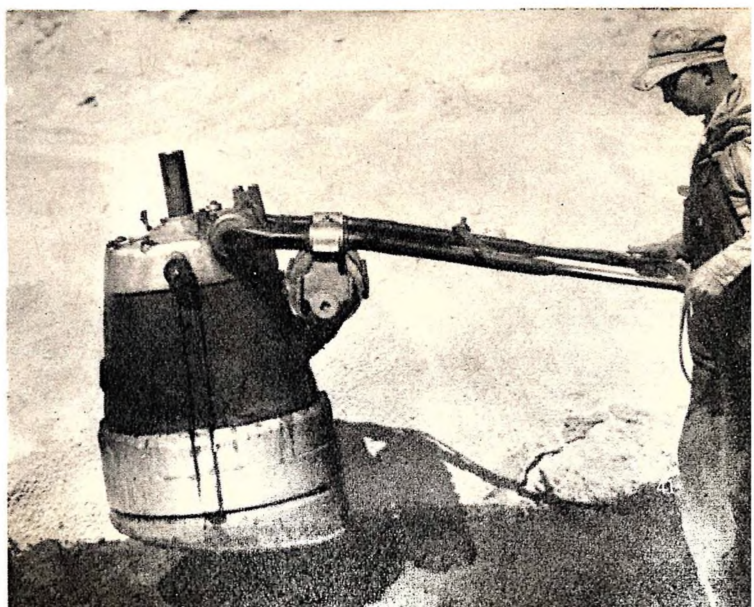
Rubber Block Serves As Clothing Brush

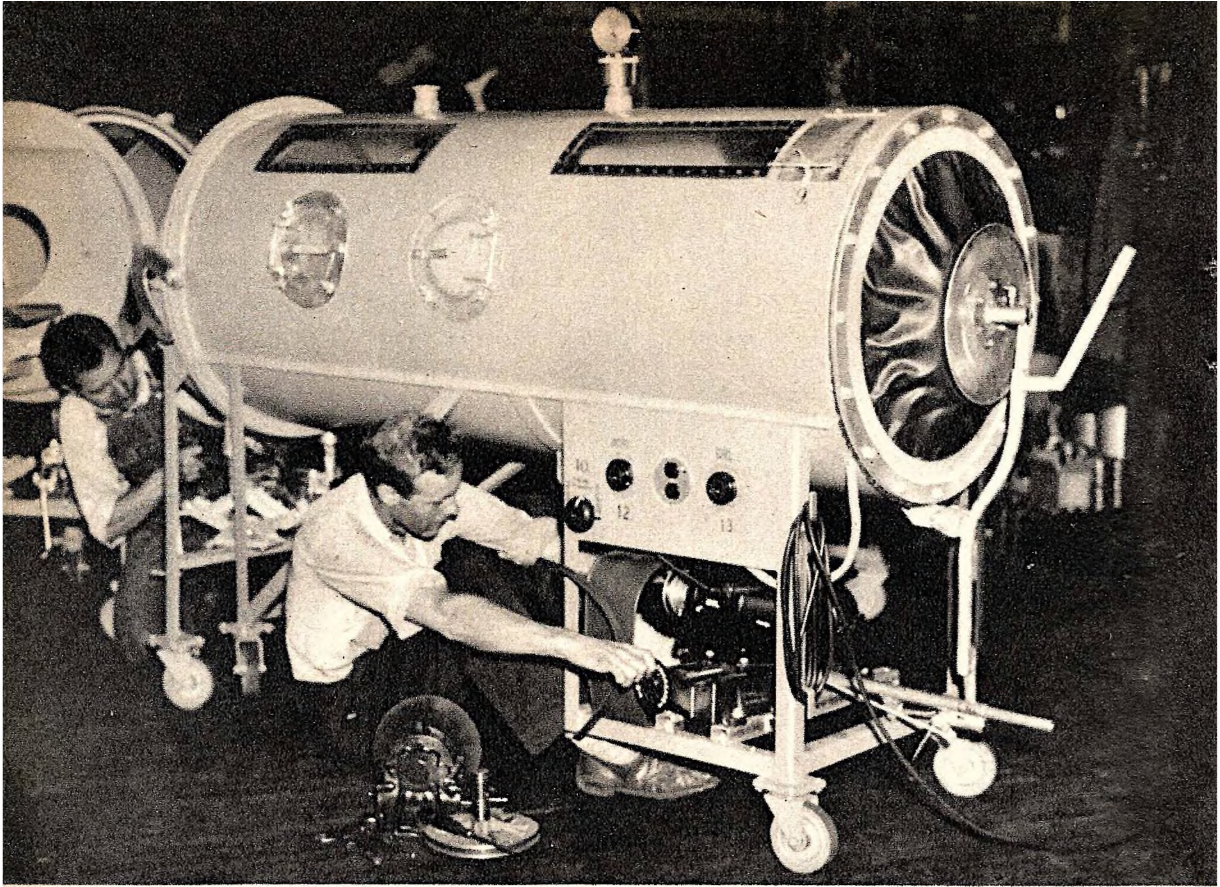
A GROOVED block of hard rubber, which is stroked with a small bristle brush for a few seconds before use in order to charge it with static electricity, is said to attract dirt particles when it is rubbed briskly over clothing or cloth-covered furniture, thus actually removing the dirt rather than merely redistributing it. After a few strokes, the dirt picked up by the rubber block is swept into a basket or dust cloth with the small bristle brush, as shown in photo.



"Leaping Lena" Device Tamps Dirt Piles

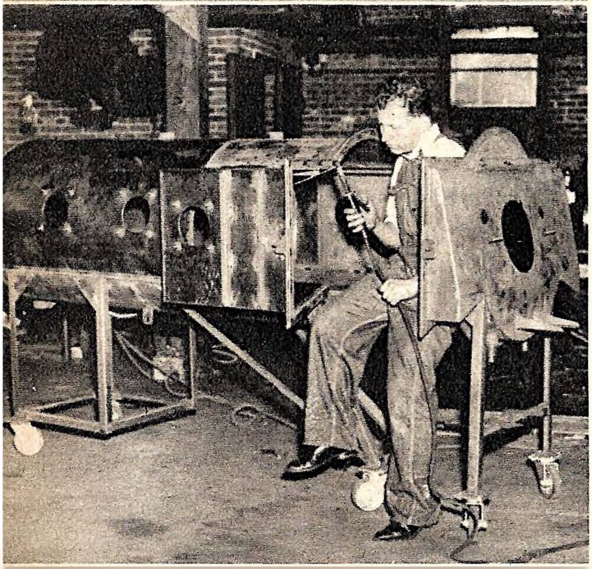
NAMED "Leaping Lena" because of its unusual action, a 2,200-pound hand-guided tamping machine being used by flood control engineers in Los Angeles, Calif., actually leaps into the air sixty to seventy times per minute, landing with a thump that compresses piled dirt until it is harder than the ordinary ground surface. The machine is powered by a single-cylinder gasoline engine.





Above—Putting finishing touches on an "iron lung" before shipment to a hospital where it will provide artificial respiration for patients whose breathing muscles have become paralyzed by disease.

Metal Lungs



Shown above is a workman welding the air-tight chamber which is the essential part of an "iron lung" or diaphragm respirator, as it is known professionally. A partial vacuum is produced in chamber when in use.

DEATH stands at the hospital bedside, waiting. Beneath the covers, a gasping youngster fights for breath. He is a victim of infantile paralysis. Slowly, cruelly, the dreadful fingers of paralysis clutch at the chest muscles which pump the breath of life through his body. Soon those muscles will cease to function and the youngster will cease to breathe.

But death has not reckoned with the mechanical ingenuity of man.

A watchful doctor nods to a waiting group of hospital attendants.

"Respirator ready?" His voice is crisp, curt, for death is losing patience. "All right—transfer the patient."

The youngster is wheeled into an adjoining room, brought to rest alongside a strange object which looks like a torture chamber out of Poe. It is a horizontal metal cylinder, large enough to hold a man, with glass windows in its sides and weird dials projecting from it. Gently, the patient is placed inside. Only his head projects from one end. It rests on a pillow and a soft collar fits snugly about his throat so that his body rests in an airtight chamber. He is a prisoner, buried alive, but buried only that he may live. The cylinder is a diaphragm respirator—commonly known as an "iron lung"—which will literally do the patient's breathing for him, maintaining the spark of life.

A switch is thrown, dials checked. A motor hums to life beneath the respirator. A miracle is taking place inside the tank. Life-giving air surges into the patient's lungs, is robbed of its oxygen and exhaled. The rhythm of breathing is perfect, except that the patient's own nerves and muscles have nothing to do with it. For hours and days the iron lung keeps the breath of life in the body of its guest.

It is a wonderful mechanism of nature which the iron lung replaces. It is only when you run for a train or have a cold that you realize you are breathing at all. The principal muscle of respiration is the diaphragm, and an extraordinary muscle it is. If you lift your hand, the action is accomplished by voluntary muscles obeying your command. The heart is a muscle, too, but different in

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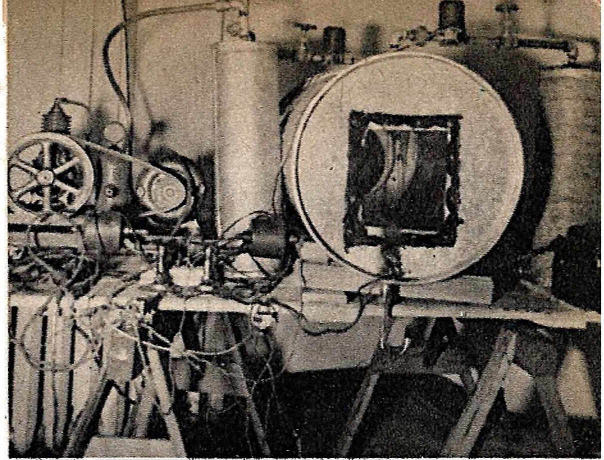
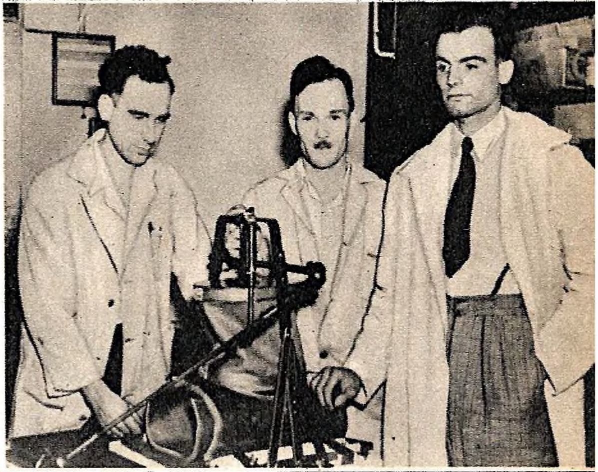


Confronted with an infantile paralysis epidemic in remote Juneau, Alaska, and unable to secure a commercially-made respirator, Dr. R. Coffey constructed an emergency "iron lung" device (above) from a large garbage can and motor-driven compressor.

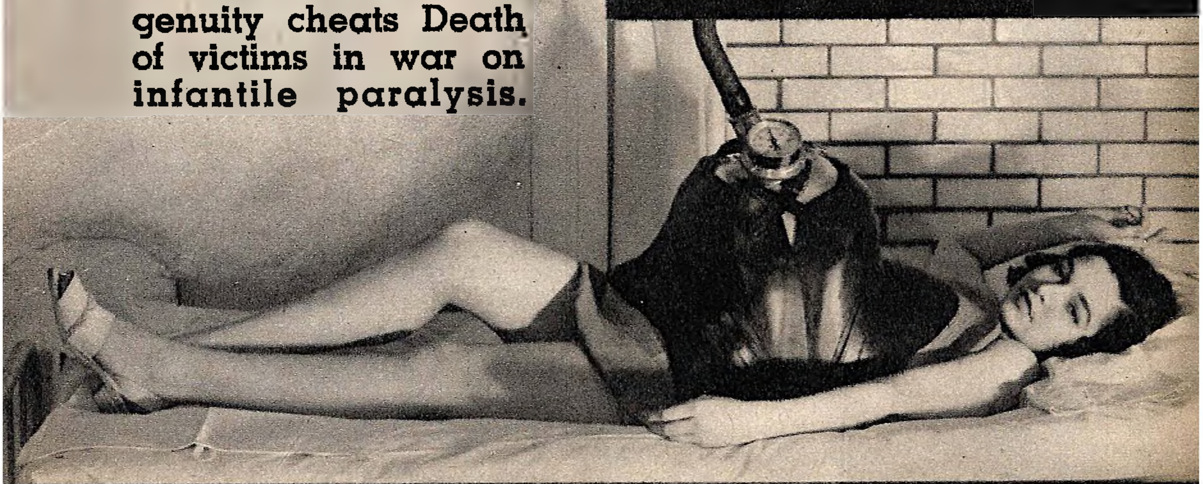


Bernard Leibel (right), and his assistant technicians pose with the simplified respirator they developed. The mechanical lung covers the patient's diaphragm only, leaving the body available for medical and other attention, thus facilitating nurses' work.

Give Life

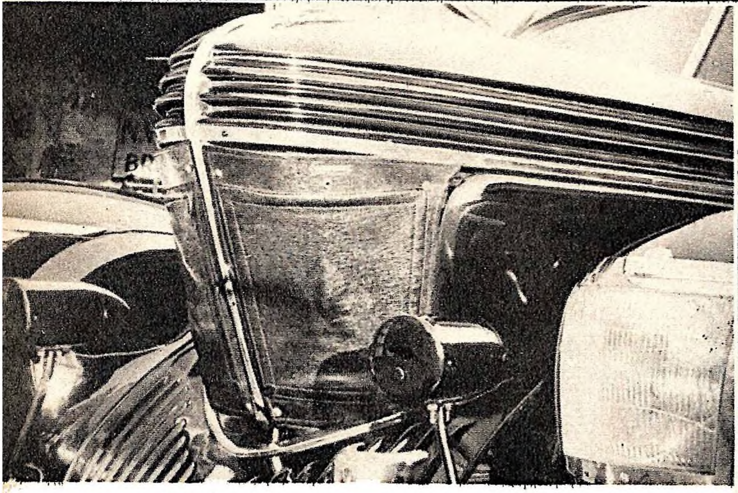
by Donald G. Cooley

Man's mechanical ingenuity cheats Death of victims in war on infantile paralysis.

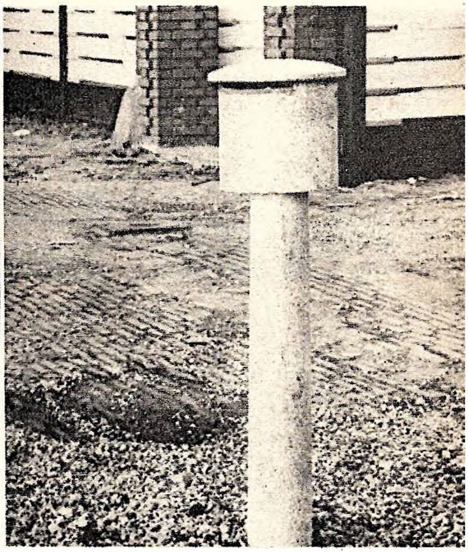


The compact rubber respirator shown above may soon replace the somewhat cumbersome metal chamber types. Like the larger "iron lungs" it creates a vacuum pressure that lifts and lowers the patient's chest walls, enabling breathing to be continued despite paralysed muscles. The aluminum framework is held to the patient's body by rubber fittings.

HOLLAND Prepares for AIR RAIDS With "INVISIBLE" LIGHT



Retouched to bring out the cars' outlines, the photo above shows how the "invisible" light beams of the rear car light up the front car's license plates, but cast no telltale reflections that might attract air raiders. The light produced, however, is sufficient to allow drivers to travel at 40 m.p.h.



Fitted to an automobile alongside ordinary headlights (above), "invisible" light lamps cast a narrow beam that enables the driver to steer safely along a highway, but which is invisible above a height of 80 yards, thus foiling aerial bombers. To facilitate traffic in a city darkened against air raids, special "invisible" light lamps are installed at street corners (right). When the driver reaches one corner, the lamp on the next corner becomes visible to him. The lamps cast no reflections, even on the blackest night, and the beams are visible only to persons directly in their path. Another adaptation of the beam is shown in the photo below. The specially designed signal gun, having a range of four miles, throws an extremely narrow beam towards a known point, which can be seen only by persons standing in its secretive path.

DEVELOPED as a safeguard against air attacks, which are usually unsuccessful unless the raiders can detect the lights of the city they are attacking, an "invisible" light lamp has been invented by Captain J. Bikker, a Dutch Army Intelligence officer. The lamp throws forward a light which can be seen only by a person standing directly in the beam. Neither the light beam nor the lamp itself can be seen, however, by anyone not in the line of the beam. No ray, not the slightest

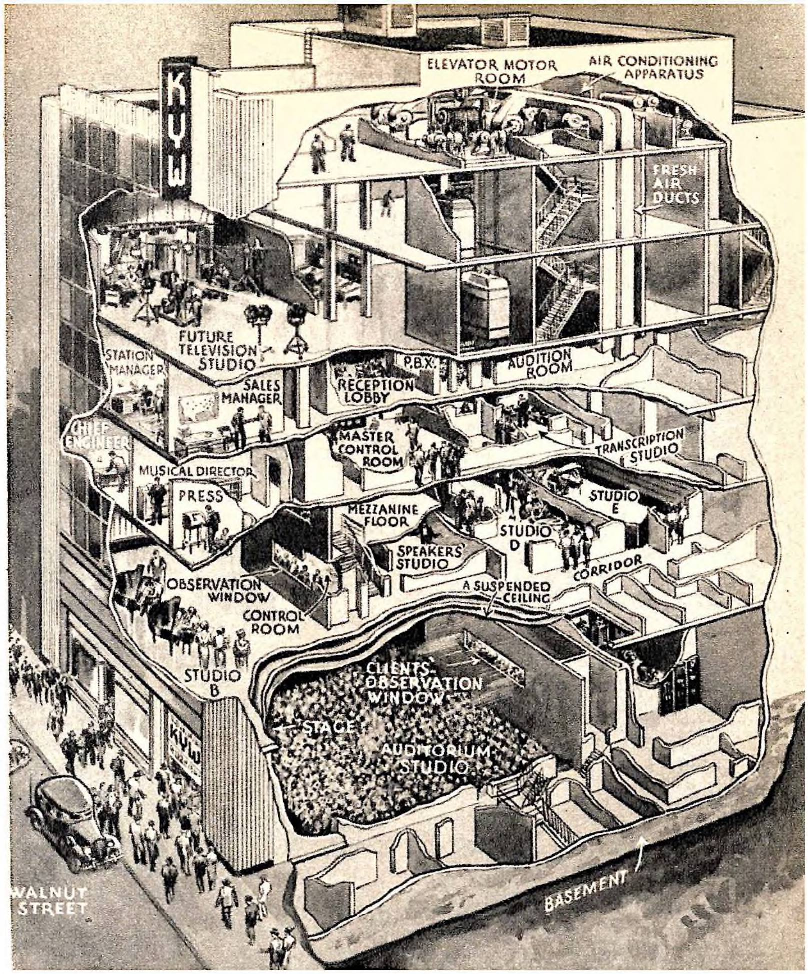
[*Continued on page* 134]

KYW Moves Into $600,000 Home

PHILADELPHIA'S new Radio Center, home of KYW, embodies the latest ideas in soundproof studio construction, lighting, air conditioning, and color schemes. The chief innovation is a large basement auditorium studio, said to be the only sub-surface studio ever built for broadcasting purposes.

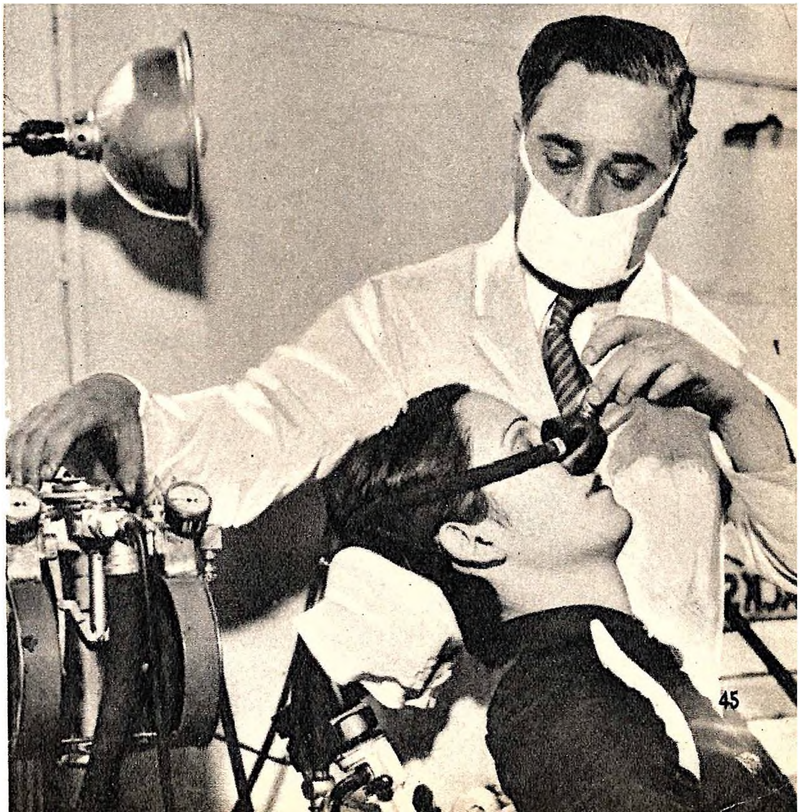
Five other studios, offices, master control room, clients' audition room, and transcription room are distributed over the second, third and fourth floors. All the large studios are equipped with observation galleries from which visitors can view broadcasting operations with comfort. The third floor affords spectators a clear view of the master control room, where engineers will be in control of incoming and outgoing radio and wire connections.

The air conditioning plant supplies artificial atmosphere for every room in the building, making windows unnecessary. The unit weighs one hundred tons and has a 25,000-cubic-foot capacity per minute.



Clamps Protect Dental Patient

BECAUSE some patients toss and injure themselves or the dentist, while under the influence of "laughing gas," a Chicago dentist has devised clamps to grip the shoulders and hold patient in position for dental work.



KILLER WELL

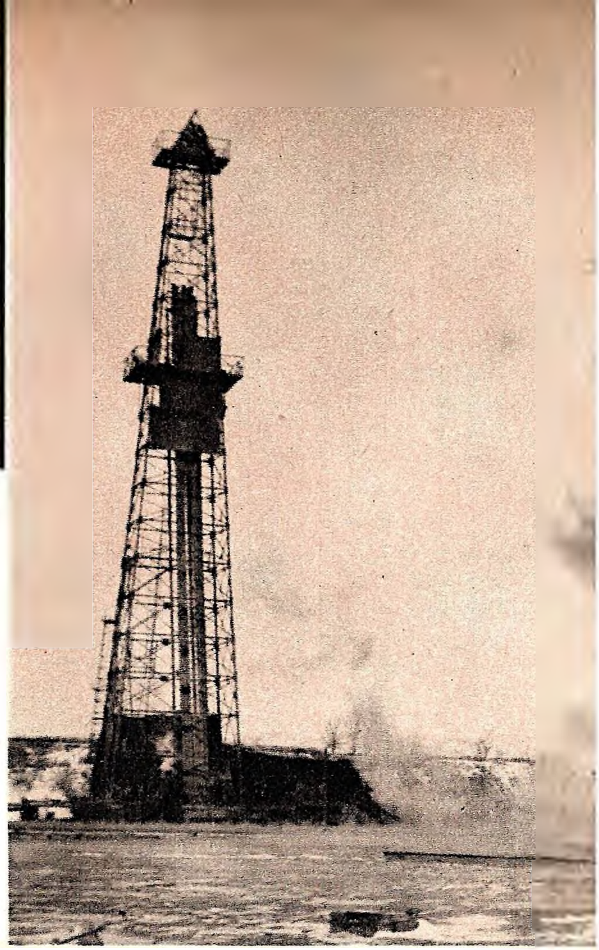
by R. DeWitt Miller

ON A hot August day in 1935 Drilling Superintendent H. P. McKay watched the drill bite for a new well on the Wyoming flats. It was known as No. 1 Allen.

"She ought to come in for a big gusher at about 4,100 feet," McKay said. "This field is pretty well proven. We know there's an oil sand at that depth."

Through the hot summer days the drill bored its way down through strata after strata. One thousand, two thousand, three thousand feet. Casing was cemented to a depth of four hundred feet. The rest of the hole was left open.

Nobody worried about that open hole. Everything was going fine. On down towards that oil sand at 4,100 feet went the bit. The continuous flow of mud, which picks up the drill cuttings and holds back the gas pressure, was circulating perfectly.



Thirty-five hundred feet. Only six hundred feet left to go. In another week the well would be brought in. Thirty-seven hundred feet. Thirty-eight hundred—and the bit stuck.

Still nobody worried. The mud was pumped out of the hole, and oil was poured in to loosen the bit. To keep the gas pressure under control, the blow-out preventor, or valve, at the top of the hole was closed.

The bit wouldn't loosen. All the local trouble shooters held a conference, while McKay pulled on his pipe. Then somebody noticed a strange thing. The ground about a hundred yards from the well began to stir about, as if a gigantic seed was about to sprout. Then gas began to come out through the earth. Nobody dared go near it. The

Superintendent McKay and his assistants peer at the wreckage of the Killer Well. Leaking gas from the old well caused the crater shown in the foreground.

A quarter of a million dollars, a man's life, and 12 months of weary fighting was the price paid to control No. 1 Allen in Wyoming's oil fields.

Twenty quarts of nitroglycerin were exploded to blow out the flaming well, pouring black clouds and tons of earth into the sky. Pipe cannon wheels are visible.

gas was both inflammable and poisonous.

McKay hunted up an old time driller and asked:

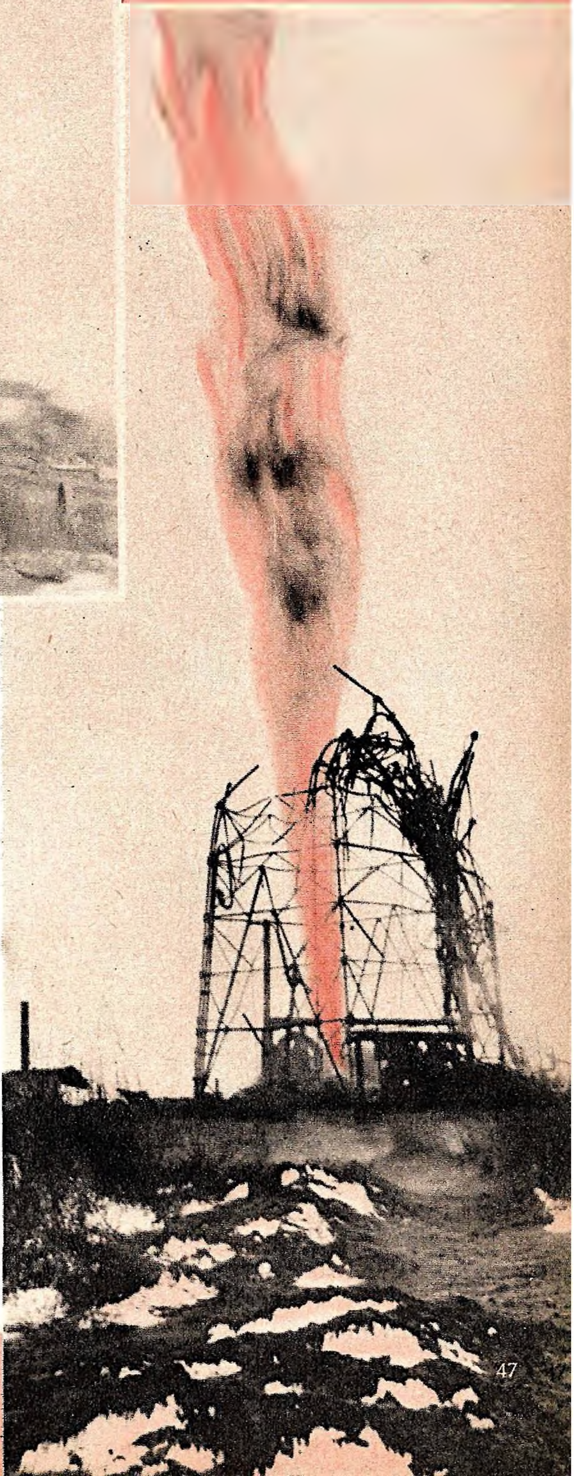
"Were there ever any other wells drilled around here?"

"I've heard about some that were put down fifty years or so ago. I guess they're pretty much filled up now."

McKay swore. The whole thing was clear now. When the top of the hole had been closed, the gas had built up enough pressure to force it through the sides of the open hole. It had run along a porous strata, and was coming up one of the shallow abandoned wells.

The crew put on gas masks, doubled their life insurance, and tried to cement the abandoned well. But the earth caved in under their feet. It was like trying to cement a hole in jelly.

Then it began to "crater." An oil well crater is like a miniature volcano. The crater



A glass blown rock striking the crown block caused the first fire that reduced the derrick to a twisted mass of steel. 60 million cubic feet of gas burned daily.

Lesh is shown placing nitroglycerin tubes in his pipe cannon. The torpedoes were drawn through the water cooled pipe and detonated at the mouth of the well.

from the old well grew steadily. Tons of cement were poured into it. The gas simply found new channels.

Day by day the edge of the crater crawled nearer the derrick of the Killer Well. Very soon it would undermine the derrick and the well would be lost somewhere at the bottom of that crater.

There was only one thing left to do.

"Open the blow-out preventor, and let her go."

The great steel jaws which had closed the top of the well were opened—and 60,000,000 cubic feet of gas a day roared into the sky. This relieved the pressure from the abandoned well. The crater stopped crawling. The derrick of the Killer Well was safe, but the well was as far from being under control as ever.

Heavy mud must be rammed down the well to force the gas below the porous strata. The slightest spark would light those millions of cubic feet of gas roaring out of the hole.

Oil well drillers aren't weaklings. They started mixing mud and getting ready for another effort to control the well. The day of the big push it turned cold, and the mud froze. There was nothing to do but play poker until the temperature went up.

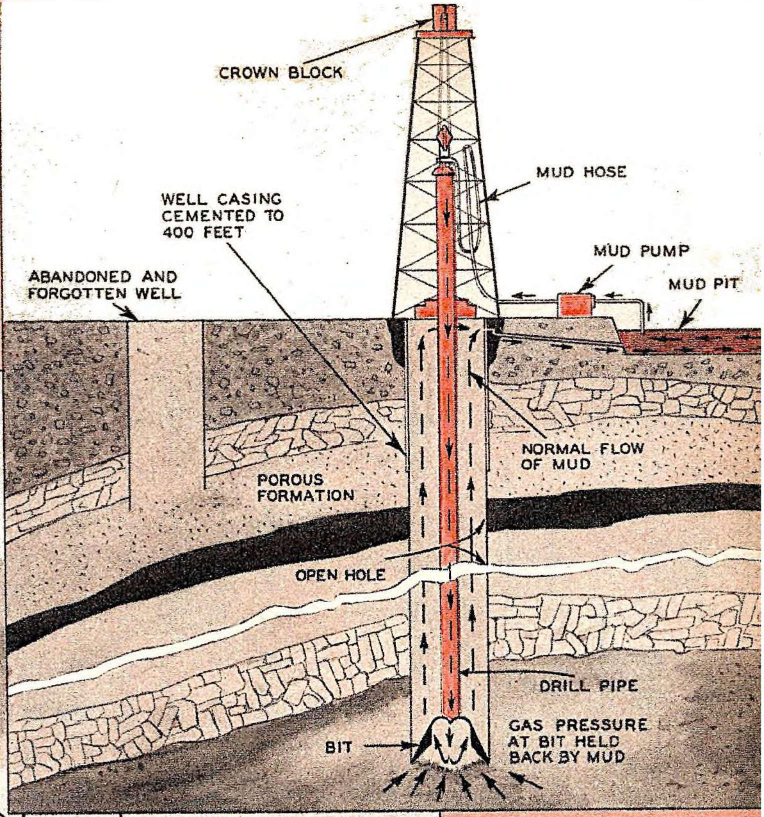
A month later work was begun again. But when the crew tried to pump mud down, they found that the drill pipe was cut in two places. It had been worn through by the stream of rocks blown up the hole by the escaping gas. The broken sections blocked the hole. New pipe could not be run in.

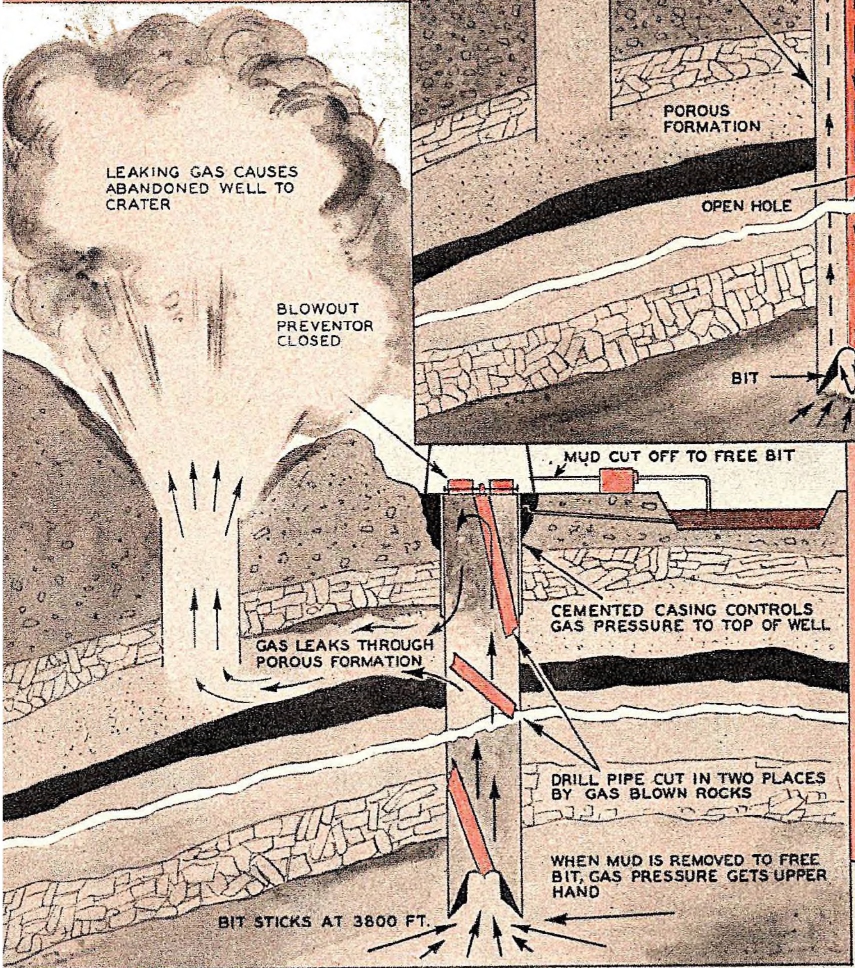
There remained only that heart-breaking job—tool fishing. But in this case the crew fished with death always at their elbows. A spark—and they would be incinerated where they stood. And so they fished patiently, slowly, trying to keep their minds off the roaring gas. One after another, trick hooks, and things like giant forceps, were lowered into the hole in the hope that they would catch the end of the broken pipe. Finally they succeeded. But after the first piece of broken pipe was pulled out, new pipe still wouldn't go down. The second broken section still blocked the hole. The crew, their nerves raw, their bodies weary, decided to declare an armistice. They left the Killer Well roaring defiantly and went home.

At midnight the red ghost which had haunted them for weeks finally struck. A rock, blown out of the hole by the gas, hit the giant crown block where the tackle was hung. There was a little spark and in less than a minute the hundred foot derrick was a twisted mass of junk. Sheets of flame shot two hundred feet into the sky. Like a huge, torch the well lighted the region for miles around.

The crew stood in a little group and stared at the flaming well. All the struggle, the money, the human courage—wasted. A spark had wiped out what they had risked their lives for. Some one said wearily:

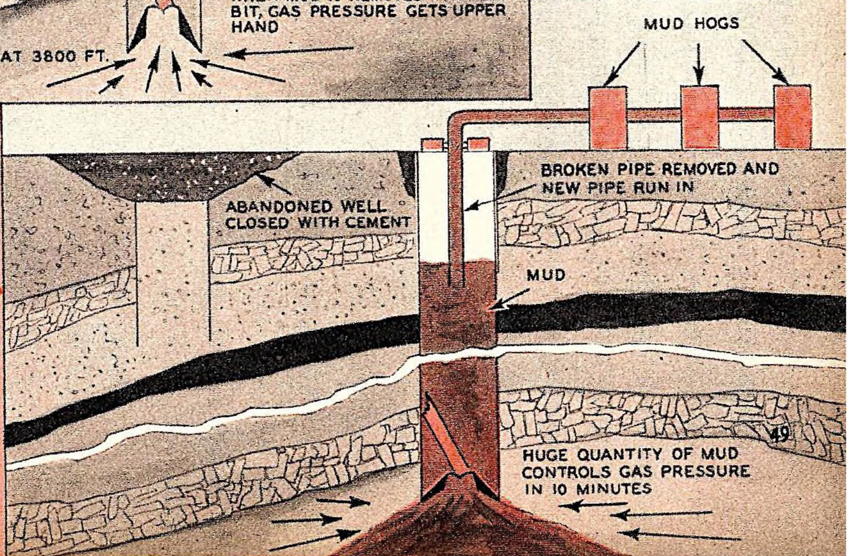
Right—Mud is pumped into hollow drill pipe and forced out of the bit where it picks up the drill cuttings and travels back up the hole to the mud pit. Steel casing was cemented in the well to a depth of 400 feet. The shallow, abandoned well at the left was drilled 50 years before and was left filled in with rubble, completely forgotten.





Left—When mud was removed to free the bit, gas pressure forced closing the top of the well. Gas seeped through porous strata and escaped through the old well which began to crater like a miniature volcano. When the blow-out preventor was opened to save the derrick from being undermined, rocks, blown up the hole by gas, cut drill pipe, clogging the hole.

Right—After the blow-out preventor was opened and gas pressure relieved, the old well was cemented. Broken pipe was removed, a new pipe run in and mud hogs installed which pumped mud into the well. Hundreds of tons of mud crammed down the well finally overcame the gas pressure and the well was under control.



"What shall we do now?"

"Call Frank Lesh," McKay said grimly. "He'll blow out the fire if anybody can."

Frank Lesh had a genius for dealing with tough oil fires. He had blown out many of the industry's bad hombres. But the Killer Well stumped him for a while. The fire was so hot that he couldn't get close enough to explode the nitroglycerine torpedoes by which an oil well is blown out—on the same principle as you blow out a match. It looked as though the Killer Well was going to burn forever, until Lesh came forth with an invention. He called it a "pipe cannon." This consisted of several hundred feet of double pipe on the end of which were two wheels. By means of these wheels the end of the pipe was maneuvered into position just at the base of the column of flame. Two torpedoes, each containing ten quarts of nitroglycerine, were pulled through the pipe by a cable. Water was circulated through the jacket formed by the double pipe. This cooled the pipe sufficiently to allow the nitroglycerine to be brought to the well without exploding. When all was ready, the charge was detonated. The fire was blown out, and everybody breathed easier for a while. Two relief wells were begun, and a new derrick was moved over the Killer Well. The crew went back to fishing for the broken section of drill pipe.

Meanwhile engineers were busy designing another gadget. This was a T-shaped manifold which was to be fitted on the top of the well, as soon as the fishing job was done. The gas would be allowed to escape through the pipes which formed the cross of the T. Pipe lines would then be hooked up, and the gas carried away from the danger zone. The crew, their faces seared ever deeper with worry, went on fishing. After a month they got the hole cleared.

Things seemed easy sailing now. All they had to do was to install the seven-ton T-shaped gadget on top of the well. The crew made ready. Superintendent McKay's son was a member of that crew.

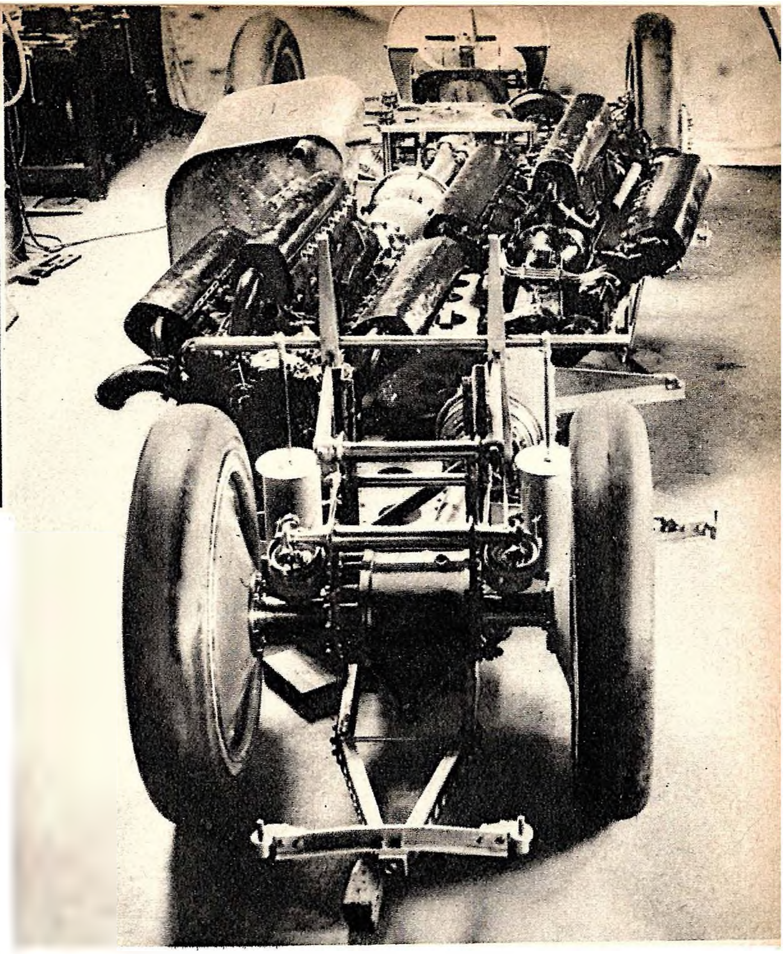
The well did not catch fire. There was no explosion. Everything was quiet. Then when the crew was lulled into a sense of security, the well struck in a subtle, deadly way.

The poisonous gas seeped into the lungs of young McKay. He collapsed and was rushed to the hospital, where he died. He was an oil man's son, and he went out fighting a driller's fight, one of the unsung men who give their lives so the gas tank of your car will be full. The Well had become a killer. From that time on there was something personal between the elder McKay and the Killer Well. It had killed his son.

The T-shaped gadget didn't work. Then they tried pumping in water from the relief wells. The water was supposed to seep through the porous strata and drown the well. That didn't work either. The Killer Well

[*Continued on page* 137]

Huge mounds of black, frozen mud, each as large as a house circled the Killer Well. Finally the huge mass was literally crammed down the well's throat.

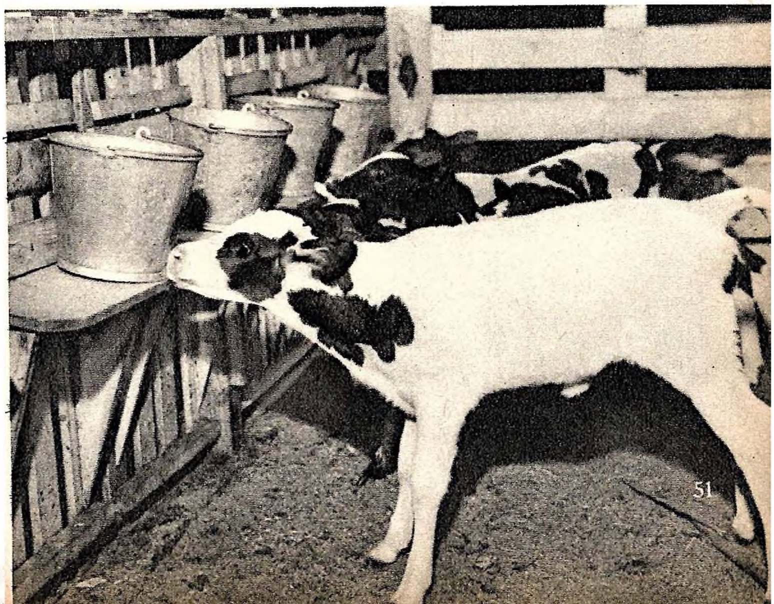


Builds Racing Car For Record Try

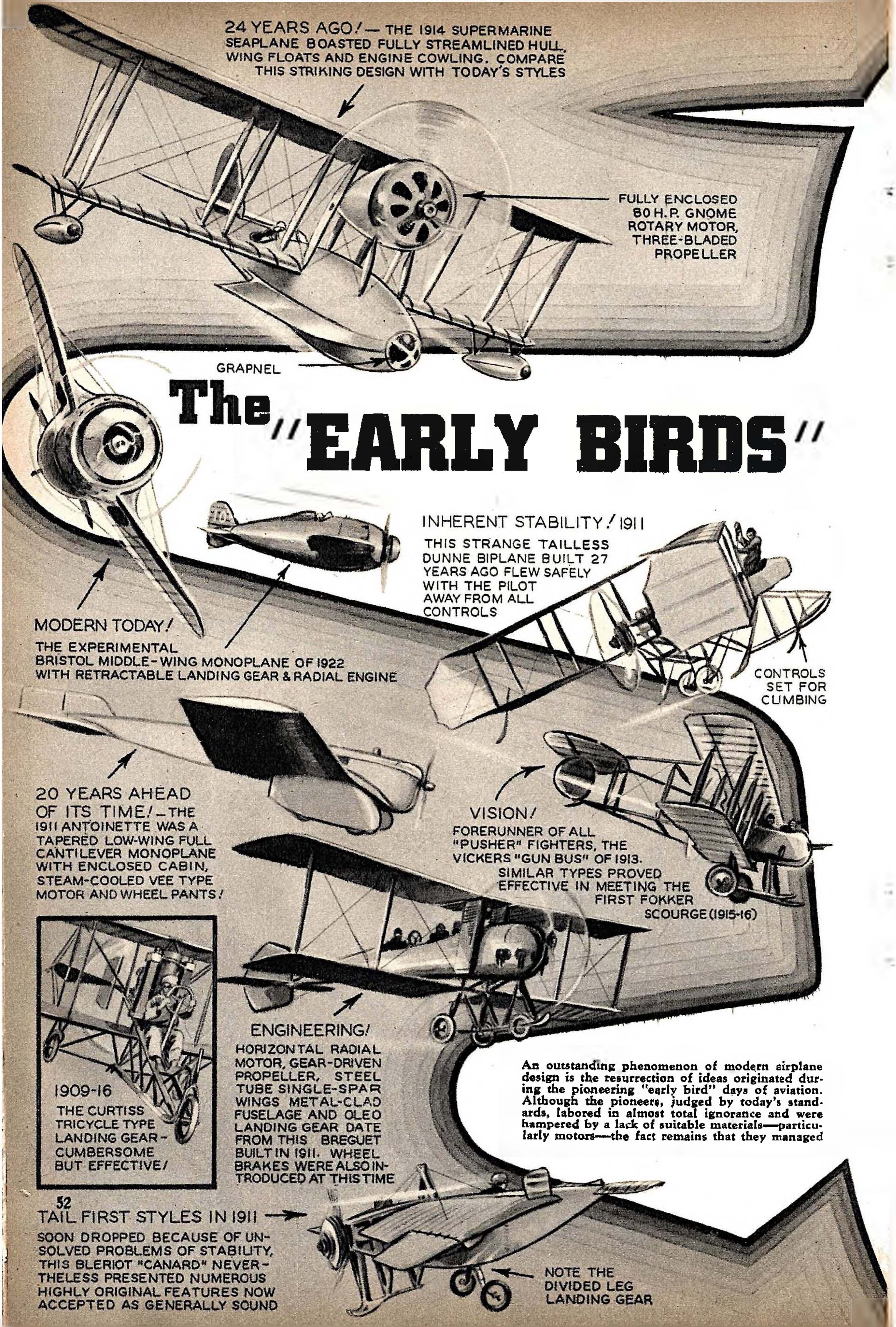
WEIGHING three tons and powered by two 1,250-horsepower motors, a specially designed racing car has been constructed by John Cobb, of London, England, who hopes to pilot it at a speed of 350 m.p.h. over the salt flats near Salt Lake City, Utah, in an effort to break the world's record of 301 m.p.h. now held by Sir Malcolm Campbell, famous British sportsman. The chassis and framework of the racer (right) is fitted with an all-metal streamlined body (above), which can be lifted off in a few minutes, thus facilitating the changing of tires and refuelling during the attempts to establish a new record. The front axle of the racer has a spread of five feet, six inches and the rear axle three feet, six inches. A glass turret in the body serves as a windshield for the driver.

Pail With Nipple Feeds Calves, Replacing Mother Cow

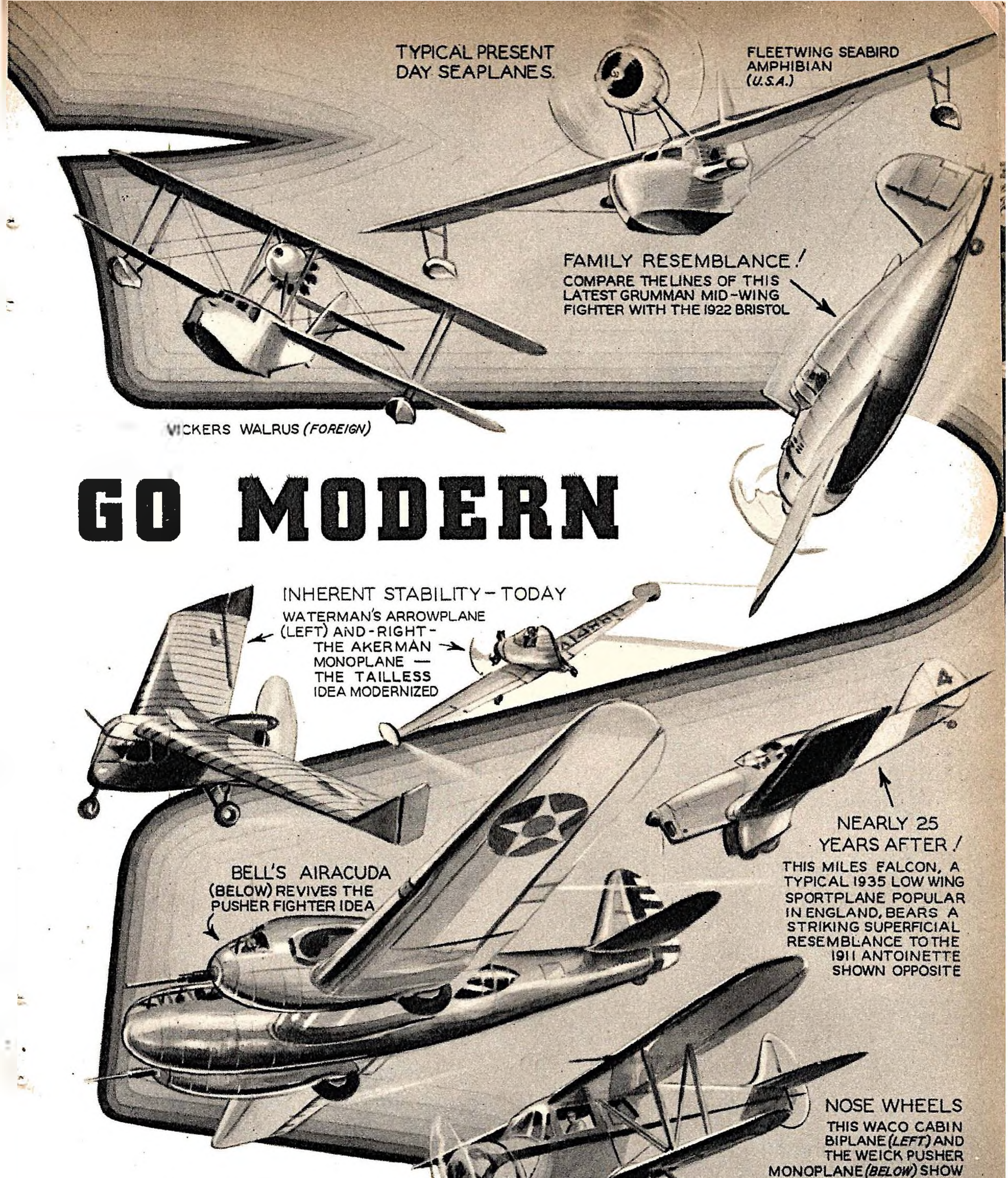
DESIGNED for the feeding of calves after they have been removed from their mothers to fatten them for the veal market, a special feeding pail that simulates a cow's udder has recently been developed. The pail is fitted with a valved rubber nipple which serves to conduct the milk safely past the calf's paunch and directly to the stomach where curdling and digestion take place as they would if the milk was being obtained from the mother. Pail is rust-proof.



The "EARLY BIRDS"

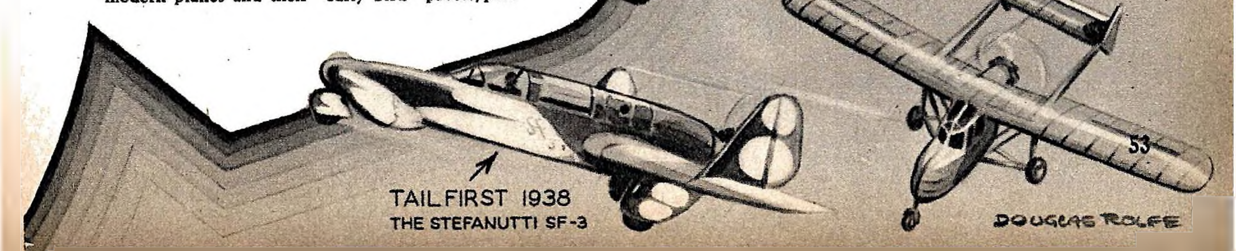


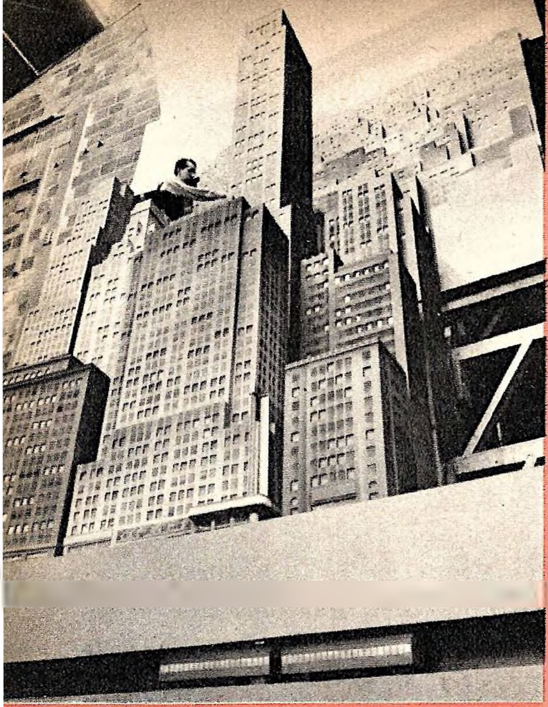
An outstanding phenomenon of modern airplane design is the resurrection of ideas originated during the pioneering "early bird" days of aviation. Although the pioneers, judged by today's standards, labored in almost total ignorance and were hampered by a lack of suitable materials—particularly motors—the fact remains that they managed



GO MODERN

to think up designs applauded today. That their designs were often carried out crudely in production is true, but in making comparisons it should be remembered that technical advances now commonplace were unknown 20 to 30 years back. On these pages, Douglas Rolfe, artist, depicts some modern planes and their "early bird" prototypes.





A completed eight-foot section of the world's largest diorama. The tall building in the background is a model of the International Building at Radio City. Directly in front of it is the Radio City Music Hall. Carl E. Cederblom, working on one of the buildings, indicates the relative sizes of the building heights.

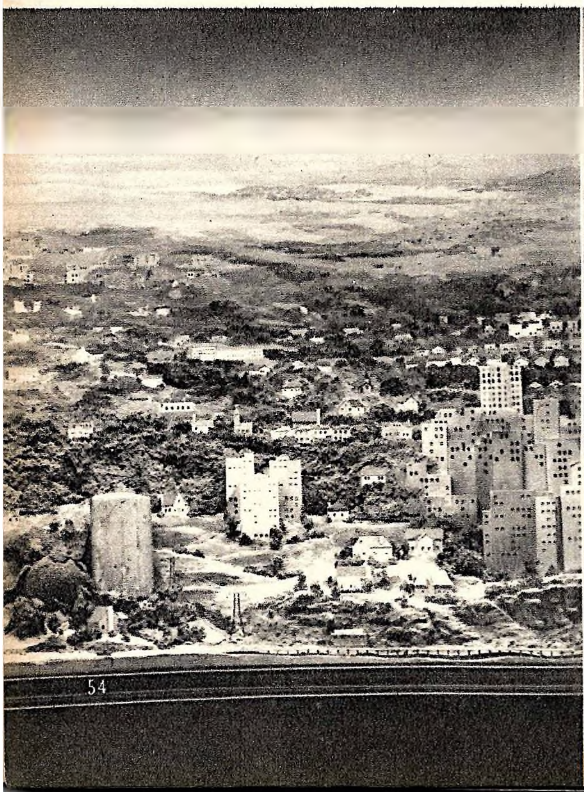
THE world's largest diorama—a colored, animated architectural model of New York metropolitan area—combined with the world's largest model subway system, will be presented by the Consolidated Edison Company of New York, Inc., and affiliated companies, as their principal exhibit at the New York World's Fair, 1939.

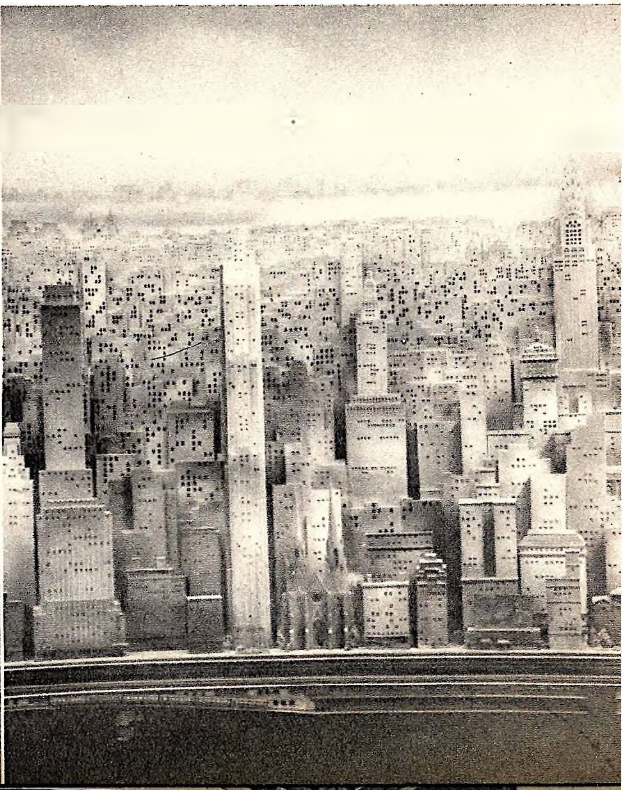
The most elaborate exhibit of its kind ever constructed, whose magnitude suggests a cross between Paul Bunyan and the Colossus of Rhodes, the model will give visitors from every spot on the globe an inspired view of "New York, City of Light." Four thousand buildings, ranging in height up to twenty-five feet, will tower over miniature automobiles starting and stopping to true-scale traffic lights as they flash red or green.

Under this colossal model—nearly as long as a city block and as high as a three-story building—a gigantic subway system will be in continuous operation. Seventy-eight cars, each a masterpiece of model-makers' craftsmanship, will travel over hundreds of feet of specially constructed track.

Designed by Walter Dorwin Teague, the diorama will be presented with striking sound effects in cycles dramatizing the con-

GIANT DIORAMA

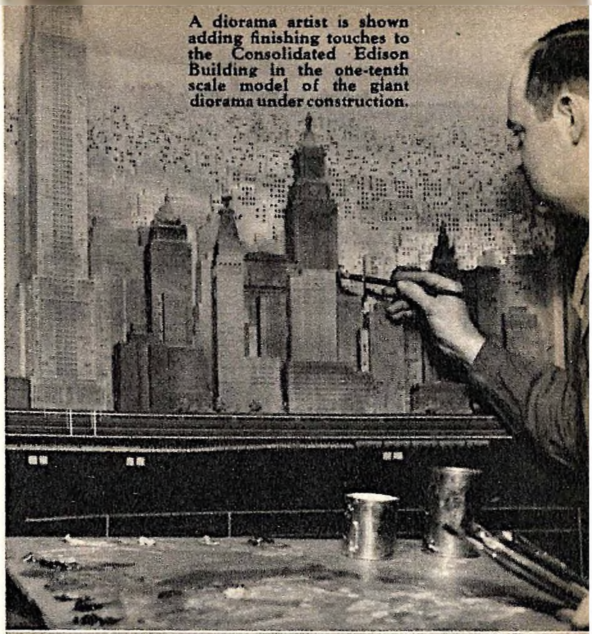




tributions of electricity, gas and steam to life in New York. Each performance will crowd into a twelve-minute cycle, the highlights of a twenty-four-hour period in the metropolis. The lighting effect of a mid-day thunder storm and the gilding of skyscrapers by the setting sun will heighten the spectacle's dramatic interest.

A project so large that a single craftsman, however expert, could not complete it in a lifetime of work, the construction of buildings alone represents 100,000 man-hours of work. Reduced to terms of a single craftsman, it represents more than forty-eight years of continuous work, five days a week, eight hours a day, and no time off for vacations. If a single craftsman should attempt such a large scale model, he first would find it necessary to spend a year or two compiling information on the size and position of more than 4,000 buildings. He then would study each individual building, familiarizing himself with architectural details so that the model would represent faithfully its larger prototype. With this work completed, actual construction could be started—a forty-eight-year job.

Even at the completion of every one of the 4,000 buildings, with their 130,000 windows,

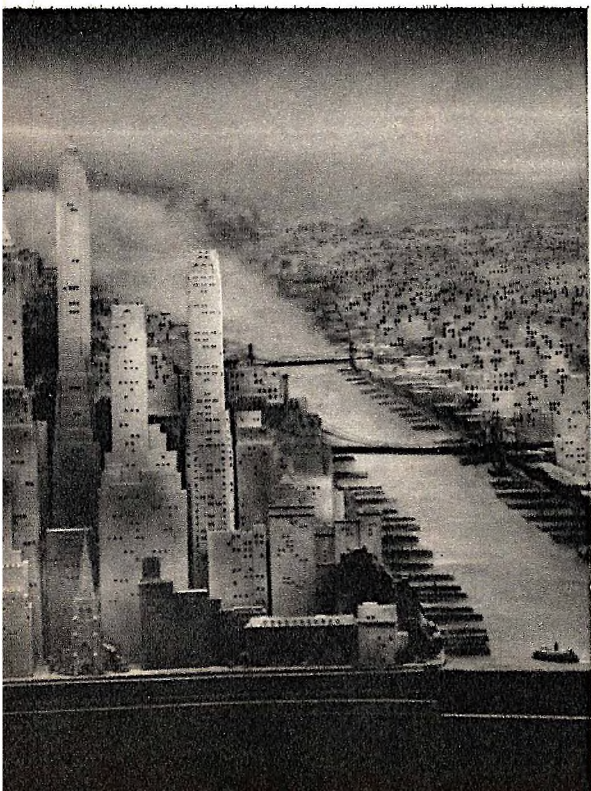


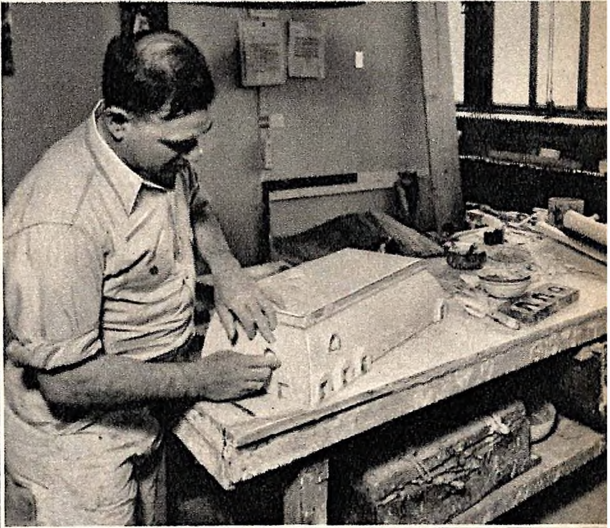
A diorama artist is shown adding finishing touches to the Consolidated Edison Building in the one-tenth scale model of the giant diorama under construction.

Miniature New York City contains 4,000 buildings.

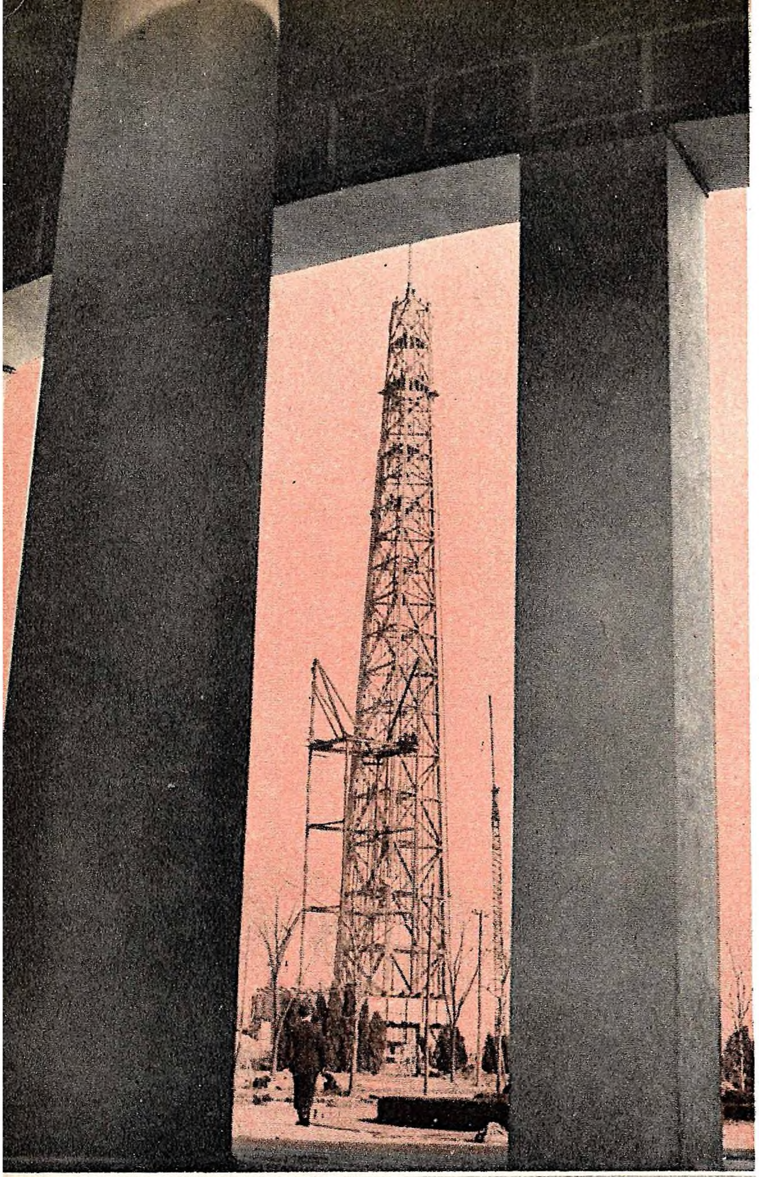
At WORLD'S FAIR

by Clifford Peters





The three photographs at the left show portions of the diorama model. At extreme left is represented the Bronx, with Westchester in the background. In the center is midtown New York with the Chrysler building at the right. The third photograph shows lower New York with Brooklyn on the other side of the East River. Above is shown a workman constructing a plaster model of the Hotel Astor roof.



Above—The partially completed steel framework of the Trylon as it appears from within the entrance arcade of the Hall of Business Administration. When completed, the Trylon will be the tallest structure at the fair, 700 feet high. Below—An artist's drawing of the New York State Exhibit Building and Amphitheater.

1,700 building lights, and 100 street lights, the craftsman would not find his job finished. He then would find it necessary to start on an elaborate study of New York's transportation facilities. Railways, street cars, elevated and subway systems would have to be just as familiar to him as each of the 4,000 buildings.

The subway system would involve the design and construction of seventy-eight cars, twenty of them powered, and fifty-eight of the trailer type. The design and selection of materials would be of more than normal importance in these particular cars because each one must be capable of running a distance equal to one and a half times around the earth.

With design completed, the mythical craftsman could start on the job of making patterns, castings, motors, trackage and finally the assembly of thousands of parts. With the cars completed, he then would face the problem of planning an elaborate system of controls, to permit nine individual trains to operate on double tracks. Local trains should stop at their correct station while expresses whiz by. Block system safety switches would be necessary so that on one particular section, three trains could operate on the same track, each at a different speed with but one train stopping at a time. The average speed on the trains would have to be two feet a second to equal a scale speed of thirty miles an hour.

With the subways in operating condition, the craftsman would start on the installation of principal electric, gas and steam lines. Neon tubes would be used for this purpose, blue green and yellow tubes indicating electricity;

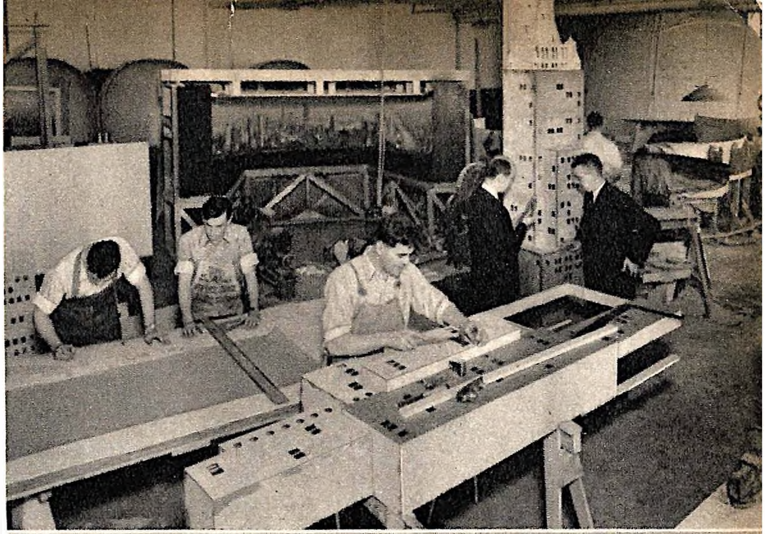
red and orange indicating gas, and white showing the position of steam. Eleven hundred feet of neon tubes would be used for this purpose. Two hundred additional feet of tubing would be required for the miniature neon signs used in their correct scale position on the buildings.

He then would face the problem of constructing the principal Consolidated Edison plants in translucent material, showing the transformation of coal into electricity, gas and steam.

Leaving our mythical craftsman to his gigantic task, and returning to the diorama as it is now being made at the Diorama Corporation of America, Long Island City, N. Y., we find that a wealth of detail will give it realism. In the Coney Island section, roller coasters and ferris wheels will be seen in action. In the Queens area, miniature World's Fair buildings will be shown. In Manhattan, where the Empire State Building will tower above the street, numerous skyscraper replicas will reproduce the skyline view. Among the Consolidated Edison plants to be shown in detailed animated form will be steam-electric, gas and steam stations, supply sources for the largest single system customer groups of their kind in the world.

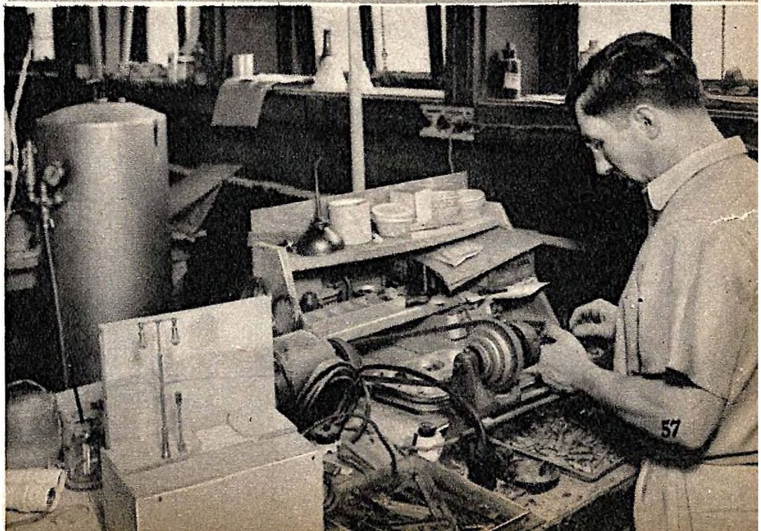
Two-hundred and four-thousand watts of illumination for the diorama will require the most extensive model wiring job on record. Times Square will blaze with light. Ocean liners will lie at river piers. Motor traffic will flow across suspension bridges from Manhattan to Brooklyn.

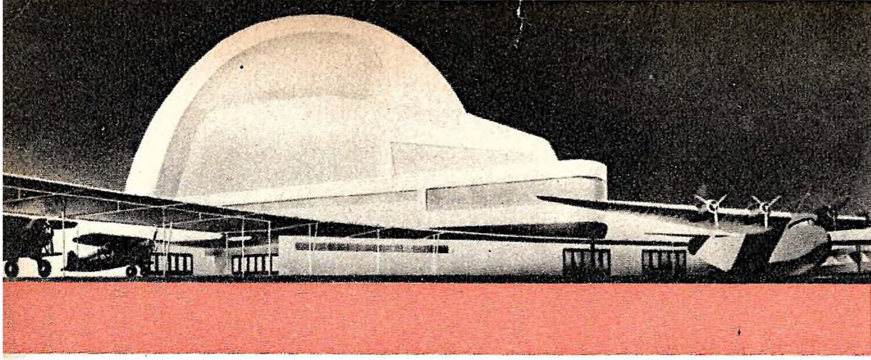
Among the modelmakers working on the diorama are architects, draftsmen, "blow-



A corner of the factory in which the giant diorama is being constructed. Edward H. Burdick (left) president of the Diorama Corporation of America, is shown explaining a construction point to Payson Jones of the Consolidated Edison Editorial Bureau.

Above—Some of the parts used for the construction of the model subway system to be operated under the diorama buildings. Below—One hundred tiny street and traffic lights will add realism to the diorama. The traffic lights contain small red and green bulbs which will flash their colors in accordance with miniature traffic conditions.





An architect's drawing of the Aviation Building, designed to give visitors the impression of arrival at an active airport. Propellers will be whirling and the drone of motors will pervade the hall.

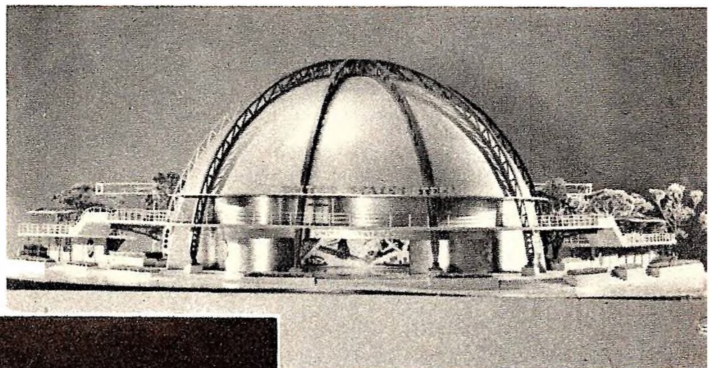
up" men, carpenters, electricians, spray men, scenic artists, sculptors and ornamental plasterers. Also, electrical and mechanical engineers, designers, pattern makers, lighting experts, glass workers, steel workers and sound effect men. Capable of modeling ocean liners, ferry boats, railroads, subways, suspension bridges, elevated highways, transmission lines, power houses, skyscrapers and cathedrals, these men bring to the diorama the special training of the building arts.

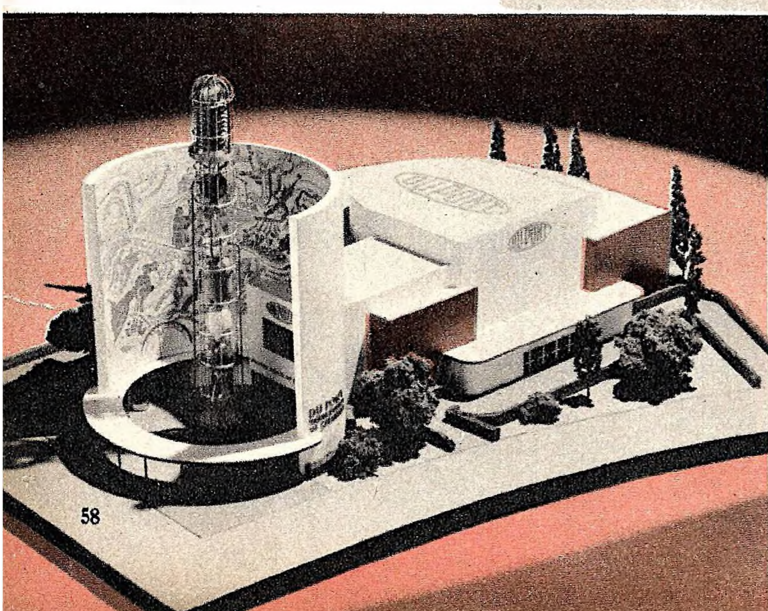
To list the diorama structures would be to enumerate the city's principal office buildings, bridges, churches, hotels, theaters, apartment houses, museums, stadia and utility plants.

Of the exhibit's thirty-seven-foot height, twenty-nine feet represents the vertical distances between street level and skyline, while an eight-foot section represents the underground. Occupying a floor space of 7,000 square feet, the diorama will be presented in a hall accommodating 800 spectators at each showing.

The building housing the exhibit will be a circular structure of modern design, 300 feet long and nearly 115 feet wide. Without windows, it will be artificially lighted and air conditioned throughout. A spectacular building facade will be provided by a crescent-shaped water screen, the only one of its kind ever erected. Floodlighted for night effects, presented against a dark blue background, 45 feet high by 275 feet long, fountains will plume upward along the entire building front in a constantly changing water display. The waters of a reflecting pool, fronting on the fair's Electrical Plaza, will mirror the building scene. A bridge will lead visitors through the screen—like "Alice Through the Looking Glass"—into the building.

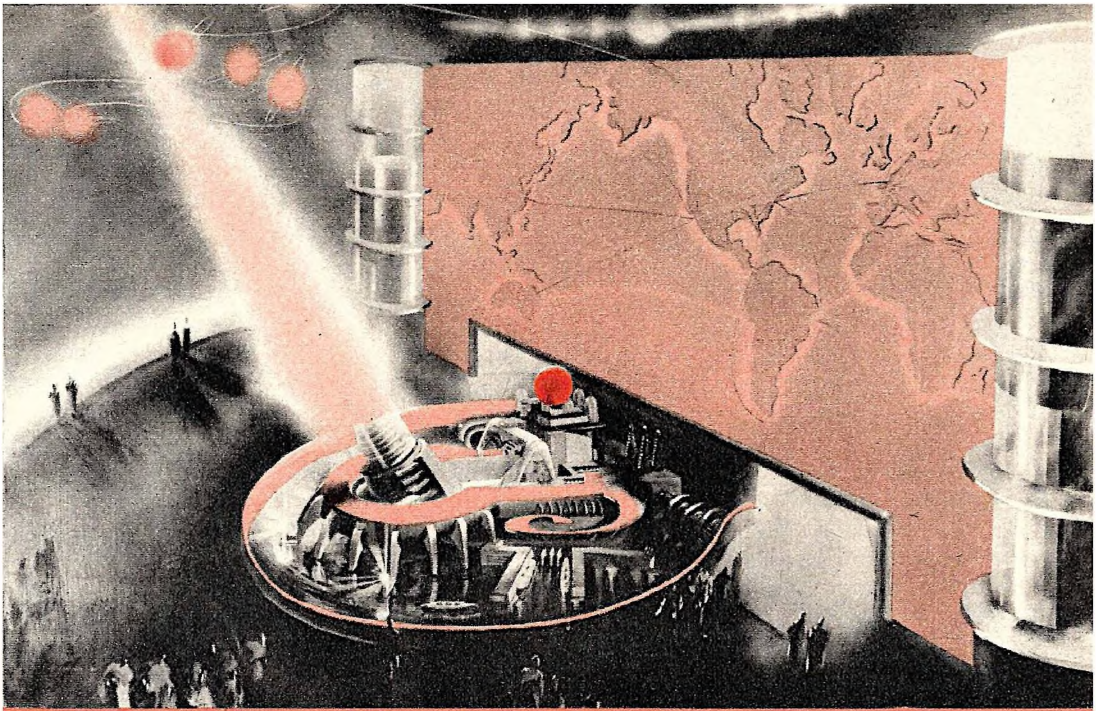
Among the displays designed to catch the visitor's eye as he enters the building, will be an airplane-view map of the New York area, occupying a wall space fifty-two feet long and eighteen and a half feet high.



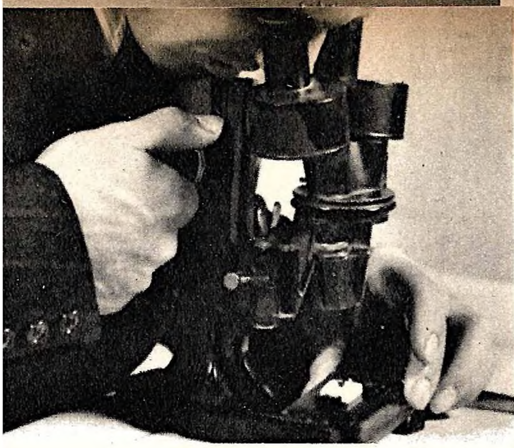


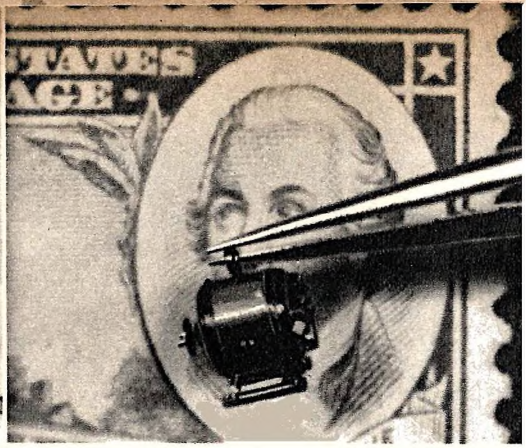
This great stainless steel hemisphere, 66 feet high and 132 feet in diameter, will house two floors of exhibits by the United States Steel Corporation. The use of structural steel members on the exterior is a feature of the building.

A glorified laboratory to demonstrate the transformation of commonplace substances into luxuries will be part of the exhibit "The Wonder World of Chemistry" by E. I. du Pont de Nemours & Company. At left is shown a model of the building which will house the exhibits of this company.



Above—A sketch of one of the exhibits of "The World of Tomorrow" which will show the possibilities of travel through the stratosphere by means of rocketships. Below—An artist's drawing of a spectacle of fire and water to be shown visitors at the New York World's Fair 1939. A thousand water nozzles and hundreds of gas burners will be used. Special equipment will be necessary for igniting the gas under water.





Italian Mechanic Builds Microscopic Electric Motor

SO TINY that it must be examined under a microscope (above) in order to see its details clearly, an electric motor constructed by Amedeo Tomassini, a mechanic in Rome, Italy, actually works, developing eight-thousandths horsepower. The motor consists of 45 parts and required 200 hours to build and assemble. The photo above shows the motor against a postage stamp background, as it appeared through the microscope.

Device Shows Color Tones

ABOUT 13,000 possible color combinations for a body paint job can be visualized by a prospective automobile purchaser through use of a new color calibrating rotator device. Two discs of different colors are placed on the rotator and whirled so rapidly that they seem to blend together, providing tones that vary with the speed of the rotator.

Kit-Form Kayaks Developed

ENABLING even an inexperienced man to build one in minimum time, a new 17-foot cedar kayak is supplied in pre-fabricated kit form. Available in either single or two-passenger types, the kayak has a carrying capacity of 600 pounds.

Carves Novel Objects From Lumps Of Coal

CARVING beautiful novelties from lumps of coal is the unique business engaged in by Charles H. Cunningham, of Summit Hill, Pa. Two of his carvings—a fireman's trumpet and a football—are shown in the photo at right.

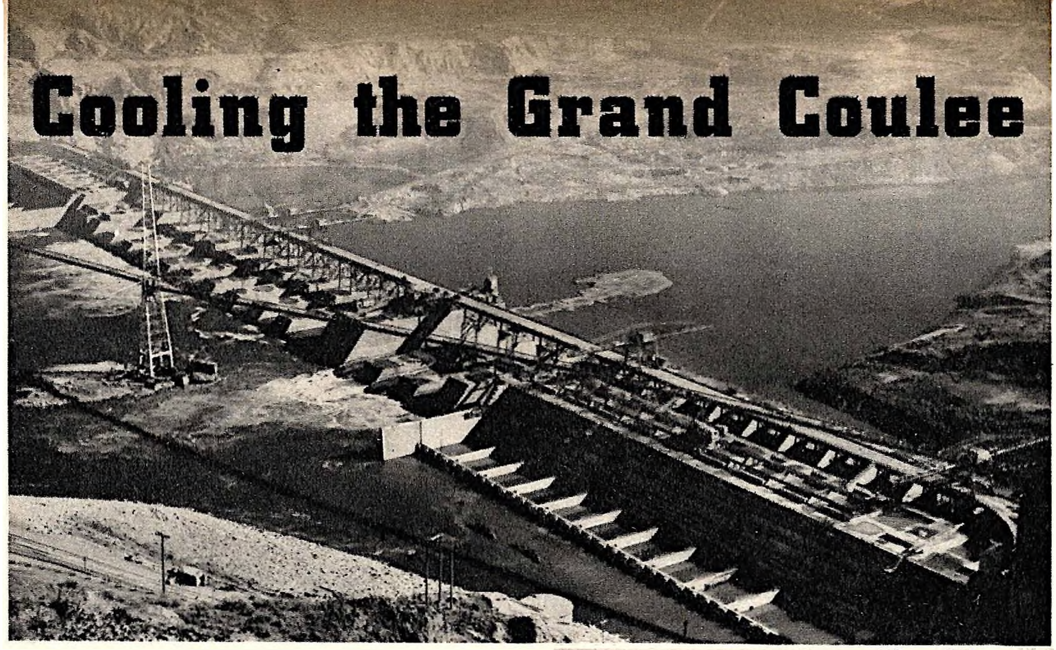
Inner Tube Rafts Are New Beach Attraction

TWO-SEATED rafts, consisting of a framework of four crossed poles attached to large auto tire inner tubes by means of broad strips of heavy canvas webbing, which also serve as seats, have created a new and popular water sport. The novel rafts are propelled by small hand-driven paddle wheels operated by the person occupying the rear seat.

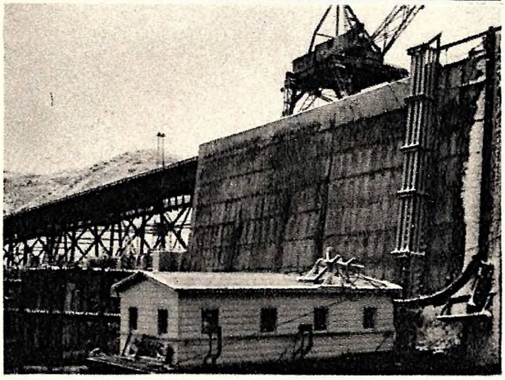
New Lens Developed

DEVELOPED by a well known optical firm for special use with aerial photography cameras, a new type of lens is said to show three times as much area as ordinary types, thus speeding work.

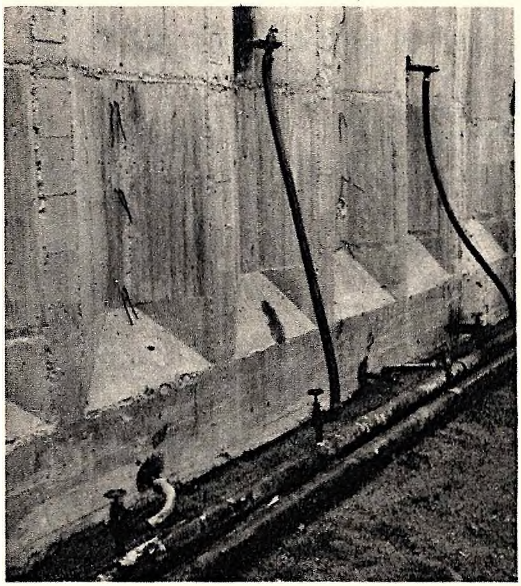
Cooling the Grand Coulee



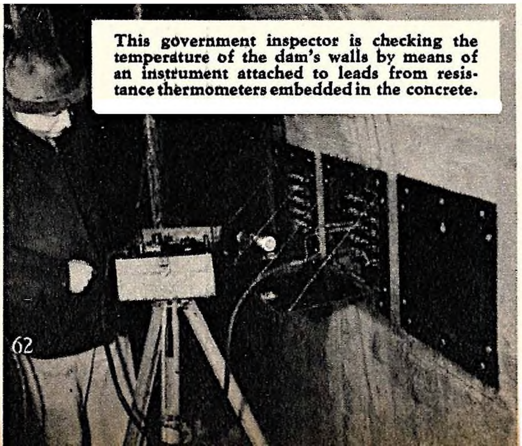
Grand Coulee Dam on the Columbia River in Washington (above) is about 50% completed. Cooling the tremendous heat liberated by the "curing" concrete is a major refrigeration problem. How it is being done is explained in the text below.



Shown above is one of the barges which are equipped with pumps that feed the cold waters of the Columbia River to the 2,000-mile network of refrigeration pipes set in dam's walls.



Above—Feeding cold water into the cooling pipes which are embedded in the dam's concrete walls at intervals of five feet.



This government inspector is checking the temperature of the dam's walls by means of an instrument attached to leads from resistance thermometers embedded in the concrete.

CONSTRUCTION of Grand Coulee Dam on the Columbia River in Washington created a major refrigeration problem for engineers to solve, inasmuch as the dam's 11,250,000 cubic yards of concrete liberated as much heat while "curing" as would be generated by burning 30,000 tons of coal. The natural process of dissipating this heat, which at times raised the concrete's temperature 55 degrees above that at the time of its placing, would require a century or more and result in strains and cracks.

To speed up the cooling process, engineers of the U. S. Bureau of Reclamation installed a network of 2,000 miles of one-inch pipe throughout the dam's walls at five-foot intervals and pumped cold water from the Columbia River through them. Checking of the dam's "fever" with special thermometers indicated that the refrigeration process removed the heat in about six weeks.

Portable Table With Drawers Aids Beauty Operators

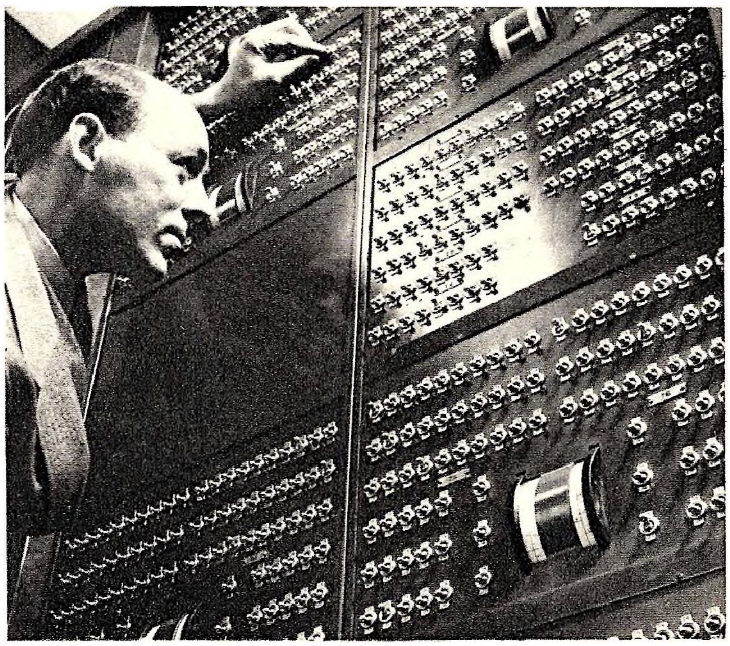
AN INGENIOUS device, patented by a Californian, is designed to hold all the appurtenances needed while beautifying milady, such as pins, hairpins, creams, waving fluid, combs, scissors and dye boat. A flexible arm holds a smaller tray which can be turned to any position.

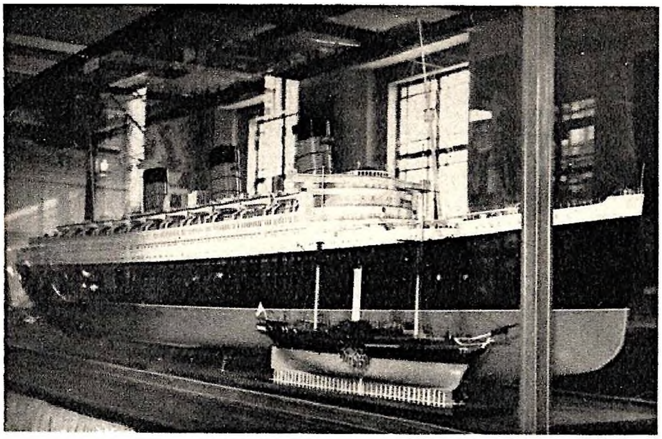
New Device Permits Patient To Administer Gas

A NEW device makes it possible for a patient to administer gas rather than having it done by the dentist. The patient takes the gas by working a small bulb held in the hand. Thus it is possible to take only as much as necessary for producing a state of analgesia.

Duplicates Large Power System

THE turn of a dial or the snap of a switch produces in the Westinghouse laboratory, at East Pittsburgh, a miniature replica of any power system in the world. Like a G-man of electricity, this "calculator" discovers why transformers are overloaded, and discloses means of better controlling the circulation of power. It helped U. S. Army Engineers to study the behavior of various proposed system designs for generators, motors and transmission lines for Boulder Dam



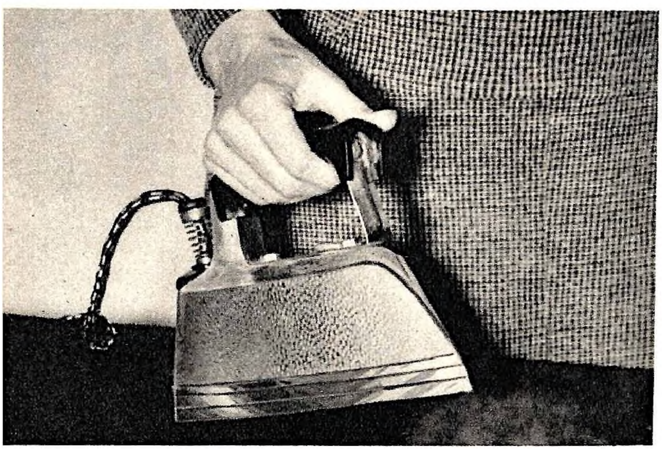


Boat Models Show Design Progress

GRAPHICALLY depicting the progress made in steamship design during the past 100 years, an exhibit in the Science Museum at South Kensington, England, features models of the 703-ton *Sirius*, first trans-Atlantic steamship, and the 80,773-ton *Queen Mary*, present day ocean liner. As shown in the photo, the *Sirius* had only one funnel and was propelled by paddle wheels at its side.

Underground Pipes Cut By New Device

PIPES of almost any size located below the ground in deep narrow trenches or other restricted places are easily cut by workmen standing on the surface through use of a newly developed cutter, which is fitted with a handle of adjustable length. The device consists of a divided ratchet-brace and a link chain with a cutter box. The necessary revolving motion is produced by working a hand lever which has double-locking pawls. The feed of the cutter is automatic and uniform and its flexible design prevents it from catching and stalling on pipes which are not perfectly round. The cut produced is clean and without the slightest trace of burr.



Hand Iron Creates Steam, Eases Work

A NEW hand iron, which contains a water chamber from which steam emerges through holes at the tip of the ironing surface, has been developed. Distribution of the steam is said to do away with the need for sprinkling, dampening and rolling the material to be ironed. The iron holds about one pint of water and operates on either AC or DC current.

Bacon Griddle Has Triangular Shape

SHAPED like the peaked roof of a house, a new triangular griddle cooks up to six pieces of bacon at one time. The slices are laid over the peaked top, the griddle is covered with a cover that holds the bacon flat and then placed on a cooking range for about five minutes. The griddle is made of heavy cast aluminum and has a chrome steel cover with a small plastic handle.

Stellarscope Helps To Identify Stars

INVENTED by Professor Walter Bartky for classroom work at the University of Chicago, a new scientific instrument, the stellarscope, provides a quick means of identifying the various constellations and the larger individual stars. The instrument consists of a lens in a plastic case, a pencil-type flashlight and a roll of 35 mm. motion picture film, which is moved by hand through the field between the light and lens. Each film roll is about 18 inches long and contains 24 sky maps showing all sections of the sky. By peering at the identified sky maps, the student soon learns how to identify the constellations when looking for them in the real sky with a telescope.

Ice Tobogganing Is New Seaside Sport

THE thrills of ice tobogganing, while attired comfortably in bathing suits at the seashore, is the latest sport introduced in Venice, Calif. The toboggan slide consists of a high wooden platform fitted with a wooden slide which is covered with cracked ice. A toboggan of ordinary design carries two persons down the slide and deposits them at the water's edge.

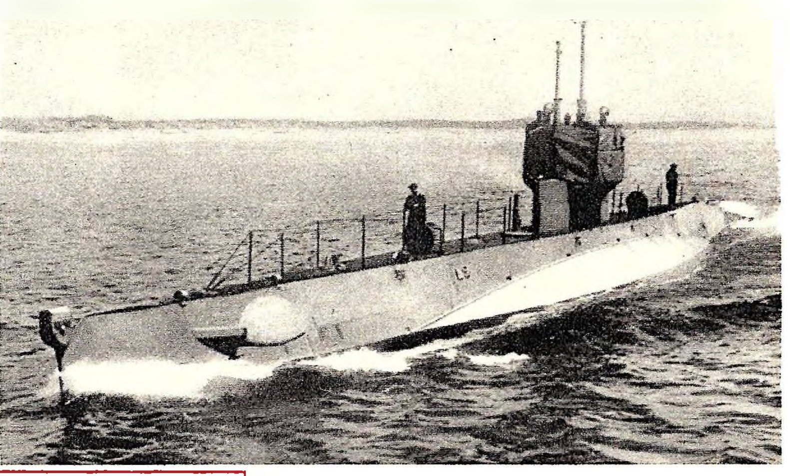
TAKE HER DOWN—

(In the dramatic passage which follows, Commander Thompson tells of a little known phase of warfare in which camouflage was used by German U-boat commanders during the World War. As exciting as any fiction, the story he tells is factual in every detail, narrated as he personally experienced it while serving as an officer aboard the United States Navy Submarine L-9.—The Editor.)

SUBMARINE L-9, which had been transferred from the relative quiet of Florida waters to active sea duty in the World War, was assigned to patrol an area 20 square miles off the coast of England at the mouth of Bristol Bay, the inshore boundary of our area running close to Lundy Light. For the first few days we patrolled the seas without mishap.

On the fifth night of patrol it was my lot to have the

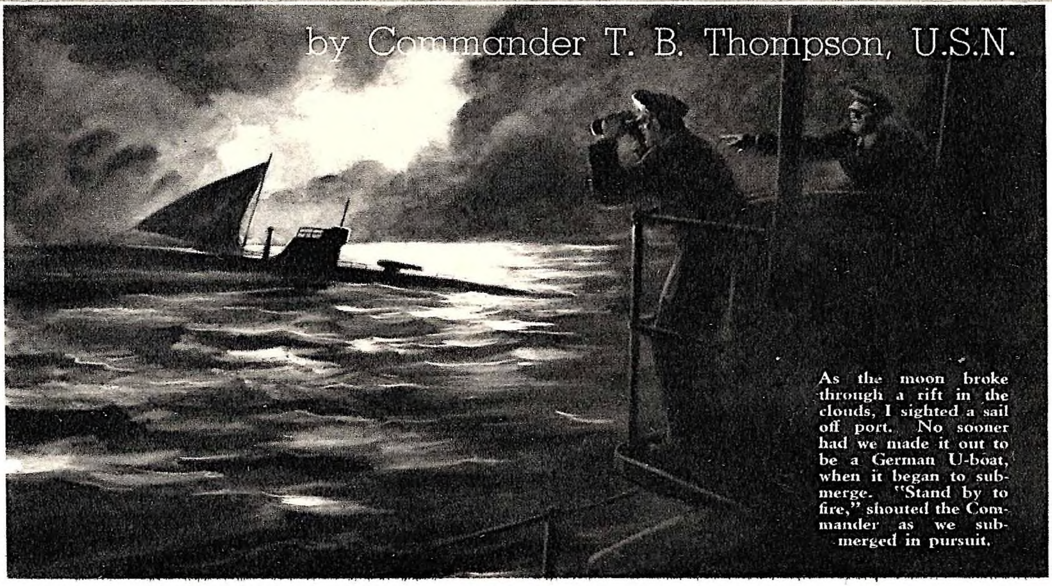
Commander T. B. Thompson relates here an exciting experience of his first U-boat patrol during the World War when he tried to ram a German submarine — with instant death as a reward.



The submarine L-9, (right) with decks cleared for action was a trim U-boat. Commander Thompson spent the most exciting days of his navy career in her belly patroling the English coast in war time.

midwatch, those endless, unholy hours from midnight to four. By this time human energy in general, and mine in particular, had reached its lowest ebb and the L-9 stood slowly to the westward on her appointed beat Heavy cloud banks hung low over a calm sea, making the night as dark as a pocket Toward two o'clock the moonlight, with startling suddenness, sifted through a rift in the lowering clouds to illuminate with silvery radiance with long smooth seas astern what appeared to be a large fishing boat with sails set. The sounding of the alarm gongs and my "Sail ho, close aboard on the port

A Submarine Portrait



by Commander T. B. Thompson, U.S.N.

As the moon broke through a rift in the clouds, I sighted a sail off port. No sooner had we made it out to be a German U-boat, when it began to submerge. "Stand by to fire," shouted the Commander as we submerged in pursuit.

quarter," sung down the voice tube, brought the Skipper to the topsides in a brace of shakes.

"Where away?" he asked, hastily raising his night glasses. "There," I said, pointing to the dim outline.

"She's a fisherman," said the Skipper, looking intently through his binoculars at the vague shadow slowly rising and falling in the seaway.

I took another look at the boat and exclaimed: "No. She's not. She's a U-boat! Look at the gun on her forecastle."

"Great balls of cat fire, she is!" fervently agreed the Skipper as the long low-lying hull of a large German submarine with a small sail rigged aft for deception now gleamed unmistakably in the moonlight. "Shift to the motors. Left, full rudder. Ahead full speed. Stand by to fire!" he ordered, and back up the voice tube came the reply:

"Rudder's full left, Sir. Going head full on the motors. Number one and two torpedo tubes ready to fire."

As the L-9 gathered way, swinging fast to port again, the Skipper gave vent to "Great balls of cat fire! Look she's going down. She's diving, sail and all. Get below quick. Crash dive."

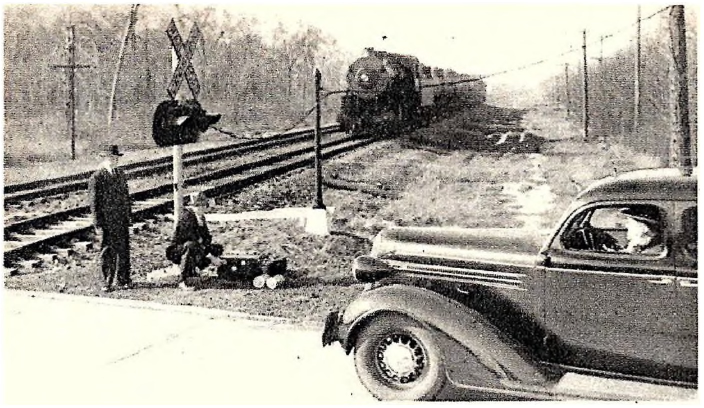
As I dropped through the hatch almost on top of the lookout, a never-to-be-forgotten picture flashed into my eyes. A last hurried glance showed the moonlight glinting from the wash around the U-boat's conning tower and stern as, inclined heavily forward, she dove under a long sea, the small camouflage sail slatting wildly.

Down the steel ladder I slid to the tune of the crash-dive howler moaning away discordantly. The disappointing fact registered that the U-boat had submerged before the L-9 could turn far enough to fire her torpedoes, but in the intense concentration of the moment I failed to realize that the U-boat could easily have let go at us with her four bow tubes when she made out the L-9, and turned away. So for all we know four Blackhead torpedoes raced madly past our now rapidly swinging sub.

"Flood emergency tank. Take her down hard," were my orders as I landed with a bang on the floor plates.

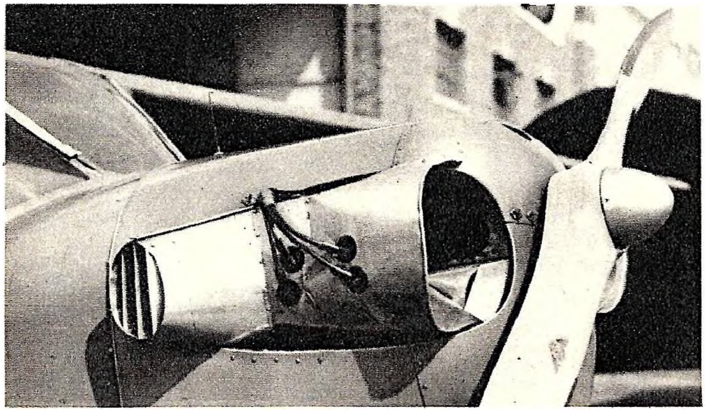
"Take her down hard, Sir." "Emergency tank flooding, Sir." The shouted replies of the men deftly manipulating the diving controls sounded above the roar of air escaping from the ballast-tank meant adding a ton or so of negative buoyancy to drive the L-9 under faster.

[*Continued on page* 139]



Radio Device Warns Of Train's Approach

INSTALLED at grade crossings and actuated by an approaching train, a specially designed radio transmitting unit with a range of 100 feet sends out a loud warning signal that is automatically picked up by a mechanism that can be installed in an ordinary auto radio receiver.



Cylinder Sheath Helps To Cool Aero Engine

EASILY attached to various types of "flivverplane" engines, a hollow, oval-shaped metal sheath device is said to materially increase the cooling of the cylinders. The sheath forces the air to pass directly to the rear cylinders before escaping, thus dissipating more heat at that point.

Radio Set Features Automatic Tuning

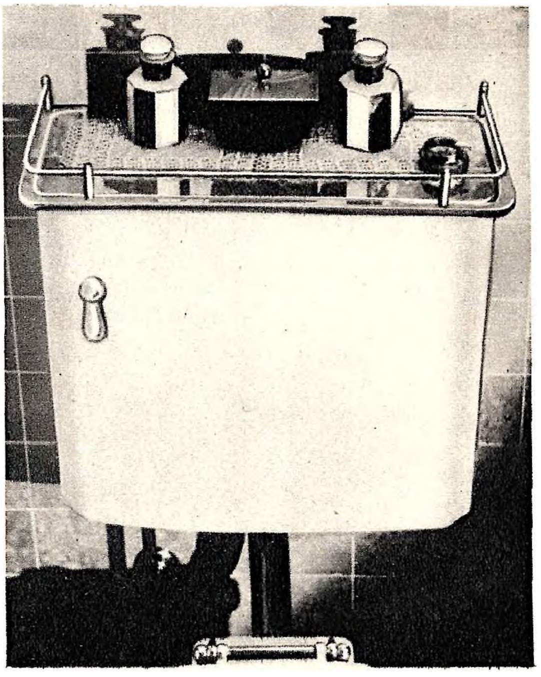
A NEWLY developed radio receiver features a control clock device which enables the set to be adjusted so that it will automatically tune in any desired program at its specified broadcast time. The clock dial is fitted with holes, representing 15-minute intervals, into which special plugs bearing the call letters of the desired stations are inserted.

"Mineral Wool" Data

FIFTY thousand tons of "mineral wool," produced by blowing air through molten slag, a by-product of the blast furnace, will be used to insulate homes during 1938, according to steel manufacturers.

Tank Unit Creates Odd Shelf

PLACED on top of a toilet water tank, a new unit provides extra shelf space for bottles too large to place in a medicine chest. The unit is adjustable to various sized tops and can be installed without tools and without marring the finish of the top.

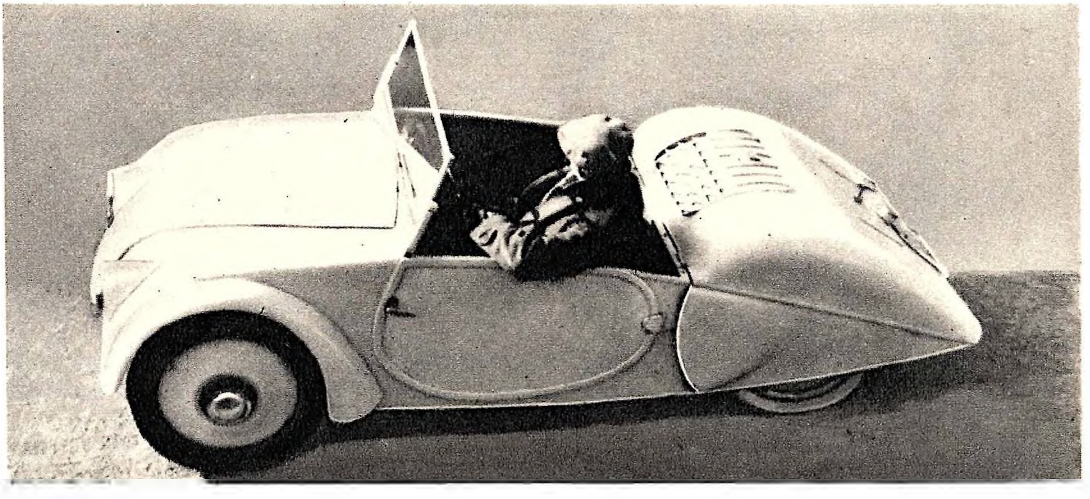


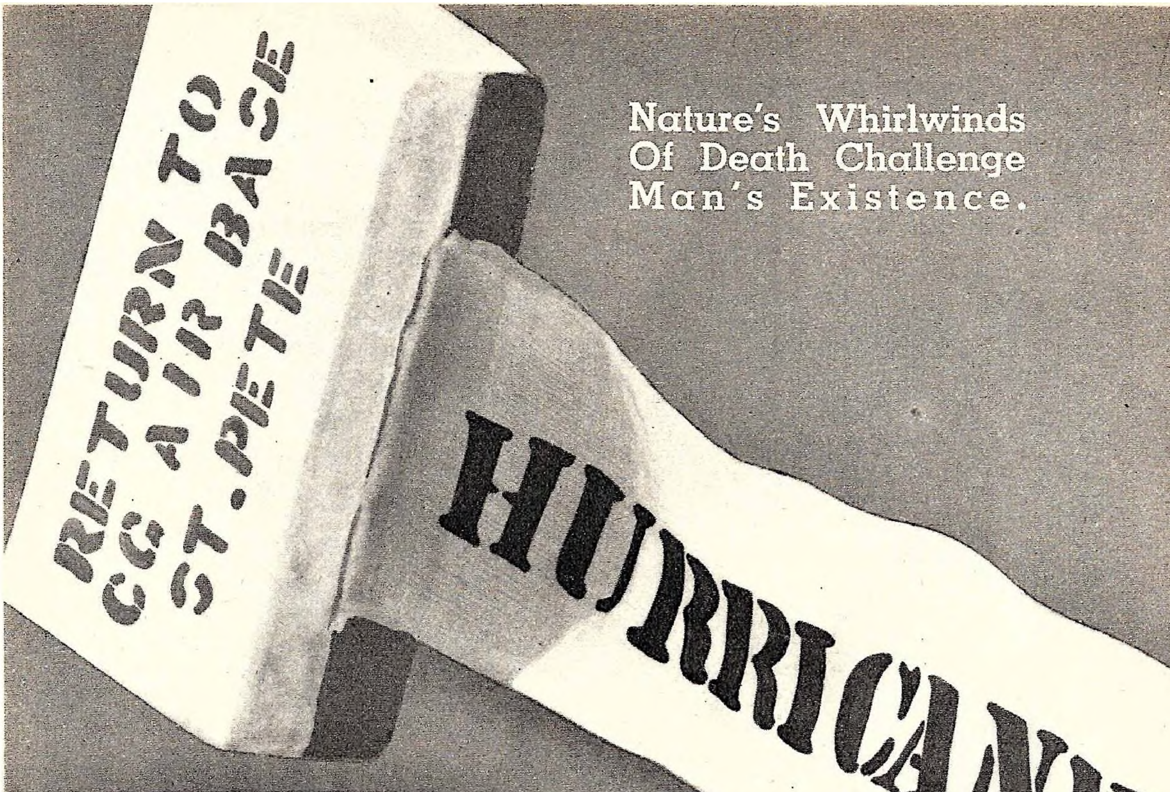
Safety Belt Devised For Car

DESIGNED to hold passengers firmly in their seats in event of a crash so that they will not be thrown violently against the car interior, a newly developed safety belt for automobiles may eliminate injuries attributed to this cause.

Swiss Engineer Designs $300 Automobile

SEEKING to develop an automobile, the cost of which would be within reach of the average man, J. Ganz, an engineer in Geneva, Switzerland, has designed a small car which he believes can be produced in quantity for about $300. The new auto seats two persons, features a rear-mounted engine of low horsepower and can travel 55 m.p.h.





Nature's Whirlwinds Of Death Challenge Man's Existence.

To warn small boat operators and fishing fleets of an approaching hurricane, U. S. Coast Guard amphibian planes drop special messages (left). Above—Type of floating message-trailer dropped from the planes.

THIS is the season when people along the coast of the Gulf of Mexico, from the Rio Grande to Florida, take a deep interest in weather signs. The reason—it is the hurricane season, and that is the hurricane belt.

From the middle of June to the middle of October coast residents are on the lookout for signs of these sea cyclones which tear in from the Gulf, sometimes with awful suddenness, to spread death and destruction in their wake.

This section of coast has had many grim lessons, particularly the Texas coast. Along this 500-mile strip in the last forty years storms have killed 21,000 persons and property worth $2,000,000,000 has been destroyed.

The Galveston hurricane of September 3. 1900, was one of the worst catastrophes of this century. The island city of 38,000 persons was demolished in the space of a few hours. Eight thousand persons were drowned, killed

In September 1936, a hurricane ravaged the Atlantic coast for 1,000 miles. Although the full force of the whirlwind was spent by the time it reached Weymouth, Mass., it was still powerful enough to lift small boats (above) clear out of the water and deposit them on a stretch of drift-covered beach.

WARNING

by
Royal Roussel

by flying debris or crushed in the hundreds of buildings and houses that collapsed.

The tornadoes in the middle south illustrate the tremendous force of the Gulf hurricanes. They are brothers of destruction. But where the tornado strikes one swift blow and is gone, the hurricane batters for hours, with its force rising. Added to the wind there usually is great destruction and danger from the sea.

Such was the case in Galveston. Wind and water combined to smash the city and create a scene of horror that lives vividly even now, thirty-seven years later.

Throughout the afternoon of that fateful Saturday, the wind blew in angry gusts from the north, piling up the waters of Galveston Bay into the streets, flooding them to a depth of a foot or more. Galveston thought this was the storm. But about dusk, the wind reversed its direction within a few minutes and roared out of the south, growing stronger and blowing steadily. This rolled the waters of the Gulf into the city and most streets were covered six feet deep. That is when death and destruction began.

No one knows how hard the wind blew.

When a hurricane struck Matecumbe Key, Florida, in 1935, it demolished Veterans Camp No. 1. The wreckage (left) yielded 300 bodies. Unlike tornado, which strikes one blow and is gone, a hurricane batters away for hours with a rising wind attaining velocities of more than 100 m.p.h. To warn cities of hurricane danger, 16 weather reporting stations dot the Gulf Coast area.

Ten American Jesuit priests were killed when St. John's College at Belize, British Honduras, was ruined by a hurricane (below) and tidal wave that struck the city in 1931, killing more than 1,000 persons. Today, better weather observation and reporting facilities serve to reduce the hurricane danger by enabling people to evacuate towns in time.

It blew the weather bureau's instruments to pieces—a trick of hurricanes — after 84 miles an hour had been registered. It is estimated that the top was between 110 and 120 miles per hour. Buildings were crushed like egg shells. Heavy timbers were lifted and whirled through the air. Fifteen hundred acres were swept clear of buildings and when daylight finally came bodies floated thick in every street and dotted the wreckage of the buildings.

There are innumerable reports of the almost unbelievable force of the wind and water that night. A train was lifted from its tracks and blown yards from the right of way. Ocean-going steamships were carried twenty-two miles inland—even into another county. Buildings tumbled like card houses.

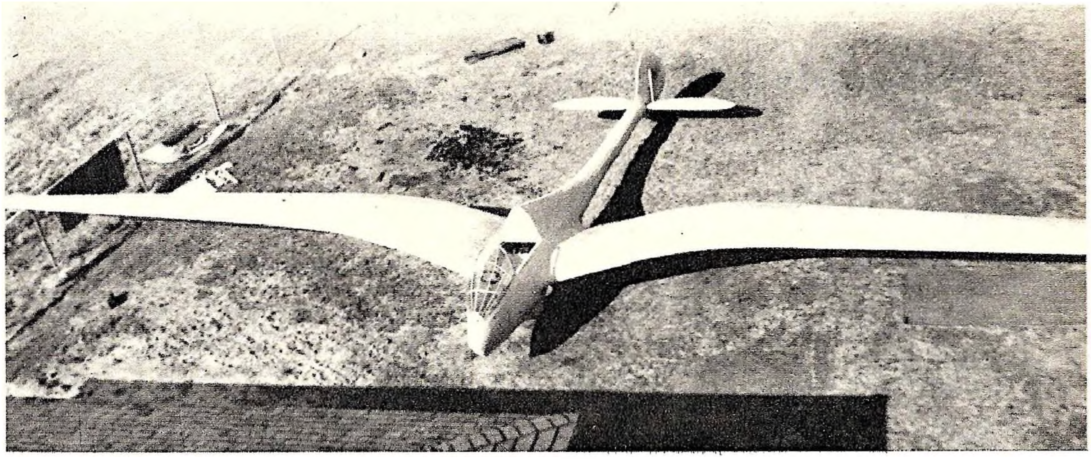
What Gainesville, Georgia, and Tupelo, Mississippi, experienced in a few minutes in the Dixie storms of 1936, Galveston battled for an entire night in 1900.

Storm reporting such as exists today could have saved thousands of lives in the Galveston storm. The city had ample warning of an approaching storm, since it took four days to travel from Key West to Galveston, but information on its intensity and area was lacking. The city thought it would be just another blow.

Storm reporting in this section today warns

[*Continued on page* 138]

Home-Built Sailplane Has 72-Foot Wing, Seats Two Fliers



Featuring a full cantilever gull-type wing that gives it a truly bird-like appearance, a soaring glider constructed by Frank Merritt, of Glendale, Calif., has a wingspan of 72 feet and is believed to be the largest sailplane ever constructed in the United States. The huge wing is five and one-half feet wide at the fuselage ends and tapers to a one-foot width at the tips. The cockpit seats a pilot and passenger and is covered with a transparent streamlined hood of special construction

"Radio Nurse" Watches Child

A "RADIO NURSE" now brings the nursery into the living room, kitchen, or any other room desired. When a child is sleeping or playing in a room when no older persons are present, every sound within that room can be transmitted to any spot in the house. The outfit consists of a pickup unit, placed near the child to be "watched," and a loudspeaker, which can be placed in any convenient location.

Device Locates "Shimmy"

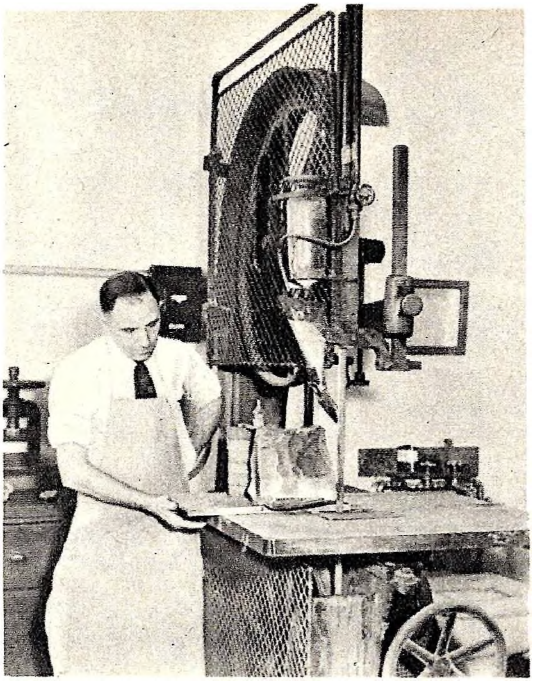
THE testing machine shown under the car wheel eliminates the need for dangerous road tests or prolonged indoor testing when trying to locate an unbalanced wheel which causes a car to "shimmy" when speed is increased beyond a certain point.

Barrel Truck Speeds Work

THIS all-metal drum or barrel truck requires a minimum of effort to handle heavy loads safely and quickly. Rugged all-steel welded construction insures ability to stand up under hard use. Wheels are ball bearing, steel or rubber tired.

Map Tape Quickly Locates Hard-To-Find Streets

A NEW type of map makes it possible to locate streets almost instantly. A built-in index lists the streets with a key number. By stretching a narrow tape to the correct point on the border of the map, the exact location of the street is spotted by means of a numbered scale on the tape. Maps of several large cities are now available with this precision street finder.

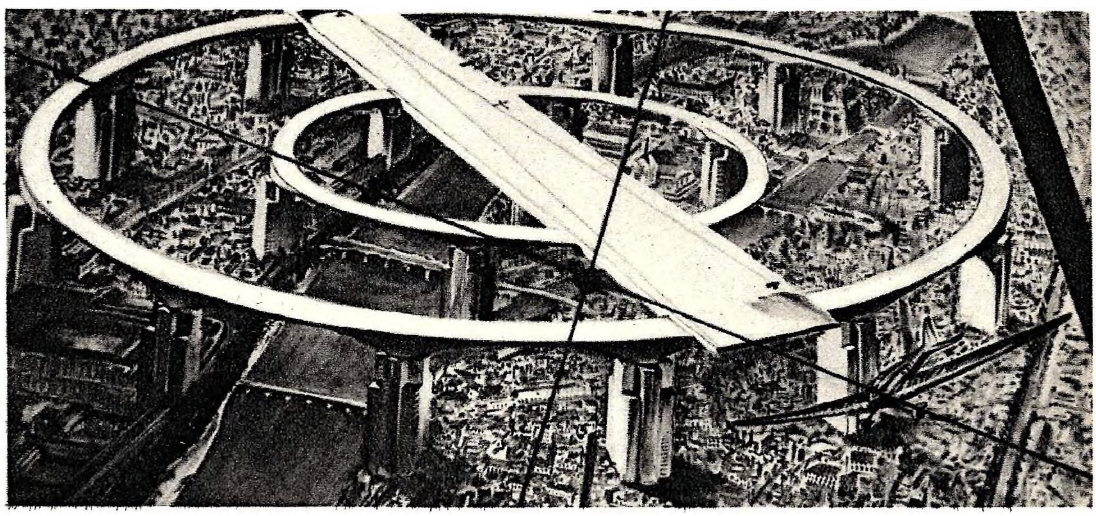


Lab Machine Slices Rocks

A SPECIALLY designed machine, which is installed in the laboratories of the U. S. Geological Survey Bureau in Washington, D. C., is said to be capable of slicing the toughest, hardest boulders into slices that are only 1/1000th of an inch thick.

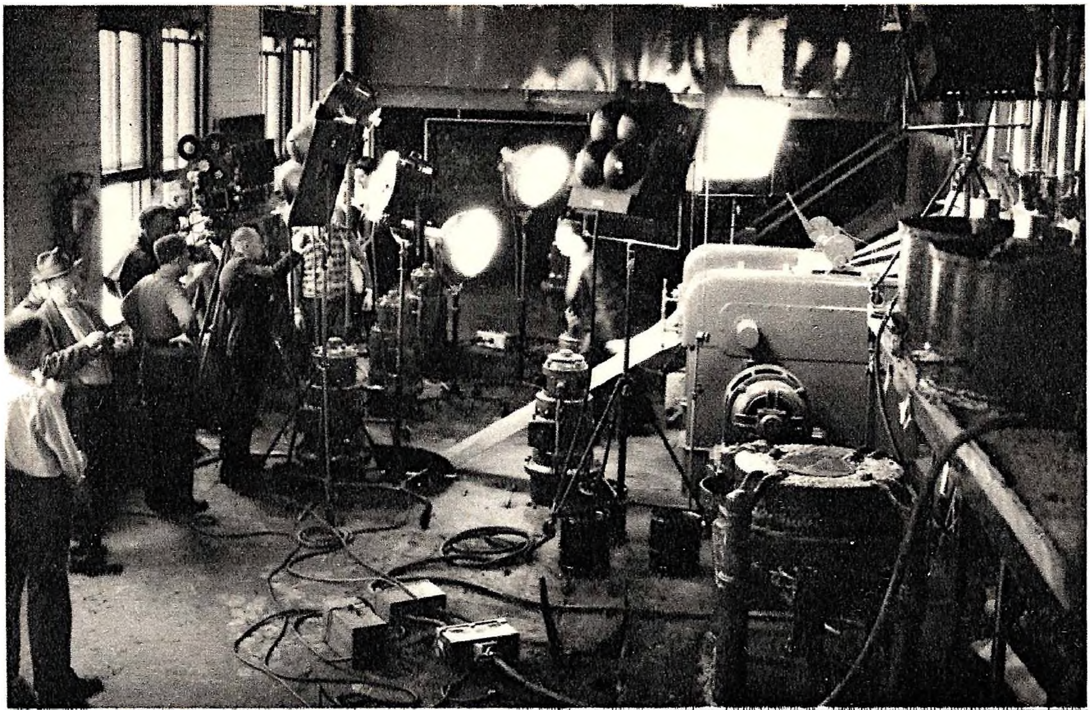
Muzzle Safeguards Chickens

EASILY attached to a chicken's beak, a new aluminum muzzle prevents vicious picking, cannibalism and feather pulling. The muzzle is so delicately balanced that it automatically swings out of the way when the chicken lowers its head for eating and drinking, swinging back into a closed position when the bird raises its head. The device thus prevents the chicken from attacking others, or its own body.



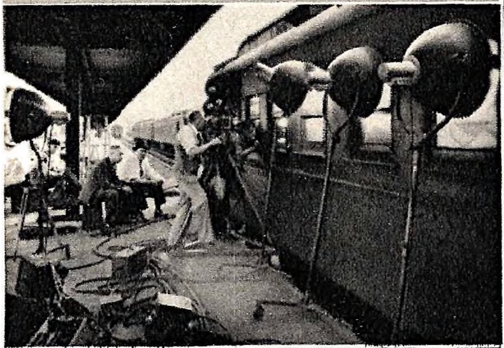
Proposes Orientable Roof-Top Airports For Cities

PROPOSED as a solution to the problem of locating an airport in the heart of any big city, a design for a long orientable runway, which would be mounted on circular tracks atop tall buildings, as sketched above, has been conceived by a French engineer.



ABOVE: Not a movie studio, but the Vitaphone camera crew "shooting" a colorful scene in the Sherwin-Williams paint plant, Newark, N. J. Note the array of lights. BELOW: Taking pictures of the compact dining car of the 20th Century Limited called for some tricky arranging of lights and camera.

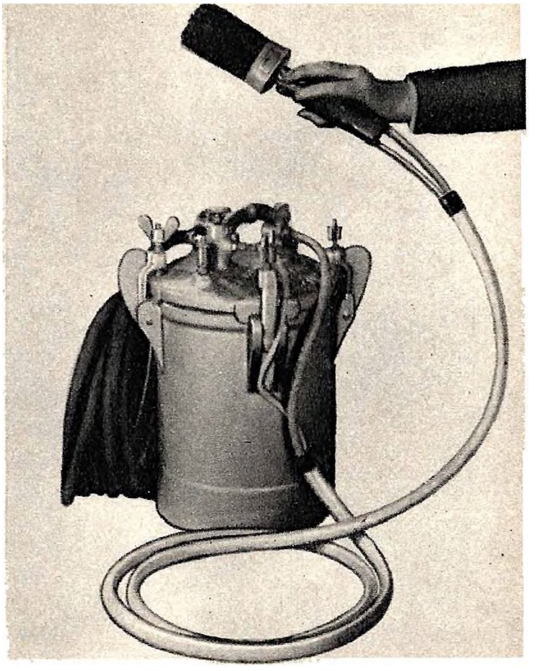
First MI MOVIE



The first of the Vitaphone-MECHANIX ILLUSTRATED movie "shorts" (announced on page 70 of our June issue) will be shown throughout the country during the early part of the summer. Don't miss it! On this page are scenes from the four sequences the reel contains. ABOVE: The color camera is hitched to a powerful microscope in the Westinghouse laboratory in Bloomfield, N. J., to record the lethal action of special ultra-violet light on bacteria. Ira Genet, Warner Brothers director of the MI "short", is in the chair in front. LEFT: Dr. William J. Conway, chemistry instructor at Fordham University, New York, demonstrates some of the magical properties of "liquid air".

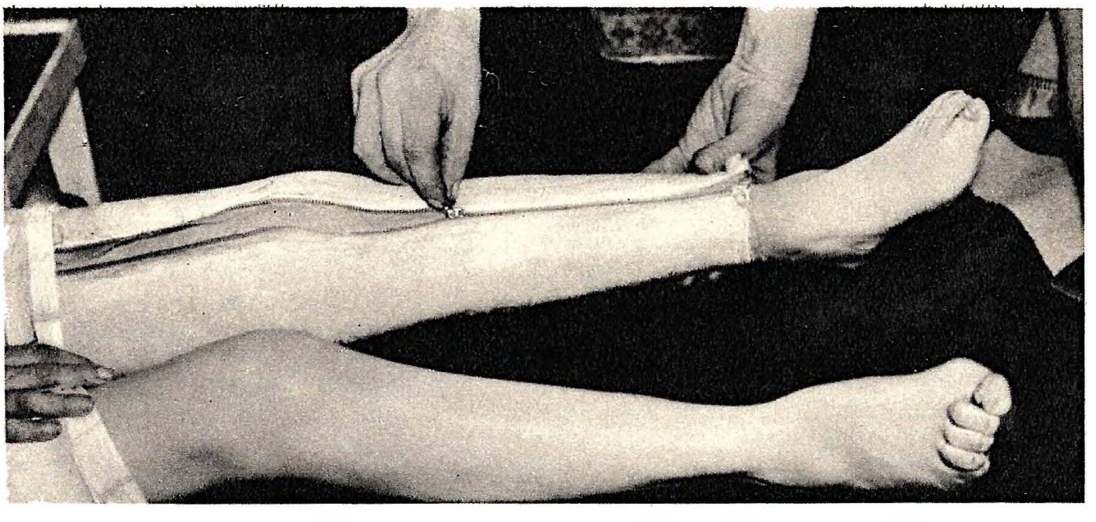
Aero Engine Silencer Tested

A NEWLY developed torpedo-shaped airplane engine silencer is said to have proved itself to be 90% effective, as compared with the 45% efficiency of older types of silencers. The silencer is receiving considerable military attention due to its wartime possibilities, while its peacetime advantages have aroused commercial interest.



Fountain-Type Brush Devised

CONTROLLED by a button on its handle, a new fountain-type paint brush is operated by compressed air in such a manner that its bristles are fully and evenly charged with paint at all times.



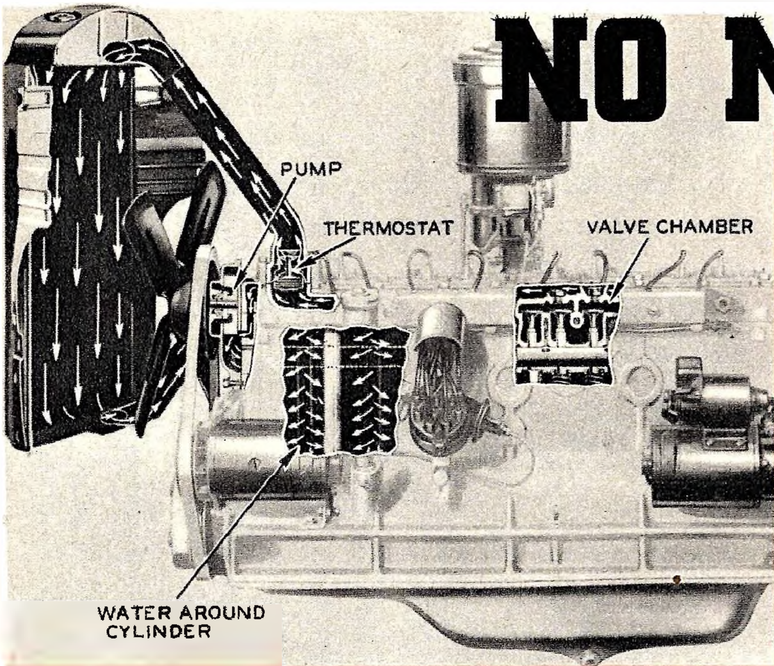
Layman Invents Zipper-Type Cast For Fractures

INVENTED by Harry M. Gillen, a former trolley conductor, a new fracture cast features a zipper, enabling a surgeon to treat a fracture without being obliged to make a new cast whenever he removes the old one for observing the progress of healing.

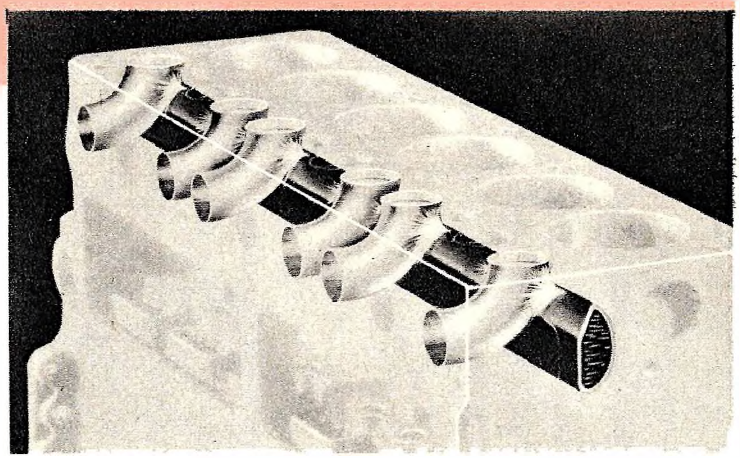
NO MORE

by
F. C. Russell

Enjoy a summer of happy motoring free from engine overheating trouble by following recommendations in this article. Keep engine temperature down by checking radiator, fan, pump, jacket, carburetor and ignition.



Flow of water for engine cooling illustrated above. Right—Miniature geysers cool the exhaust ports.



AT THE temperature an engine operates, the air that blows over it, if given half a chance, is sufficiently cool to do a successful job of preventing motor fever in hot weather. This is a simple fact which the makers of your car demonstrated to their own satisfaction in the many miles of tests conducted before it was rolled off the assembly line for your personal use. Let this air do its stuff, and you can face summer motoring with a smile.

We whipped the cold weather bugaboo by the simple process of using oil light enough to keep starting compression up to normal. We can whip the vision of hot weather fever by the equally simple plan of seeing to it that the water circulation system and the engine itself do not handicap nature's cooling system --the air flow.

There may be occasional trouble from dragging brakes, a slipping clutch or an oil-starved rear-end, but these will soon demand their remedying and thus make overheating temporary. Our real object is solving the problem of keeping the engine cool, calm and collected during that season of the year when too many cars, like some drivers, show a tendency to go crazy with the heat.

Water in the engine helps conduct heat from the engine to the air. The metal of the cylinders actually is part of the cooling system, since it conducts heat from the combustion chambers to the water jackets. Whatever media are employed the heat eventually must get to the air. You could have an oversized cooling system and yet get almost immediate overheating if there were no way for air to get to the radiator or the outside of the engine. So any attempt to keep the engine from going into a fever must start with making sure that a sufficient amount of

MOTOR FEVER

air reaches it. This air must also leave the engine quickly after it has wiped off the heat.

If the radiator core is painted or splattered with mud, if there are accumulations of dead insects between the fins, or the front is covered with too many emblems, licenses and adornments, the air cannot do a cooling job. Remove the accumulations between the fins by blowing air under pressure from the engine side. This done, take the next step by checking the fan. This unit helps drive air over the engine after heat has been transmitted to it from the water system. The fan is essential during idling, gear shifting and in the lower speed range when there is not much air in circulation. See that the belt doesn't slip, but don't make the common mistake of tightening it to a point where the fan bearings are cramped. You should just be able to turn the fan by pressing lightly with your fingers. The fan's bearings should be lubricated as specified in the instruction book. Some bearings should be greased; others oiled.

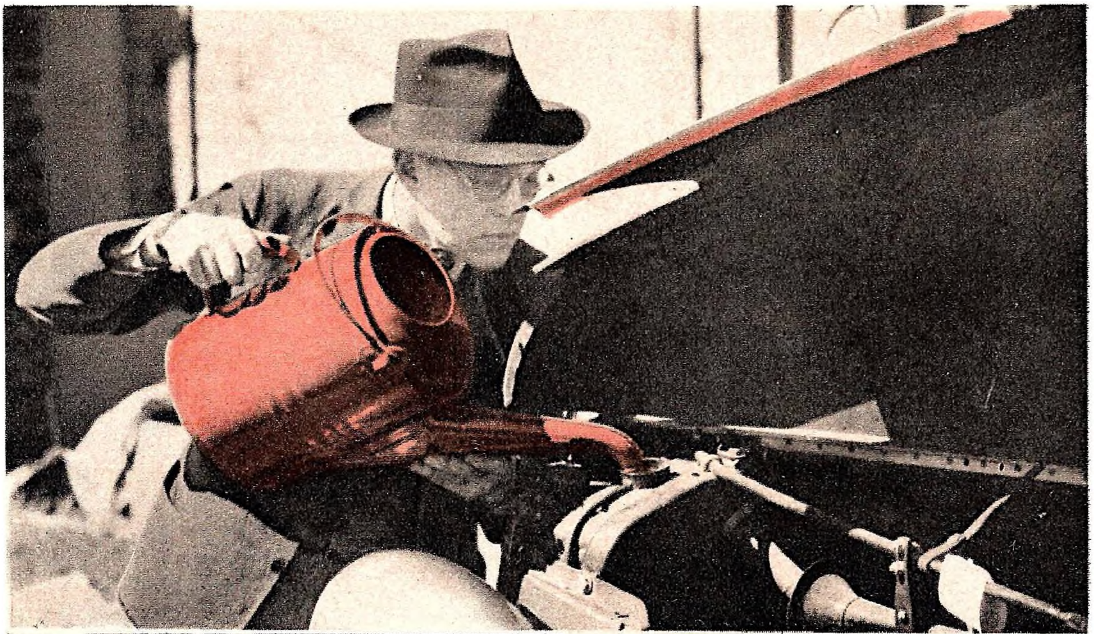
Assisting the fan in dissipating the air after it has wiped off the engine's excess heat are the hood louvres. Many motorists make the mistake of not opening these in hot weather, just as they overlook the advantages in keeping the engine cool through maintaining a flow of air under the hood. Why, for example, stop at the top of a hill to "let the engine cool off?" Why not go on down the other side and stop at the bottom? On the downgrade quantities of air will blow over the engine, and with the water circulation to help along the process of dissipating heat, the engine's temperature will show a marked drop in a few minutes.

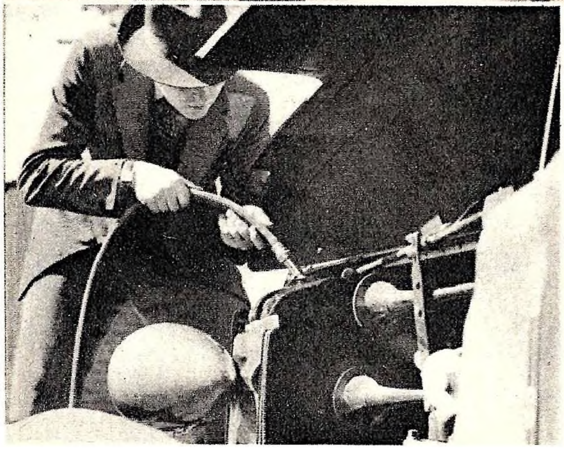
The next step concerns the medium of water circulation. Here we run into most of the trouble. Water circulation tends to drop in efficiency because of the action of air and water on metal. If we could have a closed cooling system with no air circulating through the radiator and water jackets there would be no oxidation, and thus no rusting. We could use distilled water and obtain an ideal arrangement. In fact, we could use anti-freeze all year 'round and never give the circulation system a minute's thought.

As matters stand we have to expect rust, scale and sediment, but we do not have to force this to collect in the radiator which we certainly do when following the usual method of flushing the circulation system. Why stir up the sediment and then allow it to flow through to the fine passages of the radiator core? Why not make two jobs of flushing by separating the jackets and the radiator?

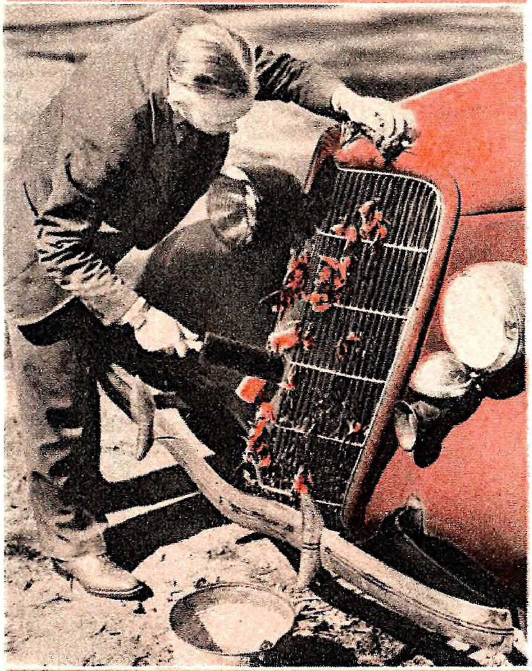
This is just a matter of disconnecting the hose between radiator and engine. Reverse flush the radiator with any of the prepared compounds now on the market. If you prefer to make up your own solution use ordinary washing or baking soda dissolved in hot water in the proportion of one teacupful of soda to each two gallons of water. Bear in mind that when reverse flushing the engine jackets where an aluminum head is used a special flushing compound is necessary. All this should be done with an air and water stream under pressure, and as the average car owner does not have such equipment it is advisable to go to a good radiator man for this work.

The fan belt should have about an inch play. If it's too tight the fan bearings will be cramped—and heat-up.





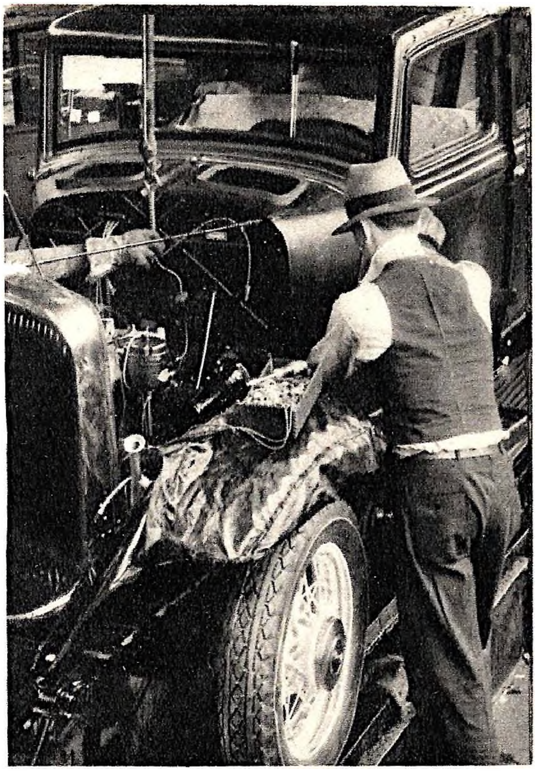
Above—When checking radiator watch for insufficient water supply, obstructed flow, anti-freeze not removed, leak in overflow pipe, pinched overflow pipe, inside of tubes or passages clogged. Left—Radiator should be flushed. A garden hose will answer the purpose. Disconnect the hose between radiator and engine when flushing the former.



Fins or air passages stopped up with mud, insects or leaves; bent or loose baffle plates, tubes or passages pinched or bent all serve to overheat an engine. Clean the radiator cores with a brush or air hose. Don't attach license to the grille.

If the motor thermostat has been in service for some time the chances are that it will not work freely and should be replaced. Hose connections also should be replaced. With the radiator partially clogged, and the water pump drawing heavily, the lower hose may collapse and shut off circulation of water just like a thermostat that fails to open. A makeshift remedy is to insert a coil spring in the hose so that it won't suck inward, but the more permanent solution is to go back to the radiator and try to find out why it doesn't allow water to circulate freely.

A badly clogged radiator will upset all hot weather calculations. No matter how efficient the rest of the system may be it cannot possibly get over this hurdle. Where the radiator is not too hopeless it should be given a bath of one quart of commercially pure



Interference with an engine's normal power output will cause overheating. Then the engine needs an overhauling job.

muriatic acid to five gallons of water; otherwise it should be replaced. Many a radiator reaches the end of its usefulness in its third year. It is usually because the owner has not taken steps to inhibit rust, not forgetting his habit of flushing the system in such a way as to force a collection of sediment to be trapped in the radiator core.

Rust can be checked by the simple process of putting emulsifying oil in the circulating system. A little goes a long way. You can purchase such rust inhibitors at any filling station or in bulk at chemical and paint stores. Ask for emulsifying oil. A pint will be enough for the season. So effective is such oil that it will clear up a rusty cooling system.

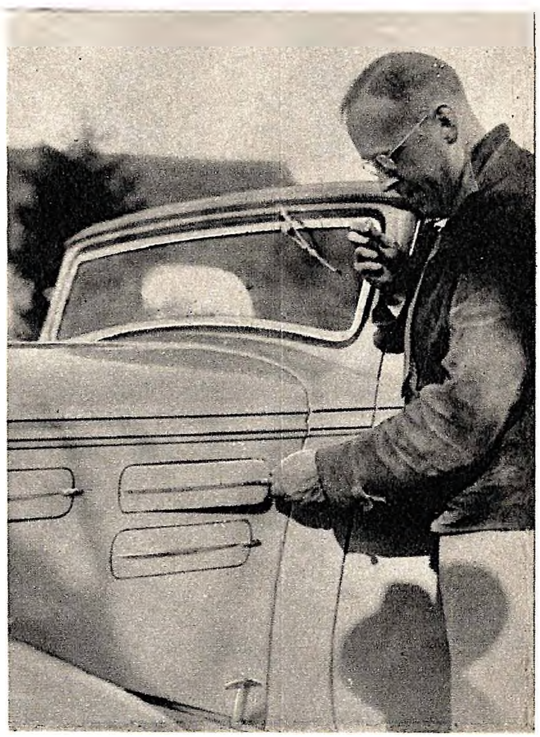
Occasionally a water pump will fail when the impellor sheers off its shaft. In that case the engine's fever is so acute that the owner is forced into having the situation remedied immediately. Where the pump has gone bad no water will be forced to the top of the radiator while the engine is running. Looking into the radiator top will also tell you when the radiator is blocked or the lower hose is collapsed. As you accelerate the engine the water level in the radiator should not rise. You can quickly decide whether the blockage is due to the radiator or the hose connection by glancing at the latter.

So much for what might be called the heat dissipation process. Equally important is the business of seeing to it that the engine does not generate more heat than it normally would. To check any such tendency is to prevent the engine from overtaxing the cooling system. Most important in this part of the work is timing and carburetion. An engine that overheats in summer would be equally troublesome in cold weather, but owners are inclined to take a fatalistic attitude toward the situation and blame the weather. Timing tends to go late and should be checked up at least every two months.

Much knocking that is believed to be due to carbon, fuel detonation and pre-ignition from overheated spark plugs is simply a result of the engine laboring with a lean mixture. An excessively rich mixture will also cause overheating, but since most owners are trying for maximum gas mileage in summer the chances are ten to one that the mixture is too lean.

Any tendency toward constant detonation will encourage overheating. Anti-knock fuel usually checks this. Among the special but

[*Continued on page* 137]



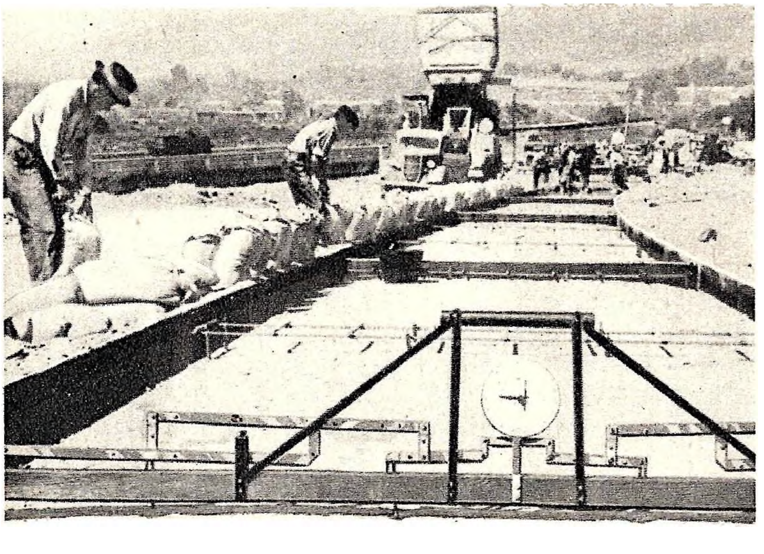
Much overheating is due to failure to open hood louvres. These allow exit of the hot air after it cools the engine.

Chair Aids Window Cleaner

ATTACHED to the window framing by means of clamps, a newly developed high-backed all-metal chair enables a housewife to accomplish the usually dreaded task of washing windows in absolute safety and comfort. The chair folds flat when not in use.

Novel Glass Washer Devised

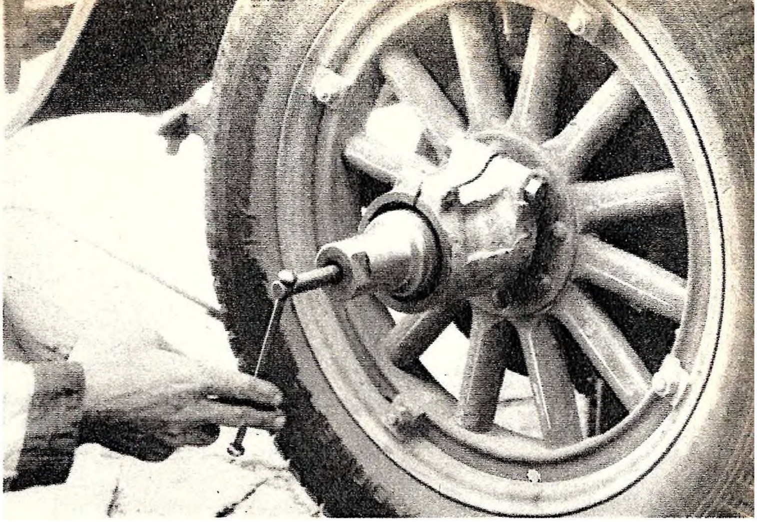
USING water pressure for power, a new sanitary glass washer bombards the interior of the glass with tiny rubber pellets, which are impregnated with fine emery particles, thus washing, scouring and polishing the glass. The water carries away all residue



Device Figures Concrete Bulk

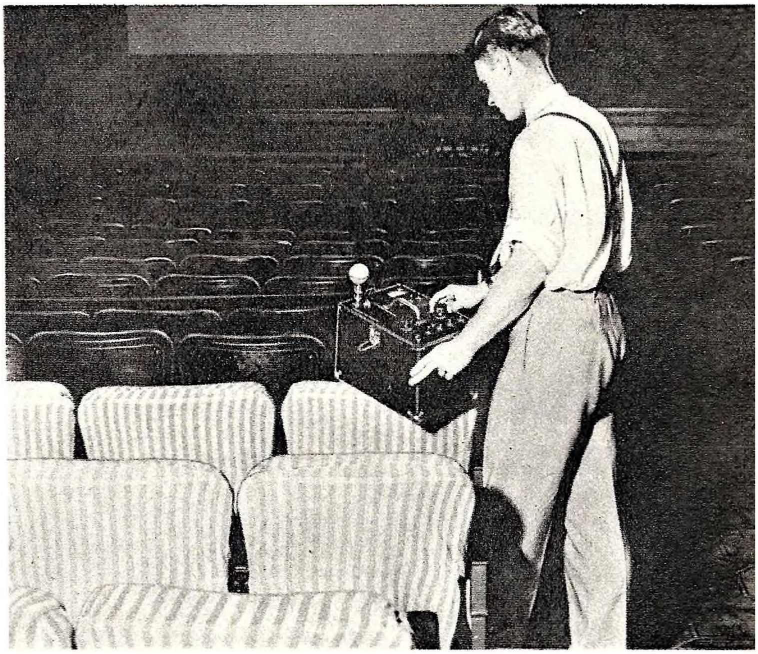
DESIGNED by C. N. Wilozek, an engineering assistant of the California Division of Highways, a portable "volumeter" device is said to quickly and accurately indicate the volume of concrete needed for each 25-foot length of pavement. The meter eliminates guesswork, elaborate figuring and the occasional differences in estimates that arise between contractors.

Wheel Remover Jack Exerts 100-Ton Pull



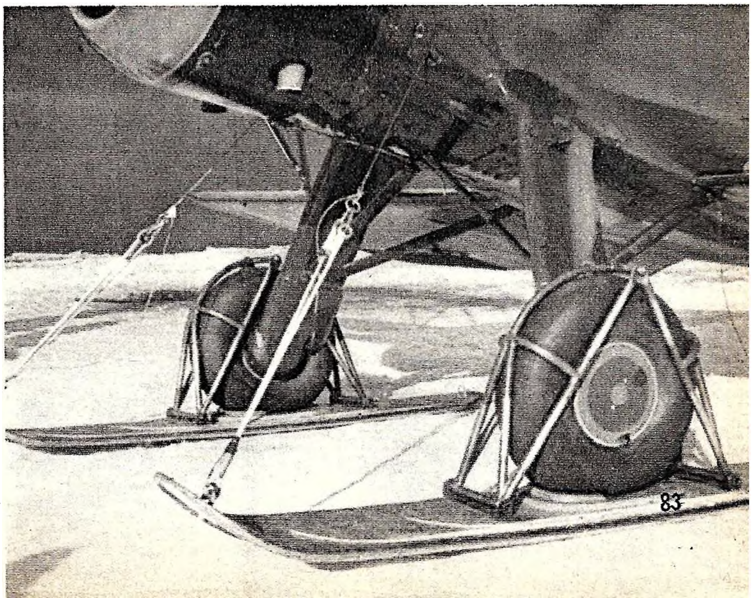
SCREWED on the axle of any auto wheel by means of a special adapter unit, which is clamped firmly on the hub, a new hydraulic jack exerts a 100-ton pull and, at the mere turning of a hand lever, is said to remove the most stubborn wheel without the damage sometimes caused by wedging and tapping methods.

Portable Unit Gauges Intensity Of Sound

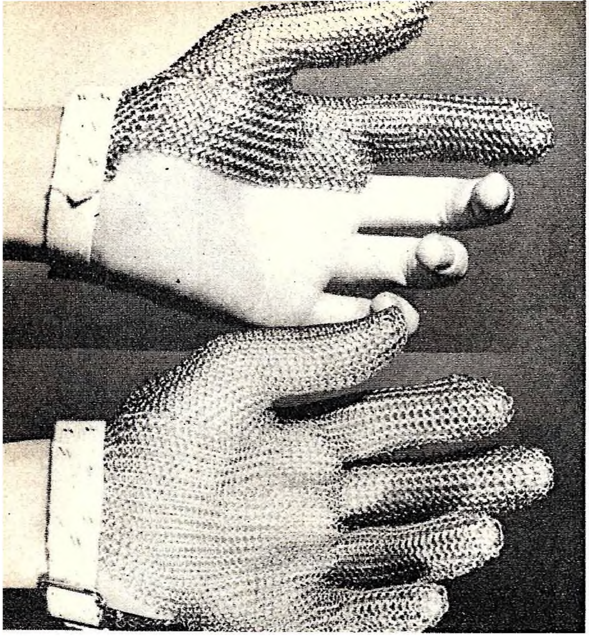


PORTABLE and entirely self-contained, a recently developed sound meter unit measures the sound made by all types of machinery. Operated by batteries, the sound meter has a non-directional pick-up and does not have to be pointed at the source of the sound. The device can also be used to measure the efficiency of sound-proofing material in offices, airplanes, trains and broadcasting stations. The accompanying photograph shows the meter being used to plot the sound distribution inside a theater, one of the device's most common adaptations.

Rig Adapts Plane Skis To Landing Wheels



ENABLING skis to be attached to an airplane landing gear without the need of removing the wheels, a novel ski rig has been developed by C. Skinner, a Canadian commercial pilot. The rig consists of hinged tubing which is attached to the skis in such a manner that it can be slipped over or off the wheels by simply removing a couple of cotter pins. The pneumatic wheels act as shock absorbers.



Gloves Made Of Wire Mesh

SAID to be as flexible as canvas types, newly developed metal-mesh work gloves cannot be pierced by knives, broken glass, etc. The novel gloves can be obtained in models to protect a few fingers or the entire hand.

Device Frees Wedged Foot

INVENTED by H. C. Schultz, a fireman in Kansas City, Mo., a special type of metal shoehorn is designed to help free the human foot if, by accident, it should become wedged within a drain pipe.

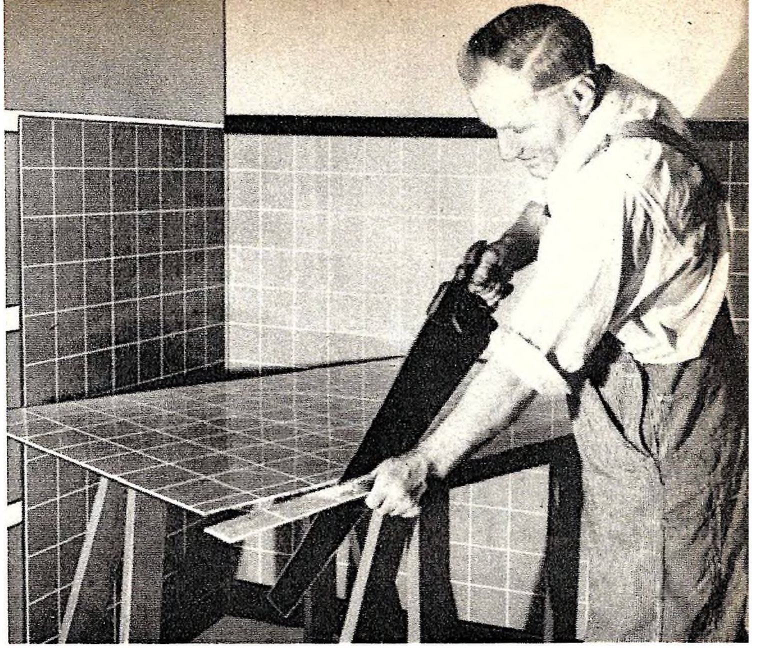
Builds Speedy Power Bike

CONSTRUCTED entirely from salvaged parts such as an electrical conduit, wheels from an old airplane, a second-hand washing machine motor, etc., a powered bike built by Howard Strube, of Omaha, Nebraska, is said to attain a speed of 35 m.p.h. In addition to its comfortable traveling speed, the home-built power-bike is economical to operate, three quarts of a gas-oil mixture running it for 100 miles.

Glazed Lines Guide Traffic

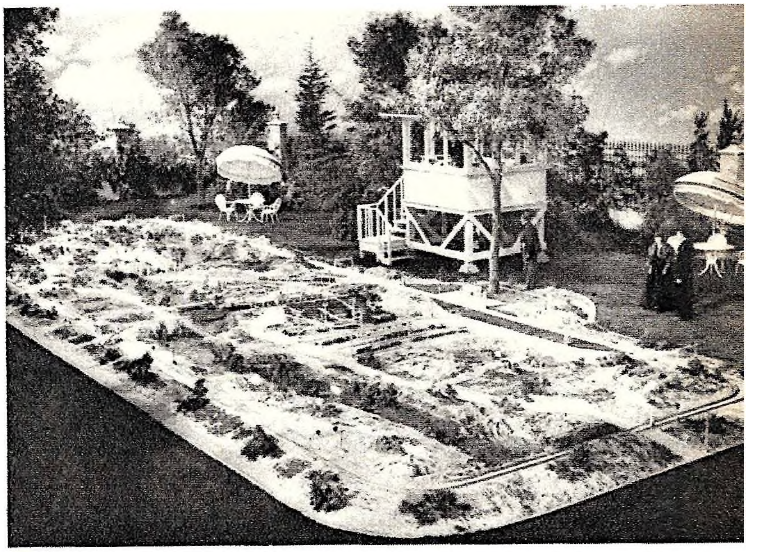
TERRA-COTTA is the latest material to be used for guide lines to separate streams of traffic. In the new Lincoln Tunnel under the Hudson River between New York and New Jersey a double line of white glazed terra-cotta blocks have solved the difficulty of painted marks, which wear off, and of concrete markers, which become discolored by traffic. The terra-cotta is white throughout its thickness, and remains white and shining regardless of wear.

Fireproof "Tiles" Sold In Sheet-Panel Form



RESEMBLING ceramic tile in appearance, a new fireproof material made of cement and asbestos is available in 32x48-inch panels, each containing 96 "tiles" of any desired color. The panels can be cut to size with a saw and are easily applied to walls. Made under hydraulic pressure, the panels have unusual strength, and an oil and baking treatment makes them waterproof. The tiling material is available in a variety of bright colors.

Model Railroad Used For Movie Set

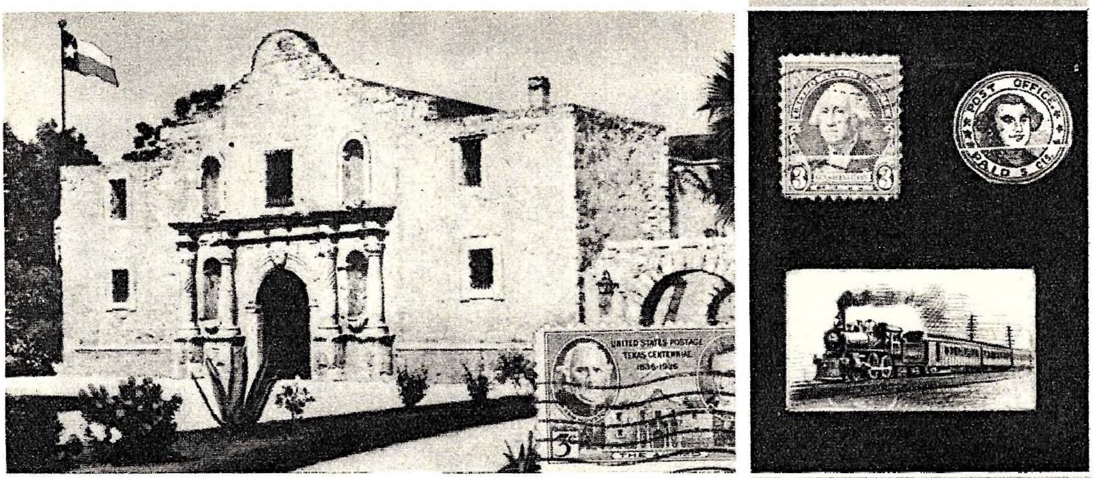


ONE of the most complete model railroad systems ever constructed was recently completed by Warner Brothers' technicians for use in a motion picture—"Four's A Crowd." The system features a double tracked "right of way" which crosses 13 bridges, circles the side of sun-baked and brush-clad hills, clambers over the top of hills and loops around the shores of a lake the size of a dishpan. The layout covers a space 80 by 30 feet in size.

Device Projects Book Pages On Screen

ENTIRE pages from books or catalogs can be flashed upon a screen through use of a newly developed projection machine. The device can also be used to project images directly from tools and other objects. Besides a lens for projecting opaque objects, the projector is equipped with an auxiliary lens for use with lantern slides. A small fan dissipates the heat generated.

NOW They Can Be Shown



by Montgomery Mulford

FOR upwards of fifteen years pictures of United States stamps were forbidden. But at last the law has been changed, and we may now view our country's stamps in black and white reproductions.

The effect of this will be very beneficial. Hitherto, when stamp writers discussed U. S. adhesives, they could not show in pictures what they were writing about, and so, sometimes, were unable to point out emphatically, so that it could at once be noted, certain important things about these stamps. The permission to picture U. S. stamps will also have an effect on the philatelic market, increasing, still more, the popularity, and the attraction, of these issues.

This means, also, that albums will now illustrate main types, so that the beginner will not be puzzled as to where some of the issues should be placed.

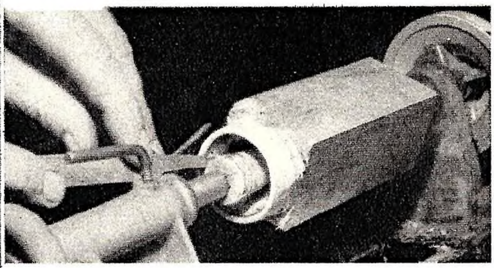
Since we may picture U. S. stamps at last, a number of interesting things which we have been talking about for fifteen years, will be illustrated. For instance: note the number of stamps showing different "cent" markings —examples of which are illustrated above.

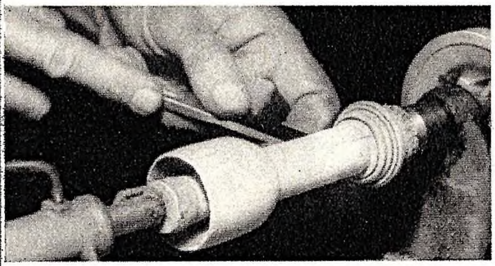
The Senate of the United States passed the bill legalizing the illustration in black and white of U. S. stamps, in mid-August, 1937. The House of Representatives passed the bill during the third week of January, 1938. The President signed the bill the latter part of January. It had long been prophesied that this would come about; and in 1937 the post office issued a large booklet on the story of

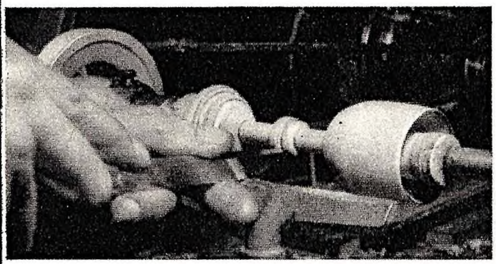
[*Continued on page* 140]

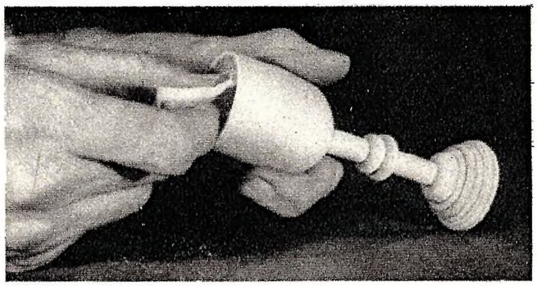
CRAFTS and HOBBIES

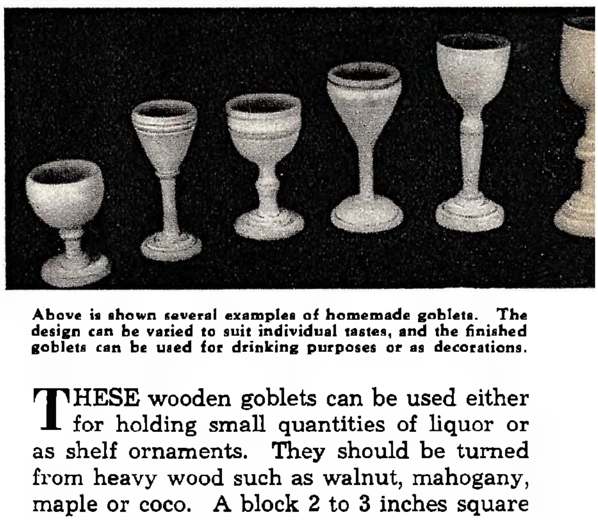
Small Wooden Goblets Lathe Turned In Home Workshop



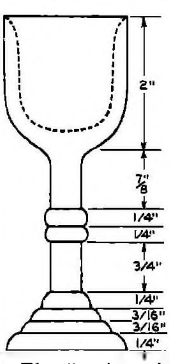








Above is shown several examples of homemade goblets. The design can be varied to suit individual tastes, and the finished goblets can be used for drinking purposes or as decorations.



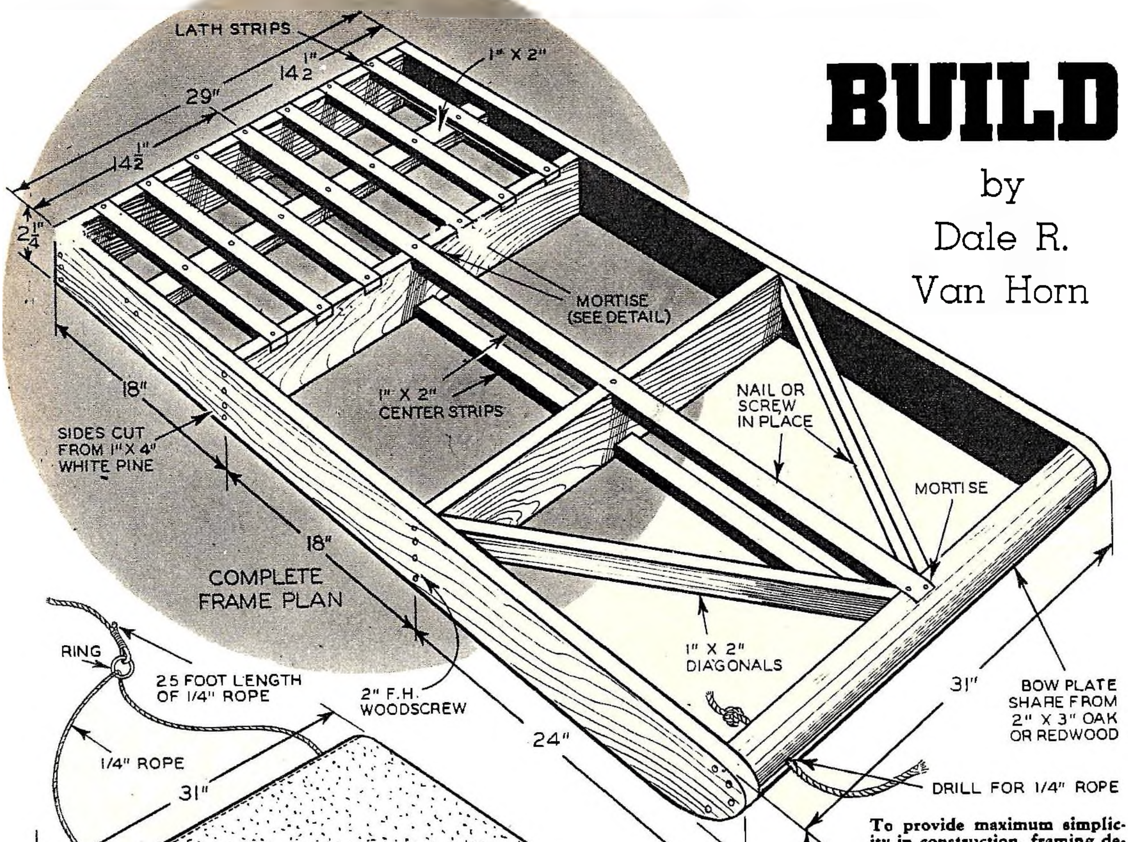
The dimensions given above are for the goblet shown in the lathe. The sharpened tang of a flat wood file makes an excellent cutting tool for scooping out the center. When the shaping is completed, the goblet is sanded while still in the lathe. If the goblet is to be used, it should be finished with several coats of varnish.

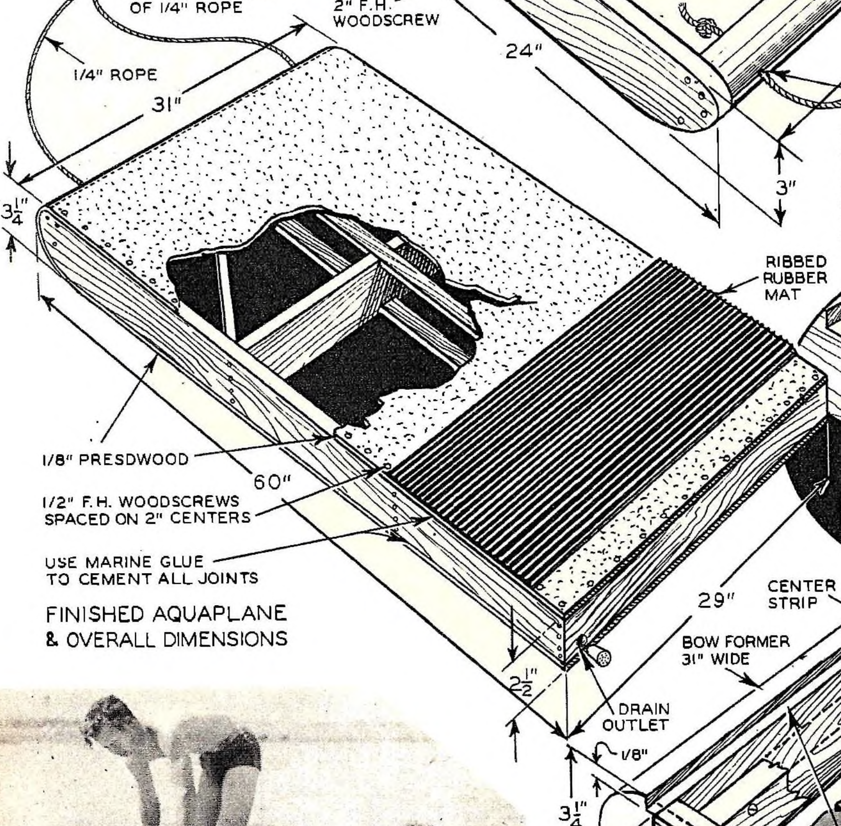
THESE wooden goblets can be used either for holding small quantities of liquor or as shelf ornaments. They should be turned from heavy wood such as walnut, mahogany, maple or coco. A block 2 to 3 inches square and 6 inches long is the correct size. Mounted in the lathe, the center should be scooped out first. The depression should measure about 1½ to 1¾ inches. When the center is removed, the outside of the bowl is turned. A skew chisel is the correct tool for this work. When the shaping is completed, the dead center holding burr is removed. A thorough sanding of the outside is obtained by using coarse, medium and then fine abrasive paper while the goblet is still in the lathe.

WOODWORKING - RADIO - METALCRAFT - AUTOMOBILES - CHEMISTRY
PHYSICS - MODEL BUILDING - ELECTRICITY - HOME AND SHOP KINKS

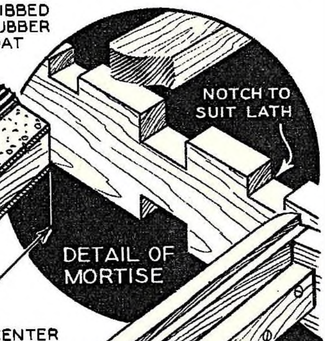
BUILD

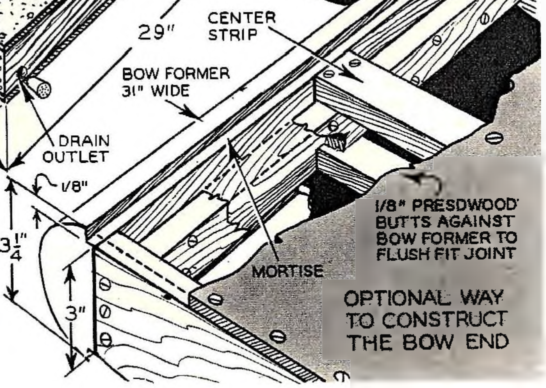
by
Dale R.
Van Horn





To provide maximum simplicity in construction, framing detail and "cut-through" plan of the completed aquaplane are shown in perspective. Below—Mortise detail and optional simplified bow assembly.





THIS *Low Cost* Aquaplane

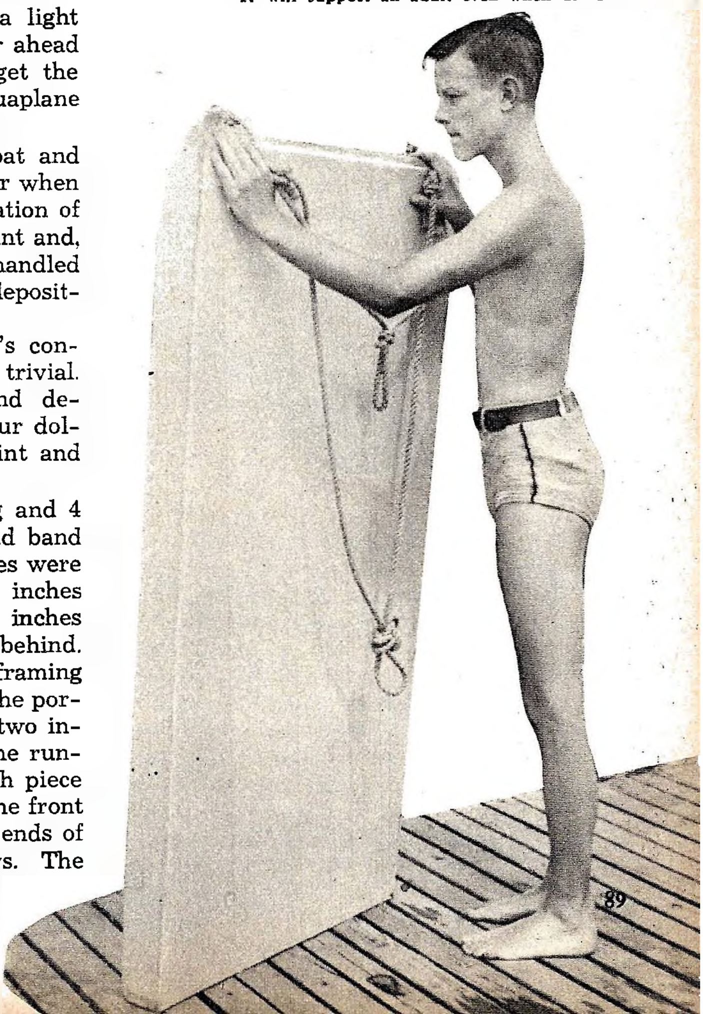
Piloting an aquaplane behind a speeding outboard racer does not require as much skill as when handling a surfboard, but gives the same thrills. The buoyant qualities of the aquaplane are evident in the upper inset photo. It will support an adult even when at rest.

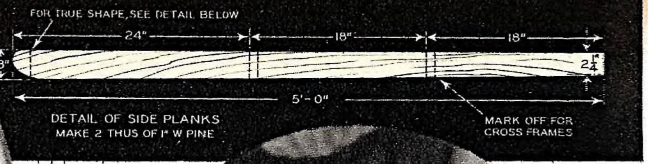
WHY not an aquaplane—a trailer to hitch behind your outboard board? If you think there's sport in piloting a light composition racer over rippling water ahead of a kicking 2-cylinder job, you'll get the real thrill of your life riding an aquaplane behind it.

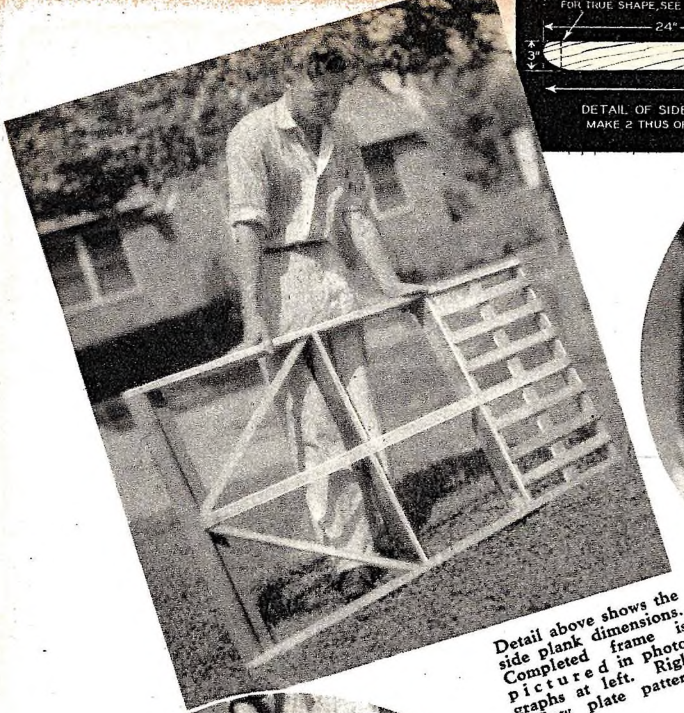
Everyone who has ridden both boat and aquaplane invariably chooses the latter when breath-taking fun is desired. A variation of the surfboard, the aquaplane is buoyant and, therefore, can be much more easily handled at low speeds without unexpectedly depositing its rider in the water.

Due to the simplicity of the craft's construction, the outlay for materials is trivial. In fact, the aquaplane pictured and described here cost its builders only four dollars. And that included such as paint and rope!

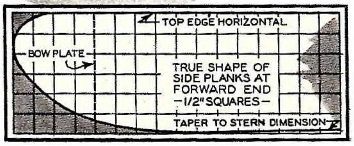
Two white pine boards 5 feet long and 4 inches wide were tacked together and band sawed sled runner shaped so the pieces were 2½ inches at the back end and 3¼ inches wide in front. These were space 31 inches apart in front and 29 inches apart behind. The accompanying details show the framing method used. Lath strips reinforced the portion on which the rider stands, with two intermediate cross members between the runners spaced as shown. A 2 by 3-inch piece of redwood was shaped round along the front edge and fastened between the front ends of the side pieces with long wood screws. The



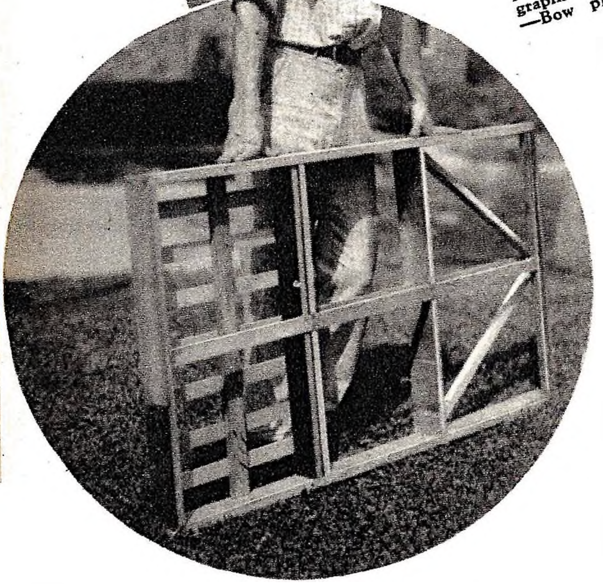




A drain hole, plugged with a cork makes it an easy matter to remove any water that may seep into the aquaplane through seams.



Detail above shows the side plank dimensions. Completed frame is pictured in photographs at left. Right—Bow plate pattern.



angle braces and the long center strip were all tacked to this.

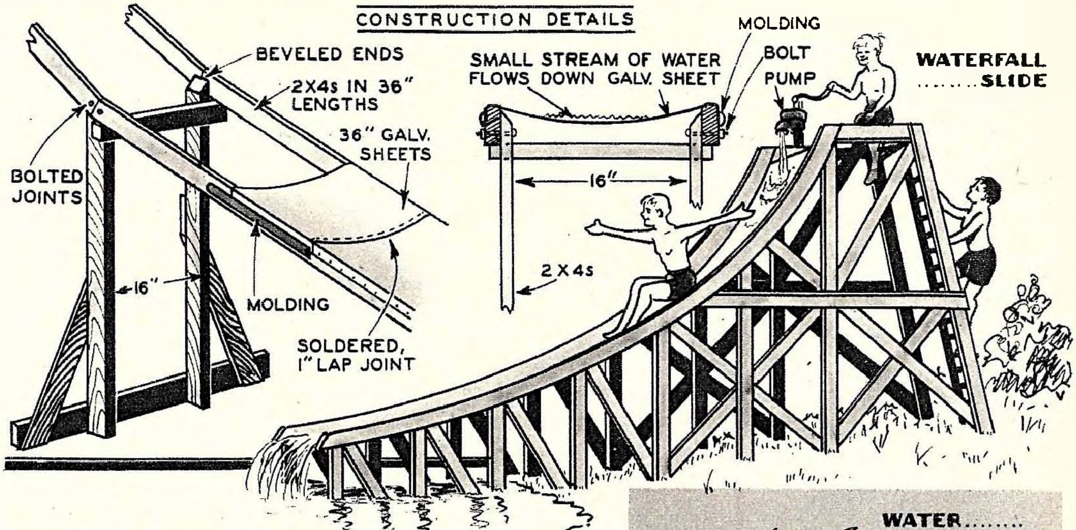
Covering for the top and bottom was presdwood ⅛-inch thick. A little bending to shape was necessary for the top, front edge, but the rest was flat work with wood screws put through holes bored along the edges 2 inches apart. Then the whole job was painted. Two holes were bored through the redwood stick in front to admit the ends of a ¼-inch rope, about as long as an ordinary sled rope. A hole was also bored in one corner of the back end and a cork inserted so that, in case of slight leakage, the water could be easily poured out. Slight cracks and holes were filled with filler and smoothed off with sandpaper before painting. A ribbed rubber mat was also provided after the first trial so that bare feet would have a good chance to stay put. Between the aquaplane rope and the boat was strung another 25-foot length to give more thrills and permit swinging far out on the turns if desired.

There are two ways to ride this boat "trailer." One is to spread the feet, stand with the body's weight evenly distributed when making a turn. The other method for rounding corners is to ride the back, outside corner, causing the aquaplane to follow pretty accurately its own groove.

Tests showed that the motor planes both boat and aquaplane with two in the boat and one behind.

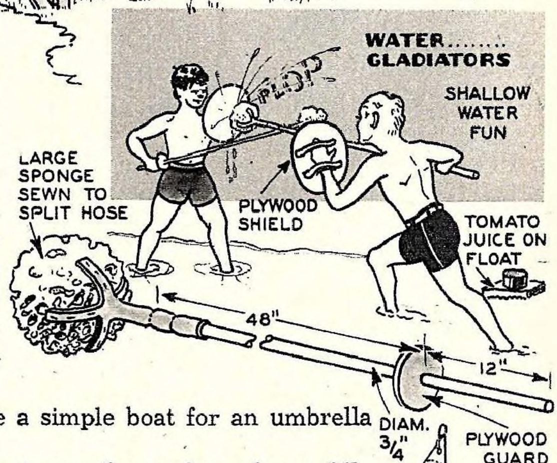
The aquaplane is not cumbersome to transport to a lake or river with power boat, engine and accessories loaded on top a small car. An old mattress cushions them from jolts.

SOMETHING .....NEW IN WATER SPORTS



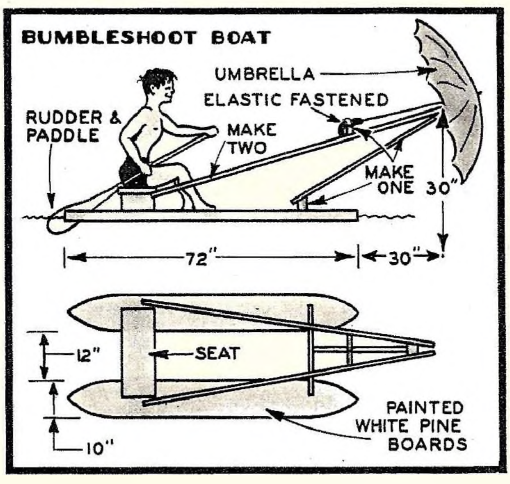
SLIDING down a steep, smooth trough in a stream of water will add a new sensation to swimming experiences. The chute will not be expensive if built with old lumber. The galvanized trough, however, must be absolutely smooth and the joints lapped shingle-fashion and soldered. Water is supplied with an old-fashioned hand pump which can be purchased for a nominal sum.

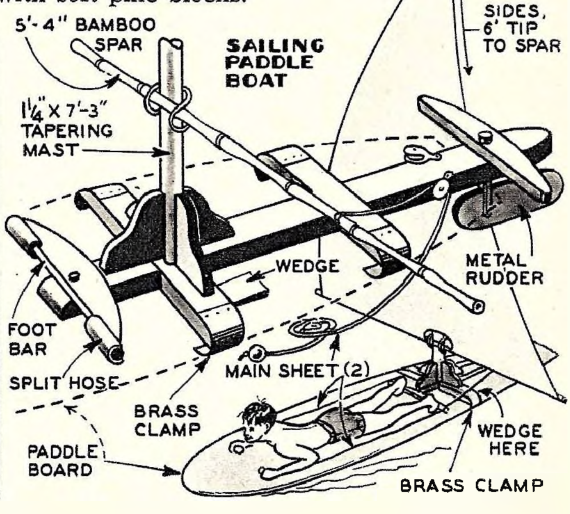
Combat in shallow water with tomato-juice soaked sponges is harmless and hilarious fun.



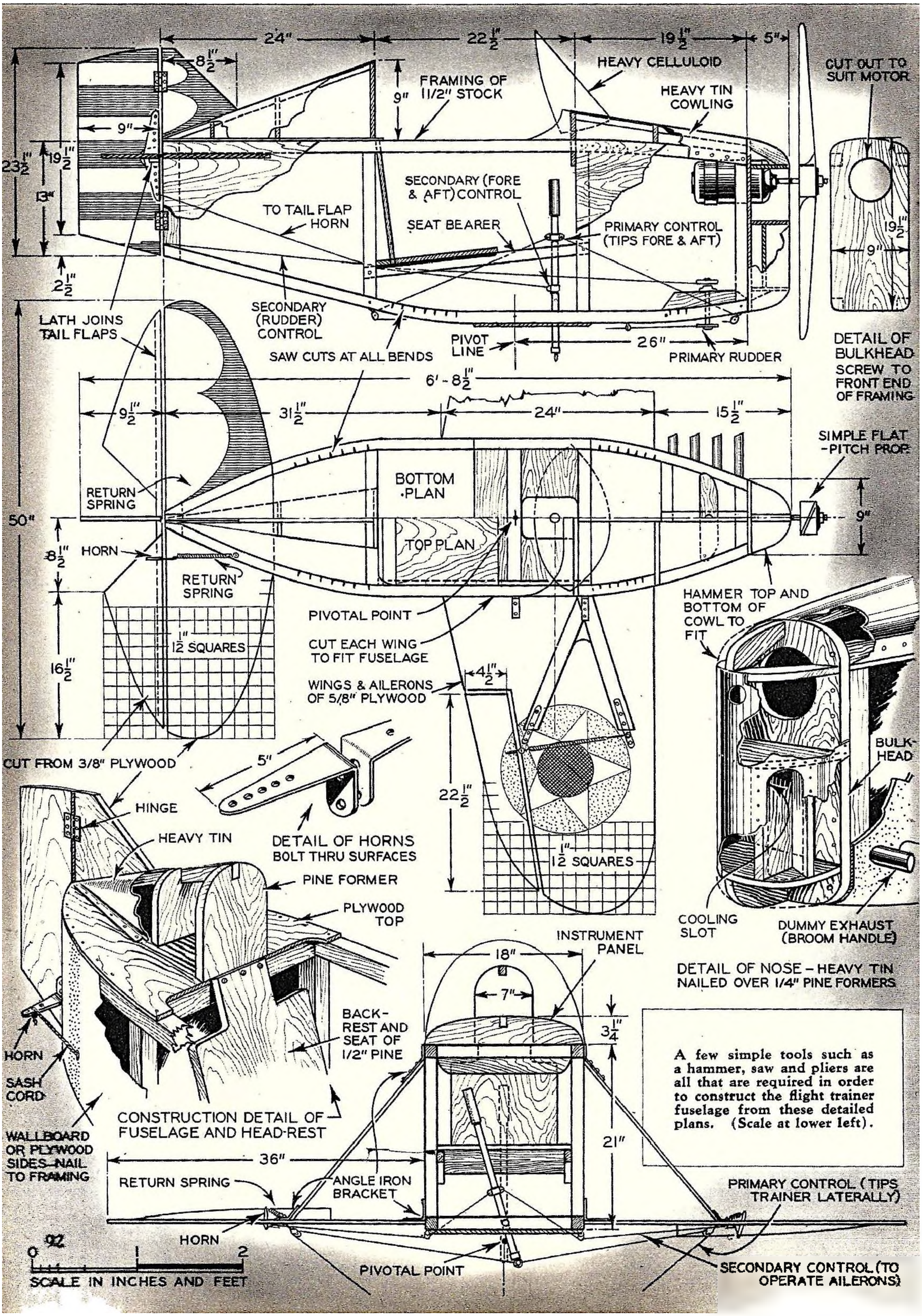
Two planks and a light tripod frame make a simple boat for an umbrella sail—and it travels fast in a wind.

This sail rig is so constructed that it will not mar the surface of a paddle board, being wedged on the tapering stern with soft pine blocks.





A Flight Trainer For



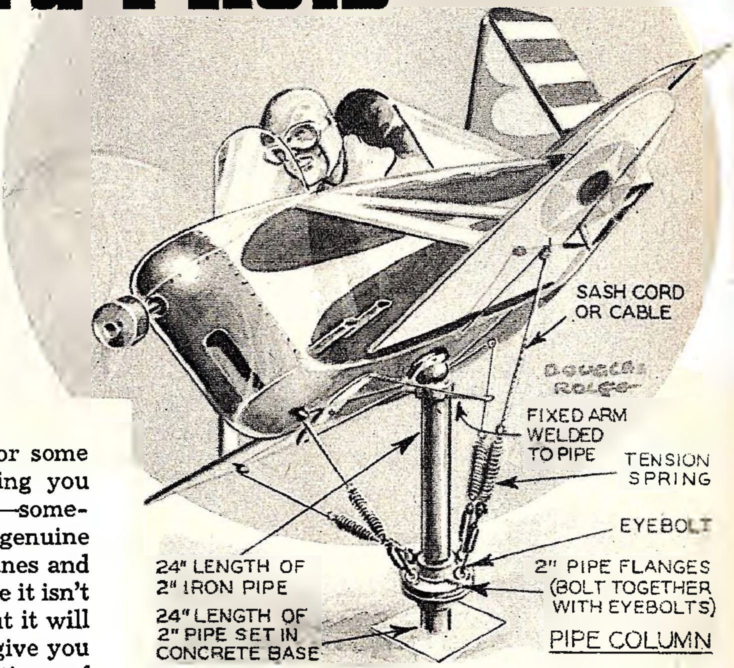
A few simple tools such as a hammer, saw and pliers are all that are required in order to construct the flight trainer fuselage from these detailed plans. (Scale at lower left).

Back Yard Pilots

A practice "plane" that is instructive and thrilling, too.

by Doug Rolfe

The manner in which the flight trainer can be mounted on a pipe column anchored in concrete and how springs are utilized to help maintain balance are shown at right.



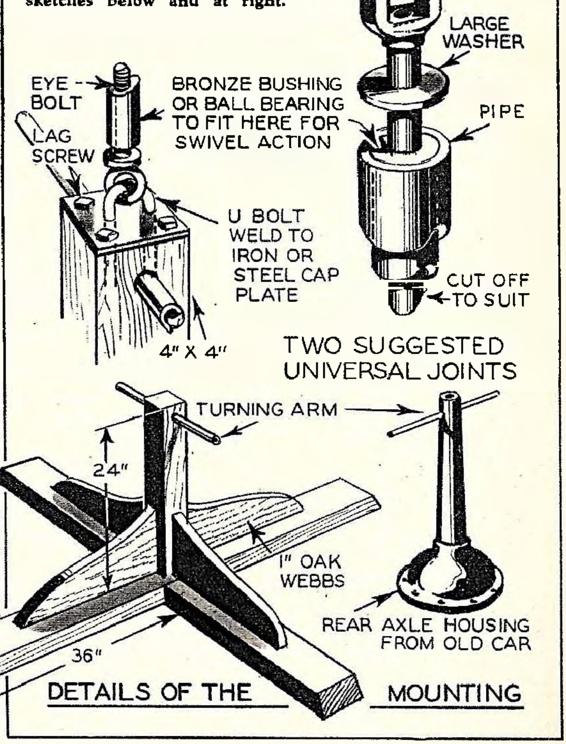
"DO YOU want to be an aviator some day?" Well, here's something you can practice on in the meantime—something that really looks like the genuine flight trainers used by the big airlines and lots of flying schools, too. Of course it isn't so complicated, or as expensive, but it will provide you with endless fun and give you some real instruction in the functions of the controls, and their preliminary handling.

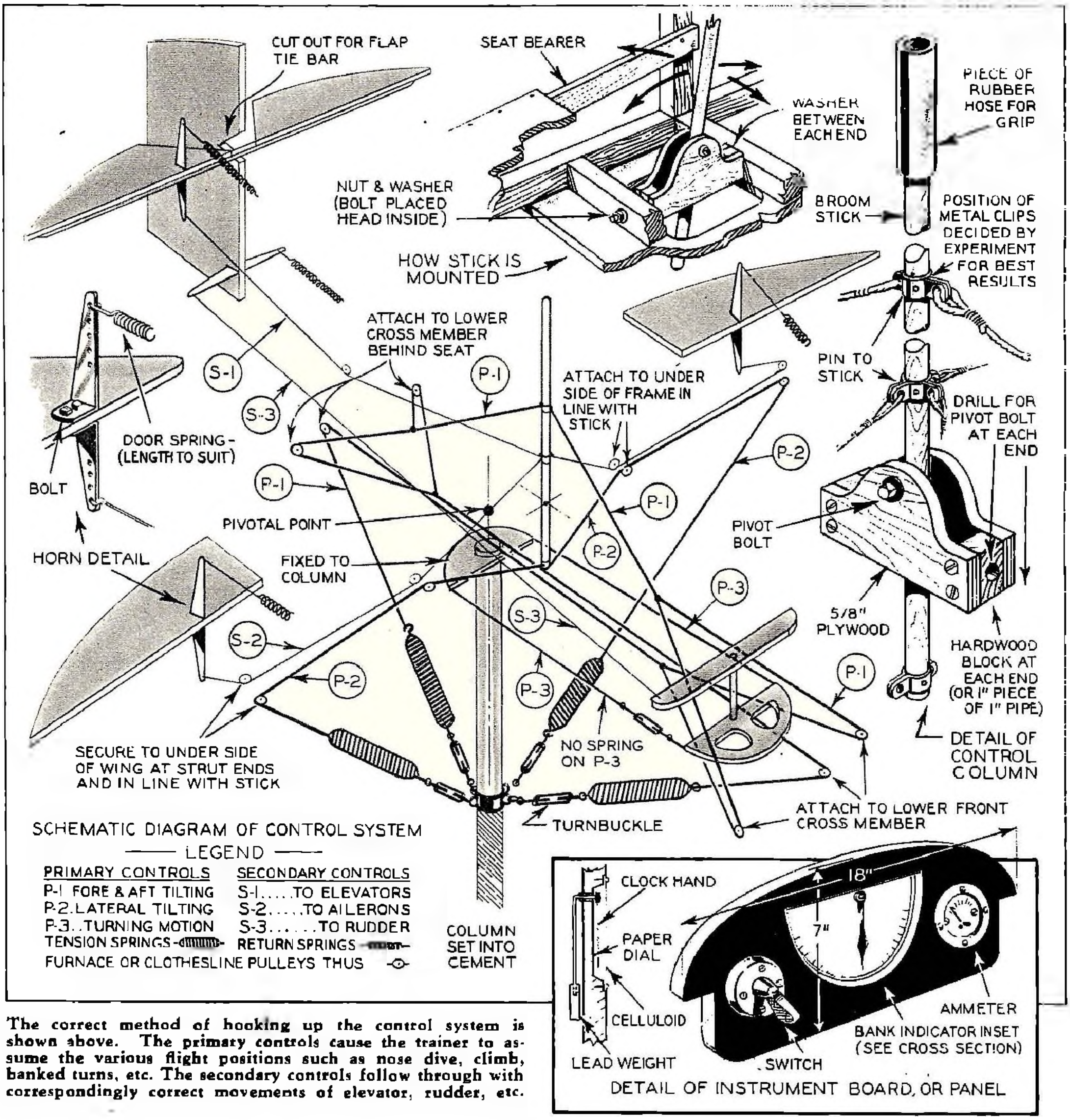
Seat yourself in the Junior Trainer, switch on the motor and ease back on the stick. Down goes the tail and up comes the nose and, as a glance over the shoulder will quickly verify, the elevators are where they should be for this flight position! Center the stick and back she comes to level "flight." Now let's do a little elementary banking. Shove the stick over to the left and watch the ailerons as the trusty ship dips to the left! Give her right or left rudder and the nose will swing in the proper direction. All these stunts are possible with the trainer described here and your own ingenuity may easily add to them.

As the trainer is at all times anchored securely to the good earth and has positively no special strains to withstand, it is absolutely safe to manipulate and its construction is quite simple. The accompanying plans are straightforward enough but even so they may be further simplified if the builder feels some of the detail beyond him. This detail, however, adds much to the realism of the job and will pay dividends by producing a sense of being actually aloft, so do a proper job while you are at it.

The plans are clear enough to require a minimum of explanation as far as the construction goes. A word

Suggestions for making a universal joint that will permit axial movements of the trainer fuselage, as well as construction details for a central mounting, appear in the sketches below and at right.





The correct method of hooking up the control system is shown above. The primary controls cause the trainer to assume the various flight positions such as nose dive, climb, banked turns, etc. The secondary controls follow through with correspondingly correct movements of elevator, rudder, etc.

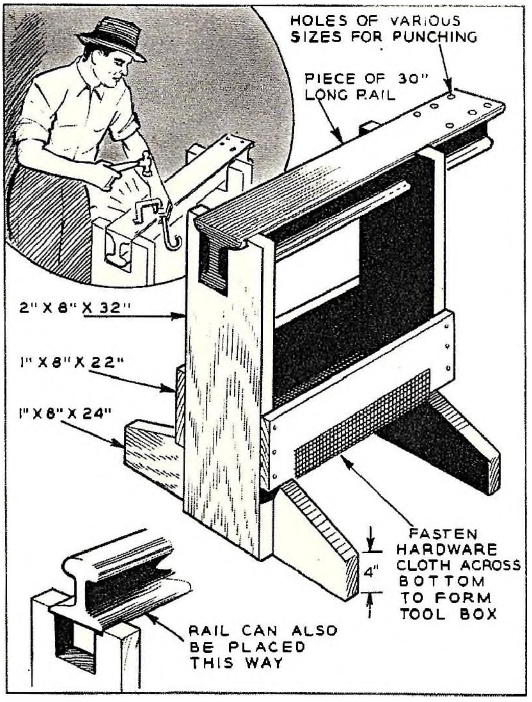
or two about the controls may be of advantage and will be given further on in this article. The fuselage should be sturdy to take the stress of the tilting controls and the same applies to the attachment and bracing of the simple plywood wings. The tail group can be as light as you like and the secondary controls—the ones which move the elevators, rudder and ailerons—are not required to take any strain at all so they can be light to the point of using twine for the control cables. The primary, or tilting, controls call for at least sash cord and might be improved by using stranded steel wire cable if you can get hold of any.

The outer fuselage covering may be of wallboard, plywood or even canvas. The central mounting column can be made up from stout timbers or of a single two-inch iron pipe imbedded in concrete. Both types of column are illustrated in the accompanying sketches.

The motor depends upon what you can dig up. It plays no part in the actual functioning of the trainer beyond serving to heighten the illusion of free flight by turning a simple propeller and creating something like a breeze. An old electric washing machine or starter motor should suffice for the purpose and can be run from a lead to the house plugs or from a battery situated under the

[*Continued on page* 136]

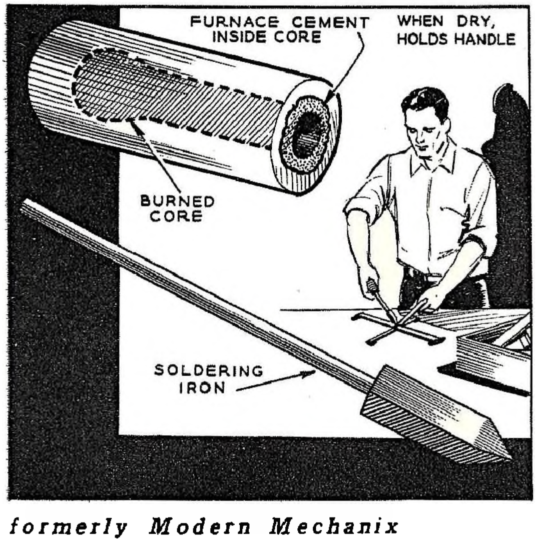
Home Made Anvil



A short piece of street car rail becomes a very satisfactory anvil when mounted as shown in the drawing. The mounting is a convenient type for moving from one place in the shop to another. If its location is to be permanent, a concrete base should be used. The frame will be considerably more rigid if each of the joints is wiped with strong wood glue before they are nailed together.—L. W. Harazim.

Furnace Cement Repairs Soldering Iron Handle

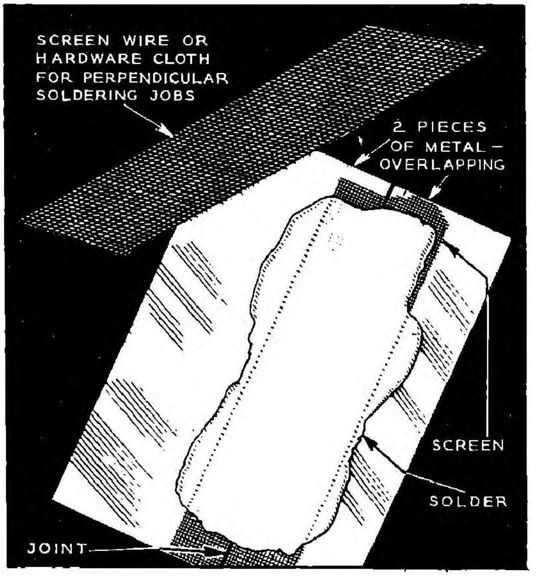
Many times after continued use, the heat from the metal rod of a soldering iron burns the handle, thereby enlarging the hole and making a replacement necessary. If the hole is packed with ordinary furnace cement and the soldering iron forced back in, the wood handle will be insulated from the heat and the trouble will be eliminated.—Richard Scott.



Old "V" Belts Prevent Small Parts From Falling

Ball bearings, small bolts and nuts, and other small articles have a tendency to roll off the workbench, falling to the floor to be stepped on, or lost. An old "V" fan belt tacked to the edge of the bench will prevent this from happening, and at the same time will not interfere with work. The narrow edge of the belt should face inside.—W. C. Wilhite.

Screen Wire For Soldering



If solder refuses to stick when soldering perpendicular seams, a narrow strip of screen or hardware cloth placed across the seam, as shown in the drawing, will solve the problem. When exposed to the weather, the screen will expand or contract according to the temperature, thus eliminating the possibility of cracking.—R. A. Scott.

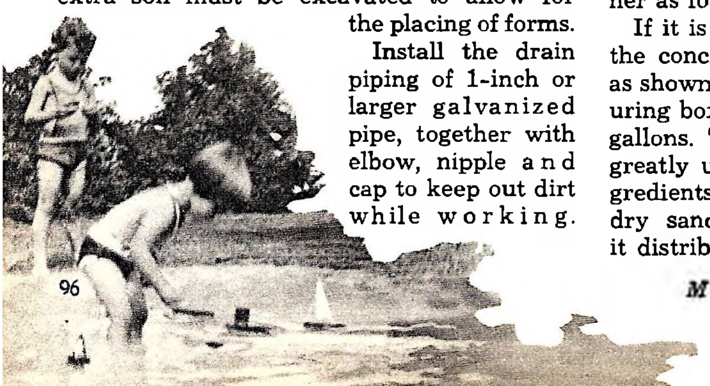
SIMPLE WADING POOLS

AND HOW TO BUILD THEM

NOTHING gives a child more wholesome pleasure than the opportunity to play in water, and for those too young to swim, a wading pool meets the demand economically.

The simplest form is a square plan, sloping gradually toward the center for draining through a pipe. Its depth depends upon the age of the children who will use it. If high ground is available, locate the pool there so that it may be drained off on to garden or shubbery without waste of water. If necessary to locate it on level ground, the drain pipe should be connected to the sewer. Of course it is possible to dip the water out with a bucket, but this is unhandy and almost impossible to clean the bottom thoroughly. It will be necessary to change the water at least every ten days.

Having decided upon the location, make the excavation six inches deeper than the completed pool is to be; this is to allow six-inch thickness of bottom. On the sides extra soil must be excavated to allow for the placing of forms.



Install the drain piping of 1-inch or larger galvanized pipe, together with elbow, nipple and cap to keep out dirt while working. Now erect the wooden forms, using old lumber which, if possible, is surfaced on the side next to the concrete. These boards should also be oiled to permit removal after the concrete has set. The inner wall of the form is supported six inches above the ground, as shown in the drawings. For a circular pool, 20-gauge galvanized iron is used to form the wall or parapet, supported in the same manner as for the square forms.

If it is not possible in your locality to buy the concrete ready mixed, build a platform as shown in the drawing; make a stout measuring box and mark a bucket for quarts and gallons. The strength of the concrete depends greatly upon the proper portions of the ingredients. First pour two cu. ft. of sharp, dry sand on the platform and on top of it distribute the cement. Mix with a shovel

Few pastimes are as popular with children as playing in water. High ground is the best possible place to locate the pool, inasmuch as it can be drained by gravity. Drain pipe should be one inch or larger to make rapid emptying possible.

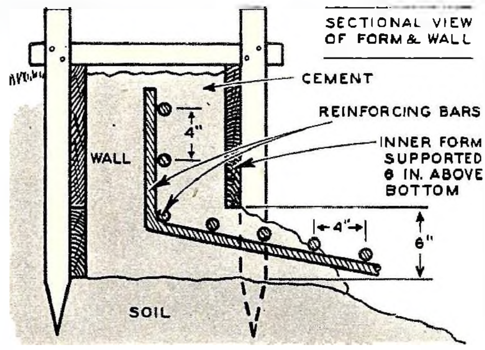
until the mass is a uniform gray color without streaks. Now add three cu. ft. of coarse aggregate or pebbles and mix again. Next make a depression in the center of the pile and add water slowly (5½ gallons if the mixture of sand and gravel is quite dry, 4¼ if it is moist) and work it in with a shovel.

The reinforcing of the pool should be laid before the pouring of concrete begins. This can be of No. 40 wire mesh, or ⅜-inch steel bars spaced 6 inches apart, and laid at right angles to each other.

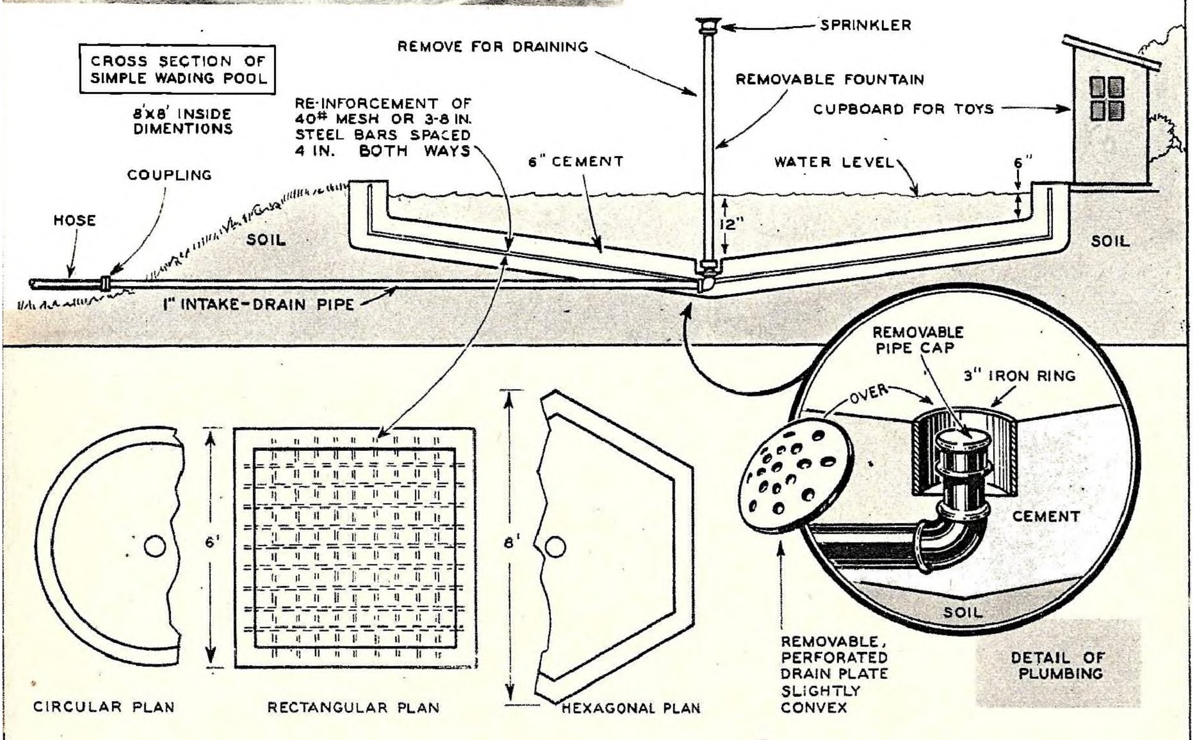
When the concrete has set, it should be kept damp for several days. Do this by filling the pool and laying wet burlap over the exposed parapet. Then drain and refill, adding one quart of vinegar to each 100 gallons of water, to neutralize the chemical effect of the new cement. Allow this to stand for three or four days, then drain and refill. It is now ready for use.

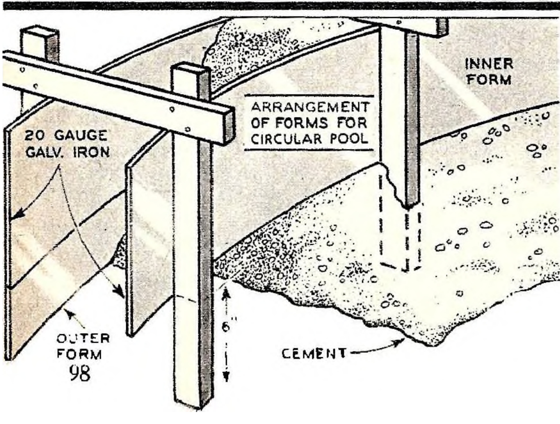
"Bluestone" or copper sulphate crystals will keep down the growth of algae, but should be used sparingly, as an excess will cause the eyes to smart and blond hair to take on a greenish tint, which, however, is not permanent.

For excessive growth of algae and also as a disinfectant, some pool owners add a very small amount of chlorox, a kitchen cleaning compound. This, however, should be done with caution, as it will irritate tender skins or abrasions if too much is added. Inasmuch as the strength of this chemical varies with different brands or grades, consult your druggist before using it.



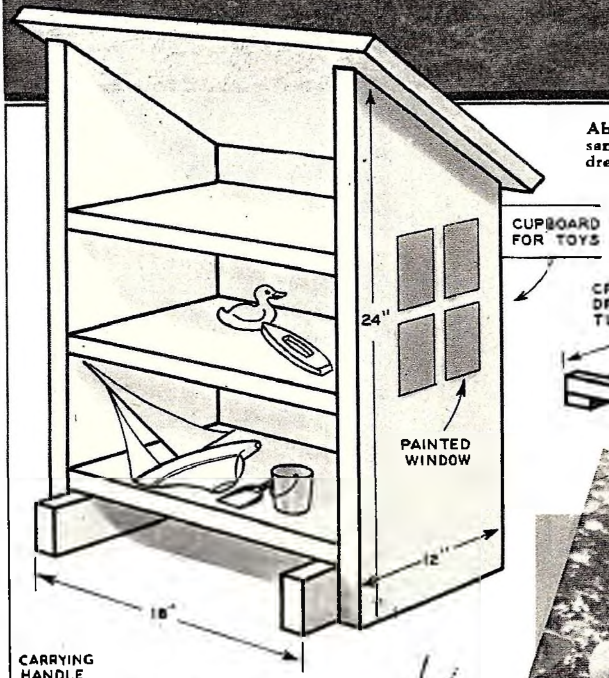
When the ground is such that it is inconvenient to dig into. a pool can be built entirely above the surface. At the left is shown the arrangement for the construction of circular type pools. Galvanized iron is used for the forms.

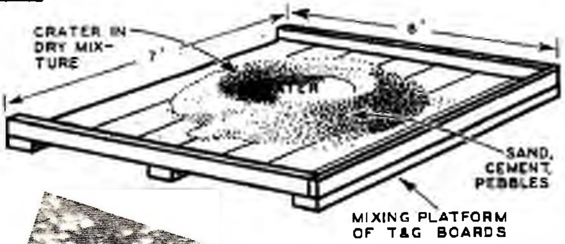


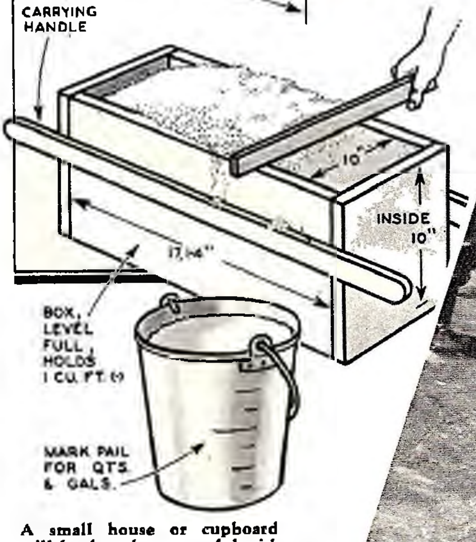


At the left is an odd shaped pool deep enough for the youngsters to swim in but not deep enough to be dangerous. This pool will give summer a new meaning.

Above is a small pool suitable for wading and at the same time is decorative. If not used by the children, gold fish will add to its decorative qualities.

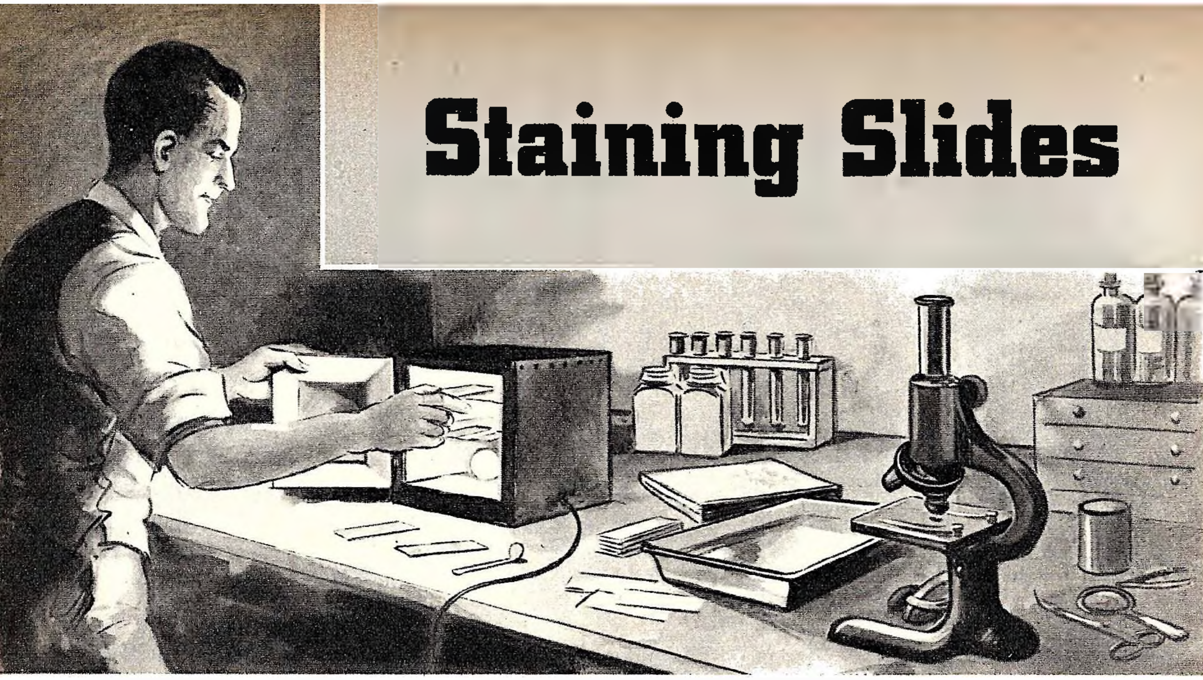






A small house or cupboard will be found very useful with the wading pool. It is a convenient place to keep toys and small boats. It can be constructed of any convenient lumber and painted to match any surrounding buildings.

Staining Slides



One of the important steps in the preparation of slides is the drying operation. A small stove top gas oven can be purchased at a low price and serves the purpose perfectly. A light bulb is a suitable light source.

THIS is the ninth in a series of articles on modern microtechnique and takes up the processes known as staining, clearing and mounting. The steps concerned with the fixing of organic materials, were covered in the June issue while sectioning was described in May. By gradually mastering all of the procedures described, the reader should be able to make a professional type of finished microscope slide, further improvement being a matter of practice.

In the previous installments a tree bud was used for processing. During the present season, however, with buds largely things of the past until another spring rolls around, try the technique described in the May and June issues on cross sections of roots or green stems, about the diameter of a pencil. Avoid tough and hard stems of old wood, selecting the present season's growth. Favorite subjects are basswood, grape, dutchman's-pipe, hemp, alfalfa, mint, elder, sunflower and goldenrod; for roots, buttercup.

Stains may be natural in origin, as cochineal, from an insect, or haematoxylin (pronounced hay-ma-tox-lin), from Brazilian logwood. They may be metals, as silver nitrate, or they may be coal-tar derivatives, as eosin, safranin or other anilin dyes. Some are general stains, like carmine, and affect all parts of materials immersed in them, just as textile dyes do. Others are selective and work only on substances of a certain chemical composition, leaving some parts uncolored. Staining is necessary since protoplasm is itself colorless, and some contrast is necessary in order to bring out all the fine detail of organic material under the microscope; hence selective staining is especially valuable. One may pass a section of the intestine through the dye haematoxylin, which will color the nuclei of cells blue but leave other structures unaffected; then put the same section through eosin, which stains the cytoplasm of cells red but does not affect the nuclei. The result is a very pretty slide showing red cells with blue nuclei, and giving excellent contrast for study or photography.

Regulation biological stains may be purchased from supply houses in either of two forms, the dry powder, or solutions of the powder ready for use. The cheapest and most satisfactory method is to buy ten-gram bottles of the dry stains and make up your own solutions—except in the case of haematoxylin, the manufacture of which is a bit difficult for those inexperienced in this sort of work. One such bottle of dry powder will last a lifetime, and fresh solutions are easily and quickly prepared at any time.

Some stains are made up with water (aqueous solutions), others with various strengths of alcohol, as 70% or 95% (alcoholic solutions). Mostly they are of 1% strength. Two general rules may be stated here: material goes into a stain when it has reached that step in the series of treatments that corresponds to the solvent of the stain—

For Your Microscope

by Julian D. Corrington, Ph.D.

from water into aqueous solutions and from alcohol into alcoholic solutions. Secondly, the action of staining is stopped and excess stain removed by the process termed *washing,* and the same rule again applies—wash out aqueous stains with water, alcoholic stains with alcohol.

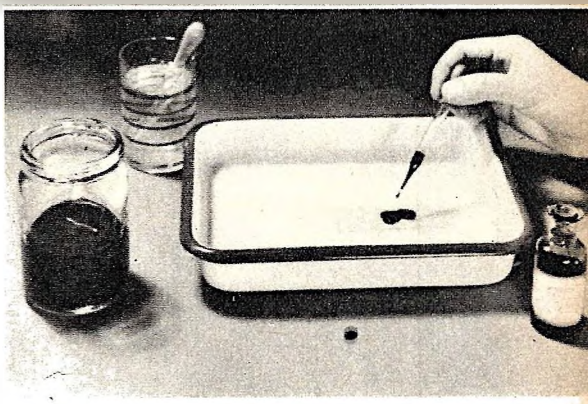
Washing is not as active as the word implies! one does not hold the slide under a faucet—far from it. The slide is placed in a glass of water and very gently and slowly waved back and forth a few times; then into a fresh glass of water, and so on for three to four changes, one to two or more minutes in each. Unless otherwise specified in staining technique, when water is mentioned it is distilled water, obtainable from any garage.

Biological stains are expensive and the beginner may hesitate to invest before he is certain that he will continue this sort of work. As a temporary substitute and for practice, the ten-cent store dyes may be used, but the reader is cautioned not to expect the perfect results described below, nor should those attempting serious work with staining slides use anything but the best.

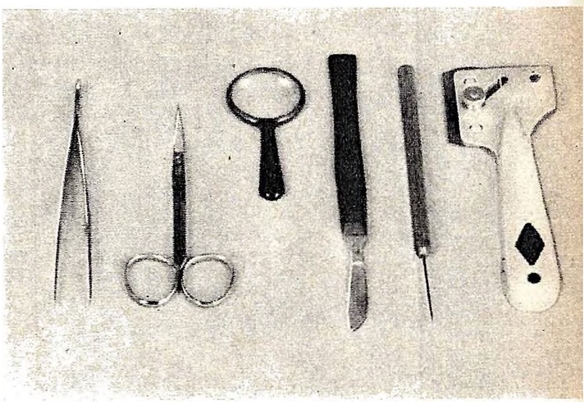
As an example of staining and to gain practice, try the famous *safranin-light green* technique, now so widely used with the majority of botanical materials. Safranin stains certain structures in the plant stem red, light green affects other objects with a pleasing contrast, the whole making a most beautiful slide for examination under the microscope.

From a supply house purchase one ten-gram bottle of the dry powder of each of these two stains. If you have a chemical balance, weigh out one gram of safranin; otherwise have this weighing done for you by your druggist. Measure 100 cc of distilled water in your graduate cylinder, pour into a small bottle, add the safranin and shake or stir until dissolved. Similarly weigh out one gram of light green and dissolve in 100 cc of 95% alcohol in a separate bottle. Label each bottle.

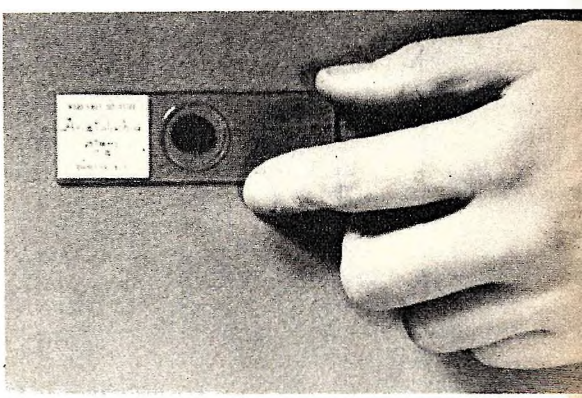
Safranin washes out easily and so it is purposely used for a relatively lengthy period, overstaining the tissue and dehydrated rapidly. In such cases it is best to pour the stain into a glass tall enough so that the whole



At left, a jar of stain with slides immersed. At right, the stain is applied with a medicine dropper.



These are the tools miscroscopists find necessary for the preparation of professional slide mounts.



This is how the labeled slide will look when made according to the directions given in this article.

At the left is a section of a human scalp, unstained. Note the lack of detail and contrast. In the center is a correctly stained section of the same scalp which shows contrast and detail. At right is a photomicrograph of warfare in a drop of pond water. A Didinium (shaped like a turtle) is attacking a Paramecium.

slide, up to a level beyond the middle where the sectioned material lies will be immersed. The cheese-spread glass, tall Stender or Coplin staining jar, with grooved slots to receive slides, are most serviceable. When finished, pour stain back into bottle; it can be used repeatedly.

Light green is an exceedingly rapid stain, from 10 to 30 seconds being ample. While a staining jar can be used, it is easier and better to place the slide flat in a photographic developing tray or glass dish and apply a few drops of the stain directly upon the tissue with a pipette (medicine dropper). The duration of stain may be carefully timed and the wash also put on with a dropper.

After sections have been cut they must next be affixed to thoroughly cleaned slides, and this is best done with albumen fixative. To prepare this, beat up the white of one egg and pour into a tall glass vessel. Allow to stand, then skim off the surface and filter the rest through several folds of cheesecloth. To 50 cc of such egg albumen, and 50 cc glycerin and one gram of either thymol or salicylate of soda, from the drug store, to prevent putrefaction. Shake well, bottle, and label.

Clean the right forefinger well, then with a toothpick place a very small drop of the fixative in the center of a clean and dry slide. Smear the fixative with the finger into a very thin and even film all over the slide. With a dropper, flood the central portions of the slide with distilled water, and with a section lifter or camel's hair brush transfer a cut section of tissue (plant stem in this case) onto the film of water. Place the slide in perfectly flat position on a slide dryer and allow to remain for 24 hours. As the water evaporates, the section is drawn down into the fine film of albumen and bound tightly so that it will not wash off during subsequent operations. The paraffin in the section is melted sufficiently so that the section lies flat, without wrinkles.

The next day, when thoroughly dry, this slide is ready to pass through the staining operations. Place it in a glass of xylol for 10 minutes to dissolve the paraffin; then, in succession for one minute each, into 100%, 95%, 85%, 70%, 50% and 35% alcohols; distilled water, 1 minute; safranin, 24 hours; wash in distilled water; 35%, 50%, 70%, 85%, 95% alcohols (the same series but in reverse

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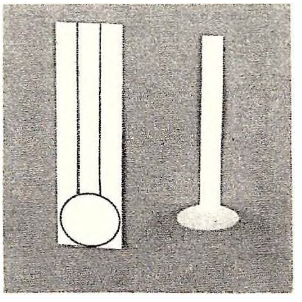


This shows the method of making a section lifter from a piece of sheet brass. This is a valuable piece of equipment for the amateur microscopist.

This is the ninth in a series of articles published by this magazine on this fascinating subject of microscopy. Previous articles are as follows:

June—"Chemistry of Microscope Slides"—How to fix speciments for microscope examination.

May—"How To Cut Sections For Your Microscope"—The first step in the preparation of home-made slides.

April—"Documentary Evidence"—A study of the characteristics of handwriting and typewriting, and how the microscope is used to track down law breakers.

March—"The Silent Sherlock"—The microscope and its use in present day crime detection.

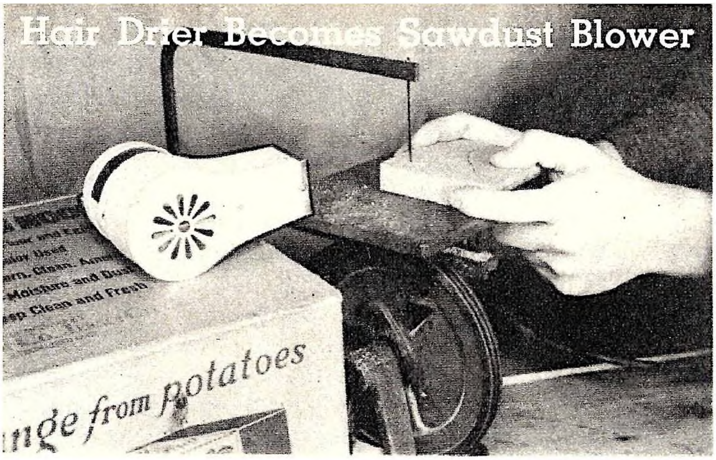
February—"Finger Prints in Fur"—How the microscope is used by the fur industry for identification purposes.

December—"Hitching a Microscope to Your Camera"—How a camera can be used with a microscope to preserve the wonders seen by the eye.

November—"The Autumn Empire of Insects"—The thrills of big game hunting are revealed under the lense of the microscope in the study of common insect species.

October—"Microscope Reveals Mysteries of Life in Water"—How to delve into the wonders of nature with a microscope as your magic key to the storehouse of life at its conception.

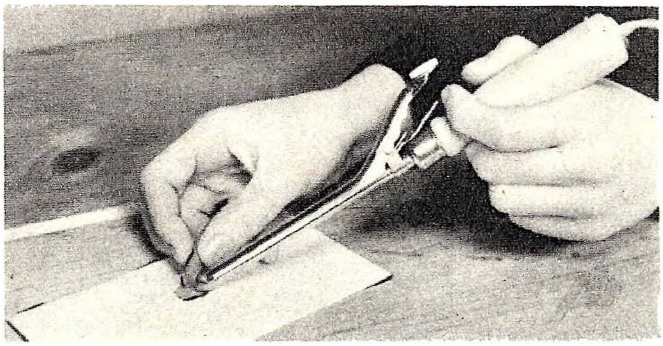
Hair Drier Becomes Sawdust Blower



Iron Heats Water

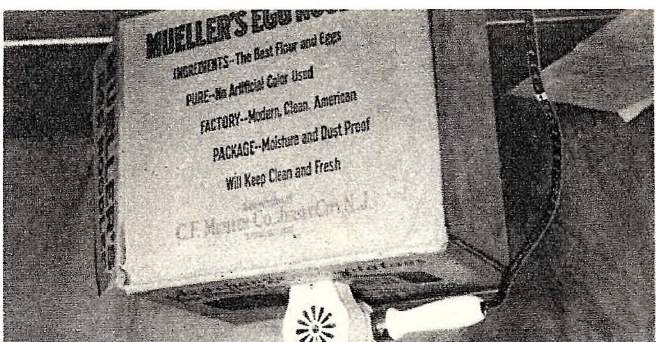
Upper left—A small electric hair drier mounted on a box standing beside a jig saw will be found useful for removing sawdust as fast as it forms. Above—If a curling iron is sterilized with boiling water and carefully washed, it will be found useful as an immersion heater for the sick room. Also, it will prove useful when traveling, as a means of heating water for shaving or washing. Photography fans will find the curling iron valuable for heating a small amount of water when mixing chemicals. One of the advantages of this type of heater in the laboratory is the lack of flame which constitutes a menace when certain chemicals are heated.

Sealing Wax Melted Quickly And Easily With Ordinary Hair Curler



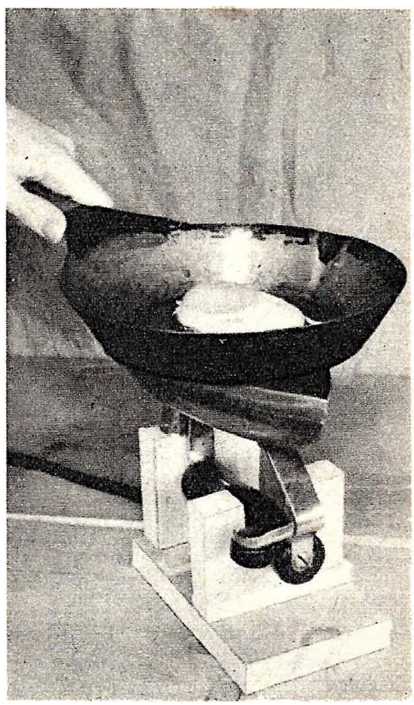
A curling iron at maximum heat will be found suitable for melting sealing wax. If a number of letters are to be sealed, this method will speed up the work and is more convenient than using matches or candles. When finished, the wax left on the iron can be scraped off easily and quickly.

Hair Appliance Speeds Paint Drying



A small electric hair drier can be used to heat a paint drying cabinet as shown in the photograph. The "cabinet" can be nothing more than a cardboard packing box. A hole should be placed in the bottom to permit the air to circulate.

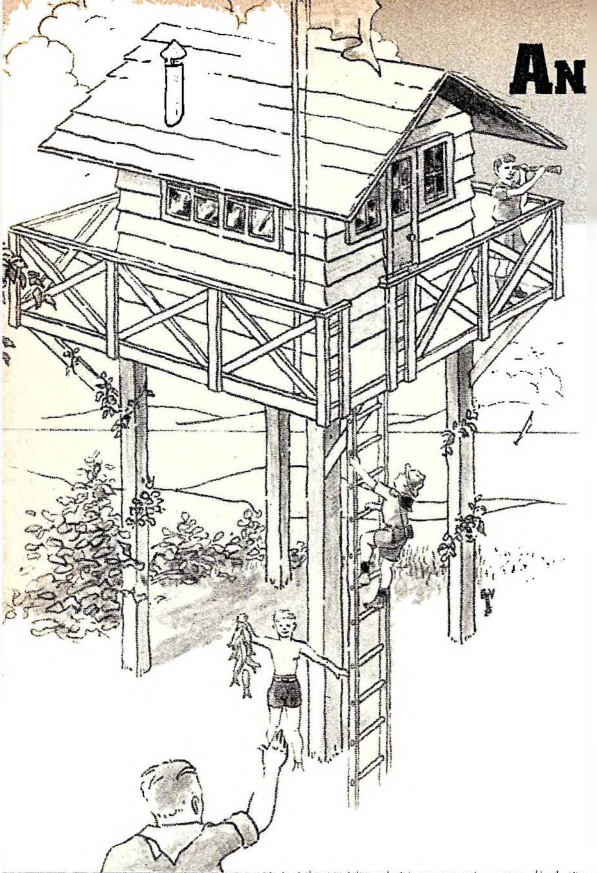
Flatiron Serves As Frying Heat Source



When an electric flatiron is inverted and placed in a holder as shown by the photograph, it becomes a good heater for the frying pan when eggs or meats are to be fried. The support can be made of wood or metal.

An OBSERVATION CLUBHOUSE

by Hi Sibley



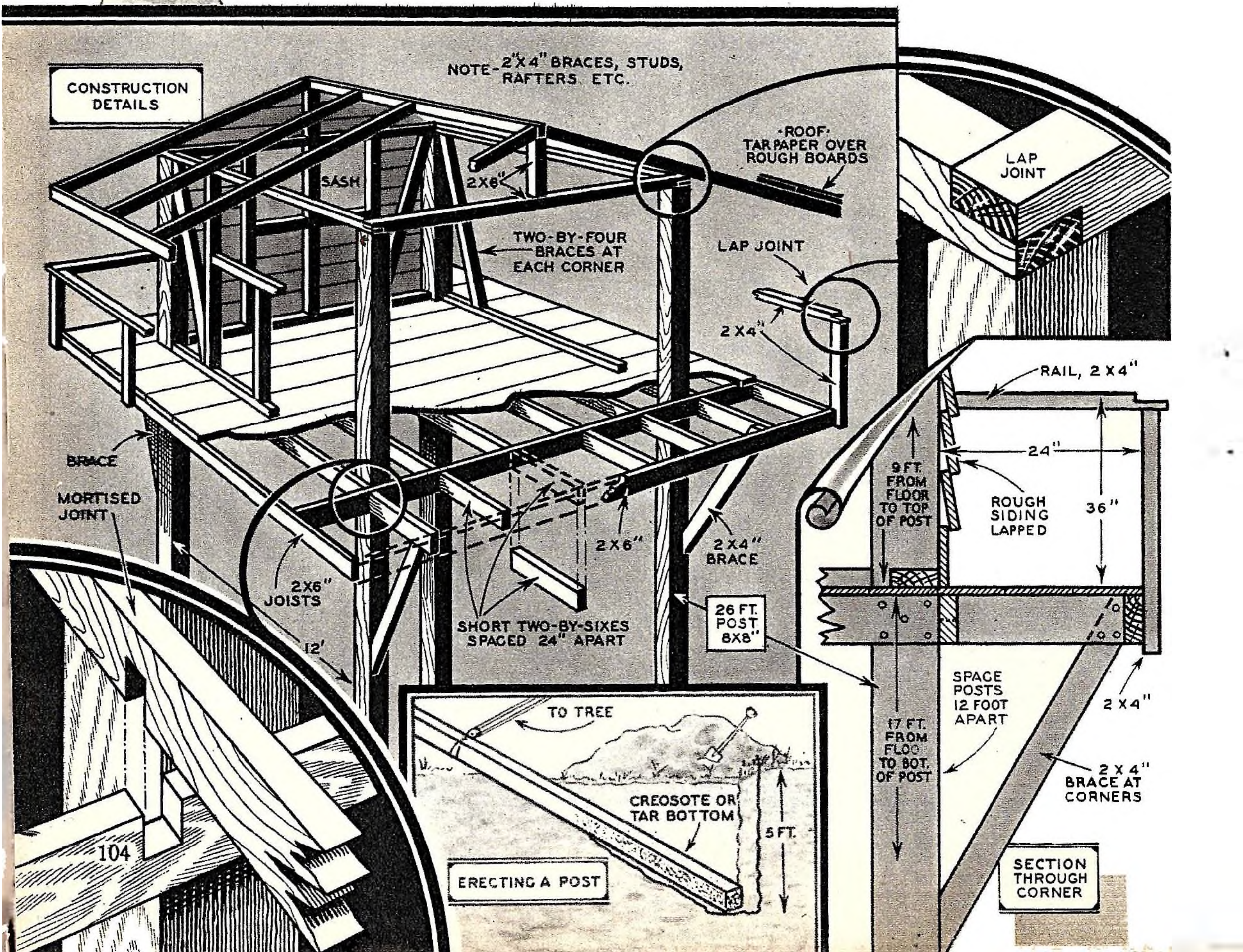
BUILT on high posts, this comfortable observation clubhouse not only affords a fine view of the surrounding territory but will be inaccessible to unwelcome callers when the ladder is drawn up.

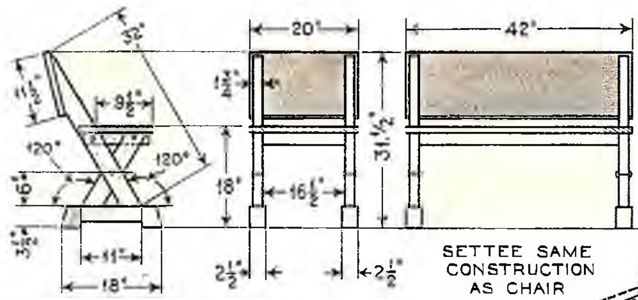
When selecting a location, take advantage of high ground to get all the elevation possible. For supports use heavy, rough squared timbers, or posts made by nailing six two-by-fours together. If old telephone poles are available, use four of them. In this case do not have the ends continue up through the floor, but erect a structure upon the platform as you would on the ground.

To raise heavy posts dig a sloping trench,

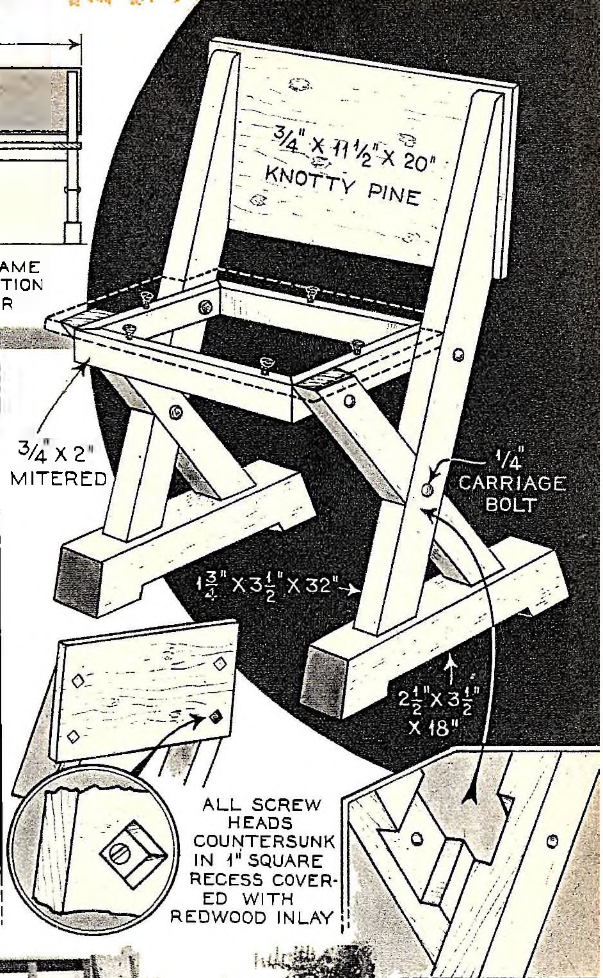
[*Continued on page* 136]

The snugness of the interior will be increased by sheathing the inside of this observation clubhouse with insulting wallboard. In the winter, a stove will add greatly to the comfort as well as furnish a means for cooking simple meals. If small children are to be permitted in the clubhouse, the rail height should be increased and wire screening should be fastened around the edge.





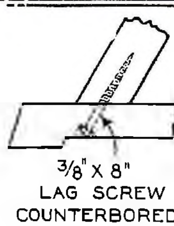
Barbecue Set in Knotty Pine

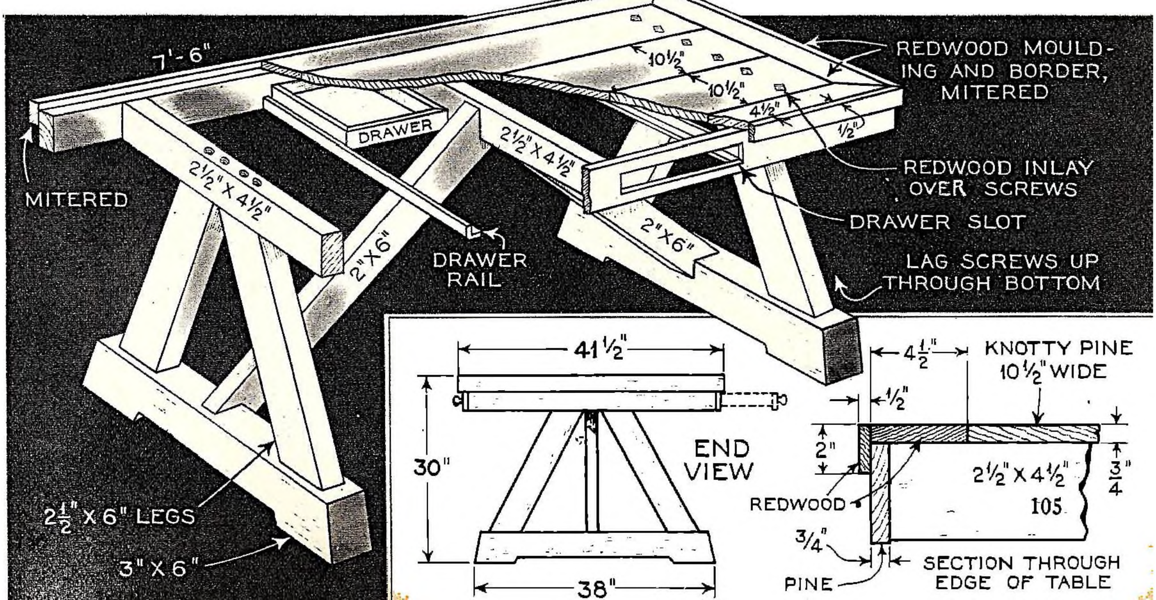


A COMBINATION of redwood trim with knotty pine surfaces and square redwood inlay over the screwheads makes an exceptionally attractive barbecue picnic set. Knotty pine is available in nearly every locality and if California redwood is not on hand, use some other dark wood. If used without shelter an oil or wax finish will not be amiss.

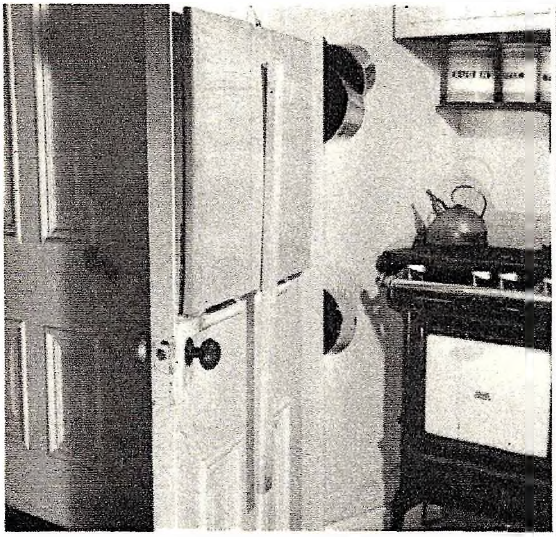
Construction of the chair and settee is identical with the exception of the greater length of the latter. The X-legs are mortised at the cross and secured with carriage bolts. Lag screws are inserted up through the bottom of the feet. Knotty pine is used for seat and back, and a square recess about ⅛-inch deep is chiseled for each screwhead, then inlaid with redwood.

The table legs are of a 2½-inch by 6-inch section, feet 3 inches by 6 inches, braces 2 inches by 6 inches and cross members under the table top, 2½ inches by 4½ inches. A shallow drawer is fitted in each side.

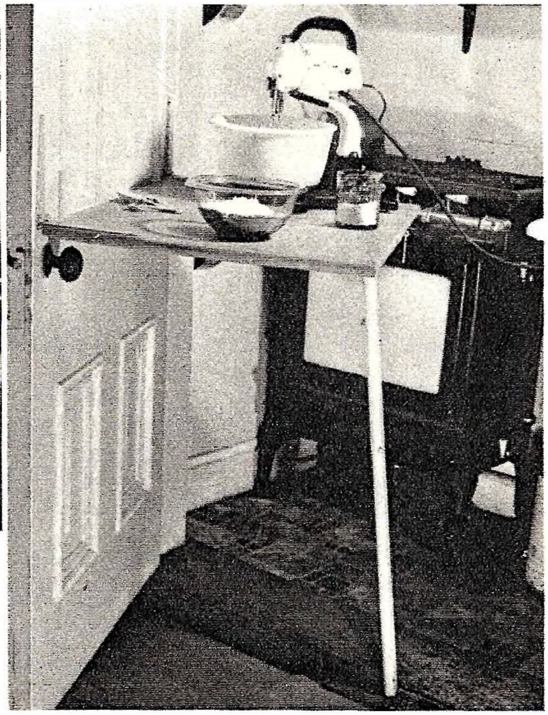




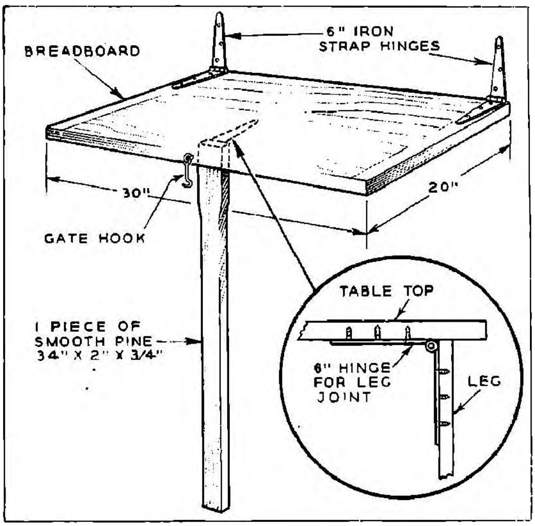
A KITCHENETTE TABLE



When folded up against the door, this table takes up very little room. Although the breadboard used in this particular case measured 20 by 30 inches, a larger or smaller one can be used depending upon conditions. The outside should be painted the same color as the door on which it is hung.



In position for use, the table is sturdy and will hold safely, most of the appliances used in the average kitchen. If a larger table size is desired, two legs may be necessary. Left—The drawing shows the dimensions of the top and leg.



by Charles C. Hay

THOSE who have attempted to keep house in a one-room apartment with the aid of a pulman kitchenette will realize that the chief impediment to successful cooking is the lack of table space. And while this lack of space is not as great as it was a generation ago, some table space is necessary if only to hold a can while it is being opened.

A simple, yet inexpensive, solution to this problem was found by the construction of a folding table on the back of one of the kitchenette doors. It required the following material, purchasable at the nearest hardware store:

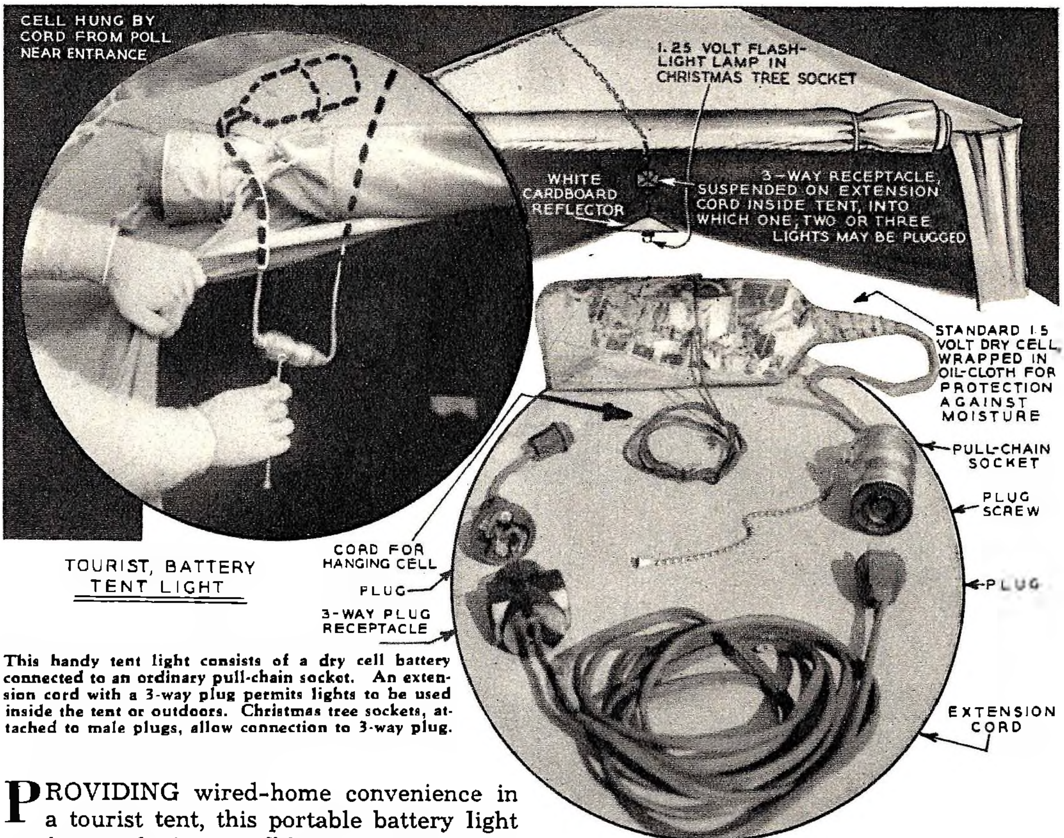
One breadboard 20x30 inches.
Three 6-inch iron strap hinges.
Twelve flat-headed wood screws $\frac{1}{2}$-inch long.
One piece of smooth pine $\frac{3}{4}$x2x34 inches.
One gate hook and screw eye.

The total cost should not exceed two dollars.

Selecting the door nearest the stove as being the most convenient, the breadboard was attached to its inner surface by means of two of the hinges. The third was attached to the opposite surface of the board in the center of the outer edge. To this hinge was fastened the long strip of smooth pine, which acted as the third leg. To hold the table up out of the way when not in use, the gate hook was attached to the outer edge and the screw eye to the upper half of the door.

Less than a half hour was required to construct the entire layout. The effort was well repaid by the convenience of having the additional space.

PORTABLE EXTENSION LIGHT FOR CAMPERS



TOURIST, BATTERY TENT LIGHT

This handy tent light consists of a dry cell battery connected to an ordinary pull-chain socket. An extension cord with a 3-way plug permits lights to be used inside the tent or outdoors. Christmas tree sockets, attached to male plugs, allow connection to 3-way plug.

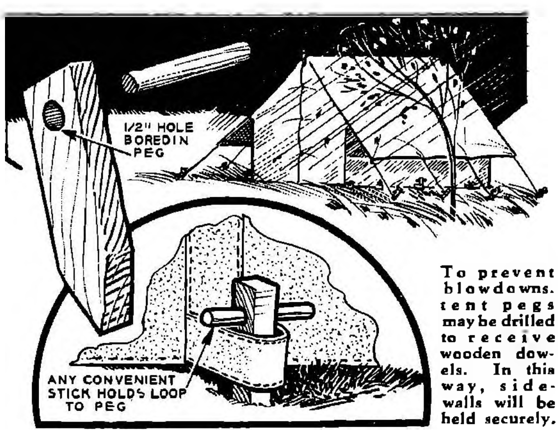
PROVIDING wired-home convenience in a tourist tent, this portable battery light can be switched on or off from outside the tent by reaching through flap and pulling chain of a pull-chain socket. From inside, the chain may be more easily located in the dark if the pendant has been coated with luminous paint.

As illustrated, the pull-chain socket is wired directly to a standard 1.5-volt dry cell, wrapped in a piece of oil-cloth for protection against moisture. In use, the cell is hung from the top of the tent pole near the entrance. A flexible cord, plugged into a socket, carries current to any part of the tent interior, or outside of the tent if wanted. Into a 3-way receptacle at the end of the cord may be plugged one or more 1.25-volt flashlight lamps, screwed into Christmas tree sockets provided with white cardboard reflectors.

Using lamps of slightly less voltage rating than the dry cell is not likely to burn them out, while with their use, brighter light is provided. Although extra cells may be carried as spares, a single cell supplying one or two lamps, burned for several hours every night, will hold out for the average vacation.

Improved Tent Wall Stakes

UNLESS the ordinary type of tent sidewall stake is driven in at an angle, it is of little value in holding the canvas down. To prevent flapping sidewalls, drill holes in stakes to receive ½-inch wooden dowels.



To prevent blowdowns, tent pegs may be drilled to receive wooden dowels. In this way, sidewalls will be held securely.

THE RIGHT WAY

Although this canoe is badly water bogged, the occupant is experiencing no trouble in paddling craft to shore.

by Julius Fanta

CANOEING is one of the most fascinating sports afloat and yet the novice paddler makes it an arduous task instead of sheer pleasure by using incorrect paddling methods.

Getting the most out of a canoe depends on using the most effective strokes as well as close cooperation between the bow and stern paddlers. It should not be forgotten that the bow paddler is responsible for most steering maneuvers, while the stern man contributes most of the forward drive.

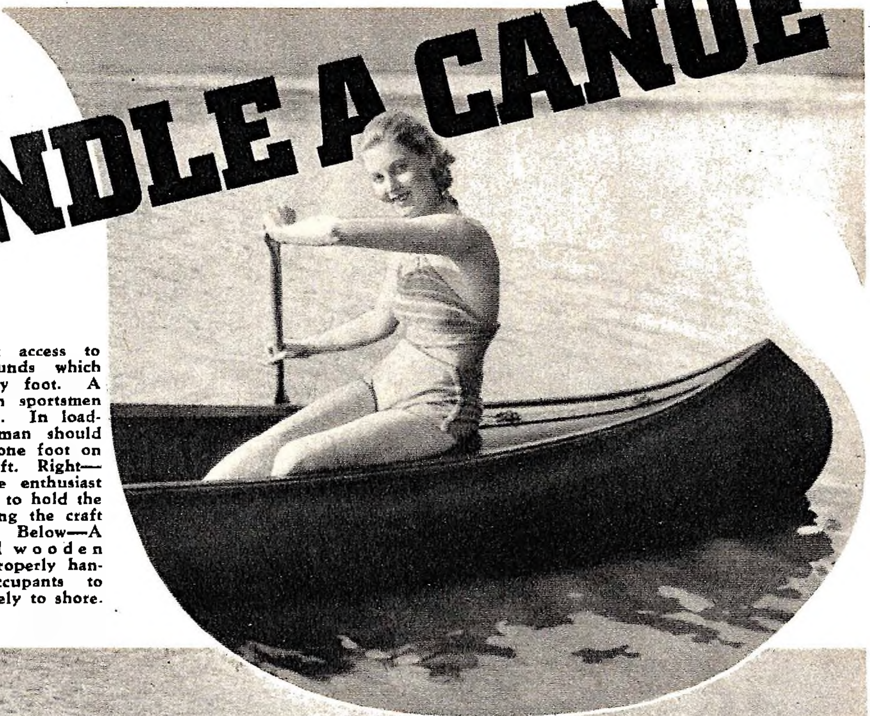
The novice should realize this fact early in his paddling experience, because it will be harder to break yourself of conflicting strokes afterward and get the right swing. Always remember that in maneuvering the canoe steering strokes outnumber forward-pulls at the bow.

Perfect balance while embarking is maintained by stepping into the canoe as close to the keel-line as possible. When two are boarding, the bow-man should enter first, then steady the craft for his mate. Always hold the gunwhales with both hands to avoid the menace of leaning too far to one side. This precaution steadies both the canoe and canoeist.

Now the paddles are taken up; they should always be placed within reach so that neither paddler has to leave his seat, unnecessarily. The widest paddle is always used at the bow. Both paddles should be about as high as the users.

Develop the art of paddling with the least effort by alternately stroking on one side, then the other, with ease and grace, instead of prolonged one-sided paddling, which is readily tiresome. Short, quick strokes will be found less fatiguing. They give greater driving power than long, slow pulls.

To HANDLE A CANOE



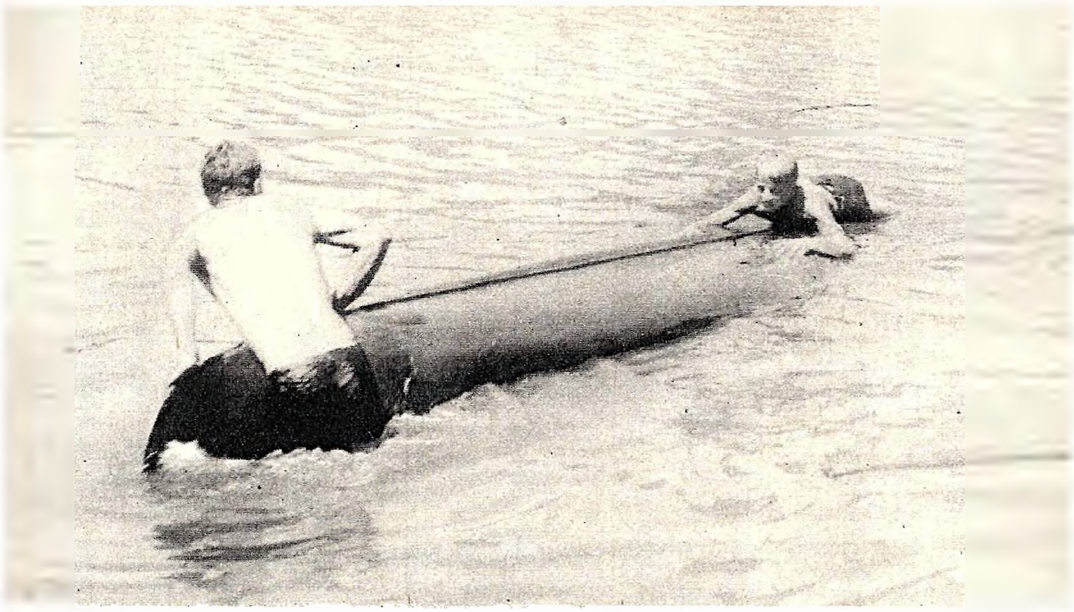
Water routes permit access to choice camping grounds which cannot be reached by foot. A canoe will carry both sportsmen and equipment safely. In loading the craft, one man should steady it by placing one foot on the pier as shown at left. Right—An attractive canoe enthusiast shows the proper way to hold the paddle when propelling the craft from the stern seat. Below—A completely submerged wooden canoe will float if properly handled, permitting occupants to paddle themselves safely to shore.

When paddling is done on the left side, the left hand holds the paddle close to the blade, while the right hand grips the top of the handle. On the opposite side, the hold is just the opposite. Keep the wrist of the lower hand flexible throughout to provide a comfortable pivot. The arm at the elbow should be almost rigid as the blade is moved backward by pushing the upper handle forward. The best canoeists always control the paddle for steering and propelling with the upper hand.

Although the popular conception is that the canoe is steered at the stern, the importance of the bow strokesman as steerman and an efficient paddler as well as lookout will soon be noted.

Efficiency in straight-going depends largely upon the bowman's ability to paddle without causing the canoe to turn; that is, without necessitating subsequent steering movements to correct the heading. Here's how the forward stroke is correctly effected: Begin the stroke farther away than usual from the canoe's side, sweeping it slightly inward as it is carried through. This keeps the bow right on its course.

To make a sharp turn, the bow paddler should reach the blade in the direction he wishes to turn. In doing so, the blade is



When the canoe overturns, occupants should brace themselves on the ends if it is a sinkable type. By doing this, air underneath has no chance for escape. After paddles have been recovered, canoe can be easily beached.

submerged in the water parallel to the craft and drawn at right angles toward it. To maintain speed in turning, end the stroke with a sweep aft alongside. Thus the bow is swung with a side-pull, while the direct drive comes mainly from the stern paddle.

In landing at a dock or coming alongside other objects in close quarters, the bow can be brought closeby with sculling movements; that is, moving the forward blade back and forth almost on the water's surface.

The chief reason why the bow-man does the steering is that, as lookout, he sees submerged rocks and other obstructions first. These can be avoided best through the bow-man's steering without losing time by warning the man at the stern. Sharp bends and sudden turns call for "throwing" the canoe, while the stern paddler continues to stroke forcefully for necessary speed.

Throwing is accomplished by holding the forward paddle upright, with the blade pointed fore and aft, and thrusting it outwards so that the bow is lifted and thrown to the opposite side.

The rapidity with which a canoe is maneuvered reflects the quality of paddling at the stern. Because dragging the paddle supposedly as a rudder retards speed, it is deterrent to the efforts of the bow-man. This is a common canoeing mistake. The stern paddler should give the one forward all possible cooperation to facilitate momentum.

This is best done by terminating the stern stroke with an outward sweep to balance the steering. Otherwise paddling on one side will have a tendency to turn the canoe slightly.

Either at the bow or stern, strokes should not be continued more than a little past the paddler's side. Long strokes automatically turn the paddle to disadvantage, increasing the drag of the canoe. Except when backing up, never back-water the paddle while the canoe is under way. If back-watering is done with the intention of turning, much time and effort are wasted in resuming full headway. As noted before, turning movements are part of propulsion strokes.

The conventional way of paddling a canoe alone is first turning it around (stern first) and then using the otherwise stern seat. Thus your weight is brought closer amidship to improve balance and stability. In single-handed paddling, the drag or submerging of the stern is further decreased when the strokesman's position is amidships, kneeling on a pillow or cushion.

The technique of paddling is somewhat different amidships. The canoe will turn and keep turning, if the stroke is begun close alongside and pulled straight back. To prevent turning against will, the paddle should be dipped away from the side, then moved slightly toward the gunwhale in a slight inward sweep, finishing the stroke with a slight outward curve.

When paddling alone against heavy wind and waves, take the regular bow seat and ride bow-first. The light end of the craft will follow perfectly. Otherwise the unweighted forward end may be caught by a wave and swept broadside in the trough.

Nosing into head seas at right angles taxes a canoe's durability, while paddling parallel to the troughs is made dangerous by water shipping aboard and capsizing possibilities. A dry trip in heavy weather is more often the result of angling obliquely across the waves. If a windward objective cannot be made on one leg, zig-zag or take tacks of several legs.

Familiarity with the traits of canoes and their proper handling makes this type of craft safer than many another when mishaps occur. That a canoe is a wooden craft and wooden craft does not sink is always a welcome thought. Remember it when your canoe swamps or capsizes. *DON'T DESERT IT*, because striking out for shore is far more dangerous, unless you are a powerful distance swimmer.

A canoe is safe whether upright or overturned. This fact is clearly illustrated in the accompanying photographs. Fewer tragedies would result from canoeing mishaps if canoeists would trust the safety of water-logged or capsized wooden craft.

A canoe can support two, three, or four persons when overturned or submerged to the gunwhales. It is a definite haven of safety by clinging to it, in an emergency, and waiting till help arrives.

If thrown into the water by capsizing, enthusiasts should slip along the hull to the ends where holding on is surer and easier. Whether tipped over or swamped, a canoe can be reboarded safely over the ends. One person should board at a time, while the other balances the craft. A swamped craft will submerge somewhat more, but its buoyancy will support your weight.

When overturning, canoes automatically retain sufficient air which limits the water rising underneath and which increases buoyancy. For this reason, as many as three or four persons can safely ride atop an inverted craft and drift ashore.

The possibility of capsizing can be minimized by exercising special care in loading such a craft. Canoes up to 18 feet in length should carry *NO* more than three persons. The third person should sit well amidships and as low as possible to maintain proper balance.

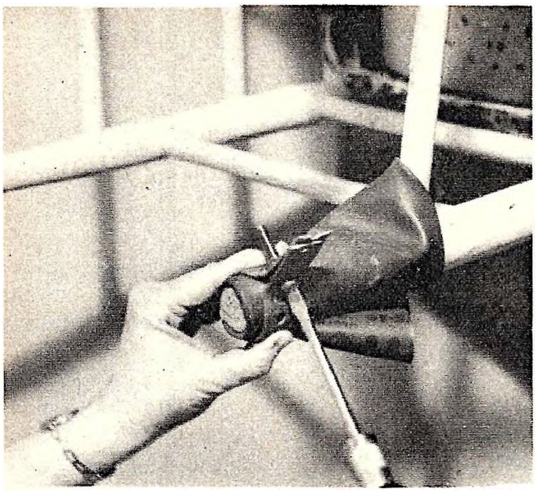
On an extended canoe or camping trip, where considerable equipment is necessary, stow the gear amidship with the heaviest items, such as tent, canned goods, etc., down at the bottom. Pack the rest of the gear compactly no higher than the gunwhales, eliminating unessential pieces that will overload the craft.

Changing positions off-shore is inadvisable. If absolutely necessary, however, it can be done safely with the cooperation of every man aboard. If a relief paddler is to replace the bow-man, the bow-man should walk backwards, holding into the gunwhales with *both* hands to keep his balance. The relief passes him while moving forward by crawling through the bow-man's legs, always keeping along the center line.

During the shifting of positions, the stern-man steadies the canoe by holding both gunwhales, as illustrated. If the stern-paddler is to be relieved by the man amidships, they pass each other likewise, while the bow-man holds the gunwhales steady.

Those who have taken a ducking through improper handling of a canoe know that there is no fun in store, unless attired in a bathing suit and that's not likely. Sportsmen, for the most part, use a canoe to facilitate traveling by water to a remote camp site. If you and your companion are wearing heavy sports apparel a chilly bath is something to avoid.

When changing positions in midstream, pass through legs of the occupants, or step over them, holding fast to gunwhales.



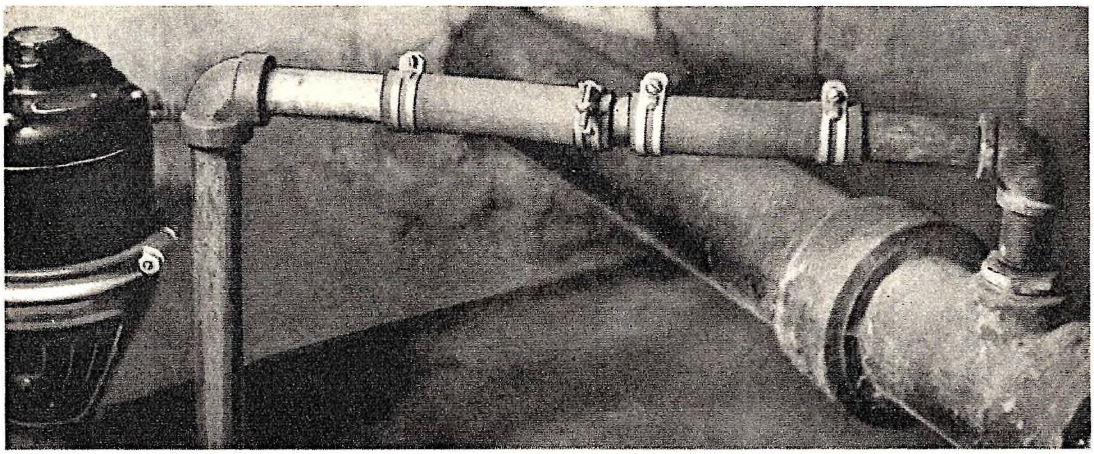
Inner Tube Is Gluing Aid

A SPLIT chair leg is easily glued together if it can be held tightly while drying and a piece of old inner tube and a plumber's pipe strap will do the trick. Soak the glue into the split and then bind it up as shown in the photo above. The tube keeps the metal strap from marring the furniture and excess glue can be cleaned off after the leg has set. If the leg is split too far, two of the plumber's metal straps can be used to hold the parts together until the glue thoroughly dries.

Sanding, Shellacking Renew Toilet Float Valve

WHEN the bottom of the float valve in the tank of a toilet becomes rough, it often causes the ball to hang on the edge of the valve seat. This trouble can be overcome and the ball made serviceable again by removing the ball, drying it thoroughly, sanding lightly and applying a coat of shellac. The ball is ready for use when the shellac has dried.

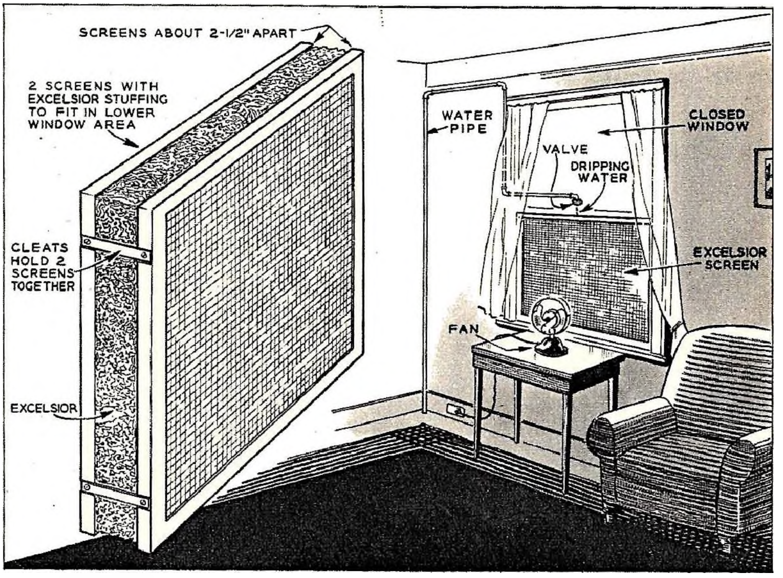
Rubber Hose Silences Pump



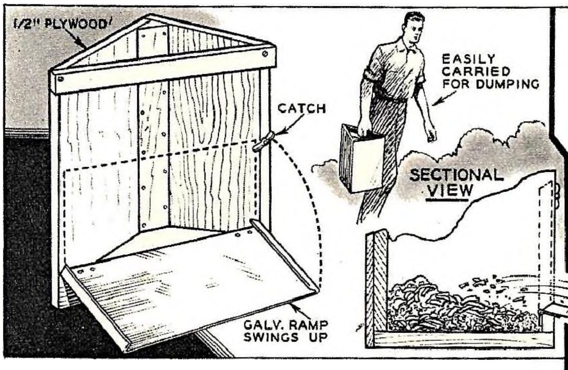
WITH the approach of summer, home owners who have sump pumps or cellar drainers will find them running more often than usual. Most of these pumps vibrate considerably and the resultant noise can be eliminated quite easily by inserting two pieces of ordinary radiator hose in the discharge line, as shown in the accompanying photograph. It may be thought that one piece of hose would quiet the vibration, but that is not the case so use two pieces. Besides, the use of two pieces of hose lessens the chance that the vibration of the pump will work the pipe free from the metal binding straps.

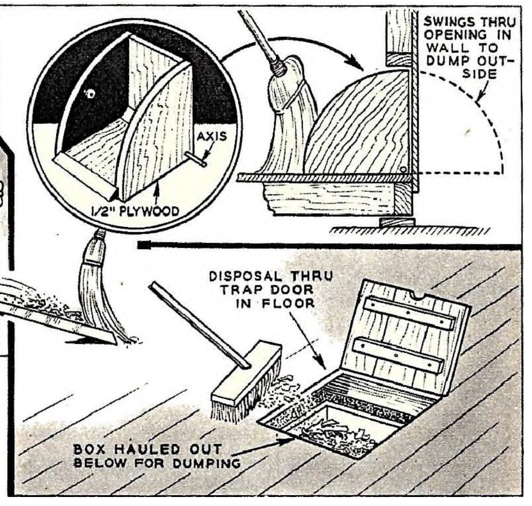
Screens Make Simple Home Cooling Unit

An efficient, inexpensive home-made cooling system, utilizing the cooling effect of evaporation, can be made with two screens, some excelsior and an electric fan. The screens, of the correct size to fit the window into which they are to be placed, should be fastened about two-and-a-half inches apart, and the interior loosely packed with excelsior. The screens are placed in the lower half of an open window. An electric fan in front of the window draws air through the screen into the room. A water pipe, with a valve at the end, should supply enough water to the excelsior to keep it moist at all times. As this water evaporates, the air passing through it will be cooled as much as 15 degrees, depending upon the amount of moisture in the air outside. All other windows but one should be kept closed. The open window will permit the warm air to escape as it is replaced by the air drawn into the room through the "cooling" window.—I. E. Houk.



Disposing of Shop Litter





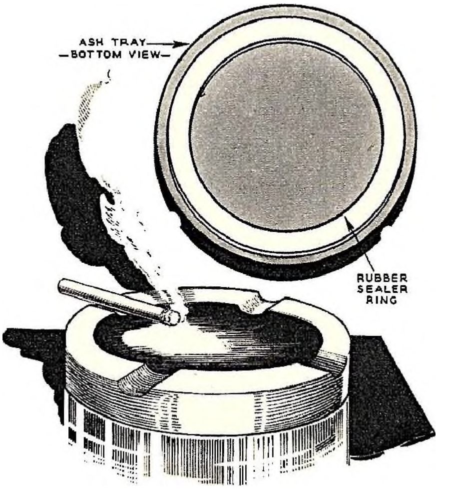
Trash Box Fits Corner

This trash box is designed to occupy very little space and at the same time is convenient for filling and carrying. A galvanized flap serves as a "ramp" when sweeping refuse into the box, and folds up to prevent the spilling of the contents when being carried. It is made of plywood, with a three-corner cleat at the rear joint.—Hi Sibley.

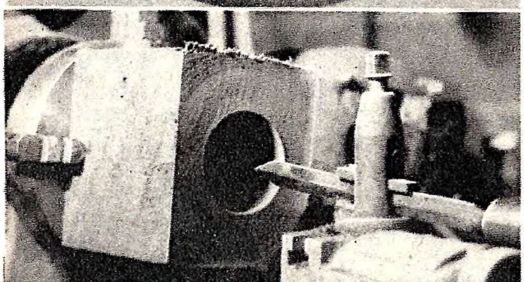
A pivoted trash container shown at upper right is arranged so that it will swing outward through an opening in the wall. It can be dumped from the outside, and in either position closes the opening against flies and drafts. If the shop floor is slightly higher than ground level, a box can be pushed under a trap door, and all rubbish can be pushed into it. The box should be provided with a small handle.—Hi Sibley.

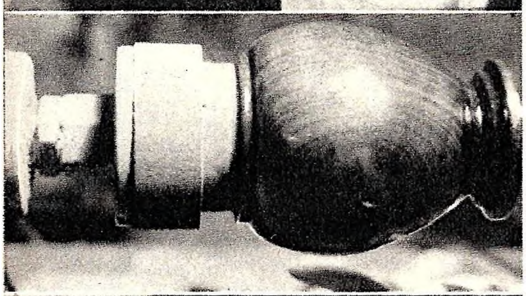
Non-Marring Ash Tray

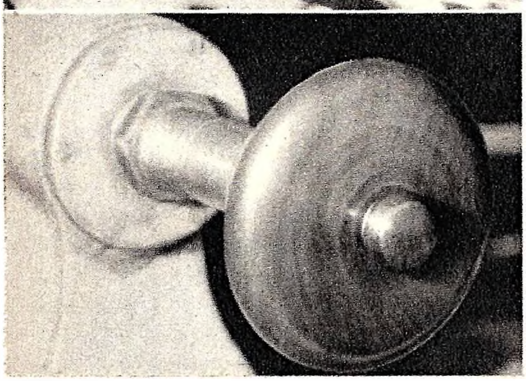
Ordinary jar sealing rings can be attached to the bottom of ash trays to prevent marring or scratching of furniture. The rings can be fastened in place by metal cement or glue. When the ash trays are turned on a lathe, cut a groove in the bottom the same width as the rubber ring but not quite as deep so that the ring will project slightly below the surface.



TURNED WALNUT BOX







THIS walnut box can be constructed in an evening and is useful as well as attractive when completed. If a metal turning lathe is available the inside turning is done on it, to good depth, accurately and easily.

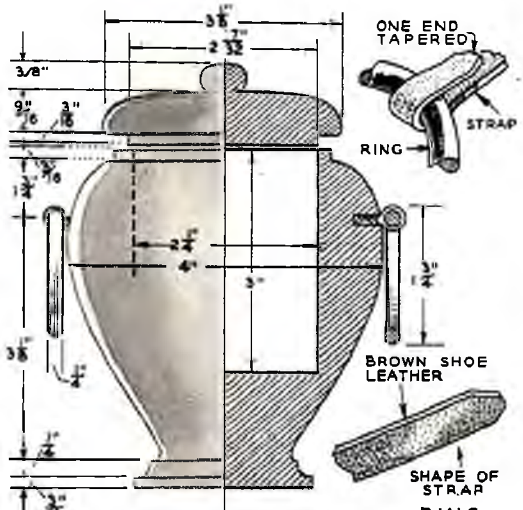
Saw off a piece of solid or glued up walnut 5 inches long and large enough square to give a finished job 4 inches in diameter. Chuck this in the metal lathe and gradually turn the inside opening. When done, turn a jig on the face plate of a wood lathe, which will just make a snug fit for the block. Fit this in place, move up the dead center to minimize chattering, and turn down the outside of the block to the dimensions shown. If walnut is used, it must be filed after sanding, before the clear lacquer is applied. Lastly, rub down with steel wool, wax well, and polish. This procedure completes the box proper.

The lid can be turned from a scrap of the same walnut block. It is a single piece, that is, lid and knob being turned in one piece. Be sure that the lid does not fit tightly, because the box will work slightly out of round, due to some inherent warping. Fill and finish the lid to match the box.

The leather strap used to connect the rings with the box offers a great flexibility totally lacking in wood, so the finished job becomes one with little or no fragility.

Turn the rings from a single block. Mount

[*Continued on page* 134]



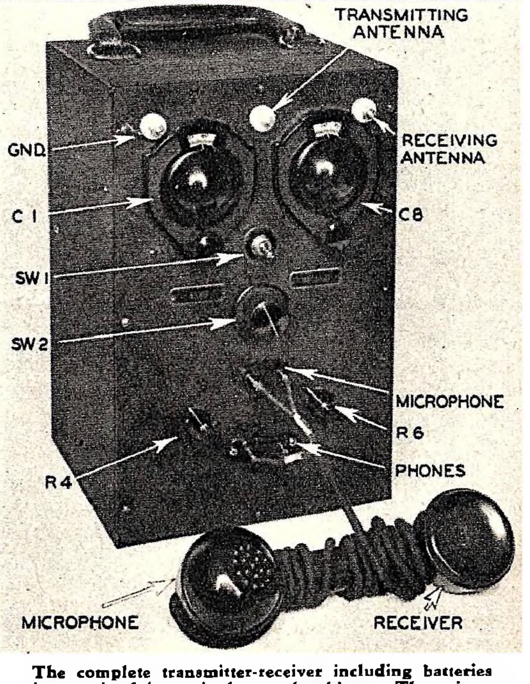
WALNUT BOX SECTION AND ELEVATION

RING FITTING DETAILS

The MI Portable Transceiver

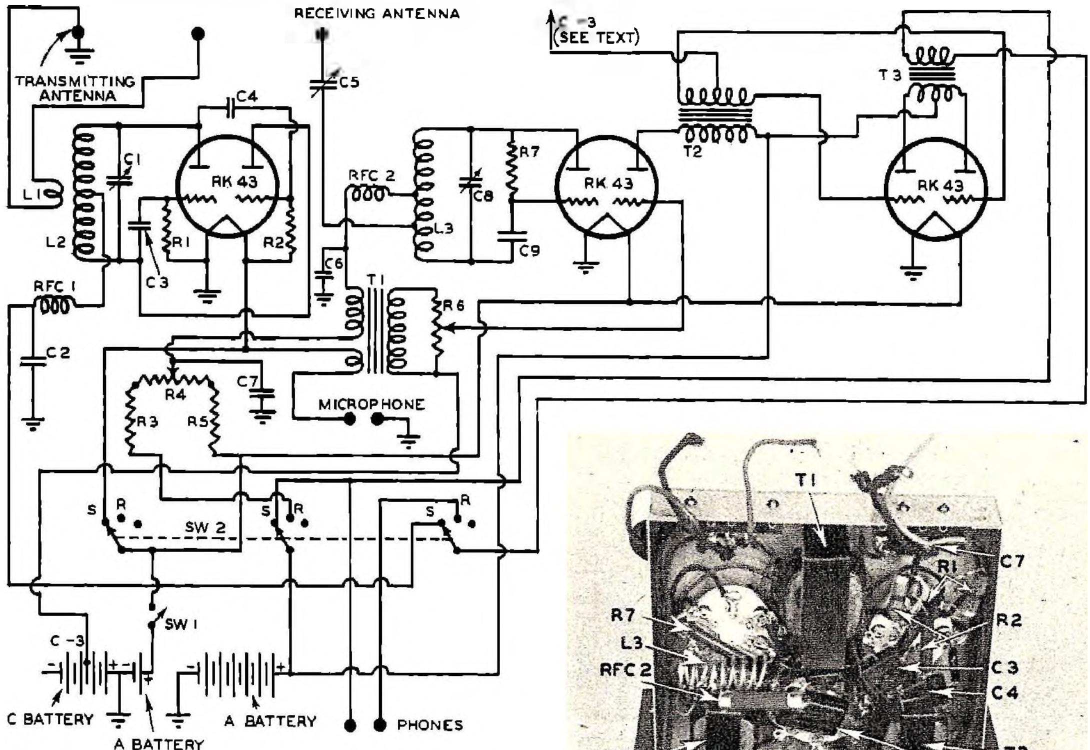
by John H. Potts

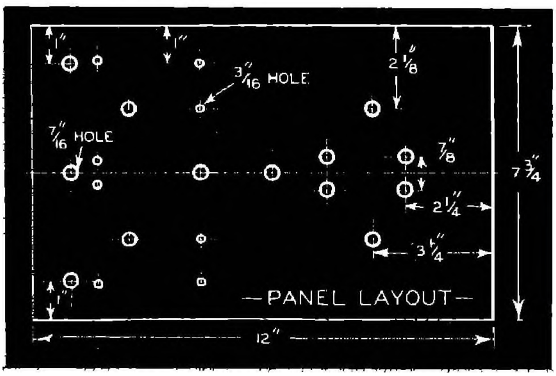
Five-meter transmitters and receivers operate best at high altitudes with no intervening objects between communicating stations. Inasmuch as this rig is self-contained, it can be used in car during summer trips.

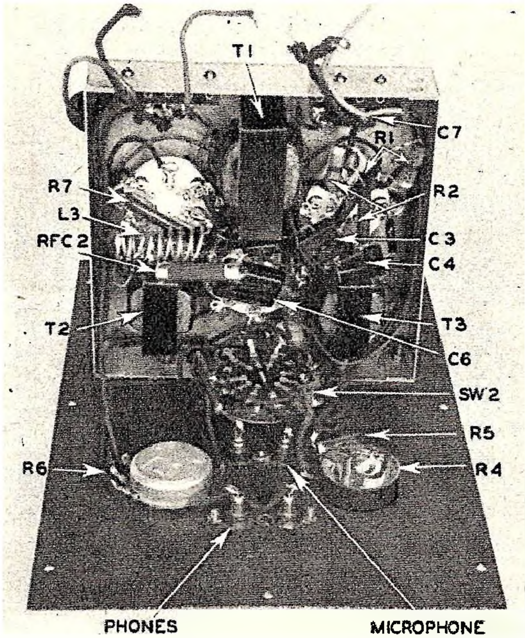


The complete transmitter-receiver including batteries is contained in a single metal cabinet. The microphone and receiver is shown in front.

FOR vacationing "hams," here is a simple, inexpensive 5-meter transmitter-receiver which will afford no end of pleasure and usefulness. For camping, boating and touring it may be set up instantly anywhere and contacts made with the utmost ease and convenience. While tiny in size, it is a thoroughly practical instrument with power output exceeding that of many larger and heavier rigs. Though the battery requirements are lower than those of many portable jobs, performance and convenience of operation have been given first consideration. The oscillator uses an entirely separate tube which performs no other function. It is tuned by its own tank circuit and its coupling is permanently adjusted to the proper value for the separate transmitting antenna. Therefore, during a QSO, one may transmit or receive by the simple method of turning a switch, no readjustments of any kind being required for







At left are shown the panel layout dimensions. Above is the layout of the parts, looking up under the chassis. The change-over switch (Sw2) is in center of panel.

maximum efficiency in either form of operation.

This new unit employs three tubes, all type RK-43 dual-triodes. Because they operate on 1½ volts, a single dry-cell battery serves as the entire "A" supply. The filament current drain is only 120 milliamperes per tube, as against 260 mils for the more-commonly used type 19, yet the rated power output in class B service is 2.7 watts for the RK-43 and only 2.1 watts for the type 19. Thus the drain from a single cell with the RK-43's is less than half that required from two cells with the type 19's, with a resulting saving in space requirements, replacement expense, and the need for voltage-dropping resistors. The low internal capacities of this tube also make for excellent performance in the ultra-high frequency bands.

The entire instrument, with self-contained batteries, measures only 12 inches high, 6½ inches deep and 7¾ inches wide. The cabinet is a standard type, readily obtainable, which comes already supplied with the convenient handle. The transmitting antenna, which is adjustable in length, is likewise a commercial product, made of light metal tubing. The handset slips readily in a pocket. With a short piece of wire for use as a receiving antenna, one is completely equipped for two-way communication.

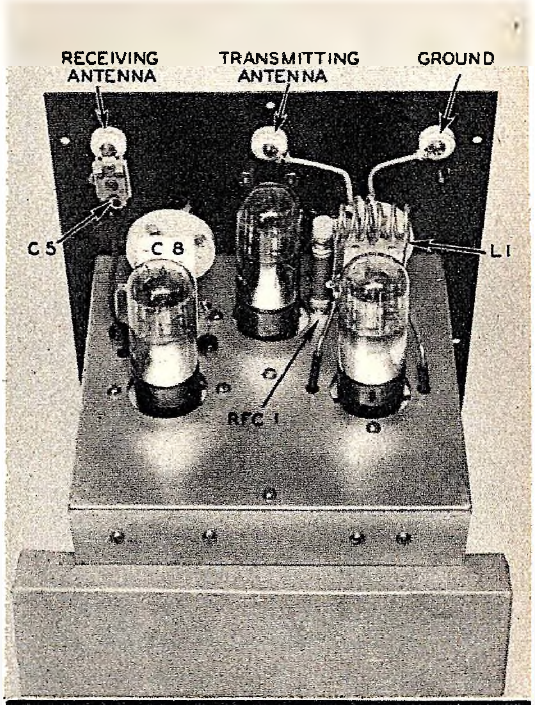
The push-pull oscillator is a derived Hartley type which is best adapted to such compact jobs. Only a single, easily-wound coil

PARTS LIST

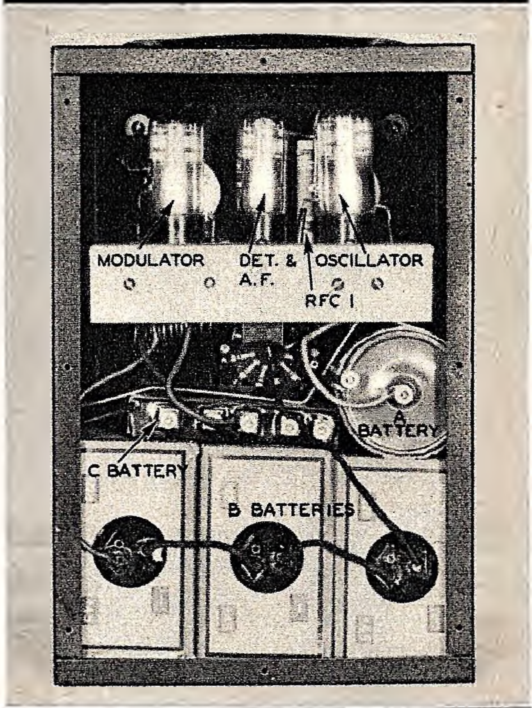
L1—2 turns, ½-inch inside diameter (see text)
L2—6 turns, No. 12 tinned bus bar, ½-inch inside diameter (see text)
L3—8 turns, No. 12 tinned bus bar, ½-inch inside diameter (see text)
C1—National midget variable condenser, 15 mmfd., type UM-15
C2—Mica condenser, .001 mfd.
C3, C4—Mica condenser, .0001 mfd.
C5—Hammarlund type MEX-30 trimmer condenser, 3-30 mmfd.
C6—Mica condenser, .006 mfd.
C7—Tubular paper condenser, .01 mfd., 200 v.
C8—Same as C1, but with one rotor plate removed
C9—Cornell-Dubilier midget mica condenser, .00025 mfd.
R1, R2—Carbon resistors, 13,500 ohms (value obtained by using 10,000 and 3,500 in series) ½ watt
R3—Carbon resistor, 25,000 ohms, ½ watt
R4—Volume control, 50,000 ohms
R5—Carbon resistor, 50,000 ohms, 1 watt
R6—Volume control, 500,000 ohms, audio grid taper
R7—Carbon resistor, 5 megohms, ½ watt
Sw 1—Toggle switch, s. p., s. t.
Sw 2—Yaxley single-gang, three-circuit switch
T1—Kenyon input transformer, plate or single-button mike to grid, type KA-114M
T2—Kenyon audio transformer, plate to push-pull grids, midget, type KR-19
T3—Kenyon output transformer, type KR-19M
RFC 1, 2—ICA radio-frequency chokes, 5-meter type
3—National Isolantite sockets, 6-prong, one-piece type
2—National Isolantite shaft couplings, type TX-9
2—Twin pin-jack assemblies
3—ICA name plates, marked "Send", "Receive", and "ON-OFF"
3—pairs Communication Products Co. "butt-ins" for antenna terminal insulation
2—Kurz-Kasch 3-inch vernier dials
1—American Radio Hardware Company 2-section, 5-meter rod antenna
1—Parmetal portable cabinet, 12x7¾x6½ inches
1—Parmetal chassis for above, 6½x6¼x1½ inches
3—3-terminal lug assemblies
3—Raytheon RK-43 tubes
1—Universal Handset, single-button type with receiver
3—Eveready portable 45-v. B batteries, type 762
1—Eveready 1½-volt dry-cell, type 7111
1—Eveready 7½-volt C battery, type 773
1—Piece ½-inch strip brass, 1 foot long
6-32 machine screws, nuts and lock-washers
3 lengths No. 12 tinned bus bar for coils
Push-back wire
2—knobs for volume controls

is required, small in size so that little energy is absorbed by the cabinet. Note that the feedback condensers C3 and C4 must connect from the plate of one section to the grid of the opposite section of the RK-43. The oscillator grid leaks, R1 and R2, are rather critical. The recommended values are between 12,000 and 16,000 ohms. In this design 13,500 ohms were used for each with excellent results. The proper value is determined easiest by noting which size gridleak holds the plate current steadiest when modulating the tube with antenna load connected. L2 is made by winding 6 turns of No. 12 bus bar on a half-inch form. Wind the coil with the turns close together first, then remove from the form and spread the turns with a screwdriver until the whole coil is about 1¼ inches long. Leave the ends about 2 inches long on each side so the coil may be mounted on top of the tank condenser and soldered directly to the condenser terminals. It will be necessary to put a lug under the condenser stator

[Continued on page 141]



The layout of parts shown by this rear view should be followed as closely as possible for best results. The transmitting tank coil is located at the right.



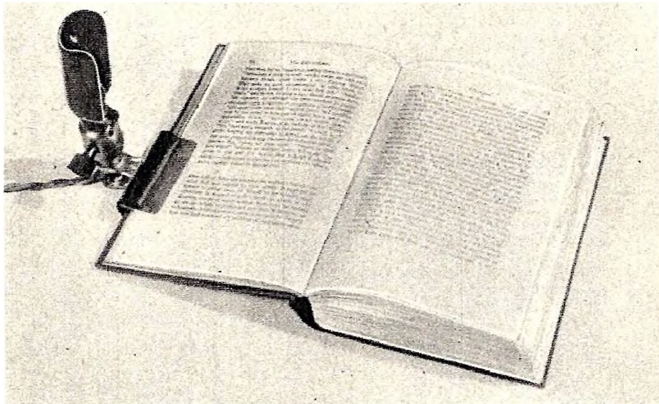
Small size batteries should be used for "B" power. Because the tubes used have comparatively low plate current drain, the life of the batteries will be long.

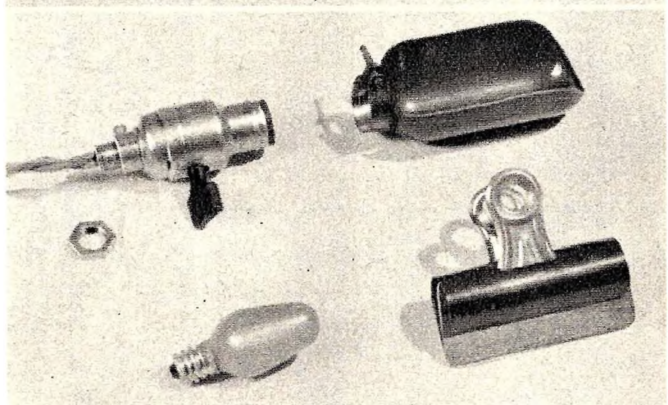
Paper Clip Holds Convenient Portable Light

THE accompanying pictures show how a large paper clip of the spring type can be converted into a portable light that is very convenient and useful. The only parts required are a key socket of the candelabra type, a small brass shade to fit it, a short threaded bushing and nut, and a 7½-watt light bulb — the type used for Christmas trees.

The hole in one of the fingers of the clip is reamed out to take the threaded bushing, which fits in the neck of the socket. A flexible cord is wired to the latter in the usual manner. The entire job takes about ten minutes.

Many applications for this lamp will suggest themselves. It is ideal for the person who likes to read in bed before retiring. It is handy for lighting up dark closets, and makes a fine little "trouble light" when one is working on the furnace, under stairs, etc. If a red or green bulb is used, the device makes a good clock illuminator in the photographic darkroom.



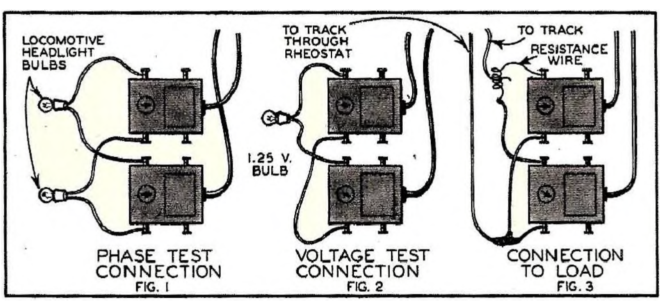


How To Use Two Transformers At The Same Time

A GREAT many model railroad owners, after finding that their single transformer heats excessively after being loaded with extra equipment, have tried the experiment of connecting two transformers together to supply additional power. This is sure to result in a burnout of both transformers if no test is made—if not the first time the transformer cords are plugged in, then the second or third.

This is because it is just as important which prong of each transformer plug is placed upward in the electric outlet as which way the transformer secondaries are connected.

The purpose of this test is to insure that the voltages at connected terminals are identical. They must not only be equal numerically, but both must work in the same direction. The test should be repeated every time the transformers are connected into an outlet. This need not be done if a double socket is used, and both socket and plugs are marked to insure that the plugs will always be inserted in the correct way.



A pair of headlight bulbs and sockets (Christmas tree light sockets will do) are all the equipment needed to make the test. Select identical voltage terminals from data given in the tables usually stamped somewhere on the transformer case. If terminals

[Continued on page 134]

FIRST PRIZE—$15—Oh, Grandma, what big teeth you have! By John Price, 3848 Blaisdell Ave., Minneapolis. Taken with 3¼ x 4¼ Graflex on Ortho-press film at f-4.5 and 1/10 sec.

SECOND PRIZE—$10—"Self-portrait" by E. Lauren, 318 Elmhurst St., Detroit. Double exposure with Graflex; superpan film; f-4.5, 1/10 sec.

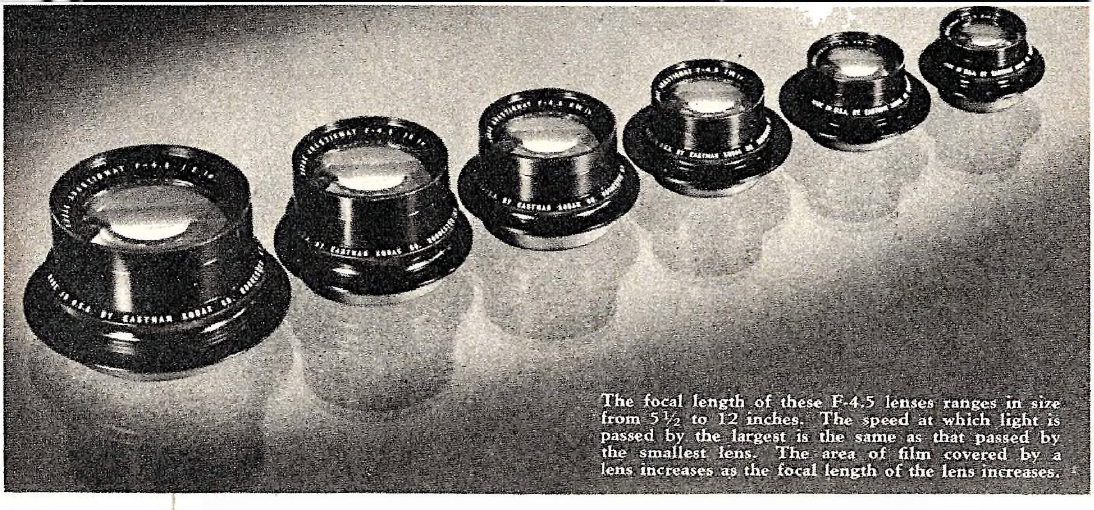
THIRD PRIZE—$5—"Quiet" by James Keyes, Lewistown, Pa. Voightlander; 9 x 12 cm. superpan film; one photoflash; shutter set on "bulb."

FOURTH PRIZE—$5—"Tornado!" by Grover Brinkman, Okawville, Ill. Speed Graphic; f-4.5, at one second. Right—FIFTH PRIZE—$5—"Table-Top Trick" by Coursin Black, 3111 W. Tusc St., Canton, Ohio. Ziess; f. 16, 1/10 sec.

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 if you want them returned. Address all contributions to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

WHAT The "F."



The focal length of these F-4.5 lenses ranges in size from 5½ to 12 inches. The speed at which light is passed by the largest is the same as that passed by the smallest lens. The area of film covered by a lens increases as the focal length of the lens increases.

A QUESTION frequently asked at camera club meetings is, "What does the 'F' marking on a lens mean?" The simple explanation involves only the most elementary arithmetic.

The letter "F" represents the aperture ratio, or, more specifically, the ratio of the focal length of the lens to its actual physical diameter. The number indicates the light-admitting ability of the lens. The smaller the number, the bigger is the lens and the more light it admits to the camera. A lens that admits a lot of light can be used with a fast shutter speed to stop motion in the subject being photographed, so the aperture ratio is commonly known as the "speed" of the lens.

As practically all lenses are fitted with adjustable diaphragms, it is obvious that the "speed" will depend on their setting. When the diaphragm is wide open, the entire surface of the lens is in use, and the speed is then the ratio marked on the lens barrel. As the leaves of the diaphragm are closed down, the effective area of glass is reduced, while the focal length remains constant, so the ratio increases and the "speed" becomes lower.

Figures 1, 2 and 3 illustrate the principles involved. Suppose we have a lens 1-inch in diameter, with a focal length of 4 inches. (The "focal length" is merely the distance behind the lens at which the light rays from a distant object come together, after being bent or "refracted" by the lens, to form a sharp image of that object.) With the diaphragm open, the aperture ratio is 4:1, so we say this lens has a speed of F.4. Now if we close the diaphragm so that it leaves only ¾ inches of glass in the center of the lens free, the ratio is 4:¾, or a speed of f. 5.3. With only ½ inch of free glass, the ratio is 4:½, or f.8, and so forth.

A few quick calculations will indicate that a lens 2 inches in diameter and of 8-inch focal length also has a speed of F.4, as does another lens only ½ inch in diameter with a focal length of 2 inches. What, you ask, is the difference between them?

In optics, as in everything else, we do not get something for nothing. All these lenses have the same "speed," but they produce images of altogether different size. Thus, the 2-inch lens will cover only miniature camera film, measuring 1x1½ inches. The 4-inch lens will make 2¼x3¼-inch pictures, while the 8-inch glass will cover 4¾x6½ inches. The focal length determines the size of the image, while the diameter determines its intensity. An 8-inch F. 4 lens makes exactly the same picture as an 8-inch, F.8 lens, with the exception that the latter requires approximately *four* times the exposure, all other things being the same.

This brings us to the values of the F. figures in relation to each other—probably the most confusing thing in practical camera operation. A speed of F.8 sounds twice as slow as a speed of F.4, but it isn't. It's four times as slow. Remember that we are concerned with the

Numbers Mean

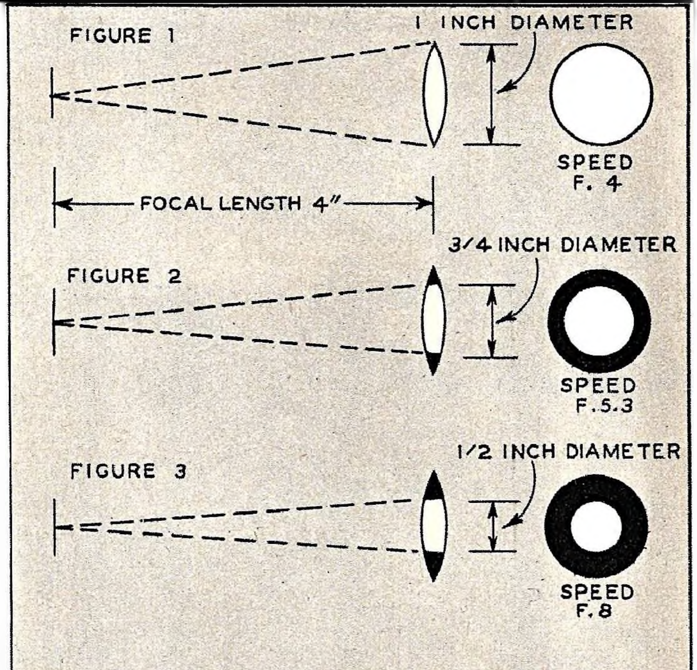
area of the lens, and this varies with the *square* of the diameter. Look at Figures 1, 2 and 3 again, and compare the areas of the full 1-inch lens and the same lens with only ½ its area showing. To compare the actual speed values of any F. settings, square the numbers and then compare them.

More than half a century ago the Royal Photographic Society of Great Britain recommended that an aperture ratio of 4:1 be adopted as standard, and a series of uniform openings be selected in such a manner that each higher number would indicate an area one-half that of the preceding one. This system was to eliminate the need for mental arithmetic on the part of a busy photographer. A properly marked F.4 lens would therefore have its diaphragm stops labeled 4; 5.6; 8; 11.3; 16; 22; 32; 45; the relative exposures would then simply be 1, 2, 4, 8, 16, 32, 64, 128. For instance, if a man knows that correct exposure for a certain scene is 1/50 second at F. 16, and he wants greater depth of focus, he closes down one stop to F.22 and merely cuts the exposure in half to 1/25 second. The adjustment can be made in either direction, of course.

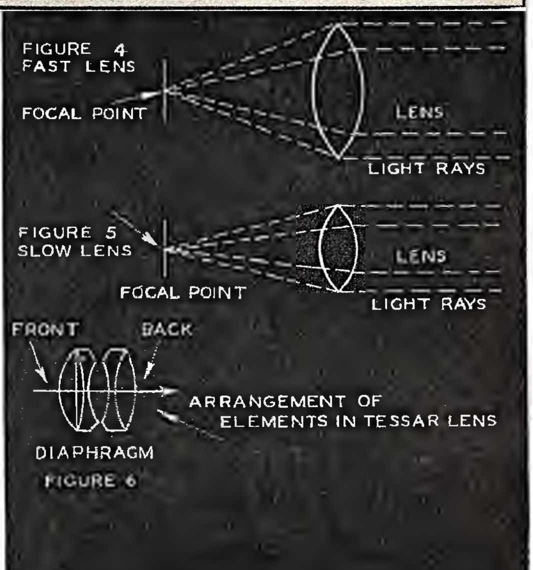
Throughout the years, as lens manufacturing methods improved, speed increased too. Today there are few F.4 lenses on the market, the universal standard, for some reason or other, being F.4.5. Faster lenses, all the way up to F. 1.5, are common. Some of the speed figures do not work out evenly, and for this reason it is interesting to study the table at the end of this article which gives the F. numbers and their squares.

An important thing to watch when working with an F.4.5 lens is that the next smaller stop, F.5.6, is only 50% smaller. However, from 5.6 to 8, from 8 to 11, etc., the ratio

[*Continued on page* 140]



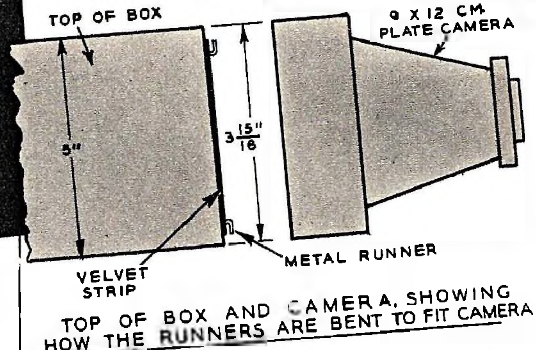
The speed of a lens is in direct proportion to the square of its diameter. The F-4 lens shown in Fig. 1 is approximately twice as fast as F-5.3 in Fig. 2; four times as fast as F-8 in Fig. 3.

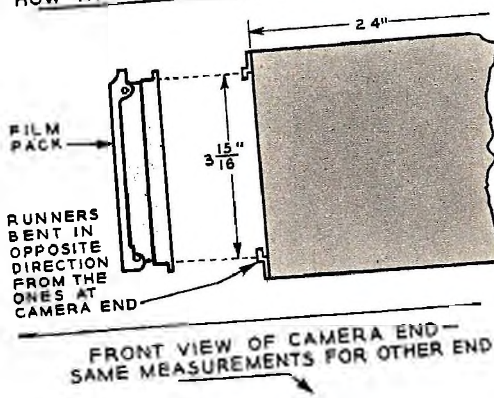


Faster the lens, the larger is its area, as illustrated by Figs. 4, 5. The Tessar lens (Fig. 6) has two elements each, front and back. Diaphragm fits between them.

Close-Up

by D. J. Murphy

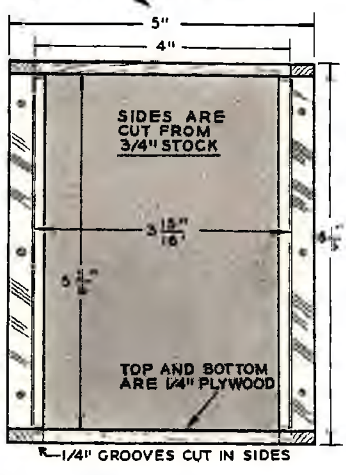


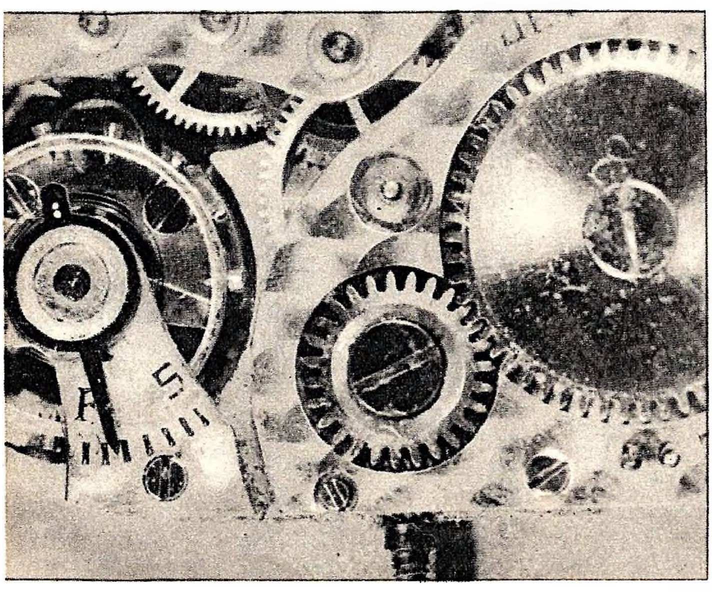


THE usual way to make close-up pictures of small objects is to insert a specially-made tube between the camera and the lens. Since most cameras have their lenses permanently attached, this procedure is not open to everyone.

However, as the sole purpose of this arrangement is to increase the distance between the lens and the film, it is possible to achieve exactly the same result by placing a similar attachment, in the form of a box, between the back of the camera and the film.

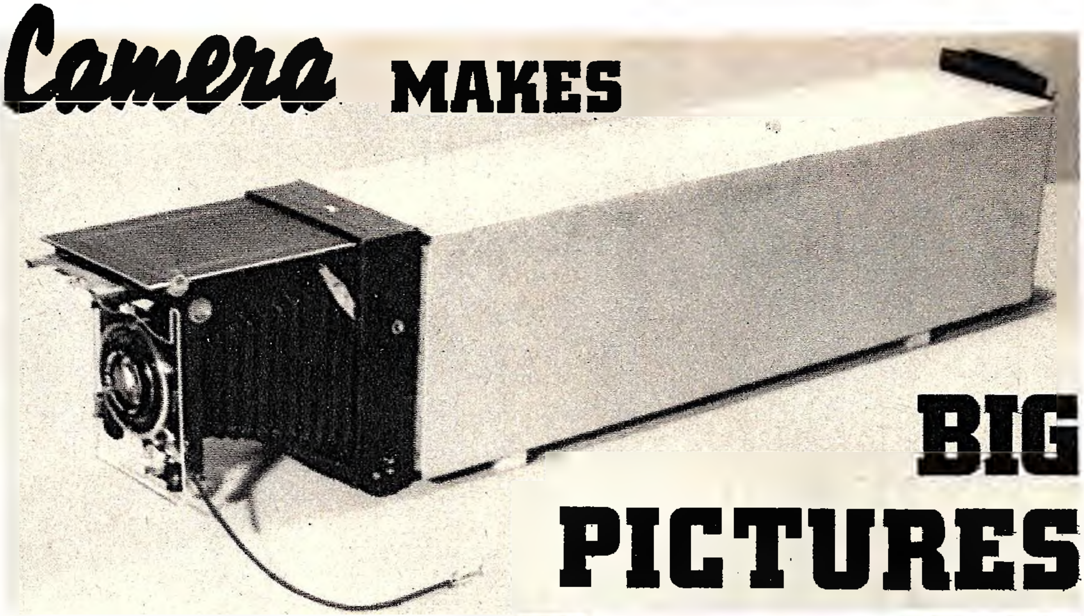
To do this, all that is needed is a light tight box. This must be arranged so that the camera may be attached to one end, and the film pack adapter or plate holder to the other.





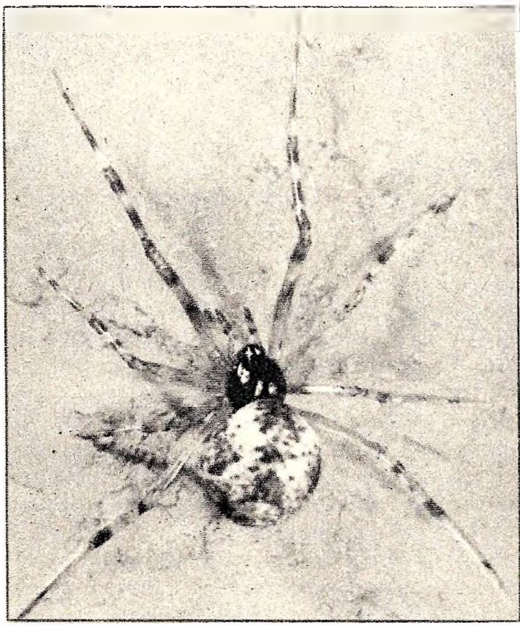
Above—Details of box attachment. Left—These might be the wheels of a huge punch press, but actually the picture is a "close-up" of the movement of a small wrist watch, taken with the attachment described herein.

Camera MAKES BIG PICTURES



How the completed camera looks with the original camera on one end and the focusing panel at the other.

The marked degree of direct enlargement possible with the "close-up" camera is well illustrated in this picture. A 9 x 12 cm. contact print, made with the attachment, is compared with the actual size of the object, in this case a common ruler. Intimate close-ups of pins heads, nails, pebbles, grains of salt, etc., will suggest themselves to the ingenious photographer.



Tiny insects are easy to take with the aid of the above "box." The image fills most of the negative area, and enlargements can therefore be made without loss of sharpness or detail.

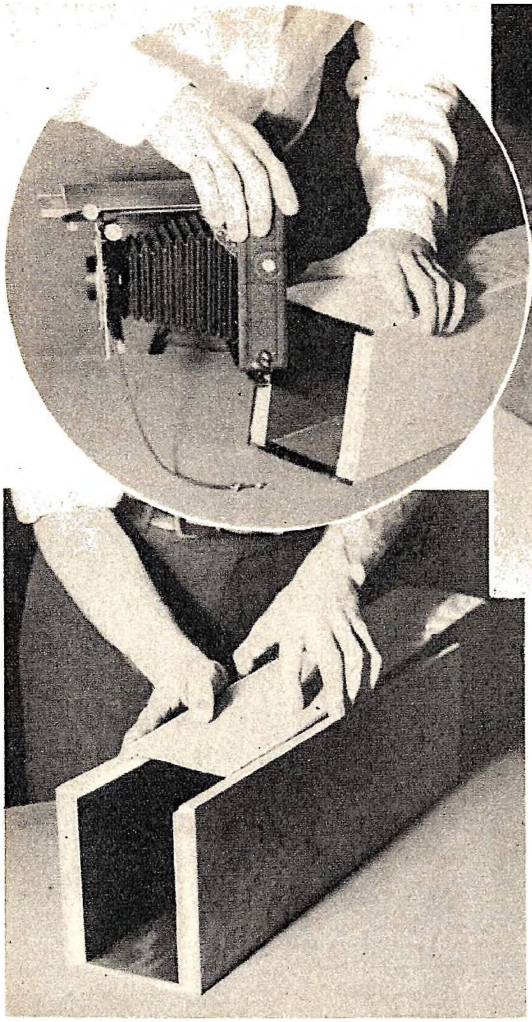
The length of the box will determine the degree of enlargement.

The one described here is 24″ long, and enlarges the object about five or six times. The dimensions given are for a 9x12 cm. film pack camera. If your camera is larger or smaller, the measurements are easy to change.

The sides are cut from ¾″ pine. Grooves are cut in each, ¼″ deep, into which the top and bottom pieces are fitted. Before the top is put on, paint the interior of the box with flat black paint. Don't forget the top piece.

The runners for the camera end are made next. Any sheet metal of about 18 gauge thickness will do. Cut the strips about one inch wide. The length is determined by the size of the camera, being just so long that when the bottom flange, which holds the plates in place, reaches the top of the runner, the camera will be exactly centered in the opening of the box.

The distance between the runners, when

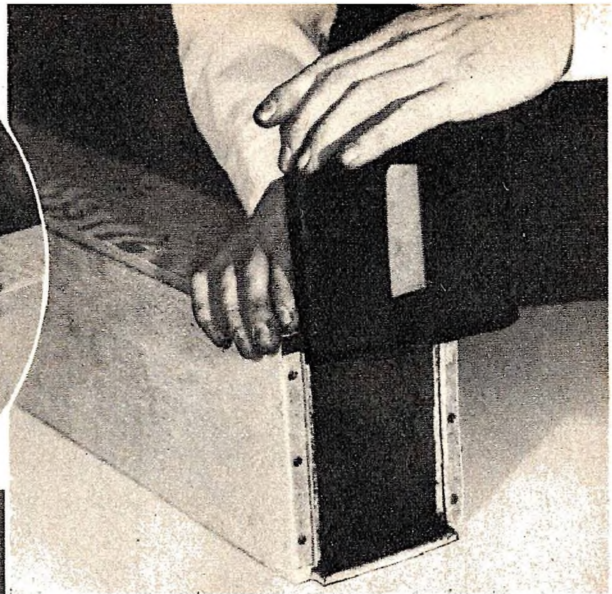


Circle—The camera is turned upside down, and slid over the metal runners. The outfit can be used vertically, as shown on preceding page, or turned on its side if the subject is wider than it is high. Above—Before nailing on the top, paint entire inside of box with flat black paint, to kill internal reflections.

placed on the box, will be the same as the width of the film-pack adapter. A good way to be sure that they are correctly placed is to first screw one runner firmly in place. Make sure that it is perfectly straight. Then with the camera in place against this runner, place the other in position and screw it lightly in place. See that the camera slides up and down easily, and then tighten the screws.

The runners at the opposite end, for the film-pack adapter, are put on in the same way, substituting the adapter for the camera. Note that these runners are bent so as to face in the opposite direction.

Next, strips of black velvet are glued to the ends of the box. Cut these strips so that



Above—The new "back" of the camera, with the film-pack adapter being slid in place. Note how the bottom extends about 1/2 inch, forming a stop.

they fit snugly up against the tops of the metal runners.

At the end where the film-pack adapter is to be inserted, the bottom piece should extend beyond the rest of the box about 1/2". Another strip of velvet is glued here, so that the adapter will rest down on it.

Now you are ready to test for light leaks. Take the adapter off, and place a strong light directly in front of the camera. With a black cloth over your head, look through the box. Any light entering around the edges will immediately be seen, and may be stopped with adhesive tape or velvet, as the case may be. Other end is tested in exactly the same way.

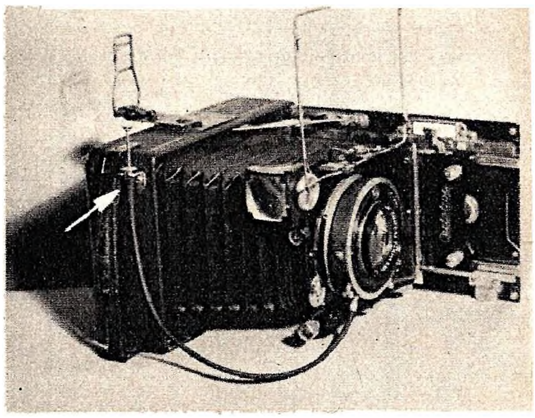
Assemble everything, and place the outfit on a level surface. If the carrying strap on the camera touches the surface, two small blocks of wood will have to be glued to the bottom of the box, otherwise the camera will not go all the way down, and demon light will get in around the lower edge.

The next step, naturally, is to take a picture. If your subject is an insect, it will have to be mounted; in any event you will have to build a small "set" that will bring the subject up to the height of the lens. Cigar boxes and bits of wood are useful for this purpose. Place the object about eight or ten inches from the lens. Two photoflood bulbs, one at either side, will provide the light; however, a small spot light, if you have one, will prove much better.

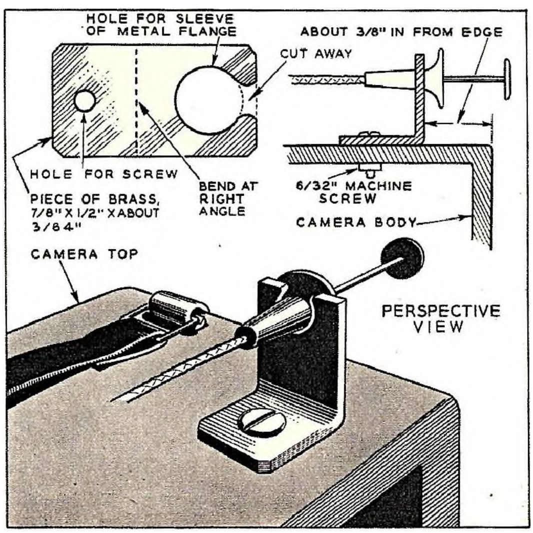
"Finger on Button" SHUTTER RELEASE

THE illustrations show an attachment that holds the cable release firmly to the camera body, making it possible to get a good grip on the camera and release the shutter with one finger. It may be used on any camera with a direct vision finder and cable release.

Material used is a piece of brass about 3/64 inches thick, ½ inches wide and ⅞ inches long. A hole is drilled in one end of the brass so that the sleeve part of the metal flange on the cable release can be slipped in. The hole is right size when half of the tapered sleeve can enter the hole. In practice the fabric part of the metal sleeve is slipped through the hole and the metal part jammed down to hold tightly. The brass flange is bent at right angles and is fastened to the camera box with a 6/32 machine screw.

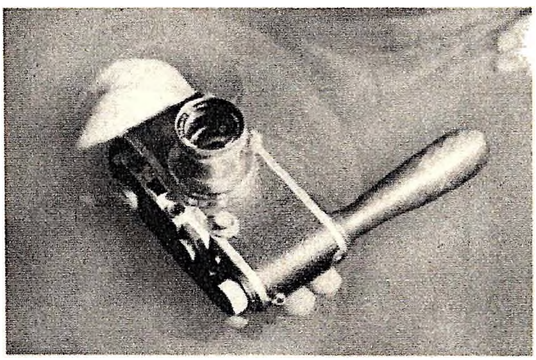


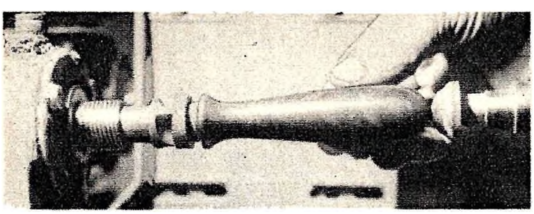
Top—Showing camera in position for trigger-finger action. Above—Showing release ready for use. Below—Working details of the finger-on-button hook-up.



HANDLE GRIP

For Camera

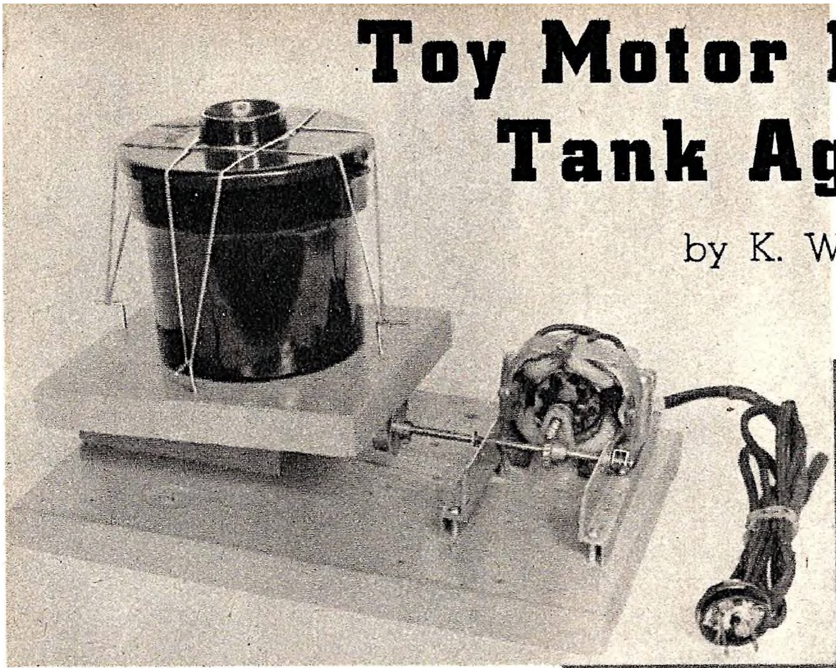


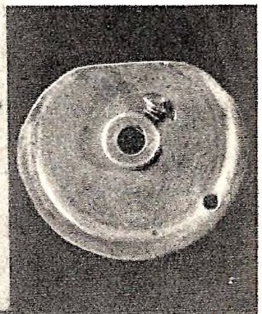


THIS useful handle will work on any hand camera. Turn down a walnut grip 5 inches long, shaped as shown. Fill the wood, polish and dip in lacquer. Drill a hole for a ¼-inch bolt. Put liquid glue in the hole, cut off head of the ¼-inch bolt and drive it in the hole with a mallet until only ¼ inches of the thread-end protrudes. This finishes the grip and it is turned into the camera as shown above.

Toy Motor Makes Tank Agitator

by K. W. Strong



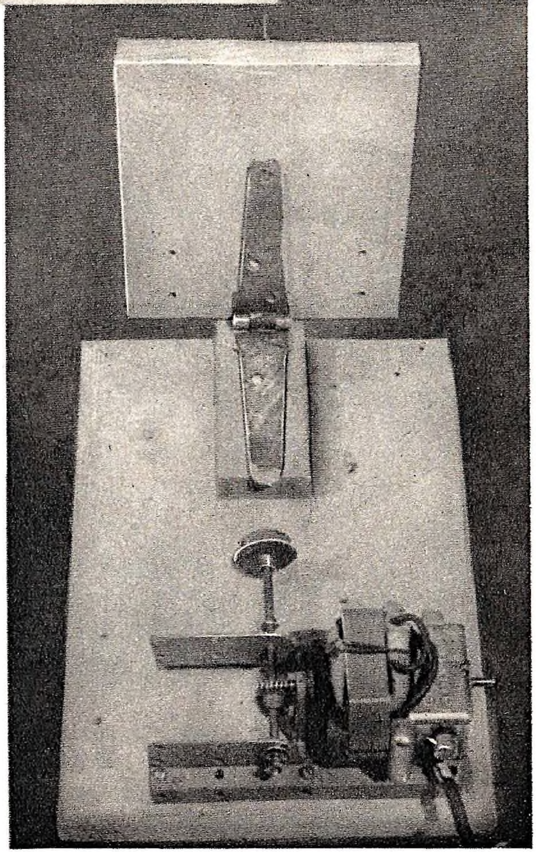


Above: The completed agitator with the loaded film tank in place. Right: Close-up of the rocker cam, made from a small pulley, about an inch in diameter.

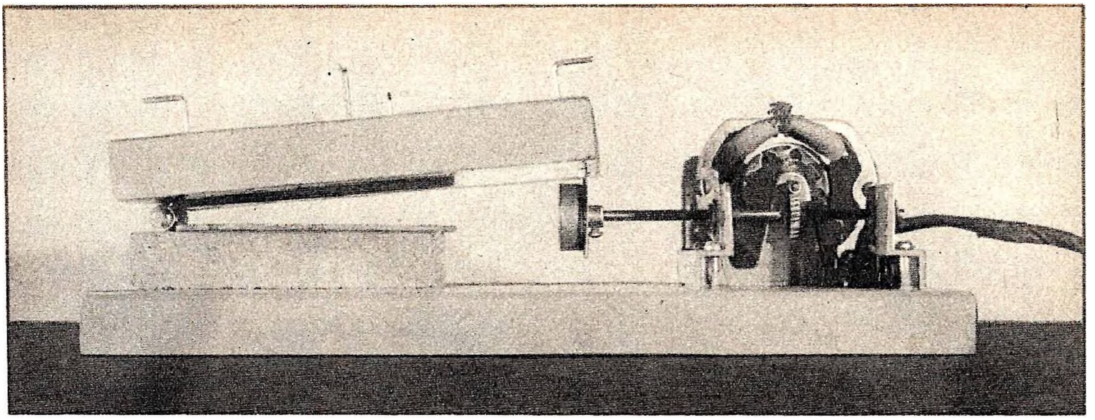
AGITATION of the film tank during development, particularly if miniature film is handled, is strongly recommended by photography experts. Constant movement prevents the formation of tiny air bubbles on the surface of the film, and in many cases increases the contrast of the negative.

Since the fine-grain developers used with miniature camera films are very slow in action, requiring upward of twenty minutes, the job of shaking a tank or twirling the inside reel by hand is a very tedious one. The only commercially available agitators cost almost as much as a good camera, so the writer decided to build one.

The main requirement being a fractional horsepower electric motor, a search was made among local hardware and electrical stores. Fan and sewing machine motors were found in great number, but these seemed to have too high a speed for the intended purpose. A hardware dealer who was cleaning out surplus Christmas stock finally offered the ideal unit: a small A.C.-D.C. motor from a broken-up Erector set. This was fitted with a worm drive reduction gear for the operation of toys; the reduction ratio of about 1:6 proved just right. The dealer was glad to dispose of the motor for less than two dol-



How the rocker table is fastened to the hinge. The rocker axle is in line with the center line of the table. A rubber cam in place of the metal one shown will operate more quietly.



Side view showing the relative positions of the parts.

lars, along with an assortment of axles, pulleys, gears and small fittings.

A couple of pieces of scrap wood, an old hinge, some rubber bands and a few screws were all that was needed. The motor was screwed along the end of a piece of 7½-inch wide shelving about a foot long, as shown. A six-inch axle was fitted to the reduction gear, the long end pointing inward. A stamped metal wheel from the Erector set was trimmed off with a pair of snips to form a slightly irregular cam, and then it was fastened by means of its own set screw to the end of the axle.

A piece of shelving about six inches square was then fastened to the left end of the baseboard, in the manner made clear by the accompanying pictures. An extra piece of wood was put under the fixed part of the hinge to bring this little "table" to the correct height. As the sideview shows, it rests on the pulley and is free to move up and down with the latter. It is important to loosen the pin of the hinge, if it already is not loose, so that the table can move freely.

The tank is held in position by two rubber bands stretched over its neck. They snap under the heads of four L-shaped curtain hooks, which are screwed into the "table" with the "L's" pointing outward. While this looks like a rather make-shift arrangement, it really works very well if a couple of husky rubbers are used.

After the tank has been loaded with a roll of film and the developer poured in, it is mounted on the table and the motor is plugged in. The table then begins to jog up and down at a merry rate as the cam on the motor shaft wobbles around. After a few weeks of service the sharp edge of the pulley wore a ridge in the under side of the "table," so a strip of brass was nailed in place over the worn section.

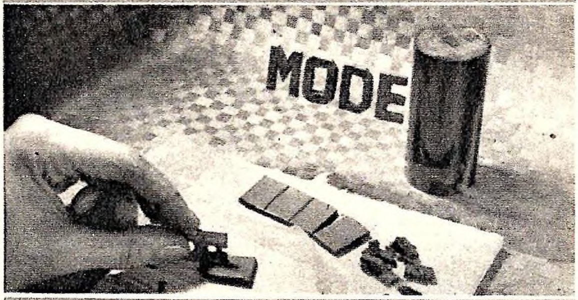
Since this agitator has been placed into operation, all trouble due to pin holes in the film has disappeared. It is not necessary to keep the motor running for the entire developing period. The first five minutes are most important; after that the device is turned on for about a minute at a time every three or four minutes. Likewise, it is again used after the tank has been flushed thoroughly with water and filled with hypo. Agitation during the initial fixing period is just as important as during developing.

The cam, in hitting against the rocker table, makes quite a racket. This is not objectionable in a cellar darkroom, but if the camera fan does his work in the kitchen or bathroom other members of the family will surely object. However, it should be a simple matter to cut a quiet rocker cam out of a rubber sink stopper or an old rubber heel.

Thermos Jug Protects Film In Hot Weather

A THERMOS jug serves as an excellent safeguard for film in extremely hot weather. Use a jug with a wide opening. Cool it with chopped ice for several hours. After removing the ice, dry it *thoroughly* and then place the film inside and cover the jug. A good thermos jug will keep film cool for about 8 hours, possibly longer. Use a jug with a porcelain tank as porcelain does not retain moisture the way crockery jugs will.

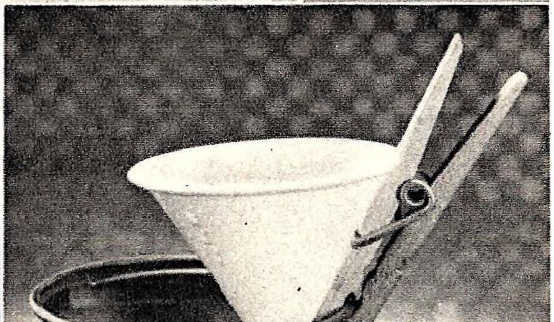
KINKS for



MAKING TITLE LETTERS. Block letters that can be photographed for titling either movies or stills can be made of modeling clay quickly and easily. Roll the clay into a sheet about a quarter of an inch thick. Cut it into strips about one inch wide and then into squares. A knife or razor blade should be used to cut the squares into finished letters.

A SIMPLE DIFFUSER FOR ENLARGING. When an image is projected through this diffuser, the picture will have sharpness as well as a quality of soft diffusion. To make it, criss-cross lines of sodium silicate (water glass) a quarter of an inch apart on a small piece of clean glass. Glycerine can be used but is not permanent.

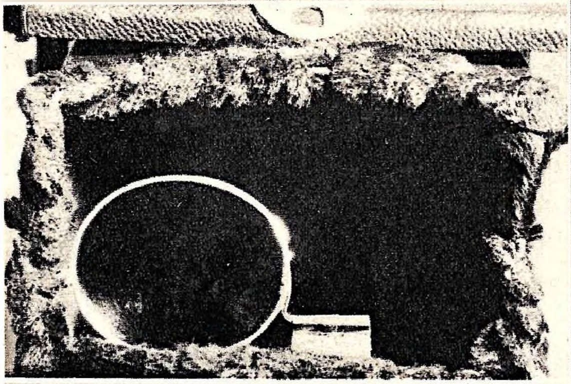
SUN SHADE FOR BOX CAMERA. A simple and inexpensive sun shade for a box camera can be made by cutting three 2-inch squares of cardboard and fitting it over the lense as shown in the photograph. The cardboard should be fastened together by narrow strips of adhesive tape.



NON-REFLECTING BLACK FOR ENLARGERS. When the black interior finish of an enlarger becomes chipped or requires replacing, coat inside surface with a thin solution of asphalt varnish in turpentine. When it is tacky, dust the surface with lamp black and allow to dry. Excess can be dusted away, leaving non-reflecting surface.

FUNNEL CLIPS TO DEVELOPING TANK. When a funnel is used for filtering developer, it can be attached to a spring clothespin which in turn can be clipped to edge of developing tank. The solution then will filter directly into container in which it will be used. Cellulose cement should be used to hold the funnel to the clothespin.

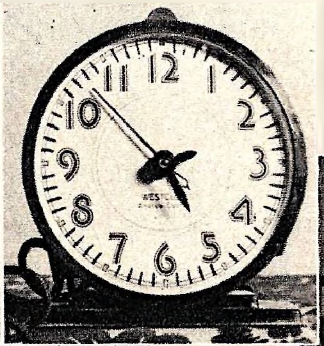
Camera Fans

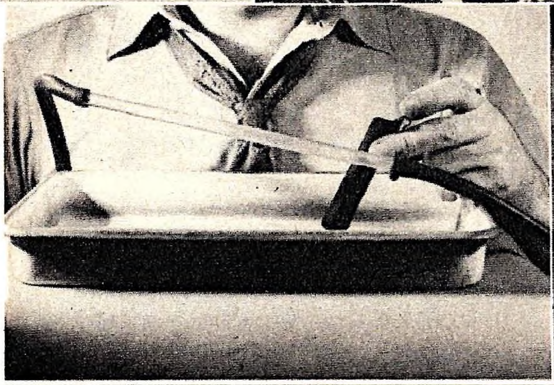


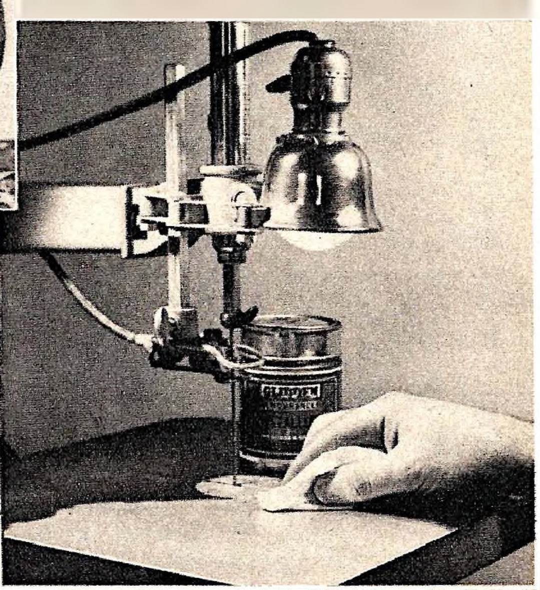
FOCUSING AID FOR GRAFLEX OWNERS. A spectacle lens soldered to a small hinge and bolted to the inside of the hood will make focusing considerably easier for those whose eyes are weak or defective. This is especially useful when small stops are used or critical definition is desired. When camera is closed, it folds down against inside of hood.

SETTING ENLARGER LENS DIAPHRAGM. This operation can be done quickly and easily by holding a small mirror underneath the lens so as to reflect an image of the diaphragm markings. At the same time, the mirror will reflect sufficient light to permit the markings to be read very easily in the darkroom.

AN ENLARGEMENT TIMING CLOCK. An efficient and handy timer for the darkroom can be made from an electric clock having luminous numerals. The hour and minute hands should be cut short as shown in the photograph. The second hand should be darkened or covered with luminous paint.



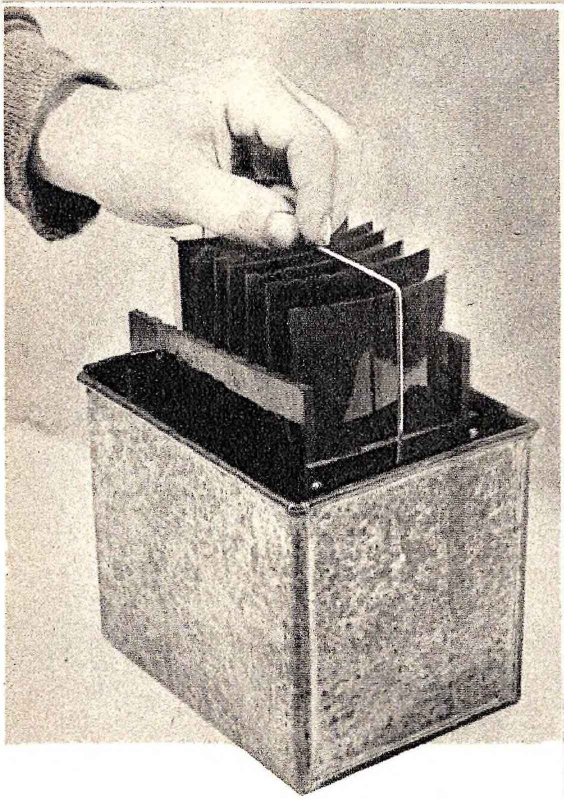




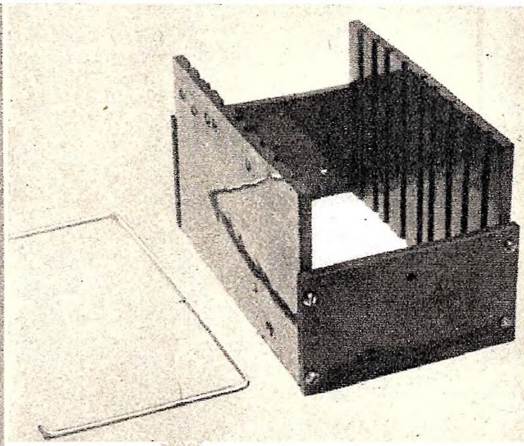
KEEPING DEVELOPER COOL. A simple way to keep developer cool during summer is to immerse in it a length of glass tubing, to the ends of which are attached pieces of rubber tubing. Connect one end of the tubing to the cold water tap and allow the other to empty down a drain.

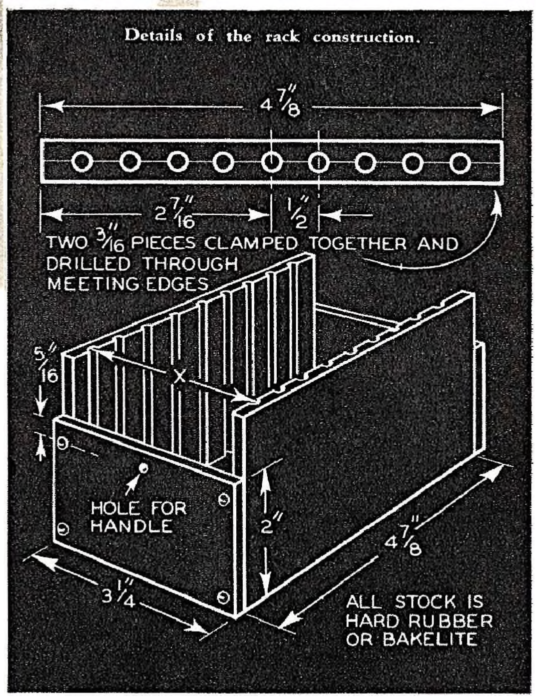
PHOTOGRAPHING METAL SURFACES. Darkened steel and other metals do not photograph effectively unless their surfaces have a bright appearance. Sometimes chalk is used, but the most satisfactory method is to place a dab of bronze paste on a pad and rub it over surface.

Radio Panel Makes DEVELOPING RACK



Above: The rack loaded with film, about to be lowered into the developing tank.





AN EXTREMELY simple and very useful developing rack for cut film in the amateur sizes (up to 9x12 cm.) can be made in about an hour out of some scraps of hard rubber or bakelite cut from an old radio panel. This is intended for use with the Kodak monel metal developing tank, which holds two quarts of developer and takes negatives up to 4x5 inches (press size).

The dimensions shown in the drawing are for the popular 3¼x4¼-inch film. They are readily changed to suit smaller or larger films. At any event, the distance **X** in the drawing should be about 1/16-inch smaller than the width of the actual film, so that the film will tend to hold itself in position.

The main job is to drill holes to form notches for the film. To do this, clamp the side pieces together by means of small C clamps and drill through the center line formed by the meeting edges of the panels. When the pieces are separated you will have perfect half circles.

Both hard rubber and bakelite are hard on drills. Work through a little at a time, and clean the hole of shavings before proceeding.

[*Continued on page* 141]

The Movie Short Subject That Opens A New and Entirely Different Field of Motion Picture Entertainment!

Miles ahead of anything ever offered in the educational short field. It explains in terms you'll be sure to understand the why's and wherefore's, the how's and who's behind the closed doors of science, industry, invention, research...and above all, the causes and effects of these great forces affecting your world today.

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WHAT is cold light...will it be mankind's greatest weapon in the struggle against germ infection?

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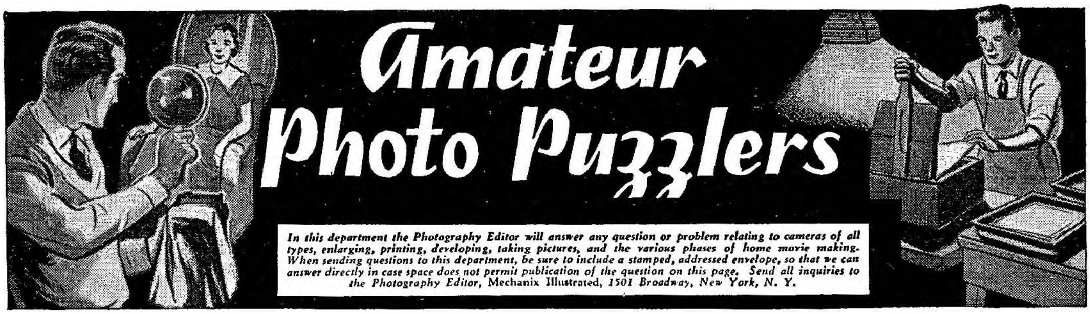


Amateur Photo Puzzlers

In this department the Photography Editor will answer any question or problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly in case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Mechanix Illustrated, *1501 Broadway, New York, N. Y.*

LOW PRICE VS. HIGH PRICE CAMERA

I have been taking good pictures with a box camera. What would be the advantage of buying a camera with an expensive lens?—Robert Simmons, Chicago.

Perfectly good pictures may be taken with an inexpensive camera. However, the utility of such a camera is limited. A camera better than a box camera offers a greater selectivity of shutter speeds which is desirable if the camera is to be used under varying light conditions, and it also affords greater latitude in focusing for special pictures. A better lens than that in a box camera corrects for distortion, concentrates the light, passes it through the lens more quickly and thus increases the speed at which the image is recorded on the film. The result is that you can take action pictures, which a box camera cannot take.

STOP PRINTS FROM CURLING

When I make large prints of my negatives, I find it almost impossible to make the prints stay flat. What can I do to prevent prints from curling, especially single weight paper?—John Crawford, Detroit.

A very simple method for preventing prints from curling is to soak them in glycerine diluted in water. Photo chemical manufacturers sell special prepared solutions for this purpose, whose base is glycerine. These solutions are diluted five or six times with water and prints are allowed to soak for five to 10 minutes (the former for single weight, the latter for double weight paper) after prints have been thoroughly fixed and washed. Prints will remain flat and flexible after this treatment. The solution may be used over and over again as it does not spoil. Simply add additional glycerine or prepared solution to the bath from time to time to bring it up to full strength.

CHEMISTRY OF DEVELOPMENT

What happens when film is exposed to light? What is the chemical reaction and why does the reaction not make itself apparent until it is developed?—H. Selleck, Los Angeles.

When sensitive emulsions of films or papers are exposed to light, the silver compounds, silver bromide, chloride and iodide undergo a chemical change. Chemists differ in their opinion of what actually happens. It is certain, however, that there is a tendency towards a reduction to metallic silver. Where light is strongest, this tendency to silver metal is more pronounced. Modern photography depends on this tendency to remain in the emulsion after the exposure, and to the fact that it can be carried further by chemical means until complete reduction to metallic silver is accomplished.

Exposure of a negative to light registers the image in the silver compound, but use of a reduction agent is necessary to completely separate the silver from its salts—which light alone cannot do. Therefore, a reduction agent is necessary to continue this reduction to free silver metal in the emulsion. This reducing agent is contained in the developer, whch also contains chemicals controlling the speed of action of the reducing agent. What remains on the negative after development is an image of silver metal free from its salts.

HARDENER FOR FIXING BATH

Sometimes when processing negatives and prints, I notice a softening and swelling of the gelatin. What can I do to prevent this?—C. H., Greenwich, Conn.

Softening and swelling of gelatin on negatives and prints, especially in warm weather, results from excessive soaking in the developing and fixing solutions. Some substance, therefore, should be used to harden the surface of the gelatin to prevent this. Potassium alum is the chemical generally added to a fixing bath as a hardening solution. Potassium chrome alum has a greater hardening effect on gelatin than white alum and is recommended for this reason. Add about ¼ to ½ oz. of alum to the fixing bath. Too much alum will have an adverse effect.

WHAT FOCAL LENGTH LENS

I have a 5½-inch focal length lens in my enlarger. Is this sufficient to cover projection of 4 x 5-inch negatives?—R. Sherman, Atlanta, Ga.

A 5½-inch focal length lens in an enlarger is sufficient for negatives from 35 mm. up to 4 x 5 inches. A longer focal length lens is also satisfactory but a shorter focal length lens is not recommended for 4 x 5 negatives, although satisfactory for smaller sizes.

RE-USING HYPO

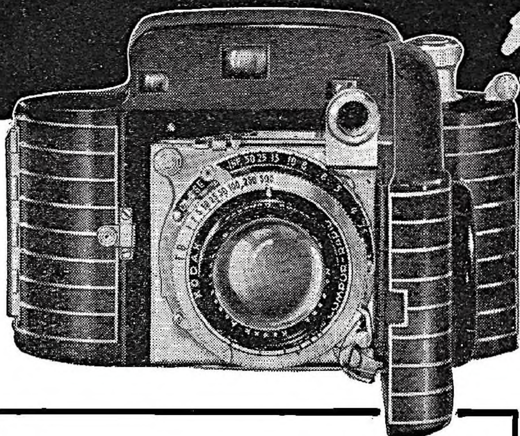
Can hypo be used over again? When should it be thrown away?—B. Lister, Pearl River, N. Y.

It is quite safe to use hypo several times if only a few prints are fixed in it with each use. When hypo begins to bubble or turn milky, it should be discarded. One danger to watch out for when re-using hypo is the possibility that it may contain considerable developing solution carried over when shifting prints from the developer to the fixing bath. This "solution" of the hypo makes it unsatisfactory for further use. If too many prints are fixed (more than 20) in 20 to 25 oz. of hypo its strength may be reduced to a point where it is no longer effective.

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.

Famous KODAK BANTAM SPECIAL now $87.50



KODAK BANTAM SPECIAL'S great reception by camera fans permits a substantial price cut. "Buy of the year" at $115, now only $87.50, with field case.

If that's about your price, this is certainly your miniature. Extra-fast lens. High-speed shutter. Built-in range finder. Handles with delightful ease. Master of every miniature shot. See it at your dealer's.

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FEATURES

LENS—Kodak Anastigmat EKTAR f.2.0, extra-fast, super-corrected.

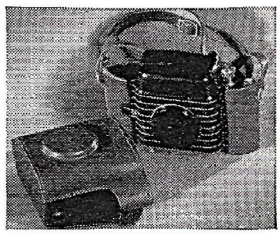
SHUTTER—Compur-Rapid, 9 speeds to 1/500 second.

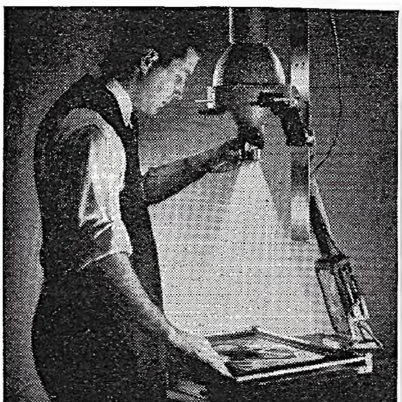
COUPLED RANGE FINDER—Military type; split-field; finds the range and focuses in one operation.

FILM-CENTERING DEVICE—Locks film accurately in position for each exposure.

FIELD CASE

Kodak Bantam Special's new low price includes a tan sole leather sportsman's field case which allows you to carry the camera on a neck strap—ready for use without complete removal from the case. A great convenience for "rapid-fire" picture taking.





KODAK MINIATURE ENLARGER, MODEL B, is a useful miniature camera accessory. Blows up your miniature negatives to 100 times original negative area, or to even greater proportions. Has an f.4.5 Kodak Anastigmat lens and many outstanding features, yet is priced as low as $52.50. Ask your Kodak dealer for complete details.

For BLACK-AND-WHITE, Kodak Bantam Special loads with Kodak Panatomic or Kodak Super X Film—the former for negatives of exceptionally fine grain that permit an astonishing degree of sharp enlargement; the latter for indoor shots, or short exposures outdoors, where high film speed is essential. **For FULL-COLOR,** you choose from two types of Kodachrome Film—regular, for daylight; Type A, for Photoflood or Photoflash exposures.

Only EASTMAN *makes the* KODAK

How To Use Two Transformers

[*Continued from page* 118]

1 and 4 will supply the desired voltages, for example, terminals 1-1 should be connected through a lamp, and so also should terminals 4-4 (see Figure 1). No other connections should be made to the terminals while the test is being made. Turn on the current in both transformers. If the bulbs light brightly, the connections are wrong. To make them right it is necessary to do only one thing—remove one of the cord plugs from the electric outlet, turn it over so that the other prong is up, and re-insert it in the outlet. The bulbs should now go out. If they still glow, the voltages do not match. A little change in the variable controls of the transformers should cause the bulbs to go out completely. A final check with a 1 .25 Volt Bulb as shown in Figure 2 will give an exact match.

Transformers of widely differing wattage capacities are best not connected together. If they are, a small piece of wire from a burned-out flatiron element, connected as shown in Figure 3, will prevent excessive currents in the low-resistance secondaries. The track wire is connected to the center of this coil.

A rheostat should be used for variation of train speed, although the small resistance coil described above will prevent damage while variable controls are being moved.

Turned Walnut Box

[*Continued from page* 114]

this in the lathe and turn the cylinder to 1¾ inches in diameter. Space off ¼-inch, another ¼-inch for the waste, then another ¼-inch for the next ring, and to the left of that, cut down enough waste to enable you to get at the work easily. Start the inside cut on the first ring from both sides, leaving perhaps 1/16-inch of wood still connecting waste with ring. Then sand and lacquer the rings. When dry, continue the cut-off, sand the inside of each ring and wipe the raw wood with lacquer.

Cut the leather ½-inch wide, as long as necessary. It should be soft, not too thick, preferably brown, and obtainable at any shoe shop. Trim one end to a taper. Bore holes diametrically opposite each other about ½-inch deep. Wipe a bit of glue in each hole. Then place the strap over a ring, line up the ends, roll the wide end about the tapered end and twist it into the hole. See that the ring lies close to the side of the box. Then put in the other ring in the same manner.

You can save money if you know how to make simple plumbing repairs around the house, and whether you are a home owner or tenant, you'll find plenty to interest you in the informative article on this subject, which will appear in the August MECHANIX ILLUSTRATED.

Holland Ready For Air Raids

[*Continued from page* 44]

reflection betrays, even in the deepest darkness, that a lamp is shining.

The beam's angle is so small that the light cannot be seen over a height of 80 yards. Thus airplanes, which cannot fly lower than a hundred yards above the ground in night flight, will not be able to locate a moving automobile or town equipped with the lamps. The light is sufficient, however, to allow the driver to travel at a speed of forty miles an hour along a known road.

For road orientation, guiding lamps are placed every 300 yards along the right-hand side of the road. As long as the driver sees the light—and he can never see more than one—he can be sure that he is on the correct side of the highway. At every corner, pavement lamps warn of turns, but become immediately invisible after the turn is made.

For room illumination—in barracks as well as civil houses—the lamps make writing and reading possible, yet the light cannot be seen from the outside—even though the curtains are left open.

The military experts of Holland have adopted the invention. In the navy port Den Helder, signal lamps have been mounted on the tops of the barracks and installed in the army munitions factories. These signal beams have a range of four miles and the messages sent can be seen only by those in the small sector in the direct line of the light—thus keeping military signals really secret for the first time. The invention has also been applied to the army's automobiles and armored cars and to harbor guiding lamps.

Staining Microscope Slides

[*Continued from page* 102]

order) 30 seconds each; light green, 20 seconds; wash in 95% alcohol, 30 seconds; absolute (100%) alcohol 30 seconds; xylol, 10 minutes. Place the slide flat on the work table, add one large or two small drops of Canada balsam and then cover with a cover glass. The slide is made!

Balsam is a resin prepared for use by dissolving in xylol. It is applied as a liquid, but gradually turns to a solid through evaporation of the xylol. This is a slow process and the slide must meanwhile be kept perfectly flat in a dust-free situation. Often this delay before the new slide can safely be used, is irksome and in any case most workers prefer to speed up this drying process. Hence the necessity for a slide dryer, a piece of apparatus already referred to as extremely useful for paraffin imbedding, spreading affixed sections on slides, and other purposes in microtechnique.

Many forms are on the market under the name of paraffin bath or hot plate; but the homemade contrivance will serve as well. Make a box in the form of a shoe box out of sheet metal, with ventilating holes around the sides near the lid and one hole near the bottom of one end to admit an electric cord. Attach a receptacle on the inside by this opening, use a 25- to 40-watt bulb and line the inside of the lid with a sheet of asbestos. Turn this box upside down, the bottom becoming the top surface. By trial, the proper area on this surface will be found where paraffin in a dish will just stay melted or where slides may be spread or dried without injury from heat.

Still better would be the making of a paraffin oven or slide dryer from a gallon tin such as used to market motor oil or molasses, a large round cracker tin, or a gas stove oven—the small, cubical, separate type that is placed over a burner on top of the stove. This oven has two shelves of wire mesh, a hinged glass-front door, perforations for ventilation, and needs only wiring for an electric bulb.

Finished slides of sectioned material will dry and harden in such an oven within 24 to 48 hours; thicker whole mounts require longer. Then comes cleaning and polishing. Add a few drops of xylol to any commercial scouring powder, as Old Dutch Cleanser or Bon Ami, to make a thin paste; cover the forefinger with a clean rag, as an old linen handkerchief, dip into the paste and carefully scour the slide. Some force may be used with a completely dry and hardened slide, but use care with freshly made ones or you may rub off the cover glass and ruin the preparation. Scour the slide all over, then rinse in warm soap suds, dry and polish with a soft old linen rag.

Sometimes the slide dryer causes excessive evaporation and air bubbles run in under the cover glass, especially if the balsam was too thin. Correct by adding a thin drop of balsam exactly at the edge of the cover glass, nearest the bubbles, so that it will run under and replace the air. Place in dryer again.

When cleaned and polished, the slide is ready to be labeled. Gummed squares, termed slide labels, are made expressly for this purpose and may be purchased ready cut in boxes, or in books of perforated sheets. Write the label before affixing it, and use only a black waterproof India ink and a fine pen. Print neatly—a sloppy label will spoil the appearance of an otherwise perfect slide. Include all pertinent data: your name and the date, name of material, plane of section, fixer and stains. Example: James H. Jones, 7/16/38. Basswood Stem, c. s. (cross section). FAA, S & LG (standard abbreviations for formol-acetic alcohol fixer and safranin-light green stains). Special labels with your name printed in fine type across the top are not expensive.

Don't moan over the fact that you have no boat with which to enjoy pleasant hours on the water. Simply get a copy of the coming August issue of MECHANIX ILLUSTRATED and build the simplified canvas kayak which will be described in the how-to-build section. It's easy and cheap to build, but you'll thrill at its performance.

An Observation Clubhouse

[*Continued from page* 104]

5 feet deep and work the post up gradually, first by two-by-four braces under it, then with block and tackle pulling from the other side. The buried ends of the posts should be protected against decay with a creosote or tar application. Temporary braces can be put on after squaring up the posts and removed when the house is completed.

Floor joists are installed as shown, with mortised joints at the posts. Diagonal braces are set under the balcony at all corners except where the would interfere with the ladder. Assuming that rough, lapped-siding is used, studs spaced 24 inches will be satisfactory. Set diagonal braces at each corner. A low, sloping roof will be more attractive than a steep one and will be satisfactory if heavy snowfall is not frequent. Roll-roofing or shingles can be used.

Casement windows are easily installed and afford good ventilation. The door should be on the same side as the ladder, which is hinged to one of the joists. It is drawn up with a rope and held with a hook over one of the rungs.

Trainer For Back-Yard Pilots

[*Continued from page* 94]

front cowling. Utilizing a battery for power has some disadvantages in the way of costs but it affords a swell opportunity to add an ammeter to the gadgets on the instrument panel.

Nailed joints are satisfactory if the fuselage is board-covered. All important joints, however, such as the wing and wing-strut attachments, the primary control pulleys and the universal joint between plane and central mount or column, should be made with bolts.

Hinges for the ailerons and other control flaps can be of the simplest type imaginable. Either flat metal hinges, such as one obtains from the dime store, or hinges fashioned from screw-eyes, will serve. Whatever hinges are used they must be so hung as to allow a minimum of friction.

Now for a word about the controls themselves. These consist of two separate systems both working from the stick and rudder bar. One set—the primary—operates the movement of the plane about the fixed central mount. The rigging of this set calls for care and considerable adjustment if the desired results are to be obtained. The principle involved is purely a matter of leverage and works on the theory that one end of the cable connected to the control stick is anchored securely to the fixed mount or to the ground so that when any movement of the stick is made it exerts a definite moving force on the articulated plane. Turnbuckles should be used at the anchorage points of the primary control cables to enable easy and rapid adjustment to the tension. The slacker the all-round tension the harder it will be to keep the ship level in "flight." Mounted as

[*Continued on page* 150]

No More Motor Fever

[*Continued from page* 81]

all too common causes of overheating are a clogged muffler, weak valve springs, loss of power through improperly adjusted breaker points, leaky hightension ignition wiring, loose timing chain, and a sticking carburetor choke valve which keeps the mixture too rich. The valves themselves represent a whole assortment of possibilities for power loss. They may be warped, they may stick or they may not have proper clearance.

Finally, there is lubrication. It is important that the oil be light enough to penetrate between the tighter fitting parts of the modern engine. That is why instructions usually call for lubricating the new engine with S. A. E. 20 grade oil. It would be better to stick to this oil through the life of the car, if thinking strictly in terms of savings in wear and tear. But there has to be a compromise between oil and engine economy, and so you are justified in going to S. A. E. 30 when the lighter oil burns off too fast, especially if using the car in any prolonged period of high outside temperature. There always are the exceptions, so where the manufacturer recommends S. A. E. 40 in hot weather be sure to use it. There are several notable examples where the lighter oils simply will not prove practical.

Killer Well

[*Continued from page* 50]

blew the water out. Next, fourteen old shallow wells were plugged with cement to prevent gas working up through the ground if the well were ever brought under control again.

Weeks became months. It was almost a year since that fatal day when the bit stuck. A quarter of a million dollars had been spent and still they were no nearer beating that well than the day she blew out.

In sheer desperation a special pumping plant was set up. Huge quantities of mud were to be rammed down the hole until the gas pressure was overcome. The pumps roared. The mud sloshed into the hole. The well seemed beaten. But before enough mud could be pumped in, the terrific gas pressure got the upper hand, and blew the mud out. Three times the same thing happened. The pumps just couldn't feed the mud fast enough.

By now everything connected with the well had become a strange nightmare. It seemed to the drilling crew that they would go on forever fighting the well, never getting anywhere, just fighting.

Then the well caught fire again, and reduced the second derrick to junk. It flamed there against the sky, defiant of men and their ingenuity. Lesh brought his cannon and blew the fire out again.

[*Continued on page* 149]

Hurricane Warning

[*Continued from page* 72]

coast residents days in advance, apprises them of the intensity of storms and of the area they likely will cover if they strike the coast. Towns can be evacuated in time.

Hurricanes form at sea and therefore the first notice of them is given by ships. These reports are radioed to land stations. The storm then is spotted on maps in the approximate position indicated by the initial reports.

Prior to last year the storm information service was slow and cumbersome. All messages were sent to the Washington bureau then relayed back to the Gulf points. But today a well-knit system exists for speeding storm warnings along the Gulf coast.

Sixteen stations have been installed at various points and equipped with teletype machines. When a ship radios news of a disturbance, the information is sent simultaneously to the sixteen stations. Stations on islands in the Caribbean Sea send information on weather conditions. The stations on the coast communicate frequently with each other and exchange data.

Each weatherman plots his own storm path. As each additional reading comes in he checks the barometer and marks the storm's direction on a special chart. The various reports tell him

[*Continued on page* 151]

Metal Lungs Give Life

[*Continued from page* 43]

function—you cannot stop or regulate its beating; it is completely involuntary.

But the diaphragm is both voluntary and involuntary. You can stop its action temporarily —"holding your breath," you call it. Possibly you can hold it long enough to become unconscious—and then the annoyed diaphragm goes back to work in spite of you. That is why you cannot commit suicide by holding your breath.

The lungs themselves do none of the work of breathing. No one really inflates his lungs. What you do is to distend the chest cavity or thorax, and air rushes in to fill the lungs, obeying the age-old principle that nature abhors a vacuum.

Occasionally something happens to the diaphragm and its related muscles and nerves. Then the patient is quite unable to breathe, and death is inevitable unless artificial aid is at hand. Infantile paralysis is the most common cause of such respiratory trouble. Fortunately, not all cases of infantile affect the respiratory system. Legs and arms are more common objects of attack, as was the case when Franklin D. Roosevelt suffered the disease in 1921.

So complex are the organs of breathing that it would seem almost impossible for mechanical

[*Continued on page* 151]

Small Diesels; Boom Industry

[*Continued from page* 39]

center of the cylinder the compressed mixture is ignited and a power stroke downward results. Thus the downward stroke is a power stroke and the upward stroke is a compression stroke.

General Motors' new two-cycle engine does not operate on a carburetor mixture and there are other variations from the operation just described. Being diesel engines, the intake is air and not an air and fuel mixture. A chamber which surrounds each cylinder contains air under pressure. As the piston travels downward the exhaust valves open and the exhaust gas escapes into the exhaust manifold. The cylinder volume is swept with clean scavenging air as the downward moving pistons uncovers the inlet ports. On the upward stroke, the exhaust valves close and the air, already somewhat compressed by the supercharger, is compressed in the cylinder. When the piston reaches top center, the injector charges the cylinder with fuel, it is fired by the compression, and the cycle is completed.

This two-cylinder principle lends itself very well to the diesel where injected fuel is used. The principle reason for the remarkable efficiency and fuel ecenomy of the diesel is the high compression ratio made possible by the absence of fuel during the compression stroke and the fact that the temperature of the air under compression

[*Continued on page* 153]

Take Her Down—

[*Continued from page* 67]

It seemed an eternity before the roar of the vents subsided and water gargled in the control manifolds, showing that the ballast tanks were full. We held on to keep our feet as the depth gauge pointers revolved faster and faster. Five, ten, fifteen feet under she went. There was an accompanying rush of water down the conning-tower hatch.

"Surface," ordered the Skipper.

The gallant old L-9 paused in her headlong dive; then, with leaden deliberation, tilted slowly upward by the bows.

After all these years I can still see every detail that met my eye in my hasty glance at the Skipper for further orders. There he stands under the conning tower, one powerful hand gripping the steel ladder. He calmly watches the depth gauges, totally oblivious to the icy-cold sea water. Beyond him loom dimly the faces of the Kingston-valve men in rapt concentration.

"Bring her on up," he ordered.

"Coming up fast, Sir," I replied as the rush of water slowly subsided and he disappeared up the conning-tower ladder.

Then for another eternity we stared at sudden death while the L-9 slowly broached the surface

[*Continued on page* 154]

What The "F" Numbers Mean

[*Continued from page* 121]

evens out. Half the speed of F.4.5 is really F.6.3.

The odd sizes of the fast lenses (better than F.4.5) make the squares a bit tricky to follow. While an F.2.5 lens is twice as fast as an F.3.5 (6.25 against 12.25), F.3.5 and F.4.5 compare as 12.25 to 20.25, only about 60%.

Fast lenses are much more expensive than slow ones, because the various sections must be ground much more carefully to bend the light rays over sharply without distorting them. Figures 4 and 5 illustrate the effect in somewhat exaggerated form. For convenience of illustration, only a single piece of glass is shown. Actually, highly corrected lenses of the popular "Tessar" type consist of four entirely distinct elements of different shape and even of different kinds of glass. The two front elements are separated by a small air space, while the two back elements are cemented together. These two units are separated from each other by another air space, in which the leaves of the diaphragm fit.

F.	Square	F.	Square
1.5	2.25	4.5	20.25
2	4	5.6	31.36
		6.3	39.69
2.5	6.25	8	64
2.8	7.84	9	81
3	9	11	121
3.2	10.24	16	256
3.5	12.25	22	484
3.8	14.44	32	1024
4	16		

Now They Can Be Shown

[*Continued from page* 86]

U. S. stamps, picturing all of them, under what could be referred to as a special governmental dispensation. Now writers may picture the stamps, and thus save a lot of wordy description when pointing out interesting facts about our issues.

A picture accompanying this article shows a postcard with a U. S. stamp attached, both card and stamp showing the same design. The combination is educational, and attractive; a method of collecting which, in the past decade or so, has gained tremendous popularity. The picture suggests that U. S. stamps may be tied up with pictures this way, and that the use of postcards for the combination are available, and fascinating in the album.

The photograph pictured with this article is the three-cent stamp issued for the hundred years of Texas, in 1936, superimposed upon a picture of the famous Alamo, which appears on the stamp between the two portraits of General Sam Houston and President Stephen Austin.

The United States, for 1937 alone, issued nine-

[*Continued on page* 152]

The MI Portable Transceiver

[*Continued from page* 117]

terminal on the side opposite from that of the rotor, since normally both terminals are on the same side in this model condenser. RFC1 is mounted directly behind C1 and the lead from it to L2 should connect at the exact center of L2. L1 consists of two turns of No. 16 insulated wire which is pushed in between the turns of L2 so that one turn is on each side of the center tap. Normally proper load conditions are obtained when L1 is about one-half meshed with L2. The plate current of the oscillator is then about 16 mils.

The second RK-43 is used as a super-regenerative detector and audio amplifier. L3 is similar to L2 but consists of 8 turns to avoid absorption effects when tuned through the transmitter frequency, L3 is mounted beneath the chassis, directly on the socket terminals. Thus the chassis forms an electrostatic shield between the coils.

The circuit is a Hartley type, similar to that in the transmitting circuit. It is sometimes referred to as an ultra-audion, which it resembles slightly. Self-quenching superregeneration is obtained by R7 and C9, both of which should be physically small in size and mounted well away from the chassis. The tap for C5 may be taken off two turns from the center of the coil. C5 is then adjusted for best reception with the antenna to be used, with a moderately weak signal. Superregeneration is controlled by R4; if it is found that a long antenna stops superregeneration even when R4 is turned all the way up, the capacity of C5 may be reduced or, more easily in the field, a foot of wire connected to the receiving antenna post will cause it to operate. If the same antenna is used, this trouble will not occur. R5 returns to A plus through the on-off switch, thus preventing any current drain from the B batteries when the apparatus is not in use.

The remaining RK-43 serves as second stage

[*Continued on next page*]

Radio Panel Makes Rack

[*Continued from page* 130]

The grooved side pieces are supported by short side pieces, fastened by short 4/36 screws forced into the edges. It is not necessary to tap the holes, as the screws will thread their way in. It is a good idea to try different sizes of drills in scraps before making the holes in the side pieces.

To permit the rack to be lowered into and removed from the tank, a simple U shaped hook is made of stiff wire. The ends are bent over and pushed into small holes in the end members.

Loading this rack in the dark room is a matter of seconds, even when panchromatic film is handled in darkness. The negatives are well separated and the solutions flow around them freely. Once the rack is loaded, the films are not touched all during the developing, fixing, washing and drying operations.

The MI Portable Transceiver

[*Continued from page* 141]

audio for receiving and as modulator for transmitting. It is operated push pull, in class A. Full modulation is secured with normal class A operation, and there is no need to use class B with its higher current drain. With the gain control about half-way, and C bias at minus 3 volts, the operation is strictly class A. Modulation is well within bounds and a signal of extraordinarily fine quality will be obtained. There is no appreciable indication of frequency modulation under such conditions and good reception may be had on a super with sharply-tuned i. f. 's.

Change-over from sending to receiving is effected by switch 2. This is a standard single-deck, three-circuit type arranged for double-pole operation by inserting the stop supplied so that the third point of each circuit is not reached. On the "send" side, filament voltage is applied to the oscillator by closing the A-plus line. Since one side of the microphone winding of T1 is likewise connected to this line, the A battery serves to energize the single-button mike. The second circuit applies B power to one terminal of the modulator-output transformer secondary. The third connects the other terminal of same to the oscillator tank circuit. On the "receive" side, the oscillator filament and mike supply are switched off, B power is provided for the detector, and one terminal of the output transformer secondary is disconnected from the oscillator tank and connected to the open terminal of the phone jack.

In wiring, particular care should be taken with the detector circuit, keeping the coil close to the socket, grid and plate leads short, and no other leads close to the terminals. The same applies to the oscillator. The audio leads are not critical; reasonable care so that low-level grid leads do not parallel output circuit leads is all that is necessary. Make all leads to the panel long enough so that they may be arranged close to the controls. Keep the space behind the A battery free and clear from wiring as there is no room to spare in this section.

Solder the condenser rotor shaft to prevent loosening of its threaded shaft.

The three 45-volt B batteries are installed in the bottom of the cabinet, with the A and C batteries directly above. The B batteries are furnished with Fahnestock clip plug-in connectors. It will be necessary to cut off these clips and solder jumpers to the plug-in connectors in order to give adequate clearance between the metal back and the battery terminals. The A battery terminals will just clear if the panel wiring is adjusted so that no wire is bunched behind the dry cell. To avoid shorts while carrying the instrument, bend a length of half-inch brass strip over the batteries and fasten it in place by turning up tabs at each end and drilling a hole through each side of the cabinet and these tabs. Machine screws should be passed through each side and the batteries held firmly in place. A thin piece of cardboard between the batteries and the cabinet gives additional insurance against shorts.

The transmitting frequency should be checked before going on the air. This can be done roughly by switching over to the receiving side, tuning in a station near the center of the band, and coupling the receiver antenna loosely to the transmitting antenna. While listening to the station being received, turn the transmitting condenser dial over its range until a spot is found where the signal being received drops in volume. This indicates that the transmitter circuit is tuned to the same frequency. Now switch over to the transmitting position, connect a 50-mil meter in series with the B supply and lengthen or shorten the antenna until the meter reading is at minimum. The antenna is now in reasonance. Next adjust the coupling coil by meshing it more closely within the oscillator tank coil until the total current reading is 26 mils. The oscillator will then be taking about 16 mils and the balance by the other tubes. This is based on a 3-volt negative bias for the audio section. Good operation with greater battery economy but some sacrifice in fidelity may be secured with a bias as high as minus 6 volts.

A half-wave doublet can be used in place of the quarter-wave rod type with some improvement in radiation of power. This is done by disconnecting the ground to the case and connecting to one side of the doublet. Tuning for proper loading is effected in the same manner as described for the quarter-wave form of operation.

An operator's and station license is required before the transmitting portion of this outfit can be used. Information on obtaining this license will be found in the booklet "How To Become A Radio Amateur." This booklet can be obtained from the Greenwich, Conn., office of Mechanix Illustrated for twenty-five cents.

If you are a radio "bug," you'll certainly want to build the compact receiver which will be featured in the how-to-build section of the August MECHANIX ILLUSTRATED. A single-tube type, gives two-tube performance.

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Rates for classified ads, 18c per word (include name, address and all numbers), per insertion. Minimum 10 words. Cash must accompany order and be received in this office June 1st for the August issue (on sale July 8th). Address Classified Mgr., Mechanix Illustrated, 1501 Broadway, New York City.

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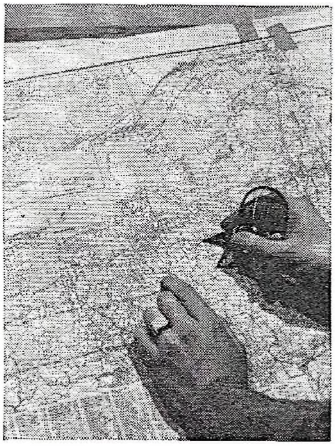
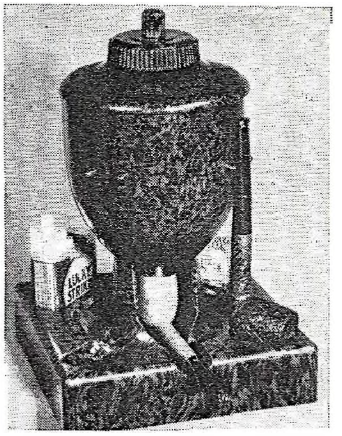
Device Combines Road Map Aids in One Unit



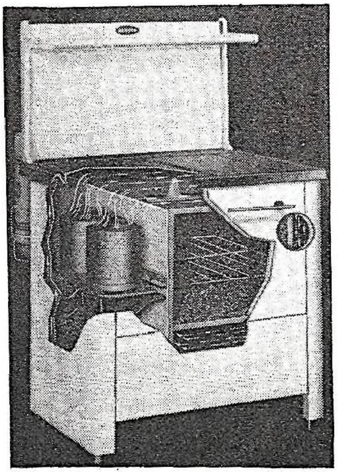
Designed to speed up and make the use of road maps more convenient, a new device combines a magnifier of high quality mounted in Zylonite, with a pair of hinged calipers for the estimation of distance between towns. The instrument is about two inches in diameter and comes in a neat leather pocket case. The colors are mottled black and white, green, and gray and red.

New Humidor Fills Pipe



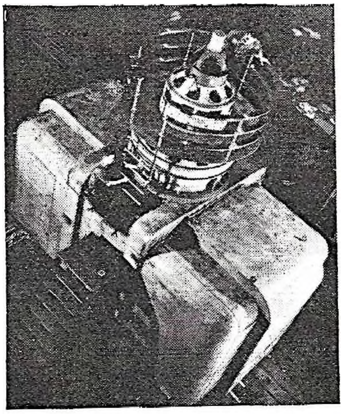
Pipes are filled and tamped without touching the tobacco with the hand when an automatic humidor is used. By operating a lever a full stroke, the pipe is filled with tobacco; a half-stroke tamps the tobacco. An inorganic, odorless substance releasing moisture slowly, insures correct humidification. The unit provides space for three pipes and space for cigarettes.

New Range Burns Oil



A new oil burning range is designed to provide top of the stove cooking and baking facilities for large as well as small families. It also supplies heat when it is needed for comfort in the kitchen or adjoining rooms. A reservoir is provided for heating water. Unusual economy is claimed to be made possible by effective insulation of the entire range.

12,000-Horsepower Motor Drives Pump



This motor, one of six, will develop 12,000 horsepower to drive the world's largest pumps of their kind. Each high-speed centrifugal pump will lift about 200 cubic feet of water a second over mountains to Southern California.

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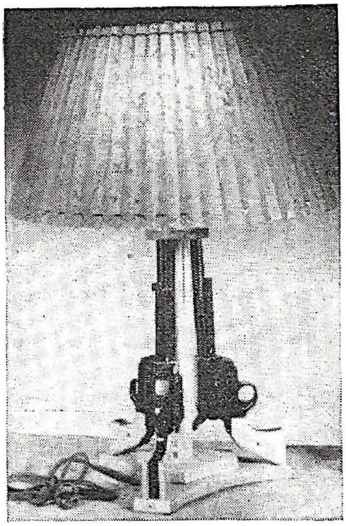
Pistols Become Table Lamp Stand



Realistic hand carved gun models present a novel appearance when making up the base of a table lamp. The lamps are made in three models with one, two and three guns.

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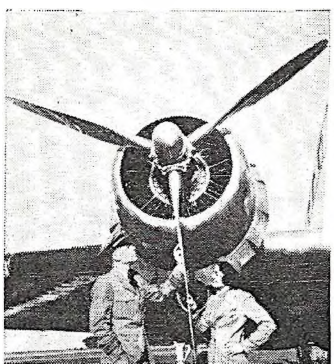
New Propeller Permits Full-Feathering Position



The photograph shows one of the new hydromatic propellers in full-feathering position, showing how blades are feathered to stop "wind-milling" during flight with engine not operating.

Aluminum Alloy Shovel Gives Weight Reduction

An aluminum alloy shovel has been placed on the market which is light weight, acid-resisting, non-corrosive and non-sparking. The extreme lightness of the alloy cuts shovel weight in half, eliminating three to five pounds of "dead" weight each stroke. Because these shovels are non-corrosive and built "close-backed," they are sanitary and easy to keep clean, a special advantage to meat-packing, dairy, brewing and other food product industries. Because they are non-sparking, they are ideally suited for use in chemical plants, oil refineries, coal mines, paint factories and other applications where fire prevention is highly important.

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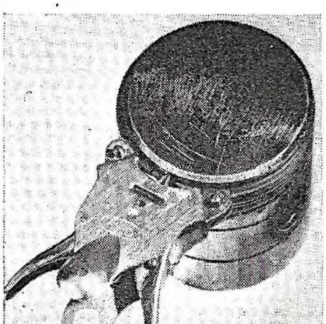
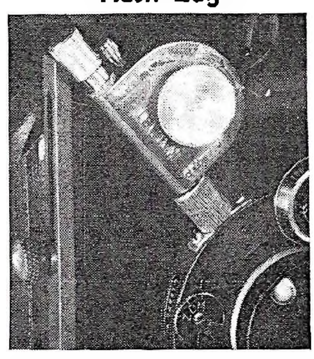
One-Piece Tool Removes Rings from Pistons



Cut fingers and stretched rings can be avoided by using a "piston ringer" recently placed on the market. Pocket size, the tool removes and installs all types and sizes of rings up to four inches in diameter. It is made in one piece and is operated by compressing the handles.

Micro-Adjustment Matches Photo Bulb "Flash-Lag"



This photo flash synchronizer matches the characteristic "flash-lag" of any popular flash bulb. It is adaptable to practically all cameras fitted with Compur type shutters, as well as other cameras by using a special attachment. The voltage carrying capacity of the new device is 45 volts—sufficient for firing multiple flash bulbs without the use of an auxiliary relay.

Killer Well

[*Continued from page* 137]

More water was pumped in. The Killer Well promptly blew it out. Over a year had passed. It was winter now. A cold snap froze the water, forming huge mountains of frozen oil and mud. By now the earth was battered into a weird no-man's-land of mud, ice, oil, and twisted steel. Everything had been tried—and the well had won.

But McKay was determined to make one more attempt. "We'll turn on more mud than anybody ever saw before," he said. "We'll start collecting pumps now. But we'll have to wait till spring," some one protested. "We can't work with everything frozen."

"There's a way to get around that. Light the well."

For the third time the well flamed into the sky. Quickly the ice was melted by the terrific heat. Preparations were made for the last try. Around the well was assembled the greatest array of mud pumps ever seen in the history of the oil industry. Intricate pipe lines, huge piles of sacks of special mud, gasoline and steam power plants—all were collected about the defiant well. Lesh and his cannon were called. Once more he blew out the fire. The crew connected the mud pipes. If this didn't work, there wasn't anything else to do. Gadgets and trick attachments had failed—water had failed—ordinary mud pumps had failed—relief wells had failed. Now sheer power was being tried. If that didn't work—well, all they could do was abandon all the wells in the danger zone, and let it go at that.

The final connection was tightened. The pumps were started. The great "mud hogs" gobbled mud and pushed it down the hole. The pressure on the line rose to 1,000 pounds.

The experts had calculated that the mud should overcome the pressure in eleven minutes. If the job took much longer than that, the mud would again be blown out.

The pumps strained. The faces of the drill crew were white and set. McKay pulled on his pipe.

The minutes ticked off on McKay's watch. The needle on the mud-line gauges crept forward. Five minutes—six. . . .

It was nipping cold—but nobody noticed. Eight minutes. . . . The connections on the mud-lines were holding against the terrific pressure. Nine minutes. . . .

Nobody's eyes moved from the top of the well. Would she blow the mud out again? Almost ten minutes now.

The crew, ripping open the sacks of special mud and feeding them into the pumps, worked like machines. Eight tons a minute, the mud was jammed into the hole.

Only a little longer. Ten minutes. The pumps throbbed on, the backs of the crew swung, the pile of mud sacks dwindled.

Ten minutes and forty-six seconds.

The mud was still going down. The gas pressure was under control. *The well was beaten.*

Trainer For Back-Yard Pilots

[*Continued from page* 136]

it is—with all the weight above the pivotal point—the plane has a constant tendency to "fall off" in one or other direction and the fact that this tendency has to be corrected by movements of the stick in order to keep the ship level is the practical basis of this design as a junior trainer. The stiff springs introduced into the primary system provide tension which takes away from the direct action which would otherwise result and sets up a slight but realistic "drag" between movements of the control stick and the reactions of the plane.

The secondary controls hook up as shown on page 94. To simplify construction as far as possible, single control cables have been used in every case and the flaps concerned returned by springs. These springs may be short lengths of ordinary screen door spring. The horns for the various surfaces are purposely designed oversize and drilled at intervals in order to permit satisfactory rigging so that the motion of the flaps is in relation to the actual motion of the ship. If the movement of the rudder, for example, turns out to be slightly exaggerated in relation to the turning movement of the ship about its central mount, it is all to the good since this accentuation of action makes observation of the functions of the controls all the more noticeable to the aviation student. Once you have the ship rigged and see the action possible by moving the controls, you will speedily find means for correcting such matters as balance and resultant heavy controls. The ideal trim is one that allows the ship to "fall off" readily and yet does not require too much exertion on your part to bring her up again with the stick.

The propeller can be of the simplest type with pitch cut down to the limit. Make it with a left or right hand pitch to suit the motor employed.

The universal joint which articulates the plane with the stationary column can be suited to your local possibilities. At worst it can be an eyebolt and a U bolt linked together in the manner shown in the drawings on page 93. At best it would be a full ball and socket joint. In between these extremes comes the universal joint from an old car (obtainable at almost any junk yard) mounted so that it can freely turn about the central mounting. The central mounting may be made from stout timber, two-inch iron pipe, or half of an old rear axle housing. The latter has some advantages in that it permits the easy installation of ball bearings in the turning action. The iron pipe too has similar advantages. Both these types of mount should be set into or bolted to concrete to provide a firm base.

A practical knowledge of mooring devices is essential to all boat owners and the August issue of MECHANIX ILLUSTRATED will feature an article devoted entirely to this vital, timely subject. Don't miss it.

Hurricane Warning

[*Continued from page* 138]

which place the low pressure area is passing and which it is approaching. From these he determines the limits of the disturbance and an accurate path of its direction.

Key storm-chasers are placed at Jacksonville, Florida, and New Orleans, La. First, news is sent to these two points and after they have spread the news along the Gulf coast, they relay it to Washington for use along the eastern coast if the storm heads that way. U. S. Coast Guard amphibian planes drop warning messages to fishing fleets and other small surface craft.

A hurricane is a tropical cyclone. It is identical with the typhoon of the China Sea, the baguio of the Philippines and the cyclone of the Indian Ocean. No storm is a hurricane until the wind achieves a velocity of at least 75 miles an hour.

Meteorologists have not determined the cause of hurricane development. They do know that certain weather conditions exist at the earth's surface during the genesis of one. Frequent showers, light winds and moist warm air are the essentials. The hurricane usually announces its intended

[*Continued on page* 154]

Metal Lungs Give Life

[*Continued from page* 138]

ingenuity to create a machine which will aid their work. Yet in principle the iron lung is extremely simple.

Imagine that your lungs are a toy balloon contained in an airtight box. The neck of the balloon is a sort of throat which leads to the outside air through an opening in one side of the box. Now imagine that you connect a tire pump to a valve in the box. You pump air *into* the box and it forces the balloon to collapse; you pump air *out* of the box and the balloon expands to fill the vacuum, drawing in outside air through its throat.

That is the principle of the iron lung. Essentially, it is an airtight chamber for housing the chest of a patient. A partial vacuum is produced inside the chamber—the patient's chest wall expands and air rushes in through the trachea to fill his lungs. Then, for the vacuum, a slight pressure is substituted, and the flexible chest relaxes and air is exhaled from the lungs. This cycle, repeated endlessly in the normal rhythm of breathing, is the mechanical achievement of the iron lung.

The most commonly used factory-built diaphragm respirator is of the Drinker or Emerson type. A late model looks very much like a small edition of a creamery churn. The patient's body lies inside the chamber on a bed which can be rotated from side to side to change his position for greater comfort. Openings in the sides are

[*Continued on page* 152]

Metal Lungs Give Life

[Continued from page 151]

provided for nursing care. Once the patient enters an iron lung he does not come out until he is well or his case ends fatally. The iron lung is, in a very real sense, the patient's own diaphragm and he would quickly die without it.

The cumbersome nature of the iron lung has led many workers to experiment with smaller models. Not long ago newspapers were filled with the dramatic story of the plucky fight being waged against infantile paralysis by Fred Snite, Jr. Stricken with the disease in China, he has lived in an iron lung for nearly two years; he made the return trip across the Pacific to his father's home in Miami encased in his metal prison. In time his arms and legs, lying inert inside the chamber with its partial vacuum, would atrophy.

To release young Snite from his life-saving prison, Dennis R. Scanlan has developed a smaller respirator based on principles first worked out by Dr. Bo Sahlin, assistant professor at the Physiological Institute, Lund, Sweden. It is more properly described as an aluminum and rubber lung rather than an iron lung and it was developed with the cooperation of William O'Neil and his company, the General Tire & Rubber Co., of Akron, Ohio. Herman Kraft, research expert of that company, cooperated in working out the design, which covers only the chest and abdomen of the patient and resembles the mouth of a gigantic vacuum cleaner.

Now They Can Be Shown

[Continued from page 140]

teen stamps, sixteen of which were commemoratives. Only eight other countries, for this year alone, issued more than that number of commemorative postal papers. The United States issued two new airmail adhesives. When the new regular postage issue appears, reported to be forthcoming this year, supplanting the present regular series which has been in use since 1922, we shall see such stamps pictured with the explanations upon them. The illustrations, also, will have an educational effect many may have missed in the past, because now it will be clearly seen, with the stamps reproduced, that our postage issues not alone picture famous men and women, but likewise beauty scenes. No longer will some hold to the wrong impression that our stamps are more uninteresting than those of some foreign lands. They are not!

The original law, prohibiting U. S. stamp illustrations, was said to have been created in an attempt to help stem counterfeiting. But ever since that law went into effect there has been a growing opposition. Today the opposition wins, and all stampdom is happy.

Small Diesels; Boom Industry

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must be high enough to ignite the oil injected in the cylinder. This high compression, which is constant at all speeds, is 16:1 in the average diesel compared to a compression ratio of 6:1 in the average gasoline engine.

Like everything else that looks good on paper, the diesel engine has worried the smart engineer and prospective user. They have been wondering where the catch is. Industrial and automotive diesel users whose experience has shown them that one of the major advantages of the diesel over gasoline engines is derived from the saving in fuel costs, look to the oil situation. They ask, "What effect will wide-spread use of the diesel have on the cost and supply of oil?" Thirty-eight states today tax diesel fuel. In most cases the tax is the same as that on gasoline; in other cases it is less. In no state is the tax greater than on gasoline. The ten remaining states have indicated that should the increased use of diesels make a fuel tax expedient, such a fuel tax will probably be equivalent to gasoline taxes in those states. With this report as a basis, it is fair to assume that the differential in the cost of furnace oil and gasoline will remain pretty much what it is today.

As far as the supply problem is concerned, increased use of diesels will cause a few ripples in the oil industry but will in no case endanger the supply. According to published figures, total sales of distillate and residual fuel oil in 1937 amounted to about 150,000,000 bbls. (42-gal. bbls.) Total crude oil production for 1937 was 1,200,000,000 bbls. of which fully 15% or 175,000,000 bbls. of distillate oil were available for diesel use. Not only are we not using all available distillate oil but yearly potential crude oil production has been unrealized. Inasmuch as new methods of drilling oil wells are being developed every year, estimates of potential oil supply made on the basis of our present methods of oil-gathering, are extremely unreliable. The answer is that we simply don't know what our potential oil supply is—and indications are that we have little to worry about in this respect.

In the light of the above facts and development of the small diesel from a heavy, slow-speed engine with an erratic fuel injection system into a light-weight, high-speed unit making low cost operation available for a variety of new uses, it is not hard for anyone familiar with the subject to visualize vast social and economic changes of tremendous benefit to the nation. The railroad's utilization of steam created an era of industrial developement that raised the country to a new level of economy. In our own time the gasoline engine did for our national economy what steam did in the last century. Now that General Motors has licked the engineering problems that hindered the development of the small diesel, the stage is set for a new era of industrial and economic activity.

Take Her Down—

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and the Skipper pounded at the hatch. The U.-boat captain might have manned his fine low-magnification night periscope and be sighting at the L-9 silhouetted by the moon; or he might have changed his mind and returned to the surface to attack.

Mentally we braced ourselves for the shock of the U-boat's forefoot crashing through the L-9's side, or the ultimate flash of a torpedo blasting us into eternity. We lived our lives over again in that interval between the time when the Skipper quickly opened the hatch and when he banged it shut with a yell, "Take her down again."

The L-9 dove rapidly as the Skipper reappeared holding a pair of wet lookout binoculars in his hand.

"Great balls of cat fire," he observed, "some lookout left the straps of these glasses over the rim of the hatch!"

It was just like him never to inquire afterward "Who?"

At long last the L-9 ran leveled off, submerged, with the main motors whining away at full speed.

"High-speed propellers, close aboard, bearing two nine zero degrees," reported the man at the listening gear.

"Left. Hard left. Steady on one two zero," calmly order our Skipper. Gradually the intent of his order gripped us. He was trying to ram the U-boat, submerged.

"Steady on one two zero, Sir," came the quiet reply from the quartermaster at the steering lever.

"Propellers getting closer. Drawing ahead, Sir. Bearing three zero. Drawing rapidly across the bows," advised the listener.

"Come right. Come right hard," ordered our Commander and the quartermaster repeated back:

"Propellers dead ahead. Dead ahead, Sir. Very close, Sir."

"Stand by to ram."

Four short words. We braced ourselves. Breaths came fast and hard. The manifold man made the sign of the Cross.

"Propellers drawing away to starboard."

"Keep coming right. Hard right."

So, for nearly an hour, the Skipper played blindman's buff down in the ocean depths as he tried to ram the slower but zigzagging U-boat, with certain death the price of success.

The U-boat continued running at her full speed of around nine knots and drew slowly away, although the L-9 could make eleven. But we had to slow the motors to allow the listener to hear accurately. At times Dobie or I relieved him. As we checked the bearings the hum of the German propellers died and we knew the chase was over.

Hurricane Warning

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siege for hours in advance. While nothing can be done to temper the winds, forewarning diminishes the death toll.

But even with the weather bureau's new storm information set-up, the people along the coast feel the need for more thorough methods of storm tracking. The present weakness is in the way storms are located at sea. A ship must happen on one before the coast becomes aware of the coming danger.

A plan has been proposed calling for a storm patrol of boats that will cruise the gulf on a constant hurricane-hunt. If they encounter one, or receive a report of one from some other ship, they will trail it like a hound trailing a fox, scout it, and measure it so that by the time it approaches the coast, complete and invaluable information on its area and intensity will be available.

One argument for this additional service is the 1932 hurricane that hit in the vicinity of Freeport, Texas. It slipped up on the coast overnight without warning. Its surprise attack took 49 lives and injured three hundred persons. Property damage amounted to $12,000,000 and crop damage was estimated at $1,750,000. More than one million dollars worth of cotton alone was completely destroyed by the wind and rain.

A storm had been reported in the Gulf several days previously but on the night before the hurricane struck the coast there was nothing to indicate that the next day would bring furious winds. On the coast the weather and the water were calm. It was a balmy, moonlit summer night.

The next morning rain began to fall, in light showers at first, but increasing toward noon. It was not until about then that the reports started going out warning that the hurricane was heading toward the coast and was very near. Warnings flashed to a hundred towns but it was too late for the word to reach many small communities in the more isolated sections. It was in places such as these that many were killed.

The hurricane's greatest force struck at night. In the towns of Freeport and Angleton, thirty or forty miles down the coast from Galveston, there were scenes identical to those that took place during the Galveston storm in 1900. Large sections of both places were demolished and there were many tragic illustrations of the fearful force of the wind.

This was not the last destructive hurricane to strike the Texas coast. The summer of 1934 was a hurricane year that coast residents will remember a long time. The entire section had the storm jitters almost constantly, for no less than fourteen of these sea storms were reported and tracked through the Gulf.

These are some of the reasons for the recent expansion of the storm reporting service and for the requests before the government at this writing for storm patrol boats to find hurricanes sooner and track them with greater accuracy.

MR. HUFFINE, 13 years a tobacco auctioneer, *knows* tobacco from A to Z. He says: "I've seen what tobacco Luckies buy, so I've smoked them since 1917."

Sworn records show that, among *independent* tobacco experts, Luckies have *twice* as many exclusive smokers as have all other cigarettes put together.

Only Lucky Strike gives you the finest tobacco *plus* the throat protection of the "Toasting" process which takes out certain harsh irritants found in all tobacco.

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