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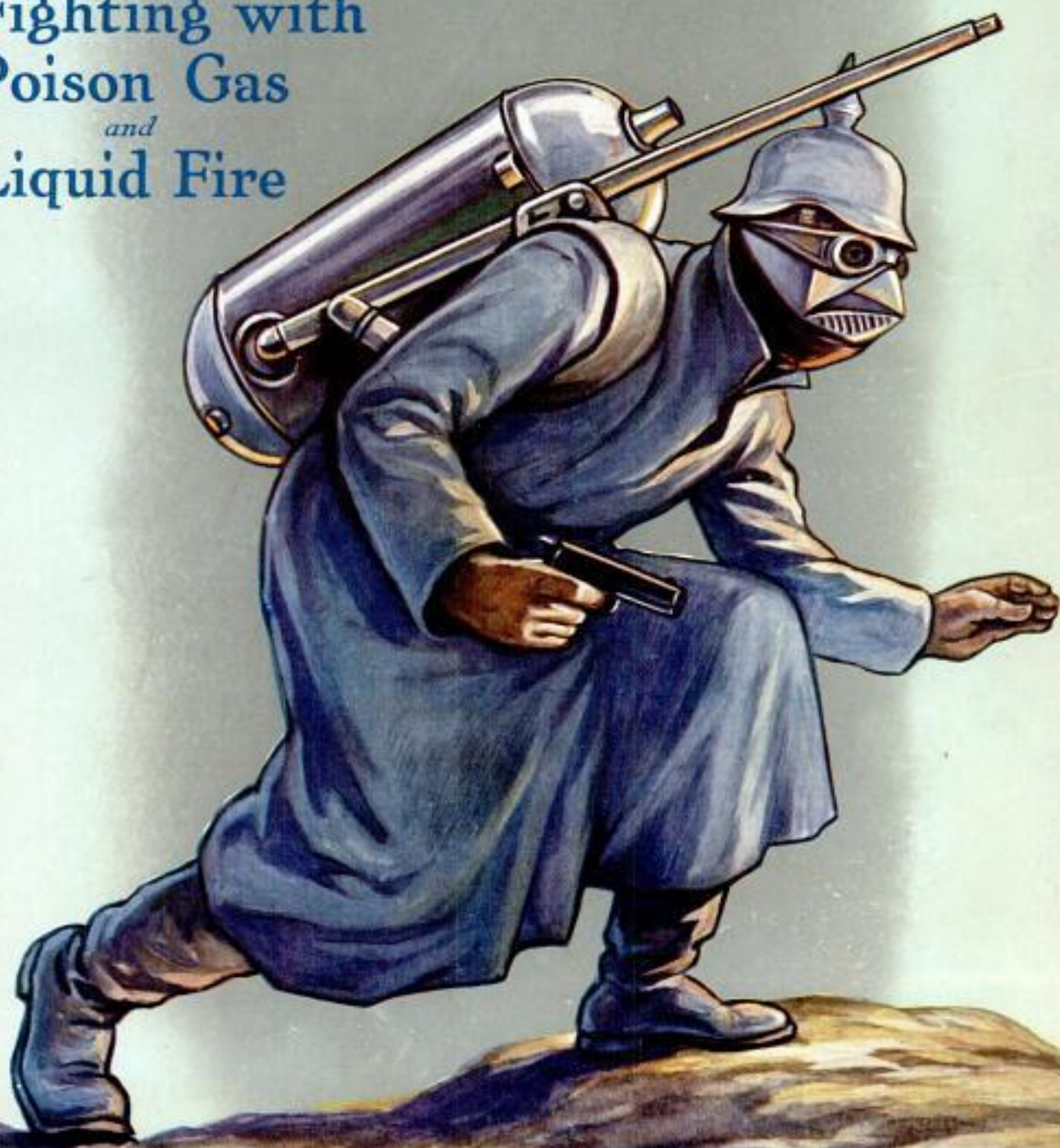
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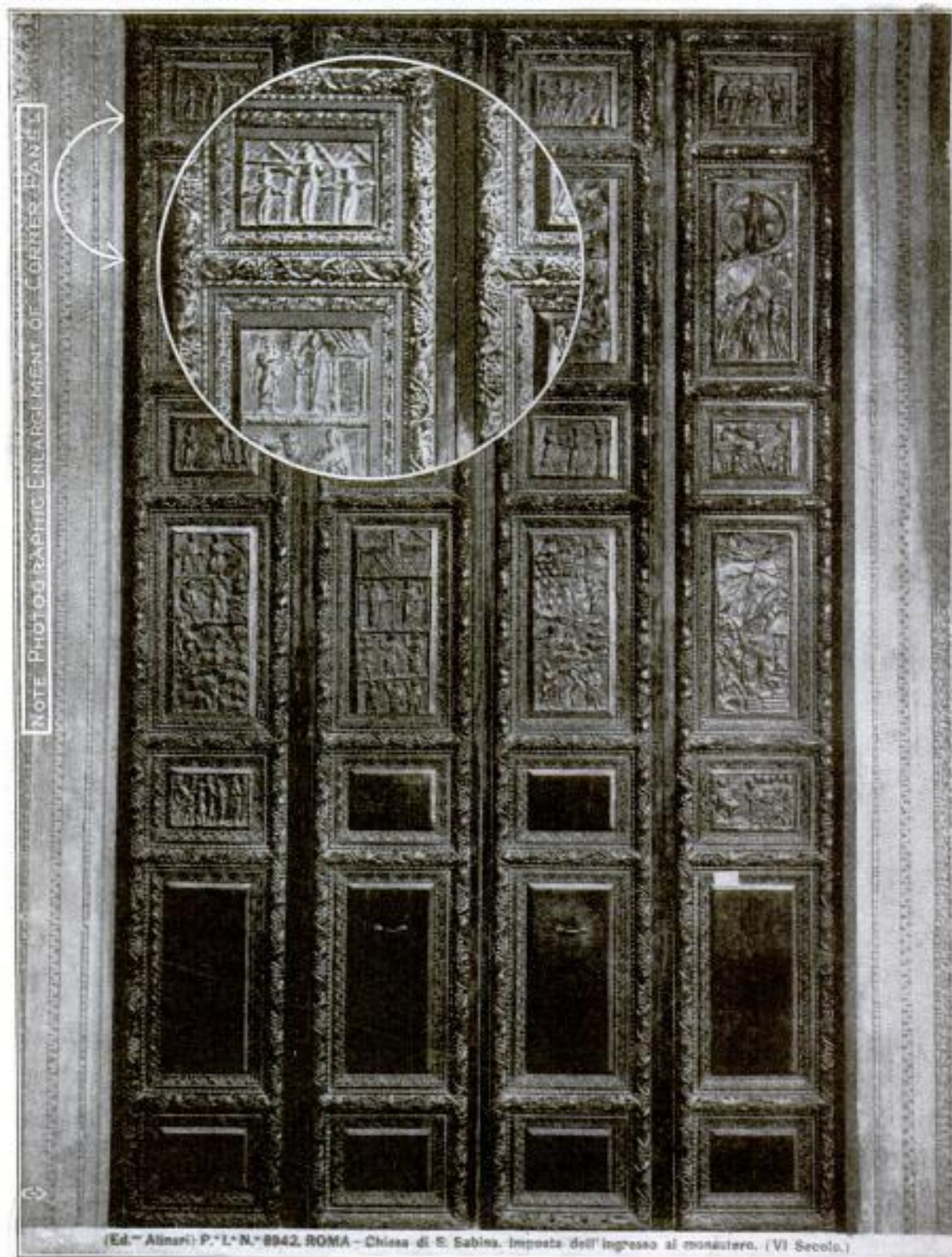
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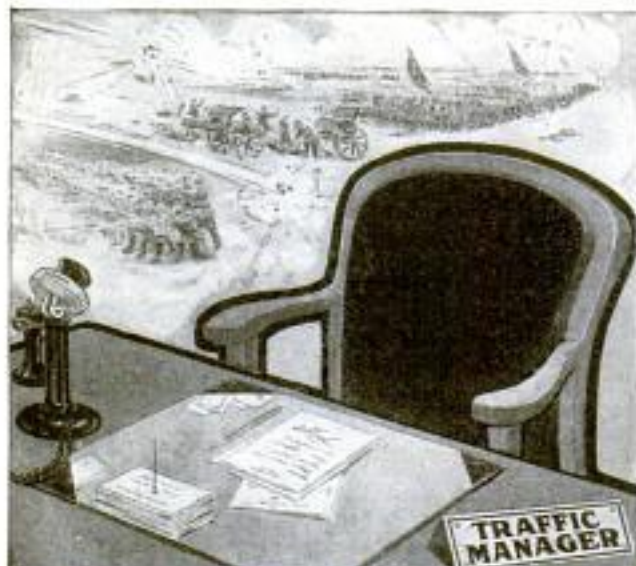
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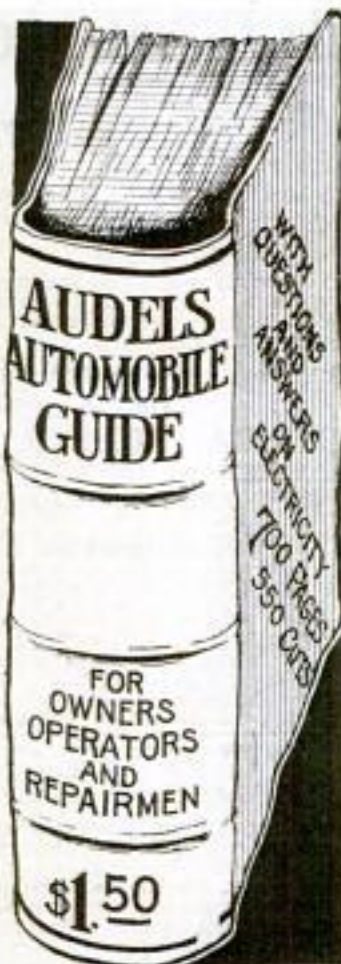
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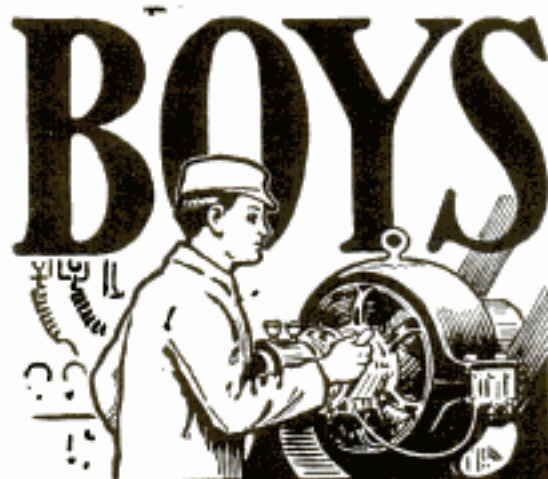
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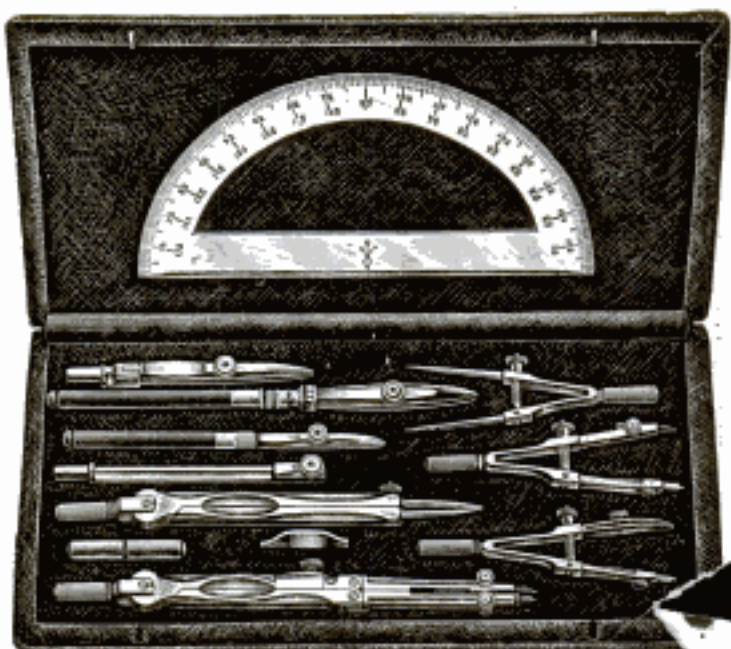
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**THEO. AUDEL & CO., 72 5th Ave., NEW YORK**

Please submit me for examination **HAWKINS ELECTRICAL GUIDES** (Price \$1 each.)

Ship at once, prepaid the 6 numbers; if satisfactory I agree to send you \$1 within seven days and to further mail you \$1 each month until paid. July, '15, Pop. Mech.

Signature .....

Occupation .....

Business Address .....

Residence .....

Reference .....



# What the Navy Has Done for Others It Can Do for You

**T**HE NAVY can help **you** win success as it has helped thousands of others. Many a man in civil life owes his success to the training he received in the Navy. The opportunities it offers are steadily broadening. Each year has brought increased advantages to the enlisted men. The last naval legislation authorized the appointment each year of fifteen enlisted men to the Naval Academy under competitive examination.

☐ Another door to the commissioned ranks has been opened to enlisted men by restricting appointment to the pay corps to candidates from the enlisted personnel.

☐ These are unusual opportunities and call for exceptional young men. But opportunity awaits **every** young man who strives to win. The chance to learn one of the many trades used on board ship is open to all who are competent to learn. Advancement in rating comes when it is earned, and carries with it increased pay. And remember, that in the navy your pay is nearly all clear. The advantages of travel and of acquiring a liberal education are unequalled.

If you are an American citizen of good health and character, it will pay you to investigate the Navy's opportunities. Send for the pamphlets, which will tell you all you want to know about the sailor's life in the U. S. Navy.

ADDRESS BOX 69

## BUREAU OF NAVIGATION

NAVY DEPARTMENT

WASHINGTON, D. C.

**Saves Washing Car**  
S. C. JOHNSON & SON  
Racine, Wis.

Gentlemen: In answer to your letter of the 24th, I had a hard time to get my boss to try the Wax on a new car he has to demonstrate with, but landed him and now he will not use anything else. He thinks it is great. It has saved me washing the car every day. Once a week or once in two weeks will keep the car looking like new. It is great stuff believe me. I take great pains in showing it up.

Yours very truly,  
K. PAUL,  
Behenectady, N. Y.

29 Elm St.

**Thought Car Was Repainted**  
S. C. JOHNSON & SON,  
Racine, Wis.

Dear Sirs: I must tell you a little experience I had the other day. An auto came in to be washed; it was so covered with mud you could not see the auto. I washed it and polished it with Johnson's Wax; the man came back after driving around the city, said everyone thought his car had been repainted.

Yours truly,  
A. H. BRILL,  
Hastings, Mich.

**What Kept Car So Nice?**  
S. C. JOHNSON & SON,  
Racine, Wisconsin.

Gentlemen: We used the Wax on the auto and had several inquiries regarding the shine.

One man, a stranger, called up by phone, asking what we used to keep the car looking so nice. He is now a user of Johnson's Wax also.

Yours truly,  
E. P. LINGQUIST,  
Logansport, Ind.

**Leaves Hard, Dry Surface**  
S. C. JOHNSON & SON,  
Racine, Wisconsin.

Gentlemen: I have never used anything that anywhere near equals Johnson's Prepared Wax for giving a high gloss that will turn rain and dust.

All polishes that I have ever used before leave such an oily surface that the body will collect more dust after using it than before, but your Wax leaves such a hard, dry, as well as glossy surface that dirt does not stick to it, and for the first time I can now polish my car without getting my hands all over grease and oil and musing things up generally.

Yours very truly,  
B. F. SAWIN,  
Chicago Ill.

# What Motorists say about JOHNSON'S PREPARED WAX

— is that it is a dust-proof, water-proof, mud-proof and sun-proof polish for motor cars, which gives a hard, dry, glossy finish that lasts. Users say Johnson's Prepared Wax is unequalled. Judge for yourself. Send for sample can.

**S. C. JOHNSON & SON**

Dept. PA7

RACINE

WISCONSIN

**Makes Car Easy to Clean**

Gentlemen: Upon the arrival of your sample can I had the Wax applied to my car in light coats. Each coat was allowed to dry well and then well rubbed before the application of the next. After the third coat the varnish seemed to me to have acquired a gloss of greater depth and the car looked as well as when new. After a few rain storms I had the car washed clean of the mud acquired and was more than pleased to find the car still bright without the application of another coat of Wax. An occasional coat of wax has kept the car looking well and easy to clean during our rainy and muddy winter.

Very truly yours,  
ERNEST O. BILLWILLER,  
Stockton, Calif.

**Best He Ever Used**  
S. C. JOHNSON & SON,  
Racine, Wis.

Gentlemen: I must say that Johnson's Prepared Wax is the best material that I have ever seen or used for this work and have recommended it to several, who I know are also using same with as good results as I am having myself.

Very truly yours,  
R. M. LAING,  
Perth Amboy, N. J.

**Is Indispensable**  
S. C. JOHNSON & SON,  
Racine, Wis.

Dear Sirs: Have used the sample which you sent me and find that it is the best polish I have used on an automobile. It keeps its lustre and improves the looks of the machine 100%.

I will keep a can on hand as it is indispensable.

Yours truly,  
H. L. MOREHOUSE,  
83 Liberty St.,  
Danbury, Conn.

**USE THIS COUPON**

S. C. JOHNSON & SON  
Racine, Wisconsin

I enclose 10c for a can of Johnson's Prepared Wax—sufficient for one polish on a large car.

Name.....

Address.....

City & State.....

My accessory dealer is.....

PA7



Send us 10c for a can of Johnson's Prepared Wax—sufficient for one application on a large car.

**A Hard Polish—That Collects No Dust**

S. C. JOHNSON & SON,  
Racine, Wis.

Gentlemen: I find that Johnson's Prepared Wax is a very fine preparation to use on automobile bodies. The wax does not collect dust like most body polish. I find that it retains its hardness under this southern sun. The car I used this polish on had lost its original gloss. After applying one coat of the Wax the finish looked like new. I remain yours truly,  
JOHN BARON, JR.,  
El Centro, Calif.

Please Mention Popular Mechanics

Buffalo Gasoline Motor Co.,  
1280 Niagara St., Buffalo, N.Y.

# Popular Mechanics Magazine

supplied picture + REGISTERED IN U. S. PATENT OFFICE *mistalled engine for*  
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 24

JULY, 1915

No. 1

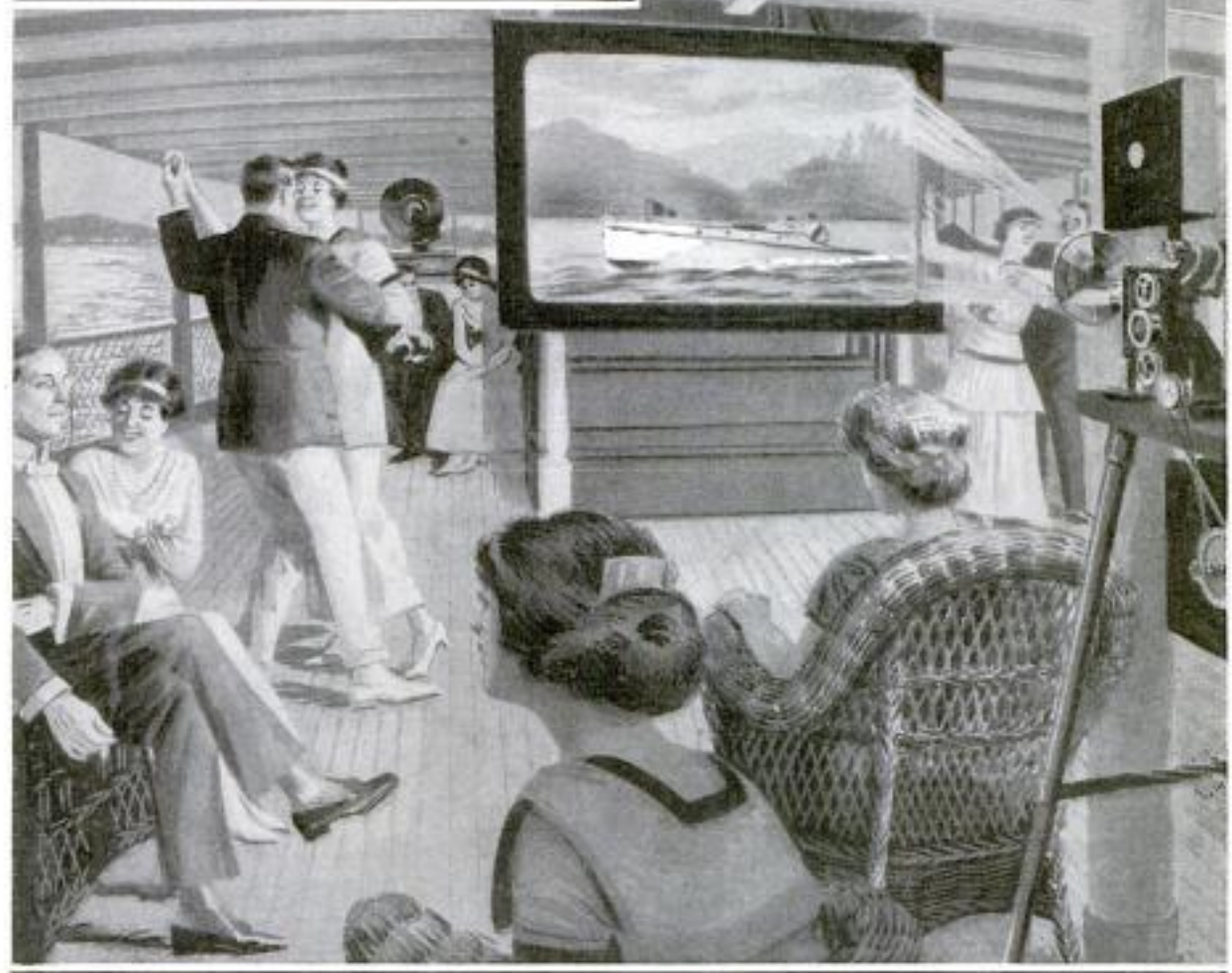
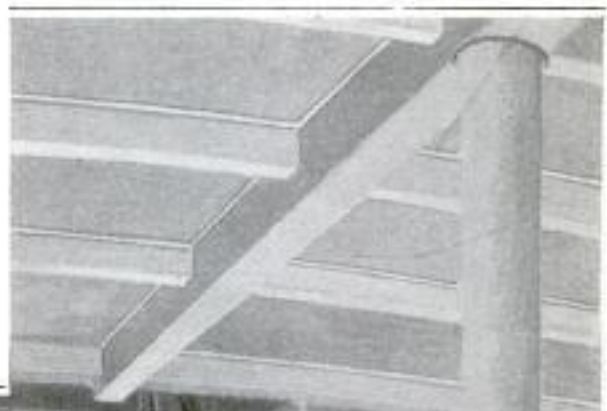
*company below.*

## Floating Motion-Picture Show and Dance Hall

**W**ITH the idea of providing amusement for the summer residents along the shore of Lake Wawasee, in Indiana, there has been built a motor-boat that is in effect a combination of motion-picture theater and dance hall. The boat is 90½ ft. long, and has a beam of 30 ft. and a draft of from 30 in. to 48 in. It is to be propelled by a 45-hp. internal-combustion engine and is capable of carrying 800 passengers. Trips around the lake are to be made six nights a week during the summer, the deck being used on alternate nights for motion-picture

shows and for dancing. The boat will have five regular landing places so located that any cottage or hotel around the lake can be reached.

9860



New Excursion Boat on Lake Wawasee, in Indiana: The Deck is Used on Alternate Nights as a Motion-Picture Theater and as a Dance Hall

Lake Wawasee Amusement Co.,  
Fort Wayne, Ind.

copyrighted material

## FIRE AND GAS IN WORLD WAR

Fighters in France and Flanders Using Deadliest Means of Destruction Known to Modern Science

**T**HE primitive warrior who used poisoned arrows when he did not intend to eat his victim could never have given the modern fighter any lessons in savagery. Poisoned arrows are

for this, liquid fire is thrown into the enemy's trenches. With the conditions favorable, a dense volume of poison gas that follows the ground in a cloud fifteen feet or more in depth is sent down on the wind to the enemy's position.

Whoever may have been responsible originally for the resort to poison gas, there is little doubt that both the Germans and the allies are now using it. The Germans used it in their recent attack on Hill No. 60 near Ypres, Belgium. In the Argonne forest in France each side attacks with gas at every opportunity. According to press reports the gas used by the French does not kill or permanently injure its victims, but renders them unconscious for a period of one or two hours. In a recent number of this magazine the new French turpinite bomb was described from information coming from an apparently reliable source. In the light of civilized standards, the best that can be said for turpinite is that it kills instantly. The use of such bombs may explain the reported recent successes of the allies in Flanders. For several weeks London has stood in fear of an attack in which the city might be overwhelmed by gas bombs thrown from Zeppelins. Nor is the use of gas and liquid fire the only lapse from the standards heretofore thought to form an integral part of modern civilization. An American manufacturer has developed a shell which, according to the advertisement, is one of the most deadly ever produced. The principal merit claimed for this shell is that when it explodes, the fragments become coated with a poison that makes the slightest scratch fatal—that places the victim practically beyond the aid of medical science, so that he dies in agony within a period of four hours.

Just what will be the outcome, or the effect on civilization, of such methods of fighting, it is impossible to estimate. Judged by the standards of modern



SUGGESTED BY COPYRIGHTED SKETCH IN ILLUSTRATED LONDON NEWS  
German Soldier Equipped with Oil Tank, Goggles,  
and Mask, Ready to Attack with Burning Oil

not being used in the European war, but apparently only for the reason that they are out of date and do not destroy life on a sufficiently large scale to meet the requirements of a twentieth-century war. To get satisfactory results the modern science of chemistry has been called into service. Poison gases are used, and if the wind is not right

*Ann. Machinist  
10<sup>th</sup> Av. at 39<sup>th</sup> New York  
adv #26027 May 6-1915*

# Worth Knowing

On the opposite page we show two sizes of high explosive shells which can be produced from the bar on our 4 1/2" PEDESTAL BASE MACHINE (see cut on opposite page).

On this machine we can finish a 13-lb. shell all over as it appears from very tough material from which shells are made, in 24 minutes, and from ordinary machine steel in 17 minutes.

The 18-lb. shell in 30 minutes, or from regular machine steel in 22 minutes.

When you figure about \$1.00 per day for operating this machine, you can then arrive at the actual labor cost for producing the piece.

We are going to say a little more—something which might be interesting. The following is a description of the 13- and 18-lb. high explosive shells which are now being used so extensively in the war to replace common shrapnel:

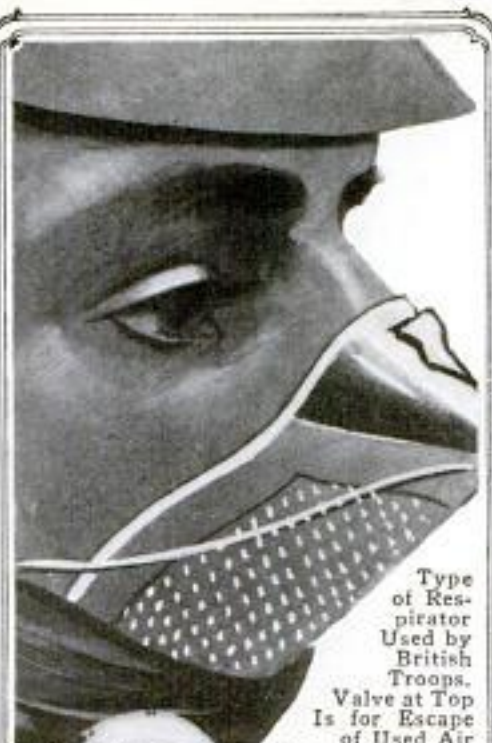
The material is high in tensile strength and VERY SPECIAL and has a tendency to fracture into small pieces upon the explosion of the shell. The timing of the fuse for this shell is similar to the shrapnel shell, but it differs in that two explosive acids are used to explode the shell in the large cavity. The combination of these two acids causes terrific explosion, having more power than anything of its kind yet used. Fragments become coated with these acids in exploding and wounds caused by them mean death in terrible agony within four hours if not attended to immediately.

From what we are able to learn of conditions in the trenches, it is not possible to get medical assistance to anyone in time to prevent fatal results. It is necessary to immediately cauterize the wound if in the body or head, or to amputate if in the limbs, as there seems to be no antidote that will counteract the poison.

It can be seen from this that this shell is more effective than the regular shrapnel, since the wounds caused by shrapnel balls and fragments in the muscles are not as dangerous as they have no poisonous element making prompt attention necessary.

## CLEVELAND AUTOMATIC MACHINE COMPANY

Cleveland, Ohio, U. S. A.



Type of Respirator Used by British Troops. Valve at Top Is for Escape of Used Air

COURTESY OF ILLUSTRATED LONDON NEWS



How the Man Handling the Gas Protects Himself



German Soldier Equipped with Mine-Rescue Helmet



Another Type of Oxygen Helmet Used by Germans

Advertisement That Appeared in an American Trade Journal

Picture at Right Shows How Poison Gas Settles to the Ground When Released



The British Soldier Simply Ties a Wet Handkerchief over the Mouth and Nostrils When No Respirator is to be Had



conscience as well as by the prohibitions laid down in The Hague conventions, they appear to be a reversion to barbarism. In the Fourth Hague Convention, which relates to the laws and customs of war on land, belligerents are forbidden "to employ poison or poisoned weapons," or, "to employ arms, projectiles, or materials calculated to cause unnecessary suffering." The stand taken heretofore by civilized nations is that the killing or disabling of the enemy accomplishes every needful and legitimate purpose. The use of gases that torture is evidently part of a system of terrorism, an attempt to make warfare as frightful as possible with the idea of discouraging the enemy. Except in the case of non-combatants the attempt is proving futile, as the army thus attacked simply equips itself with gas and fights chemical with chemical.

As a defense against gas the soldiers are being equipped with respirators of various kinds, and it is possible that as a result of this development in the war an army of fighters will soon look like an army of men engaged in mine-rescue work. Each of the French soldiers in the Argonne now has a felt mask that fits over the nose and mouth, and in the crevices of this mask is a whitish powder which neutralizes the German gas, thought to be chlorine. Thus protected, the soldier is able to stand against the clouds of gas that come floating down from the German trenches. To this mode of attack the French are replying in their own way. Several years ago when the French authorities were having trouble in suppressing automobile bandits, the military laboratories were called on to provide a bomb that would render the victim powerless without permanently injuring him. This is said to be the bomb that the French are using in the Argonne. When one of these bombs explodes it gives out a gas that attacks the mucous membranes of every one within twenty yards, causing the eyes to fill with water to the point of blindness and the throat to burn as if fire had been applied. In an hour the vic-

tim is helpless and virtually blind. In another hour or two he recovers.

While the French use explosive bombs for scattering the gas, the Germans are employing an apparently less efficient method, that of releasing the gas from containers in the trenches and letting it float down on the enemy. The German gas, however, is far the more deadly. The composition of this gas is unknown except to the Germans, but the British experts who have seen its effects are inclined to believe it is chlorine. Whatever it may be, its effects are such that death is sure to follow if it is inhaled in sufficient quantities, while a quantity too small to kill quickly will subject the victim to excruciating pains and will injure him so seriously that there is usually little hope of recovery. To escape the effects of the gas the Germans engaged in handling it are said to wear oxygen helmets. In charging the French trenches near Ypres after an attack with gas, the Germans themselves wore masks or respirators to protect themselves.

An attack with liquid fire can evidently be carried out only at close range. Each soldier engaged in this form of attack has strapped to his back a tank containing an inflammable liquid under high pressure. Connected by a swivel joint with the bottom of the tank is a pipe, equipped with a valve, which projects several feet to the front of the user. With the valve opened and the stream lighted the oil is thrown forward in burning globules to a distance variously estimated at from ten to thirty yards. How effective this device may be under favorable conditions is evident from the fact that in some places the trenches are less than 30 yd. apart, while in the continual process of attack and counter attack, different parts of the same trench are sometimes held by opposing forces. The soldier engaged in hurling the liquid at the enemy is himself in considerable danger of being blinded or fatally burned, and to give such protection as is possible, he is provided with goggles and a fireproof mask that entirely cover the face and throat.

5/6/15

9873

**"JITNEY BOATS" PLACED IN SERVICE**

The jitney-bus idea has taken possession of the owners of motorboats around Portland, Ore., and there is now a regular "jitney-boat" service for reaching points along the water front, for making week-end cruises, and for making trips to points of interest on the Willamette and Columbia rivers. There are not many of the trips that can be made for five cents, but it is the evident intention of the owners of these boats to cut the charges considerably below those made by the big excursion boats and other steamers. The "jitney boats" range in carrying capacity from three or four persons to 65. One of the boats with a carrying capacity of 10 persons cuts the water at the rate of 22 miles an hour, while a small cruiser that has been placed in the service has sleeping accommodations for nine persons and is capable of carrying as many as 16 persons on day trips.

**WRECKED RAILROAD CAR STOOD ON END**

In a train wreck near Claremont, N. H., in which several passenger cars



Unusual Position of the Baggage Car Following a Train Wreck in New Hampshire

9844

**"The Aeroplane" 4/14/15  
LOOPS THE LOOP WITH A FLYING BOAT**

The feat of looping the loop with a flying boat was accomplished recently by an English airman while testing a small single-seater craft, and it is reported that the first loop and the ones that succeeded it were as good as those ordinarily made by the same pilot with a land machine. This is the first performance of the kind by a flying boat.

were thrown down the embankment into a flood-swollen river, the baggage car was left standing almost at right angles to the roadbed with one end high in the air. The car had started to slide into the river, but had stopped when about halfway down the embankment, with the result that it remained in this unusual position. The wreck was caused by a washout.

ⒸThe fiber of the water hyacinth is being utilized in French Indo-China in the manufacture of rope, twine, matting, boxes, chairs, and cradles.

Court: *Wm J. Reis,*  
*3501 Washington Blvd.,*

### CORNETIST CALLS EASTER CONGREGATION

A cornetist playing at dusk from a platform halfway up the church spire was the striking feature of a campaign



How a St. Louis Congregation was Called to Easter Service

for attracting a record-breaking audience at the evening Easter service of a church in St. Louis. The plat-

form was more than a hundred feet above the ground and was supported on the side of the spire by brackets. To reach it, it was necessary to make a dizzy climb up vertical ladders from one of the arched openings at the top of the tower. For half an hour before the service the cornetist played Easter music. The novel plan attracted widespread attention and resulted in filling the church to its capacity.

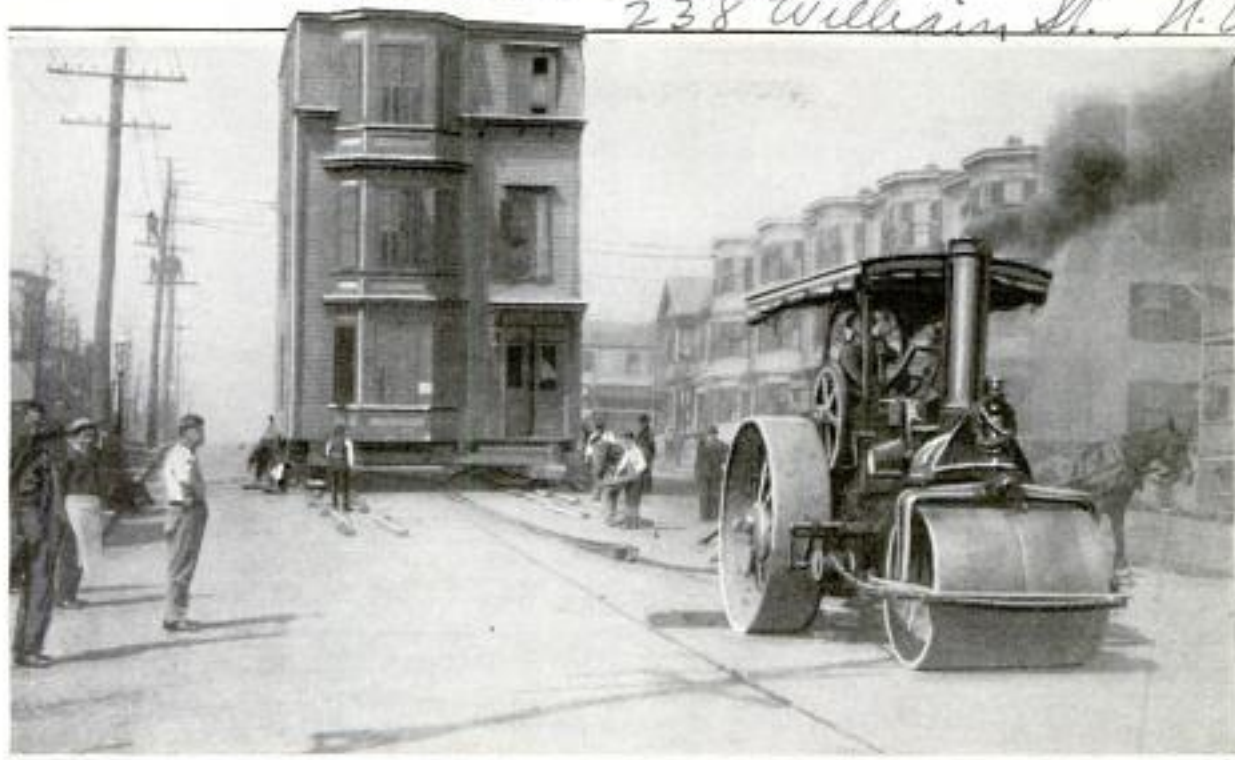
### "Railway Age Gazette" DEVICE FOR INSPECTING RAILROAD TRACK

A railroad roadmaster riding over his division can tell whether or not the track is in good condition without the aid of instruments and sufficiently well for practical purposes of operation. When it comes to awarding prizes for good maintenance, as is done on some of the leading railroads, it is necessary to use some more definite means of comparison of the state of the track on different sections and divisions. The greatest difficulty in making such comparisons with mechanical registering devices is that one section in fairly good condition may show a great number of small vibrations due to irregularities in the track, while another section in poor condition may show fewer but larger vibrations. A compact device with few parts, weighing only 22 lb., that can be picked up and carried about and placed with its wooden base on the floor of any car, seems to solve this problem completely. Vibrations are detected by two hammers mounted on flexible stems, one vertical to detect the swing of the car and the other horizontal to detect the up-and-down movements. Each is connected with a cyclometer for registering the distance the hammer travels and with a pedometer for registering the number of vibrations.

*1/22/15-156*  
*9357*  
*see card*

Satisfactory results are said to have accompanied the tests made by the U. S. Department of Agriculture to determine the merits of cheese put up in air-tight tins.





One of Three Frame Houses being Moved through a Street in Boston by a Steam Roller

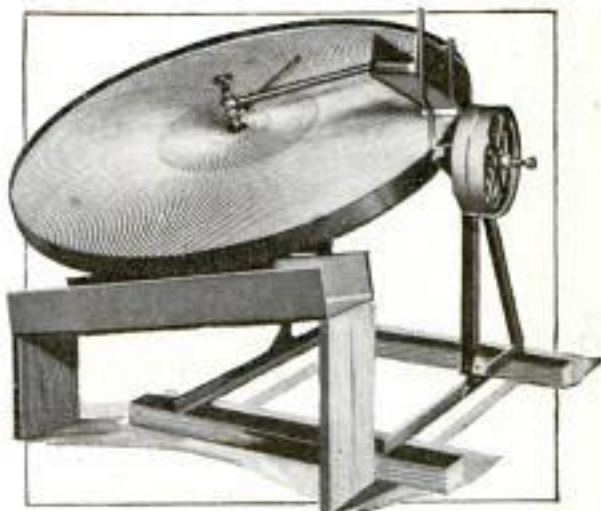
**HOUSES MOVED WITH A  
9845 STEAM ROLLER**

A novel job of house moving was recently carried out in Boston, where three frame houses similar to the one shown in the illustration were pulled in succession through the streets by a steam roller to a new site about three miles distant. The three houses were sold together for \$2,800, and the cost of moving was about \$3,700. A considerable part of the expense of moving was due to the necessity for taking down and replacing electric-light and telephone wires along the route.

**NEW MACHINE FOR WASHING  
9545 GOLD FROM SAND**

In an attempt to overcome some of the difficulties encountered in the use of ordinary sluice boxes in placer mining, and to eliminate the reciprocating tables commonly used, a Colorado inventor has devised a concentrating and separating machine for extracting gold, and other minerals, from sand and crushed ore. It consists prin-

cipally of a wooden disk, the surface of which is lined with curved riffles which radiate from the center to the circumference. This is mounted so that it may be tilted to various angles, according to the character of the material being worked. As sand is fed onto the pan, the disk is rotated slowly in a counterclockwise direction by a small motor. This carries the sand upward and passes it beneath sprayers where the tailings wash free from the mineral. The filtrate, the gold, zinc, lead,



With This Pan, It is Claimed, Even Fine-Flour Gold is Saved from the Tailings during the Washing Process.

Inventor & Const:

Harry Hertzberg,  
1448 Newton Street,  
Denver, Colo.

or whatever mineral is being extracted, remains in the riffles and is carried to the center, where it falls into a receptacle provided for it. It is claimed by the inventor that if the sand is properly

sized, the machine has an efficiency that makes it possible for placer miners, who otherwise are merely able to make a scant living, to receive fairly good returns for their labors.

*Underwood + Underwood*  
**CURIOUS STATUE AT VIENNA**

**ERECTED FOR CHARITY**  
*417 Fifth Ave. - N. Y. C.*

At Vienna a committee which is promoting a benefit fund for the widows and orphans of the war has erected

*9676*



a wooden statue representing the "Defender in Iron." Any donor who subscribes as much as the equivalent of 20 cents in American money is permitted to drive a nail into the figure. The hope is that the statue will eventually be covered by nail heads, which will give it the effect of being clothed in armor. It then will be preserved as a record of the devotion of the Viennese to their country. Each

contributor is presented with a picture of the statue and is also allowed to inscribe his name in a register which it is proposed to file permanently at the town hall. Similar statues have been built in America recently by European sympathizers for essentially the same purpose.

*Annual Ill*

*9863* **USING THE TELEPHONE TO CURE TRUANCY**

A method that has proved effective in curing truancy is being used in the schools in Los Angeles. Each school is equipped with a telephone switchboard and a schedule giving the names

*Court: Le Roy W. Allison.*  
*170 Roseville Ave.,*  
*Newark, N. J.*

of the parents and the telephone number of each pupil. If a student is absent and there seems to be no reasonable explanation, there is telephonic communication with the home immediately, and the cause of the absence is learned or the parents are advised of the truancy. The telephone exchange is operated in short shifts by the students as a part of their regular school duties. The high schools have self-governing committees among the students who look after this work.

**DEVICE FOR SEALING TANKS AND CANS AIR-TIGHT** *9073*

Designed for the purpose of sealing tanks air-tight, a device has been made by a French inventor which may be used on an ordinary sheet-metal container. It offers a means of keeping



such materials as carbide, powder, and similar things from contact with the air without requiring a threaded collar to be fixed to a container in order that a cap may be used. One of its advantages is that it may be used either temporarily, as in the case of an emergency, or permanently. It is

built with a circular plate, which fits over the outside of an opening, beneath which on two arms are attached S-shaped locking members that press against the top of the container under the plate when the screw is turned.

*Court: Francis P. Manna.*  
*12 Boulevard Arago,*  
*Paris, France.*

*Mfrs: Maurice Redoux + Co.,*  
*10 Place du Triomphe - Marché 10,*  
*Bordeaux, France.*

Joyland Company, *W. Williams & Co.*  
 Panama-Pacific Exposition, *San Francisco.*  
 9836 SIGHT-SEEING IN SAN FRANCISCO TOYLAND



One of the Grotesque Features of the Panama-Pacific Exposition is "Toyland Grown-Up," a Concession in the "Zone". The Picture at the Left Shows This Toyland during the Celebration of May Day

Below Is the Town Pump of Toyland; Through This Pump, Worked Apparently by the Figure at the Left, Passes Water Required in Keeping Toyland Grand Canal Supplied



In "Crazy Town," a Corner of Which is Shown Above, Some of the Houses are Built Upside Down While Others are Bent in the Middle and Otherwise Distorted. The Chimneys Are as Queer as the Houses



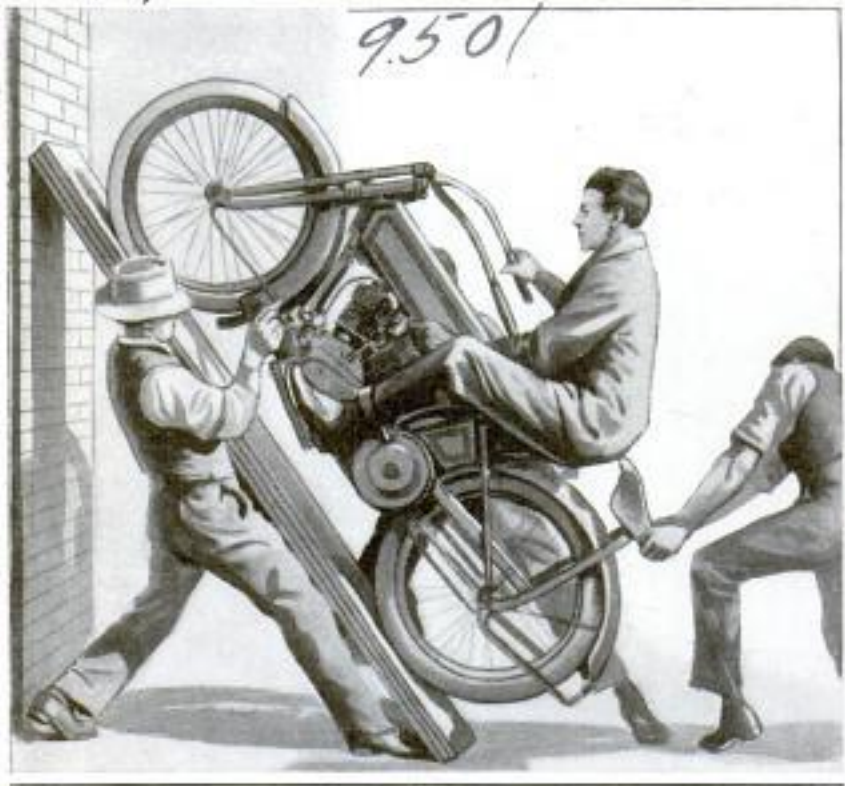
At the West Entrance to Toyland is "Little Eva," a Toy That Stands 110 Feet High, While Flanking the Entrance is a Row of Grotesque Toys Mounted on Enormous Letter Blocks as Shown at the Right



Cour.: G. A. Clark, R. R. Box 545, San Gabriel, Calif. (clipping)  
 Harley Davidson machine, being exhibited by  
 10 POPULAR MECHANICS  
 Passmore & Saurre Co., 927 S. Main St., Los Angeles, Calif.  
 SPECTACULAR CLIMB MADE QUALITY OF COAL IMPROVED  
 WITH MOTORCYCLE BY SUBMERGENCE IN SEA

Lester H. Miles of above Co.  
 To demonstrate the hill-climbing abilities of a twin-cylinder motorcycle, several striking tests were recently supplied photo.

Work which has of late years been accomplished both abroad and in this country in recovering cargoes of coal from sunken vessels has tended to show that the combustion of the product is improved by submergence in salt water. The British admiralty has also conducted special experiments, the results of which have caused like conclusions to be made. Coal subjected to the action of sea water for a number of years has been found to burn almost entirely away, leaving only a small amount of ash and no clinkers. Some time ago several cargoes of coal were recovered from old vessels in Long Island Sound which were apparently lost prior to the Civil War. The combustion of this material was



Motorcycle Climbing a Plank Which Rises Nearly Eight Feet in a Horizontal of Five Feet

conducted at Los Angeles in which a machine was driven up a 160-per-cent grade. The cycle was sent up planking inclined against a side of a building. The only assistance given was that two men pulled down on the footboards to prevent the machine from turning turtle with its rider, while a third man, after falling off the tandem seat, pushed downward on the saddle in order to give the rear wheel a better hold. The same feat was also accomplished with the machine carrying three passengers, one of them straddling the guard over the front wheel. Each climb was made from a standing start with the front wheel touching the bottom of the plank.

CA movement is on foot to make the "4-4" fire signal, now used in the schools of Massachusetts, the universal fire signal for the state.

found to be excellent. Crates of coal, each holding approximately two tons, were submerged by the British admiralty in 1903, and at different times since certain of them have been raised and experiments conducted. The tests all have been in favor of the salt-water treatment.

98432  
**TIMING WATCH HAS DIAL DIVIDED DECIMALLY** 9842

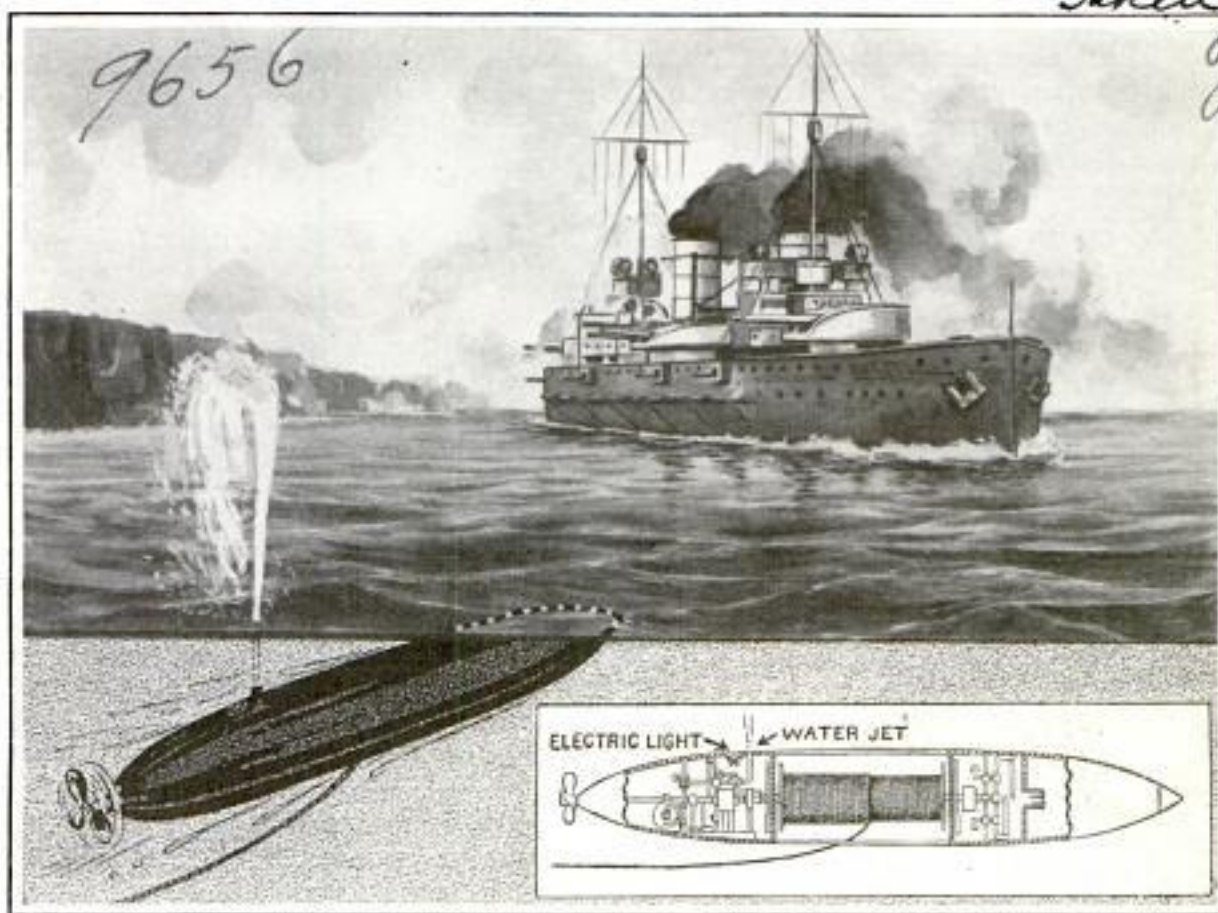
A watch just placed on the market and designed for making time studies of shop and construction work has a dial that is divided into tenths and hundredths of a minute instead of seconds, the purpose being to simplify the computation and analysis of the observations. In addition to this there is a small hand and dial recording the number of minutes up to thirty.

For sale by:  
 Sanford E. Thompson,  
 Newton Highlands,  
 Mass.

Inventor: *Gustav P. Helfrich,*  
*The Bronx, New York City*  
POPULAR MECHANICS

## SUBMARINE TORPEDO THAT HUNTS ITS QUARRY

*Taken from  
Patent  
Papers.*



This Torpedo, Designed for Coast Defense, is Steered and Exploded by an Operator Working at the Shore Station

A weapon of the greatest value in coast defense has apparently been provided by the invention of a torpedo that can be started and stopped, steered so that it will follow its quarry, and exploded at the right instant, all at the will of an operator working at the shore station. This torpedo alternately flashes a light and throws a jet of water above the surface, so that its course and position can be seen day or night. If the ship at which it is aimed gets out of range, the torpedo can be turned around and steered back to shore, a feature of importance in view of the fact that a modern high-power torpedo costs upward of \$8,000. Current for driving the propeller and controlling the movements of the torpedo is supplied through a wire that is wound around a shaft in the torpedo and has its free end connected with a generator at the shore station, the wire unwinding from the shaft as the

torpedo moves forward. The right depth is maintained automatically by water jets thrown upward or downward from pipes located near the bow, while the steering, which is under the control of the operator, is done by jets thrown to the right or left by horizontal pipes placed near the stern. Water under pressure is supplied for these purposes by an electric pump carried within the torpedo. For controlling the torpedo the operator uses a switch which is provided with four contacts. When the switch is thrown to the first contact, the propeller is started and the torpedo goes straight forward. For steering to the right the switch is moved to the second contact, and for steering to the left it is moved to the third contact. Moving the switch to fourth contact sets in action a mechanism that ignites a fuse which explodes the charge carried in the nose of the torpedo.

Mfr. The Dauberspeck Mfg. Co.

12 Butler, Pa. POPULAR MECHANICS

9833  
**COMBINED COAT RACK AND  
FIRE ESCAPE**

A coat and hatrack that can be quickly transformed into a fire escape is one of the latest safety devices to



A New Rack for Coats and Hats is Easily Converted into a Fire Escape Long Enough for Getting Down from a Second Floor

be placed on the market. The post is made up of two V-shaped metal channels, connected by a strong hinge at the top, so that it is square in section when folded for use as a rack. For making it into a fire escape, the metal cap at the top is removed, a clamp at the bottom is released, and the whole is unfolded and let out of the window and suspended from the window ledge, the hooks serving as ladder rungs. The two foot supports on one of the sections are provided

with hooks that fit over the window ledge, while the foot supports on the other section serve for holding the lower end out from the wall. When extended in this way, the device is of ample length for getting down from a second floor.

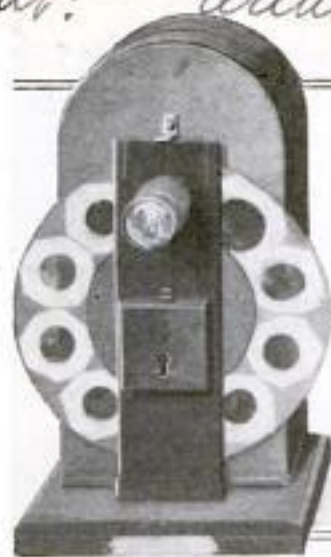
"Engineering" 4/16/15  
**COLORING THE WATER IN A  
GAUGE GLASS** 9867

One of the principal disadvantages of the ordinary gauge glass for steam boilers is the possibility of mistake in determining the water level under poor lighting conditions. To overcome this an English manufacturer has brought out a device with which the water in the gauge glass is colored a bright red. This device consists of a small gun-metal reservoir which can be screwed into the top fitting of any water gauge in place of the usual plug. When in place, this reservoir is filled with water, coloring matter is added and the top is closed by a screw plug. The colored water slowly drips into the water in the gauge glass and keeps it a bright red color, the feed being regulated by steam which leads past a small valve in the stem connecting the reservoir and the gauge glass. The steam condenses in the reservoir and thus displaces some of the colored water. The reservoir requires refilling about once a month. It is claimed that the coloring matter does not stain the gauge glass.

9482  
**ILLUSTRATED TALKS GIVEN  
BY PHONOGRAPH OUTFIT** Journal

For giving illustrated phonographic lectures, a Colorado professor has devised a stereopticon attachment for a talking machine that operates automatically and may be timed for any record. The pictures to be shown on the screen during a talk are mounted in a disk frame which revolves before the lens of the projector, bringing each slide into place at the proper instant. The shifting is accomplished by means of a series of "dogs" arranged on the

Inventor: Prof. J. W. Kirby, Boulder, Colo.  
 cout: Arthur Chapman, 6212 Clermont St.,  
 POPULAR MECHANICS 13  
 Denver,



Stereopticon  
 Attachment  
 for Phono-  
 graph Which  
 Operates  
 Automatically



back of the picture rack. A shaft connecting this disk and obtaining its power from the phonograph, actuates the turning mechanism and makes the various slides appear in sequence and at whatever time intervals are requisite,

so that as different topics are reached in the lecture, the desired pictures are projected on the screen without necessitating the attention of an operator. The device has been used by its inventor for schoolroom purposes.

9832  
**JAPANESE BANDAGE WIDELY USED IN EUROPEAN WAR**

The triangular bandage first introduced by the Japanese during the Russo-Japanese war is now being widely used in the European war. It has been found that bandages of this type are suitable for binding up wounds in any part of the body and that one can be carried by each soldier without inconvenience. The Germans improved

it by printing on the bandage itself, in sterilized ink, various figures showing how it is to be applied. The British war office then adopted the idea, and every British soldier now carries one of the printed bandages in a special pocket of his tunic. This bandage is often applied without assistance by the wounded soldier.



Triangular Bandages Like This are Supplied to Their Soldiers by Both the British and German Governments. The Figures, Printed on the Bandage in Sterilized Ink, Show How It is to be Applied

cout: W. M. Gladish,  
 33 Wineva Ave.,  
 Toronto, Canada.

Mfr. -- The United Gas Improvement Co.

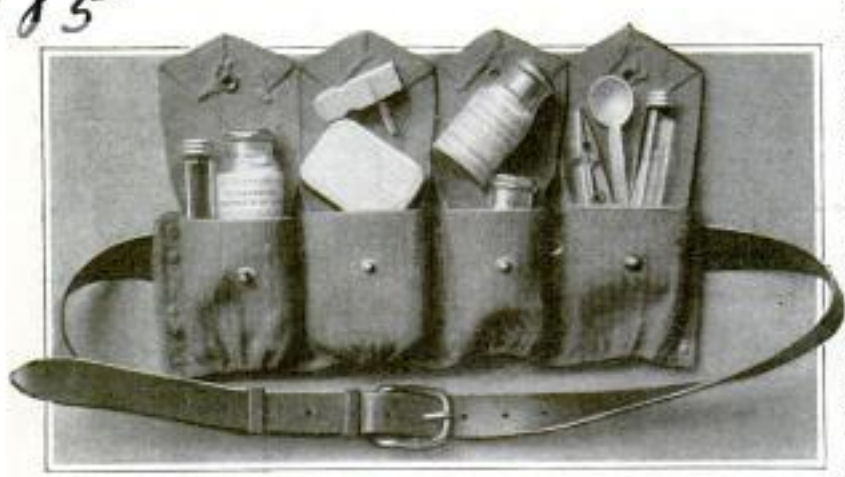
Broad & Arch Sts.,  
14 Philadelphia, Pa.

"Daily Consular & Trade Reports"  
MECHANICS

address. **FIRST-AID REMEDY CASE  
CARRIED ON BELT**

J.B. Douglas <sup>9/8 above</sup>  
For carrying first-aid remedies, a belt case not greatly unlike a cartridge bandoleer has been designed

Original by H. D. Christy, Foreman  
perfected by J. S. Parker, Supt. Filad. Div. Phila.



First-Aid Materials for Asphyxiation Cases Carried on a Belt

which is easily worn by a worker in a mine or other place where accidents are apt to occur. It is made in a strip, with four separate pockets, that fits over a belt and is worn at the back. While it is particularly designed for carrying materials to be used in the treatment of asphyxiation cases, it is of a pattern that may be used as well for other purposes. It may be quickly attached to a belt or removed from one, and is compact enough to be carried without inconvenience.

**RUSSIA SEEKING NEW USES  
FOR ALCOHOL 4/17/15**

In an attempt to utilize the numerous plants formerly employed in making vodka as well as to substitute a new market for the immense stores of agricultural material used in this industry before the manufacture and sale of vodka was prohibited at the outbreak of the war, the Russian government has offered prizes aggregating \$136,475 for processes by which alcoholic spirits can be converted into substances suitable for domestic, industrial, and technical uses. Seven prizes in all are offered, the largest being \$51,150, and the smallest, \$2,515. The processes,

9783

described in French or Russian, must be submitted by Jan. 1, 1916, and must be of such a nature as to involve a considerable consumption of alcohol.

**ARMCHAIR BICYCLE FOR  
SEASIDE USE 9244**

A bicycle that enables the rider to recline at ease in an armchair while pedaling along the beach or the board walk has been devised for use at a Florida winter resort. It is low enough so that there is little chance of being hurt in case of a fall and can be propelled easily on level roads.



Bicycle with Reclining-Chair Seat, for Use at Seaside Resorts

**SILVER DOLLAR MADE OF  
CORN**

9859

One of the curious features of the Iowa exhibit at the Panama-Pacific Exposition is a representation of a silver dollar made of corn, true to the original in form and color, but 4 ft. in diameter. It stands on a pedestal also made of corn on which a farm scene is represented. About a quarter of a million grains of corn were used in the construction. The small ends of the grains were cut off and the grains were then glued to a wooden framework on which the outlines of the dollar had been drawn. Corn meal was used for filling the spaces between the grains.

H. E. Zimmerman  
Mt. Morris, Ill.

Cont. W. S. Branch,  
Orlando, Fla.  
Copyrighted material



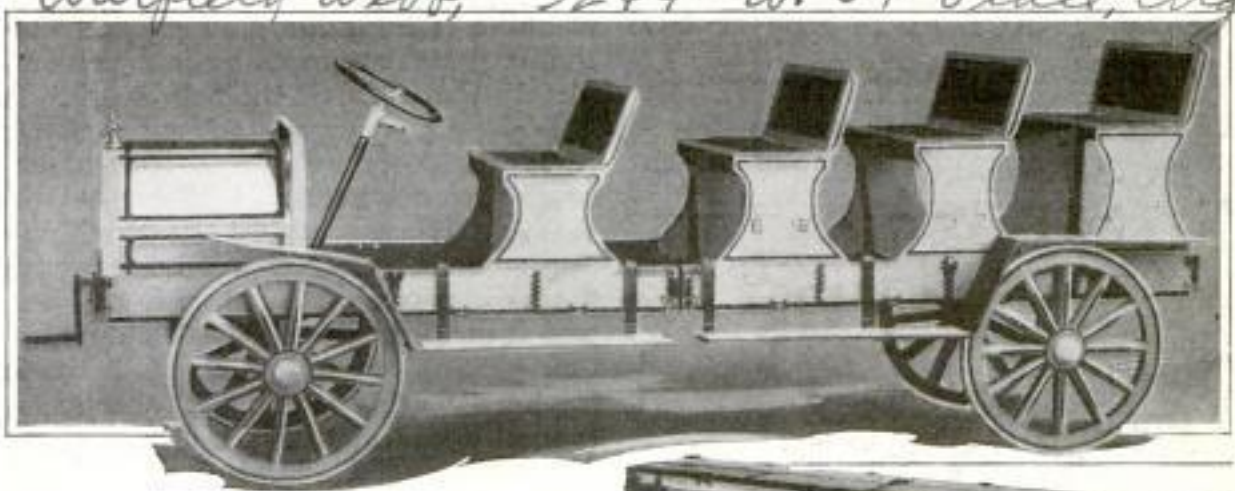
Mfr: *Taylor Trunk Works, Chicago, Ill.*  
*28 E. Randolph St.*

*for Ned. M. Becker, a showman*

POPULAR MECHANICS

15

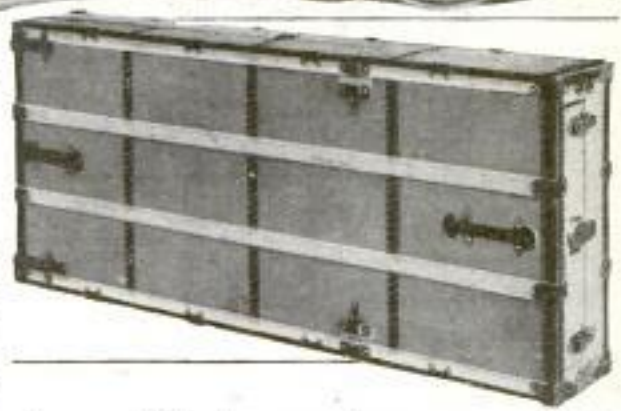
Cont: *Warfield Webb, 3244 W. 64 Place, Chgo.*



Folding Jitney Car Now being Used as a Stage Feature:  
When Folded It Has the Form of a Trunk

**FOLDING JITNEY BUS NEW  
9734 STAGE FEATURE**

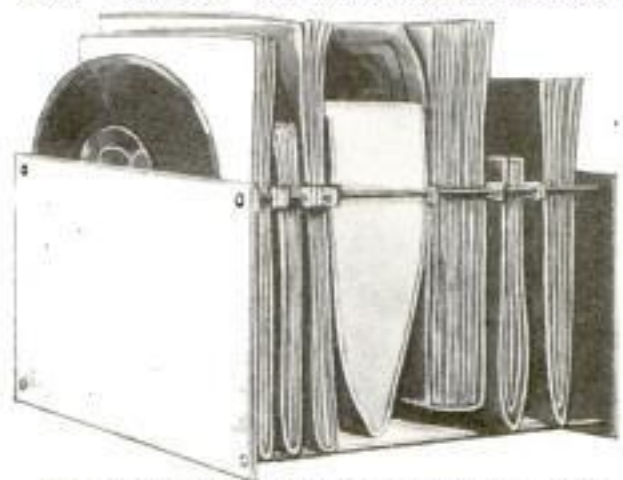
A new theatrical device that is attracting considerable attention is a jitney bus that can be folded up in the form of a trunk. It is being used in an act in which the owner endeavors to sell the car to a farmer and, failing in this, folds it up in disgust and walks off the stage with it. The car is a stage device pure and simple. It is not equipped with power, but can be wheeled about the stage easily and is capable of holding eight persons. It is made of basswood, iron, and canvas, and is painted in bright colors. When folded, the device makes a trunk, 70 in. long, 30 in. wide, and 11 in. deep, and when unfolded it makes a jitney car, 30 in. wide and 140 in. long. The operations of folding and unfolding are simple and can be accomplished in a few minutes.



bars, while the crossbars are made to slide easily on the longitudinal bars. With this arrangement the weight of the papers in each pocket is sustained by two of the crossbars and each pocket plumbs its contents by gravity. The pockets are easily moved forward or backward as required when papers are being placed in the file or taken out. One of the advantages claimed

**VERTICAL FILE WITH NEW  
9754 FEATURES**

A new feature in office appliances is a vertical file in which the papers are held in pockets made of flexible fabric. The pockets are formed simply by folding a continuous strip of the fabric in loops and placing the top of each loop over a crossbar that is loosely supported at each end on a bar that runs lengthwise of the filing drawer. The loops are fastened to the cross-



New Vertical File in Which the Papers are Held  
in Fabric Pockets

for the file is that it is suitable for carrying a miscellaneous assortment ranging from heavy catalogues to letterheads and sheets of carbon paper.

*The Flexifile Company.*

*700 Edison Building, 77 N. Adams  
Chicago, Ill.*

Copyrighted material

*Mfg. by Killifer Mfg. Co., 2209 Santa Fe Ave. Los Angeles, Calif.*  
*for Paul Weiss*

16

**POPULAR MECHANICS**

*Cour. J. J. Sturgeon, 620 S. Breed St., Los Angeles, Calif.*  
**SMALL TRACTOR IS BUILT TO REPLACE FARM HORSE**

Several original features are represented in a new motor tractor which



When Working with Four-Horse Implements, the Tractor Is Able to Make a Constant Speed of Approximately Two Miles an Hour

has recently been brought out in the West for agricultural purposes. The

machine is built for plowing and cultivating, and attempts to replace completely the horse in all field work. It is equipped with a 30-hp., four-cylinder standard motor and drives and steers on the front wheels, which are set together. These wheels instead of having smooth rims, are provided with cross members resembling paddles, which dig into the soil, assuring traction even in sand. Provision is made for keeping the machine level when it is working around a hill, or when one of the rear wheels is running in a furrow. Both of the back wheels are mounted on bell cranks which enables them to be adjusted, by raising or lowering, as different conditions are encountered.

The various implements used with the tractor are trailed at the rear. The machine is able to turn around in its own length.

*Cour. J. W. Jeffers, Franklin High School, Portland, Oregon.*  
**SCHOOL INSTRUCTION GIVEN BY AID OF PHONOGRAPH**

An instructor in a high school in Oregon is successfully using the

horn on the machine he is able to make the records heard in the largest classroom. The machine is now mainly used for teaching composition, the work being transcribed in longhand

9749



Classroom in an Oregon High School in Which Language Instruction is being Given with the Aid of the Phonograph

as it comes from the phonograph. Special types of the phonograph have long been used in offices for the reproduction and transcription of letters and in commercial classes as an aid in shorthand instruction. Their introduction in the schools provides a broader use of far-reaching importance, since in this way any language may be taught entirely by the laboratory method. The students not only have the advantage of taking down in longhand the letters, selections from classics, and language

phonograph in the instruction of his classes, and by placing an enunciator

exercises, but are afforded an opportunity for acquiring correct pronunciation.



Police Department of Waco, Texas, Attired in White-Cotton Uniforms

9897

### WHITE-COTTON UNIFORMS FOR CITY POLICEMEN

The campaign inaugurated in the southern states and carried on extensively throughout the country for some time in an attempt to stimulate a greater use of cotton as material for clothing, has resulted in the adoption of white-cotton uniforms for members of the Waco, Tex., police department. The suits are made after the same pattern as those commonly worn elsewhere, but have the twofold advantage of being cool and easily cleaned. They also serve to encourage a further adoption of cotton materials for summer uniforms.

an inner frame that carries the sashes and is hinged to swing outward. The inward swinging feature is particularly intended for convenience in cleaning the window. One of the advantages of this window is that it requires no special construction in the fixed window frame in which it is mounted.

— 9706

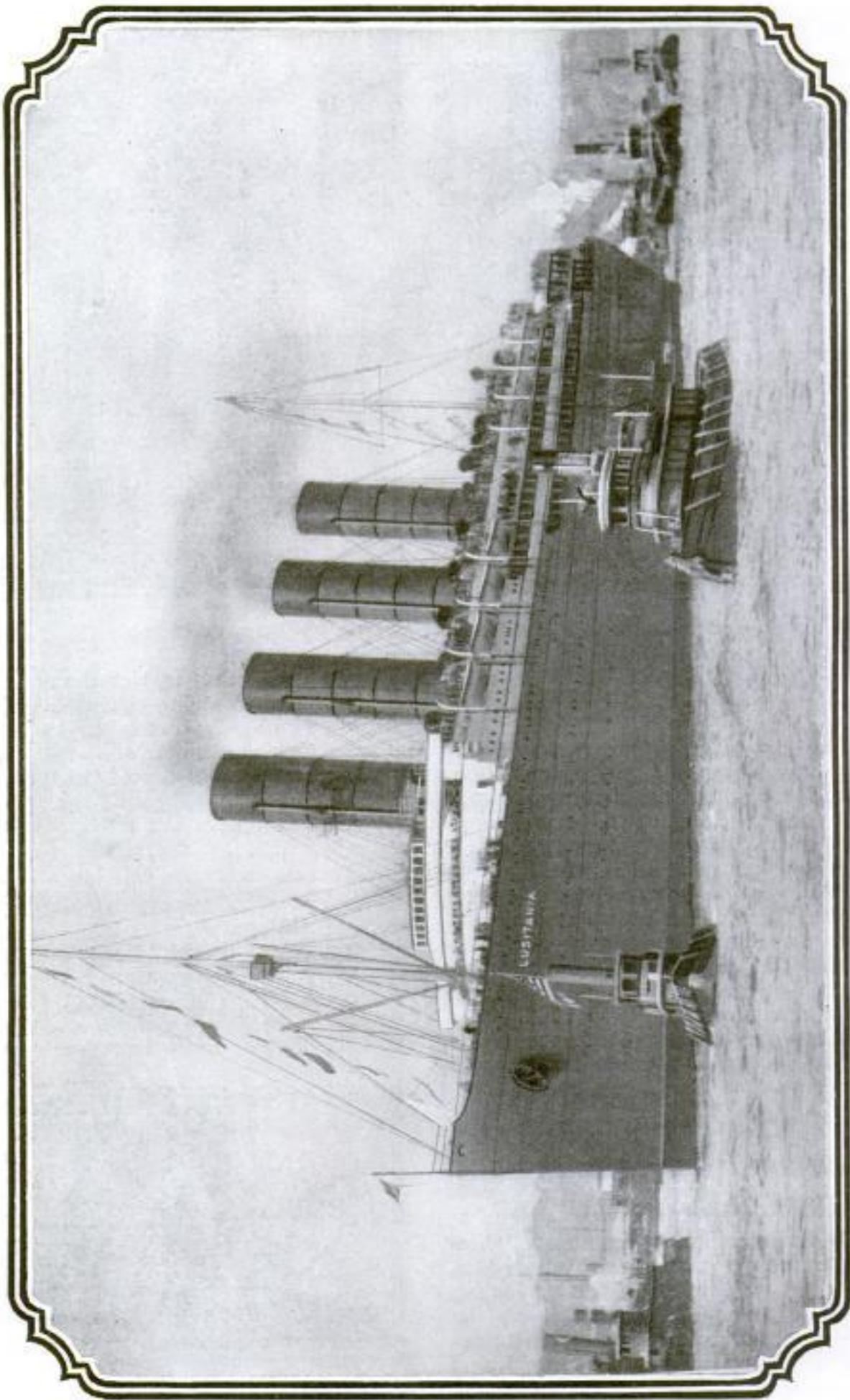
### NEW WINDOW THAT SWINGS INWARD AND OUTWARD

By an ingenious arrangement of double frames a new balcony window, equipped with the usual sliding sashes, is made reversible so that it can be swung either in or out. This is accomplished by hinging the outer frame to swing inward and mounting in this



By Means of the Double, Hinged Frame This Window can be Swung Either Inward or Outward

Mfr: Phoenix Mfg. Co.  
Milwaukee, Wis.



COPYRIGHT BY INTERNATIONAL NEWS SERVICE  
The "Lusitania," Built at Glasgow in 1907, Had a Length between Perpendiculars of 762.2 Feet and an Over-All Length of About 757 Feet; the Breadth Amidships Was 88 Feet, the Maximum Draft  $37\frac{1}{2}$  Feet, and the Depth from Bulwarks to Keel 60 Feet.

# World's Greatest Sea Tragedy

9993

By JOHN A. McALEER

*Federal Bldg. Chicago.*

[The sinking of the Cunard liner "Lusitania" by a German submarine off Old Kinsale Head, Ireland, on May seventh is unparalleled as a sea tragedy in the history of the world. So many elements enter into the disaster that only time can sift its meaning and its bearing on the standards of civilized peoples. It is neither the place nor the purpose of Popular Mechanics Magazine to enter into this phase of the catastrophe. What the conditions were and how met, the accompanying pictures graphically portray, while the article, written by a nautical expert, conveys a clear idea of just what degree of safety the public may expect in the most modern products of the shipbuilding industry.—Editor.]

**B**EFORE the sinking of the "Lusitania" it was confidently believed that a ship capable of such speed as that of the ill-fated liner was practically immune from torpedo attack, and that a vessel so thoroughly equipped with water-tight bulkheads, even if hit, could not possibly sink so quickly as to endanger the lives of the passengers. The details of the disaster furnish a startling contrast to this feeling of security. The "Lusitania" was capable of making 25.85 knots, or slightly less than 30 miles an hour. When attacked, the liner was about ten miles off shore opposite Old Head of Kinsale on the south coast of Ireland. It was running at about 20 miles an hour, this reduction in speed having been made to enable the liner to arrive off Liverpool at high tide and thus avoid the necessity for waiting outside the bar at that port. Accounts differ as to whether the ship was hit by one or two torpedoes, but in any event she sank within a period of not more than 20 minutes. The attack came from the starboard side, and with one or more enormous holes torn in the hull below the water line the ship began to sink immediately, listing so quickly to starboard that it was impossible to launch lifeboats from the port side, although boats had been swung from the davits as a precaution against just such an emergency. Some boats were got off from the starboard side, but before they could be filled they were hanging far out from the side of the ship and were practically inaccessible from the decks. Of the 1,906 persons on board 1,134 lost their lives, 115 of these being Americans.

One may well ask how it was that this steamer, representing refinements in construction supposed to make her

positively unsinkable, should succumb in 20 minutes, a query which may be further emphasized by the loss of that other palatial specimen of modern arts, the "Titanic." The traveling public have thus had thrust on them two terrible examples of supposedly unsinkable ships going down, in each case with a tremendous loss of life, and may be excused, with considerable margin, if prone to question the efficacy of some of the claims of steamship companies and naval constructors about ships being unsinkable.

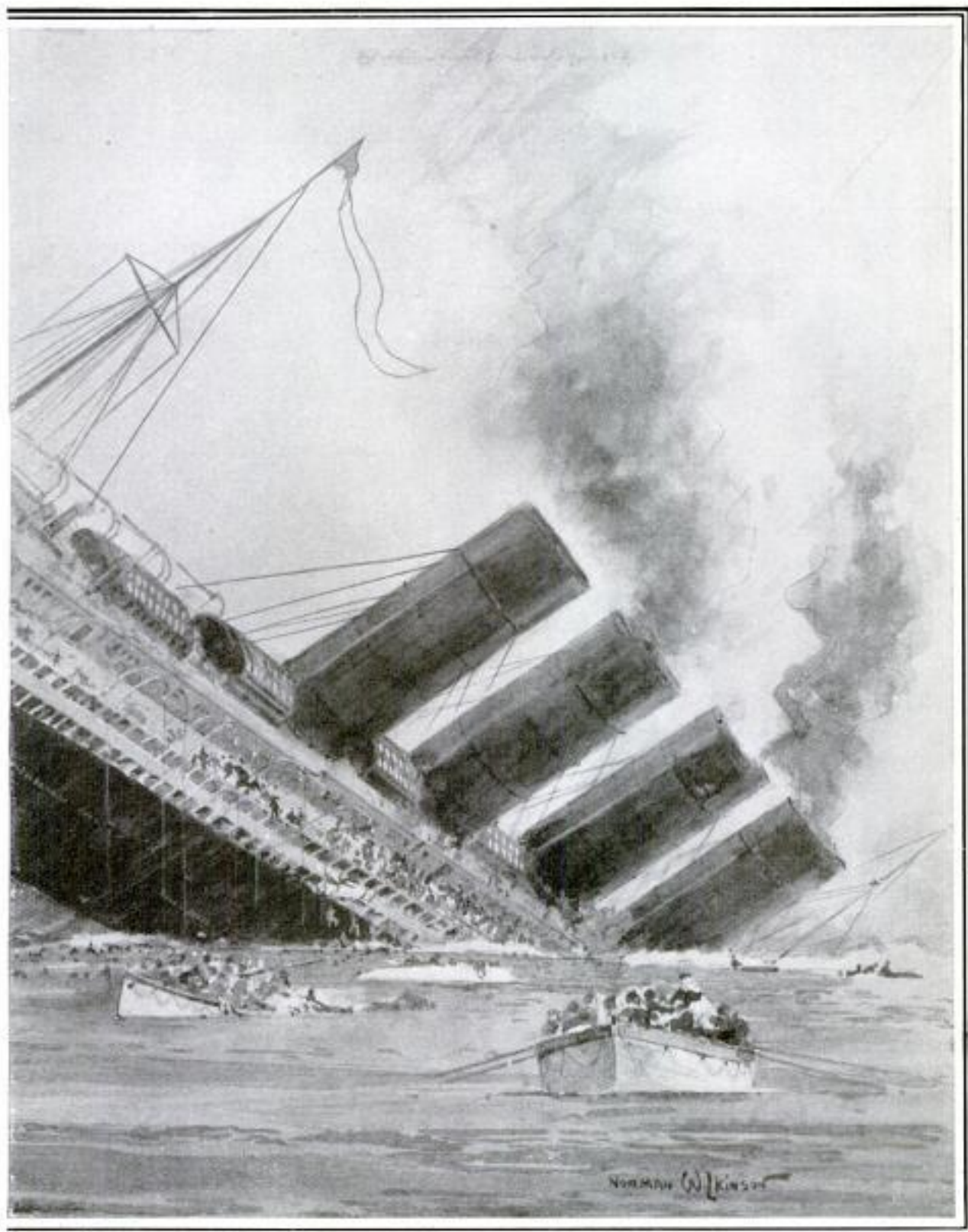
If pressed, the naval architect would contend that his calculations did not take into consideration the variable human element, or, rather, assumed that this factor were a perfect one. That is, the architect cannot take into his computations whether or not the doors in the bulkheads are absolutely water-tight when they are called upon for duty, perhaps some years after their installation; nor can he tell whether or not some of the engine force may jam the doors purposely, so that, if suddenly closed from the bridge, they will not, in their descent, crush one of the crew passing, or else make his exit impossible. Any of these things are likely to happen, but the constructor in his figuring cannot take them into consideration. His decision that the boat is nonsinkable means that it will not sink if everything is carried out according to plans, kept in good order, and presupposes, finally, that a bulkhead is what it is intended to be—a water-tight division member—when called upon.

When we come to vessels engaged primarily in the passenger business, all consideration as to the relative importance of safety and profit disappears, and this has been the decision under which most of our large passenger ves-



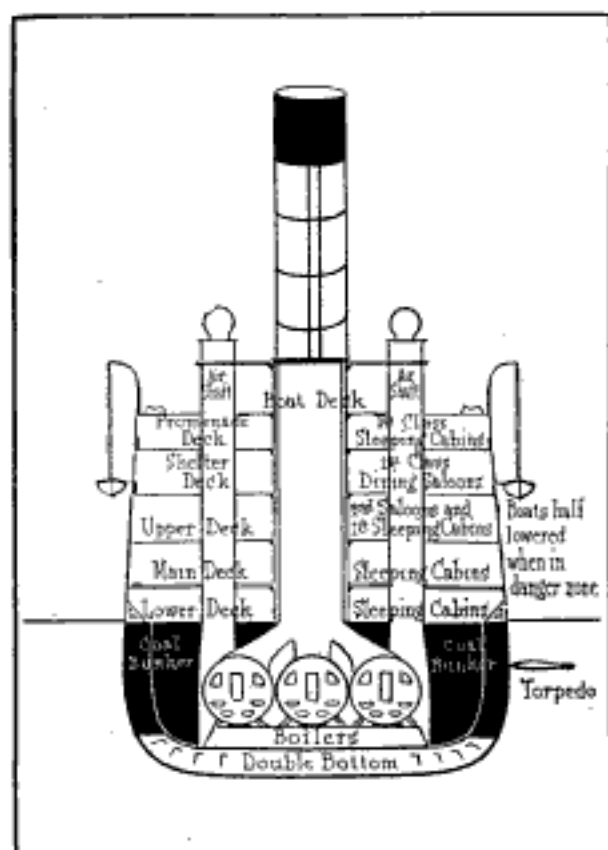
*Drawing from Illustrated London News, Copyrighted in the United States and Canada*

**W**ITH a great section of the hull below the water line splintered by the explosion of the torpedo fired from a German submarine, the "Lusitania" first listed sharply to starboard and then plunged bow first under the sea. An hour or more before the attack was made the officers sighted a submarine, but had left it astern by putting on speed and pursuing a zigzag course. It was apparent later that the liner had run into a submarine ambush. The torpedo that sank the ship and brought about the death of 1,194 persons, many of whom were women and children, was fired without warning. From all accounts, not so much as the periscope of the submarine was seen, the first intimation of danger being the white trail left by the torpedo as it sped straight toward the ship on its errand of destruction. After the torpedo struck, less than 20 minutes were left for escape from the sinking



liner. As the "Lusitania" entered the danger zone where German submarines were thought to be lying in wait, the lifeboats were swung from the davits and made ready for a possible emergency, although there was thought to be little danger that the ship would be attacked or that it would sink in so short a time even if hit. Owing to the sharp list that the ship took within a few minutes after being struck, few of the lifeboats could be launched, and of those that succeeded in getting off, several were wrecked by being dashed against the side of the ship. It is reported that there was little suction as the ship sank. This is explained by the comparative shallowness of the water, the depth being between 300 and 400 feet, and the probability that, with a length of over 700 feet, the bow of the liner found bottom before the stern began to sink.

sels have been designed. In the case of the "Titanic," it is now well agreed that if the bulkheads had been carried up farther, the adjacent compartments would not have been flooded through overflow. At the time of this accident,



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Transverse Section of the "Lusitania" Showing Where the Fatal Blow was Struck: The Torpedo is Shown at a Depth of About 15 Feet below Surface of Water

it was freely stated that under the same circumstances the "Lusitania" or the "Mauretania" would not have sunk.

The "Lusitania" had 12 transverse bulkheads, some of which were "stepped," that is, not continuous in one plane. The bulkheads in the middle of the ship did not extend above the main deck, but the five forward and five after ones extended one deck higher, that is, to the upper deck. This was to prevent the overflowing which is supposed to have caused the foundering of the "Titanic."

To explain this, let us suppose that a boiler room near the center of the vessel were flooded. The vessel would then sink bodily and probably draw

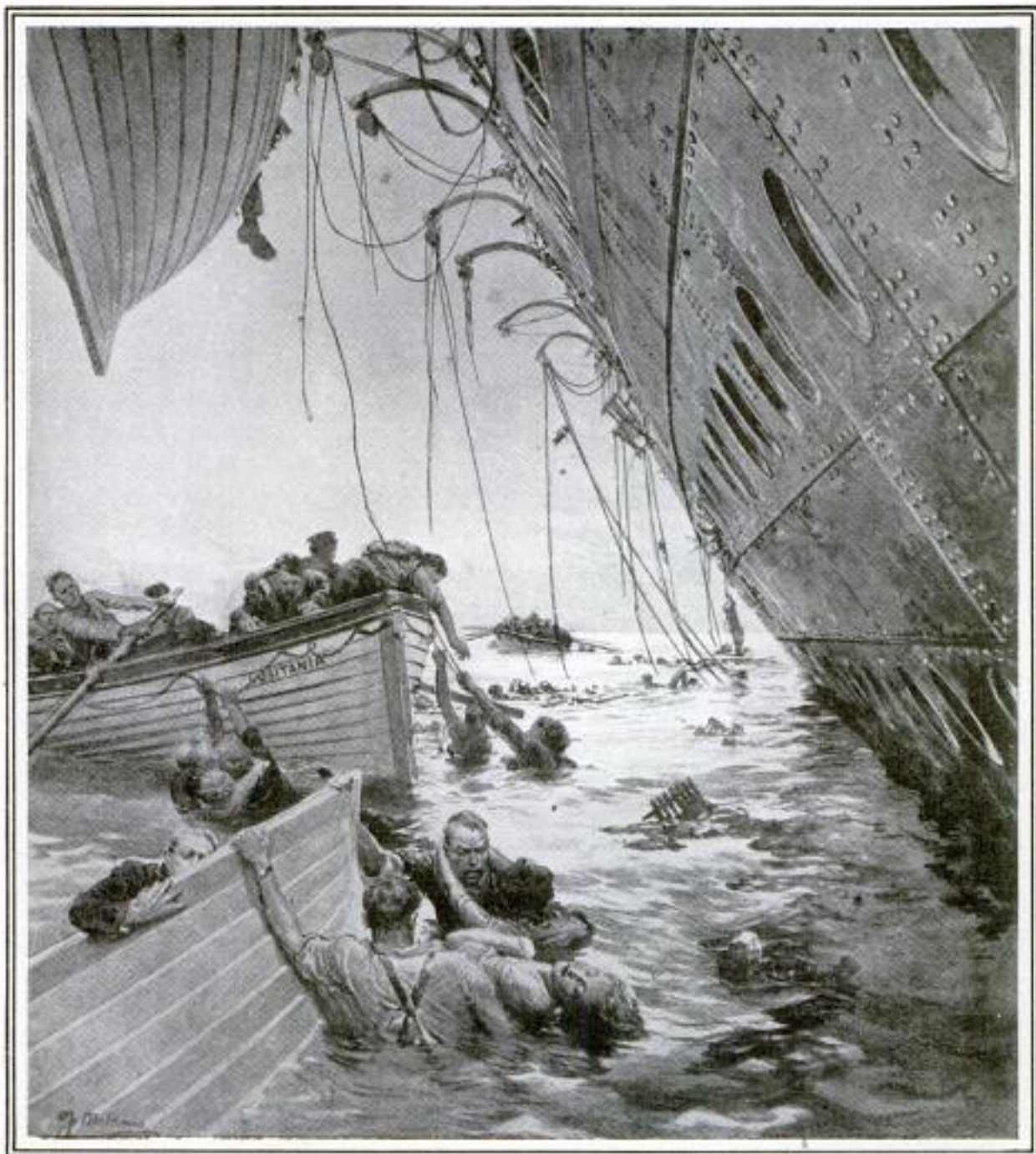
about the same amount of water forward as aft, because the flooded compartment is in the middle of the ship. In other words, she would not trim by the head or stern. But if the boiler room nearest the bow were flooded, the ship would not sink equally at both ends, but would be deeper at the bow, because the flooded section is nearer that end. The water would then rise in the bilged compartment till it was level with the outside sea. Now, unless the bulkheads extended above the water line at which the vessel finally floats as a result of the compartment being flooded, there would be nothing to confine the water and it would overflow into the adjacent compartment and eventually cause the ship to founder.

The longitudinal bunker bulkheads of the "Lusitania" were of great structural assistance and further augmented the water-tight divisions. Their continuity as fore-and-aft structures was maintained by connecting them to the engine-room bulkheads. Between these longitudinal bulkheads and the skin of the vessel were located the coal bunkers, and a small transverse division member, midway between the large transverses, further divided the coal bunkers into halves. The integrity of these longitudinals as to water-tightness was menaced to some extent by the coal passages, but all these openings were well equipped with water-tight doors.

The different fire rooms had access to each other by means of openings out through the bulkheads, but all of these were likewise provided with water-tight doors. All such doors were fitted with the Stone-Lloyd system of hydraulic closing, so that all could be closed from the bridge in a very short time.

Mention has been made of the human equation in handling water-tight doors; that the coal passers and the engine-room crew very naturally object to being locked in, in a time of danger; and that there is a tendency on the part of them to block the doors. In the Stone-Lloyd system these objections are accepted as real, and met. Under





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**With the "Lusitania" Listed at a Dangerous Angle and About to Make Its Final Plunge, It Required a Desperate Struggle to Get Any of the Boats Away in Time to Prevent Their being Drawn Down with the Ship or Wrecked against the Side. A Number of the Boats were Upset and the Occupants Drowned**

it the doors can be opened or closed separately by the operation of a handle placed near the door, or all the doors can be closed in an emergency from the bridge. A loud bell always precedes the closing from the bridge, and if, in spite of this warning, anybody happens to be locked in a compartment, there is the handle near the door for him to operate and open it. After he has escaped, the door closes again.

With all these division members, both bulkheads and decks, it was estimated that the "Lusitania" had 175 water-tight compartments.

Generally when a vessel has a hole punched in her side either from collision or what not, she takes a list toward the injured side. As the water pours in and she sinks deeper, this list increases, and just before the ship founders she may capsize. In fact, in many

cases when it has been stated of a vessel that "she went down in five minutes after she was struck," if the vessel had had sufficient stability, she probably would have remained afloat much longer. In a great many cases, the immediate cause of the foundering has not

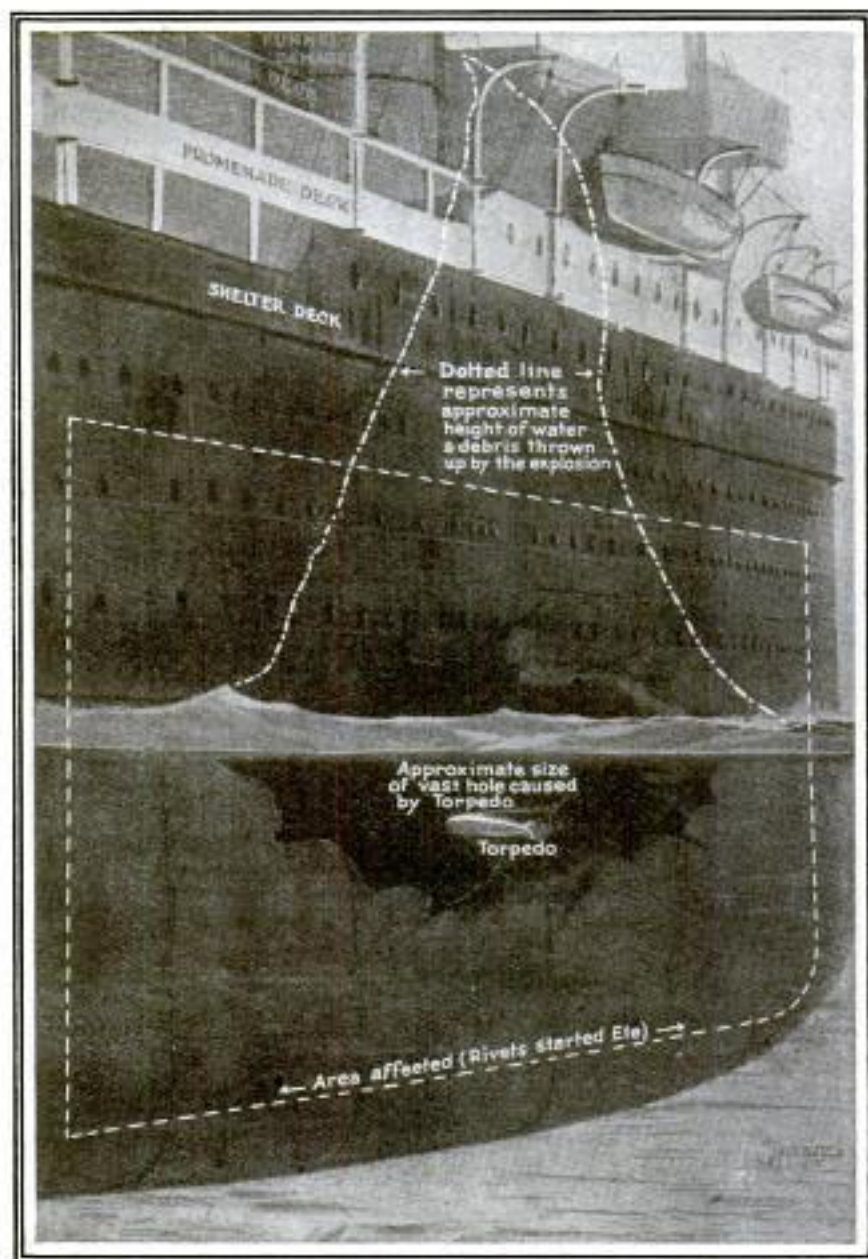
ment may produce a dangerous list, but this will not be objectionable if the vessel has plenty of freeboard, except to make it difficult to launch the boats on the high side. For this reason, middle-line water-tight bulkheads are not adopted in passenger vessels where

safety is considered paramount. The longitudinal in the case of the "Lusitania" were kept well into the wings of the vessel so that they gave her practically a double hull for the greater part of the length.

Let us assume that one of the boiler rooms of a vessel such as the "Lusitania" is flooded, due to an injury in the starboard side, for example, that penetrated both the outer shell and the inner bunker bulkhead. The vessel would then take a list to starboard. Let it further be assumed that two compartments are in this condition from an injury inflicted around one of the divisional bulkheads. This will naturally cause a further list to starboard. How far she will list or whether she will remain in stable equilibrium, it is impossible to say without more exact data.

There can be no doubt but that everybody on board the "Lusitania" knew that

an attempt would probably be made to destroy her. For that reason it is natural to suppose that they would take all ordinary precautions at least. They would certainly see to it that all water-tight doors were in good working



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The Explosion of the Torpedo Not Only Tore a Hole in the Hull Well below the Water Line, but Evidently Wrenched Adjacent Parts of the Steel Structure So Severely That the Water-Tight Bulkheads Were Useless

been so much that the vessel could not remain afloat with the compartment flooded, as that the bilging of it produced unstable equilibrium. With longitudinal center-line bulkheads, even the flooding of a small compart-



PHOTOS COPYRIGHT, UNDERWOOD &amp; UNDERWOOD

How the Victims of the "Lusitania" Disaster were Taken through the Streets of Queens-town to the Burial Place: The Coffins of All British Subjects were Covered by the Union Flag of the British Empire

order, and Captain Turner has stated that as soon as he picked up the Irish coast, he had the boats got out and all the water-tight doors closed. Therefore, there is every reason to believe that at the time of the torpedoing the conditions on the ship were very near to what the naval constructor would wish them to be to justify his calculations. In other words, a bulkhead was probably a bulkhead.

Still the brusque fact remains that the "Lusitania" went down in 20 minutes, taking with her many persons who perhaps from confidence in her unsinkability—a thing which her very size would inspire—had not even deigned to put on life preservers. She sank, too, despite all this preparation, despite all her details of construction that had made her



Photograph Taken by the Wireless Operator, Showing the Lifeboats Swung from the Davits as the "Lusitania" Entered the Danger Zone. Markings around Edges were Caused by Sea Water After Operator had Jumped from the Stricken Ship

a marvel among ships. But it was not from a peril of the sea.

There is very naturally a lack of evidence of the exact destructiveness of torpedoes, for in most cases the victims have been placed beyond examination. But in the late Russo-Japanese War there was proof plenty that they were not lacking in this respect. The case of the Japanese steamer "Sadu Maru," a transport of about 6,000 tons, is an example in point, though she was not subdivided like the "Lusitania." This vessel, though torpedoed on both sides by a Russian cruiser, remained afloat. When dry-docked, it indeed appeared marvelous that she did not founder. In her starboard side, abreast her engine compartment, there was a hole nearly 18 feet square, and in her port side the second torpedo had blown another one about 7 by 13 feet. Everything near the place of the explosion had been severely shaken and started.

Since the Japanese War everything has grown in size. The guns have grown from 12 in. to 15 in. The ships have doubled in tonnage, and it is fair to expect that the quantity of explosive used by the Germans in their torpedoes is larger with a corresponding increase in the destructiveness. Whether one torpedo, containing from 200 to 300 pounds of explosive, would cause the destruction of a ship like the "Lusitania" is an open question. From the damage done to the "Sadu Maru," it is not unfair to suppose that it might. If the torpedo struck in the vicinity of one of the transverse bulkheads and caused the flooding of two adjacent compartments, assuming the existence of sufficient stability, it is quite likely that the effect of such a tremendous explosion might so generally shake up the hull as to start the fastenings of the other bulkheads also.

It has been contended by the English that a second torpedo was in fact fired and that there were two explosions. The Germans contend that only one torpedo was used and that the second explosion was internal, due to the shock of the torpedo detonating the

ammunition that the ship was carrying. If either of these contentions is true, the sinking of the ship was natural. While it is possible that one torpedo caused the foundering for the reasons suggested, it nevertheless seems strange that the vessel did not remain afloat longer. The shock of the explosion might have started the adjoining bulkheads so that when these were subjected to the water pressure later, they would leak and later cause the flooding of other compartments. This would result in the foundering from lack of either stability or buoyancy.

The alleged second explosion has given rise to a rumor that the Germans have a torpedo containing two explosive charges, one of which is detonated by the ordinary contact with the hull and the second some few seconds later by some delayed-fuse system. This is an age when almost anything is possible, and if they have something of this sort, it must be akin to the delayed explosions now in use in shrapnel and high-explosive shells. Various claims have been made for systems working along these lines. They usually provide for a compartmented shell with various means for later detonating the high explosive. The objection to this theory would be the difficulty in keeping the vehicle of the second explosive intact during the detonation of the first. It may also be that they have some system depending on the penetrating power of the torpedo puncturing the comparatively thin shell and then later detonating the explosive by a delayed fuse. A modern torpedo, 18 in. in diameter, working under superheated compressed air, at a range of 1,000 yd., can develop a speed of forty-three knots, or 72 ft. per second, and assuming a weight of 1,000 lb., would possess considerable penetrating potential against plating from three-fourths to seven-eighths inches thick.

It has been suggested also that the second explosion might have been caused by the boiler exploding. This can be dismissed, as there are too many cases of vessels that have been raised and the boilers used again.



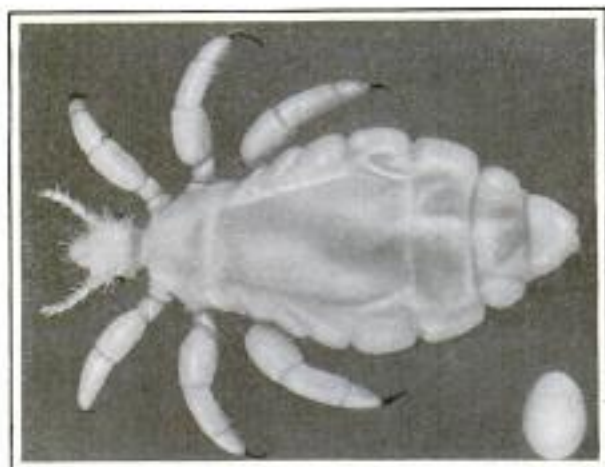
PHOTO © COPYRIGHT, INTERNATIONAL NEWS SERVICE  
 The Bodies Recovered from the Scene of the "Lusitania" Disaster were Taken to Queenstown for Identification, and Many of Them were Buried There with Full Military Honors in What might be Called Community Graves. The Grave Shown in This Picture Contains 66 Bodies



Body of an American Victim of the "Lusitania" Disaster, Shrouded in the Stars and Stripes, being Carried through the Streets of Queenstown. Of the Americans on Board the "Lusitania" 115 Lost Their Lives, and the Bodies of Many of These were not Recovered

## TYPHUS FEVER MENACING 9848 WARRING EUROPE

In the epidemic of typhus fever now raging in that country, Serbia, in the belief of observers familiar with conditions, is menaced with a disaster greater than that of the war itself. This disease has in fact become a serious



Model of the Body Louse, the Insect through Which Typhus Fever is Spread. This Model is Used in a Scientific Study of the Disease

danger to the whole of Europe. It has already spread into Greece and cases are being found in increasing numbers along the European battle lines. Even in this country several cases among steamer passengers entering the country have been stopped at quarantine during the past two months. With the vigilance that is being exercised, however, there is believed to be little danger of an epidemic in the United States.

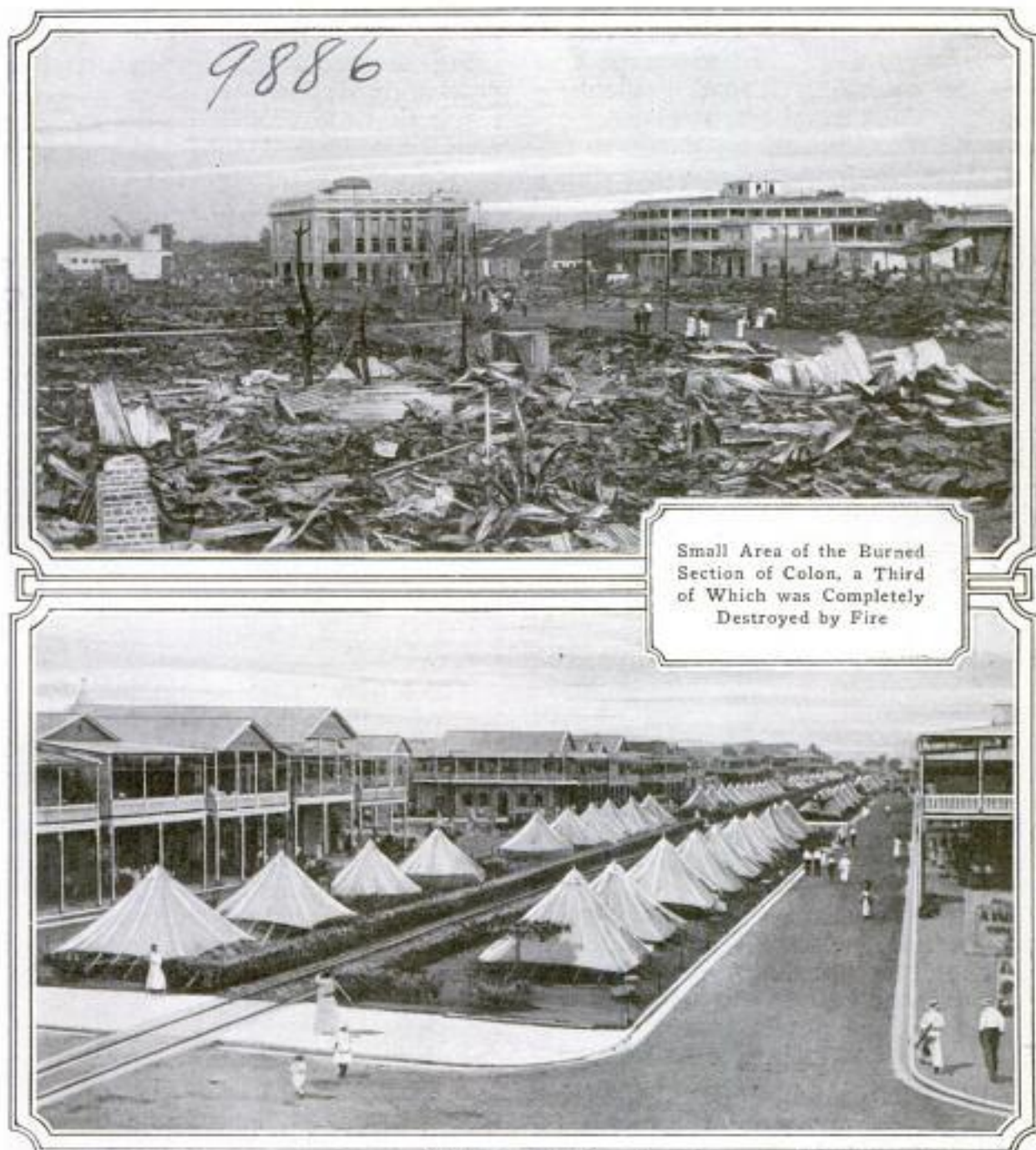
Although there is some similarity in symptoms, typhoid and typhus are two separate and distinct diseases, and there is a radical difference in the way in which they are transmitted. Typhoid is essentially an intestinal disease, differing in this important particular from typhus. In typhus a number of the vital organs are affected, the blood, liver, kidneys, and spleen all undergoing changes. One of its features is the suddenness with which it comes on. Following an incubation period that lasts from one to two weeks, during which the patient is apparently in good health, he will become ill suddenly and take to his bed within an hour or two.

The principal symptoms are high fever, a characteristic rash, and nervous derangements peculiar to the disease. It usually runs its course in from 14 to 21 days. Owing to its prevalence among persons confined in crowded quarters, it was formerly known as "jail" or "ship" fever, and from the peculiar appearance of the rash it is still sometimes called spotted fever. Until recent years the disease was thought to be transmitted by the exhalations from the lungs. It is now known that typhus is transmitted through the bite of the body louse, which acts as a carrier in transmitting the disease from an infected to a well person in exactly the same manner that a mosquito transmits yellow fever. Vermin of this kind is one of the inevitable attendants of warfare, and for this reason the disease, when it once gains a foothold, spreads rapidly among troops and through countries devastated by war. With proper treatment, the mortality rate of typhus is somewhat higher than that of typhoid. In territory subject to war conditions, where the necessary treatment and precautions in the way of cleanliness are extremely difficult, the havoc wrought by typhus may easily become a national disaster, as it already has in Serbia.

In an attempt to discover more effective methods of treatment the health authorities of the United States are making a careful study of typhus. One of the curious features of this study is a wax model, over a foot long, of the insect that transmits the disease. This model is a marvel of mechanical and technical skill and is about one million times the size of the living insect. It is made from microscopic measurements of the original. More than a year was spent in its construction, the cost of the completed model being close to one thousand dollars.

CSky periscopes have been developed for the use of lookouts who watch for hostile air craft in the war zone. The instruments eliminate the neck strains suffered by sentinels.

## LARGE SECTION OF COLON IS RAZED BY FIRE



Small Area of the Burned Section of Colon, a Third of Which was Completely Destroyed by Fire

PHOTOS COPYRIGHT BY UNDERWOOD & UNDERWOOD

417 Fifth Ave., N. Y. C.

A Line of Tents Erected for the Thousands of Persons Who were Rendered Destitute by the Disaster

Approximately a third of the city of Colon, at the Atlantic portal of the Panama Canal, was destroyed on April 30 by the most disastrous fire that has occurred at the Isthmus since the American occupation. Property damage amounting to at least \$3,000,000, the death of five persons, and the injury of more than a score of others, re-

sulted, while nearly 8,000 residents of the place were made homeless.

The fire started shortly before three o'clock in the afternoon in a building at Eighth and Bolivar streets. Fire departments from Panama City, Balboa, and Gatun were rushed to the scene to assist the Colon and Cristobal forces in fighting the flames, which

swept through the rows of lightly constructed buildings with startling rapidity. Panama and Zone police, as well as members of the U. S. Artillery Corps, were dispatched to the port to join in patrolling it and preventing looting, while canal employes were organized into dynamiting gangs to assist the fire fighters by demolishing buildings in the path of the conflagration, which burned practically everything in an area covering 22 blocks bounded by Front, Seventh, D, and Fourteenth streets.

A concrete building at an intersection of Front Street prevented the fire from moving farther westward at a point which probably would have carried it to Cristobal, where, as it was, a number of minor fires were started by flying sparks.

Relief work was undertaken immediately by the American Red Cross, and, with the help of the canal authorities and the army, 400 tents and an equal number of railway cars were provided for housing the hundreds of destitute families. Likewise arrangements were made for the distribution of food, while subscription lists were subsequently circulated throughout the zone.

Colon, which originally was named Aspinwall, was once noted the world over for its insanitary conditions. During the revolution of 1855 the town was burned, but was later rebuilt. In 1911 another fire did serious damage, but was not half so extensive as the recent disaster.

### NEW PROCESS FOR CASTING VOLATILIZABLE METALS

A newly invented process for casting volatilizable metals such as brass is intended mainly for making cast joints between the rods and tubes used in making such metal structures as bedsteads, and for making and permanently attaching the usual ornamental knobs. With this process blowholes, and other defects due to gases in the mold, are done away with. The mold used is an ordinary two-part hinged mold with recesses in each half for the

poured metal, and the feature of the invention is a vent for the gases that is separate and distinct from the channel for pouring the molten metal. In using the mold the molten metal is practically dashed into place with the result that the volatile portions of the metal are formed into bubbles that escape quickly through the vent.

### PICTURES MEANT AS HOAX, FOOL AMERICANS 9823

One of the London pictorial magazines in an issue appearing on the newsstands abroad April 1, contained a supplement of remarkably "faked" war pictures which were printed merely as a hoax. The gravures in every instance appeared to be reproductions from actual photographs, and were so unusually well executed that unless the credit lines, which were written in French and German, were read, almost anyone might have been fooled by them.

The striking point of the incident is that when these pictures reached America they were immediately reprinted by a number of the large newspapers of the country and accredited as actual photographs. This serves to emphasize the remarkable effect that the present war and its great death-dealing machines are having upon its observers. War engines which were unheard of yesterday are things of reality today, and the result is that many persons' imaginations have been so warped by startling developments that they have become prone to accept even flagrant hyperboles as fact. Nothing that has the element of possibility in it longer appears improbable, unless considered coolly and judiciously.

Over each of the pictures, as originally printed, appeared the "name" of its photographer. In one instance this was the "Comte de Tirejambe," which translated means "Count Pull-Your-Leg," who was supposed to have received the enormous sum of \$55,000 for a photograph showing the French infantry and Prussian Guard crossing bayonets in a charge.





Left: A Wooden Horse, the Hiding Place of a German Sniper. Right: What Purported to be a Giant German Armored Car, Carrying 100 Men



This was Published as an Eight-Barreled Krupp Siege Howitzer Weighing Nearly Two Hundred Tons



A Cave on the Scilly Isles, the Hidden Base of the German Submarines Operating off Ireland

COURTESY OF THE SKETCH, LONDON

## ITALY'S ARMY PUSHING ITS WAY TO THE FRONT



Above, Italian Lancers Crossing the Frontier: A Body of the Best Trained Horsemen in Europe. Beneath is Shown a Typical Bersagliere, One of the Sharpshooters Known as the "Black Devils of the Italian Army". They are Especially Drilled for Alpine Fighting



Cycle Corps of Bersagliere Pressing to the Boundary to Participate in the General Mobilization of the Italian Forces Previous to the Formal Declaration of War against the Austrian Empire

PHOTOS COURTESY, WOODFIN CAMPBELL

# EFFECT OF GERMAN TORPEDO ON MERCHANTMAN



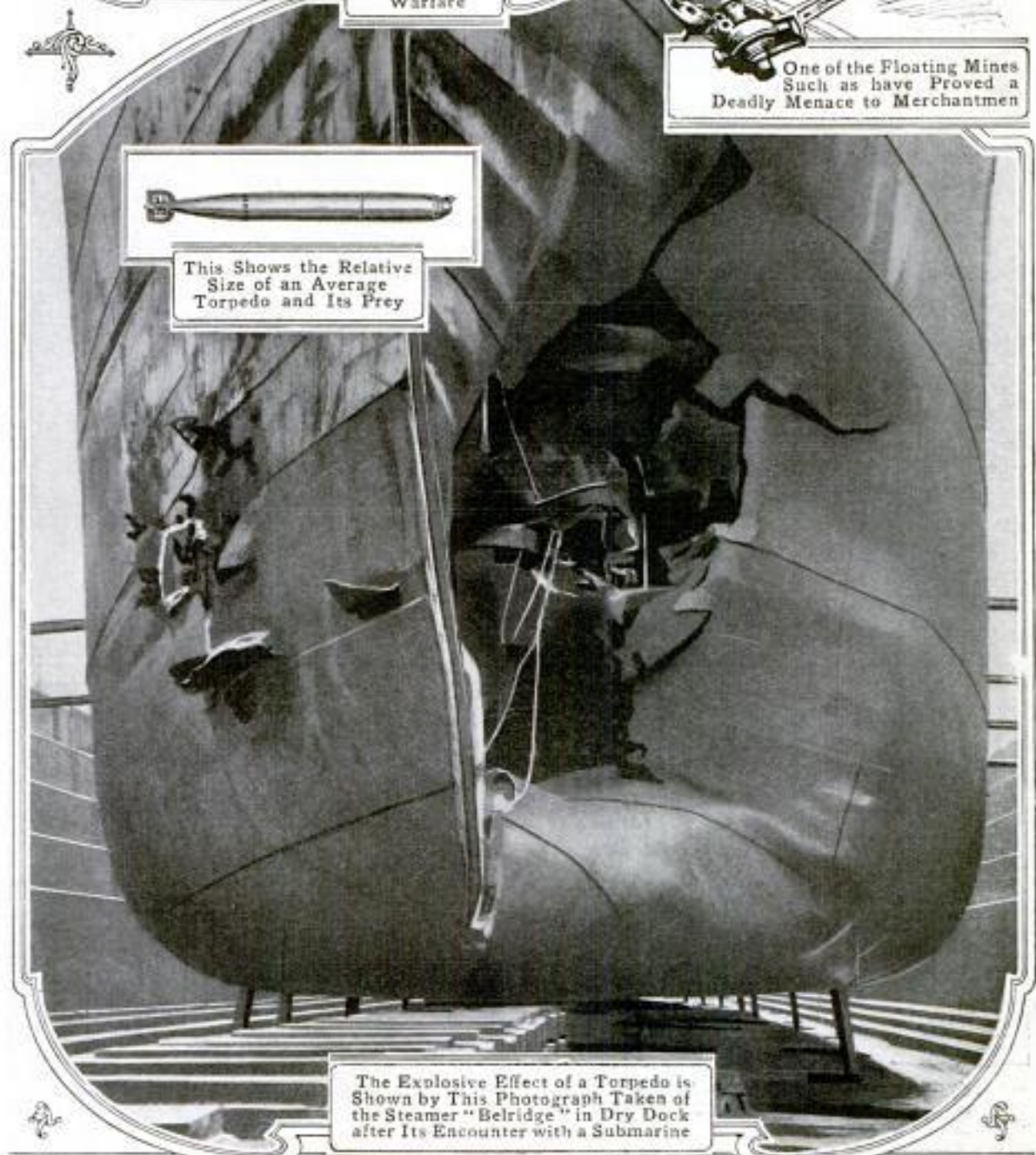
TYPE OF TORPEDO USED BY GERMANS IN SUBMARINE WARFARE



ONE OF THE FLOATING MINES SUCH AS HAVE PROVED A DEADLY MENACE TO MERCHANTMEN

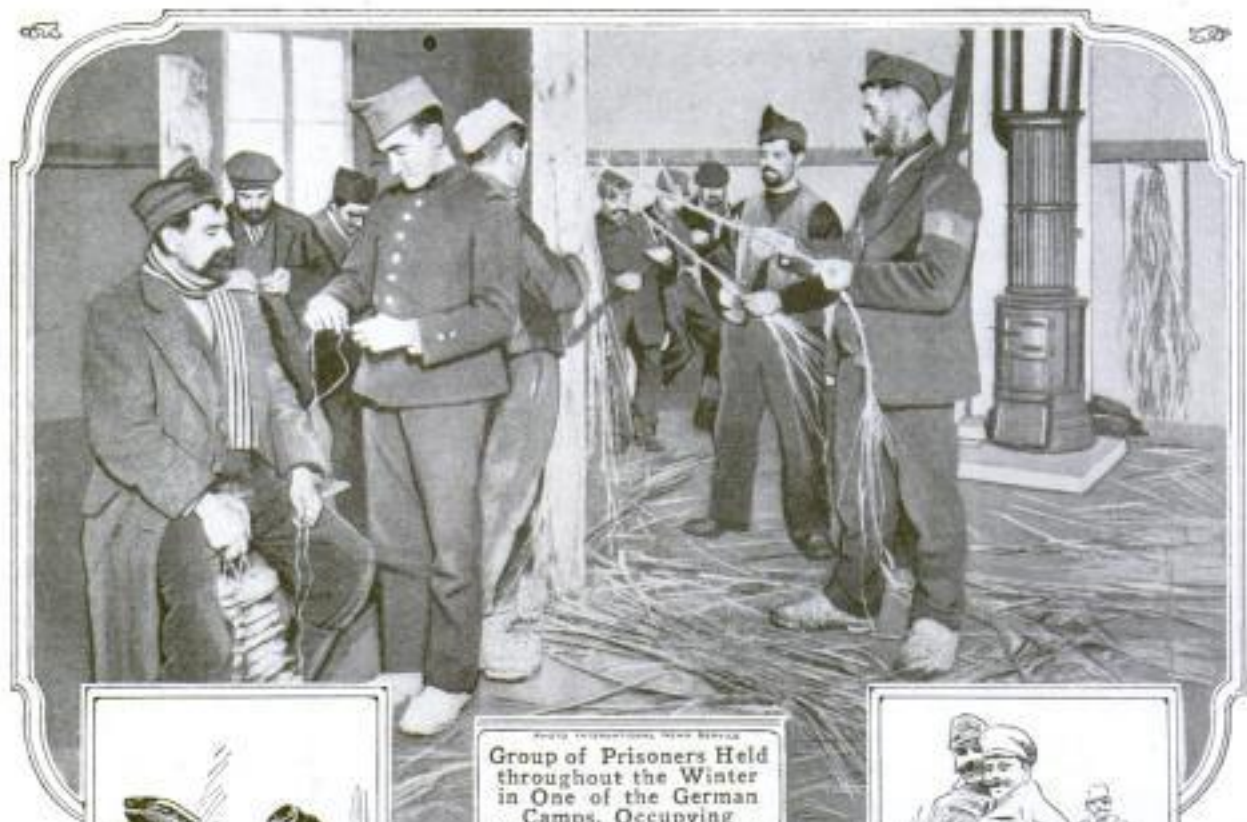


THIS SHOWS THE RELATIVE SIZE OF AN AVERAGE TORPEDO AND ITS PREY



THE EXPLOSIVE EFFECT OF A TORPEDO IS SHOWN BY THIS PHOTOGRAPH TAKEN OF THE STEAMER "BELRIDGE" IN DRY DOCK AFTER ITS ENCOUNTER WITH A SUBMARINE

# IN VARIOUS CAMPS WITH THE WAR PRISONERS



APRIL INTERNATIONAL NEWS SERVICE  
**Group of Prisoners Held throughout the Winter in One of the German Camps, Occupying Themselves by Plaiting Straw Shoes for Their Own Wear**



**Patients at a Hospital Base Amusing Themselves at Checkers**

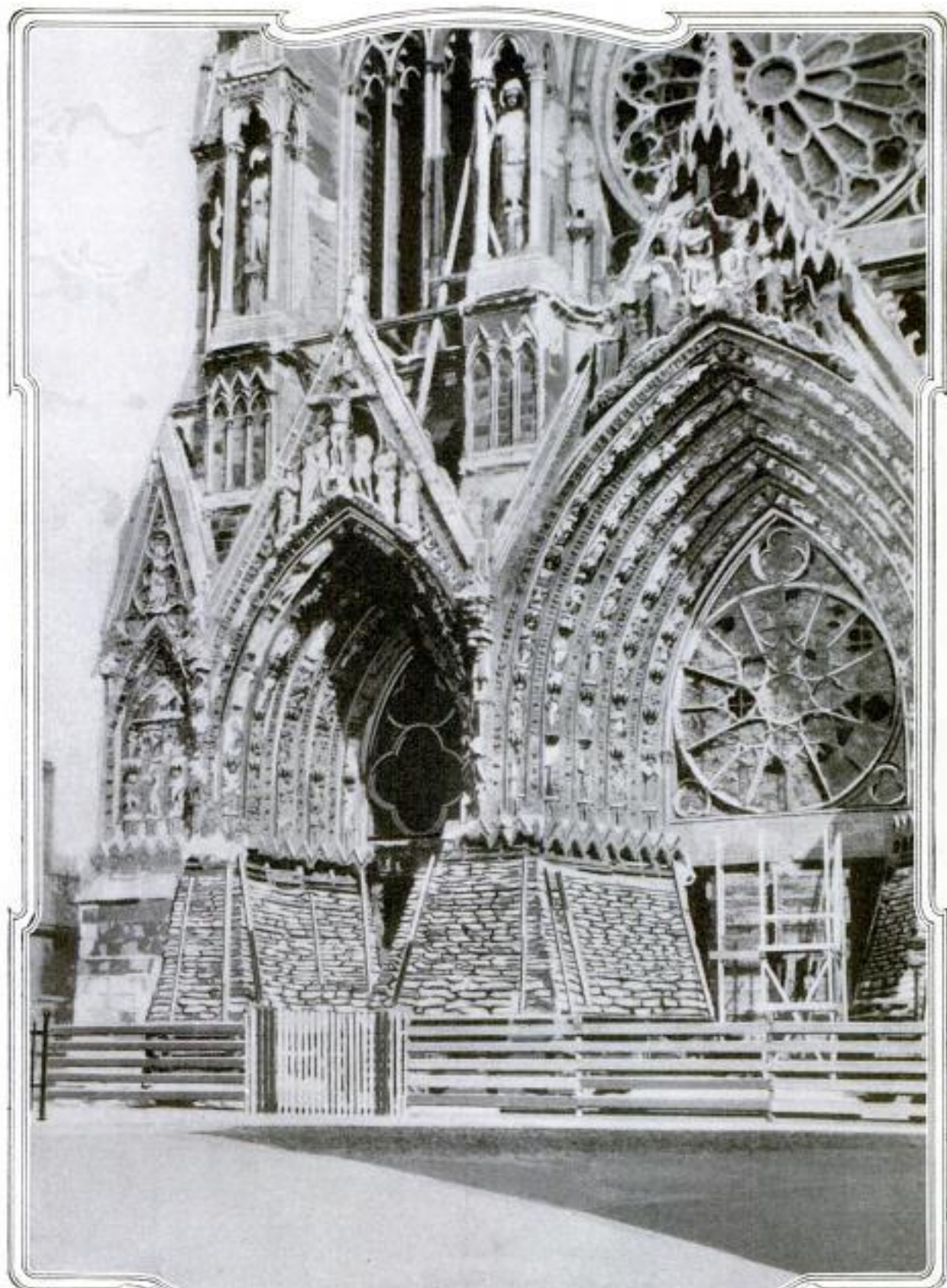


**Wrestling Match between Russian Soldier and Austrian Prisoner**



APRIL INTERNATIONAL NEWS SERVICE  
**Some of the Russians Formerly Residing in Berlin Who are Now Interned Outside of the City**

## SANDBAGS PROTECT CATHEDRAL FROM SHELLS



COURTESY, INTERNATIONAL NEWS SERVICE  
In Attempting to Safeguard against the Effects of a Possible Further Shelling of Rheims Cathedral, the French have Undertaken to Protect Some of the Sculpture Work Decorating the Facade of the Edifice, by Covering It with Heavy Walls of Sandbags Held in Place by Scaffolding



## IN TRENCHES AND TRAINING CAMPS OF ALLIES



Drilling British Recruits in the Art of Bringing a Charge to a Successful End. Straw Bags Placed in Trenches Form the Targets at Which the Men Rush with Lowered Bayonets



Approximately a Dozen Implements are Held in the Rack Strapped to the Back of Turco Shovel Carriers in the Algerian Infantry



British Soldier in Winter Attire Pumping Water from an Inundated Trench

Native Forces in East Africa Holding a Trench in the Face of Approaching Germans, Whose Advance through the Thicket in the Foreground has been Announced by Pickets

# CURIOUS PHASES OF WAR CAMPS IN EUROPE



PHOTO COURTESY INTERNATIONAL NEWS SERVICE  
**Odd Use to Which Alpine Soldiers  
 Frequently Put Their Skis:  
 Constructing the Framework of a  
 Temporary Shelter in Carpathians**



**This Drawing  
 Depicts a  
 Typical  
 Water  
 Carrier in  
 the Trenches  
 Occupied by  
 the French**

PHOTO COURTESY INTERNATIONAL NEWS SERVICE  
**Group of French Soldiers  
 Warmly Housed in a  
 Rabbit Hutch**

**Both for  
 Comfort and  
 Defense, the  
 French are  
 Lining Their  
 Trenches  
 with  
 Sandbags**

# CONTINENTAL WAR FROM VARIED VIEWPOINTS



English Seaplane Tender Painted so That at a Distance It Is without Form and Almost Indistinguishable to the Enemy

French Bomb-Dropping Apparatus Fitted with Sights

Throwing Grenades into German Trenches with a Catapult

French Gun Used in Clearing Barbed-Wire Entanglements. A Large Hook with Cable Attached is Fired into the Network and Then Drawn Back



## AND THINGS PECULIAR TO MODERN FIGHTING

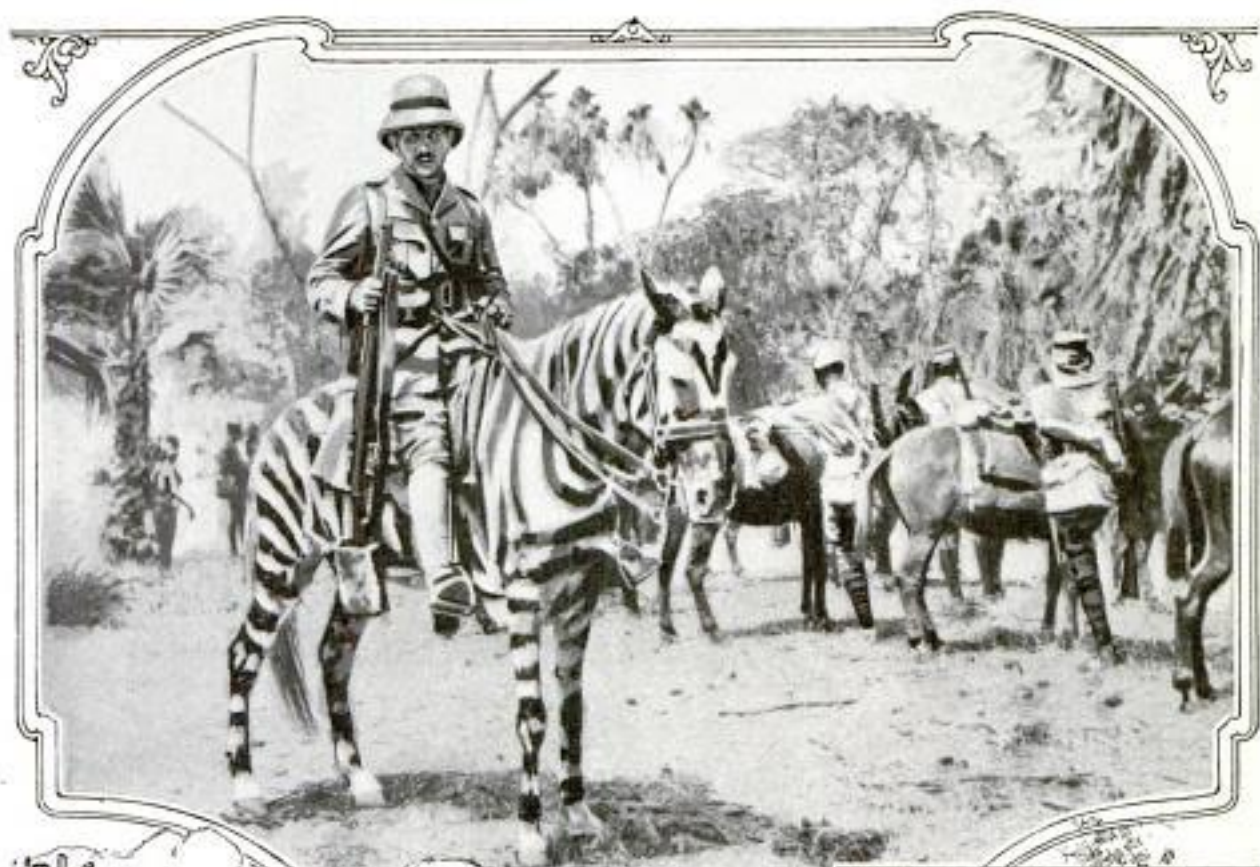


PHOTO BY INTERNATIONAL NEWS SERVICE

Many Horses Used by English Mounted Forces and Officers in the East Africa Campaign are Painted Like Zebras. This Makes It Difficult for the Enemy to Pick Them Out, Especially when They Are Under Cover in a Wood or Thicket



Turkish Artillerymen in Action, Wearing the Recently Adopted Dress, Which Bears Some Resemblance to the German Uniform



PHOTO BY INTERNATIONAL NEWS SERVICE

British Military Engineers Constructing a Suspension Bridge across an Irrigation Canal in the Vicinity of the Great Pyramids of Egypt

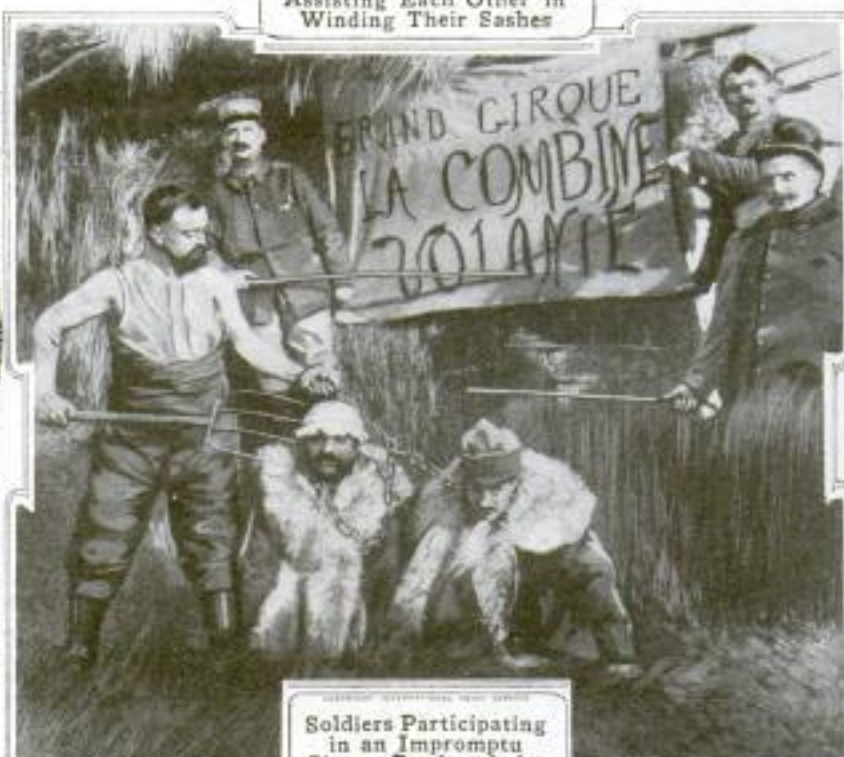
# STRIKING PHOTOGRAPHS FROM BATTLE ZONES



Mounted Colonial Forces of the French Army on Outpost Duty near Dixmude. The Men are Assisting Each Other in Winding Their Sashes



Jacket Used by British Gunners for Carrying Ammunition in Emergencies



Soldiers Participating in an Impromptu Circus Produced for the Amusement of Themselves and Their Regimental Comrades



English Sea Fighter Wearing One of the New Swimming Collars

SHOWING UNUSUAL PHASES OF EUROPE'S WAR



Cross Erected by the Germans to Mark the Graves of the "Brave French Soldiers" Whom They had Buried



Cross Made of Field-Gun and Rifle Cartridges Marks a Grave



Projectile Fired by German Siege Howitzer Compared with 3-Inch Shells



Wreath of Fuses Decorates Cross on Grave of Austrian Officer



German Army Telephone "Central," at Military Station near Warsaw

H. Channon Company,  
150 N. Market Street,  
42 Chicago, Ill.

POPULAR MECHANICS "Canal Record"

USING ORDINARY BUCKET  
FOR LIVE-MINNOW PAIL

9702 To enable a fisherman to convert an ordinary bucket into a satisfactory minnow pail, an ingenious device has



This Simple Device Attached to an Ordinary Bucket Converts It into a Minnow Pail

been made of canvas and netting. A circular top piece fitted with a skirt that may be tied tightly about the upper part of a bucket has a square opening in the top which is covered by a wire screen hinged to the canvas. Extending downward, and lining the pail, is a sack made of fine netting. A cord attached to the bottom of this allows most of it to be raised out of the water, or close to the top of it, when it is desired to select bait for a hook. The bucket may be anchored in a river or lake without danger of the minnows escaping from it. The device weighs only 3 oz., may be carried in a tackle box or pocket and can be applied to almost any available bucket.

CA traveling museum that has 7,000 individual and duplicate collections, with lantern slides, stereoscopic views, and colored charts and photographs, is a feature of the public-school system of St. Louis.

SPECIAL SERIES OF STAMPS  
MARKS OPENING OF CANAL 9511

In commemoration of the opening of the Panama Canal a special series of postage stamps has been issued and placed on sale at the different offices in the Zone. The stamps are made by the Republic of Panama in accordance with an agreement by which that country furnishes the stamps used in the Canal Zone postal service and in return receives 40 per cent of their face value. They are printed in denominations of 1, 2, 5, and 10 cents. The one-cent size is green and carries a map of the canal; the two-cent kind red, with an engraving of Balboa at the Pacific Ocean; the five-cent variety blue, and bears a picture of the Gatun locks, and the ten-cent class orange, and shows a view of Culebra Cut.

AUTOMOBILE HAS SHOW CASE  
FOR BODY 9647 file 200

An unusual body for an automobile is a glass show case permanently mounted on a car that is used in Los Angeles for advertising purposes. This novel scheme is used in advertising an institution that aims to cure disease by correct diet, and the contents of the case usually consist of a full meal of the food recommended, set out in tempting display. It is said to be a success in attracting the public attention that the owner seeks. The glass



case seemed at first to be a poor risk in the city traffic, but so far it has escaped without a smash.

Cont: C. L. Edholm,  
1353 W. 36 Place,  
Los Angeles, Calif.

*J. L. Wright,  
Kingman Ave.,  
Revere, Mass.*



This Sea Wall, Just Completed at Point of Pines, near Boston, is Built as a Series of Steps with the Idea of Breaking the Force of the Waves

9434  
**SEA WALL BUILT AS SERIES OF STEPS**

A sloping sea wall just completed at Point of Pines, near Boston, is of such form as to break the force of the waves and particularly to prevent the undermining of the wall. The feature of this wall is that it consists of a series of steps running parallel with the shore line, the idea being that with this construction the waves will be broken up as they strike and will fall back on themselves, thus breaking their force. The wall is built of concrete, is about a third of a mile long, and cost in the neighborhood of \$30,000.

9745  
**MACHINE FOR ANNOUNCING APPOINTMENTS**

A new device particularly designed for offices where a great many appointments are to be kept track of is an automatic annunciator that sounds a gong when the time of an appointment has been reached. The memorandum is made on a paper strip on which is marked in the proper order the days of the month and the hours of the day. The paper is wound in by a drum controlled by clockwork. In using, the memorandum of the appointment is

made on the line corresponding to the date and hour and on the same line a perforation is made in the paper. At the time indicated, this perforation reaches and actuates a trigger which rings the gong, giving audible notice that the memorandum should be examined. The paper strip is long enough to last a month and can be filed away after being used.



The Memorandum of the Appointment is Written on the Strip of Paper on a Line Corresponding to the Date and Hour, and at the Same Time a Perforation is Made in the Paper. At the Time Indicated the Perforation Reaches and Actuates a Trigger Which Rings the Gong

Patented:  
*S. R. Schaff  
Paul Jones Building  
Louisville, Ky.*

cont: Albert Marple,  
 322 Boynton St.  
 Tropic, Calif.  
 POPULAR MECHANICS  
 CONCRETE WALL DECORATED  
 9035 WITH SHELLS

44

POPULAR MECHANICS

A novel and attractive effect has been produced in a concrete garden



Novel and Attractive Effect Produced by Imbedding Shells in a Concrete Garden Wall

wall in southern California by imbedding shells of various sizes and shapes in the exposed surfaces. In this wall there are two series of steps, and in the part adjacent to the steps there have been placed shells from 1 1/2 to 2 ft. wide and about 12 in. deep. Imbed-

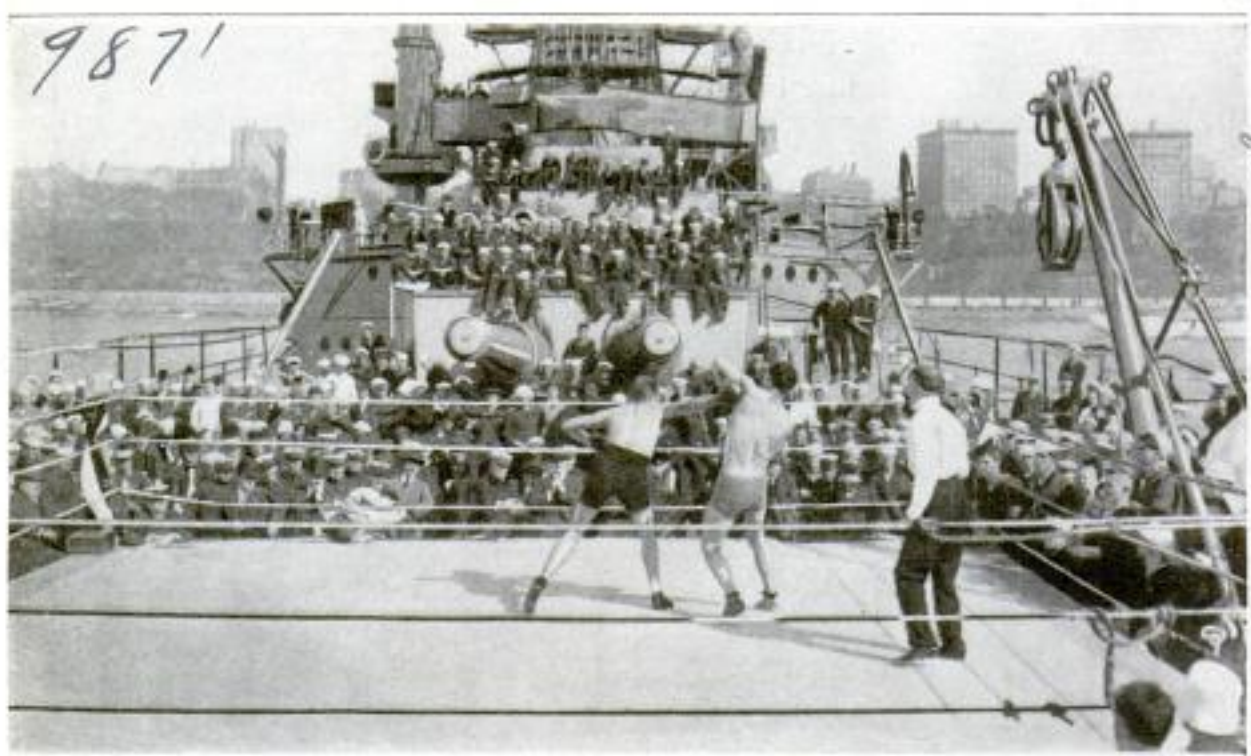
ded along the face and top of the low wall, as well as in the risers of the concrete steps, are dozens of abalone shells. The shells are all placed with the concave sides out and are highly polished.

SIMPLE TRAP FOR CATCHING ROACHES 9864

A trap for roaches that is being introduced in Indianapolis consists simply of a tin vessel having a tight-fitting cover and with the sides wrapped with burlap, or cloth, and the top left unwrapped. In the center of the cover a hole is punched, and the tin around the hole is bent downward to prevent the escape of the roaches after they have fallen into the vessel. Some substance that is attractive to roaches is placed in the vessel. The roaches will then climb up the cloth wrappings and fall into the vessel, from which there is no escape if the sides of the vessel are smooth and the hole in the lid has been properly formed.

Taken from booklet issued by  
 Bureau of Aerial Industry  
 March

BOXING CONTEST ON AMERICAN BATTLESHIP



A Feature of the Recent Naval Pageant in New York Harbor was a Boxing Match Fought on the Deck of the U. S. Battleship "Michigan" to Determine the Middle-Weight Championship of the Atlantic Fleet

International News Service,

# COMMENT AND REVIEW

## *Back Up the President*



THE sinking of the "Lusitania" has demonstrated two things important alike to shipowners and passengers: One is the inefficiency of the present lifeboat service and the other is the sinkability of a supposedly nonsinkable ship.

### *Lifeboat Failure*

As to the lifeboats, of which less than one-half the equipment actually performed their mission, it must be noted that they were even in half readiness for launching, having been swung in the davits and made all ready for loading and lowering. The event occurred in early afternoon, when passengers were dressed and for the most part out of their rooms, and as to the officers and crew was at least anticipated as well within the scope of possibilities. With some fifteen minutes in which to load, lower, and get away, fully one-half of the boats became unworkable, and of those lowered several overturned or were smashed against the ship's side. To the inlander who never saw a "Lusitania," this failure and loss of boats seems inexplicable. To the passenger who has crossed on such a ship, the difficulties and dangers of a launching are very real. In the first place, the boat deck corresponds in height to the eighth or ninth story of an office building. The boats are suspended from an iron ring at each end, and a slight overload on one side causes them to list or tip. Nervous passengers are unconsciously apt to spring toward the other side, which then tips still more or spills out its contents. A well-filled canoe in the water is a very fair illustration of the instability of a lifeboat when being lowered. A slight roll of the ship also swings the boat suspended over its side like a pendulum. The outward swing is harmless, but the force of the inward swing is destructive. An ordinary ship's lifeboat, filled to capacity, weighs about four tons, and strikes the steel side of the vessel with great force. The wash of the waves against the ship where the boat must take the water is the same as where a heavy sea meets a high sea wall, producing a boiling effect on a large scale and specially favorable to a turn-over. Unless loaded far in excess of capacity, a modern lifeboat should yield a high average of safety after it has gone a hundred yards from its ship.

In the old days of sailing vessels, the main deck where the boats were kept was only 10 to 15 feet above the water. As hulls grew in size with steam power, the boat deck and its boats were steadily lifted higher and higher, until now they occupy a dizzy height. Shipowners will dislike to give up the large amount of valuable space on lower decks necessary to accommodate the lifeboats, but apparently something of the kind will eventually be required.

It is evident, therefore, that our present system of lifeboating is absolutely inadequate, especially in the case of the large ships, and that some radical changes are imperative, to some extent in the boat itself, but particularly as to getting it into the water successfully.

**T**HE "Lusitania" was generally supposed to represent the last word in the requirements of a nonsinkable ship. With a double hull (one ship inside of another) and powerful bulkheads, both lateral and longitudinal, providing a large number of water-tight compartments, the public had cherished the idea that she could be cut in two in the middle, making two ships, or one-third her compartments fill and the other two-thirds still float the ship. Just the exact location of the explosion caused by the torpedo, and the extent of that explosion, may never be satisfactorily

*Are  
Ships  
Nonsinkable?*

explained, unless the ship is raised. The damage certainly was not comparable to that of any ordinary collision with other craft or iceberg. More and stronger, rather than fewer, bulkheads will doubtless be the rule in future ship construction, and the sinking in question is no argument against the necessity of bulkheads. At the same time, with the record of the "Titanic," the "Empress of Ireland," and now the "Lusitania" before us, the fact seems to have been sufficiently established that the passenger should give more attention to his life belt and not trust implicitly to even the best bulkhead which engineering genius can devise. Perhaps all we should expect of the marine architect is a construction which, like a slow-burning building, affords as many minutes as possible in which to escape.

This brings us back again to the absolute necessity of radical improvement in lifeboats and the method of launching them, including perhaps the placing of some boats on a lower deck than at present. Just what would happen to a boat load of passengers locked in a water-tight lifeboat of semisubmarine type, and shot from the upper deck down nearly 100 feet into the sea, can doubtless only be determined by actual experiment. Swimmers have dived that distance, and some "shoot-the-chutes" boats approach the same effect as a popular amusement. Whatever proves to furnish the solution, it is certain something radical must needs be done to reduce such loss of life as three recent disasters have caused.



**A**T this writing the "Lusitania" is supposed to rest on a fairly hard bottom in from 300 to 400 feet of water. As a salvage prize, the ship and some of its cargo are worth recovering if they can be raised within a reasonable length of time. So far as we can learn, no intention to attempt recovery of the ship has been announced, and war conditions, of course, render any possible attempt unusually difficult.

*Raising the  
"Lusitania"*

And yet it cannot be finally said such a raising is absolutely impossible, although the engineers may estimate the cost at a figure which makes the effort impracticable. Ship and cargo would represent probably a weight of, say, 40,000 tons. No such large vessel has ever been raised even from less depths, hence the problem presents difficulties which have never been solved in actual practice.

That we have no precedent, however, does not in itself establish an impossibility. Given apparatus of sufficient size and strength,



theoretically of course it could be accomplished. Whether or not it would pay is another matter.

The bare possibility, however, is one which cannot fail to interest engineer and layman alike.

Much would doubtless depend on the ability of divers to descend to a depth which must establish new records by at least 100 feet, and to perform any useful work after getting down. Considerable advance has been made of late in diving work, and a recent invention consisting of a hollow metal sphere, now under construction, claims ability to put two men down 1,000 feet, with control of the vehicle to permit the occupants moving it about, or anchoring it to a ship's side. Through windows the divers could observe the work of placing chains or cables and by means of telephones direct the work of those on the surface. Instead of groping in the dark as formerly, the men above would practically observe their own work through the eyes of the divers, in this way not only greatly facilitating operations, but making the effort effective where otherwise it might be largely experimental.

It has been suggested that an effort of this nature would probably consist in raising the hull a few feet and dragging it inshore until it struck bottom; then raising and moving forward again, until it reached shallow water where ordinary divers could work for several hours at a time.



**W**E don't hear much these days about the proposed tunnel under the English Channel, to connect England and France. Although the engineers have several times during the past 20 years submitted complete plans for such an enterprise—some of which have been published in this magazine—none has gone beyond the paper stage. The minute anyone mentioned channel tunnel, apparently the entire English press broke loose, displaying an opposition scarcely less expressive than the present fear of Zeppelins.

*English  
Channel  
Tunnel*

It is interesting to reflect on what such a tunnel would be worth to England were it in operation today. Where a fleet of battleships are now required to convoy a single transport ship carrying only a few thousand men, the same troops could be moved comfortably and safely through a tunnel in one-tenth the time, to say nothing of the supplies which would flow in an almost unbroken stream. Loaded on cars at an English factory, these supplies could have traveled to destination near the fighting line in France without having been once touched. As it is now, there is the transfer from train to ship and ship to train and the constant danger of attack and loss in the channel crossing.

Expressed in dollars alone, the tunnel would have paid for itself the first year of the present war. It would seem that the tremendous advantage of such secure and rapid transportation must have been so demonstrated that the tunnel will become a reality after peace is restored. As a menace—that is only a wild dream; for of all highways which are capable of being put out of commission, a tunnel is

the easiest. Movable stone gates, water, deadly gases, burning fluids, or explosives are all available and would be made operative before an enemy could advance more than a few hundred feet. Can one imagine anything more surely fatal than some thousands of men part way through an under-sea tunnel when deadly gases, pumped through concealed pipes, are liberated; or sea gates opened and the tunnel filled when an army was ten miles from the nearest escape?



"**S**OME comment by you on Father's Day will be vastly appreciated.—Father's Day Association." Such was the request, which properly assumed the "some comment" could be only good and favorable, for while mother-in-law is made to bear the burden of many blames, one seldom hears of father-in-law "butting in."

*Father's  
Day*

Father's Day, however, is as yet more a fancy than a fact: it hasn't been distinguished from ordinary days with a red spot on calendars; stores, schools, and banks do not shut their doors in its observance; governors do not call by proclamation upon the religiously inclined to assemble in their respective places of worship to eulogize Father on Father's Day; Sunday schools do not picnic in the woods on its account; boats and automobiles do not race because it's Father's Day. Father's Day, as a matter of fact, is whenever it gets a chance, happening as it does on different dates in various states. Even Father gibes at his own day, renounces all responsibility for its existence, and in language that can be understood repudiates the whole affair. For once Father feels a bit foolish, like a boy going home with a girl the first time.

If left to Father there never would have been any Father's Day, and yet Father, despite his protestations, is not opposed to a day which serves distinctly to remind him of his Father, gone long years since whither he soon will go. From out the recesses of his heart flock forgotten memories on Father's Day, recollections of how a father toiled and sacrificed for him, or perhaps neglected and ignored the earnest, ambitious little boy to whom Father nevertheless occupied that exalted position beside which kings and potentates were as nothing.

And Father, whether his own boyhood recalls tender memories, or unhappy, takes on fresh courage and feels a more generous spirit toward his own boys and girls.

In a boy's heart are the various gradations of love and protection for mother, sister, brother; but a boy's affection for his Father is that of an ideal, a grand something to be achieved. Of the many beautiful sentiments in life, that which Father's Day signifies is by no means least.

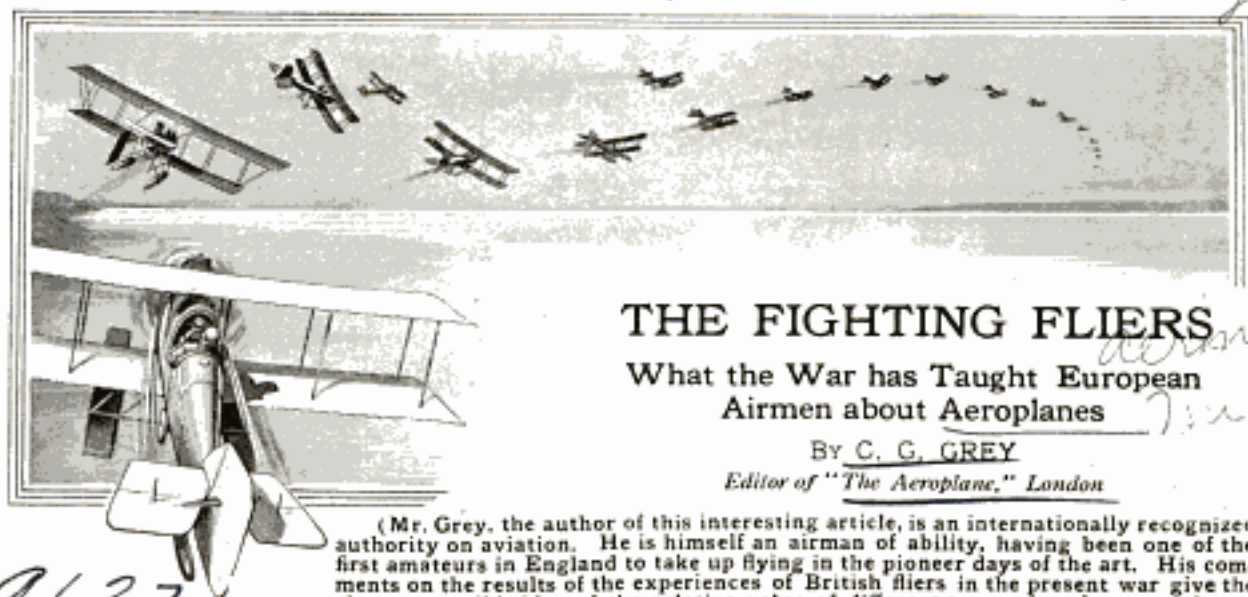


*Back Up the President*

H. H. WINDSOR

May 25th.

166 Piccadilly, W.,  
London, England.



## THE FIGHTING FLIERS

What the War has Taught European  
Airmen about Aeroplanes

By C. G. GREY

Editor of "The Aeroplane," London

(Mr. Grey, the author of this interesting article, is an internationally recognized authority on aviation. He is himself an airman of ability, having been one of the first amateurs in England to take up flying in the pioneer days of the art. His comments on the results of the experiences of British fliers in the present war give the clearest possible idea of the relative value of different types of modern aeroplanes. —Editor)

9637

AFTER eight months of war it is now possible to form some really just estimate of the value of aeroplanes in naval and military operations, and also of the various types of machines which are found most useful for various specific purposes. It speaks well for the mental ability and foresight of the officers in high authority in the British navy and army, that practically every one of their forecasts made before the war has worked out accurately in practice, but although these officers have expressed their opinions freely, chiefly at meetings of the Aeronautical Society of Great Britain and at lectures to certain naval and military institutions, at various times during the past three years, it was only too evident, even before the war, that insufficient attention had been paid to them by men in still higher political places, for in both services the available supplies of aeroplanes were obviously much too small.

Perhaps, as a constant observer of these matters, I may be permitted to point out to readers of this magazine that officers in the United States army and navy have also been "voices crying in the wilderness" for some years past, and it is earnestly to be hoped that the lessons of the great European war will not be lost on the American nation, which in due time will have to take up the "white man's burden" of armament. I have had the privilege of talking to some of the most experienced

aviation officers in the United States service, and know that their ideas on the need for adequate aerial armament are thoroughly sound, judged by our own lessons in this war.

Naturally the first task before Great Britain, when the wonderful effectiveness of aeroplanes became evident, was to turn out as many machines as possible, and in France and Germany also the problem of output effectively put a stopper on all serious forms of experimenting. Consequently, the types of air craft on both sides remain practically the same today as they were before the war, the only difference being that designs which were proved defective or ineffective were promptly condemned, and every effort was made to turn out as many as possible of those types which had proved their value.

For this reason the monoplane has been practically abandoned by all countries. In England the monoplane has never been popular, except among exhibition fliers and aerial acrobats, the objection to it being that neither the pilot nor the passenger ever has a thoroughly good view below him, and that for a given horsepower it is actually easier to get high speed out of a biplane than out of a monoplane, and yet produce a machine which will lift reasonable weights and land reasonably slowly.

If one looks at a monoplane and a biplane "head-on," one sees that a

monoplane is what is known to every engineer as a "king-post girder," whereas a biplane is a "box girder." The actual amount of struts and trusses and wires is about the same in either case, so that for a given width of wing from tip to tip, or span, as it is called, a biplane has two lifting surfaces, one above the other, against the single lifting surface of the monoplane, so that it has twice the lifting area, and yet the amount of stuff in the way of struts and wires to be pushed through the air is roughly about the same; and, as all these set up what is called "head resistance," the speed in each case is about the same; also the weight of each is pretty nearly the same, because it is possible in a biplane, or box-girder structure, to use lighter main spars for the wings.

The greater the surface of an aeroplane for the same load, the slower the said machine can land and the quicker it will get off the ground, which naturally is an immense advantage to military airmen, who have to work from any reasonably smooth field they can find instead of from a properly prepared aerodrome. All these advantages taken together give the reason why the monoplane has been ousted by the biplane.

The solitary exception is a type of monoplane built by one or two firms in France, and known as the "parasol," because the single plane is raised above the body of the machine, so that it is in fact a biplane with the lower pair of wings removed, and thus has the advantage that the pilot and passenger can see perfectly below them by simply looking over the sides of the body, but as this type possesses in other respects all the faults of the monoplane, it is but little used. Its chief purpose is the observation of artillery fire, for which no great speed is required, as the aeroplane simply has to wander round and round over a limited area watching the effect of the shells from the battery with which it is coöperating on a given mark in the enemy's lines. For this a good view is essential, but there is no need for the machine to carry any heavy load in the way of bombs, or a

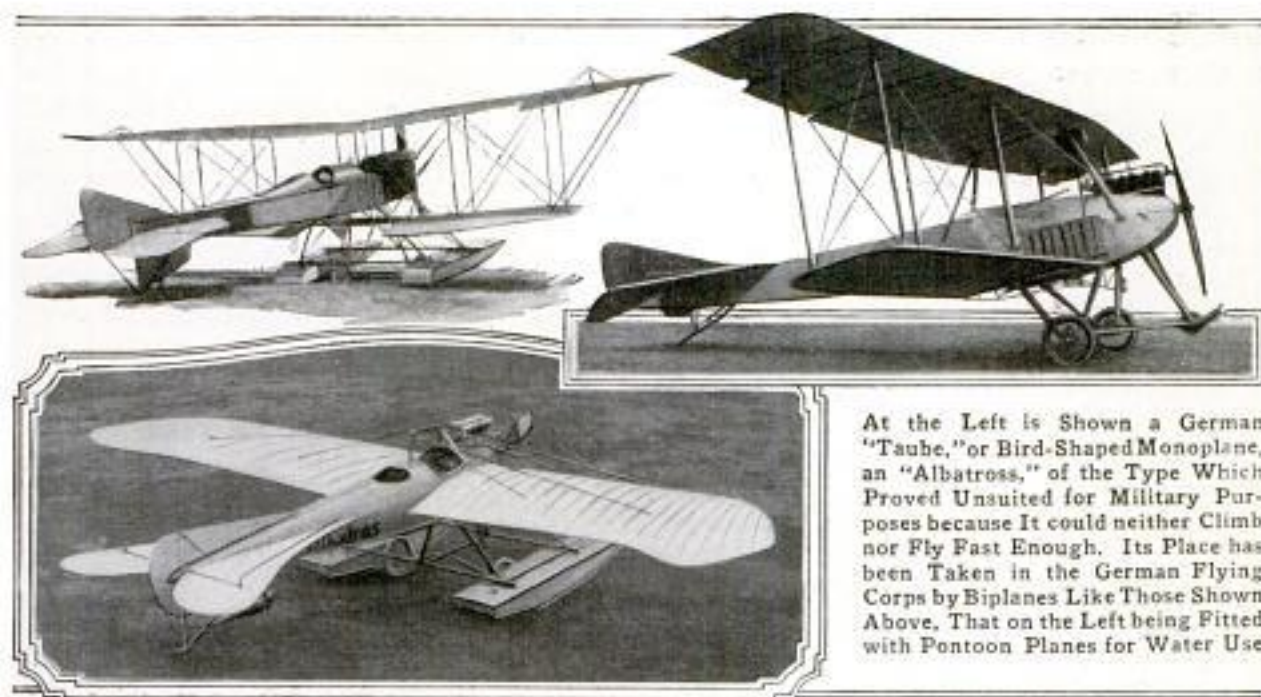
supply of gasoline (or petrol as we call it) for long flights.

The Germans have also discarded monoplanes in favor of biplanes, though at the beginning of the war one heard of nothing except "Taubes." The Taube type, I may explain, is purely a German production, although it was originated by an Austrian, Herr Etrich. It is a large monoplane with wings swept back and turned upward toward the tips, much like the wings of a bird, with the result that the silhouette of the machine from below is very like that of a pigeon, hence the name "Taube," which is German for "dove."

This type of machine is designed to be automatically stable; that is to say, if left to itself, it will roll about in the air when struck by a gust, but will always right itself, as a lifeboat rights itself in the sea. Unfortunately, from the German point of view, it has been found impossible to produce machines of this type which have any great flying or climbing speed, and for nearly a year before the war it was evident that the type was going out of date and would be replaced by large tractor biplanes of the type originated in England by Mr. A. V. Roe. I now learn from my friends at the front that Taubes are hardly ever seen, and that the big German biplanes appear to be the only things used.

The disappearance of the Taube is due to two reasons: firstly, because of the general inefficiency of monoplanes, as already mentioned above, and secondly, because, owing to their slow flying and slow climbing, such of them as ventured very far over the French and British lines were either brought down by small-arm fire from the ground, or by actual combat in the air with French and British airmen.

At the beginning of the war it was the British airmen who did practically all the flying on the western front, because the pick of the French aviation corps had been concentrated on the eastern French frontier in expectation of an attack through Alsace, and the Belgian front was left to the British Royal Flying Corps, who did the whole



At the Left is Shown a German "Taube," or Bird-Shaped Monoplane, an "Albatross," of the Type Which Proved Unsuitable for Military Purposes because It could neither Climb nor Fly Fast Enough. Its Place has been Taken in the German Flying Corps by Biplanes Like Those Shown Above. That on the Left being Fitted with Pontoon Planes for Water Use

job of scouting for both the French and British armies, and also took on the work of chasing German aeroplanes.

However, as it so happened, the British airmen were particularly well equipped, because certain types of British biplanes, notably the "Avro" two-seater tractor, with the 80-hp. Gnome engine, and the "B. E." type tractor biplane, with 70-hp. Renaults, built by various engineering firms to government designs; the Sopwith single-seater biplane scouts commonly known as "tabloids," and the Bristol scouts of similar type, were all very much faster and very much quicker in the climb than anything the Germans possessed. This and the personal pugnacity of the British officer himself accounts for the fact that quite early in the war the Royal Flying Corps obtained a distinct mastery in the air over the German airmen, and have maintained that mastery ever since.

As an instance of this pugnacity, I may quote what happened to one of our young officers, who in this case came off second best. He had gone out on a bomb-dropping expedition with the intention of destroying various aeroplane tents at a German landing ground which had been discovered some way behind the German lines. In order to carry as many bombs as

possible he had left his rifle and revolver behind, and so had no weapons except the bombs. On his way he saw a German machine coming toward him, and, as he had not had an opportunity for scrapping in the air for some time, he thought it was a pity to waste a perfectly good German target, so he proceeded to climb rapidly and tried to drop one of his bombs onto the German machine. To make as certain as possible of his aim he came down quite close to the German—and missed him. At the same time the German's passenger, who was armed with a rifle, hit him in the leg with a bullet, which struck his trouser pocket and distributed over his anatomy assorted splinters of bullet and coins. He was then at a height of about 6,000 feet, and, feeling that he was pretty badly hit, started to come home as fast as he could. At about 2,000 feet he spotted various aeroplanes on the ground not far from him, and knowing that even if he landed among hostile airmen he would probably be better treated than if he were captured by any other of the enemy, he promptly made for that field. A few hundred feet from the ground he recognized them as British machines and a second or two afterward lost consciousness. However, he must have had some subconscious energy at work,

for he made a perfect landing without running into any of the other machines, and fetched up about 25 yards away from a motor ambulance, whither he was promptly taken, bandaged up, and packed off to the base hospital. It took about half a dozen operations to get the various pieces of metal out of him, and it took him about four or five months to recover, but he returned to work afterward as cheerfully as ever.

As regards bomb dropping in general, this is one of the two subjects on which the preconceived opinions of those concerned with aviation have been thoroughly changed, for most people thought that bombs would only be dropped as a means of annoying the enemy and not as a serious attempt to do material damage. However, actually quite a good deal of effect has been produced by bombs. The same officer whose adventure I have quoted above succeeded in dropping a bomb on a motor ammunition column, which blew up the first wagon, which in turn exploded about half a dozen others, destroying a considerable quantity of ammunition and blocking a very important road with wrecked motor trucks.

Late last autumn when the great German attack was delivered on the British army at Ypres, it was discovered that the kaiser himself had arrived at the little town of Thielt, Belgium, quite close to the German lines, and a young fleet of British army aeroplanes started out to try and put an end to the kaiser. It turned out afterward that he had left only a few minutes before the aeroplanes arrived, but they succeeded in blowing up the inn which he had used as his headquarters and smashing up a considerable amount of his personal belongings, besides killing several of his immediate personal attendants.

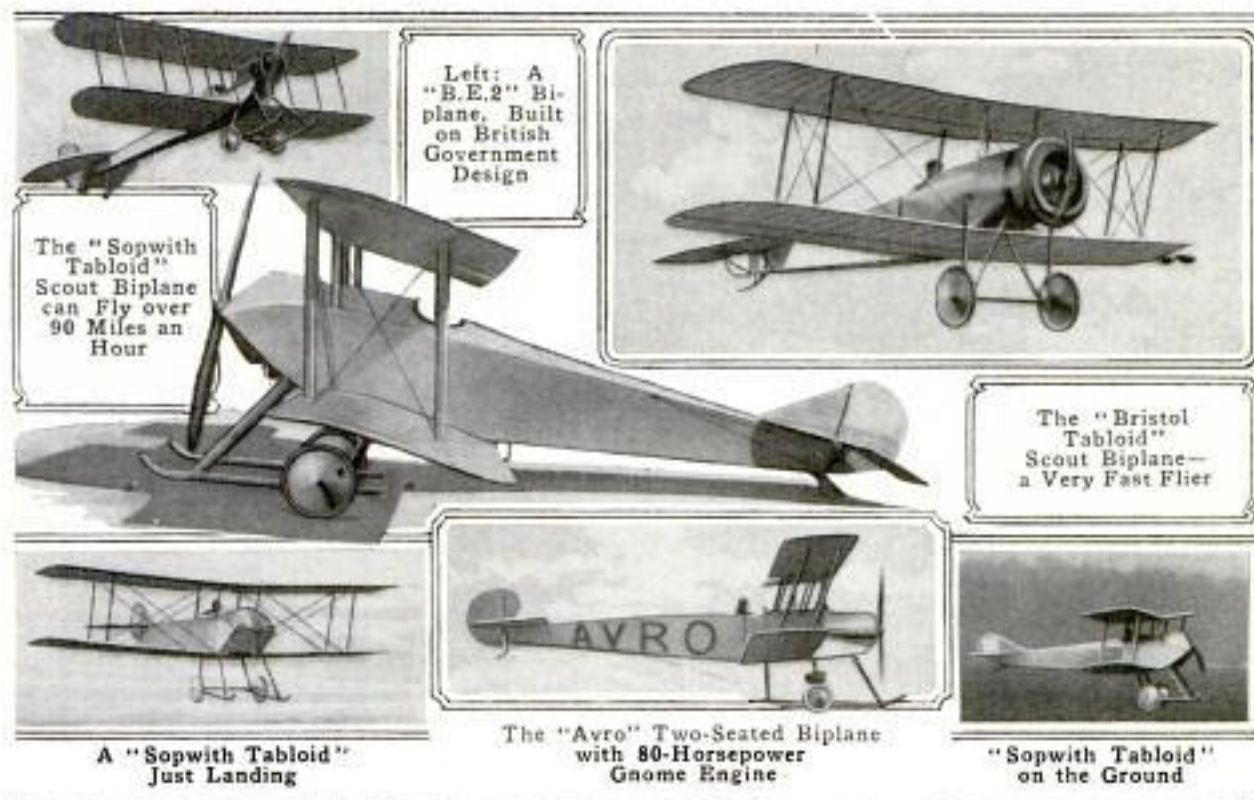
The Royal Naval Air Service, not being employed directly as air scouts for the army, have had a station of their own on the continent ever since October last, and thence have carried on a regular campaign of raids on German stores and points of military im-

portance behind the German lines in Belgium. It will be remembered that on the very day on which Antwerp was evacuated two officers of the R. N. A. S. made a raid into Germany, where one of them damaged the railway station at Cologne and another one succeeded in blowing up the airship shed at Düsseldorf with a brand-new Zeppelin inside it.

Both these officers were flying the little Sopwith scouts which I have already mentioned—machines which do well over 90 miles an hour. The officer who blew up the Zeppelin shed came in over the city at a height of about 5,000 feet, and promptly all the guns posted there for the defense of the air station opened on him. As soon as he spotted the airship shed he stood his machine on its nose and simply let it drop. This had the double advantage that it made it much more difficult to hit him with small-arm fire, for his speed would probably jump up to something like 160 miles an hour in a few seconds, and also his descent would be so rapid that the German gunners would be unable to change the fuses of their shells quickly enough to burst them anywhere near him as his height decreased. A couple of thousand feet from the ground he simply appeared to be falling vertically and the Germans stopped firing, waiting to see him smash up. Five hundred feet from the ground, he suddenly pulled the machine out of its dive and, being then in such a position that he could scarcely miss the shed, he dropped all the bombs overboard.

The machine, lightened of the load of bombs and impelled by the terrific dive, shot up again like a rocket and was practically out of range before the astonished Germans had time to start firing again. When he looked back he found the whole shed a mass of flames which were shooting hundreds of feet into the air, showing that there must have been a gas explosion along with the fire caused by the bombs themselves.

He said afterward that all the while he was going to Düsseldorf he was



Left: A "B.E.2" Bi-plane. Built on British Government Design

The "Sopwith Tabloid" Scout Biplane can Fly over 90 Miles an Hour

The "Bristol Tabloid" Scout Biplane—a Very Fast Flier

A "Sopwith Tabloid" Just Landing

The "Avro" Two-Seated Biplane with 80-Horsepower Gnome Engine

"Sopwith Tabloid" on the Ground

Types of British War Biplanes That have Proved Their Efficiency for Scouting Purposes by Valuable Service in the European Conflict

chiefly worried by wondering whether his engine would last out for the distance, and as he dived over the shed his only thought was whether he was going straight for it or not. It was not till he got halfway back to Antwerp that he began to wonder why he was still alive.

Not long afterward a highly effective raid was made by three naval airmen in two-seater Avros, each carrying bombs instead of a passenger, on the Zeppelin factory at Friedrichshafen. These officers also succeeded in doing a considerable amount of damage, and delayed the output of new Zeppelins for several weeks. One of them was shot down and was nearly lynched by an infuriated mob, but it appears that a German officer took him prisoner and protected him from the mob, and the officer commanding at Friedrichshafen very sportingly sent a wire to the British admiralty, via Switzerland, the same afternoon, informing them that the airman had been captured and was uninjured.

From the base in Flanders raids have been made on numerous stores, tem-

porary airship sheds, aeroplane camps, and so forth, at Bruges, Ghent, Brussels, and elsewhere, and recently raids were made by as many as 40 aeroplanes at a time on the Belgian coast towns, especially on Zeebrugge, which is being used as a German submarine base. At the time of writing, the latest raid is that on the Cockerill yard at Antwerp, where submarines are actually being built by Germans who have commandeered the works, and are carrying on construction apparently with Belgian labor.

The seagoing section of the R. N. A. S., which is continually on patrol on seaplane-carrying ships, also carried out quite an effective raid on the German ports of Cuxhaven and Wilhelmshaven, besides damaging aeroplane sheds on the Frisian Islands. The seaplane-carrying ships are as a rule light, fast, unarmored ships carrying several aeroplanes apiece, which are lowered over the side by derricks, and get off the water with their own floats.

For this work, of course, much use is made of the big biplanes produced by

the Short Brothers something over a year ago. In these machines the wings are made to fold back, so that the total width of the machine is only the width of its own tail, and thus three machines at least can be stored in the space which would otherwise be occupied by only one. This type of machine caused very much interest when it first became publicly known at the time of the Aero Show in London, in March, 1914, and it has naturally been improved in many details since.

Seagoing machines are also quite largely used in hunting for submarines and mines. In mine hunting the aeroplanes generally circle round just ahead of their mother ship, alighting when a mine is spotted, and then the ship comes up and fishes for the mine. Their precise method of dealing with submarines must not, of course, be mentioned at present, but it may be taken that this branch of the service is no less efficient than other branches.

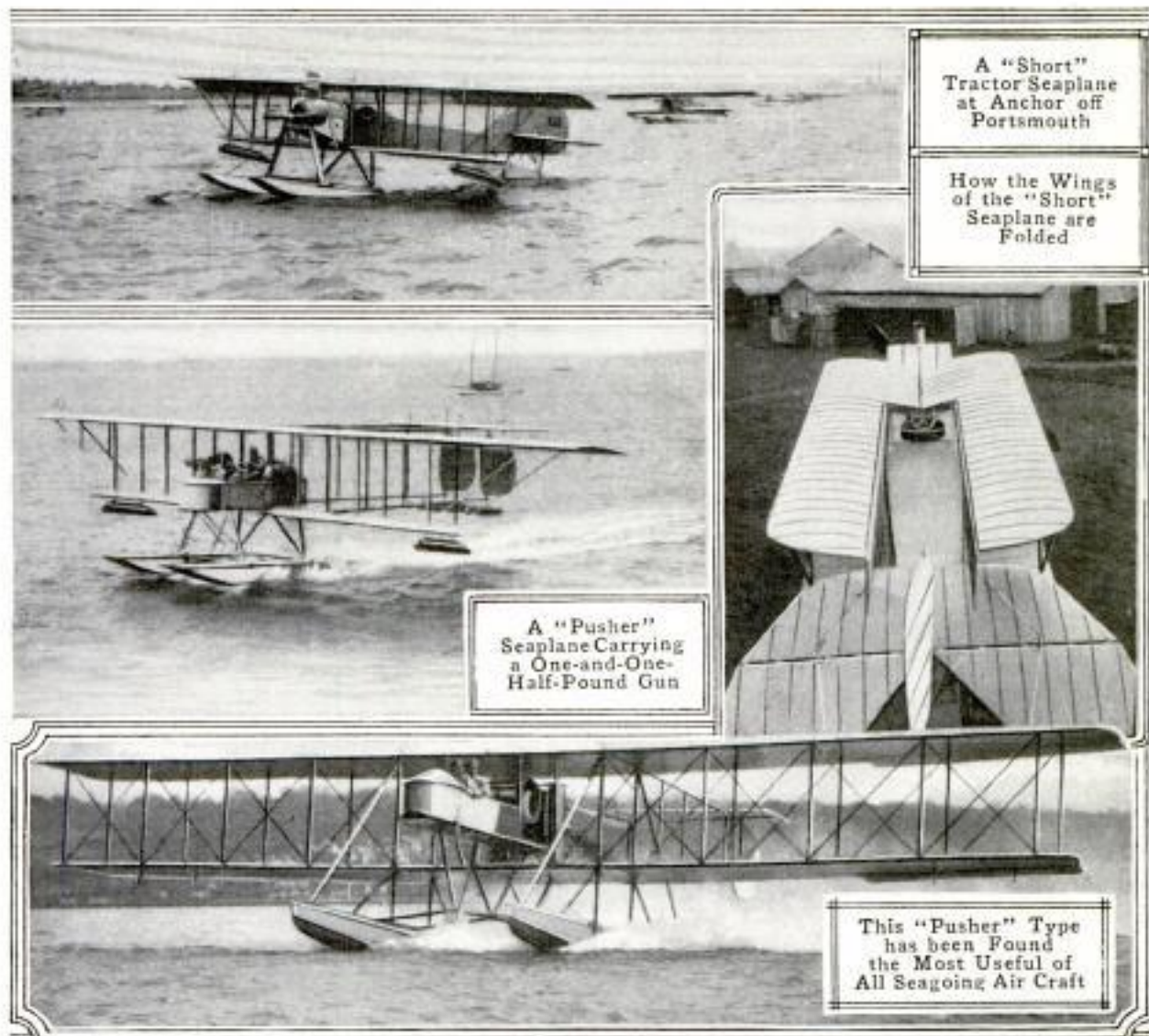
In the Near East, in the fighting round the Dardanelles and on the Egyptian frontier, seaplanes have also done good work, for they have been able to start from the sea and patrol for a considerable distance inland, thus keeping the officer commanding in Egypt accurately informed as to the advance of the Turkish column which made the futile attack on the Suez Canal. A French seaplane carrying as passenger an officer—an Irishman—had a rather uncomfortable adventure in this work, for the engine stopped when they were some 16 miles from the coast, and the pilot was compelled to land. Naturally an aeroplane without wheels and with heavy floats is not calculated to land with accuracy on steep sand hills in the middle of the desert. The result was that as soon as the floats struck the ground they stopped dead and the rest of the machine endeavored to continue its course, so that it stood somewhat ungracefully on its head. The passenger was caught in the wreckage of the front part of the machine and was unable to pull himself out, and the pilot was thrown clean out on his head and appeared to

be killed. However, he recovered consciousness after some little time and rescued the passenger, and after many adventures the two got back to the coast and were fortunately seen by their ship before they were captured by the Turks. According to the Irish officer, their one consolation was that although they had to leave the wreck of the aeroplane, they left it with the tricolor of France, which was painted on the rudder, proudly waving over the desert.

In a small way, compared with operations in France and the North Sea, seaplanes have been used effectively for watching the movements of Turkish troops toward the Dardanelles, in watching the effects of the shell fire of our ships on the forts, and also in dropping bombs on the camps of Turkish soldiers round about the forts. In the early part of the Dardanelles campaign it was stated that some Turkish aeroplanes endeavored to make themselves unpleasant to the fleets of the allies, but apparently they were quickly driven off, and it was recently reported that a number of German aeroplanes and their mechanics had passed through Bulgaria on their way back to Germany, which seems to indicate that the Turks have given up any idea of putting up a show against the French and British air craft, for the Turks have practically no airmen of their own, and the aeroplanes reported as being Turkish were almost undoubtedly German.

In tackling hostile air craft in the early part of the war, the usual weapons were either ordinary service rifles or automatic pistols, though a good many pilots, especially the crack fliers of "tabloid" scouts, preferred to use the old-fashioned long-barreled Colt revolver throwing a heavy bullet. They trusted to their own skill and to the speed of their machines to escape being hit themselves, and preferred the heavy-caliber weapon because of the smashing power of its bullet, as the ordinary rifle bullet will go clean through a strut or a spar of an aeroplane without doing any damage.





Flying Boats, or "Seaplanes" as the English Call Them, Used by the British Flying Corps

However, it soon became evident that a machine gun mounted on an aeroplane was actually the most efficient weapon, but there was the obvious difficulty of fitting a machine gun on a "tractor" machine so that the stream of bullets would not hit the propeller. Various efforts, all of them futile and a good many of them humorous, have been made to get over this difficulty. Some people have tried fitting a machine gun on the top of a biplane so as to fire over the top of the propeller, and the French even tried fixing the gun so high up on a monoplane that it cleared the propeller tip, but of course the passenger in each case had to stand up to fire, which was exceedingly uncomfortable for him, considering that he is plowing through the air at over

60 miles an hour, and consequently his shooting was apt to be more erratic than effective.

The best system of all is to mount a machine gun on the front of an ordinary pusher biplane of the type which was originated by Mr. Henry Farman. This system has been used for quite a considerable time in experiments in all countries, and before the war a good many firms laid themselves out to produce gun-carrying pushers. One of the most successful of these was turned out by the big armament firm of Vickers, Limited, and the result is that quite a large number of Vickers gun carriers are in constant use. Naturally one cannot give any approximation of the number produced since the war began, but perhaps it is permissible to say

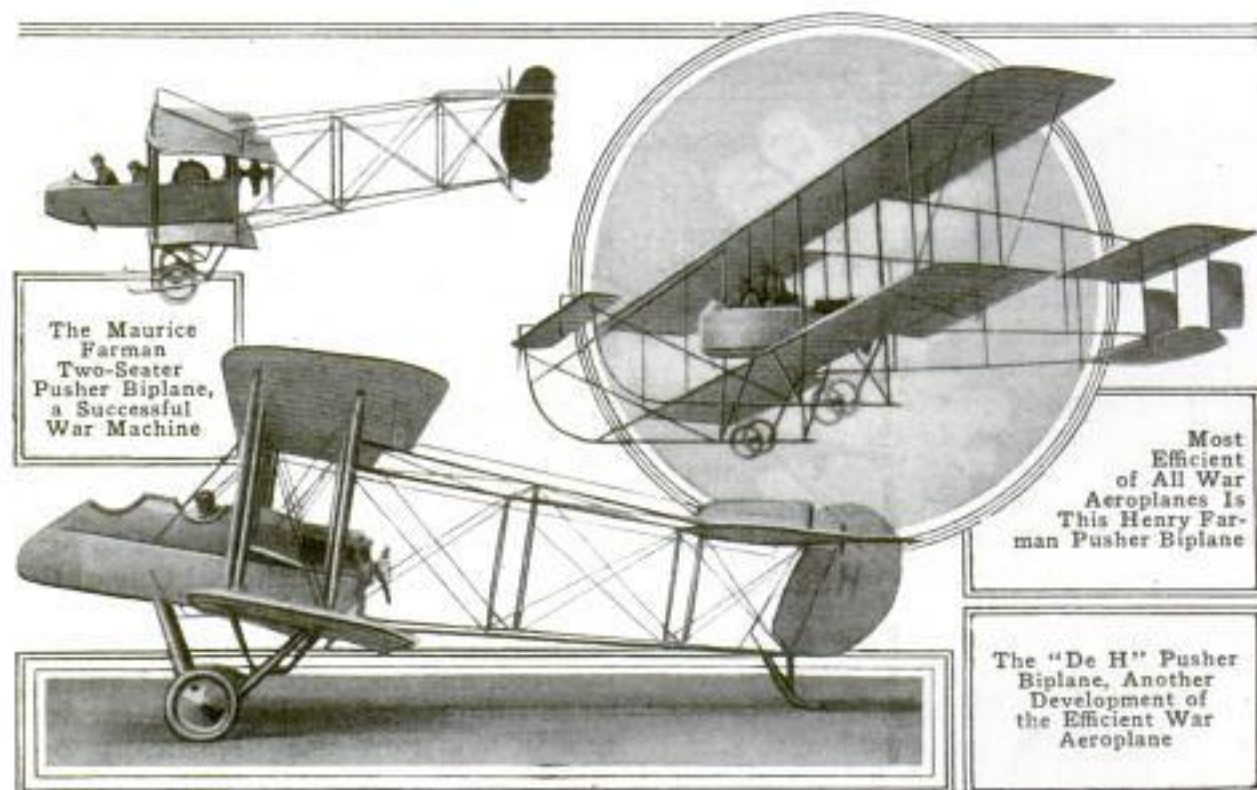
that there are quite enough of them to make it very uncomfortable not only for German aeroplanes who are too inquisitive about the movements of British troops on the continent, but also to any enemy aeroplanes which arrive in the vicinity of London.

The success of this type of machine has, of course, encouraged the production of still bigger things of this kind, and just before the war it became publicly known that the Short Brothers had produced a big seaplane of 160 hp. which carried a 1½-pounder quick firer instead of a machine gun. This machine was much noticed at the great review of the British fleet less than a month before war was declared, and naturally similar weapons have been produced since, so it is quite possible to believe that we are actually within sight of the aerial warship capable of carrying at any rate naval 3-pounders, if nothing bigger.

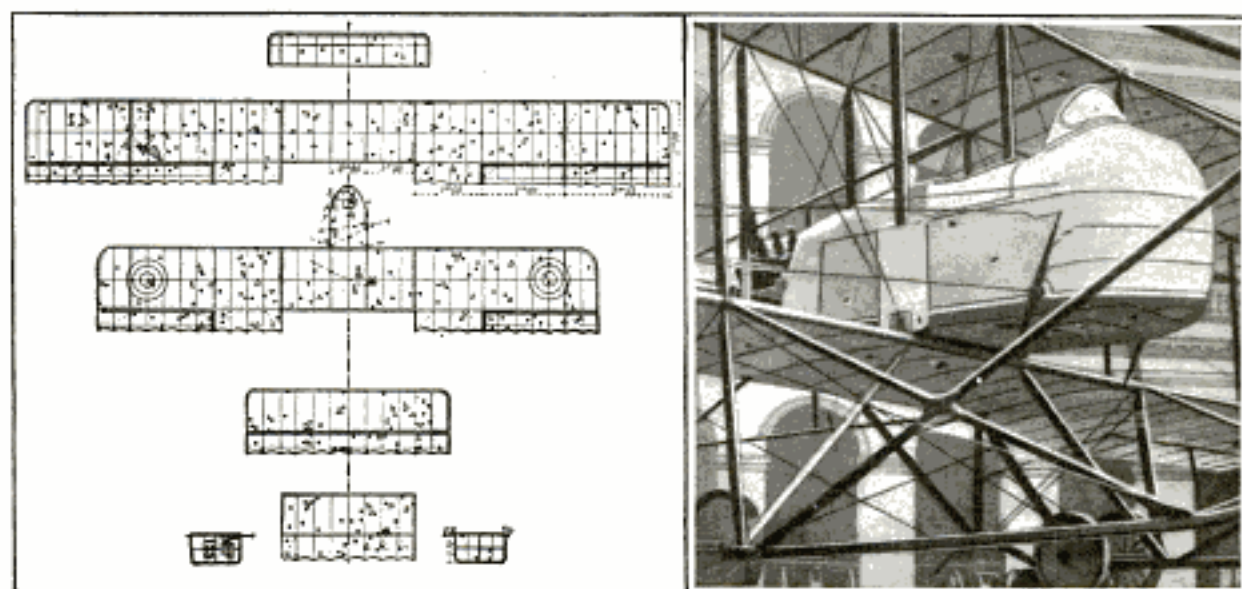
Considerable attention has been paid of late to the production of machines which are "inherently stable," that is to say, aeroplanes which will right themselves if left alone, in whatever

position they may be thrown by wind, or, say, by the air shock of a shell bursting in their immediate neighborhood. A considerable amount of success has been obtained in this way, but it is recognized by designers as a kind of axiom, something like the law of leverage, that what one gains in stability one loses in efficiency. However, now that engines are becoming more efficient, one can afford to sacrifice something for the sake of this stability, which is quite an important question, especially for the passenger in an aeroplane if the pilot gets hit.

Some time ago an officer was out as a passenger observing artillery fire, when suddenly the machine stood on its nose and began to dive vertically. He looked back and saw the pilot sitting with his hands covering his face and blood streaming between his fingers. He made up his mind that his time had come to hand in his check—having no control over the machine himself—when the pilot again took charge. The passenger saw then that a bullet had struck his companion's goggles, smashing them and



These Pusher Biplanes with "Sawed-Off" Fuselage, Nicknamed "Shorthorns," have Proved the Most Efficient Type for War Use, Since They can Carry Two Passengers and an Effective Gun at High Speed



COURTESY L'ILLUSTRATION

Illustrating the Severe Injuries an Aeroplane can Sustain and Still Remain Serviceable, This Henry Farman Pusher Biplane, Which Made 120 Flights over the German Lines from July 31 to December 24, 1914, was Struck by 400 Bullets, Shrapnel, and Pieces of Exploding Shell without being Disabled. Neither the Pilot nor the Observer was Ever Wounded, Although on One Ascent the Machine was Struck 47 Times. The Diagram Shows the Location of the Holes

cutting the side of his face rather badly, but fortunately it did not knock him out nor damage his eyes. The pilot tore off the damaged goggles, wiped the blood out of his eyes, and landed behind the British lines, where he had his face roughly bandaged, put on another pair of goggles, and the two of them calmly went up again and resumed their work. But both of them after that began to think rather more highly of inherent stability, at any rate for such a job as artillery observation, where speed is not very important and where one is compelled to fly very much lower than one would in long-distance reconnaissance or on a bomb-dropping expedition, and so is more likely to be hit.

So far, very little attention has been paid to the armoring of aeroplanes, simply because bullet-proof plate is naturally somewhat heavy, even in the latest kind, which is less than one-eighth of an inch thick. Generally, opinion seems to be that a fast machine which climbs well out of range of rifle fire is actually of more value at the moment than an armored machine which climbs slowly.

The only serious attempts at armoring are that practically all the British aeroplanes and most of the French ones are fitted with seats made of bul-

let-proof plate, which do at any rate protect the pilot and passenger from body wounds when fired at from below, though, of course, it is no protection against fire from hostile machines on approximately the same level, nor against fire from the ground while the machine is banking in turning around.

In some machines also bullet-proof plate is fitted underneath the tanks, but only for special purposes, as when a fast machine is employed without a passenger with the intention of dropping bombs on some important point at which it is essential to come down very low.

One of the most astonishing things learned from the war is the amount of punishment an aeroplane will stand from hostile fire without collapsing in the air. In numerous cases shells have burst right underneath an aeroplane and have simply riddled its wings and body with shrapnel bullets, yet the machine has come down safely with anything between 100 and 200 bullet holes in it, and bits of torn fabric flapping in the wind. One officer recently described his machine after such an escape as looking like a molting chicken.

Taking it all round, very few defects have been discovered in the general design or construction of aeroplanes

used during the war. Some of them showed, after a few weeks of active service, that they were weak in the landing gear, and some of them that the internal structure of the wings was so designed that they would not stand exposure to wet and weather. These machines were promptly condemned, and the makers, chiefly French, were employed by their government to make aeroplanes after the designs of more successful constructors.

Perhaps the most curious fact connected with air craft in the war is that it has disproved entirely the opinion of those military people who believed that air craft would hasten the end of the first war in which they were employed. The idea was, of course, that as each commander-in-chief would be able to tell just exactly what his enemy was doing, there would be little or no preliminary maneuvering, and everything would be settled quite soon in one huge battle.

In practice, it has worked out in exactly the opposite way. Owing to air craft spotting everybody's maneuvers, it is impossible to mass troops at any one point without the opposition commander being able to mass, at any rate, sufficient troops to be able to hold up an attack until sufficient reinforcements arrive to repel it altogether. Even at the beginning of the campaign this proved to be the case, for although the German army utilized the wonderful Belgian railway system, and their own still more wonderful motor transport system, to rush whole army corps across Belgium with the intention of swamping outright the little British expeditionary force, the British air craft were able to spot their enormous movements, so that, by sacrificing a

few regiments, which were either shot to pieces or captured wholesale, the rapidity of the German advance was considerably delayed and the bulk of the British expeditionary force was able to retire with very little loss, and in good order, back to the line of the Marne, by which time enormous French armies had been formed, and reinforcements had arrived from England, to such an extent that the German army was driven back to the Aisne; and at the time of writing, both armies are facing one another practically concealed in two rows of ditches running from Nieuport in Belgium down to the Swiss frontier, and, thanks to air craft, neither side can possibly attack without the knowledge of its opponents.

As a result, the decisive battle of the war will simply have to be fought by sheer masses of men and weight of artillery. So that, after all, our latest invention as a weapon of war brings us back to the most primitive fighting of all—man-to-man frontal attack.

— 9715

### PARACHUTES RECOMMENDED

#### FOR ARMY AIRMEN

*"Army & Navy Journal"*

It has been recommended by the chief signal officer that parachutes designed for use with aeroplanes be purchased for members of the army aviation service. This step was taken following tests at the San Diego aeronautic station when a young woman made a successful drop of 1,200 ft. from an aeroplane. The parachute is light, compact, and so made that it may be folded and strapped to the occupant of a machine in such a way that it does not interfere with his normal movements.



The Newest French Warplane, the "Caudron," of Which France has Ordered 1,000

9713

POPULAR MECHANICS

## CELILO CANAL A LINK IN IMPORTANT WATERWAY

Uninterrupted water transportation to the Pacific Ocean is provided for 300,000 square miles of territory located in Oregon, Washington, and Idaho through the opening of the Celilo Canal, eight miles in length, connecting the navigable sections of the Columbia River above and below The Dalles, a gorge 220 miles from the mouth of the river consisting of a succession

500 miles inland. The canal cost the government \$6,000,000 and its construction required 10 years of continuous work. Five miles of the canal was cut through solid rock and the remaining three miles through sand and



Canal and Railways Paralleling The Dalles



Excavation for Tandem Lock Completed and Ready for the Concrete



Steel Reinforcing in Place for Concrete Walls and Bottom; This Is One of the Points Where the Lava Rock Is Too Porous to Hold the Water

of falls and rapids. Above and below The Dalles the river is a mile wide at an ordinary stage, while in one section of the gorge the river virtually turns on edge, the channel being 165 ft. wide and 200 ft. deep. With the completion of the canal continuous navigation is possible from the Pacific to Lewiston, Ida., a city located on the Snake River,

gravel formations that called for the construction of walls and bottom, mainly of reinforced concrete. The fall from the upper to the lower section of the river is 82 ft., and there are five locks with 10 passing basins for vessels. The minimum depth of water is 8 ft. Owing to the fact that the Columbia River is subject to heavy floods, spillways have been provided at a number of points along the wall. These will allow the water to pour out or in readily, in case the canal gets too full or is drowned out by a rise in the river. Construction of the canal was begun in 1905.

Inventor: *Geo. M. Stopper*  
*426 Market St.*

60

POPULAR MECHANICS

*Williamsport, Pa.*

### ALARM ATTACHED TO KEY,

### PREVENTS ITS LOSS

*9686*  
In an attempt to provide a means of preventing hotel guests from neglecting to deposit the keys to their rooms



with the management before leaving the building, an inventor has recently made a device which undoubtedly would accomplish its purpose if used. It consists of a cylindrical case, approximately the size of a watch, within which

several small bells are fitted with weighted clappers. The name of the hotel, the number of the room to which the respective key belongs, and the name of the city all appear on one side of the case. It is fastened to a chain holding the door key. If a hotel patron places this in his pocket, he is reminded of the fact constantly by the ringing of the small bells with each step he takes. The faster he walks the louder the chimes are rung.

*8968*  
**RUBBER DOLL THAT SWIMS  
IS NEW AQUATIC TOY**

Quite an unusual toy has been made in the form of a rubber doll which swims. It is hollow and connected by



a slender piece of tubing to a small air bulb. When it is not inflated the arms and legs are folded close to the body, which, to add to the effect, is clad in a miniature bathing suit. When it is placed in the water the head of the doll protrudes above the surface, while the body re-

main

*"The India Rubber World"*

*12/1/14*

mains submerged like that of a swimmer. By pressing on the bulb and forcing air into the device the small arms and legs are straightened out, while the release of the air quickly draws them back to their folded position so that a very lifelike stroke is made. By pressing the bulb intermittently the doll is made to swim ahead quite rapidly through the water.

### GAS HEATERS DISPLAYED ON REVOLVING RACK

*9670*  
By means of a revolving rack built at small cost and occupying floor space less than 4 ft. in diameter, a



Detroit firm is able to display 16 gas heaters in such a way that comparison of the different heaters is easy and convenient. The vertical shaft is made of 2-in. pipe while the arms from which the heaters are hung are made of 3/4-in. pipe. The arms are supported by a collar that revolves on the shaft. This collar

in turn rests on a second collar that is fixed to the shaft by setscrews, a ball bearing being provided between the two to insure ease in turning. There are two such racks, swinging independently of each other on the same shaft and each provided with arms for holding eight heaters.

¶To prevent injury to pedestrians by the rear wheels of motor busses, a kind of accident that the driver is usually unable to guard against, a motor-bus company in New York City has installed fenders for the rear wheels of all its cars.

*A. Harvey's Iron Manufacturing Co. Detroit, Mich.*

Cont. - Ed. Fletcher Company

POPULAR MECHANICS

920 Eighth St. San Diego Calif



Sleeping Rooms Like These, Built in the Tree Tops and Furnished Like the Rooms of the Hotel, have Become a Popular Feature of a Mountain Resort in Southern California

**SLEEPING ROOMS BUILT IN TREE TOPS**

9641

Sleeping rooms built in the tree tops furnish one of the novel attractions at a mountain resort near San Diego, Cal. These structures are built as little one-room cottages, and are supported on spreading branches or hung from the upper limbs of the trees by strong wire cables. The rooms are reached by stairways built around the tree trunks. They are furnished like the rooms of the hotel proper and are said to have proved one of the most popular features of the resort.

became necessary to supply an additional 100,000 gal. a day. To accomplish this a 4-in., single-stage centrifugal pump was connected into the well pipe line at the level of the ground, and after considerable experiment a speed for the pump was found at which it would deliver the required additional supply. The effect of the pump is that of lowering the head

**FLOW FROM ARTESIAN WELL INCREASED BY PUMPING**

The use of a centrifugal pump for boosting the flow has proved a successful solution of the water-supply problem in a city in North Dakota that depends on an artesian well sunk 20 years ago to a sandstone stratum 2,800 ft. below the surface. The normal flow from the well is approximately 170 gal. a minute, or 244,800 gal. in 24 hours. With the growth of the city it



The Flow from Artesian Well is Increased 100,000 Gallons a Day by the Centrifugal Pump Located in the Housing at the Edge of the Reservoir

against which the water must be lifted by the natural pressure and is exactly the same as if the depth of the well had been decreased, the pump pulling the water at the top while the natural

cont. - Alfred C. Fox, Box 796, Devils Lake, N. D.

9673

pressure pushes it up from the bottom. The pump is of a type that permits the water to flow unobstructed when not in operation. The water supply in the sandstone stratum is thought to come from the Black Hills or the Rocky Mountains and to be inexhaustible, and if this is the case, getting a further addition to the supply is only a matter of speeding up the pump.

*Cont. Frank C. Perkins, 655 Prospect Ave. Buffalo, N.Y.*  
**THREE-WHEELED TRACTOR**  
*mfr. The Hume Mfg. Co., Hume, Ill.*  
**FOR FARM USES**

Several novel features are incorporated in a new gasoline tractor which has recently been developed for agricultural purposes. The machine is mounted on three wheels and is designed particularly for plowing, harrowing, and cultivating soft or sandy soil. The drive wheels are slightly more than 6 ft. in height and have 16-in. rims. The bull gear is made in five sections, each of which is easily removed so that a break may be repaired quickly. The weight of the machine is approximately 7,000 lb., the over-all length 12 ft. 6 in., and the speed, while working or on the road, between two and three miles an hour. It is lubricated by an automatic splash system. In factory tests it has shown a drawbar pull of 4,000 lb. continuously for several hours, it is claimed. Plowing may be done close to fences.

**EXHAUST PLACED AT SIDE  
OF MOTOR AMBULANCES**

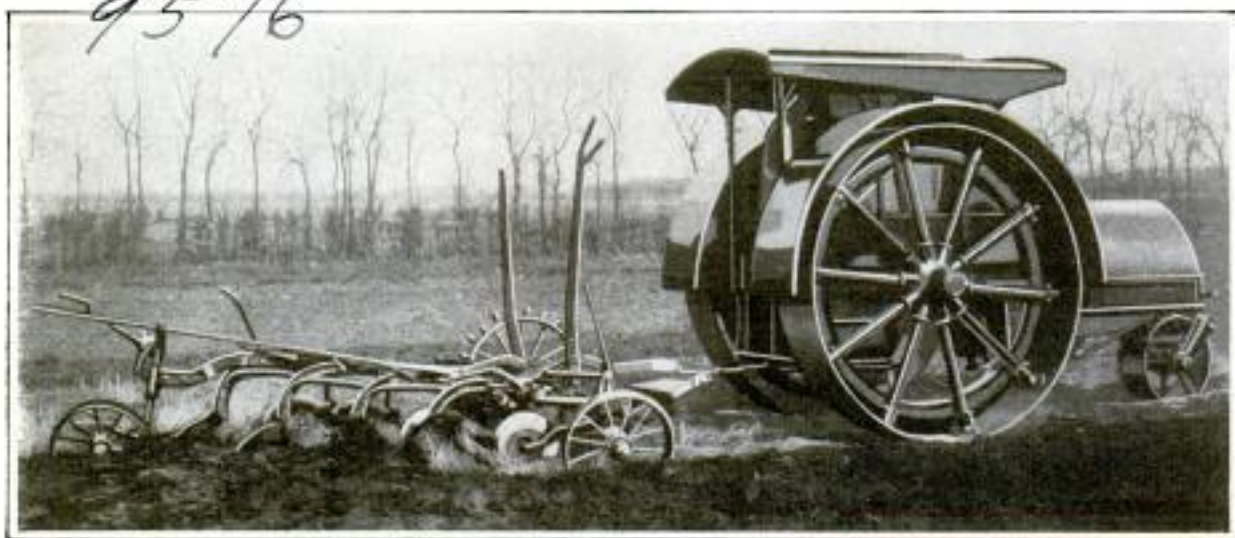
9550

Experience in the European war has shown that the practice in motor-car construction of placing the exhaust pipe at the rear is wrong when applied to hospital ambulances for field use. When the doors of one of these machines are opened at the back, the fumes from the engine have a tendency to rise into the compartment occupied by the wounded soldiers. This has proved very annoying and has resulted in the exhausts on new ambulances, sent from Britain into the fields, being placed at one side of the cars and in front of the rear wheels, pointing outwardly. This causes the smoke to be shot away from the machine instead of to the rear and is said to be more satisfactory than the old method.

*Cont. W. H. Hornaday, Austin, Texas.*  
**NEW HYDROELECTRIC PLANT  
AT AUSTIN, TEXAS**

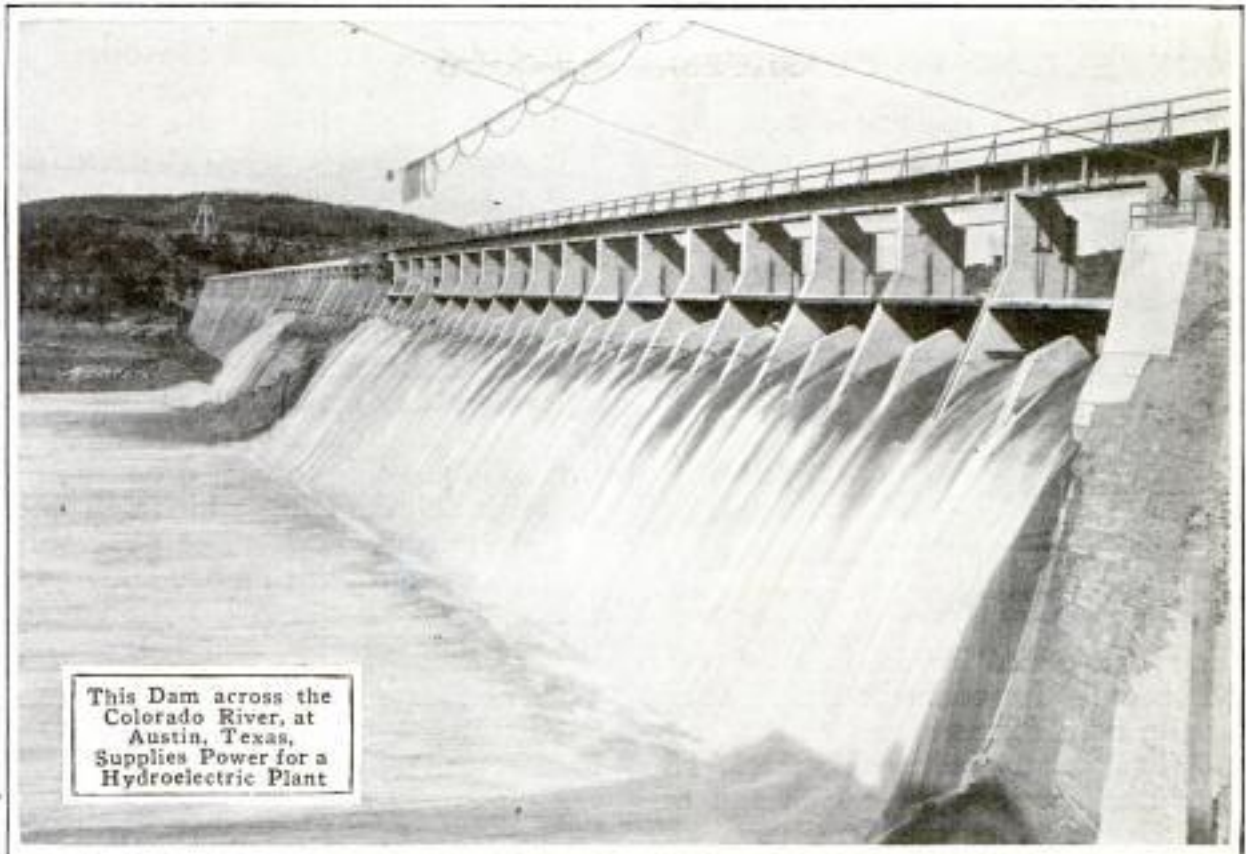
By damming the Colorado River and creating a large reservoir, or lake, which extends back almost 30 miles, water power has been provided at Austin, Texas, for a hydroelectric plant that is now lighting the city and supplying its industries with electric power. The enterprise, which represents an investment of approximately \$1,750,000, has been financed without

9023



An Easily Driven Tractor Which is Intended for Cultivating Soft and Sandy Lands





This Dam across the Colorado River, at Austin, Texas, Supplies Power for a Hydroelectric Plant

the city issuing bonds. The work was constructed by private capital which for a term of years will control the properties, subject to the terms of a contract ordinance, receiving its revenues until, loosely, the amount of the investment, with interest upon that sum, and the contractor's and promoter's profits have been collected, when the enterprise will revert to the city free from debt, to be thereafter municipally owned and operated. The lake which has been created by the establishment of the dam gives the city a large expanse of water which it is planned to beautify. The new dam occupies the site of a previous one which was destroyed by a flood a number of years ago.

device consists of a broad board, in the middle of which a piece is cut out following the lines of a two-piece suit. This member is hinged in the opening so that various fabrics may be placed over it and pressed flush with the display board when it is pushed back in place. Only that part of the cloth forming the model suit is visible. The outlines of the pockets, the collar and the cuffs are formed by wires, while a set of buttons is held in place by a similar arrangement.

**THE MODEL SUIT MAKER**



*See from 15  
824*

At the Left is Shown How the Device Looks When in Use, While at the Right the Frame is Open Ready to Receive a Piece of Fabric

*The Big Four Sales Co.,*  
**DISPLAYING SUIT FABRICS BY**  
**NOVEL MEANS**  
*Ohio.*

An ingenious apparatus has recently been invented which enables a tailor to display his fabrics in such a manner that a customer is given a fairly concrete impression of how different pieces of goods would look if made up. The

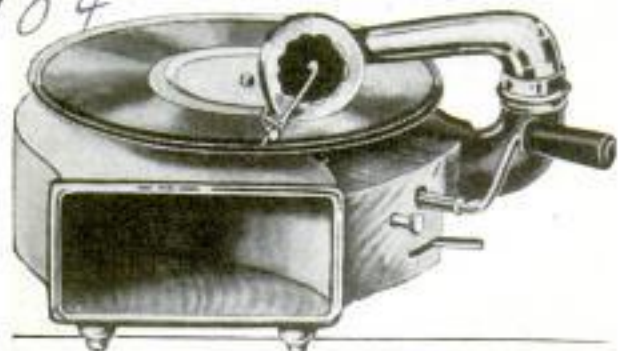
*Invented*  
**Emmett McCarroll**  
*Bedford, Ind.*

*9468*

*9468*

### PORTABLE TALKING MACHINE CONVENIENT FOR CAMPERS

Because of its unusual compactness and lightness, a new phonograph which has recently been developed is particularly adapted for use in a canoe or motorboat. Its construction is novel, for the horn forms a part of the body and thus greatly reduces its size. The instrument weighs only 6 lb. and fits into a case which may easily be carried on a camping trip or stored in a locker at a canoe house where it is accessible for use whenever wanted on the water. It plays disk records and is very inexpensive.



This Compact Phonograph Is Remarkably Light and may Easily be Carried on Canoe or Camping Trips

particularly adapted for use in a canoe or motorboat. Its construction is novel, for the horn forms a part of the body and thus greatly reduces its size. The instrument weighs only 6 lb. and fits into a case which may easily be carried on a camping trip or stored in a locker at a canoe house where it is accessible for use whenever wanted on the water. It plays disk records and is very inexpensive.

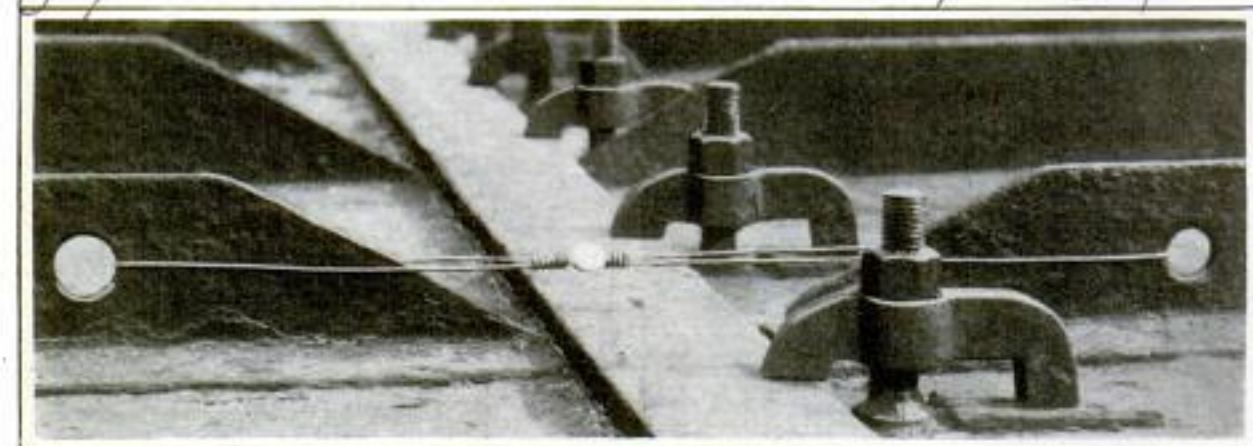
"The Engineer" Feb. 9, 1915  
SOUTHERNMOST RADIO PLANT  
IS OPENED BY CHILE

Near Punta Arenas on Brunswick Peninsula on the Strait of Magellan the Chilean government has established a powerful wireless station which is now in operation. The plant

has two separate equipments, one for long-distance work and the other for ship traffic; the former being a 100-kw. installation and the latter a 5-kw. set. The steel towers are 250 ft. in height and support four different sets of aeri-als, two of which are for radiating 100-kw. waves of different lengths, the third for receiving the long waves, and the fourth for the small equipment. To safeguard the antennae against damage when they may be covered heavily with ice, they have been arranged so that it is possible to pass a heavy current through the wires which will thaw the sleet from them. The generating plant is supplied with a 270-hp. engine which develops 140 kw. with voltage ranging between 200 and 360.

International News Service  
SEALING CARGOES BOUND  
THROUGH WAR ZONE

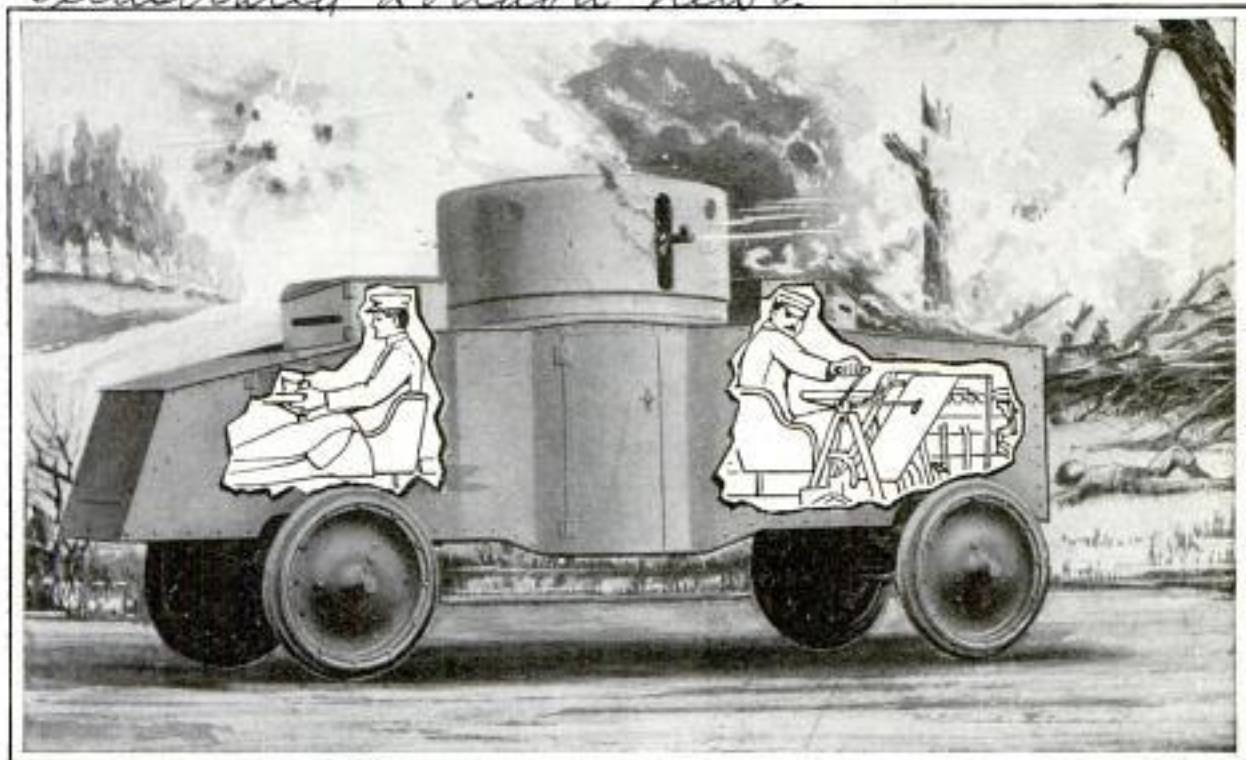
In order to do away with the necessity for the detention of merchant vessels by British warships and the taking of such vessels into a British port for examination, British officials at American ports are now putting their official seals on cargoes that are to pass through the war zone. The ships are inspected before they leave the American port, and if the cargoes are found to be of a satisfactory nature, the hatches are closed and sealed. How this is done is shown by the illustration of the sealed hatch of the "G. E. Fordney," which sailed from Brooklyn recently.



One of the Hatches of the Steamship "G. E. Fordney," Sealed by British Officials at an American Port to Prevent Detention of the Ship While Passing through the British War Zone

Thos. B. Jeffery Co.,  
Kenosha, Wis.

Illustrated London News



This Armored Motor Truck, Which is Designed Throughout for War Purposes, may be Driven from Either End at the Same Speed

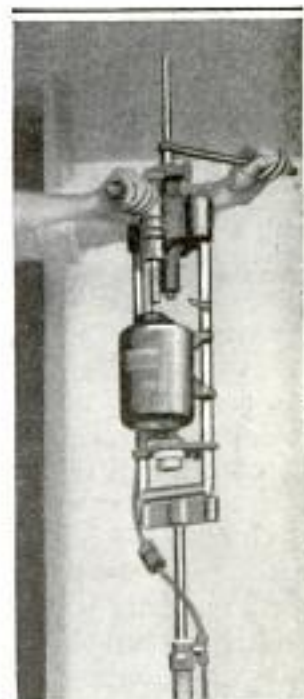
**ARMORED MOTOR CAR DRIVEN  
9552 FROM BOTH ENDS**

Several of the European armies now engaged in war are using an American-made armored motor car which is designed to be driven from either end. It has four forward and reverse speeds, enabling it to be driven as rapidly in one direction as in the other and doing away with the necessity of having to turn the machine around before it can proceed in a direction opposite to that in which it has been traveling. It drives, brakes, and steers on all four wheels, and has a place at each end for a chauffeur. The man at the front of the car has complete control of it when it is going forward, but when it is run backward, the steering wheel, brakes, and clutch are operated by the rear driver. The car is fitted with a central revolving turret, in which a machine gun is mounted. It can also be cranked from the driver's seat.

Using waste tin plate left after standard tin goods are made, a Baltimore manufacturer produces a large variety of cheap tin products.

**NEW PORTABLE ELECTRIC  
PERCUSSION DRILL 9422**

A new portable electric drill that has just been brought out is designed for drilling in such materials as concrete, brick, and marble. It is operated by a motor that takes its current from any light or power line and can be used either with direct or alternating current. The motor and drill are mounted on an adjustable standard that can be fitted to practically any space required in working about a building. This apparatus is capable of drilling a 1-in. hole in concrete at the rate of one inch of depth per minute.



Cont. - Frank C. Perkins,  
655 Prospect Ave.  
Buffalo, N.Y.

Mfr: The Electric Tachometer  
Co.,  
Broad & Spring Garden  
Philadelphia.

Mfr.- Holt Manufacturing Co., Stockton, Calif.

Cour.- 66 Herbert A. Migraw, 825 W. 178 St., New York City  
POPULAR MECHANICS

**WAGON BUILT WITH WHEELS  
TEN FEET IN HEIGHT**

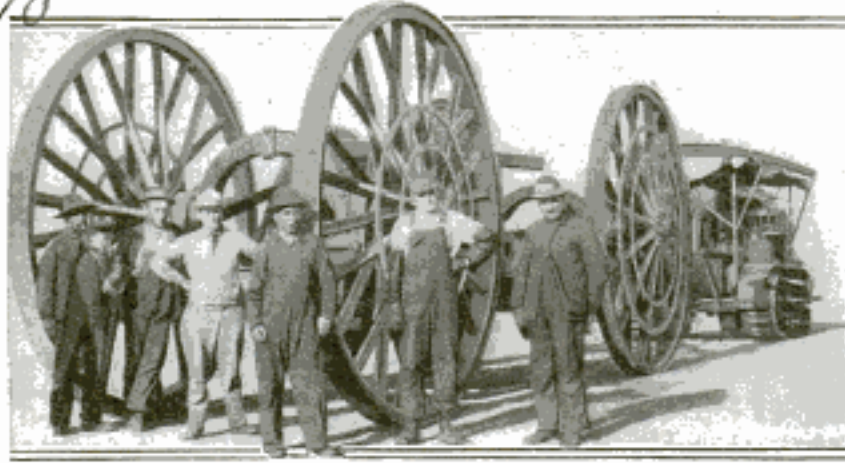
For transporting machinery of great weight from one point to another in

fitted with wheels approximately 10 ft. in diameter and drawn by a caterpillar-tread tractor, is used. The wheels are provided with spokes which are set in the same manner as those of a bicycle

wheel, and are placed on heavy steel axles highly arched in the middle. The purpose of this arching is to enable the load to be suspended beneath the axles instead of being carried above them. This materially lessens the difficulty of hoisting machinery onto the bed of a wagon and also eliminates the danger of the vehicle being overturned on

account of the load being carried high. The load is suspended by heavy chains.

9370



This Type of Wagon is Used in the Mining Districts of California for Transporting Heavy Machinery

the mining districts of California, a specially designed vehicle, which is

Cour.- W. A. Hillam, 1178 Pender St., W., Vancouver, B.C., Canada  
NOVEL METHOD OF RAISING SUNKEN STEAMSHIP

9689

The raising of the steamship "Curacao," which had sunk near Warm Chuck on the southeast coast of Alaska over a year before after striking a reef, was in many ways one of the most remarkable pieces of salvage work ever carried out on the Pacific coast. When the ship foundered it went down with its bow hard against an abrupt beach, with the bow showing above the water and the stern submerged 18 ft. at low tide. The range of the tide on that part of the coast is 15 ft. The "Curacao" is a ship of 1,500 tons' carrying capacity with a length of 258 ft., a beam of 38 ft., and a depth of 18 ft. At the time it foundered it had on board 800 tons of coal and 150 tons of general cargo. Before the work of raising was begun, a channel 110 ft. long was excavated inshore from the vessel on the same grade as that on which the hull rested, and it was up this channel that the vessel was hauled as it was gradually raised to the surface. The cargo was first removed, the coal being taken out with a suction pump, and the hold was filled with 600 empty gasoline drums

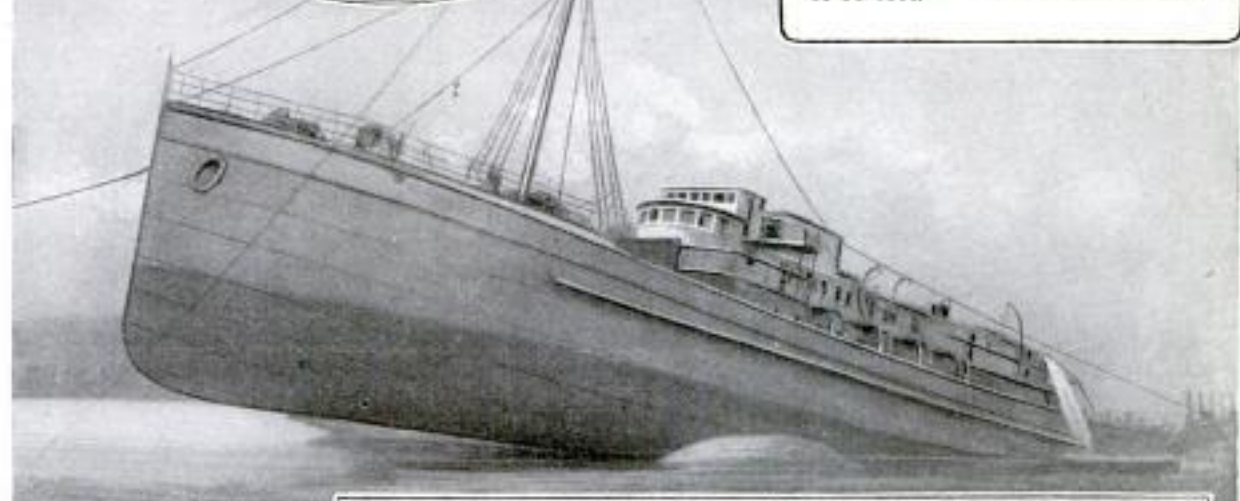
that had been made air-tight and water-tight and had a total lifting power of 270 tons. The tide was then set to work to do the lifting.

In this work three scows were used, one being placed on each side of the vessel and one over the submerged stern. To get the lifting slings under the hull it was necessary to use a hydraulic jet and to build a cofferdam around the forward hold, as the vessel had settled about eight feet into the silt and sand. At low tide the lifting slings were made taut. As the tide raised the scows, the hull was gradually lifted to a height of approximately 15 feet and was hauled forward, until it grounded, by a powerful tackle worked from shore. At the next low tide the lifting slings were again made taut, and the process was repeated until the vessel was beached above low-tide level. The hull was then pumped out and repaired, and the machinery was found to be so slightly damaged that after minor repairs the ship was able to make port at Vancouver under its own steam.

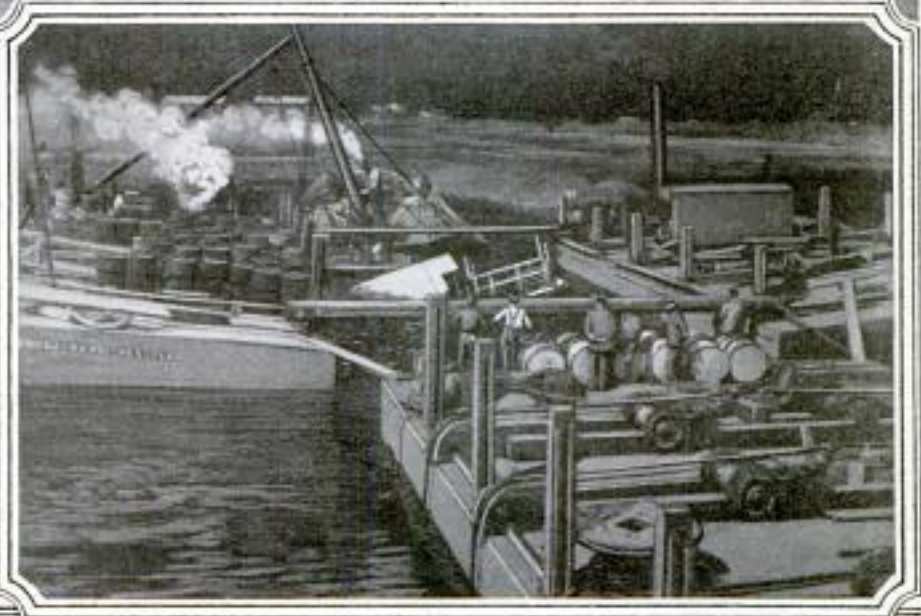
Looking toward the Bow of the "Curacao" from the Deck of One of the pontoons



**T**HE picture above shows how the "Curacao" looked after the work of raising had been well started, while the one below shows the vessel ready for the final haul to the beach. When the ship foundered it went down with its bow hard against an abrupt beach, with the bow showing above the water and the stern submerged 78 feet at low tide. A channel 110 feet long was excavated inshore from the hull and it was up this channel that the vessel was hauled as it was raised to the surface. The actual lifting was done by the tide through the action of lifting slings suspended from scows moored around the hull. The "Curacao" is a ship of 1,500 tons' carrying capacity with a length of 258 feet and a beam of 38 feet.



A Close View of the Scows with the System of Winches Used for Tightening the Lifting Slings: As Each Tide Raised the Scows the Hull was Gradually Lifted to a Height of Approximately 15 Feet and was Then Hauled Forward Until It Grounded, the Work of Hauling being Done by Powerful Tackle Worked from Shore



Cour.-- Florence L. Clark.  
~~W. H. Rogers, Iowa.~~  
 Watford, S. D.

Inventors: Geo. B. & Wm. H.  
 (S. B. assigned) Bradshaw,  
 18. H. (entire) Brooklyn, N. Y.  
 1134 073 - Nov 30 - 1915  
 RUBBER AND RESIN USED AS  
 CHICLE SUBSTITUTE Taken  
 from Patent Papers  
 9654

**7501 DANGEROUS CURVES SHOWN BY ROAD SIGNS**

To lessen the possibility of accident on some of the mountain passes of Colorado, signs which give warning



A Diagram of the Curve Ahead is Shown by These Road Signs Which have been Erected on Some of the Mountain Drives in Colorado

of dangerous turns and also indicate their character have been erected in various places along several of the drives. A chauffeur upon approaching a sharp curve, or letter "S," can tell at a glance the nature of the road he is about to encounter, by reading the diagram carried on the board. The signs appear at one side of the road and are sufficiently large to be seen for several hundred feet.

C The average power development of the human body is 2.5 kw.-hr. per day.

An inexpensive substitute for chicle, a gumlike material obtained from the sapodilla and bully trees and largely used in this country as the basic ingredient of chewing gum, has recently been found in a product manufactured from resins, gutta, and oil. The resins used represent the waste obtained in deresinating various kinds of rubber. This material is dried, ground, and put through a purifying process which partly consists in treating it in a solution of sugar and soda and superheating it with steam. Several varieties of gutta are then deodorized and disinfected by being ground and treated in a solution of soda and zinc chloride, to which salt may also be added. A certain amount of rubber is masticated and worked in a solution of rubber and petrolatum. In order to lower the melting point of these materials so that they will become plastic from the heat of the human body, coconut butter or petrolatum, a petroleum residue, is added. The resins and oil are mixed with the guttas at a boiling temperature. The result is the chicle substitute, which for chewing-gum purposes contains 47½ per cent resin, 8¼ per cent petrolatum, 11 per cent sugar, 1¼ per cent coconut butter, 8 per cent rubber, and 2½ per cent gutta and salt.

**ELECTRIC-CHAIR APPARATUS FOR FLESH REDUCTION**

Rigorous exercise which fatigues the muscular system and oxidizes its fatty infiltrations without subsequently causing physical exhaustion, is produced, it is claimed, by an electric apparatus which has recently been introduced in this country as a cure for obesity. A reclining chair covered with aluminum electrodes, which fit the curves of the body and are supplied with an interrupted galvanic current regulated by a series of rheostats, briefly describes the device, which is a German invention.

9628

Machine in use by  
The "Nagelschmidt  
System"

Dr. J. M. Blake  
15 E. Washington St.  
Chicago.  
69

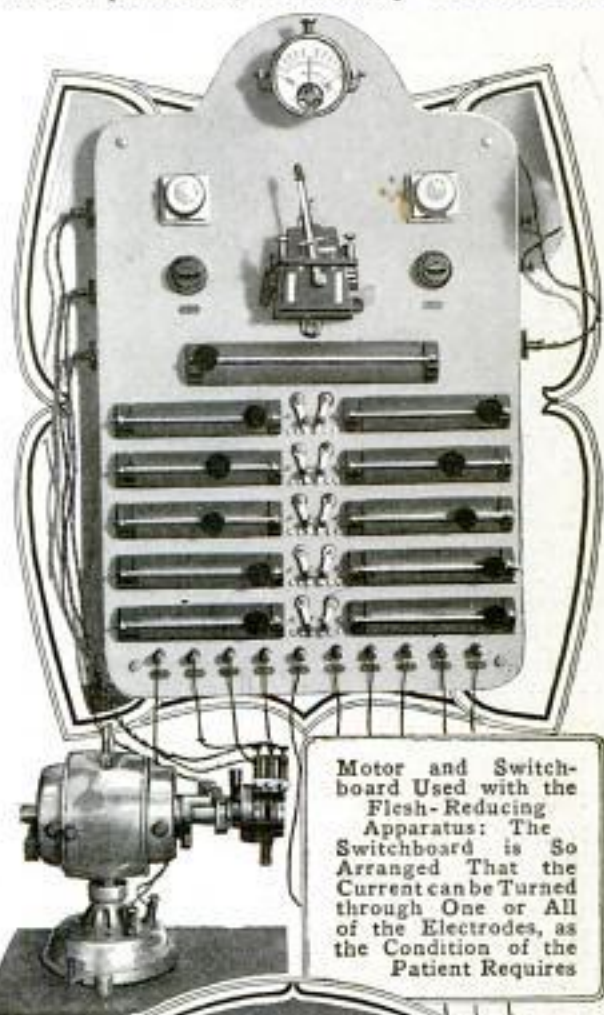
### POPULAR MECHANICS

Mfr-- *Sanax Co. - Berlin, Germany*

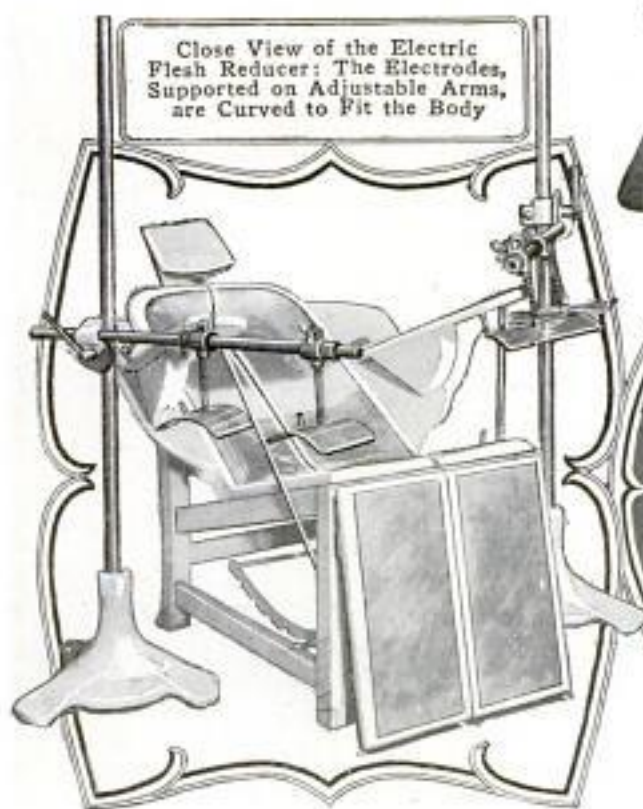
By means of the insulated electrodes, each of which is controlled separately, the current may be applied to whatever part of the body requires treatment. If a subject, for instance, is excessively large at the waist, but elsewhere not heavier than he cares to be, the flesh-reducing may be limited to that specific region.

A 30-volt, 250-milliamperere current is used. The circuit is alternately opened and closed from 40 to 80 times a minute, according to the condition of the patient, by a metronome. This is a pendulum device fitted with a cross-bar, at both ends of which are platinum needles that work in and out of small cylinders of mercury, closing the circuit and then breaking it. Each time this is done, all the muscles included in the region reached by the circuit are contracted. Besides this, the current is so interrupted that the muscles are given up to 2,000 vibrations with each contraction, which in the lower-trunk muscles is sufficiently strong to lift

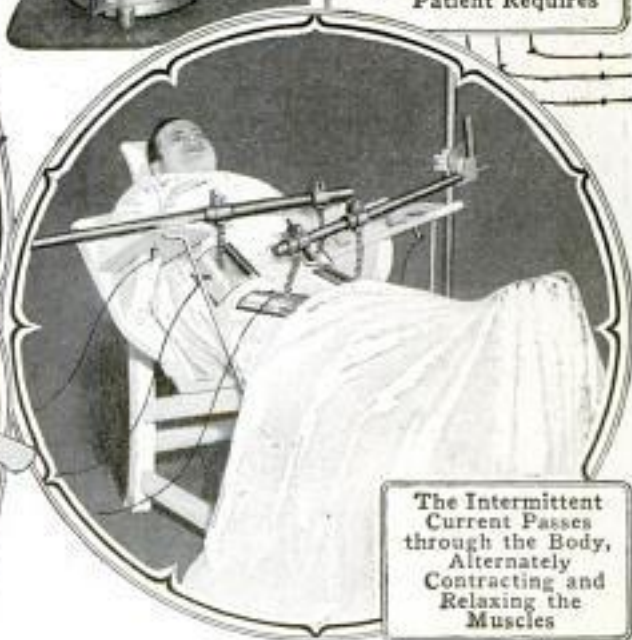
induced exercise, which is entirely involuntary and said not to increase the blood pressure, noticeably increase the



Motor and Switchboard Used with the Flesh-Reducing Apparatus: The Switchboard is So Arranged That the Current can be Turned through One or All of the Electrodes, as the Condition of the Patient Requires



Close View of the Electric Flesh Reducer: The Electrodes, Supported on Adjustable Arms, are Curved to Fit the Body



The Intermittent Current Passes through the Body, Alternately Contracting and Relaxing the Muscles

weights of from 40 to 50 lb. They are thus worked far more violently than could possibly be accomplished by physical endeavor. This electrically

heart action, nor cause mental fatigue, demands heavy breathing on the part of the patient, developing the lungs and muscles while eliminating fat.

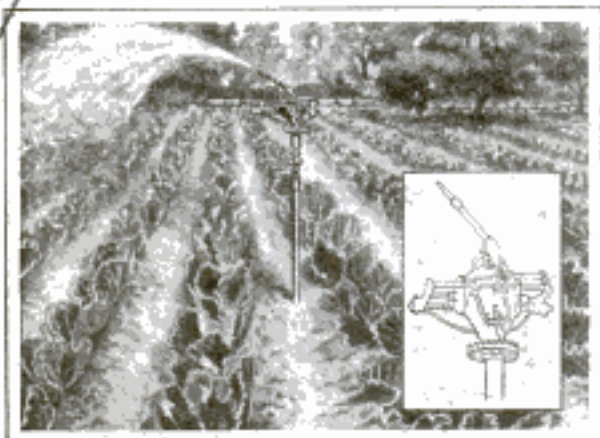
Inventor: J. P. Campbell, Jacksonville, Fla.

Cont: -- John J. Mulkey, of "Metropolis," Jackson, Fla.  
70 POPULAR MECHANICS

### SPRINKLER SYSTEM DEvised FOR TRUCK GARDENS

For irrigating truck gardens, berry patches, and small fruit farms, an auto-

8881



Automatic Sprinkler in Use in a Truck Garden

matic sprinkling system has been designed by a Florida inventor which is said to have proved useful to small growers who have experimented with it. The sprayer used throws water over a circular area varying in radius according to the height at which it is mounted and the pressure available. The device is made with a quarter-inch nozzle which is alternately raised and

lowered as well as turned to the various points of the compass by a mechanism actuated by the flow of water. It is mounted at the top of a water pipe which is intended to be extended from 6 to 30 ft. above the ground, as the pressure will permit. The piping may be laid to include a wide area, and, if necessary, the sprinklers changed from one pipe to another as different parts of a garden are irrigated.

9626

### ROAD MIRRORS FOR FENDERS OF CLOSED MOTOR CAR

Round mirrors mounted on plain metal fixtures, approximately three inches in height, are being fitted to the front fenders of motor cars in order to provide a driver, especially of a closed machine, an adequate view of both sides of the street behind him. The devices are small enough not in any way to detract from the appearance of a car. The glass is slightly concave, providing a somewhat broader view at close range than would be obtained with a straight surface. The mirrors are placed on each fender.

supplied by an accessory firm

7539

### CANTILEVER BRIDGE BUILT BY LUZON NATIVES

Bridges spanning small streams in the Philippine Islands are customarily made of bamboo poles, the native lumber of the tropics which is used in the construction of almost everything for which wood is utilized elsewhere. An interesting piece of work consisting of a cantilever bridge built solely with bamboo, exists near the small village of Legaspi, on the coast of Luzon. The uprights, or abutment piers, are sunk firmly into the ground and braced, forming slender but substantial supports for the flooring. The approaches to these are similar to broad ladders,

and are leaned at an angle so that they can be climbed without the use of the hands. The poles are lashed together tightly with "bujuco," a tough vine re-

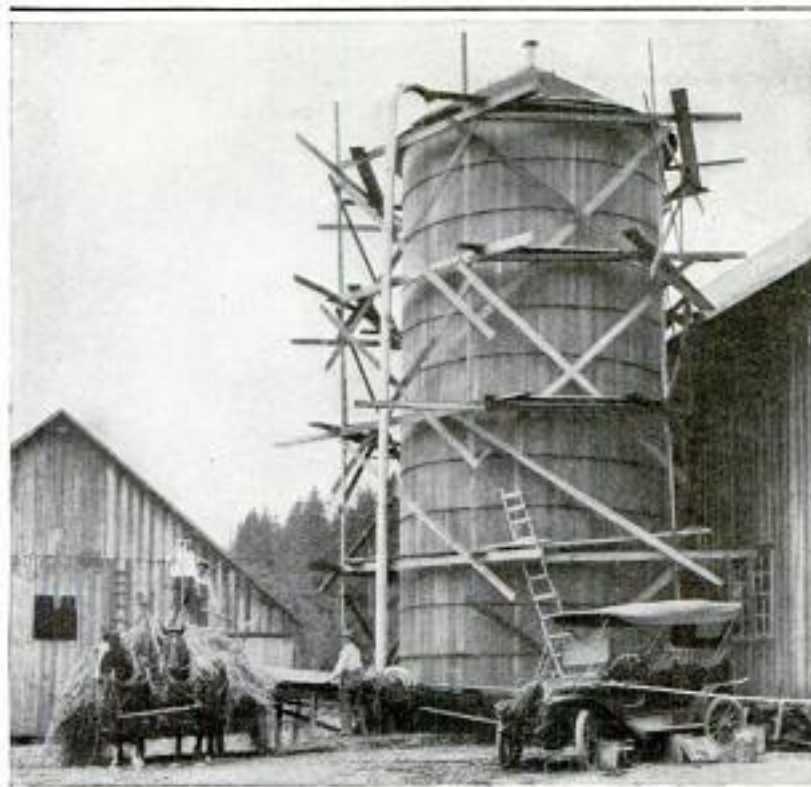


Philippine Bridge Made of Bamboo with Cantilever Principle

sembling cane, which is used extensively for building purposes and furniture making.

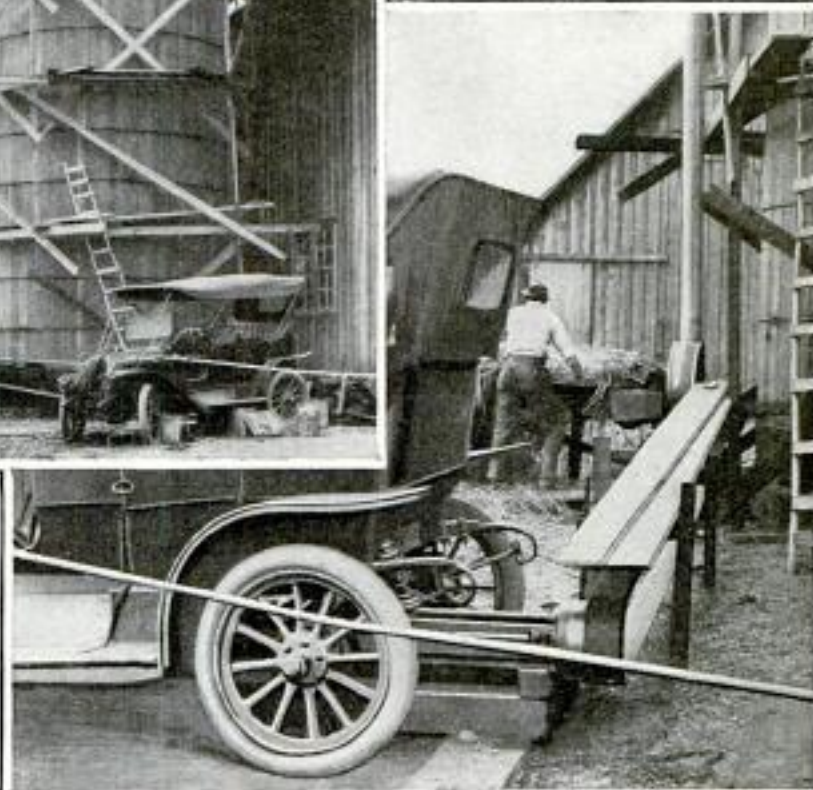
Cont. - Gerald Wright,  
24 Park Place,  
Newark, N. J.





Instead of Transmitting the Power through the Wheels as is Ordinarily Done, a Connection is Made with the Main Driving Shaft of the Car by Means of a Shaft Extension Which Drives the Cutter and Blower through a Belt. The Engine is Kept Cool under the Heavy Load by a Continuous Circulation of Water Supplied to the Radiator by a One-Half-Inch Pipe

The Picture Above Shows How an Enterprising Western Farmer Uses His Motor Car for Supplying the Power for Cutting Up Ensilage and Depositing It in the Silo, Which Holds 65 Tons of Oats Ensilage. The Work is Done in One Operation. As Fast as the Material is Cut It is Blown by a Fan up a Chute and Deposited at the Top of the Silo



### MOTOR CAR CUTS ENSILAGE AND FILLS SILO

8/5/ An Oregon agriculturist who utilizes his motor car for power purposes, harnessing it to various pieces of farm machinery, cools the engine when it is running under a heavy load by providing a continuous circulation of cold water. This is accomplished by allowing a 1/2-in. pipe to feed into the radiator, the water passing through its channels and out of the drain cock. An accompanying photograph shows the machine cutting ensilage and filling a 65-ton silo in one operation. Instead of transmitting the power through the wheels, as is ordinarily done, a connection is made with the main driving shaft. As the fodder is cut it is blown by a fan up a chute to the top of the silo.

### SURF WASHERS OF ALASKA ON BEACH AT NOME

9252  
D. F. Kellogg.  
Grafton, N. D.  
Along the beach at Nome, Alaska, there are a number of old miners who derive small incomes by washing the gold out of the sands as the fine particles of the mineral are concentrated here and there in little dark streaks by the waves of the Bering Sea. They are called surf washers, a name also applied to the apparatus they use. One of these devices consists of a rough inclined structure built where the waves will wash upon it. The sand is carried in a wheelbarrow from points where it is concentrated, and is dumped in the hopper and carried down the incline, or sluice, across which is a series of cleats that catch the gold, which is heavier than the sand and sinks to the bottom. A small amount of quicksilver is put

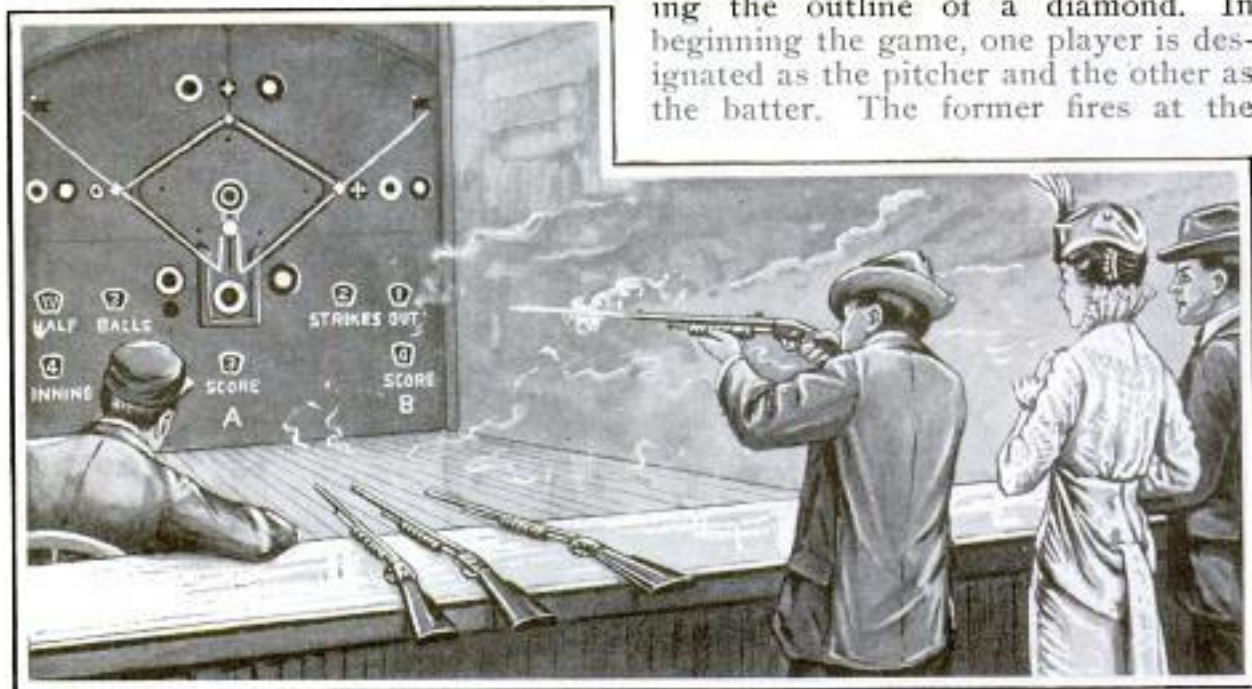


Some of the Old Miners at Nome Still Wash Gold Out of the Sands on the Beach, Where It Collects in Small Dark Streaks as It is Washed Up by the Waves

into the sluice so as to catch some of the small particles of gold that otherwise would escape. There is only a little gold to be found on the beaches now, but each year tiny patches of the black sand, the color of which is caused by the presence of other mineral particles which follow the gold as it is washed about by the waves, are found by the surf washers.

### RIFLES PLAY BASEBALL IN SHOOTING-GALLERY GAME

Baseball played with rifles is a new adaptation of the summer sport which has been made for shooting-gallery purposes. It is played by two persons, one opposing the other, and demands quick, accurate shooting. Two targets are placed at each base position and at the pitcher's mound, on a board carrying the outline of a diamond. In beginning the game, one player is designated as the pitcher and the other as the batter. The former fires at the



Playing Baseball in a Shooting Gallery: A New Game That Offers a Diversion in Target Practice

*Mfr.* *Baseball Playograph Co., Stamford, Conn.*

*Cont:* *Brown & Dawson, Stamford, Conn.*

Mfr. - The Oklahoma Metallic  
Tie Co.

Coalgate, Okla.

9478

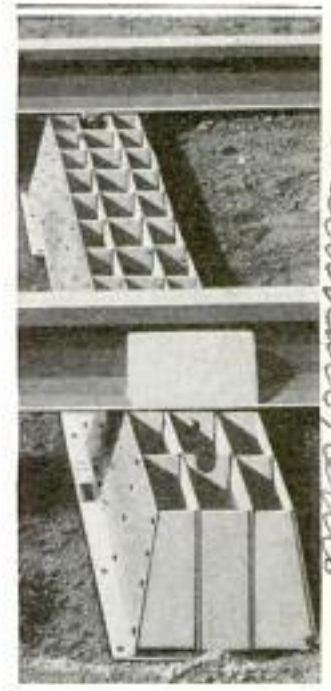
POPULAR MECHANICS

target marking the pitcher's box. This is a double target with a small bull's-eye in the center. In case this part is struck, a ball suspended between the pitcher's and batter's positions is dropped; in other words, thrown to the batter. If, however, the bullet misses the inner target and strikes the outside one, a "ball" is registered against the pitcher and in favor of the batter.

When the ball is put in play, the batter then fires at a similar target placed at the home plate. Providing he hits the bull's-eye, the base running is commenced, but if he hits the outer part, a "strike" is marked against him. At each base are two targets of different colors, one of which is used exclusively by each player. When the first-base target shot at by the pitcher is hit before his opponent sends a bullet against his target, the runner is put out. But if the reverse is the case and the batter strikes his target ahead of the pitcher, the imaginary runner is safe and passes on to second base, the shooting operation being continued until the man is either put out or makes his way around to "home" and scores.

STEEL TIE MADE AS REMEDY FOR RAIL SPREADING

Experiments are being conducted with a steel railroad tie built for the purpose of preventing the spreading of rails, which is one of the frequent causes of disastrous wrecks. The member is built up with steel plates and made in a honeycomb form so that it also serves as a guard that tends to prevent cattle from roaming along the tracks in rural districts. It is claimed that with this type of tie a road may be laid in less time and at a lower cost per mile than is possible when wood is employed. The life of the tie is said to be longer, also.

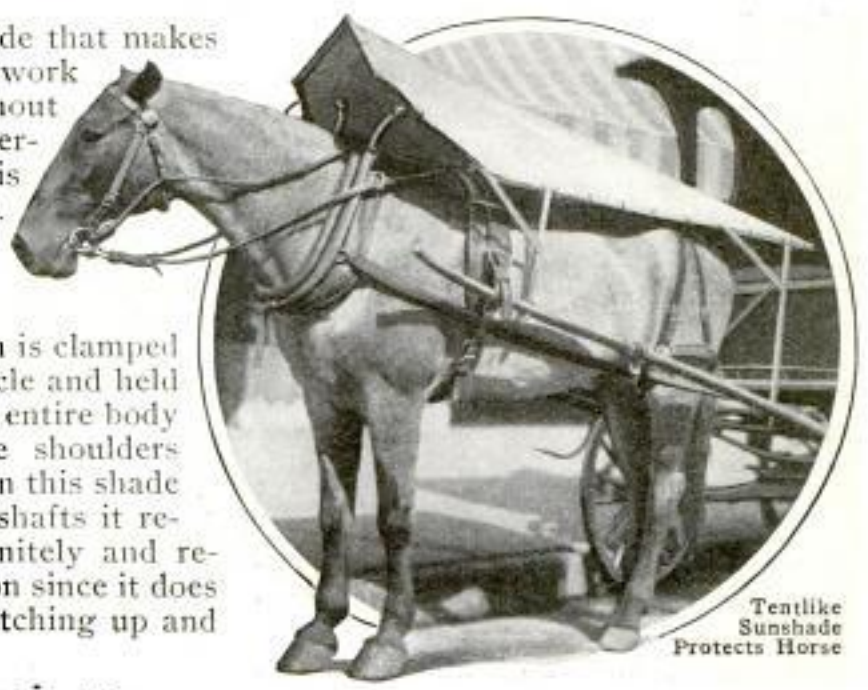


Cont. J. R. Schmidt, 3557 St. Charles Place, Cincinnati, Ohio, Hyde Park.

NEW SUNSHADE FOR HORSES PROTECTS WHOLE BODY

8032

A new type of sunshade that makes it possible for a horse to work all day under a tent without having his motions interfered with in any way is now coming into use. This shade consists of a piece of canvas stretched over a light steel frame which in turn is clamped to the shafts of the vehicle and held rigidly in position. The entire body of the horse, from the shoulders back, is protected. When this shade is once adjusted to the shafts it remains in position indefinitely and requires no further attention since it does not interfere with the hitching up and unhitching of the horse.



Tentlike Sunshade Protects Horse

Cont. - J. R. Schmidt, 3557 St. Charles Place, Hyde Park, Cincinnati, Ohio.

## COLOR LIGHTING MAKES MOVIES REALISTIC

By ERNEST A. DENCH

326 Decatur Street, Brooklyn

9512

**O**F the many imperfections in present methods of producing photographs the entire absence of color in the projected images is probably the one that is the most keenly felt by spectators at the motion-picture theaters. In this particular the theatrical stage has a tremendous advantage. It can revel in a wealth of color, and with modern facilities for stage lighting it is possible to produce almost any color effect to correspond with the atmosphere of a scene. On the movie screen there is none of this lifelike coloring—nothing but a monotonous succession of black and white pictures.

A new method now being tested in California gives every promise of eliminating this defect in film pictures. The apparatus consists mainly of a spot light provided with color screens, and with it any color, or combination of colors, can be thrown on the movie screen. The spot light is mounted on the projector and is under the control of the operator, but the exact way of mounting and manipulating has not been given out, as the apparatus is still in the experimental stage.

Attempts to inject color into the pictures by other methods have been made in the past. One of these consisted in treating the films with chemicals so that a red that would suggest fire and a blue that would pass muster as a night effect could be projected. This method met with little success and in many cases the films were seriously damaged by the chemical treatment. Another method was that of taking films made in the usual way and coloring them by a stencil process. This also proved unsatisfactory, largely because any imperfections in the coloring are magnified several thousand times in the projection of the pictures. That managers and public alike want realism is shown by the devices sometimes resorted to to accentuate the action shown in the pictures, such as the imitation of the throb of an

automobile engine when an automobile scene is thrown on the screen. One manager even went so far as to spray his auditorium with oriental perfume when a scene from Turkish life was being given.

But it is the realism of color that is most important and most wanted. With the new apparatus it is possible to produce realism and color effects in practically endless variety. Since a number of colors can be projected at one time it is an easy matter to tint the scene in almost any manner desired. In tests made at Los Angeles, a sunset at sea was so successfully colored that the effect was as good as if it had been produced by the best stage-lighting equipment, the crimson on the waves being apparently reflected from the deep red of the sunset clouds. Following this, the scene was changed to a moonlight night at sea by the simple expedient of taking away the red and throwing a pale blue on the screen. In these tests it was found that the players could be given an air of naturalness and the ghostly white faces characteristic of the movies could be transformed into something lifelike by tinting the screen with a pale pink. Office interiors were made realistic by pale amber, which suggested the glow of the electric lights, while the use of appropriate colors brought out all the natural beauty of woodland scenes. One of the novel effects was that of a fog at sea. This was produced simply by placing a bluish-clouded glass before the projector, with the result that the ship and sailors appeared to be moving about in a mist. The beams of colored light are projected with the beam from the projector, so that the real source of the coloring is not apparent to the spectators, and the illusion of natural coloring is correspondingly increased.

—

ⒸA jointed spring to replace the single, long, spiral spring used on screen doors, has been invented.

Men's Hospital Bldg.  
South Dakota Hospital for the Insane  
Yankton, S. D.

# Harry A. Robinson,

POPULAR MECHANICS

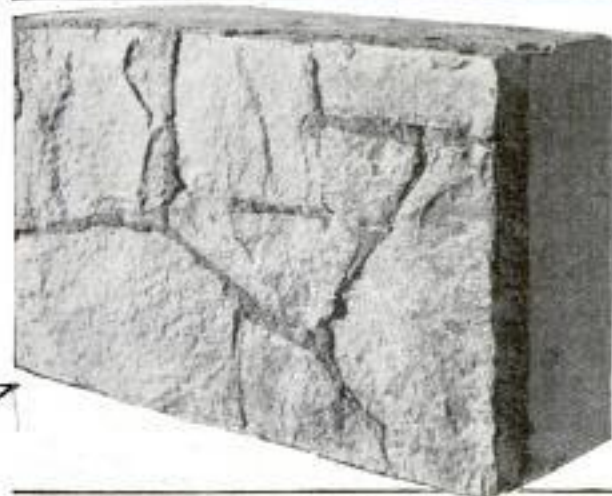
75

Vermillion, S. Dak.



*Built by patient labor.*

The Walls of This Building are Made of Solid-Concrete Blocks with Natural-Stone Face



One of the Concrete Blocks Faced with Quartzite Ready to be Placed in the Wall

### CONCRETE BLOCKS WITH NATURAL-STONE FACE

A practical and economical method of putting a natural-stone face on concrete building blocks has been developed in connection with the construction of a public building in South Dakota. The shell of the building is made of solid-concrete blocks which are faced with pink quartzite taken from a quarry 60 miles distant, and have the appearance of cut quartzite stone. The blocks were made by the wet process, and for forming the stone face, quartzite chips were simply laid in the mold and the concrete was poured. In this way the chips were permanently imbedded in the side of the block. It is estimated that these blocks cost about one-third as much as natural stone, a small part of this saving being due to the fact that the

quartzite chips, heretofore a waste product in connection with the shaping of finished stone at the quarry, were obtained by the state in large quantities at little cost.

### "Electrical World" Apr. 17- INDIRECT LIGHTING FOR BIG 1915 CLOCK DIALS

A novel method of indirect lighting is being used for illuminating the 21-ft. clock dials at the top of the 500-ft. tower of the new customhouse at Boston. There are four of these dials, each carrying numerals 3 ft. high, formed by pouring concrete around copper-lined slots, from 8 to 10 in. wide, and these numerals are outlined by light from a chamber having white walls situated in the tower behind the dial. In each of the four chambers are seventy 100-watt lamps so mounted that no unreflected light can pass through the slots. The clock dials are each equipped with twelve 100-watt lamps mounted between the hands and the dial.

### OREGON POWER PLANT HAS LARGEST CHAIN DRIVE

What is said to be the largest and most powerful chain drive ever installed has recently been placed in service at a power plant at Copperfield, Ore., to furnish power while a new dam is being built. The plant consists of a 3,600-kw. generator driven by two water-wheel units mounted on a horizontal shaft and each made up of two pairs of 48-in.

Head Superintendent  
Invention of Dr. H. C. of the institution

Sioux Falls S. D.

8795

9778

9117

# W. J. Kingsley See Oct. 1916 p 549-2516  
 Idaho Oregon Light & Power Co.  
 76 Copperfield, Electric Investment Co.  
 Oregon POPULAR MECHANICS Boise Idaho  
 O. G. F. Matthews Gen. Sup.

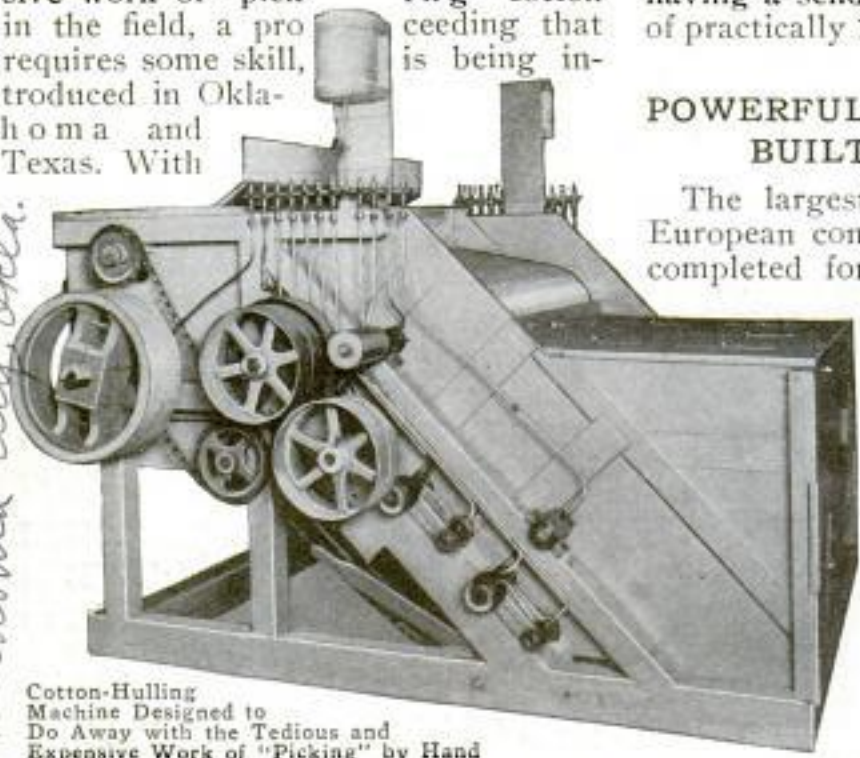


Chain Drive Placed in Service at a Hydroelectric Power Plant in Oregon: The 3,600-Kilowatt Generator is Driven by Four Chain Belts, Each 21 Inches Wide

water wheels. From the shaft of each unit there are four chain belts connecting with the shaft of the generator. The shafts are 10 ft. apart, and each belt is 21 in. wide. The water wheels work under a head of 21 ft. at a speed of 147 revolutions per minute, driving the generator at a speed of 225 revolutions per minute.

8723  
**MACHINE TAKES PLACE OF COTTON "PICKER"**

A cotton huller that is designed to do away with the tedious and expensive work of "picking" cotton in the field, a proceeding that requires some skill, is being introduced in Oklahoma and Texas. With



Cotton-Hulling Machine Designed to Do Away with the Tedious and Expensive Work of "Picking" by Hand

this machine the cotton is simply gathered, boll and all, and then run through the machine, which removes the boll and all trash, with a reduction in cost of about half.

cont.- C. P. Forsythe,  
 607 Majestic Bldg.,  
 Oklahoma City, Okla.

9729  
**GROWTH OF THE NATIONAL WIRELESS-RELAY LEAGUE**

Some idea of the growing importance of the national league of amateur wireless stations organized in this country, and mentioned in recent numbers of this magazine, is given in the fact that there are approximately 600 stations included in the 1915 list just issued by the league. This is an increase of about 200 stations since the list of 1914 was issued. There is also a big improvement in the capacities of many of the stations, some of them now having a sending and receiving radius of practically 1,000 miles.

8684  
**POWERFUL STEAM TURBINE BUILT IN GERMANY**

The largest steam turbine on the European continent has recently been completed for an electrical works at Hagen, Germany. It is capable of developing approximately 40,000 hp. and is built to use steam at 662° F. under a pressure of 184 lb. At a speed of 1,000 revolutions a minute, the generator will produce an 11,000-volt three-phase current. The total weight of the unit, including a condensing apparatus, is 385 tons, while in size it is 52½ ft. in length and slightly less than 14 ft. in width. A steam turbine which will develop about 32,000 hp. is being built for a Brooklyn electric-light company.

Mfr: Zalondek Machinery Co.,  
 325 E. California Ave.,  
 Oklahoma City, Okla.

9729  
 American Radio Relay League  
 "Berliner Tagblatt"  
 "Industri-Zeitung"  
 "Norddeutscher Lloyd"

Cont.

8751

J. L. Graff, 84 W. South Water St.  
POPULAR MECHANICS Chicago, Ill.

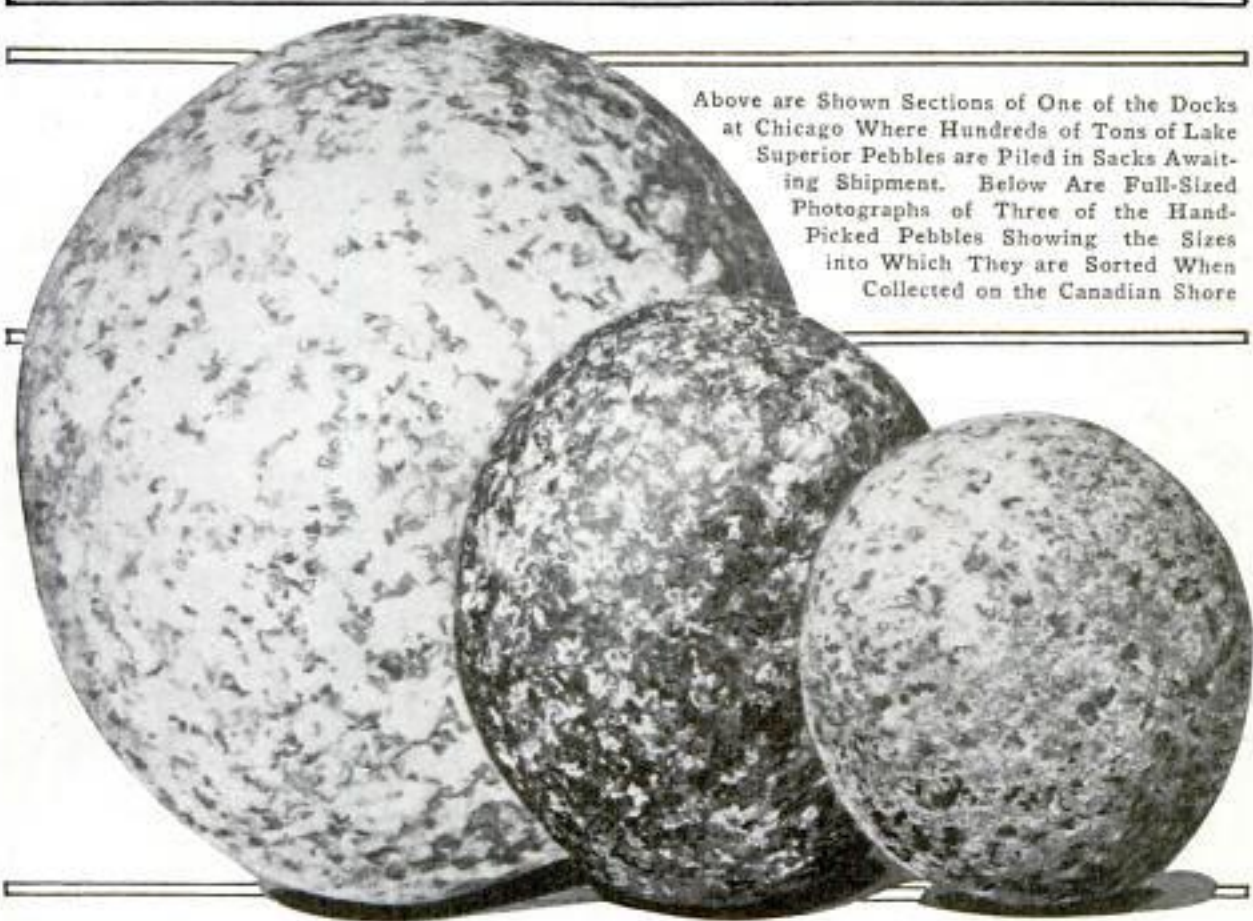
### EMPLOY CANADIAN PEBBLES FOR GRINDING PURPOSES

Thousands of tons of flint pebbles picked up along the coasts of Denmark have for years been shipped to this country to be used in grinding cement,

grinding medium, which in certain parts of the country in some instances has cost more than \$40 a ton. The outbreak of the European war caused



Above are Shown Sections of One of the Docks at Chicago Where Hundreds of Tons of Lake Superior Pebbles are Piled in Sacks Awaiting Shipment. Below Are Full-Sized Photographs of Three of the Hand-Picked Pebbles Showing the Sizes into Which They are Sorted When Collected on the Canadian Shore



milling gold ore, and manufacturing mineral pigments. Until very recently these and other industries have been dependent upon Europe for this

a shortage in the supply of these pebbles and directed attention to possible substitutes available in America.

More than 100 miles of the north

✓ Canadian Pebble Co., Ltd.  
Port Arthur, Ont.

Copyrighted material

*Cour.:*  
*Alvin W. King,*  
*1 Payson Ave.,*

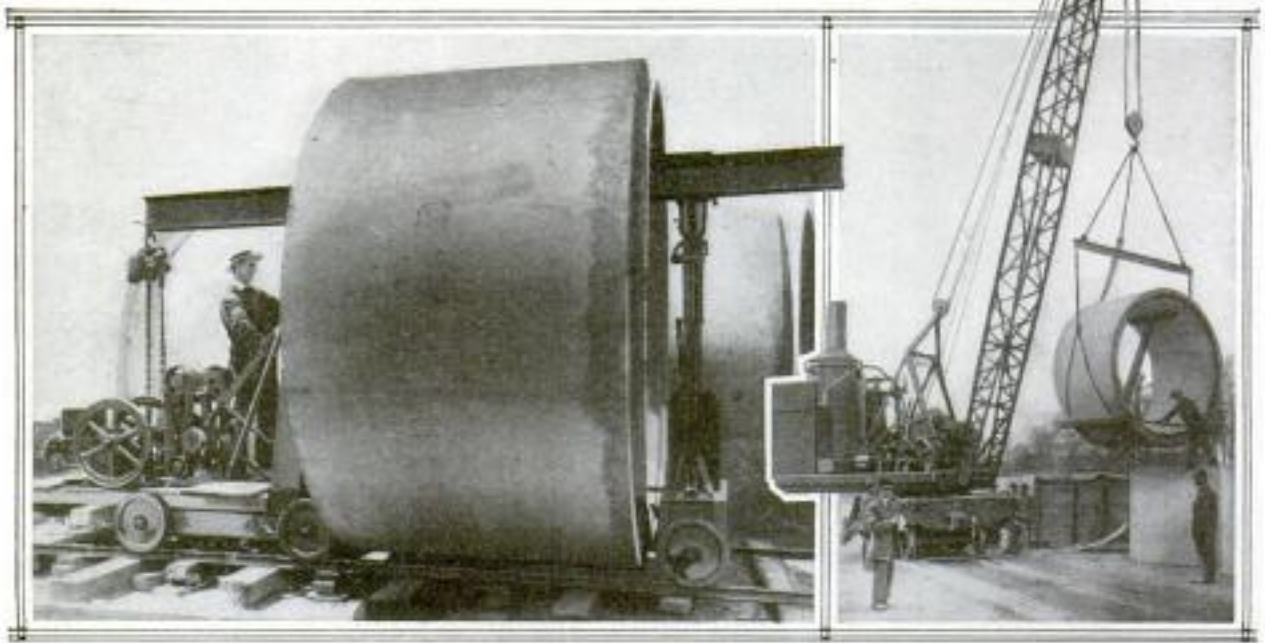
shore of Lake Superior is covered with well-rounded granite pebbles of various sizes. This field is now being exploited, the pebbles sorted by hand into different sizes, sacked and shipped to Chicago, and other lake ports, for distribution. It is claimed that the pebbles have approximately the same life in the tube mills as the Danish pebbles and serve the purpose equally well. For the most part, however, shipments have been confined to a few plants in the southwest, so that the use of these pebbles has not been general.

Flint pebbles are more or less abundant in Texas, Arkansas, Missouri, and Mississippi, and according to the reports of certain investigators, it is possible that they can be made use of successfully. Quartz pebbles are found in California and a number of other points. A plant has been established at Manhattan, Nev., for the purpose of manufacturing pebbles from rhyolite, a volcanic rock which is broken into pieces and rounded by rolling in a rotary chamber.

CA German chemist has devised a method of keeping true vulcanized rubber in a semifluid state, for use in cementing rubber surfaces together.

## LARGE CONCRETE PIPE USED AS TUNNEL LINING 8728

In reconstructing a part of the water-supply system at Baltimore, an old subterranean aqueduct, 12 ft. in height, is being lined with a sectional reinforced-concrete pipe which has an outside diameter of 9 ft. While the size of this conduit makes it an interesting example of the advances which are being made in concrete construction, the method employed in laying it is also worthy of attention. The pipe, which is cast in units 6 ft. in length, weighing  $10\frac{1}{2}$  tons, is lowered by a crane down a shaft to the tunnel, where it is slipped over a steel beam supported on a car. This operation requires considerable maneuvering because of the limited space available for working underground. When the pipe is loaded and the truck placed on the track by block and tackle, it is carried to the place where it is to be set. More than 5,000 ft. of conduit of this size is being laid, most of it within the aqueduct, and 2,000 ft. of 7-ft. pipe, each unit of which weighs  $7\frac{1}{2}$  tons. The reinforcing consists of steel bars and wire mesh, and the molding is done in upright metal forms.



Lowering a Section of the Concrete Pipe Weighing Ten and a Half Tons into the Aqueduct, and the Method Employed in Transporting It Underground to the Place Where It is to be Set



Cont:- *H. E. Zimmerman, Mt. Morris, Ill.*



Small Citrus Trees, Infested with Larvae of White Fly Containing Its Parasite, on Way to America

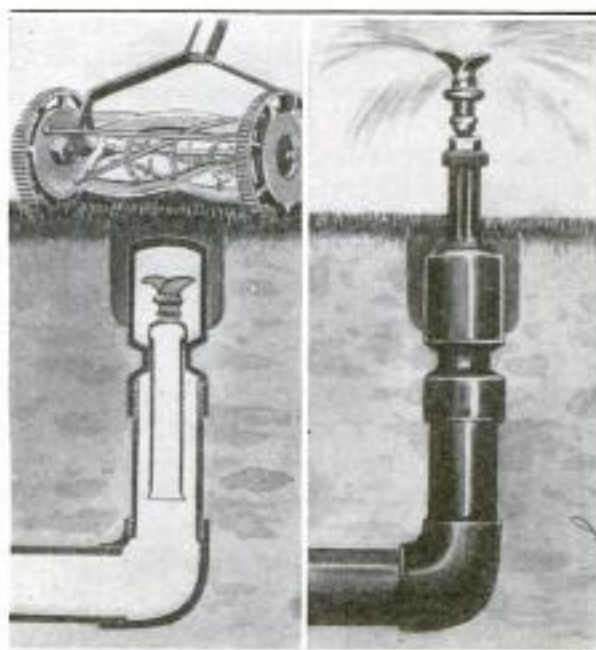
**ENEMY OF WHITE FLY FOUND  
IN INDIA CITRUS GROVES**

8965 Orange growers for some time have experienced serious difficulty in combating the white fly, a small insect which does great injury to citrus trees, with the result that the Department of Agriculture has carried on quite extensive investigations in an attempt to find something to destroy it. A parasite of the fly was found in India and has been imported to this country. It is microscopic in size and lives in the body of the white-fly larva. In order to carry it to the United States, it was necessary to import small citrus trees infested with the larvae, and this was accomplished by packing them carefully in wooden crates, such as are shown in the accompanying photograph.

9459  
**LAWN-SPRINKLING SYSTEM  
DOES AWAY WITH HOSE**

Intended particularly for large lawns, a sprinkling system has been devised which entirely eliminates the use of garden hose. Piping is installed beneath the ground, and at intervals joints are provided for small sprays which, when not in use, remain out of

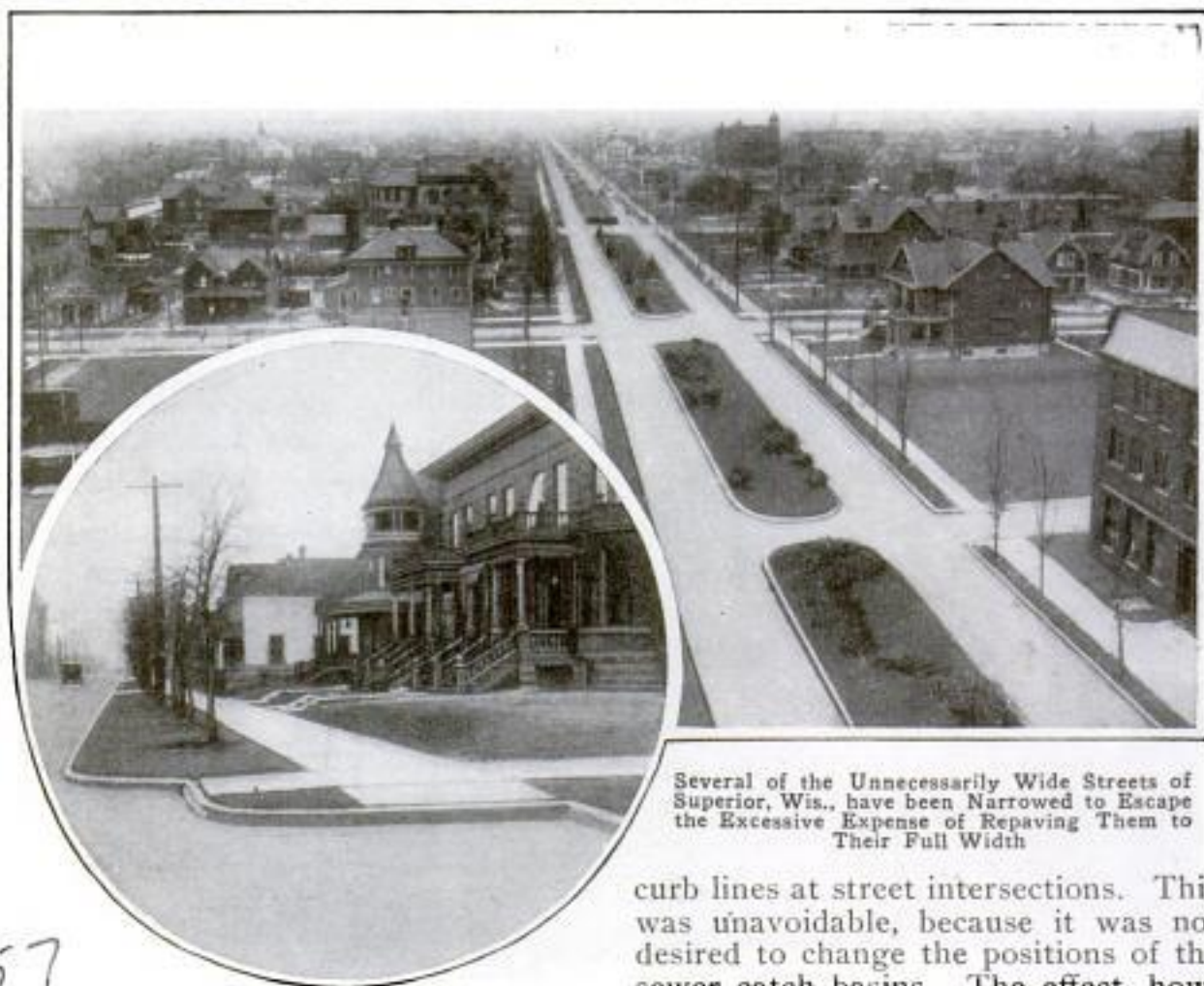
sight beneath the surface. When the water is turned on at a conveniently located cock the pressure pushes these sprinklers above the ground so that they work much the same as an ordinary garden spray. When the water is



The Pressure of the Water Raises the Spray above the Ground, Allowing It to Drop Out of Sight When Not in Use

turned off the nozzles drop back into the ground, enabling a lawn mower of any type to be used without meeting interference.

*Mrs. Beaman Brothers,  
Ruddeley, Ill.*



Several of the Unnecessarily Wide Streets of Superior, Wis., have been Narrowed to Escape the Excessive Expense of Repaving Them to Their Full Width

8957

### NARROWING BROAD STREETS TO LESSEN PAVING COST

When the town of Superior, Wis., was originally laid out in boom days, its streets were built exceptionally wide in anticipation that the place would eventually have a large population. It recently became necessary to repave some of these thoroughfares and, in order to escape what would have been an almost prohibitory expense, many of them were narrowed to widths equivalent to traffic needs. This was done in some instances by setting the curb lines farther into the streets, thus widening the parkings, and in other cases by dividing the streets by building center parkings. This latter method was employed on Hammond Avenue, which originally had a width of 60 ft. A 24-ft. parking was built in the middle of the drive, narrowing the roadway on either side to 18 ft. At some points triple curves occur in the

curb lines at street intersections. This was unavoidable, because it was not desired to change the positions of the sewer catch basins. The effect, however, is not bad, while the arrangement leaves very adequate turning room at the corners. By following this method the cost of paving was cut nearly one-half.

9.658

### KNOCKDOWN BOX FOR PIANO SHIPMENTS

The increasing price of pine lumber has resulted in the invention of a knockdown piano box that can be taken apart when the instrument is delivered, packed in small bulk and returned to the shipper. The box has iron bindings at the edges, is reinforced with angle irons, and is held together with bolts. As the box is intended to be used for a great many shipments, it is made of the best materials that can be obtained.

For starting an automobile engine in cold weather half a teaspoonful of sulphuric ether poured into the priming valve is very effective.

Cost. - -

C. B. Traver,  
Davidson Theatre  
Milwaukee,  
Wis.

Chicago

Wm. - - Roseman & Sons Co.  
341 W. Superior St.  
Milwaukee, Wis.

Oscar Odee,  
Hotel Gregorain,  
42 West 35<sup>th</sup> St.,

## HOW A SUBMARINE CABLE IS REPAIRED

By OSCAR ODEE

New York City

9389

AT a time when the public expects its war news almost before the smoke of battle has cleared away, the submarine cable and the methods used in keeping it in repair are of interest.

Each submarine-telegraph company has in service a fleet of cable ships, the units of which are stationed at different ports for quick access to the different sections of the cable. Let us take, for example, the cable stretching from San Francisco to Manila, a distance of 10,010 miles. This cable is divided into four sections—San Francisco to Honolulu, Honolulu to Midway Island, Midway Island to Guam, and Guam to Manila. The cable lies on the bed of the Pacific, which in places runs from three to five miles in depth, the latter depth being found off the island of Guam. Some idea of the shape of the ocean bottom, with its submerged plains, valleys, and mountain peaks, is given by the accompanying profile taken along the line of the cable. Sufficient slack must be paid out in laying a submarine cable to allow every part to rest on the bottom of the ocean, however irregular the bottom may be.

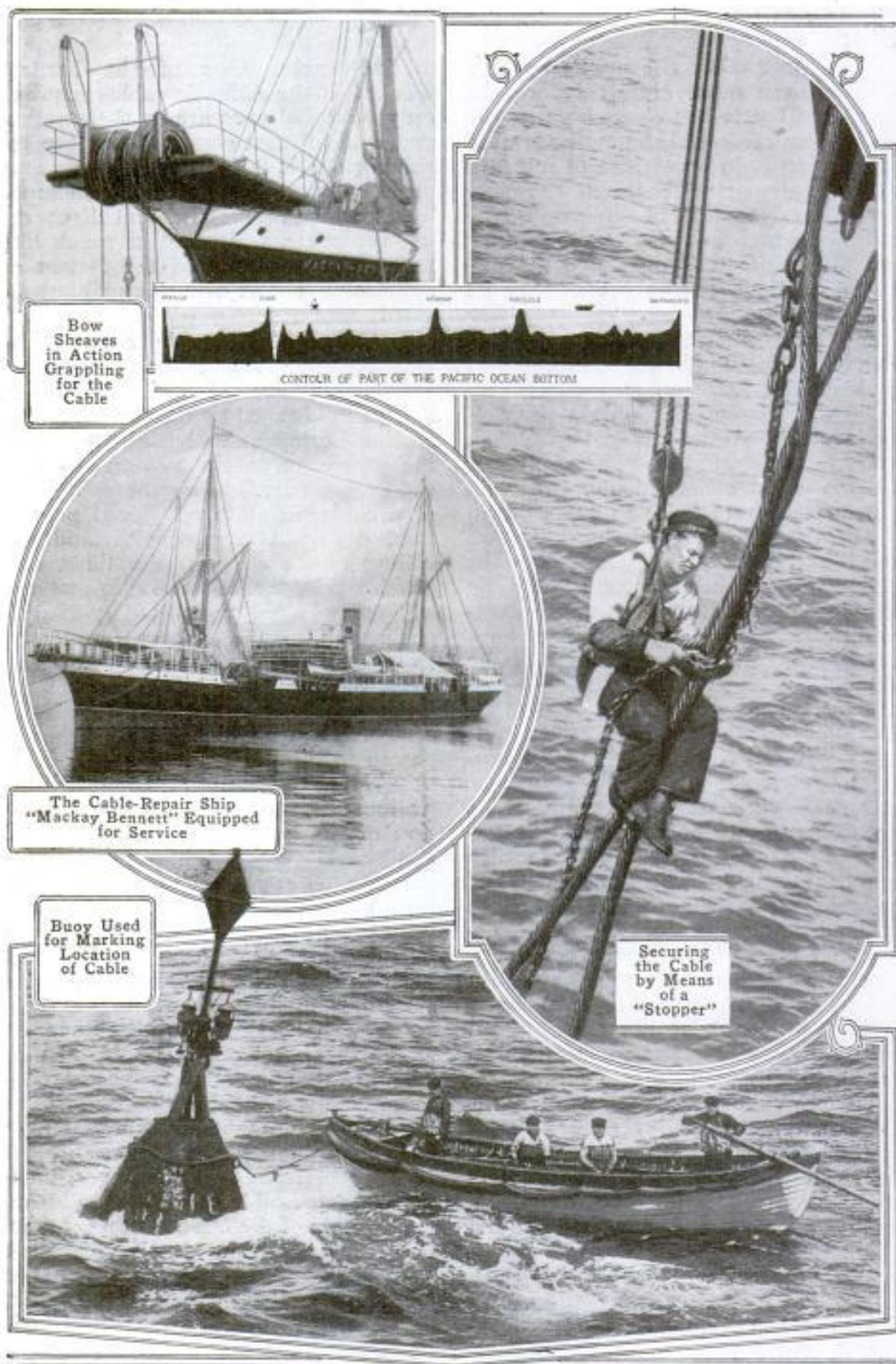
A cable varies in thickness and type according to its position and the nature of the ocean bottom in the locality where it is laid. The "shore end" of a cable, meaning a section laid close to land, is always thicker than a section out at sea. Ordinarily the diameter of a shore section runs about  $2\frac{1}{4}$  in., while a section laid in deep water runs about  $\frac{7}{8}$  in. in diameter. About seven strands of copper, comprising a single conductor, form the core of the cable. Over this core are laid coatings of gutta-percha, a layer of jute or oakum, and an envelope of composition rubber. Over this some strands of strengthening wires are wound on, and tarry rope and tape are wound about the whole. The average cost of a cable complete is about \$1,000 a mile.

A surprisingly small amount of current is required for operating a sub-

marine cable. One of the hardest worked of the Atlantic cables requires only 50 volts' pressure at the sending end, and all that comes out at the receiving end is 20 millionths of an ampere. Signals are transmitted simply by alternately charging and discharging the cable, which works much like a Leyden jar. One of the fastest of submarine cables transmits about 80 words a minute.

Interruption in cable communication between two stations may come from one of several causes. There is the "fault" caused by the teredo, a submarine boring animal that penetrates the protective coatings in an effort to get at the core. Then the shore end of a cable, in spite of special protection, does not always withstand the rolling and friction of the tides, and besides this, there is the risk that the cable may be fouled or lifted by a ship's anchor. A cable may part completely, from one cause or another, forming what is known as a "total break."

An excellent example of the build of boat engaged in cable repairing is shown in the illustrations of the cable ship "Mackay Bennett." In these illustrations are shown the peculiar formation of the bow of this kind of ship, and the large triple sheaves used for the grapnel rope and for guiding the lines attached to the cable when once it has been picked up. Having obtained some idea of the boat, let us imagine that the cable from San Francisco to Manila is "down," as it is technically expressed when the cable is unworkable, in that section, 2,098 miles long, between San Francisco and Honolulu. We will assume that a series of tests based on the law of resistances has shown that the fault lies at a point 1,000 miles from San Francisco. Sometimes it is possible by testing to locate the position of the fault within  $\frac{1}{10}$  mile, but the average is about five miles. Before the cable ship sails for the "ground," as the location of the break, or fault, is called, the ship's electricians will have made their own tests



Bow  
Sheaves  
in Action  
Grappling  
for the  
Cable

CONTOUR OF PART OF THE PACIFIC OCEAN BOTTOM

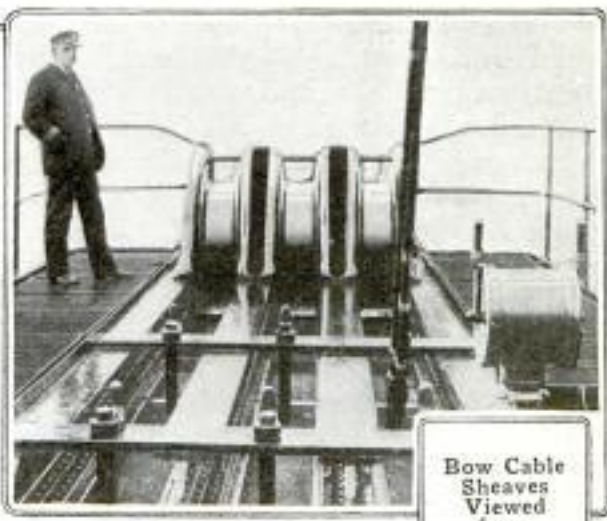
The Cable-Repair Ship  
"Mackay Bennett" Equipped  
for Service

Buoy Used  
for Marking  
Location  
of Cable

Securing  
the Cable  
by Means  
of a  
"Stopper"



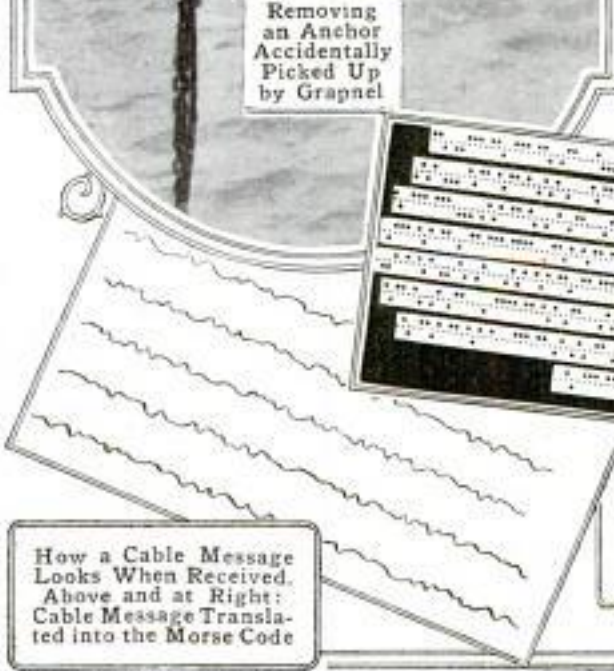
Removing an Anchor Accidentally Picked Up by Grapnel



Bow Cable Sheaves Viewed from Inboard



Machinery for Controlling the Paying Out of the Cable



How a Cable Message Looks When Received. Above and at Right: Cable Message Translated into the Morse Code



One of the Marker Buoys in a Heavy Current

PHOTOS BY COMMERCIAL CABLE CO.

and advised both the San Francisco and Honolulu offices—the latter by an alternate route—to keep watch on their instruments in the office for the ship's call. As soon as the cable ship reaches the "ground," a signal, consisting of two red globes with a white diamond between, for day use, and replaced by similarly colored lamps at night, is hung in a vertical line in front of the foremast head. This signal indicates that the ship is engaged in cable-repair work, and is therefore not under control so far as getting out of the way of other craft is concerned. A marked buoy, moored to a mushroom anchor, is then dropped overboard at the point where the fault in the cable is supposed to be.

The ship then proceeds to grapple for the cable. This is done by means of a grapnel, of which there are many kinds, all studded with prongs calculated to catch anything they encounter. To this grapnel is attached a steel hawser, the inboard end of which is connected to an instrument known as a dynamometer, or vertical scale, and capable of registering a pull up to 15 tons. The ship then steams ahead at a speed of one or two knots an hour in a kind of tacking maneuver at right angles to the line of the cable. While the ship is engaged in grappling, a member of the crew, ordinarily the fourth officer, sits on the grapnel rope near the bow and can usually tell by the strain when the cable has been hooked. The instant the cable is hooked the ship is stopped and the grapnel rope is slowly wound in by the hauling machinery. Sometimes the cable will stand the heavy strain of being lifted until it reaches the surface, only to snap and sink to the bottom again before it can be secured. When this happens the ship steams to a new location and starts grappling anew.

When the cable is brought safely to the surface, it is first secured on either side of the grapnel by what is known as a chain "stopper," this work being done by a man lowered over the bow in a boatswain's chair, as shown in one

of the illustrations. The cable is then cut, each end is connected to the instrument in the testing room, and the stations at San Francisco and Honolulu are each called up. It is more than likely, of course, that the ship will not be able to speak to one of the stations, as the fault will probably lie at some point between the ship and the station. In case it is necessary for the ship to steam one way or the other to find the fault, as it usually is, it is necessary to leave one end of the cable behind and to secure it so that it can be raised again without grappling. One of the big seven-ton buoys shown in the illustration is made ready, a flag is put on it, and it is lifted overboard by a derrick. One end of the cable is attached to the buoy by a long mooring chain and rope, and is allowed to sink to the bottom, the buoy itself being held in place by a mushroom anchor. At night time the buoy carries a light.

The ship now starts picking up the cable toward the fault. This is a slow process, requiring careful navigation, as the ship must be kept going slowly ahead at such a speed as to relieve the strain on the picking-up gear. The cable comes on board at the rate of one or two miles an hour and is coiled by the men into one of the large round tanks that take the place of the hold in an ordinary ship. The cable is guided from the bow to the tank by a series of sheaves placed at intervals on the deck. While this operation is going on, the electricians continue testing and the cable may have to be cut several times before the actual fault is on board. With the fault found, the defective portion of the cable is cut out, and a good piece from the ship's tank is spliced in in its place. Then the cable is paid out as the ship returns to the buoy marking the location of the other end. With this recovered, the ship has both the San Francisco and Honolulu ends of the cable on board. Tests are made to ascertain that no other faults have developed and that both sections are in good condition. A message reading "Communication restored—now making final

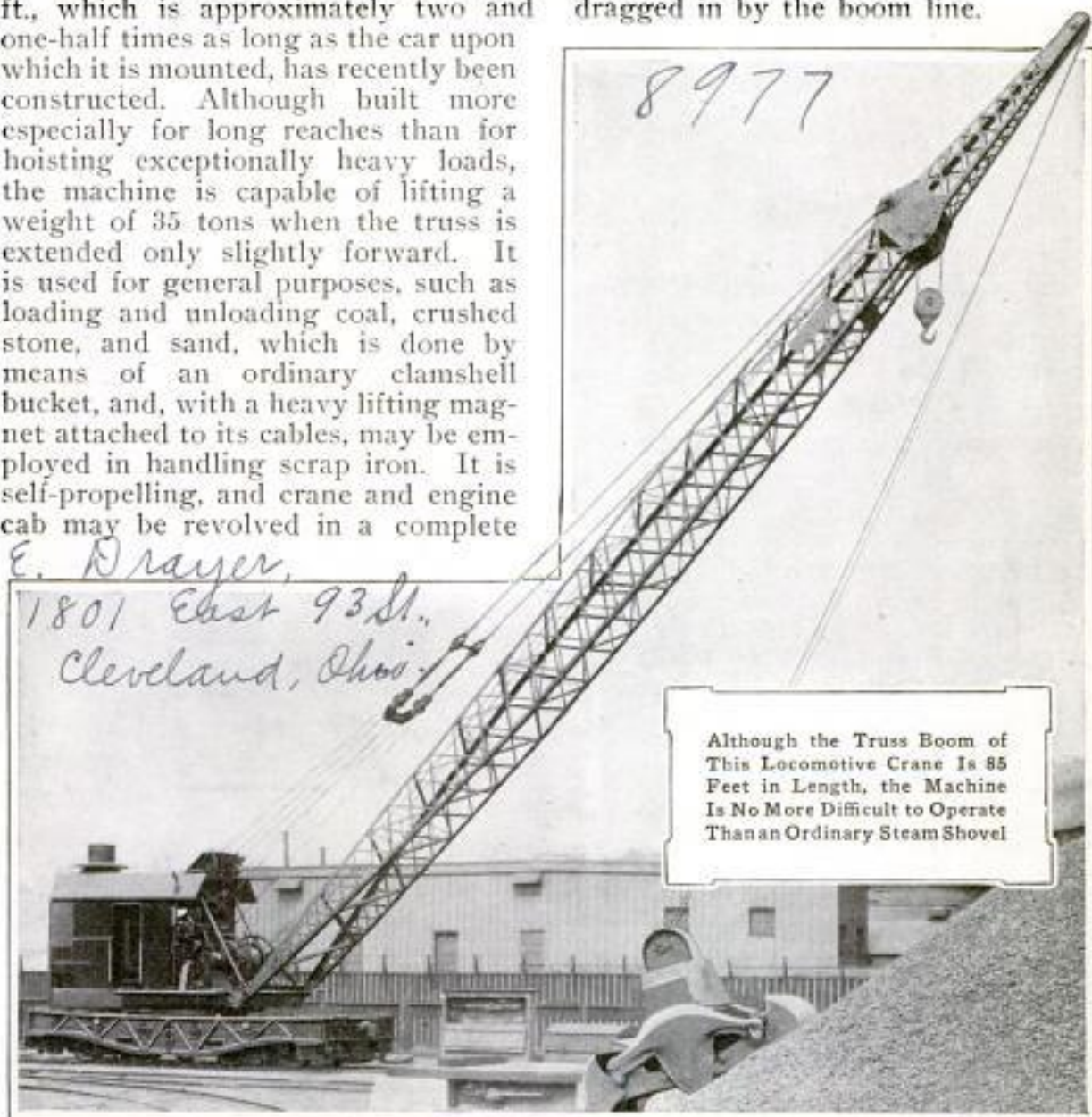
splice" is sent to both of the stations. Following this message two hours are allowed before the stations attempt to communicate with each other. This is a very busy two hours on board the cable ship. The ends of the cable are secured over the sheaves at the bow and are connected by a splice from 36 to 40 ft. long. With the splice completed two ropes, one at each side of the bow, are attached to the cable and

it is lowered overboard and slacked out slowly until it reaches the surface of the water. A block of wood is placed on the deck under each of the ropes. At a given signal the ropes are cut at the same time with axes, the ends of the ropes fly overboard and the cable sinks to the bottom of the ocean. As the cable disappears from view, the engines are run full speed ahead and the cable ship returns to port.

## EIGHTY-FIVE FOOT BOOM ON LOCOMOTIVE CRANE

A locomotive crane provided with a swinging boom having a length of 85 ft., which is approximately two and one-half times as long as the car upon which it is mounted, has recently been constructed. Although built more especially for long reaches than for hoisting exceptionally heavy loads, the machine is capable of lifting a weight of 35 tons when the truss is extended only slightly forward. It is used for general purposes, such as loading and unloading coal, crushed stone, and sand, which is done by means of an ordinary clamshell bucket, and, with a heavy lifting magnet attached to its cables, may be employed in handling scrap iron. It is self-propelling, and crane and engine cab may be revolved in a complete

circle and likewise operated at any point. Material beyond reach is dragged in by the boom line.



Although the Truss Boom of This Locomotive Crane Is 85 Feet in Length, the Machine Is No More Difficult to Operate Than an Ordinary Steam Shovel

Mfr. -- Savage  
5 Beekman St., New York City.

86

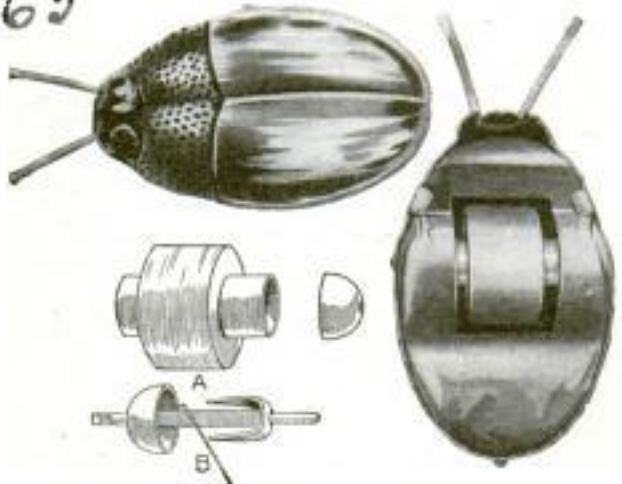
POPULAR MECHANICS

Cont. - J. J. Sturgeon, 620 S. Breed St., Los Angeles, Calif.

GUM BRAKE ON TOY BEETLE  
NOVEL CONTROL DEVICE

A mechanical beetle which moves slowly in cold weather and rapidly when the atmosphere is warm, is an

9463



This Shows Two Views of the Beetle and Its Working Parts

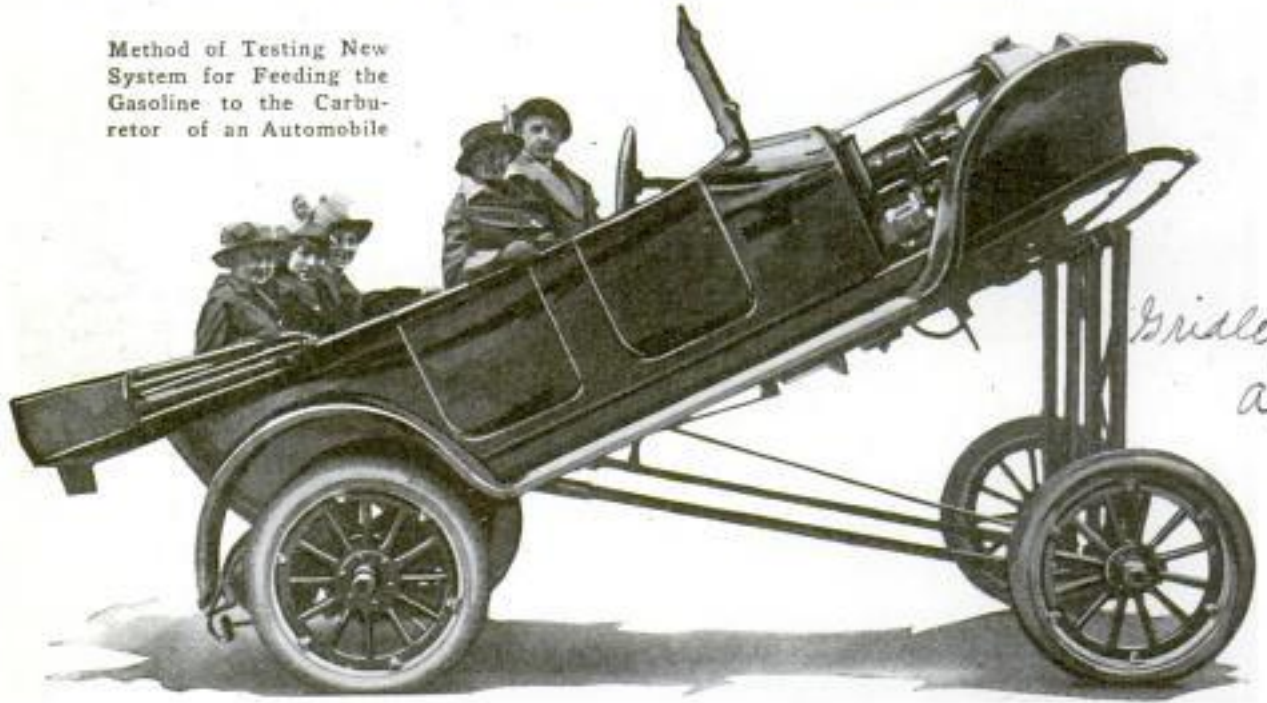
oddly constructed toy which has recently been introduced. Locomotion is provided by means of a coil spring on an immovable shaft, inclosed by a tube over which fits a wooden spool that revolves when the spring is wound by drawing the beetle backward. One end of the spring is attached to the shaft and the other end to the tube

which turns the spool. There are two small paddles attached to one end of the wire shaft and these come in contact with a gummy substance contained in the tube, thus serving as a brake and preventing the spring from unwinding too quickly. Because the temperature of the air affects the gum, the bug moves more slowly in a cold room than in a warm one. In the accompanying illustration, A shows the spool and tube, and B, the wire shaft, spring and paddles.

TEST OF VACUUM FEED FOR  
AUTOMOBILES 9600

An interesting demonstration of the efficiency of a vacuum system for feeding the gasoline to the carburetor of an automobile is being made with a car in which the body is tilted at a sharp angle by mounting the front on standards which raise it several feet above the axle. The angle at which the body is tilted corresponds to that at which gravity overcomes traction, or the grade that is just beyond what a car can climb without slipping back. According to reports the flow of gasoline with the vacuum feed is regular even under these extreme conditions.

Method of Testing New System for Feeding the Gasoline to the Carburetor of an Automobile



Gridley Adams  
Adv. Mfg.

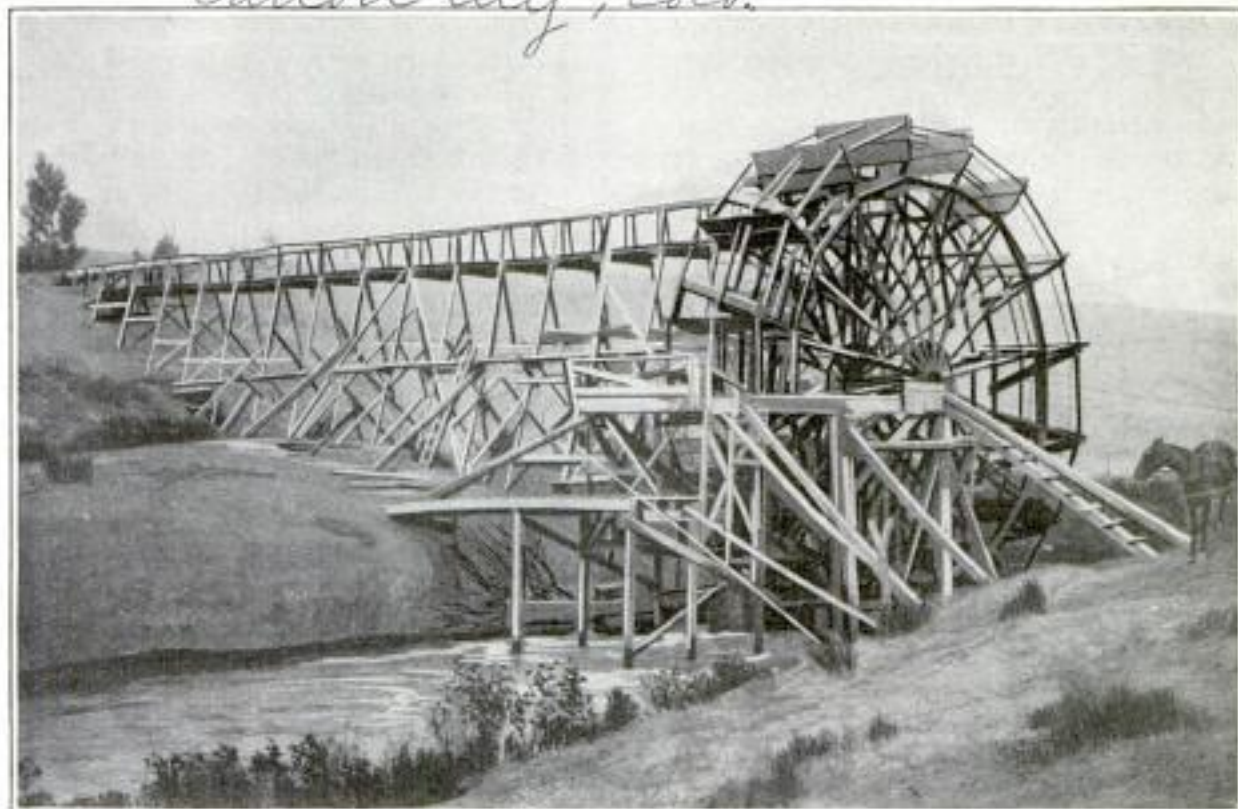
Stewart-Warner Speedometer Corp.,  
1876 Riverside Blvd.  
Chicago, Ill.

Copyrighted material



Cont:  
Florence L. Clark,  
412 Greenwood Ave.,

Canon City, Colo.



This Wheel is Used to Irrigate a Hilltop Orchard, Which Formerly Was Barren Because There Was Apparently No Economical Means of Conveying Water to It

89/2

### TRANSFORMING BARREN HILL INTO FRUIT ORCHARD

The conversion of a barren hilltop into one of the best orchards in the Grand Valley, Colorado, has been accomplished by an ingenious method of irrigation. For several years the area has been considered practically worthless because of the absence of water upon it, while surrounding lands under irrigation were valued in some instances at more than \$1,000 an acre. The present owner of the tract purchased it for a nominal sum and then had constructed a large water wheel, equal in height to that of the hill, which was placed in a ditch at the base of the knoll. A flume was built to reach from the top of this to the summit of the hill. On each of the paddles of the wheel water troughs were attached in such a manner that as the wheel revolves water is carried to the flume without employing any other power than that provided by the current of the water in the canal. In this manner the hill is thoroughly irrigated.

### NEW GAS-ENGINE PISTON FOR HIGH SPEEDS

Auto Access

9394

The latest tendency in automobile design is toward engines of long stroke, small bore, and high speed, and for engines of this kind lightness of piston is a desirable feature that contributes to ease in running. The required lightness and strength are both apparently obtained in a piston that has just been placed on the market. Instead of having the usual cylindrical form, the middle of the piston is cut in, making that portion of much less diameter than the head and back. All of the piston except the head is made hollow and is pierced with holes for decreasing the weight. The bolt for attaching the pitman passes through the smaller middle portion of the piston.



Mfr. - The Wridgway Co.,  
Wilkes-Barre, Pa.

Cont.  
 Esco. A. Oberauer  
 921 Smith St.  
 88 Buffalo, N. Y.

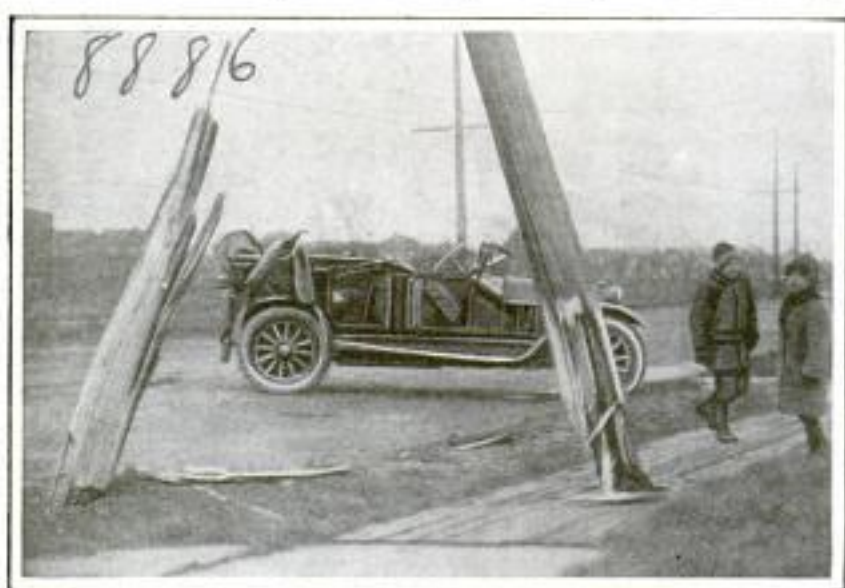
Taken from  
 "Science Conspectus"  
 Vol. 5, Page 23  
 9452

POPULAR MECHANICS  
**TROLLEY POLE IS SNAPPED  
 OFF BY MOTOR CAR**

**WHERE THE PLUMB LINE  
 IS OUT OF PLUMB**

In attempting to guide his machine out of the path of an approaching surface-traction car, a chauffeur, driving

Along the southern edge of the Himalaya Mountains engineers have found that a plumb line does not hang vertically, but with a marked northerly deflection, toward the mountains. In the effort to explain this phenomenon, which is clearly due to some marked variation in the specific gravity of the earth strata as between the mountain country and the territory to the south, several ingenious theories have been advanced. The latest explanation is that all of northern Hindustan was once an immense depression which has been filled with alluvial



This Trolley Pole was Broken Off Fully Six Feet above the Ground When Struck by the Motor Car in the Background. The End Shown at the Right is Supported by the Wires It Carries

in one of the suburbs of Buffalo, N. Y., turned it so abruptly that it skidded, striking a trolley pole with such force that the heavy timber was broken off. Two quite remarkable things about the accident were that the car was not badly damaged and that the pole was snapped off at a point fully 6 ft. above the ground.

silt washed down from the mountains. This silt, not having yet become packed solidly, is of much less density than the strata forming the mountain range, and since the pull of gravity is in direct proportion to density, the plumb bob is deflected from the perpendicular position and swings toward the mountains.

**LATEST TYPES OF FRENCH FLYING CRAFT**



This Monoplane Has Wings with Channeled Under Surfaces and is Made of Aluminum and Steel



The "Uniplane" Shown Above Has an Elevator at the Rear and Rudders on Top

All-Metal War Aeroplane with Skids at the Tips of the Wings



Francis P. Mann,  
 12 Boulevard Arago,  
 Paris, France.



This Pit, Which Extends Presumably Hundreds of Feet into the Earth, was Blown Out After Gas had been Struck

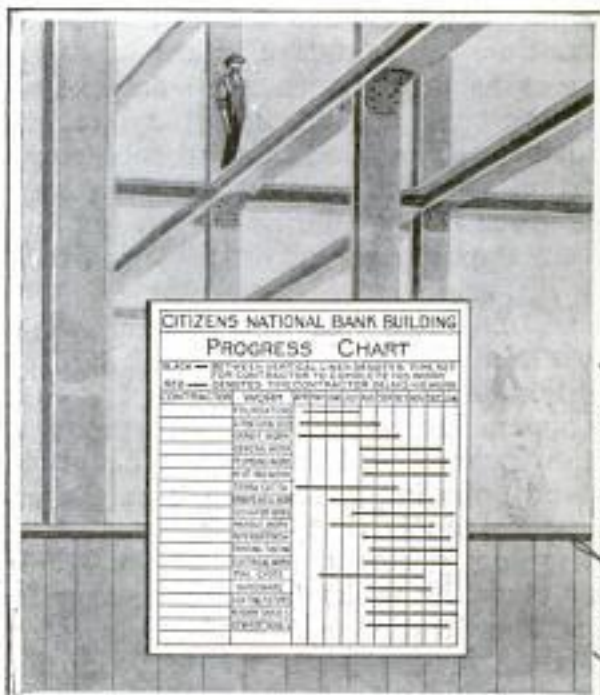
9479 DEEP PIT TORN IN EARTH BY GAS ERUPTION

Quite a remarkable earth eruption occurred near Sinton, Texas, recently, after gas had been struck at a depth of 2,200 ft. at a new well which was being sunk. When the stratum holding the gas was reached by the drill, the casing that lined the bore was blown for a considerable distance into the air by the terrific force of the flow. For approximately three weeks the well remained uncapped and the gas shot out in great volumes. Then, without warning, a hole 75 ft. in diameter and extending presumably to the bottom of the original well, was blown in the earth. Almost immediately this fissure was filled, to within 100 ft. of the surface, with boiling water. All the well-drilling machinery disappeared in the great pit.

8531 CHART SHOWS PROGRESS OF BUILDING CONSTRUCTION

A progress chart erected in front of a building under construction in Los Angeles is designed to answer the questions most frequently asked by passers-by. This chart has demonstrated its value not only in preventing waste of time of the employes in answering questions, but as a good

advertisement for the contractors and building owner. Nothing interests the average man more than a big construction job, and the facts are impressed on his memory when he sees them set forth in this fashion. The chart tells, by means of black lines, the time in which each contractor is to do



Progress Chart Erected in Front of Building under Construction in Los Angeles

his work, and by red lines just how much he is behind his schedule. About 18 contracting firms are listed on the chart.

C. J. Edholm, 36 Place Los Angeles, Calif.  
1353 W.

9758 Aero Club of America.

297 Madison Ave., New York City

## NATIONAL AEROPLANE COMPETITION PROMOTED TO DEVELOP FEDERAL AERIAL RESERVE CORPS

Address: Alan R. Hawley c/o above.

**T**O revive popular interest in aviation, stimulate domestic manufacturers and fliers, and assist the War and Navy departments in developing aerial corps for the National Guard and Naval Militia, a national aeroplane competition of broad scope is to be held throughout the present summer. The purpose of this undertaking is purely a constructive one. It is not a wholesale amusement propaganda, but a serious attempt to encourage sane flying and impress upon the people of America, the parent country of aviation, the real value of air craft in contrast to the county-fair uses with which they are most familiar.

This aeronautical meet is being promoted by the Aero Club of America, backed by the various state and city clubs, as well as commercial organizations in different parts of the United States. The contest is to start July 4 and end on Columbus Day, October 12, giving more than three months of continual flying in all parts of the country, something hitherto unknown on this continent. Tentative plans and the rules as now drawn are solely in the interest of normal flying by regular airmen. The conditions of the competition are such that no encouragement is given spectacular or foolhardy work, but opportunity afforded for worthwhile achievements.

Each state has been requested to enter machines and pilots, while 1,200 cities have been appealed to for their coöperation in making the demonstration general and fruitful. One of the conditions imposed on each participating airman is that in the event of his winning prizes amounting to \$7,500, or more, he will volunteer his services to the National Guard and Naval Militia for a period of 15 days during the ensuing year. In turn, military organizations are asked to encourage their personnel to learn aviation.

Back of the movement is a concerted effort to bring about the development of better and safer machines, and it is expected that special

aeroplanes will be constructed particularly for long-distance flying, as the strongest inducements will be offered for transcontinental touring. An award of \$10,100 is proposed to be used in prizes of \$100 each, which will be given daily to the airman who holds the best cross-country record for that day, while eight prizes aggregating an equal amount will be presented to the fliers who make the best showings in the daily distance competition. It is planned to divide \$25,000 between the three airmen making the best time in flying across the country, either starting or ending at New York, and between \$5,000 and \$10,000 is to be distributed between the men who fly the greatest number of miles during the contest. Other prizes, ranging between \$1,000 and \$5,000, will be given for the best aeroplane and flying boat entered in the national flights, considered from points of engineering, finish, and comfort; for the best schedule record made; for the winning demonstration of automatic stabilizers; for the lowest consumption of fuel and oil for miles covered; for the machine that carries the largest number of passengers a given distance, and for the best demonstration of a craft equipped with two motors, each working independently of the other.

Especial attempts are to be made to demonstrate to the Post Office Department the advantages of the aeroplane for the delivery of mail to isolated places. A list of out-of-the-way points in different states, where it now requires several days to carry mail matter from 20 to 90 miles, has been prepared by the postal authorities and airmen will undertake demonstrations at these places. A prize of from \$5,000 to \$10,000 is to be offered to the winner of this contest. The judging will be done by considering the regularity of the service maintained, the protection afforded the matter against the elements, and the proportionate amount of time saved over the established system of delivery.

One reason that interest is being shown in this particular field is that the adoption by the postal department of an aeroplane mail service would afford the government trained airmen, forming the nucleus of an aviation reserve that could readily be trained for military service in an event of war. Fly-

ing during the competition will be limited to 10 hours a day. This will preclude attempts to break the world records for duration and distance, but will also have the effect of holding the contest down to sane, constructive demonstrations of practical aerial navigation.

*Hamilton M. Wright, Publicity Mgr.*

*Panama-Pacific Exps. - San Fran.*

## 1785 CURIOUS DANISH PAVILION AT SAN FRANCISCO FAIR

One of the most interesting buildings constructed for the Panama-Pacific Exposition is the Denmark pavilion, which was inspired by the medieval Kronborg castle at Elsinore, the setting of Shakespeare's "Hamlet." Throughout, the structure embodies features reproduced from many famous Danish architectural monuments. Two stones placed on either side of the central entrance of the structure are replicas of the tombstones, dating from the eighth century, which were discovered some years ago at the burial mound of Gorm the Old, the first historical king of Denmark. At the front of the building is a large sundial, and at one side a repro-

duction of a Danish burial ground. The balustrade around the loggia behind the main tower is copied from that at the top of the "Round Tower" in Copenhagen, which was built by King Christian IV. The platform where Hamlet communed with the ghost of his father is in one corner behind the central tower. One of the rooms represents the underground chamber beneath Kronborg, where, according to tradition, a giant sleeps, waiting the time to arise and free Denmark of its enemies.

☞ Panama Canal earnings for the first eight months were \$2,334,515.24, or \$261,098.09 less than the cost of operation.



Denmark's Exposition Building at San Francisco Which Recalls the Scene of Shakespeare's Tragedy, "Hamlet"

*Courtesy: The Miller Train Control Corp'n. (Mfr) Danville, Ill*  
*W. D. Goodwin*  
*527 W. 124 St.*

92

**POPULAR MECHANICS**  
*New York City*

**NEW AUTOMATIC STOP FOR  
 BLOCKING TRAINS**

9645

It is claimed that a train going 60 miles an hour can be stopped within 2,000 ft. by means of an apparatus now **THE MILLER TRAIN CONTROL**



How the Ramp and Contact Shoe are Arranged in a New Automatic Train Stop



American railroad. This apparatus is intended to be used in connection with a double-track block system, and automatically sets the brakes and stops the train at the entrance to a block if the block is not clear. The track part of the apparatus consists

of a steel ramp 180 ft. long supported on the ends of the ties at a distance of 22 in. from the rail. This ramp slopes each way from the center, the center being 3 in. higher than the ends. Each locomotive operating on this section of the road is equipped with a contact shoe that engages the ramp and is mounted on the lower end of a vertical rod, the whole being supported

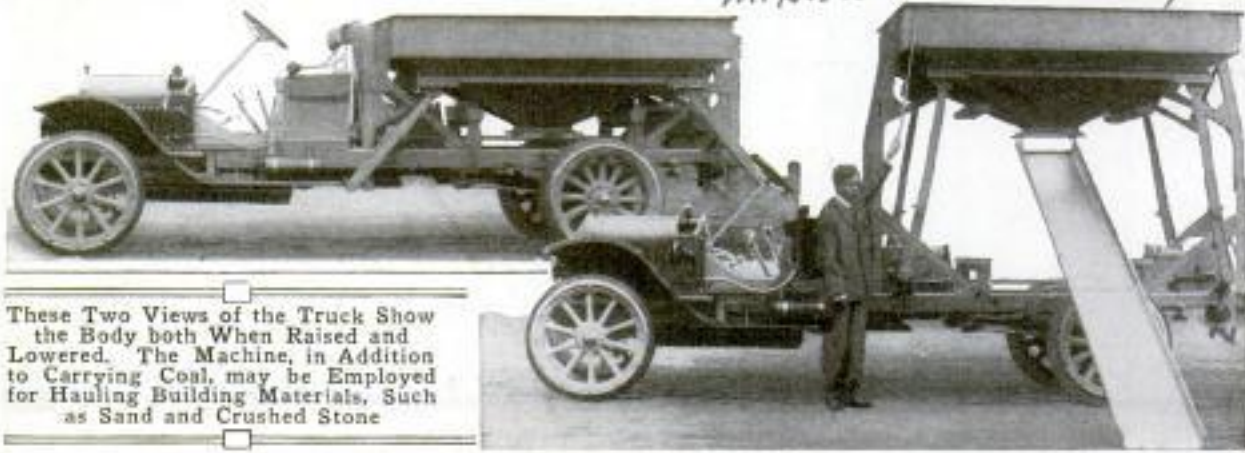
on the crosshead guides. As the locomotive passes the ramp this shoe is raised 3 in. The shoe operates a piston and through this a pneumatic mechanism that closes the throttle and sets the brakes if the rear end of the ramp is not electrically charged, while if it is electrically charged, magnets are energized that hold the mechanism and prevent it from operating. The control consists of electrical connections so arranged that the rear end of the ramp is charged only when the block is clear. The forward end is always charged so that trains are not interfered with when backing up.

**BODY OF NEW COAL TRUCK  
 HOISTS ABOVE CHASSIS**

9666

Adapted particularly for use in the congested districts of cities where unloading must be done quickly, and in most instances through manholes or basement windows, a new type of medium-service coal truck has been built with a body that may be hoisted above the chassis. The advantage of this is that the coal may be led by a chute to the innermost edge of a sidewalk, if necessary, without considerable difficulty. The bottom of the body, the capacity of which is 72 cu. ft., is shaped like an inverted pyramid. When the hopper is opened and a chute placed beneath it the coal is discharged rapidly down the inclined chute. The elevating is done by means of four arms connected to transverse shafts driven by the engine.

*M. B. Newton, Adv. Mgr.*



These Two Views of the Truck Show the Body both When Raised and Lowered. The Machine, in Addition to Carrying Coal, may be Employed for Hauling Building Materials, Such as Sand and Crushed Stone

*Chicago & Eastern Illinois R.R. (et al)*  
*90 Adams & 107 mi. of dtl track - equipped*  
*Wm. B. Murray, Engineer, C&E.I.R.R.*  
*Danville, Ill.*

*Mfr: The Wm. Compans, Cleveland, Ohio*

Court. J. L. Graff.  
84 W. South Water St.  
Chicago, Ill.

286 **BANK SAFE SHIPPED AT MONEY-CARRIAGE RATES**

When the time lock that controlled the opening of a safe in a Missouri bank failed to work, it was finally necessary to send the 3,600-lb. safe to the shop of the maker to be opened, a proceeding that involved a round-trip journey of 1,100 miles. The safe was first offered to a railroad company for transportation, but the agent refused to accept it unless the money and valuable papers were removed. This being an impossibility, the safe was then offered to an express company which accepted it at money-carriage rates. To open the safe a hole was burned in the door with acetylene gas and an electric torch, and when this hole was big enough to admit the hand the lock was broken and the bolts released. A new lock was then installed, the hole was plugged securely, and the safe was sent back home.

**NOVELTY ACTS AS APPLE CUTTER AND SERVER**

An individual apple cutter, which is both a novelty and a serviceable table utensil, is being displayed. The device is made of German silver, is easily cleaned, needs no adjustment, and cuts and cores the fruit in one operation. It has a plate slightly larger than a coaster, upon which the apple is placed. The cutter is divided into seven sections, besides the corer, and has small handles on its outer rim. It is placed over an apple and pushed down.

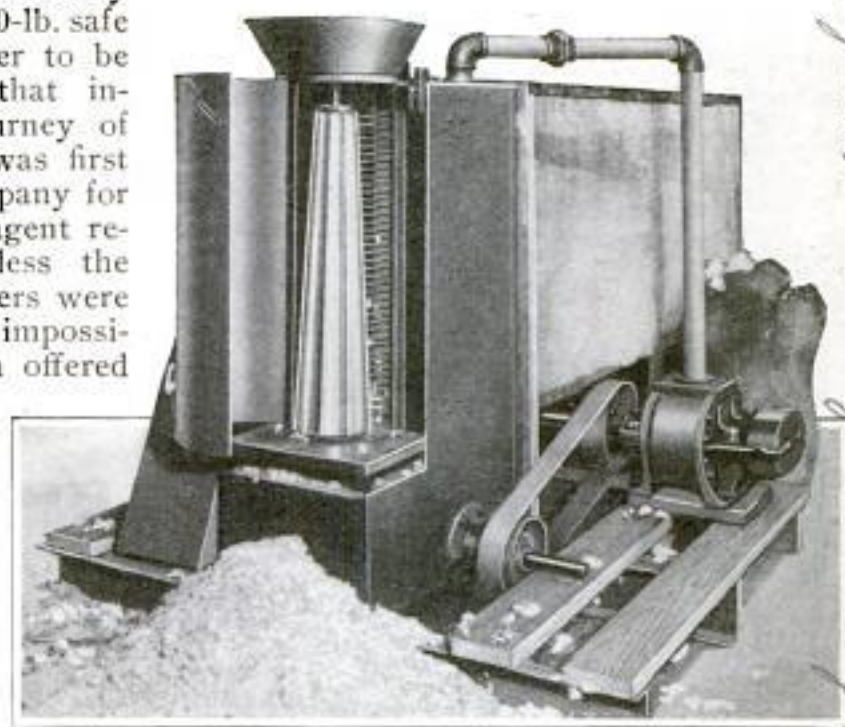


8263

Taken from Jewellers' Circular Weekly Sept. 2, 1914

**POPULAR MECHANICS 8722 93**  
**NEW COTTON GIN HAS NOVEL FEATURES**

In a new fireproof cotton gin, developed by an Oklahoma inventor, the



In This Cotton Gin the Saws Rotate Horizontally in the Cone-Shaped Cylinder, and are Cleaned of Lint by Compressed Air

disk saws that strip the lint from the seed rotate horizontally in a vertical cone-shaped cylinder, and with this arrangement only about one-fourth as much floor space is required as with the ordinary cotton gin. The cotton is fed into the hopper at the top, and as it passes through the cylinder, the lint and seed are separated and deposited in separate heaps at the bottom of the machine. Compressed air is used for cleaning the lint from the saws in place of rotary brushes.

9319  
**CARDBOARD SOLDIERS USED AS MILITIA TARGETS**

A method of training his troopers under conditions simulating those of actual warfare has been devised by the captain of one of the cavalry troops in the Rhode Island National Guard. Life-size figures of men are cut out of stiff cardboard, and painted so as to look

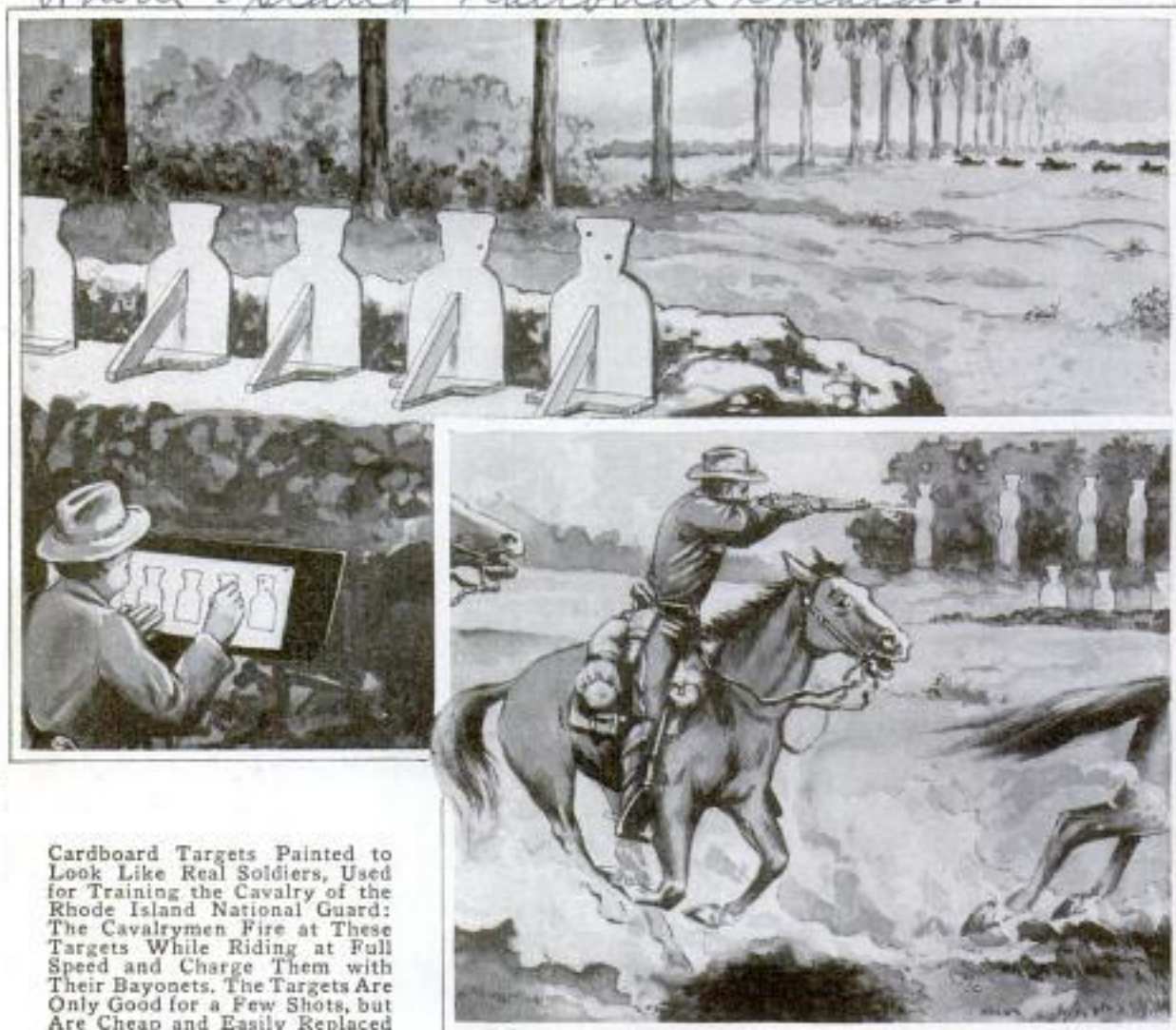
Mr. - - Jewelers Machinery Co., 325 E. California Ave., Oklahoma City, Okla.  
 C. P. Forey, 607 Majestic Bldg., Okla. City, Okla.

Covt. -- Wm. M. Strong, 96 Barrows Street,  
Providence, R. I.

94

## POPULAR MECHANICS

*Rhode Island National Guards.*



Cardboard Targets Painted to Look Like Real Soldiers, Used for Training the Cavalry of the Rhode Island National Guard: The Cavalrymen Fire at These Targets While Riding at Full Speed and Charge Them with Their Bayonets. The Targets Are Only Good for a Few Shots, but Are Cheap and Easily Replaced

like real soldiers at a little distance. These "human" targets are set up in various places in the woods or along the road. The cavalrymen fire real bullets at them, and charge them with their sabers. They do not last long, but are cheap and easily replaced, and the training of the men in prompt action has proved very efficient.

— 9707

### DEARTH OF BINDER TWINE NARROWLY AVERTED

American farmers are dependent upon Yucatan henequen for binder twine, approximately 200,000,000 lb. of which are used annually in harvesting grain. Four-fifths of the raw material for the manufacture of this very necessary cord comes from Progreso, an inconspicuous port on the northern

coast of the Mexican province, which General Carranza planned some time ago to blockade. Had this step been taken, the effect would have been felt more forcibly in the United States than it is possible to estimate. Through the action of the administration this government succeeded in keeping the roadstead open and preventing a disastrous dearth of twine which the Department of Agriculture concedes would have resulted in a loss of a large percentage of this season's crops. Heretofore a certain amount of sisal fiber has been imported from German East Africa, British East Africa, Java, Hawaii, and the Bahamas. Most of this is cut off this year. Practically the only good substitute for the Yucatan product appears to be Manila hemp, which is much more expensive and for the purpose no better than the cheaper twine.

*Information sheet sent out by Dept. of Agriculture.*

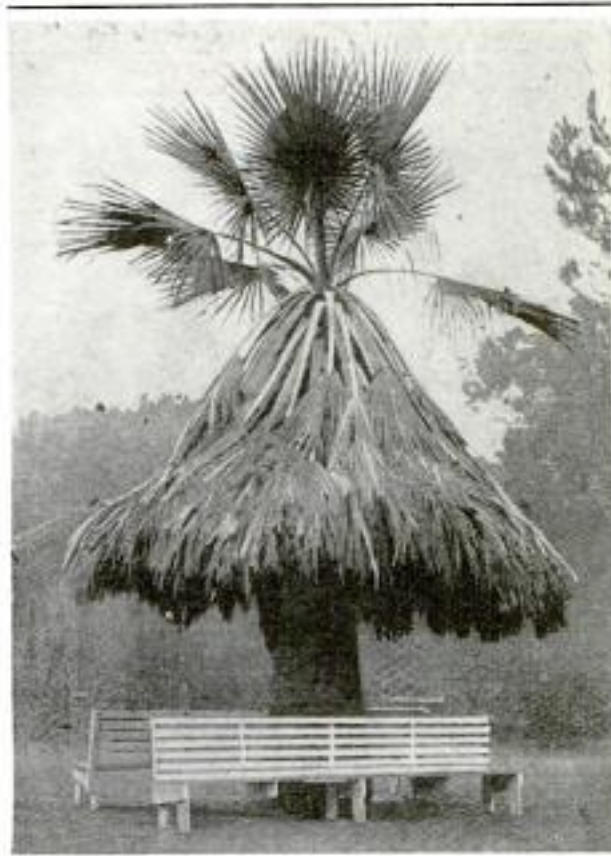


9677 **LATEST TYPE OF GERMAN  
SUBMARINE**

Through the alertness of a photographer who was a passenger on board the Dutch steamer "Batavier V" when that vessel was captured and taken into Zeebrügge by the German submarine "U-36," some idea of the enormous size and power of the latest type of German submarine can now be obtained. In point of size the submarine resembles a destroyer, as will be seen from the illustration. As estimated by observers on board the Dutch steamer, the "U-36" has a displacement of at least 1,000 tons. It is propelled on the surface by Diesel oil engines thought to be of more than 2,000 hp. and by electric motors when submerged, and is said to have a surface speed of from 21 to 23 miles an hour and a surface-cruising radius of 3,000 miles. The submarine is of the submersible type with outer hull shaped like that of a surface craft and with high bows that enable it to withstand the roughest seas. All parts of the hull that are exposed when the vessel is in surface trim, as well as the conning tower, are armored. The deck is equipped with hinged wireless masts that can be laid flat and with rapid-fire guns that can be lowered into closed pockets when the craft is to be submerged. The "U-36" is equipped with at least four torpedo tubes. From these are fired the new 21.6-in. torpedoes, which have an effective range of over 7,000 yd. and carry about 290 lb. of trotyl, one of the most powerful explosives known. The "U-36" is a sister ship of the "U-29," recently sunk by a British warship.

**PALM TREE CONVERTED INTO  
SUNSHADE** 8807

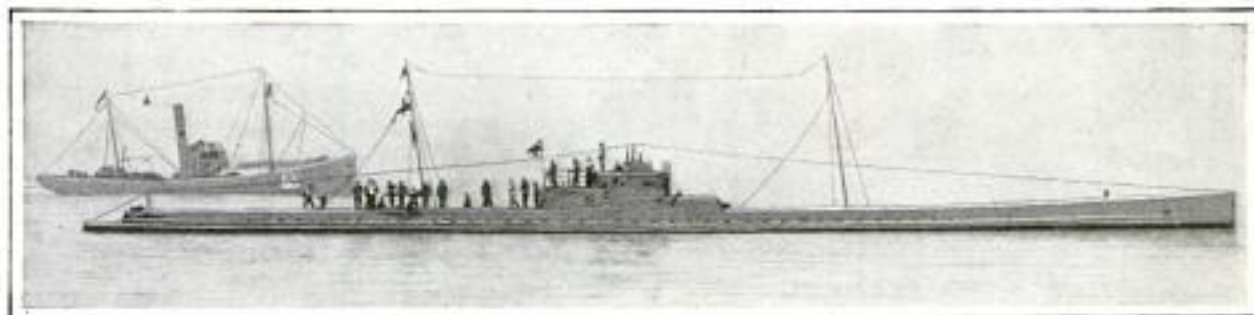
Novel and attractive sunshades have been made in a park at Coronado, Cal.,



With the Limbs Held Away from the Trunk by Props, This Fan-Palm Tree Makes a Novel and Attractive Sunshade

by the simple expedient of propping out the limbs of fan-palm trees. The limbs of the tree are held out at an angle by a steel hoop held in place by props resting against the tree trunk.

⌈The heat radiated from the human body is about the same as that from a 16-cp. electric lamp.



COPYRIGHT, INTERNATIONAL NEWS SERVICE

The "U-36," German Submarine of the Latest and Most Powerful Type, with Its Tender; This Photograph was Taken from the Deck of the Dutch Steamer "Batavier V," Which was Captured and Taken into Zeebrügge by the Submarine

The Golf Shop,  
75 E. Monroe St.,  
Chicago, Ill.

**NEW INDOOR-GOLF DEVICE FOR DRIVING PRACTICE**

For indoor use a golf device has been introduced which allows a player to practice driving when it is not possible for him to get on a course. The ball is captive at the end of a strong cord, approximately 15 ft. in length, attached to a lever that is held back by a spring. This lever moves in a

*"The Howard Golf Developer"*



*Machine - 100 f.o.b. Ch.*

The Force of the Stroke is Translated into Yards, Showing the Distance the Ball would have been Driven had It been Free

slot in the curved side of a quadrant which is graduated so that the force behind a stroke is translated into yards by the indicator. When a stroke is made the lever is drawn forward and locked so that the approximate distance which the ball would have gone if free is shown. The driving is done on a grass mat.

slot in the curved side of a quadrant which is graduated so that the force behind a stroke is translated into yards by the indicator. When a stroke is made the lever is drawn forward and locked so that the approximate distance which the ball would have gone if free is shown. The driving is done on a grass mat.

**NEW TYPE OF OXYACETYLENE TORCH**

Saving of oxygen and increased intensity of flame are the two principal advantages claimed for a new oxy-acetylene equipment that has been placed on the market. With this equipment the oxygen, before entering the torch, passes along a spiral groove that gives it a whirling motion, with the result that the oxygen and acetylene are thoroughly mixed before they reach the combustion point. The welding and cutting torches are fitted with needle valves with the control so placed that adjustments can be made with the hand that holds the torch.

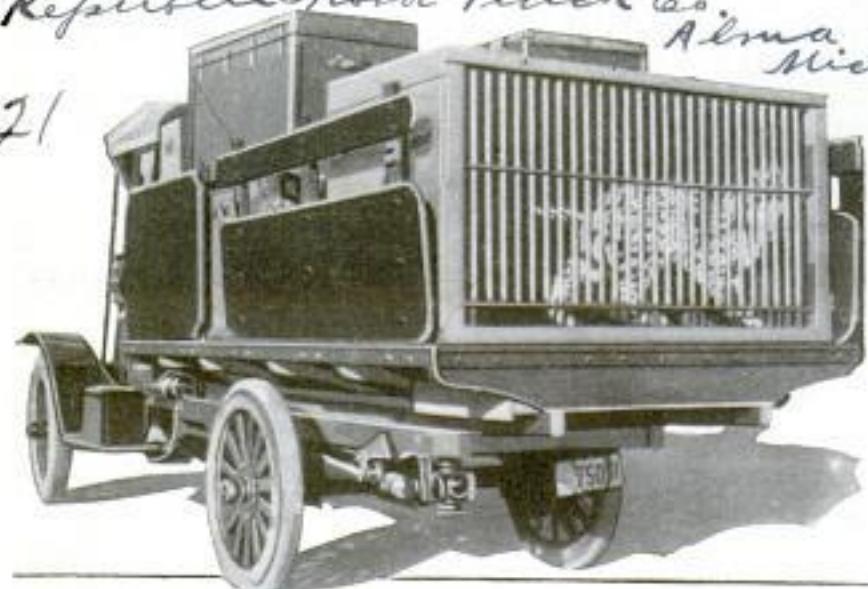
*524 So. Superior St. Milwaukee Wis. 1911*

**9421 MOTOR-TRUCK CIRCUS PLAYING ACROSS COUNTRY**

*A. L. Brown & wife*  
One man, a woman, a leopard, three monkeys, a motion-picture outfit, an

equipment, as well as management, of a circus which is playing one-night stands and slowly making its way across the continent to San Francisco. Everything needed for the show, the box office included, is carried on the truck in a few crates and trunks. The circus proceeds unheralded from town to town, playing in out-of-the-way places as well as in neighborhood districts in cities, when they are encountered. The circus started from a small Michigan town and has been on the road for several weeks.

with the Panama-Pacific Exposition as its ultimate destination.

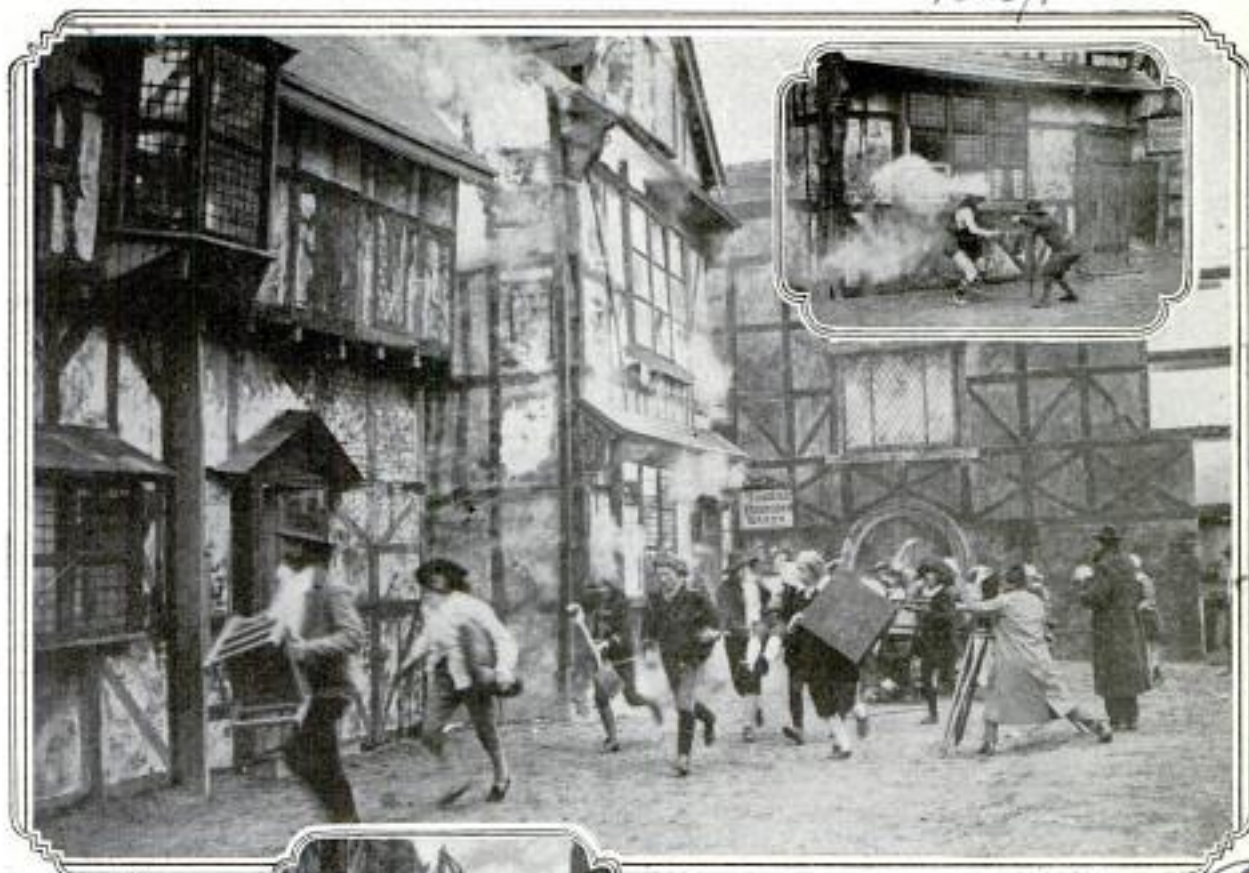


*9421*

Curious Motor-Truck Circus Which is Showing in Small Towns While Working Its Way to San Francisco

exhaust organ, and a motor truck constitute the personnel, menagerie, and

*J. E. Toland, 4530 Oliver St. Kansas City, Mo.*



How Film Pictures Representing the Great Fire of 1666 in London were Made: These Buildings, Typical of the London of That Time, were Erected and were Then Burned as the Camera Clicked



**GREAT FIRE OF LONDON  
7108 SHOWN BY FILM**

One feature of the motion-picture business that is steadily growing in importance is the representation of historical events by means of films. Films of this kind must be historically accurate, and a great deal of study of the customs, costumes, and buildings peculiar to the period represented is necessary, as will be seen from the reproductions of a film showing the great fire of 1666 in London. Before making this film, a group of buildings showing a typical section of London as it was at the time of the fire was built, and while the camera clicked these buildings were burned under conditions similar to the real event.

**SIGHTLY AND SERVICEABLE  
STREET LAMP-POST**

Besides forming a very attractive support for a street lamp, this reinforced-concrete post also offers a convenient place for displaying street signs. At the top of the pole is a 12-in. frosted-glass globe in which there is a high-candlepower electric lamp. Surrounding the globe is a square framework in which four strips of blue glass, carrying the street names in white letters, are held. During either the day or night, the names of the street and its intersecting thoroughfare are thus plainly visible when the pole is placed at a corner.



9037  
Covr: Albert M. Waples  
322 Broadway  
New York City

Inventor - Wm. D. McQueston, Mt. Vernon, N.Y.  
Mfrs. - Arora Company, New York City  
501-5th Ave.

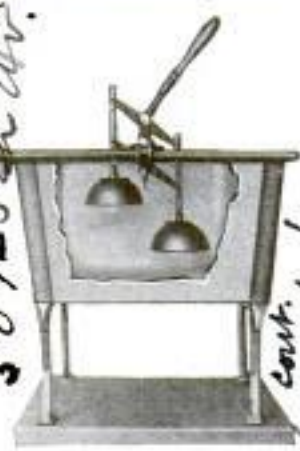
9426

### POPULAR MECHANICS

Court: Sam Raddon, Jr.,  
736 E. 46 Street, N.,  
Portland, Ore.

#### NOVEL SEESAW WASHING MACHINE

A washing machine recently invented has hollow suction cups suspended from pivoted levers which are alternately worked up and down by means of the operating handle. The entire device is supported by a rod that may be readily clamped to any washtub. The cups lift above the water on each upward stroke, while on the downward stroke they come in contact with the clothes and force the water through the meshes of the fabric. The efficiency of the device is partly due to the vacuum action of the cups on the upward stroke. No labor other than working the handle is required.

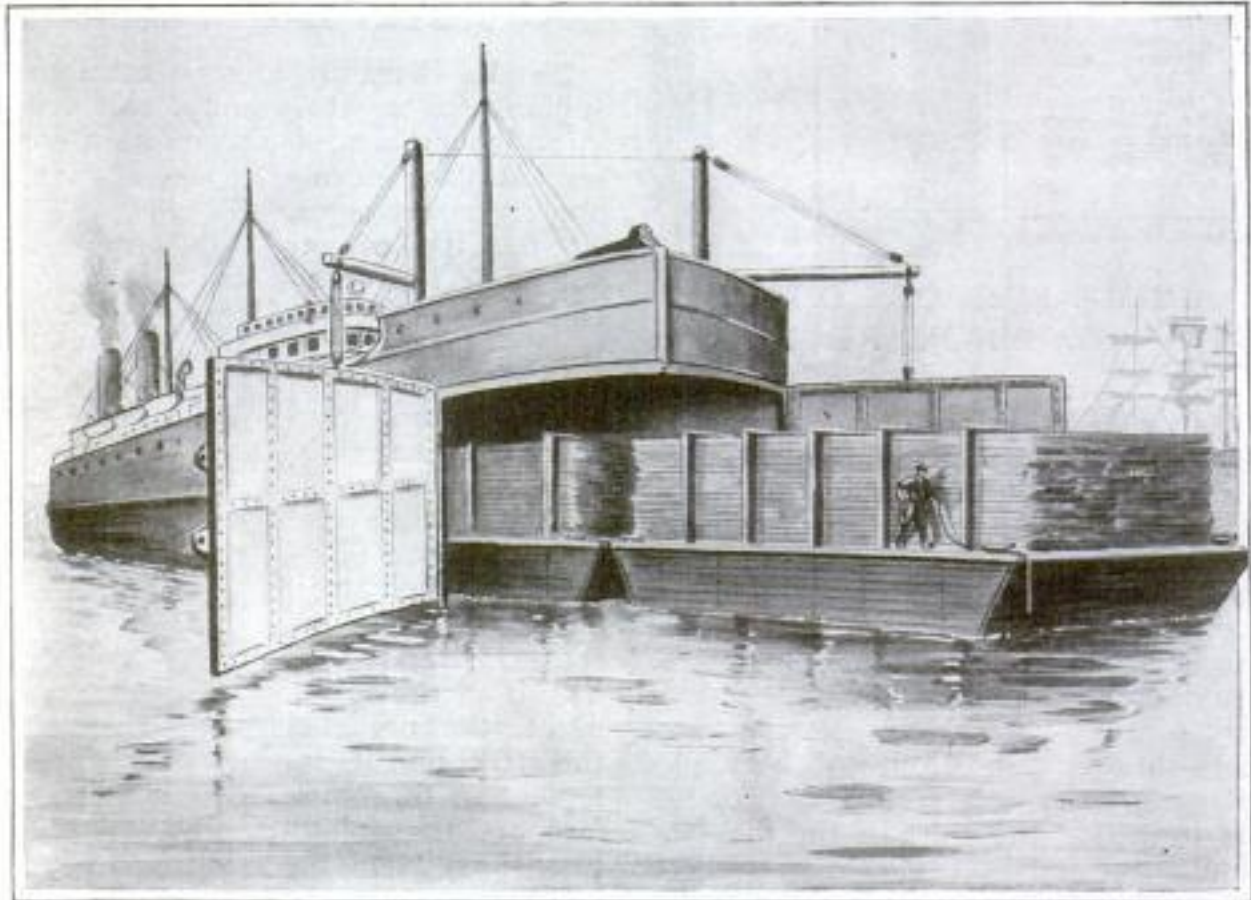


cont. barges  
for  
washing  
clothes

#### DRY-DOCK SHIP FOR PACIFIC LUMBER TRADE

88666

Plans are now being made for a ship that is to be built like a floating dry dock, and is to be used for carrying loaded lumber barges from Portland, Ore., to San Francisco. This novel vessel is to have a length of 640 ft., a beam of 80 ft., and a hold depth of 41 ft., and will be capable of carrying 10 barges loaded with 500,000 ft. of lumber each, or 5,000,000 ft. in all. When the vessel is to be loaded or unloaded, it is lowered by the admission of water in the same way as a floating dry dock, the bow gates are opened, and the barges are simply floated in or out of the hold. The ship is then raised to the required level for going to sea, and the barges seated on the bottom of the ship, by pumping out the water. The plan is to have three sets of barges, 10 at each end of the route and 10 on the way, so that barges may be loaded for the next trip while the ship is at sea.

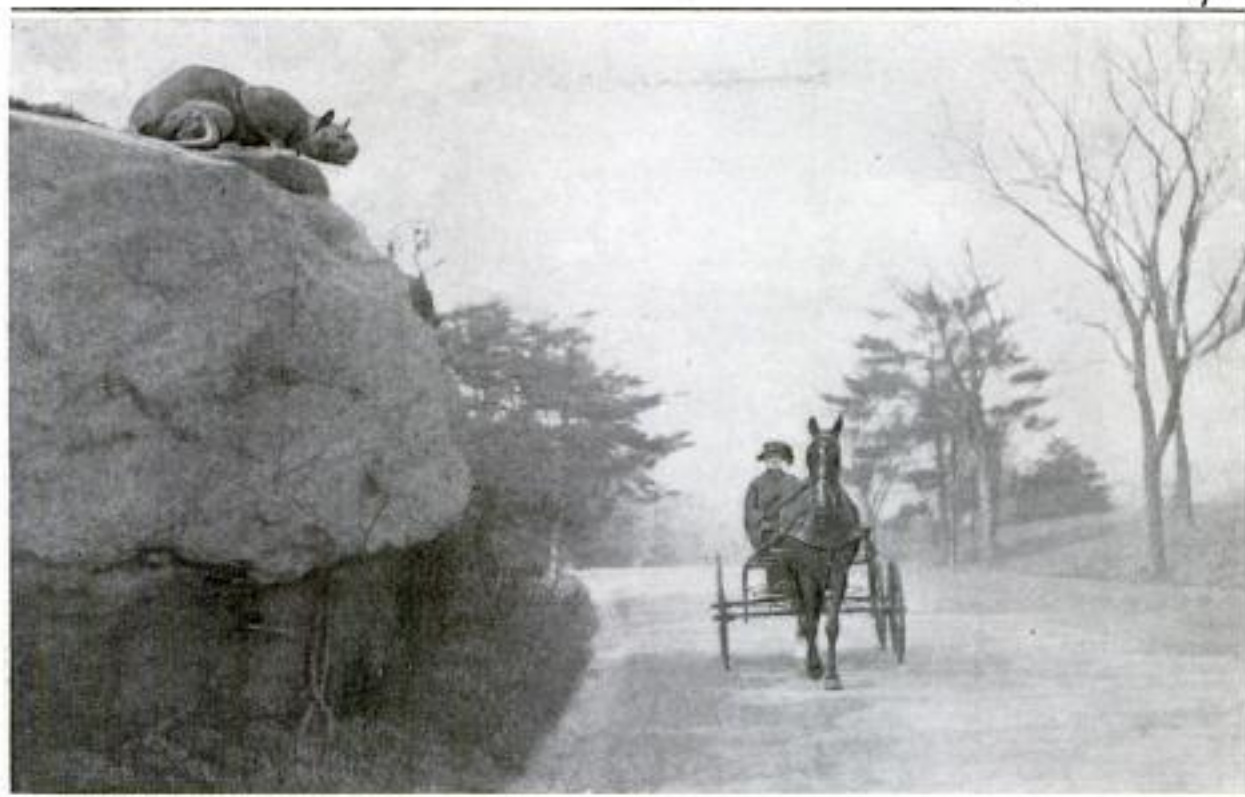


Floating a Loaded Lumber Barge into the Dry-Dock Ship

Cont.

Charles Phelps Cushing.  
159 West 73 Street.

POPULAR MECHANICS New York City 99



This Stone Lioness, Crouched as if for a Spring to the Road Below, Is One of the Features of Central Park, New York

9004

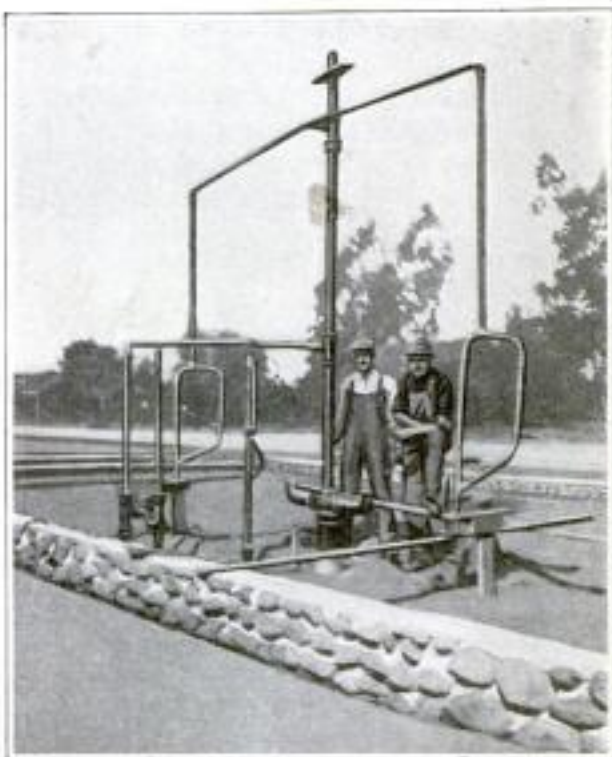
### REALISTIC STONE LIONESS IN NEW YORK PARK

A stone lioness that is too realistic to be entirely pleasant when seen for the first time is one of the features of Central Park in New York. The statue occupies the top of a rock overlooking a turn in a road near the Metropolitan Art Museum, and represents a lioness in a crouching position ready for a spring.

### RUNNING THE PIPES BEFORE BUILDING IS FRAMED

Waiting for the plumber to get out of the way is one of the most common causes of delay in house building, as carpenter work often has to stop while pipes are being run, or be done over after the plumber is through. In California, where many bungalows are built without basements, an enterprising plumber has devised a way of avoiding these troubles and of getting his own end of the job done quickly. Working from the blueprints, he erects all the piping before even the

frame of the building is up, leaving nothing to do but place the fixtures, which can be done after the carpenters are all through.



Putting in the Plumbing Before the Frame of the House Is Up

9242

work done by Clarence E. Gray, <sup>owner</sup>  
La Manda, Calif.

also cont.

*Chicago Daily News*  
 HOW ENGINEERS BREATHE IN  
 MOUNTAIN TUNNELS

9535 Engineers on the long freight trains which are sent across the western mountains with sometimes as many as



COURTESY CHICAGO DAILY NEWS

five or six locomotives to pull them over the heavy grades, use respirators in order to keep from being suffocated while passing through the long tunnels. Some of these bores are several thousand feet in length and require a number of minutes to pass. The men in the cabs of the rear engines are continually in an atmosphere heavily filled

with the gases and smoke given out by the locomotives ahead, and were it not for artificial means of getting air it would frequently be impossible for them to stay at their places. The breathing masks which are now being used are funnel-shaped and designed to fit tightly over the eyes, nose, and mouth of a wearer. Attached to one of these is a rubber hose which is connected with the compressed-air tank of the locomotive so that all of the oxygen needed is available. The air is usually passed through a sponge and cooled by cracked ice before it is taken into the lungs.

FUNERAL PYRES OF INDIA  
 SEEN IN EUROPE 9526

For centuries it has been a religious custom of certain natives in India to cremate their dead instead of burying them or placing them in tombs, as is the usual practice in this country. And even in war time, when it is at all possible to do so, the rite is rigidly carried out. At the British military hospitals where the wounded Indians fighting in France are cared for, funeral pyres are frequently erected and the dead incinerated by their comrades.



Wounded Indian Soldiers at a British Hospital Praying before the Pyre of a Fallen Comrade

Cont:

Le Roy W. Allison,  
170 Roseville Ave.,

POPULAR MECHANICS

Newark, N. J. 101



These Illuminated Crossed Arches Span One of the Business Streets of Portland, Oregon, at the Various Crossings

9349

### ILLUMINATED ARCHES SPAN STREET INTERSECTIONS

On one of the business streets at Portland, Ore., a lighting system has been installed which is both novel and effective. Crossed arches made of structural steel, supported on heavy concrete columns and outlined on the under side by electric lamps, have been erected along the thoroughfare, bridging the various street intersections. On each of the double arches there are 192 globes. Both the columns and the steelwork are painted a light-gray color, while crowning the point where the arches intersect is an ornamental pylon which carries a socket for the insertion of a flagpole.

### ECONOMICAL PORTABLE TIRE-INFLATING APPARATUS

For inflating motor-car tires an Illinois garage owner has constructed a homemade, portable device, which besides serving its purpose adequately, represents only a small investment. It consists of a steel tank, 24 by 37 in. in size, an air compressor and a 1-hp. gasoline motor mounted on a

Made by B. S. Miller, Cluiton, Ill., for his own use. Not on market.

small hand truck. The tank is capable of withstanding a pressure of 250 lb. to the square inch, although for ordinary purposes it is not pumped to a pressure of more than approximately 140 lb., which can be done at a cost of about three cents. It may readily be wheeled to any car in the garage



An Inexpensive, Homemade Tire-Inflating Apparatus for a Garage

or taken to the curb when a passing machine needs to have its tires inflated.

☐ The owners of Newfoundland sealing ships are planning to use aeroplanes for locating the seal herds.

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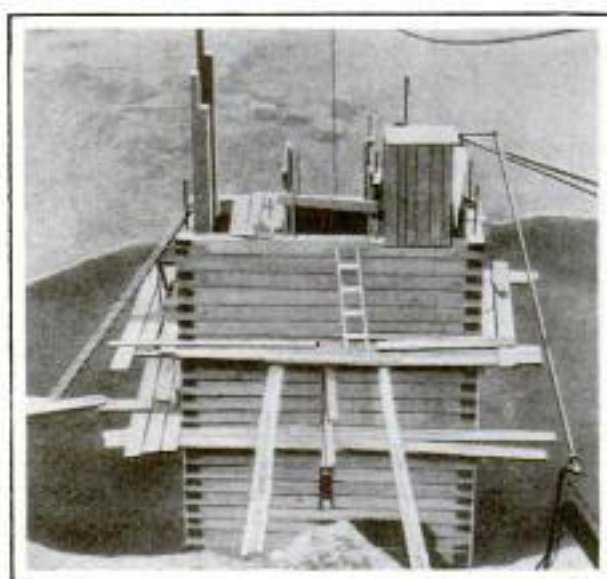
Cont: H. E. Smith Cluiton, Ill.

Covt: a. L. Kellogg.  
Grantwood, N.C.

### HOW MINE SHAFTS ARE SUNK THROUGH QUICKSAND

9116

In sinking a shaft there are few things that a miner can encounter which are more unwelcome to him than a deep vein of quicksand. That is



Sinking a Shaft at a Michigan Iron Mine through a Thick Vein of Quicksand

what has been struck at a Michigan iron mine, the shaft opening of which is shown in the accompanying photograph. In quicksand the ordinary procedure of timbering down as the excavating is done, is impossible. In most instances the work must be done in much the same manner as a caisson is sunk. This necessitates the construction of a casing by bolting together heavy timbers, usually about a foot in thickness. At the bottom of each wall of this timbered "chimney" a cutting shoe is trimmed on the inside so as to assist the shaft in sinking under its own weight. All the material beneath the walls of the structure is in this way squeezed, or cut, into the confines of the casing, while the latter gradually sinks as the excavating is carried on. As rapidly as the shaft sinks into the earth additional timbers are bolted in place on top, this operation continuing until rock is encountered. As a rule the sand is hoisted out in a bucket that is operated on a cableway extending across the opening of the shaft. This is usually

made necessary because a clear span of even as much as 200 ft. is required on account of a crater frequently being formed by the sand running into the shaft, as is shown in the photograph. The work on the inside of the shaft is precarious. Ladders are ordinarily provided at each corner of the timbering so that the men can jump to them and climb away from danger when there is a "sand boil," or a sudden filling.

— 9516

### NOVEL MIRROR ATTACHMENT FOR PORTRAIT CAMERA

Quite a curious attachment for a portrait camera has been invented which enables a photographer's subject to pose to suit himself and make an exposure at the time he thinks he has struck a posture which is becoming to him. The apparatus is made so that the camera lens appears in the middle of a mirror. The instrument is focused so that the same image appearing in the looking-glass is reproduced on the photographic plate when

Covt: Austin Gilman, Battle Creek, Mich.



By Looking in the Mirror a Person may Pose for a Photograph to Suit His Taste

the shutter is opened. The person doing the posing holds the operating bulb and presses it when he finds the pose he wants.



*In use on Pennsylvania, P. R.*



New System of Block Signals in Which Rows of Electric Lights are Employed for Giving the Standard Semaphore Indications

*Railroad Signal*  
**ELECTRIC LIGHTS IMITATE  
 9442 SEMAPHORE POSITIONS**

Semaphores are done away with and the standard semaphore indications are given by white electric lights mounted on a black background in a new system of block signals now being installed on the Pennsylvania Railroad. The lights are so arranged on the board that the three positions of a semaphore arm, horizontal, diagonal, and vertical, are imitated by the rows of lights, and these signals are used by day as well as by night. Two boards, corresponding to two semaphore arms, are used for each track, the upper board constituting the stop signal and the lower board the cautionary signal. When a train enters the block the horizontal row of lights on each board is lighted, giving the stop signal to any following train. When the train passes out of the block, which is 3,500 ft. long, the horizontal row on the upper board is extinguished and the diagonal row lighted, while the lights on the lower

board remain horizontal. This is the cautionary signal, meaning "Proceed, prepared to stop at next signal." After the train reaches the third block ahead, the lower board, if no other train has entered the block in the meantime, also changes to the diagonal row of lights, indicating that the track is clear for three blocks ahead.

*9372*  
**GRAVITY FIRE ESCAPE MADE  
 LIKE REVOLVING LADDER**

Constructed in the form of an endless-chain ladder, an automatic fire escape has recently been invented which for operating power requires only the weight of a passenger on one of its rungs. It is supplied with a speed governor which allows it to move at a predetermined rate and which, for ordinary purposes, is usually set at about 150 ft. a minute. This is arranged by a gearing at the top which is driven by the main shaft and acts upon a friction brake. The ladder will accommodate as many persons at one time as are able to crowd upon it and will move

no faster under the weight of several passengers than it will under the weight of only one. When installed,



Consisting of an Endless-Chain Ladder, This Fire Escape Requires Only the Power Derived from the Weight of a Passenger to Operate It

it is provided with landings at each floor, the same as any ordinary fire escape. It is planned so that it may be used as easily by a woman or child as by a man.

— 8357

**TELLTALE SPEED REGISTER FOR AUTOMOBILES**

An automobile speed register that has just been invented for preventing violations of the speed laws, is designed to keep a continuous record of the speeds at which the car has been driven, and to show in large figures,

that are in plain view from the rear of the car, just what the maximum speed of the car has been. The mechanism is housed in a casing carried at the rear of the car and is driven by the rear axle through a flexible shaft. At one end of the casing is the license number and at the other end, placed behind a glass panel, are the various registering devices. One of these devices consists of a series of plates on each of which is painted a number corresponding to a given speed in miles per hour. These plates may be arranged for any set of speeds, among which should be included the maximum speed allowed by the ordinances of the municipality in which the car is operated.

When the speed shown on the face of any plate is exceeded, that plate with its telltale number comes into view and stays in view, and thus serves as unimpeachable evidence for the first police officer that the car passes. There is no way of moving the number out of sight except by unlocking the casing, which is supposed to be done only at the end of the day's run. The plan involves having the key for doing this in the hands of the police department, or of some individual other than the driver of the car. An electric bell operated by a governor gives the driver warning just before a registering speed is reached. This governor is in plain view and serves to show the police officer whether the device is working. In addition to this, a continuous pencil record of the



This Device Keeps a Continuous Record of Speeds and Shows at a Glance Just What the Maximum Speed of the Automobile has Been

speeds for the entire 24 hours is made on a disk which is run by clockwork and is also in plain view. The mechanism may be put out of commission

*American Railway and Fire Escape Co., Spokane, Wash.*

*Inventor: Edward A. Rottley, 3116 Clifton Ave., Chicago.*

by means of a cut-out, and in this case a red light shows through the glass panel. This is designed to enable a driver to run his car at any speed while in the country without getting into trouble with the police when he gets back into town.

Cont.- C. B. Traver,  
Davidson Theatre,  
Milwaukee, Wis.

**PEDALS THAT EXCLUDE MICE FROM THE PIANO**

One of the common causes of damage to pianos is the destruction of the felt coverings of the hammers by mice that gain access through the pedal apertures, and to prevent this, one manufacturer is using a new connection for the pedals. Instead of entering through slots in the front of the case, as is the usual practice, the new pedal arms are curved down and under the front, and are connected with the vertical rods beneath the case. The rods slide up and down under the action of the pedals and can therefore be made to fit the openings so closely that the mice are unable to get inside the case.

**MINNOW PAIL COOLS AND AERATES WATER**

A self-cooling minnow pail, fitted with a small hand pump which affords a fisherman a means of aerating the water contained in it so that minnows may be kept alive without necessitating its frequent changing,

has been introduced. The container is made oval in shape and is covered with a heavy cloth. This is kept moist by means of a wick, with the result that the continual evaporation cools the water within the pail. In this way, by occasionally pumping fresh air into the cooled water, minnows may be kept alive without difficulty.

7923



Cont: Mrs. Vestal

Mfr. - Abbey + Imbris,  
18 Vesey Street,  
New York City.

**ELECTRIC CRANES FOR WINDOW CLEANERS**

Electric cranes installed for giving cleaners easy access to the windows and the enormous arched skylight in the main banking room constitute one of the interesting features of the equipment of a big bank building in Chicago. The banking room is 325 ft. long and 162 ft. wide. Running longitudinally of the room and covering about one-third of its width is the arched skylight with its springing line 38 ft., and its crown 70 ft., above the floor. The crane used in cleaning the skylight is simply a bridge built to an arch

9194



The Picture at the Top Shows the Traveling Crane with Electric Lift, Used in Cleaning Windows; Arched Crane for Cleaning Skylight Shown at Left

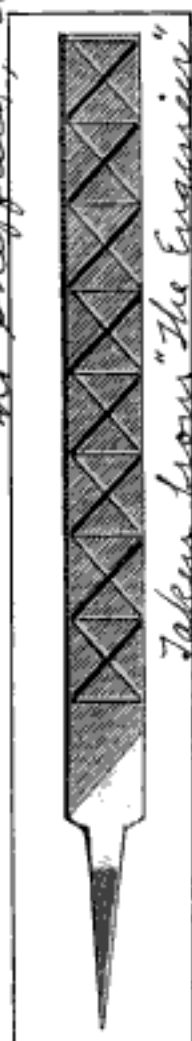
corresponding to that of the skylight and spanning the space between springing lines. It is mounted on wheels that run on rails supported at the springing lines, and is propelled from one end of the skylight to the other by electric power, as required. The bridge is equipped with drains and with faucets for supplying water, so that every portion of the inner surface of the skylight

can be reached and cleaned easily by workmen standing on the bridge. When not in use it is concealed in an arched recess at the end of the room. Each of the window-cleaning cranes consists of an upright frame, 30 ft. high, 3 ft. deep, and 6 ft. long, in which is a working platform that is raised and lowered electrically. The frame is suspended on wheels from a rail near the top of the wall and is held in vertical position

by grooved wheels that run on a heavy brass tubing fixed to the wall a short distance from the floor. A hinged leaf, that is turned back to clear the wall when the crane is to be moved, enables the workman to stand within a few inches of a window when doing the cleaning. At the top of the crane is a second platform used for reaching the upper windows. This crane is also propelled by electric power.

9102  
FILE MADE WITH TEETH CUT  
IN NEW PATTERN

Intended for rough metal work, a file has been devised in England which differs from the ordinary form in that heavy teeth are cut over the diagonal ones, making a pattern similar to that of a series of bedstead trusses. This arrangement of the cutting edges, it is said, adds to the filing qualities of the tool and likewise to its wearing qualities. It is especially useful when quick work is necessary, although it is not made for this purpose exclusively.



TESTING TYPES  
OF STEAMER  
ENGINES

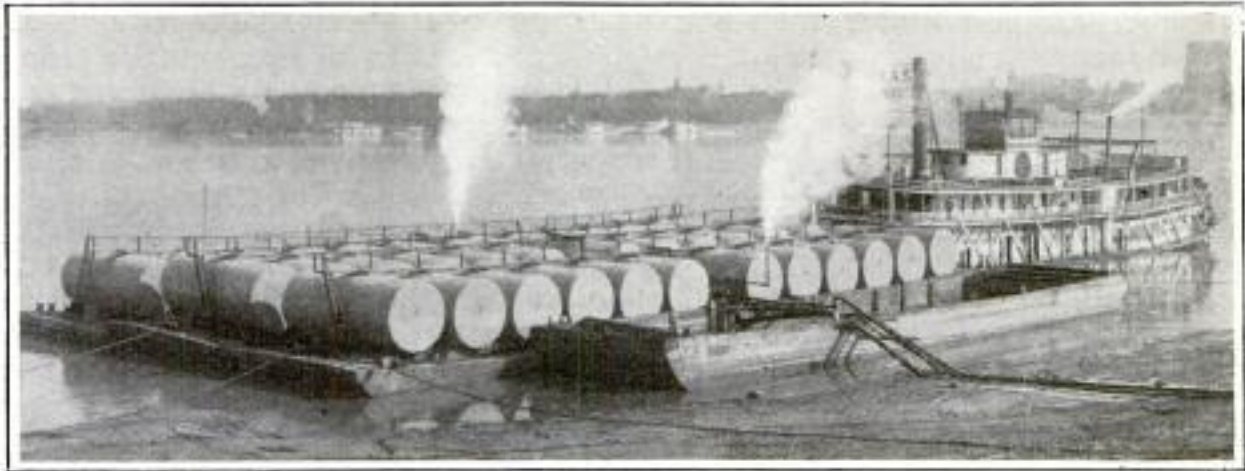
Power 3/2/15  
On trial runs conducted in Sweden for determining the relative efficiency of two sister ships, the "Mjölner," fitted with turbo-electrical engines, and the "Mimer," fitted with ordinary triple-expansion engines, it was found that the coal consumption of the "Mjölner" was 35 per cent less than that of the "Mimer" under exactly the same conditions. Each vessel is of 2,225-tons

displacement and was designed for a speed of 12.65 miles per hour, one of the stipulations being that the engines in each case were to develop 900 indicated horsepower. During the trial runs the "Mjölner" developed 975 indicated horsepower and made an average speed of 13.57 miles per hour. Both vessels are to be placed in coast-wise service and their hulls have been especially designed for operating in the ice.

SHIPPING OIL BY BARGES UP  
THE MISSISSIPPI 9/22

Another advance in the use of the Mississippi River as a transportation route has been made with the installation of a barge service for transporting Louisiana oil from a refinery at Baton Rouge to distributing stations at Arkansas City and Pallfelt, Ark., the latter town being across the river from Memphis, Tenn. From these two points the refined products, such as kerosene and gasoline, will be loaded in tank cars as occasion requires and shipped by rail to retailers in Tennessee, Arkansas, Mississippi, and Alabama. On the first trip, made in December, 1914, the loaded barges were taken up the river by a river steamboat, but as soon as it can be built and put in service an all-steel towboat will be used for this purpose. The station at Pallfelt is a short distance inland from the Mississippi, and the oil is pumped direct from the barges through two 6-in. pipe lines to the storage tanks. At Hopefield Point, where the barges are unloaded, a floating dock has been an-

9495



Unloading Oil from Barges on the Mississippi and Transporting It Inland through Pipe Lines

chored for carrying the pipe lines from the shore to the barges, while a flexible joint in each pipe line allows for the rise and fall in the river without damage to the pipes. The distributing plant at Pallfelt is located on a 10-acre tract which has been inclosed by a levee, 35 ft. high, to prevent damage during the flood season. The three barges that have already been built are of steel, and each carries 12 tanks of large capacity. Some idea of the commercial importance of this distribution of oil is given in the fact that the estimated output of crude oil from Louisiana in 1914 was over 11,000,000 barrels.

DEVICE FOR LIFTING CAR  
OUT OF MUD HOLE 9/44

A new and simple device for extricating an automobile from a mud hole consists of a longitudinally grooved block upon which the automobile wheel climbs and thus lifts itself out of the mud. A tire chain is attached to the forward end of the block, and the other end of this chain is fastened to the rear wheel by means of a padded lock that fits over the wheel felly. When the engine is started, the pull of the wheel against the chain pulls it up on the block. After



Grooved Blocks in Position for Backing an Automobile Out of a Mud Hole

*The Nov 13-704  
Jan 15-1114  
Dec 16-901*

*Con. by Lester L. Bargey  
700 North St.  
Washington, D.C.*

*Inventors = Samuel Robe, Footman Robe and L. H. F. Robe, Kenmare, N. Dak.  
They are in automobile business, probably manu.*

the wheel has passed over, the block is moved forward and the operation is repeated as many times as may be necessary.

**WOODEN SHOES BEING MADE BY BELGIANS IN LONDON**

Since the invasion of Great Britain by thousands of Belgian refugees a number of war-time industries have



COURTESY ILLUSTRATED LONDON NEWS

Belgian Refugees in London Making Wooden Shoes

been started up by the continental people which the average Londoner is almost as unfamiliar with as the American. Of these, one of the most curious is the manufacture of wooden shoes. These are being made in what seems a primitive manner by a few sabot makers who have found their way to the city. The work is done with a long-bladed knife which, so far as size is concerned, is much the same as the corn knives used by farmers in this

country. It is shaped differently, however, and has a keen cutting edge. Instead of coming to a blunt end, the blade tapers down to a hook which fits into a staple driven at one edge of the working block. The purpose of this is to give the operator a leverage and at the same time allow him to do the cutting with the right hand while using the other to hold the shoe on the block. The sabot makers are very expert in the use of this instrument.

**HILLTOP ABOVE COAL MINE CHOSEN AS FACTORY SITE**

In locating a zinc and chemical works at Langeloth, Pa., a new town which is being built a short distance from Burgettstown, the site chosen was the crest of a hill beneath which is a coal deposit. It serves as an interesting example of present-day tendencies in selecting sites for industrial plants, for in this instance railway facilities and the availability of labor were not the only items considered. Ventilation is an important thing in all factories, but especially so in a zinc or chemical works. By choosing the top of the hill, light, ventilation, and a cooler atmosphere during the hot months of summer are possible, while immediately under the factory is the fuel by which it may be operated; an item of importance, since by the installation of hoisting apparatus, practically all of the expense of transporting coal to the factory has been eliminated.



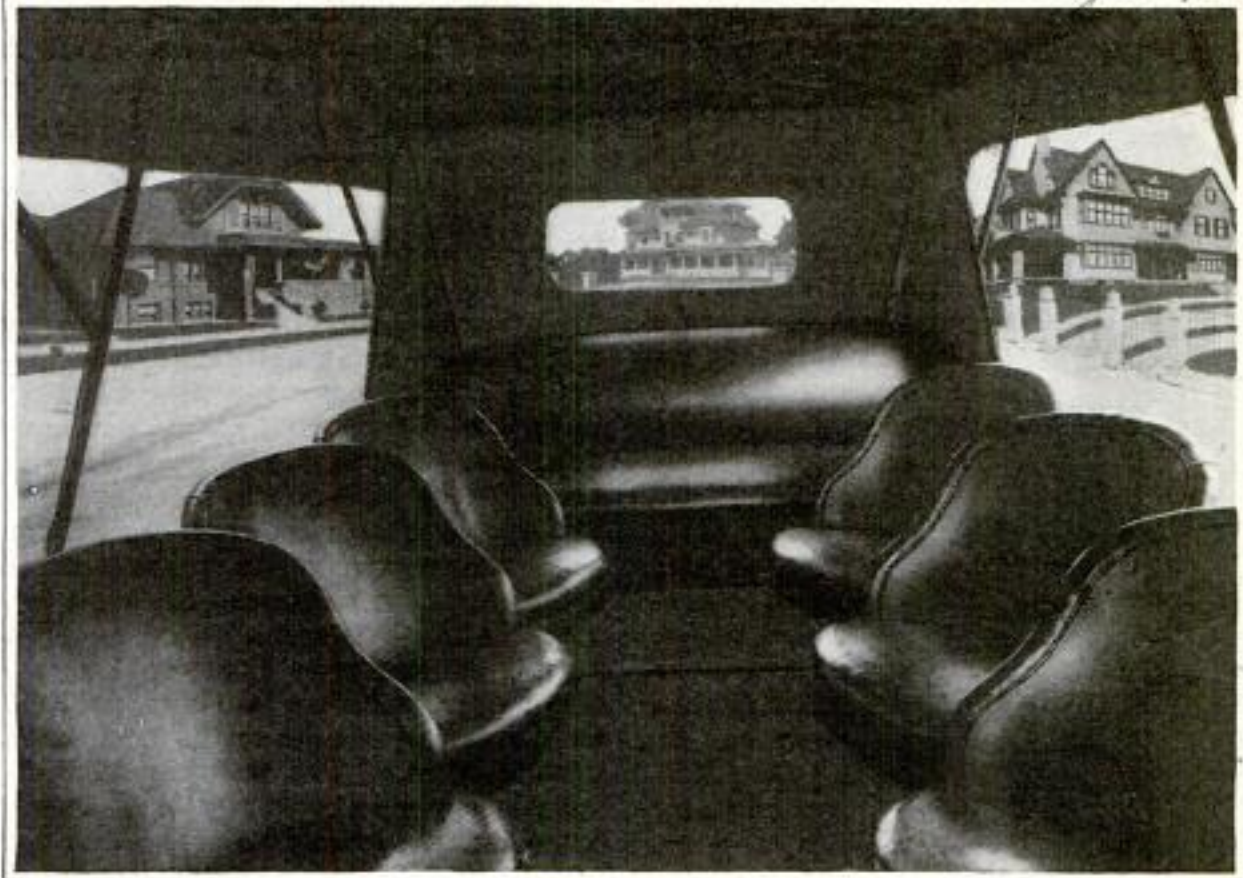
The Crest of This Hill was Chosen as a Factory Site Partly Because of the Coal Deposit Beneath

*Illustrated London News.*

9204

*Pa. - near Burgettstown, Pa. Coal. by Chas. & Reynolds, P.O. Box 468, Pittsburgh Pa.*

Cont: Charles Alma Byers  
 4013 Bernice Ave.  
 POPULAR MECHANICS 109  
 Los Angeles, Calif.



Touring Car Equipped with Upholstered Chairs for Long Sight-Seeing Trips Out of Los Angeles

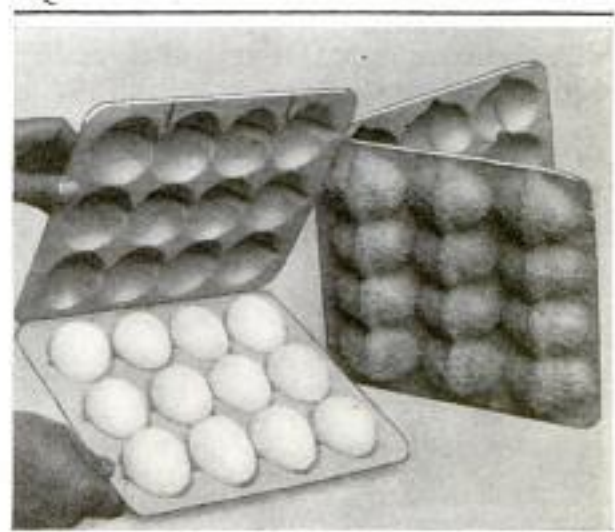
**TOURING CAR EQUIPPED  
 8867 WITH CHAIRS**

A company that handles automobiles for sight-seeing in the country around Los Angeles is installing large touring cars equipped with individual chairs for the passengers. In each car there are six of these chairs, and a seat of the usual type at each end. The chairs are well upholstered, and are fixed in a stationary position so that the passenger faces slightly toward the center instead of straight ahead.

**EGG CARRIER FOR SHIPMENT  
 9487 BY PARCEL POST**

A recently invented carrier for shipping eggs by parcel post is made of wood pulp pressed to such a shape that each egg is held safely in an individual cell. The carrier is formed from a single sheet of the pulp and contains 24 depressions, each as deep as half the thickness of an egg. The sheet is scored across the middle, and, when it

is folded over, the depressions form 12 cells for holding the eggs. In the process of making, heavy ribs are formed on the outer walls of the cells to give strength to the carrier. The edges are



With This Egg Carrier, Made of Wood Pulp, Each Egg is Held Safely in an Individual Cell

secured by metal clips, and from 12 to 30 carriers are packed in one box for shipment.

Mfr. - U. S. Safety Egg Carrier Co., Newark N.J.  
 Cont. - F. D. Burgess - Newark

*Library copy*

**NEW MACHINE FOR GRINDING  
AUTOMOBILE CYLINDERS**

A new portable electric grinder for grinding worn automobile cylinders, that has just made its appearance on the market, is particularly designed for use in small establishments, such as garages and repair shops. Current for operation is taken from an electric-light socket, and the grinder can be carried about and used anywhere in the shop. The machine is operated by a 1/10-hp. horizontal motor and a 1/6-hp. vertical motor, and can be adjusted to any size of cylinder. The feed is automatic, and when set for a given cut, the grinder works with-



*(Arch. 8/15/14)*

out further attention. In the illustration one side of the cylinder which is being ground is cut away to show the method of grinding.

**ARMY AIRMAN FOILS ENEMY  
BY FLYING UPSIDE DOWN**

*Aeronautics  
New York World  
April 2*

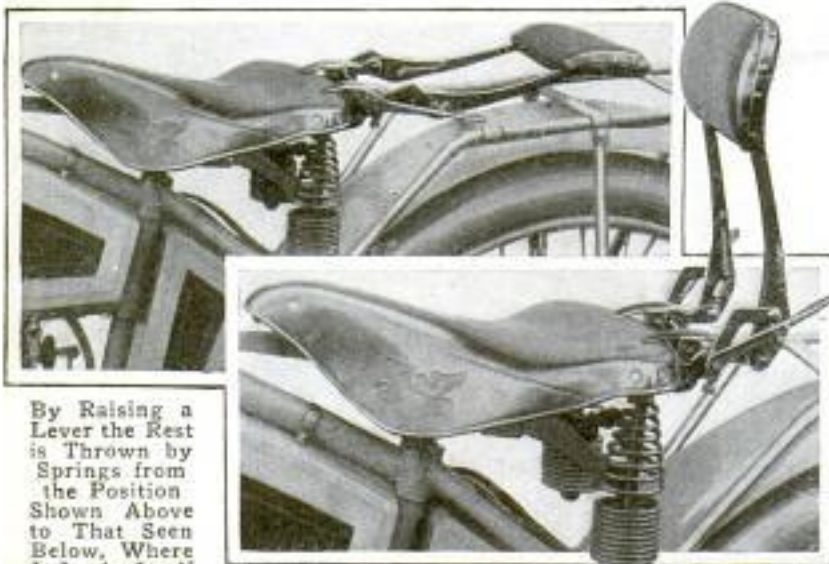
The first concrete demonstration of the practical value of being able to fly upside down in an aeroplane, was witnessed in the war zone near Ghent a short time ago when a heavy bombardment was in progress. A military airman in flying over the German lines got within range of aerial guns and was greeted with a heavy fusillade of shots. His best chance of escape apparently lay in working a ruse. This he did by suddenly directing his machine downward for a short distance and throwing it over on its back, as if it were falling. The shooting immediately stopped, according to a correspondent, the enemy thinking that the pilot had been struck. After gliding in this manner until out of his greatest danger, the airman suddenly righted the machine, dropped two bombs and darted away out of sight.

*979*

**DETACHABLE "LAZY BACK" FOR MOTORCYCLE SEAT**

Designed so that it may be readily applied to any motorcycle saddle, a

"lean-back" rest has been invented which may be folded down on the rear fender when not in use, or when it is desired to mount the machine. On either side it is supplied with a lever which, when lifted slightly, releases springs that throw the brace forward into place, where it automatically locks itself. Both when in use and folded out of the way, the device is held rigidly so that it does not rattle nor cause inconvenience. When riding along smooth pavements it adds much to the cyclist's comfort.



By Raising a Lever the Rest is Thrown by Springs from the Position Shown Above to That Seen Below, Where It Locks Itself

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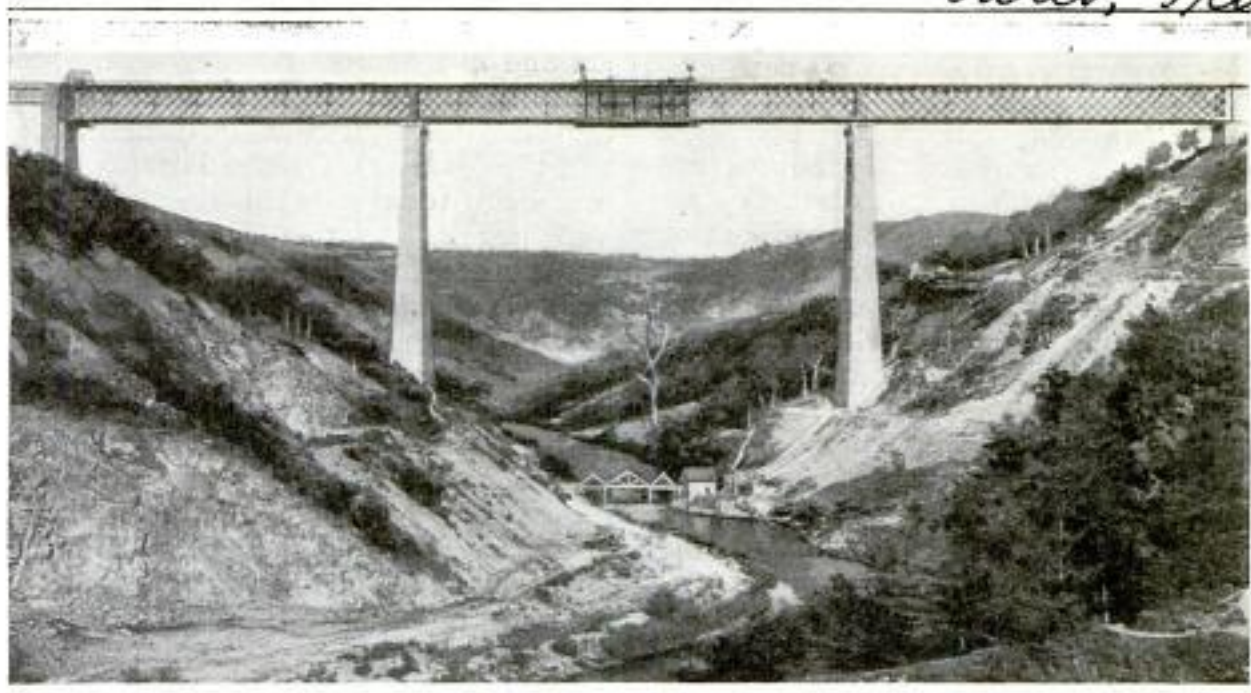
*Comp. = Brown & Dawson, Stamford, Conn.  
Inventor = Howard W. Weed, Stamford, Conn.  
Mfr. --- Weed Folding Back Rest Co., Stamford*

*Copyrighted material*



cont.

Francis P. Mann. 12 Boulevard Arago,  
POPULAR MECHANICS <sup>111</sup> Paris, France.



Fades Viaduct in Southern France: The Cage-like Frames at the Center Are the Traveling Derricks Used in Building the Span

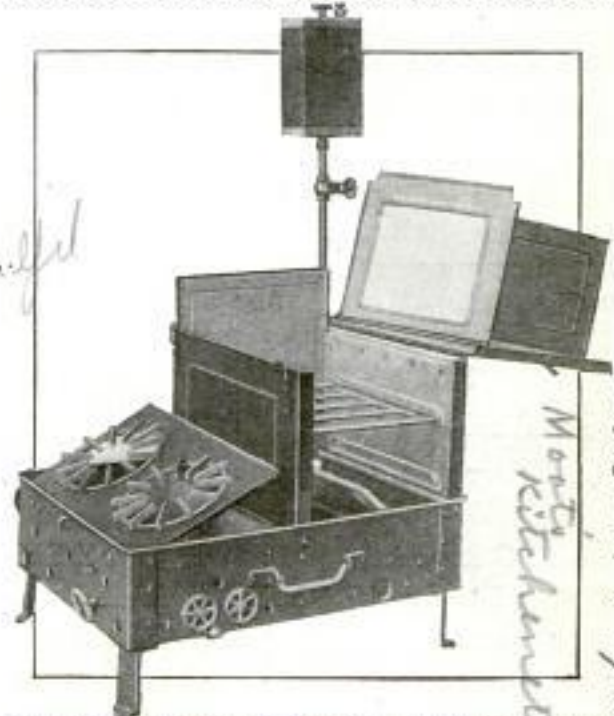
### HIGH VIADUCT FOR FRENCH RAILWAY 9084

A railroad bridge remarkable for its height and the length of its spans is the Fades viaduct built across the River Sioule in southern France. The track is 437 ft. above the water, while the masonry piers stand 305 ft. above the ground and 343 ft. above the foundations. The central span, 475 ft. in length, was built out from the piers as two cantilevers to a junction at the center.

### FOLDING GASOLINE STOVE AND MOTOR-CAR KITCHEN

For the use of motorists making long junkets and cooking their meals at roadside places along the way, a complete kitchen equipment, including a folding gasoline stove, has been brought out which may be carried on the running board of a car. The outfit is packed in a dust-tight container which is neatly made and sightly in appearance. It is about 30 in. in length, 12 in. wide, and approximately 18 in. high. The special feature of the equipment is a two-hole, folding gasoline stove that is built with an ample oven

for baking and roasting things of ordinary size. A table is formed by folding down the front lid of the container, while all of the necessary cooking utensils, enameled dishes, and other articles,



The Portable Stove, Showing Its Different Parts Ready to be Folded into a Compact Form Resembling a Suitcase

required for a party of six persons are supplied. The feed pipe of the stove is provided with a double cut-off valve which insures safety.

Why:- Mention: Wabaco Mfg. Co.  
Grand Rapids, Mich.

**ELEVATOR USED FOR ICING REFRIGERATOR CARS**

At the season of the year when large quantities of perishable products are being shipped in through-express trains, the icing of refrigerator cars in some of the large freight yards requires rapid

work in order to avoid congestion and delay. A portable elevator truck is being used at Chicago to facilitate this work. It operates along a narrow-gauge track between the rows of trains and conveys the ice to the tops of the cars, where it is dropped through holes into the refrigerators. The ice is transferred to

the elevator from cars at one side and then hoisted by a horse. "Slide" boards are laid along the roofs of the long strings of cars and between different rows of them, so that when the cakes are delivered at the top of the lift they may be pushed off with pikes and shot from one point to another by men stationed on different cars. When a working gang is well organized and shows "teamwork," the icing is almost as interesting to watch as a game of shuffleboard.



*Cont.:- J. L. Graff, 84 S. Water St., Chgo.*

— 9402

**MOTORBOATS PROVE WORTH IN EUROPEAN WAR**

Motorboats have taken an important part in the military activities abroad and the service rendered by them has exceeded all expectations. There has been considerable praise given the British Motor Boat Reserve for its work, while the same is equally true of the Volunteer Motor Boat Corps of Germany, which has been active in

*Motor Ship & Motor Boat, Feb. 4, 1915*

several of the battles in eastern Prussia and in Poland. Flotillas of motorboats have operated particularly along the river Memel, the Kurischer Haff, and the Vistula. On the latter stream one fleet took part in the battle of Wloclawek. In this engagement six motorboats formed an advance which covered the left wing of the German forces. The boats were well armed with machine guns and engaged both troops and artillery of the Russians. Although there were losses in the personnel and one craft was struck 16 times, none of the boats was put out of service. During the several months of the war the reliability of the motorboat for military purposes has apparently been proved several times over.

**COMPACT TRANSFORMER FOR MOVIE PURPOSES**

Made in compact form so that it occupies a minimum of space, an electric transformer has been designed for use in motion-picture playhouses to change an alternating current into direct current for the arc. A direct current is much preferred for the projector, as it produces a light which is free from the intermittent flickers of an arc fed by a changing current. The machine is built vertically, so that it occupies a space only 15 in. square, which is an important item in an operator's booth. It is made in two sections, the bottom part holding the rectifying mechanism and the top part the switchboard, control, and indicating devices. The regulator adapts the arc to the correct intensity for a film of any character, while the meter provides a means for gauging and maintaining the light on the screen at the proper intensity.



THE MOTTOR REXOLUX

8840

*30 channel, New York, Cleveland, Ohio, California situation*



A Map of the Western Hemisphere Folded Back at the Equator, Showing the Positions of Points in Both North and South America in Relation to Their Latitude

## EFFECT OF OCEAN CURRENTS ON CLIMATIC CONDITIONS

Ordinarily, in attempting to determine the climatic condition prevailing in a South American country, the average person relies principally upon the latitude of the point in question to guide him, comparing it with that of some place in the United States or Canada which is equidistant from the equator and with which he may be familiar. If this method were a sound one it would only be necessary to fold a map of the western hemisphere at the equatorial zone in order to make a quick comparison. This would indicate, for instance, that Bahia Blanca, which is on the east coast of Argentina, should have a climate comparable with that of Baltimore, Md. While in certain instances this rule will work splendidly, it is not a safe one, the reason

being that ocean currents and altitude frequently go far to offset latitude.

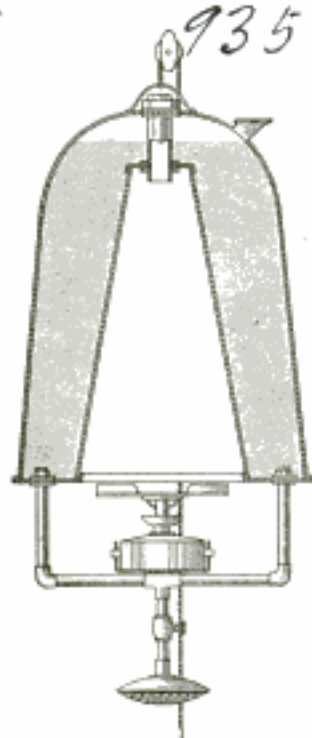
From its position on the folded map Argentina might be expected to have a climatic range somewhat the same as that to be found between the central part of Mexico and the Hudson Bay country in Canada. This extreme range does not prevail, however, for the climate of Argentina is materially affected by the warm ocean current on the Atlantic coast and the cold one along the west shore. This gives it a climate which has a range more nearly similar to that existing between Florida and Maine on the east coast of the United States. The mountain ranges along the western side of the country also have much to do with the climate of the republic. The action of ocean currents

on climate is shown again in the case of the British Isles. London is farther north than any point in the United States, Alaska excluded.

### SHOWER BATH IS DEvised FOR USE OF CAMPERS

For use in camps, and other places of temporary residence where the conveniences of the home are lacking, a

portable shower bath has been devised which serves its function admirably. It is so arranged that either a cold or hot shower may be had at will and without troublesome preparation. The device consists of a water tank which has a hollow space in the middle extending from the bottom nearly to the top, beneath which is a heating lamp. A Y-shaped pipe connection carries the water from the two sides of the tank to the spray, which is held at the lower end, and also serves to support the lamp. By means of a rope and pulley the device may be raised or lowered at will.



9356

### ELECTRICAL CONTROL FOR TRAIN BRAKES

One of the greatest faults in the operation of railroad air brakes has been overcome by the development of a new system for actuating the brake valves electrically, which has been adopted by the Pennsylvania Railroad. With the system now almost universally in use the brakes are set or released by diminishing or increasing the pressure in the air pipe by means of a control valve in the engine cab. With

J. W. Lee, Publicity Agent  
Penn. R. R. Co.  
Broad Street Station,  
Philadelphia

this system the brakes are actuated progressively, the brakes on the car next to the engine being set or released first. This not only results in delay in the operation of the brakes but in serious bunching of the cars when the train is a long one. The new system, while retaining this apparatus, provides for setting and releasing the brakes on all the cars simultaneously by means of electromagnets that operate the brake valves and are controlled from the engine through a wire running the full length of the train. It is claimed that with this apparatus a train can be stopped in two-thirds the distance required for stopping with the ordinary pneumatic apparatus. In case of failure of the electrical control the brake valves can be controlled pneumatically in the usual manner.

### NEW LADDER MADE WITH TRUSSED SIDES

A new ladder has the sides made in the form of shallow trusses, a simple expedient that not only adds greatly to the strength of the ladder, but makes it possible to provide a more secure attachment for the rungs or steps. In a demonstration of a 14-ft. ladder made in this way, and set up so that it inclined five or six feet from the vertical, a distributed load of over a ton was sustained without serious strains. This ladder was made of wood and weighed 32 pounds. It is particularly designed for fruit picking, but is adapted to other uses as well.

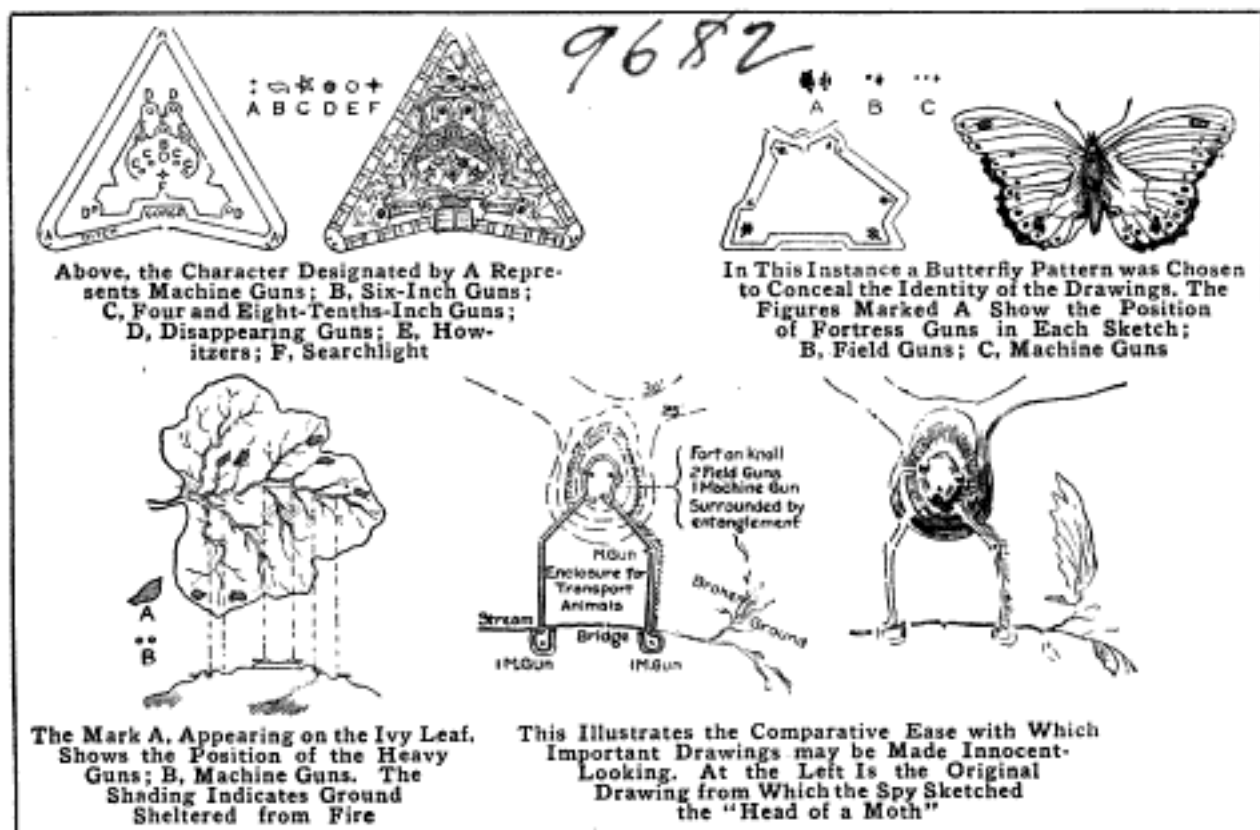


8184

Taken from "The Scientific American" Dec. 1914  
 Patented by H. A. Adams, Queensland.  
 Taken from "Information" published by Penna. R. R. Co.  
 Mrs. H. A. Davis, 425 E. 7th St. Phila. Pa.

How Great Britain before the outbreak of the present war obtained detailed plans of many of the important fortifications in countries now hostile

window. To the casual observer the drawing would bear no indication of its importance, but to the spy it was a carefully executed map of a military stronghold. Certain of the figures represented howitzers, others disappearing guns, searchlights, and so on, while the



COURTESY OF THE SKETCH

to it, has recently been told by a lieutenant general of the army who acted as a secret agent for the British war office. The methods pursued by him correspond to those used by the military spies of other European nations, but some of his drawings offer especially good examples of how valuable such a thing as an apparently innocent sketch of a butterfly or moth may in reality be.

In making the drawings of fortified positions after ascertaining their plans, it was the work of the spy so to disguise them that their true character would not be recognized in the event of his capture by military authorities in the country where he was operating. The plans of a fortification were first drawn in a regular manner and then disguised. In one case this was done by sketching ostensibly a stained-glass

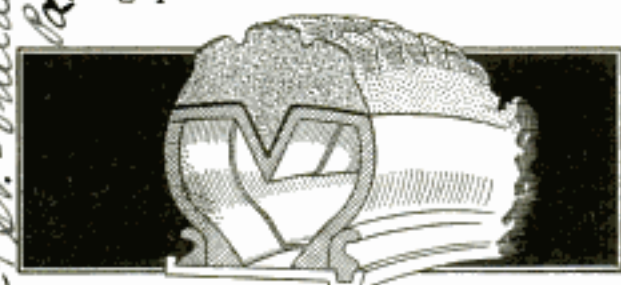
mass of scrolls and finely traced lines had no significance other than as a veil. In another case the spy chose an ivy leaf as a pattern, the veins being drawn to represent the outline of the fortified position; the shading marking the ground sheltered from fire, and heavy spots, resembling worm-eaten holes, the positions of the large guns.

In a butterfly drawing a design sketched over the body and inner parts of the wings, on the back, marked the outline of the fort, and dark spots on the veins of the wings the location of the guns, their size and character being indicated by the relative sizes of the spots and their designs. The head of the butterfly indicated north on the map. The same general scheme was also followed in another case in which a sketch of a moth was employed. Beneath this drawing the agent scribbled,

"Head of Dula moth as seen through a magnifying glass. Caught 19, 5, 12. Magnified about six times the size of life." This indicated that the scale of the map was six inches to a mile.

*7730*  
**AUTOMOBILE TIRE WITH  
 DETACHABLE TREAD.**

A new type of automobile tire with detachable tread has been invented and is being placed on the market. This

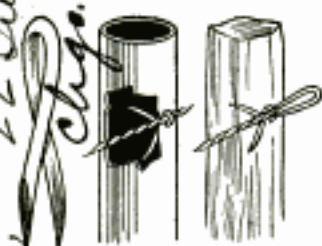


With the Tire Inflated the Tread is Held Securely in Place by the Rib

*Mfr. if yet on market.*  
 tire is made in two parts. One part consists of a hollow main tire of special design that is inflatable and is fixed to the wheel, while the other part is a solid rubber tread that can be taken off or put on as wear or other conditions require. The tread has a longitudinal rib that fits into a groove in the main tire. It is easily put on when the main tire is deflated and is held securely in place by the rib when the tire is inflated.

*7651*  
**FENCE STAPLE THAT LOCKS  
 ITSELF AUTOMATICALLY**

A new fence staple for which patent has been allowed is made like an ordinary staple except that the prongs, instead of being parallel, are bent

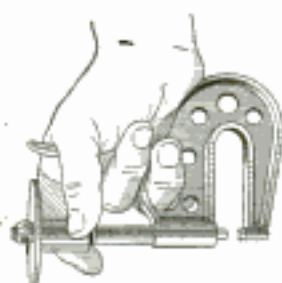


sidewise and curved to converge, the effect being that of twisting the staple into a spiral with a quarter turn. The points clear each other about  $\frac{1}{4}$  in. As the staple is driven into a wooden post the points drive diagonally past each other, with the result that the staple is

securely locked in place and can only be removed by the tearing of the wood or by the application of sufficient pulling power to bring the prongs back to their original shape as they are withdrawn. When the staple is driven into the hole in a steel post the same locking effect is produced, the prongs being forced into a diagonal position by the action of the steel against the shoulders of the staple. This action also results in the forming of a loop at the head of the staple which binds the fence wire securely in place.

*9087*  
**NEW MICROMETER SCALE  
 EASILY READ**

A direct-reading micrometer has been introduced which carries two different gauge scales as well as the customary scale in decimals of an inch. These three scales appear concentrically on a circular dial. The instrument is made so that only the use of one hand is required in operating it, which



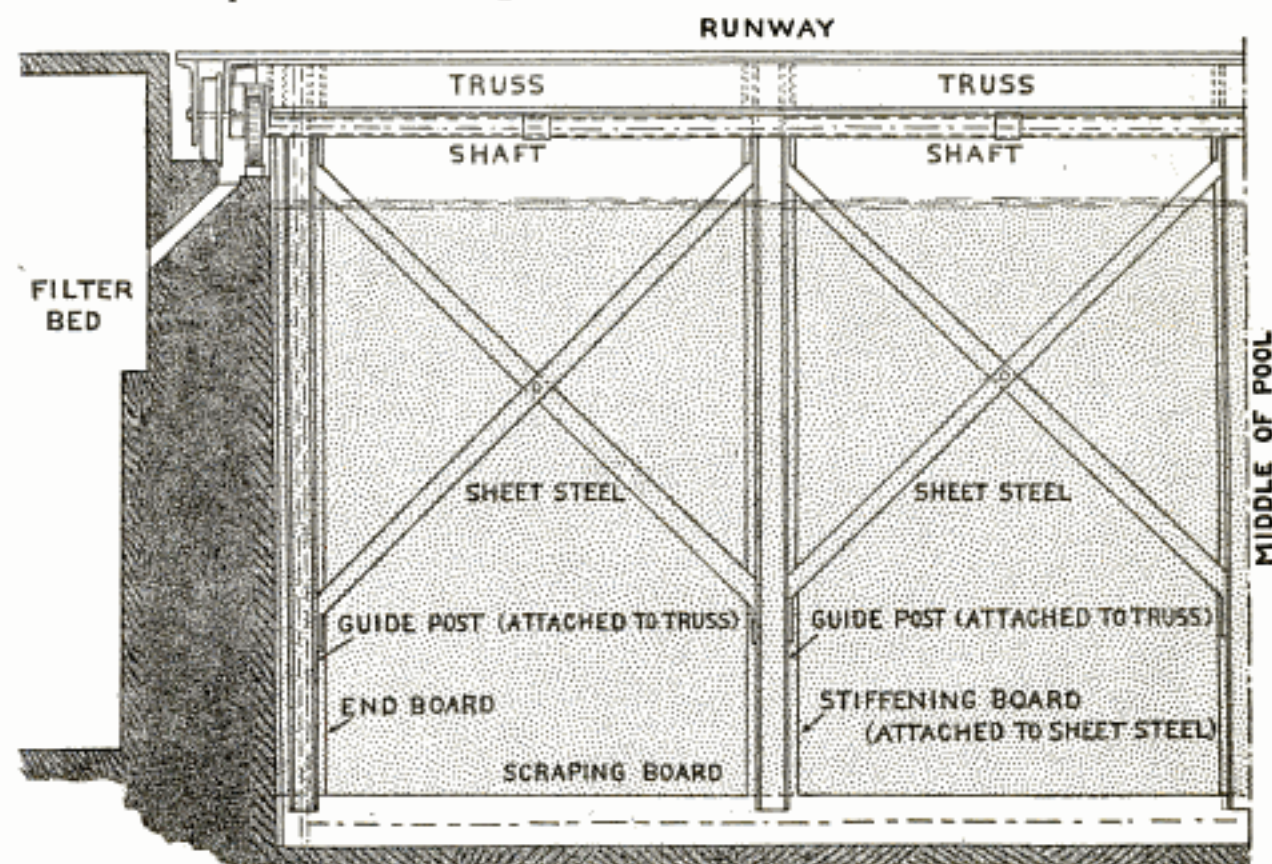
leaves the other free to handle the work. A coarse multiple-pitch screw with a  $\frac{1}{4}$ -in. lead enables the instrument to be used quickly, and all measurements up to No. 80 steel-wire gauge may be made by one revolution. The whole system of wire gauging is a confusing one because of the variance in the scales. In England the Imperial Standard Wire Gauge is one which carries the official sanction of the British Board of Trade, while in America what is known as the B & S is extensively used.

Patent rights have been granted in England on a telegraphic system which uses alternating instead of direct current. It is said to be particularly applicable to submarine cables.

**BATHING POOL KEPT CLEAN BY INEXPENSIVE METHOD**

8818 By designing a large sand-filtering system with capacity sufficient to purify the water quickly, and a light bulkhead that may be pushed from one end of the pool to the other so as to separate the incoming fresh water from that which is polluted and being forced

swimming pool. In beginning the operation, the bulkhead is at one end of the tank. The water in front of it is allowed to flow gradually into the filters so that its level is lowered, causing the intruding filtered water back of the bulkhead to force the device



Cross Section of a Swimming Pool Showing the Bulkhead and Position of the Filtering Tanks

into the filters, a means has been devised for cleaning the walls of a bathing pool and purifying the water in it as many times each day as may be needed, without materially increasing the expense of its maintenance.

The filter beds are constructed alongside the pool. The bulkhead is so constructed that it fits snugly between the walls and on the floor of the tank. On the sides and bottom of this partition, which is made of sheet metal and supported at the top by a truss bridging the pool and resting on small trucks that operate along tracks placed on either side of the basin, are scraping boards which clean the walls and floor as it is moved along the

along the pool to the opposite end of it. When the end of the basin is reached the bulkhead passes over a number of by-pass channels in one of the side walls of the pool, allowing the fresh water to pass around one end and back between it and the end of the pool, driving out the remaining dirty water. At this time, also, the surface of this part of the pool may be cleaned by hand.

Experiments with cotton fabrics for window coverings in factories show that the atmosphere in rooms so protected contains approximately 30 per cent less dust than in those with ordinary screened windows.

NOVEL AND PRACTICAL THINGS  
FOR DAILY USE

Newly Devised Dish Mop

INVENTED which supplies a constant flow of clean, soapy water. It is provided with a rubber hose which connects with the hot-water faucet at a sink. In the

head of the device is a chamber for holding soap, through which the water passes. An ordinary string mop is fastened over the sprayer.

For the motorist a combination eye shade and goggle has been introduced

which is nonbreakable and may also be washed. The upper half is colored dark green so that the eyes of a driver are shielded from blinding headlights at night and the sun's rays during day driving. The lower portion is amber-colored.

A clothes sprinkler that has lately been brought out is made of glass and shaped similarly to a small gourd. It is fitted with a perforated cap, serving as a sprayer, which, when removed, allows the device to be refilled with water.

Made large enough so that it may be used to carry cigarettes and matches, or personal jewelry, including a man's-



Eye Shade and Goggle Combined



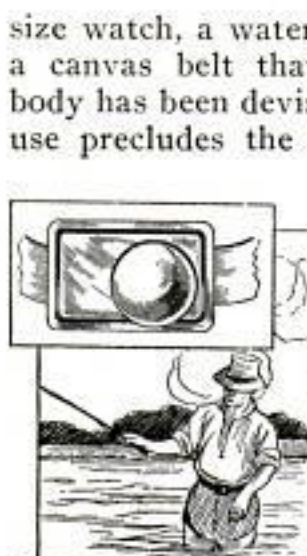
Convenient Clothes Sprinkler

size watch, a water-tight case fixed to a canvas belt that straps about the body has been devised for bathers. Its use precludes the theft of money or other things of value which otherwise would be left in a locker.

Adapted particularly for use on camping and motoring junkets, an opener for condensed-milk cans is being made which serves to cover a container and protect its unused contents from dust and flies. It fits on the top of a can, furnishing an instrument for puncturing the lid, and may be turned to cover the aperture thus made.

For persons who carry memoranda, and then need to be reminded of the fact, a finger

ring has been devised which serves this double purpose. Beneath a transparent stone mounted in the setting is a shelf-like surface which may be drawn out and written upon. The notation thus made is continually brought to the attention of the wearer.



Belt Vault for Bathers and Fishers



Serviceable Opener for Milk Cans



Novel Memorandum Ring



To employ a drinking glass as an advertising medium in a restaurant is the novel use suggested by the introduction of a newly designed glass. A depression molded in the under surface enables the insertion of a paper disk, corresponding in size to a milk-bottle cap, on which advertising matter pertaining to the establishment is printed.

A small coin purse, intended for the use of a woman, has been designed which may be worn out of sight beneath the belt of a summer dress and in which there are no pockets. On the back is a safety pin with which it may be fastened to any part of the apparel, such as the lining of a jacket.



Drinking-Glass Advertising

Substantial paper bags are being made for use in vacuum cleaners. When it is time to remove the dirt the bag is tied and taken out. This does away with the unpleasant task of emptying and cleaning the dust receptacle, as the



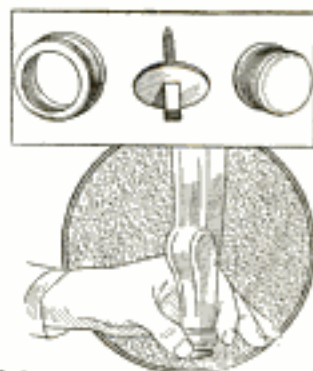
Coin Purse for Woman

paper sack may be thrown away after once being used.

Casters which may be adjusted, so that a table, or other piece of furniture, will stand firmly on an uneven floor, have been patented. The leg

of a table, for instance, may in this way be lengthened or shortened in a moment's time. An-

other convenient feature of the device is the readiness with which it may be applied to a piece of furniture. Instead of fitting into a hole specially bored for it, the caster is provided with a spike head so that it may be driven into a table or chair leg with a hammer.



Casters for Uneven Floors

A mixing device which may be used for whipping cream, beating eggs, or preparing iced drinks and frappés, has been introduced. It consists of a tight, cylindrical container fitted with a plunger, at the lower end of which is a propeller-shaped set of blades that revolve rapidly when raised and lowered. It is claimed that cream can be whipped in less than a minute.



Mixer Whips Cream Quickly

Intended to perform a double service, a laundry package has been invented that may be used both for the delivery of fresh linen and the subsequent return of soiled articles. It consists of a lidless pasteboard box, in which the laundry is placed, and a substantial paper envelope for the whole. The sack may be hung up in the home and used as a receptacle for soiled linens. In this way it serves still another purpose, that of an advertising medium for the company employing it.



Double-Service Laundry Bag



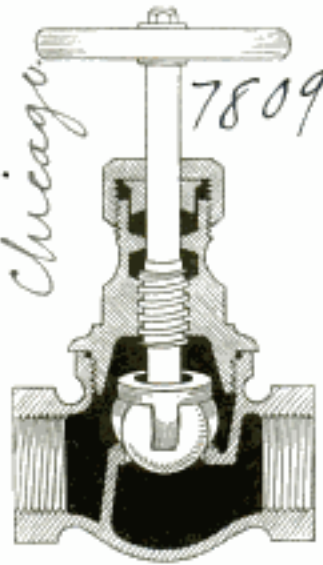
Paper Bag for Vacuum Cleaner

Also  
New York  
Brooklyn  
Boston  
Pittsburg  
Detroit  
Indianapolis  
New Orleans  
Phil.  
Baltimore  
Albany  
St. Louis  
Hartford

POPULAR MECHANICS

**METAL BALL REPLACES DISK  
IN NONLEAKABLE VALVE**

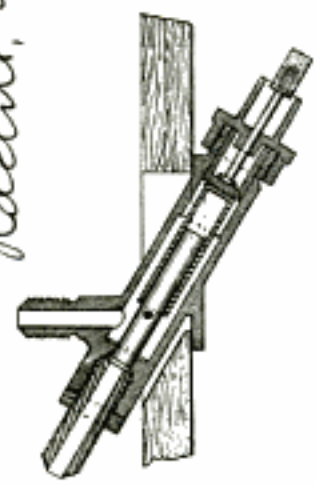
Designed to be proof against loosening and leaking under long or heavy usage, a valve has recently been introduced which employs a sphere of brass or noncorrodible nickel steel instead of the customary disk. This ball is held loosely within claws which revolve freely at the end of a spindle. The flanged end of the latter is concave and presses upon the top side of the sphere, holding it solidly on the valve seat. In opening or closing the valve the ball is whirled, altering the point of contact between it and its seat, thus preventing wear.



Chicago  
7809

**NEW OIL INDICATOR FOR  
MOTOR VEHICLES**

One of the most important things in the operation of a motor vehicle is a constant supply of lubricating oil in the right quantities to the motor, cylinders, and other moving parts. A new indicator, designed to be placed on the cowl, or dashboard, shows by the position of an indicating bulb, and without the use of a glass gauge, whether this circulation of oil is going on properly or not. The oil as it comes from the pump enters a perforated pipe within the indicator, and can only

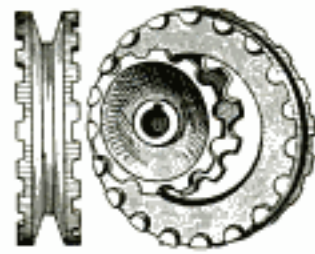


8678

reach the outlet pipe by passing through the perforations. A sleeve with a closed top fits over this pipe, being made to slide easily on the pipe without permitting any leakage of oil. The upper end of the sleeve is connected with a rod, at the top of which is a metal bulb. Under the pressure exerted by the pump, the oil lifts the sleeve high enough to uncover the perforations in the pipe, with the result that the bulb is raised out of the housing at the end of the tube, and when the circulation of oil stops, the sleeve slides to the bottom of the pipe, drawing the bulb inside the housing.

**NEW BELT PULLEY FOR  
MOTORCYCLES**

The disadvantages of a belt drive for motorcycles are apparently overcome in a double driving pulley recently brought out by a French inventor. This pulley consists of two wheels, one working within the other, the smaller wheel being fixed to the wheel axle,



7494

while a V-belt works over the outer and larger wheel. The rim of each side of the inner wheel consists of a series of indentations which engage lugs that project inward on each side from the rim of the outer wheel, as shown. The advantage in this arrangement is that it gives a long bearing for the belt without cutting down the speed as would be the case if a single large wheel were used. The inner wheel has 12 indentations and the outer wheel has 19 lugs, so that the axle of the motorcycle makes 19 revolutions for each 12 revolutions of the belt-driven wheel.

Following the fall of the Belgian fortifications at Liège and Namur a German scientist has condemned the use of reinforced concrete in forts. He recommends a return to brick and stone.

Mfr: The Pratt & Cady Company, 159 W. Lake St. Chicago  
Geo. W. Morris, Racine, Wis.

Inventor: M. Barrea, Paris, (France) France

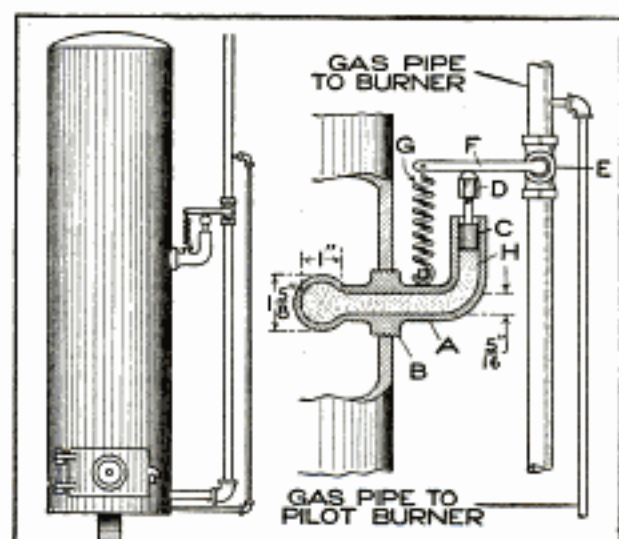


### Water-Heater Controller

The device shown in the sketch is for automatically controlling the temperature of the water in a water heater. It consists of an iron casting, A, screwed into the water tank at B; a steel float, C; an adjusting nut, D, and a gas valve, E, with an arm, F, which is held against the nut D by the spring G. When the arm is in a horizontal position the valve is closed. The casting A is filled with mercury, H.

The operation of the device is very simple. When the water in the tank cools, the mercury contracts, the float C descends, and the gas valve is opened, thus starting the fire in the burner of the tank. When the water reaches the required temperature the mercury expands and closes the gas valve, putting out the fire.

The control mechanism is shown

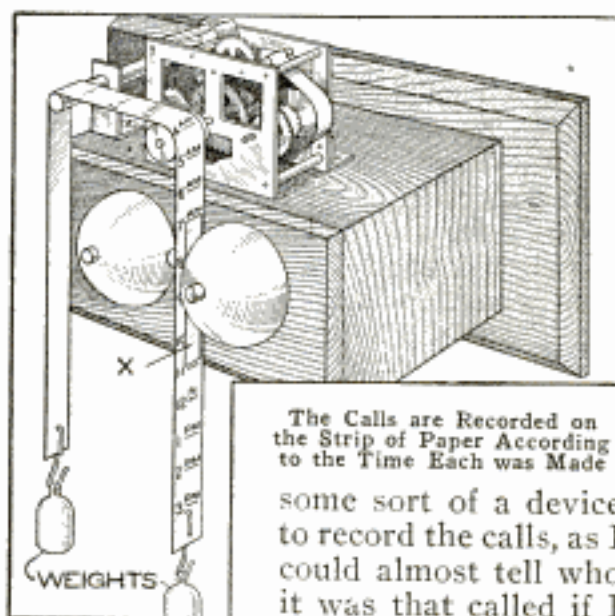


The Expansion and Contraction of the Mercury Caused by the Change in Temperature Operates the Valve

large in proportion to the tank so that its construction may be clearly understood. Dimensions are given for its size.—Contributed by F. B. Hays, Houston, Tex. *F. B. Hays*

### Recording Telephone Calls

Having occasion to leave my studio much of the time and my telephone calls being so few, I decided to make



The Calls are Recorded on the Strip of Paper According to the Time Each was Made

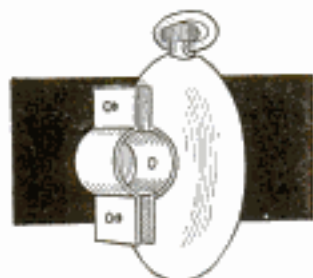
some sort of a device to record the calls, as I could almost tell who it was that called if I knew that a call was

made and at what time. The device illustrated was the outcome of my efforts. An old clockwork is attached to the top of the telephone-bell case so that a roller, attached to the hour-hand spindle, projects over the side and its edge is in line with the space between one of the bells and the clapper. A strip of carbon paper is placed on one side or the other of the strip of recording paper so it will be struck with the clapper or bell edge. The recording paper is graduated so that the time the call was made is also recorded. When I go out, a strip of the recording paper is placed in the device, and if anyone calls, the information recorded is not only convenient but sometimes valuable.—Contributed by R. F. Pohle, Lynn, Mass.

Use fine emery for grinding a plug valve in its seat.

### Watch Holder for Automobile

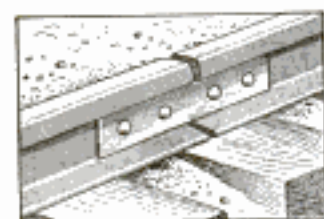
A cheap and serviceable watch holder for automobiles can be made out of a



watch-protector case and the clips from a discarded bicycle bell. For this purpose one of the clips should be fastened to the back of the case with a small flat-head rivet, fitted in a hole drilled through the clip and case. The two ends of the clip may then be clamped in a suitable place on the rim, or spokes, of the steering wheel, and the holder is ready for the watch. In order that this should not be scratched, or suffer from constant jarring, the protector case should be lined with soft material, such as velvet.—Contributed by E. R. Hastings, Corinth, Vt.

### The Expansion of Rails

Anyone who is observing will notice, if walking along a railroad track in winter, that the ends of the rails do not



meet. There will be a space between the rails of from  $\frac{1}{4}$  to  $\frac{1}{2}$  in. according to the length of the rails, character of the track and climatic conditions. On sidetracks the rails will often be found butting together or spaced 1 in. apart, all within a few hundred feet. This is simply because the tracks are unimportant and are laid with as little expense as possible.

The rails on the main line of a trunk road will be found equally spaced with unending regularity. This is done on account of the expansion of the rails in the hot summer, for if the gap was not provided when the steel was laid, the heat would cause such a tremendous end pressure that the tracks would assume a grapevine appearance.

Should the extreme temperatures be  $10^{\circ}$  below and  $90^{\circ}$  above zero, there would be a range of  $100^{\circ}$ , and as steel expands in length per inch .000006 in. for every degree rise in temperature, a 33-ft. rail would differ  $.000006 \times 100 \times 33 \times 12 = .2376$  in. or almost  $\frac{1}{4}$  in. in length between winter and summer. In laying the rails, a gauge is used to secure the proper spacing.

### Combined Belt Pole and Shaft Cleaner

Instead of having one pole for placing belts on pulleys and another for cleaning the shafting, the two can be combined in one, as illustrated.



A block of wood, A, which is of a width equal to that of the pole B, is cut to the shape shown. A hole is bored in the part C to fit over the rod D in the belt pole, and a cotter, E, keeps it in place. Two metal strips, F, one on each side, are fastened to the piece A to keep it from turning sideways.

When the belt pole is to be used for cleaning the shafting the block A is slipped on the rod D, the cotter E is inserted, and all is ready to clean the shafting. It is obvious that a piece of emery cloth, or felt, should be fastened in the curve G, which fits the curve of the shafting and does the cleaning.

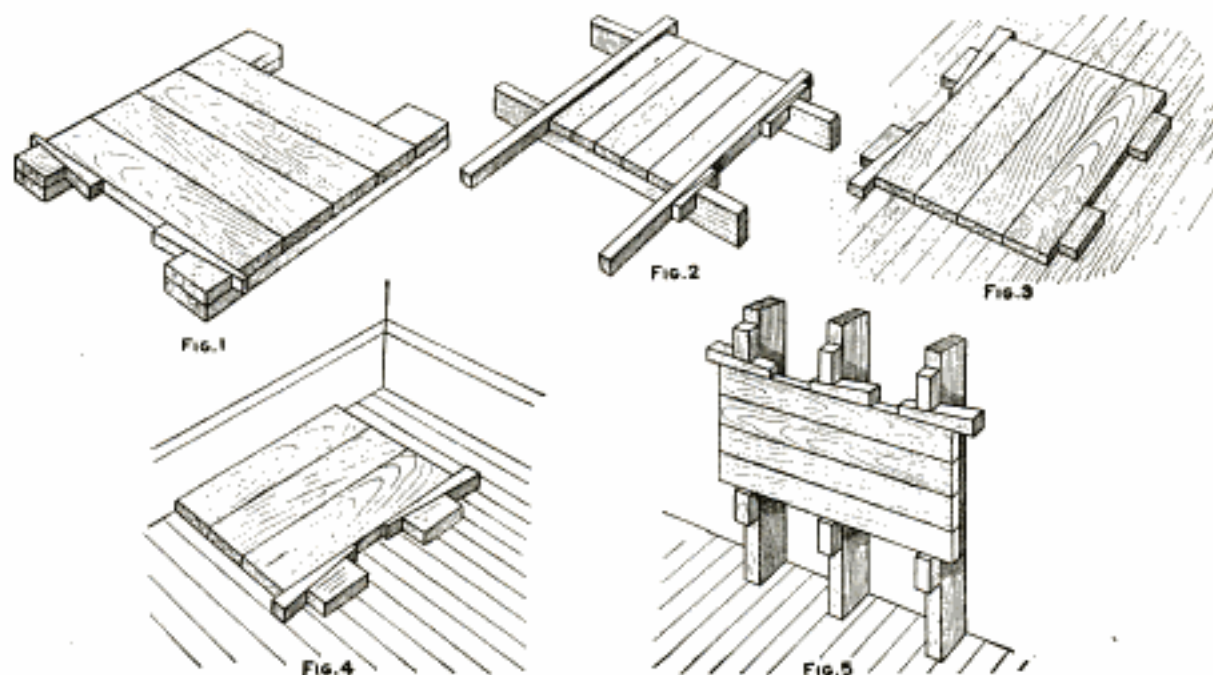
### Emergency Clamps

The holding together of several pieces of wood for fastening with screws or nails, or to hold them while the glue is drying, presents but small difficulty when suitable clamps are available, and when these are not at hand, then clamps of some sort must be improvised. These are almost always of the bar-and-wedge type, and being of a temporary nature, may be made of scrap material around the shop, and if they are fastened together with screws, they are easily taken apart without injury to the stock used.

For gluing table tops, or similar pieces made up of a number of narrow strips, the type of clamp shown in Fig. 1 is best; in fact, it is the best form of wedge clamp for any purpose, all others being modifications of this one or employing the same principle. Its

verse the middle one, as this helps to overcome the buckling tendency.

In Fig. 2 is shown a modification of Fig. 1, which is used for light work. This clamp is made of a single piece of  $\frac{7}{8}$ -in. stock. Two thin wedges driven from opposite sides are used



Various Forms of Clamping Devices Using Blocks and Wedges on a Plane Surface, Either Movable or Stationary, to Hold a Number of Pieces Together While Gluing or Fastening Them with Screws or Nails

construction is very simple: a bar of suitable length, with two crosspieces, one fastened at right angles to the edge of the bar and the other set at an angle to match the taper of the wedge. This taper should be about 1 in. to the foot, and it is well to cut the wedge before setting the crosspiece. Screws will do very nicely for fastening these crosspieces, if the clamps are to be used only once or twice; but if they are to be used a number of times, it will be best to use glue, in some cases further strengthened with dowels, to fasten them to the bar.

To counteract the tendency of springing up in the center when the wedges are driven home, it is customary to lay other pieces across the ends and clamp them with hand screws to the bars, but if the joints have been well made and the wedges are not driven too tightly, this is not necessary. Where three clamps are used, however, it is a good plan to re-

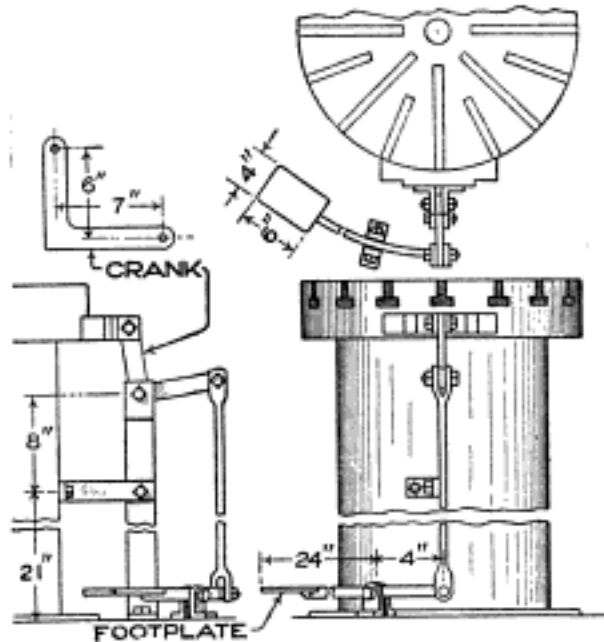
instead of one, as both ends of the clamp are cut square with the face.

These devices would appear to be the acme of simplicity both in construction and use, but simple as they are, the lack of material for making them may at times force one to resort to other means for accomplishing the work in hand. In this case a floor, or other plane surface, is necessary, using blocks and wedges as the clamping means. If a baseboard, or something equally firm, is at hand, but one set of blocks will be required.

Some examples of this form of clamp are illustrated. In Fig. 3 is shown the blocks used on a floor or bench top, and in Fig. 4 the clamping is done against a baseboard. The blocks can also be fastened to studs, as shown in Fig. 5. In nailing the blocks, in each instance allow about  $\frac{1}{4}$  in. to project so that they may be easily removed with a claw hammer.—Contributed by J. A. Shelly, Brooklyn, N. Y.

### Brake for Bed of Vertical Boring Mill

A great many types of vertical boring mills are not equipped with a brake arrangement for stopping the rotation



Brake Attachment for Use on Old-Style Boring Mills to Stop the Rotating Table Quickly

of the heavy bed at any point necessary. With many of these machines much time is lost while accurately centering work because of the care which must be taken in attempting to stop the bed at the greatest off-center portion of the work on the table. Of course, the latest machines of this type are supplied with a device for quickly stopping the rotation of the table, yet many of the older, but none the less efficient, machines are not so equipped.

The sketch illustrates the application of a very suitable braking device for the mill tables, which is inexpensive in erection, and in addition to this, is of much help to the operator of the machine. The brake shoe is of wood and acts directly on the side surface of the table, with sufficient leverage and friction to stop almost instantly the heavy rotating part. The foot lever can be curved somewhat around the lower portion, or base, of the machine, to enable the operator to get closer to the work being centered by the needle to the layout lines.

The body of the table can be readily tapped for an angle iron to steady the

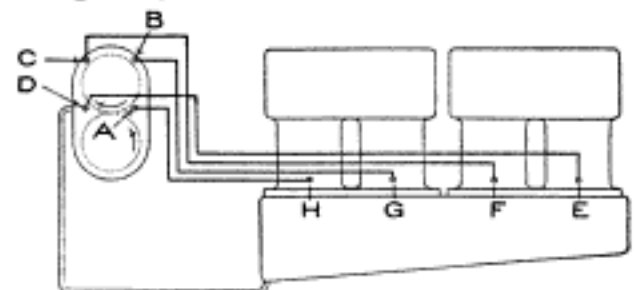
top of the lever post holding the bell crank. The device is well worth its construction and application to the types of vertical mills not equipped with a special brake apparatus.

### Improving an Oiling System on an Automobile

A certain manufacturer brought out a line of automobiles that proved to have an unreliable oiling system. The system consisted of a geared pump drawing oil from the crank-case sump and delivering it through individual pipes to the lower end of the bore of each cylinder in a ring-shaped reservoir into which the piston dipped on the downward stroke, carrying back with it a film of oil on the cylinder walls.

The theory of this was fine, but in practical use it was not so good, and the automobiles all went bad in respect of the oiling. At the manufacturer's expense, necessary repairs, alterations, and substitutions were made for owners, as a better oiling system was devised. In one locality there were several of these automobiles, and one owner undertook to locate and remedy the trouble. He succeeded and passed the word along to the others, and all of this lot were fixed up for a nominal sum without recourse to the factory.

As shown in the sketch, the delivery was through four outlets arranged around the circle of the pump gears. Originally the outlet A served the



Connections of the Pipe System so That Oil was Forced Equally to All Cylinders

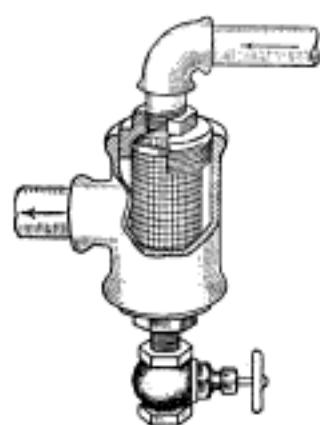
cylinder E; B, the cylinder F, and so on. It was the cylinder E that gave the most trouble; cylinder F, a little less, and the others, no trouble at all. It was discovered, by disconnecting

the pipes at the cylinder end, that the cylinder E received little or no oil, and increasing amounts farther back, the cylinder H being well oiled.

The inside construction of the pump is not shown, which is not essential. The outlet D was nearest the source of supply and its pipe was the shortest, which seemed to the investigator to be wrong. The whole piping was changed by reversing it, so that the outlet nearest the supply forced oil through the longest pipe, and the outlet farthest from the supply fed the cylinder closest to the pump. The arrangement was a complete success.

### Strainer for a Water Line

To prevent any dirt from entering a pump, I constructed a simple strainer,



as shown in the sketch. The body of the strainer is made of a large reducing tee, the ends of the main throughway being reduced with bushings.

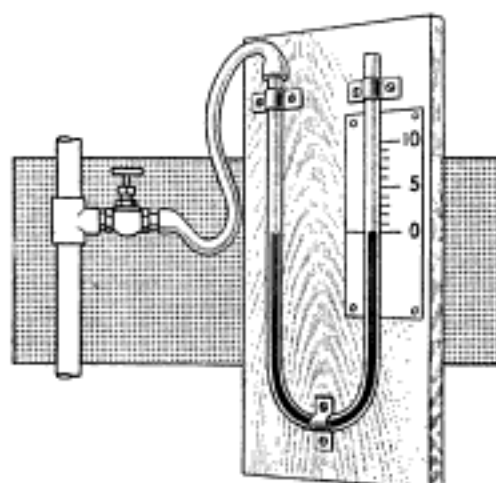
A brass-wire screen is shaped to fit snugly in the bushings, so that all water passing out through the side outlet will pass through the mesh. A drain valve is attached with a nipple to the lower end. The drain will allow the cleaning of the screen for a considerable length of time. The strainer is suitable for steam, water, or air lines.—Contributed by Geo. J. Little, Passaic, New Jersey.

### Homemade Steam Gauge

In running a small steam engine in my shop on the first floor I found it took a great deal of time to run down into the basement every few minutes and look at the gauge on the boiler. With the aid of two chains attached to the damper and running up through the floor, I was able to keep the pres-

sure uniform by means of the gauge shown.

A U-shaped tube was filled with mercury to within about 4 in. of the



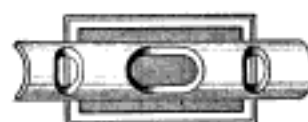
A Mercury-Filled Tube with a Calibrated Card as a Substitute for a Steam Gauge on Low Pressures

top, and one end was connected to the steam pipe with a piece of rubber tubing with a petcock in the line. After fastening this to the wall with leather straps I tacked a card underneath the free arm and drew a line upon it at the level of the mercury. I then raised the pressure in the boiler, and for every pound on the gauge I made a mark on the card at the new level of the mercury. As the pressure never exceeded 10 lb., the improvised gauge served the purpose fully as well as an expensive one.—Contributed by H. H. Raymond, Newburyport, Mass.

### Making Use of Broken Gouges

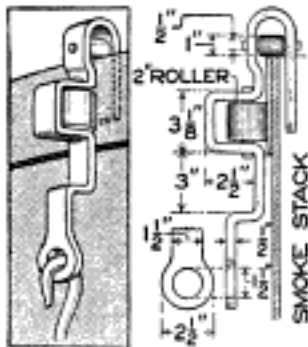
In almost every pattern shop one or more broken gouges can be found. Instead of throwing them away they can be made into very useful tools.

Take a full sweep of any width and grind out as many holes as desired, as shown in the sketch, and a corner rounder will be had that is better than the double ender, as it can be worked into small places and used similar to a knife. A large, long opening makes a fine spokeshave.—Contributed by S. H. Bossart, Birmingham, Ala.



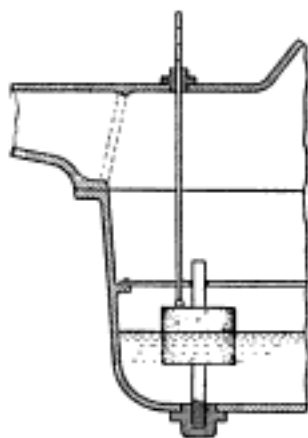
### Traveling Hooks for Smokestack Painters

Painting high stacks is quite a serious problem and should be done with appliances of absolute safety. The usual method of placing hooks over the top of the stack to hold the scaffold makes it difficult to change the position. To make the changing more easy, one stack painter made hooks having rollers, one for the top edge of the stack and the other to prevent the friction on the side, as shown. Each hook consists of a piece of soft steel, having dimensions as given. The rollers are made of pipe, the smaller one  $\frac{3}{4}$  in. and the larger  $1\frac{1}{2}$  in. in diameter. They are fitted with hardwood centers to turn on  $\frac{1}{2}$ -in. pins.



Oil Gauge for an Automobile Crank Case

Quite a few of the older types of automobiles have their engines unequipped with a suitable form of oil gauge. A gauge of this kind is extremely handy, as the owner can readily tell at a glance the exact amount of oil in the crank case. The float should be made first, and consists of a cylindrical piece of cork, about 2 in. in diameter and  $1\frac{1}{2}$  in. long. A piece of brass, or copper, tubing, a trifle more than  $\frac{1}{2}$  in. in inside diameter and  $1\frac{1}{2}$  in. long, is inserted in the center of the cork. The float is then given two or three coats of shellac. A steel rod,  $\frac{1}{2}$  in. in diameter, is fastened in the



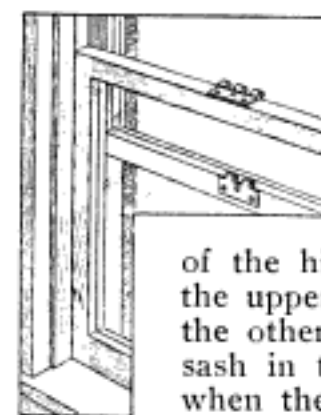
bottom of the crank case by means of a plug. The float will easily slip on the rod.

The gauge staff is made of a piece of  $\frac{1}{4}$ -in. drill rod, the length depending on the design of the engine. A hard-fiber ball is attached to the lower end of the rod, to prevent wear on the cork and its shellac coating. The rod is guided at the upper end by means of another plug through which a hole is drilled for it.

The rod is graduated as follows: Drain the crank case and assemble the gauge. Pour in a quart of oil and mark the rod. This process is repeated until the required amount of oil is poured into the crank case. The marks will then show in quarts the amount within at any time.

Window Latch Made of Door Hinge

A latch, making an absolutely safe lock for a window, can be made of an old door hinge.



The pin is first removed from the hinge and, if it fits tightly, filed down to allow easy removal. One half of the hinge is screwed to the upper window sash and the other half to the lower sash in the center, so that when the window is closed the two parts of the hinge will come together; then the pin is replaced. It is easy to put in place and take out.—Contributed by L. E. Turner, New York City.

### Substitute for Kindling Wood

A very good kindling for fires can be made of waste paper. To make it more effective, wet the papers thoroughly and wring them out as in wringing clothes by hand, and stack up the twisted forms to dry. When dry they are used the same as kindling wood.



# BUILDING A HOME

By Geo. M. Petersen



## PART IV—Materials

**T**HERE is a wide range of material from which homes may be built, and an almost endless variety of combinations. A building may be constructed of stone block laid in regular courses, known as coursed ashlar, or stone laid up as a veneer. Frame construction is well understood by every one; brick may be laid in mass formation, or may be laid up as a veneer the same as stone. Stucco is also used in considerable quantities and is really a plaster, or cement, veneer. These materials are used in various combinations, such as, brick and stone veneers, brick veneer and frame, brick veneer and stucco, frame and stucco, etc., with satisfactory results.

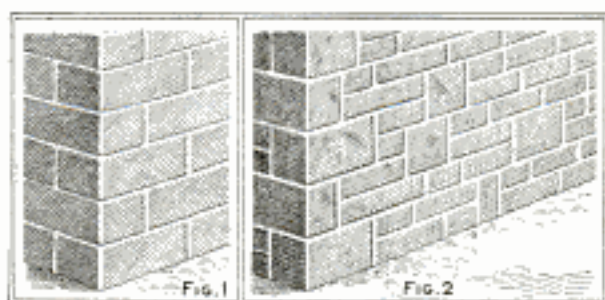
### Stone and Stone Veneer

When erecting a stone wall first become familiar with the class of stonework called for in the specifications. The most common kind of stonework is known as "rubble work." This stone requires no attention except to break it up with a hammer. If a rubble wall is laid in regular, or fairly regular, courses, it is known as "coursed rubble." The name "ashlar" is used to designate stone on which the outside face has been squared, and when laid to form regular courses around the building it is known as "coursed ashlar." When the stones are laid in irregular courses, or different heights, it is known as "broken ashlar." This work is perhaps the most attractive

and certainly among the most expensive classes of stonework.

First-class ashlar work requires the stone to be dressed on a bench with chisels, and the beds and end joints to be cut back square with the face. There is also a cheap grade of stonework known as "hammer-dressed ashlar," in which the stones are roughly dressed with a hammer. This class of work is very cheap and is seldom used. Then there are all kinds of cut stonework, where the stones are all squared up and brought to a smooth face. A coursed-ashlar wall is shown in Fig. 1, and a broken-ashlar wall in Fig. 2. A section of a stone-veneer wall on frame construction is shown in Fig. 3. This type of construction requires the stone to be cut from 4 to 8 in. thick and then laid up in mortar and fastened to the framework with iron ties.

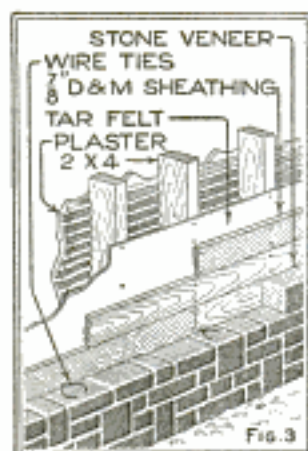
Stonework of all kinds can have the



Stone Laid in Regular Courses is Called Coursed Ashlar, and in Irregular Courses, Broken Ashlar

joints finished in various ways, some of them being shown in Fig. 4. Tuck pointing is probably the most com-

monly used, while the raked joint is the more artistic. The frost, however, affects both of these joints and eventually chips off the tuck pointing. On the raked joint the frost affects the joint only and sometimes causes the edges to crumble, or break, from the stone blocks.



Brick and Brick Veneer

Brick dwellings are usually erected with a 16-in. wall up as far as the second-floor level, and a 12-in. wall for the remainder of the height. The brick commonly used in walls are what are termed "hard commons," although the outer course is usually some kind of a pressed, rough texture or other face brick. These brick are usually quite expensive, but a very good grade may be had for about \$16 per thousand. These brick can be obtained in all kinds of finishes and several colors, and when laid up in mortar of a color different from the brick, very pleasing effects can be obtained. There are several different ways in which the joints, or bonds, may be laid, some of which are shown in Fig. 5.

Brick veneer is laid identically as stone veneer, as shown in Fig. 3, and is also veneered on tile, as shown in Fig.

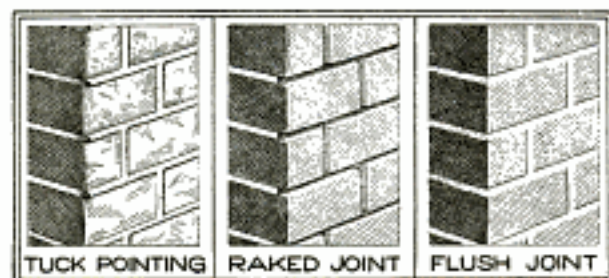


Fig. 4

Three Kinds of Finishes for the Mortar in the Joints between the Stones

6. Brick veneer on interlocking tile is undoubtedly the best, most satisfactory, and most nearly fireproof con-

struction which can be used for a medium-priced residence.

#### Stucco

There is no class of building material which is attracting more attention than stucco for exterior walls. A section of a stucco wall on a frame building is shown in Fig. 7. The stucco may be applied directly to the surface of interlocking tile with excellent results.

The surface on a frame building for stucco should be made up of  $\frac{7}{8}$ -in. matched sheathing on which two thicknesses of heavy building paper are placed, then wood furring strips and galvanized, expanded-metal lath, securely fastened to the strips with heavy staples. The stucco is applied to the metal lath.

Three-coat plaster is frequently used where a good heavy coat of stucco is desired. The first and second coats should be of good thickness. The secret of obtaining good stucco work is to use a cement mortar with as little lime as possible. For three-coat work the first and second coats should be composed of 2 bbl. of hydrated lime, 1 cu. yd. of clean, sharp sand, and 4 bu. of cattle hair. These materials should be mixed at least three days before they are used. The third coat is composed of one part cement and two parts clean, sharp sand, mixed in small quantities at a time. The finish coat should contain no lime. The color of the finish coat can be lightened by using white cement and white sand, or the color may be made as desired with the aid of mortar colors.

There are several attractive finishes which may be used successfully on stucco and are known as the "float," or smooth, finish; the "sand," or rough, finish; the "scratch" finish, in which the surface of the stucco is scratched at irregular intervals with the point of a trowel; the "pebble-dash" finish, in which small pebbles under  $\frac{1}{2}$  in. in diameter are thrown on the stucco with a wood paddle; the "rough-cast" finish that consists of large pebbles, about 1 to  $1\frac{1}{2}$  in. in diameter, stuck into the mortar like plums in a pudding.

The main reason why the float finish is seldom used on stucco work is that any variation of color can be readily seen, and also that the surface is apt to check or crack on account of the troweling.

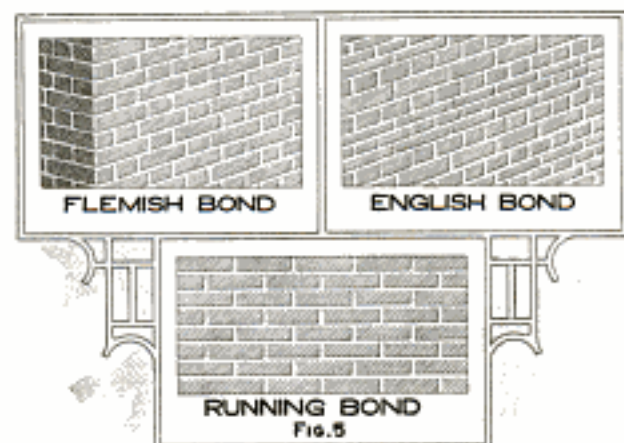
The great objection to stucco has been that it would crack and drop off the building, but this trouble is usually due to either too little hair, too small a quantity of cement, or too little pressure being put on the trowel when putting the stucco on the lath. Stucco is really a kind of plaster and must be put on with sufficient force to insure a good clinch on the back of the lath.

#### Frame Construction

Frame construction is the most important one mentioned in this article, because the great majority of houses are built of wood. A brick-veneer, stone-veneer, or stucco house is classed as a frame by the bureau of building in most cities.

A section of a typical balloon-frame house, so well known in this country, is shown in Fig. 8. The most important parts of a frame house are the sills, girder, joists, attic joists, wall studs, partition studs, rafters, subfloor sheathing, roof boards, veranda flooring, finish floor, plates, siding, shingles, and exterior trim.

The sills, and all other framing lumber, should be No. 1 hemlock, sized. The common styles of sills are shown

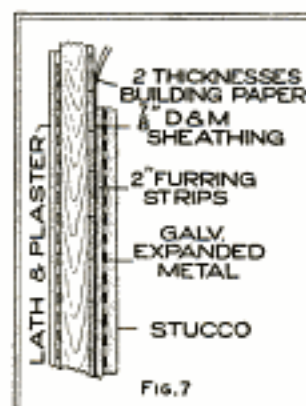
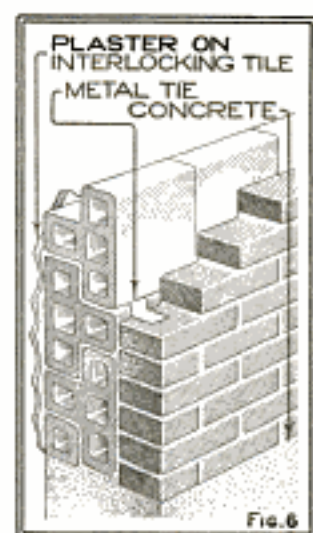


The Three Most Popular Ways of the Many for Making the Joints or Bonds

in Fig. 9. The box sill is undoubtedly the best where there is a cellar or base-

ment under the house. The sills carry the walls.

The girder is generally placed a few inches to one side of the center, bearing the partition above, and carries the center weight of the house. This girder should be either 6 by 6 in. or 6 by 8 in. in size, or it may be built up of timbers 2 by 6 in. or 2 by 8 in. in size. The girder should be supported at intervals, not over 9 ft., with 4-in. iron columns resting on a firm and solid foundation.



There has been considerable discussion about whether or not a steel I-beam is better than a wood girder, but in actual use the former has been found unsatisfactory, because of the fact that the walls will naturally shrink and settle a year or two after the house is complete, and the girder, if wood, will settle along with it so that the house actually remains almost level. With a steel girder, however, the side walls settle and the center of the building remains stationary so that in a few years the building will be high in the center and low at each side. The center of a frame building should be crowned from  $\frac{3}{8}$  to  $\frac{1}{2}$  in. in the center over the sides of the building.

The joists should be not less than 2 by 8 in. in size and of sound, sized, No. 1 hemlock, and bridged every 8 ft. with 1 by 2, or 2 by 4-in. bridging material. The floor joists generally run about 2 by 12 in. in size for the

first floor; 2 by 10 in. for the second floor, and 2 by 6 in. for the attic floor. Joists and studs should always be sized when a first-class job is wanted.

Wall studs are generally 2 by 4 in. in size, and extend from the sill to the roof plate in one piece. Partition studs are the same as the wall studs, but are set on a plate at the bottom, and have two plates on top. All studs and joists are set 16 in. apart on centers.

Rafters are either 2 by 6 in. or 2 by 8 in. in size, and in some instances where they do not exceed 8 or 10 ft. in length, 2 by 4-in. material may be used.

#### Subfloor and Sheathing

Where a double floor is used the rough or subfloor is usually laid with matched hemlock or yellow-pine boards, 5 or 6 in. wide and  $\frac{7}{8}$  in. thick. The same material is used for sheathing, and, when slate, or asbestos, shingles are to be laid, it is used as roof boards only. Subfloor and sheathing are always covered with a good heavy red rosin, or black glazed, building paper. All subfloors, sheathing, and roof boards are fastened with two eight-penny nails in every bearing.

Porch, or veranda, flooring consists of dressed and matched white pine,  $1\frac{1}{8}$  in. thick, which is called No. 2 barn quality, the width being not over  $2\frac{1}{2}$  in. Such floors are laid with leaded

joints drawn close together and well nailed. Finish floors are usually of oak, laid in different patterns and with narrow border designs. The three principal styles are: straight strips across the room with a border of the same material, and parquet floors, laid either in square or herringbone pattern. These are all shown in Fig. 10. Oak and

other finish floor material can be obtained either square-edged or tongued-and-grooved, the latter being preferable under most conditions, as it can be drawn up and held in place better than the square-edged stuff, which is face-nailed. Maple floors will outlast oak floors, but because of the great amount of labor necessary to keep them clean, they are not in demand except for kitchens where they will be covered with linoleum.

The grades of oak flooring are very confusing in certain parts of the country. In the East the grades are No. 1, select, and clear. The clear is the best grade, select is about the cheapest grade possible for use. Oak flooring may be obtained  $\frac{3}{16}$ ,  $\frac{7}{16}$  and  $\frac{13}{16}$  in. in thickness, and from  $1\frac{1}{4}$  to  $2\frac{1}{2}$ -in. face, the narrower material making the best-looking floor. Yellow pine is also used a great deal for floors and when rift-sawed—quarter-sawed—it makes a very attractive finish and is almost as expensive as clear oak.

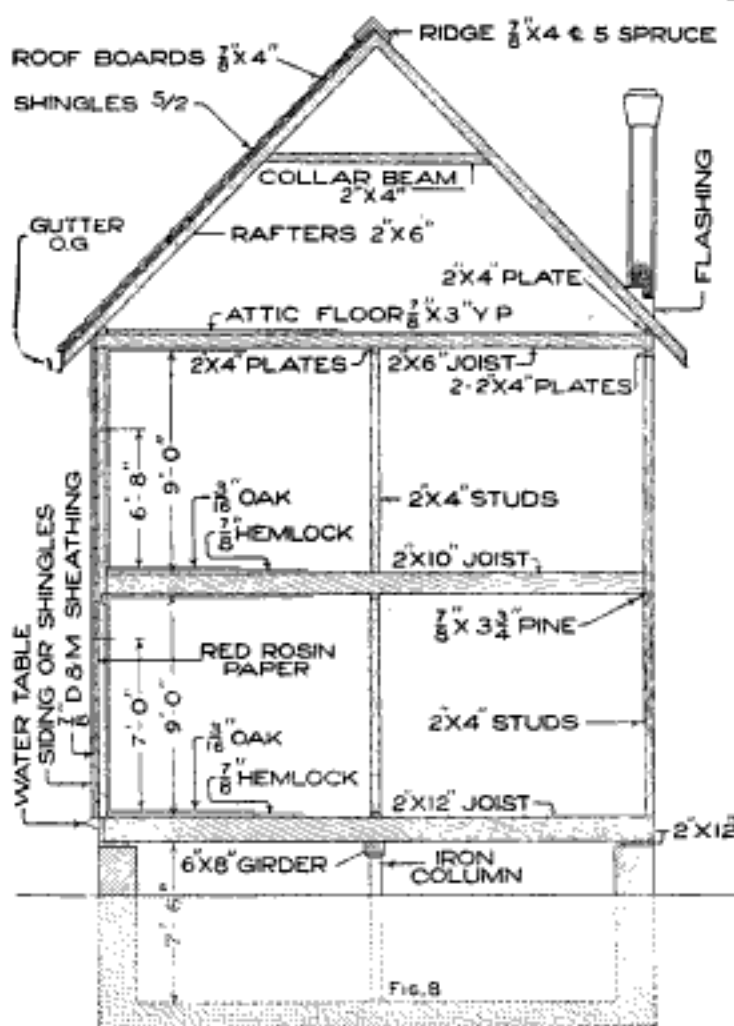


Fig. 8  
A Section of a Typical Balloon-Frame House, in Which the Important Parts Are Sills, Girder, Joists, Wall and Partition Studs, Rafters with Necessary Sheathing, Flooring, Covering, and Finishing Material

All thin finish floors should be laid either with a cement-coated or barbed floor nail to prevent them from loosening and making a squeaky floor. All finish floors should be laid over paper or deadening felt and never directly on top of the subfloor. Double floors are laid either to keep out the cold and dirt, or to deaden the noise from the floor above, and would not accomplish their purpose in either case unless they were lined as mentioned.

Plates are generally the same size as the studs with which they are used, the usual size being 2 by 4 in. In good building construction, the plate should be doubled under the rafters and at the top and bottom of all inside partitions.

Siding is of various widths and kinds of woods, among them being redwood, poplar or white wood, and jack, or swamp, pine. These woods are all about alike in regard to lasting qualities, but all of them should be painted as soon as placed. Siding is usually laid 3, 4 or 5 in. to the weather, and in some instances  $\frac{7}{8}$ -in. pine boards are used for siding and are laid 8 or 10 in. to the weather. Regular siding should be secured in place with six-penny common, or casing, nails.

Shingles are of several grades and lengths, but the standard shingles are "5 to 2," or "6 to 2," and 16 in. long,

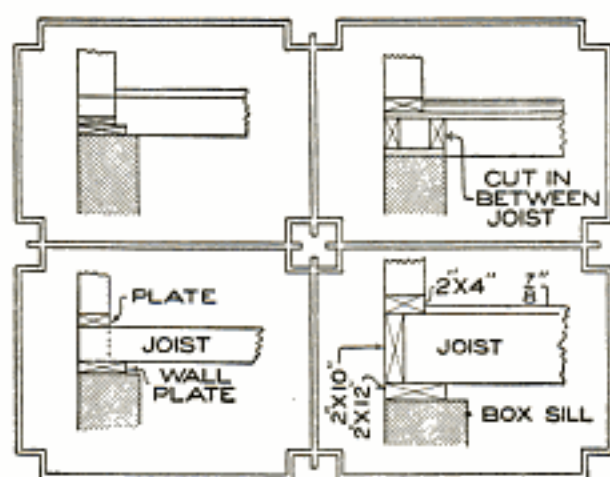


FIG. 9

Of the Four Kinds of Sills the Box Is Best to Use over a Basement

made of red cedar. The meaning of 5 to 2 is that the thickness of five shingles at the butts will measure 2 in. The 5-to-2 shingles, called clears, are,

or should be, used for roofs, and the 6-to-2—star A star—should be used for shingling outside walls, etc., where it

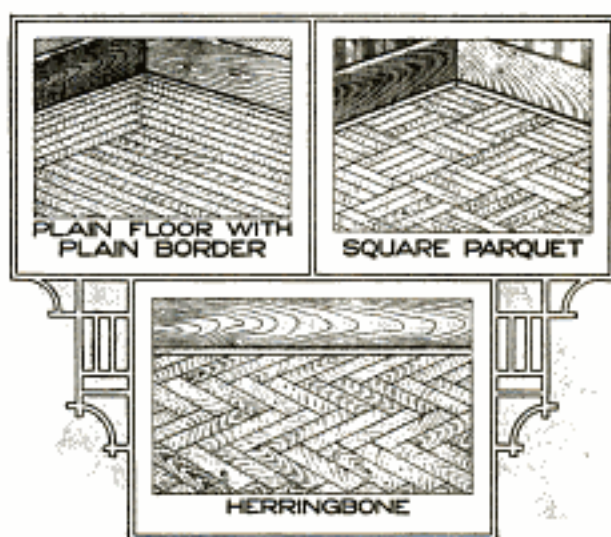


FIG. 10

Plain Floor with a Plain Border, and Parquet Floors Laid in Squares and Herringbone Designs

is not necessary to have the joints so thick. Clear shingles are secured with  $3\frac{1}{2}$  or 4-penny galvanized, cut nails, zinc nails, or copper nails, as these are the first thing to cause trouble on a roof. The star shingles, when used on walls, are secured with three-penny fine galvanized nails in order to prevent their splitting.

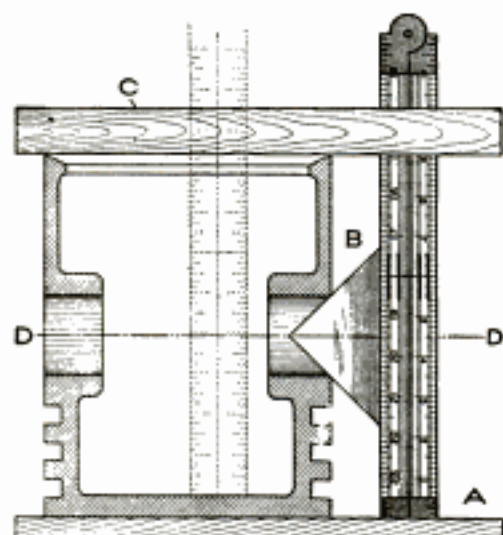
White pine is used for exterior trim, as it will stand up in exposed places longer and better than any other popular-priced wood. Redwood is often used for window and door frames, but does not stand up properly for a good building.

#### Adding Glue to Calcimine

If too much glue is added to calcimine, it will cause cracks in the finished surface. Just enough glue should be put in to bind the pigment and prevent it from coming off when the wall is rubbed. If, when applying the second coat, the first rubs up under the brush, add a little raw linseed oil to the mixture. A size made of alum in water applied to the first coat will also prevent its rubbing up when following with a second coat. The first coat must be dry before size or a second coat of calcimine is applied. Wherever possible, use only one coat of calcimine.

### Measuring Head Thickness of a Gasoline-Engine Piston

The simple device illustrated is very useful in a garage where new pistons are being made for replacement. It



Obtaining the Thickness of a Piston Head with a Surface Plate, Rule, Straightedge, and Triangle

consists of a surface plate, A; a triangle, B; a straightedge, C, and a 2-ft. rule. The straightedge is placed across the top of the head and the rule is inserted in the opening to obtain the inside measurement; then the rule is placed on the outside of the head for the other measurement, the two numbers being subtracted to get the thickness of the head.

The triangle is inserted in the bore of the head, and the rule is placed against the triangle. The center line D on the triangle is the center of the hole, as shown.—Contributed by A. L. Kerbaugh, Allentown, Pa.

### Copper-Inlaid Work

The method herein described is suitable for decorating small tool and gauge boxes, instrument cases, etc. Of course, it is just as easy to use any metal, but copper will be the most suitable for the work. Transfer the design, or lettering, with the use of carbon paper to the surface where wanted and engrave it lightly; then go over the engraved design with glue and fill in the depressions with fine copper filings, and when

thoroughly dry, sandpaper it to a nice smooth surface.

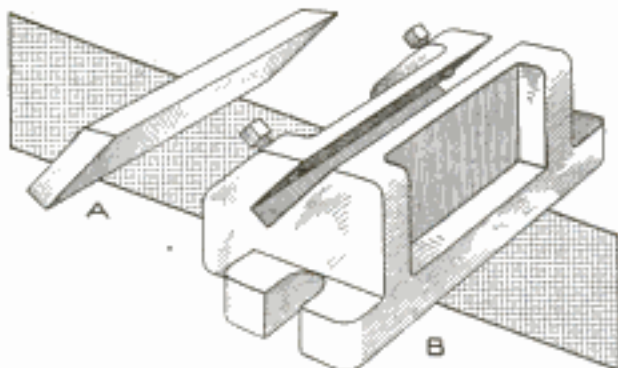
This method will provide a lettered inscription or design on instrument cases, tool boxes, and the like, in a nice, durable, copper inlay that will sometimes outlast the article, on the case of which it was placed.

### Fitting Tight Rubber Parts

It sometimes happens that a piece of rubber tubing must be stretched over a nipple that is too large. Rubber is so elastic that it offers a great deal of resistance to any tightly fitting part and makes movement well-nigh impossible. Soap is a good lubricant, and about the best kind to use is a glycerin soap, which is melted up and mixed with water. This water is the slipperiest kind of lubricant, and when much of such work is to be done it can be kept on hand ready-mixed. Tubing, hose, tires, gaskets, etc., are some of the parts which may require such treatment.

### Planing Gibs on an Angle

The sliding parts of innumerable machines are planed tapering either 45 or 60° and fitted with an adjustable piece, called a gib, to take up the wear. This gib is also planed on one or both edges to the same angle, as shown in the illustration at A. Where large repairs are made, this is a frequent machine-shop job. If a great number of these pieces are to be planed each year,



Jig for Use on a Machine Bed to Hold Gibs for Cutting the Angle Surface

it will pay to have a jig for the work, similar to the one shown at B. It consists of a casting having a slot ma-

chined in its center length to the angle of the gibs. In this slot the blank is placed and tightened with setscrews. Such a jig can be used on a planer, shaper, or milling machine, as desired. The jig may be bolted to the table of the machine, or it can be held in a vise. With its use the tapered side may be cut by any of the ordinary movements of the machine without tilting the work or setting the cutting head over at an angle. The time saved by its use will soon pay for the fixture.

### Unsymmetric Photo Reduction

In copying charts, maps, tabulated sheets, etc., it is often desired to reduce them to a certain height and width to correspond with the page of the report they illustrate. Ordinarily, reduction to the desired height will make the width greater than that of

the image focused on the ground glass C was approximately the measure desired. The width of the image registered as shown by DE and it appeared like the rectangle Fig. 2. The width desired was that shown by DF in Figs. 1 and 2, instead of DE. The side G of the drawing was held in its original position and the side H swung toward the camera, as indicated by the arrow, until the width of the image on the ground glass was that of DJ, the line J being halfway of the distance EF, the amount the image was to be narrowed. This distorted the image so that it appeared as shown in Fig. 3, the side G remaining approximately the desired height. An exposure was then made with the

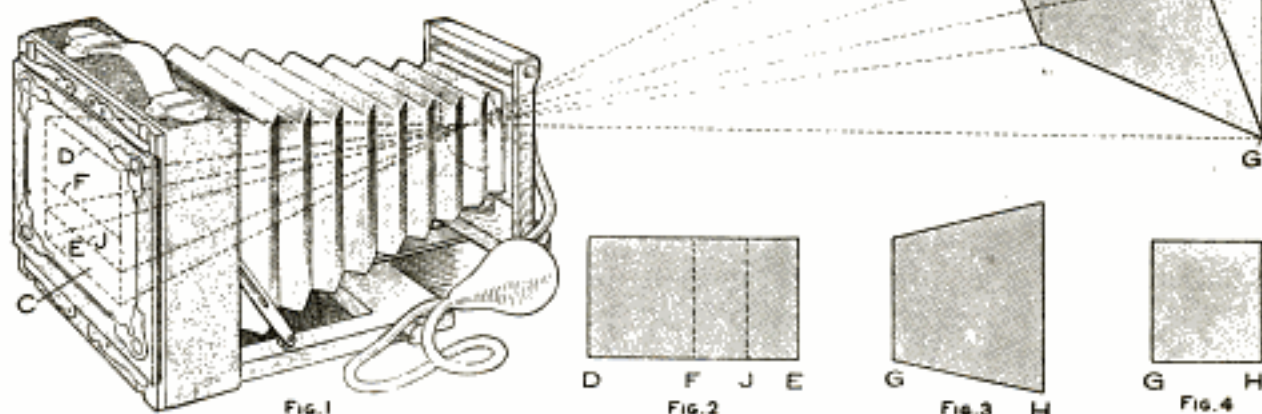


Fig. 1 Tilting a Drawing to Reduce Its Size More One Way Than the Other; the Operation being Done Twice to Eliminate the Distortion Caused by the Great Difference in the Focal Plane

the page and a fold must be made in the reduced copy when inserted as a page opposite the description. As an engineer photographer I was requested by the head of the department to reduce the width of a large general drawing of a data sheet for boilers about twice as much as the height, to fit the page of the printed report. The illustration shows how this was accomplished.

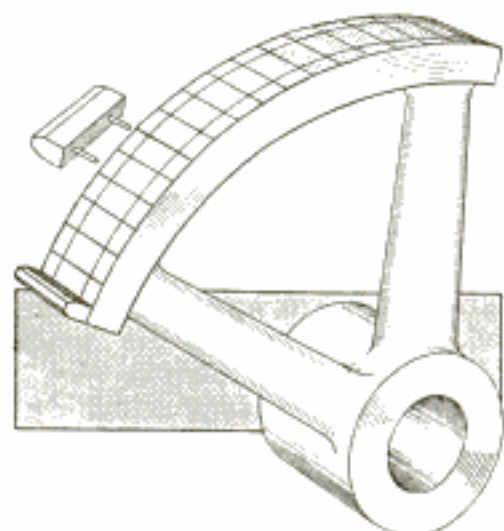
The sheet to be copied was fastened to a movable stand, A, Fig. 1, which was set facing the camera and in a vertical position for a plan view. The distance between the camera and the sheet was varied until the height of

stop to give depth of focus, the plate developed, and a print made.

This print was fastened to the board and set in front of the camera, but on a slant with the side G closer than the side H, or reversing the slant shown in Fig. 1. The distance from the camera was varied until the side G showed on the ground glass the exact height required; then the slant was varied until the side H showed the same height as G, and the top and bottom lines showed parallel, the whole appearing as in Fig. 4. A plate was exposed and a print made to the desired size.—Contributed by H. M. Plaisted, Granite City, Ill.

### Pattern Gear Teeth Made Quickly

Having a hurry-up job to make a pattern for a special, short sector rack with 18 teeth, and as the two or three

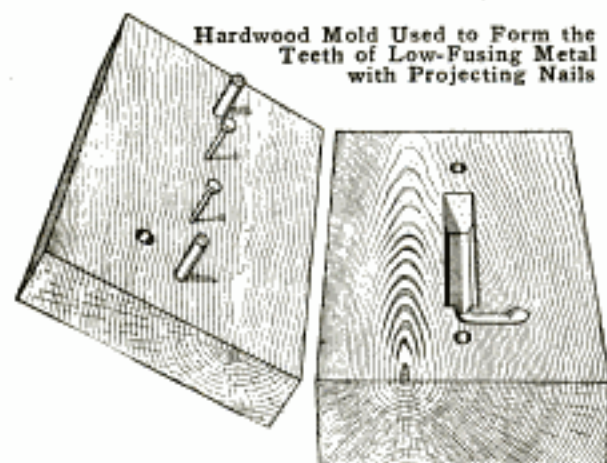


A Sector on Which Eighteen Teeth were Placed to Make a Pattern for a Sand Mold

plans submitted did not appeal to me as being easily and quickly worked out, I set about forming the teeth with an especially prepared metal to make all of them exactly the same size and outline.

This was accomplished by carefully cutting a mold with sufficient draft in hard wood, preparing a good gate and vents, and fitting the cope on the novel with dowels so that it would register each time the parts were clamped together.

Two holes were accurately drilled



Hardwood Mold Used to Form the Teeth of Low-Fusing Metal with Projecting Nails

into the cope of the mold a certain distance apart, into which nails were inserted so that their heads and a part of the body would extend into the mold.

The holes were of a size to make the nails a snug fit for holding them in place while the metal was poured.

The metal used for making the teeth consisted of lead, 5 parts; tin, 3 parts, and antimony, 1 part. This makes a fine-flowing metal and very hard. After casting the 18 teeth, which were all alike with the points of the nails exactly the same distance apart and projecting equal lengths, as well as being set at exactly the same place relative to the width of the tooth, they were fastened to the sector as follows: The blank was spaced for the 18 teeth and lines drawn on the circumference marking the place to start the nails. It was only necessary to start the nails properly and drive them home to place each tooth where it should be on the sector.

The metal used is very fluid at a low temperature and can be run in wood molds where few pieces are required, but in making a gear with a large number of teeth, it will be found necessary to make an iron mold, which can be quickly cut on a shaper or milling machine. The metal will be found especially adapted for making small patterns, as it is nonshrinkable.—Contributed by W. E. Smisor, Waterloo, Iowa.

### Making Blueprints from Heavy Paper

Many times it is desired to make a blueprint from a drawing made on heavy paper, or Bristol board. The main reason for wanting such a print is usually that a copy is desired for filing to provide a temporary reference, or as a duplicate in case the original is lost, in consequence of which a reversal from right to left is no serious objection. If such is the case, place the drawing in the frame with the ink in contact with the sensitized surface of the printing paper. This perfect contact immediately precludes the possibility of blurring due to dispersion of the light in passing through the thick paper; and, to get a clear-cut reproduction, it is merely necessary to increase the length of the exposure sufficiently to compensate for the reduction in the



intensity of the light due to passing through the extra thickness.

If the drawing bears considerable lettering and would be very inconvenient in a reversed form, it can be easily read by holding it up to the light and viewing it from the back, or by reading it as reflected in a mirror.

A rather interesting variation of this method of printing that gives an unreversed reading, but with a less degree of sharpness, consists in placing the back of the sensitized paper in contact with the inked surface of the original and then exposing the back of the latter to the sun. In this manner the only dispersion that occurs is that occasioned by the passage of light through the body of the blueprint paper, and when this is of the thin mailing variety, very good results may be secured.

### Cleaning a Hardwood Finish

To clean a dirty hardwood finish, apply a coat of kerosene and let it remain until the grime is softened, then wipe it off. Rub with some crude petroleum oil, then polish with felt. An old felt hat will do, or soft, old flannel. Allow it to stand for at least two hours, then polish with a soft linen rag.

### Homemade Motorcycle Throttle Adjustment

Desiring to have a more suitable form of adjustment for a throttle connection on a motorcycle engine, one rider constructed the lever arrangement shown in the illustrations. The mechanism was fastened to the gasoline tank directly above the engine, and a pull rod run to the butterfly valve on the carburetor. The general arrangement is shown in Fig. 1. An assembled sketch of the regulating device is shown in Fig. 2. A segment of an old magneto drive gear was fastened with a set-screw to the shaft A, which in turn was fastened to the gasoline tank, as shown. A lever, B, which freely moves on the shaft A, is provided with a projection, C, permanently soldered to its upper

end. A plunger, D, slides through the projection C and operates against the helical spring E. The device is oper-

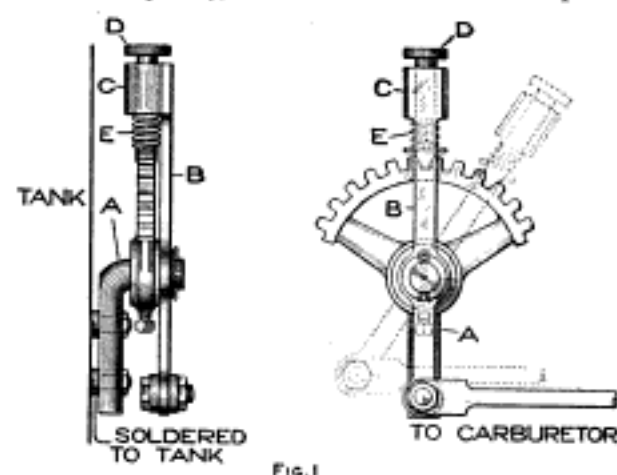


FIG. 1

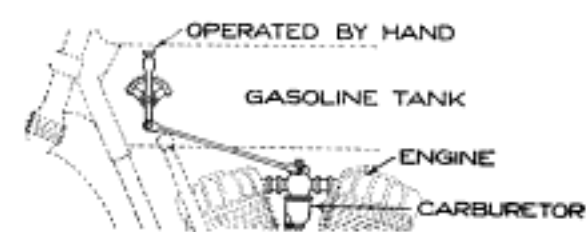


FIG. 2

General Assembly of the Parts After They are Attached to the Tank and Carburetor

ated as follows: The plunger D is pulled out and at the same time the lever B is swung around to any desired angle, depending upon the amount of adjustment required. The hand is then removed from the plunger D, which, engaging with the teeth of the gear, locks the device and makes the adjust-

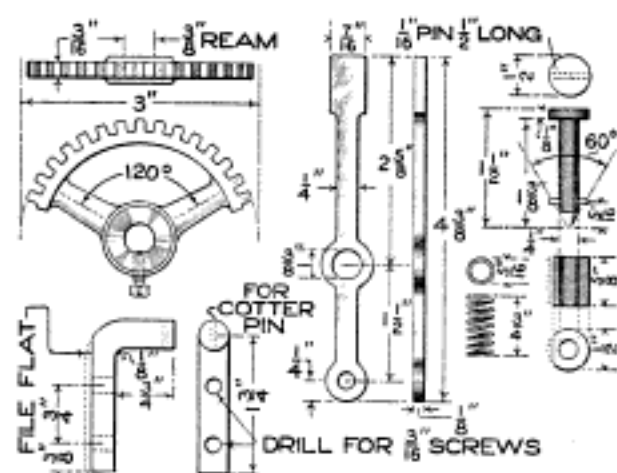


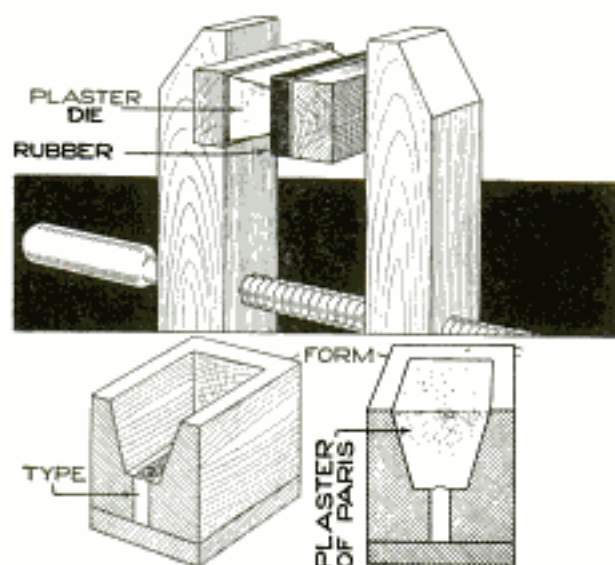
FIG. 3

Detail of Each Piece for the Construction of the Throttle Adjustment for a Motorcycle Engine

ment permanent. A complete set of detail sketches of the various parts is given in Fig. 3.

### How to Make a Rubber Stamp

All that is necessary for making rubber stamps that will give excellent results is a few type, some plaster of



Simple Process of Making Rubber Stamps without the Use of an Expensive Outfit

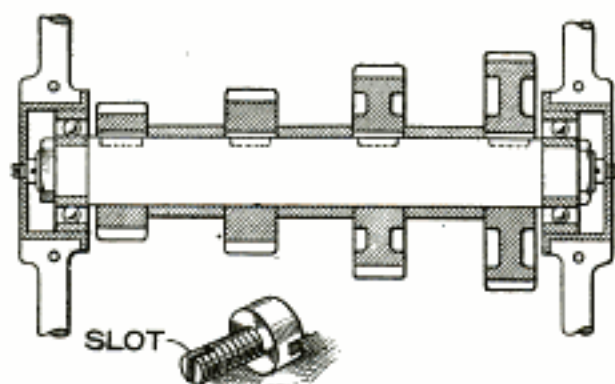
paris, a strip of vulcanized rubber, and a wood type form. The type can be procured from any printer and comes in almost any style. The block type of letter is very satisfactory for all-around work, while the script type, such as is used for calling cards, makes a nice stamp for signatures. The plaster of paris necessary can be purchased at any drug store for a few cents. The rubber, about  $\frac{1}{8}$  in. thick, can be obtained from any rubber-supply house, or the kind used for vulcanizing patches on automobile tires can be used. The vulcanized patching rubber is probably the easiest to obtain, as most motorists and garages keep a supply of it on hand.

First select the style of type desired and make a wood frame, or form, as shown, in which to set the type. The construction of this form is clearly shown. If it is desired to have more than one row of letters, the slot can be made wide enough to accommodate the extra rows. This form should be rather long so that it can be used for stamps containing many letters, as it is an easy matter to block off the extra length when making the short stamp. After the form is completed, set the

type in the slot, as shown, and brush lightly with oil. Mix the plaster of paris with water until it has the consistency of thin cream, then pour into the form and allow it to set. After hardening, remove it from the form, and a die will be had from which to make the rubber stamp. Cut a piece of rubber large enough for the stamp and place the plaster die and rubber in a screw clamp, as shown in the sketch. Apply enough heat to soften the rubber and tighten the clamp so as to force the rubber into the depressions in the die. Allow the rubber to become thoroughly cooled before removing the clamp. The pressure can be applied by weights set on the wood block, if a clamp or a vise is not at hand. After the rubber is removed, trim and glue it to a block of wood and the stamp is complete. Very satisfactory rubber stamps can be produced by this method if proper care is taken. —Contributed by Arthur Steed, Swissvale, Pa.

### Holding Gear Shaft of an Automobile in Place

In taking the gear box of an automobile apart, it was found that the countershaft had been pushed to one side, due probably to the side thrusts when the gears were shifted and meshed. To avoid this it was necessary to hold the shaft in place at its ends. The repair was made as follows: Two special



The Screw Heads Resting against the Ends of the Shaft Prevent It from Moving Endways

screws were turned from a good quality of drill rod with large heads,  $\frac{3}{4}$  in. in diameter and  $\frac{1}{4}$  in. long. The threaded

end of each was  $\frac{5}{8}$  in. long and  $\frac{1}{2}$  in. in diameter. A slot was provided at the threaded end. The large ends of these screws were then hardened and ground flat, and inserted into the ball bearings with the heads on the inside, as shown. Then they were adjusted by means of a screwdriver on the outside. The shaft was held between the two screws without end movement.

### An Automatic Siphon to Drain Basins below Sewer Level

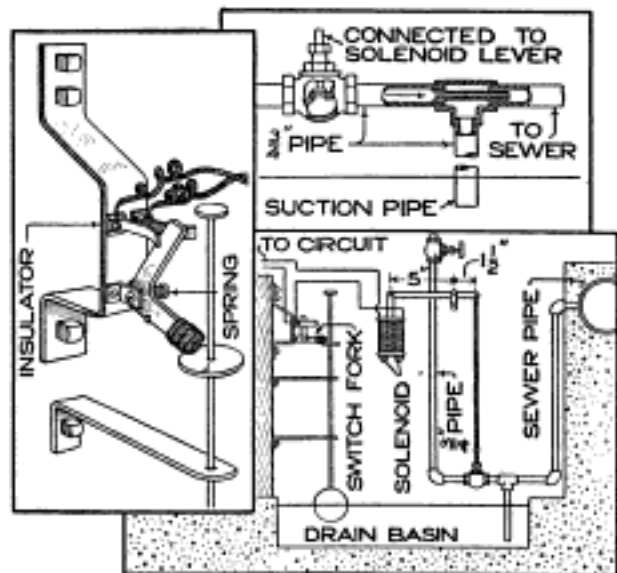
A number of large water pumps were necessarily located below the surface of the ground and also lower than the sewer-pipe levels of the shop. A drain basin, of course, was left in the flooring of the pump cellar, which was emptied by a siphon lifting the water up into the sewer some distance above it. When the basin filled with water the siphon was set in action by the engineer. On one or two occasions the basin ran over and flooded the cellar. An automatic siphon, as shown in the illustration, was put in which made it impossible to flood the cellar.

The construction of the siphon is simple, and it is easily put into operation. The globe valve furnishing the steam for starting the siphon was removed, and the threads bored out of the bonnet and turned off from the stem. This did not interfere with the function of the stuffing box on the valve stem. The body of the valve was turned so that the stem entered the valve on top of the disk seat, the stem being attached to a long rod extending up to the lever on the solenoid magnet. The construction of the siphon and arrangement of the globe valve supplying steam to it is plainly shown in the illustration. The siphon part was left unchanged. It was made of a  $\frac{3}{4}$ -in. pipe tee, a small nozzle being worked back into the steam pipe through the horizontal faces of the tee.

The solenoid was made of an old 4-in. wood packing spool wound with No. 20 gauge insulated copper wire. A piece of  $\frac{3}{4}$ -in. soft iron, about 5 in.

long, was used for the magnet core, one end being attached to the long end of the lever.

The make and break of the circuit



Automatic Valve-Stem Operation for Applying Steam to a Siphon to Remove Water from Low Levels

was accomplished by the sinking and rising of a copper-ball float, to which was soldered a long  $\frac{1}{4}$ -in. rod having at its upper end two disks set at a distance apart equal to the depth of the basin.

When the water in the basin accumulates to a certain height, the float, in rising with it, pushes the knife switch in contact, forming a circuit through the solenoid. The pull of the magnet core on the lever bar opens the steam valve and the siphon drains the basin. The sinking of the float brings the upper disk on the rod to a point where it engages the end of the switch crank and the weight of the float pulls the knife switch out, breaking the circuit. The passage of the steam acting on the valve disk from the top immediately closes it tightly to the seat of the valve, thus shutting off the action of the siphon. The electricity in this case was supplied by a 110-volt lighting circuit.—Contributed by F. W. Bentley, Jr., Missouri Valley, Iowa.

Ordinary thumb tacks, such as used by draftsmen, make good fasteners for the ironing-board cover, as they are easily put in place and removed.

### Substitute for a Broken Swivel Nut

It being necessary to replace the broken swivel nut of a screw clamp, the following simple substitute was

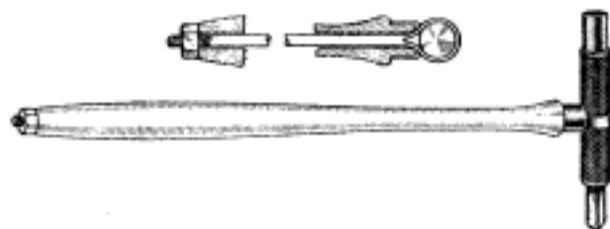


A Pipe Cap Notched and Fitted over the Ball of the Screw, Then Clinched

made: A pipe cap was secured that fitted the ball of the screw. It was notched to form four prongs. With the cap fitted in place the prongs were bent in, thereby clinching it to the screw, and answering the purpose as well as a regular swivel nut.—Contributed by J. J. Kolar, Maywood, Ill.

### Handle for Holding Light Tools for Hammer Heads

Many times a mechanic needs a hammer of a different shape than any in the kit of tools. With a handle or holding device, as shown in the sketch, a



A Detachable Handle for Holding Small Punches to Use as a Hammer Head

nail set, a center punch, small cold chisel, or any convenient piece of metal or small tool, may be converted into a hammer exactly suited for the work at hand.—Contributed by Floyd B. McElroy, Indianapolis, Ind.

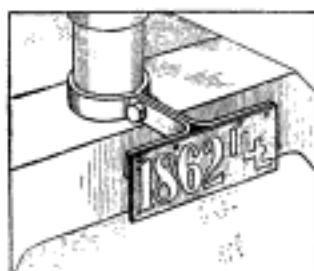
### To Make Carbon Granules for Telephone Repairing

It is almost impossible to obtain fine carbon granules for use in telephone repairing, but the following method is one that I have used with good results. Remove the lead from a hard pencil and cut it into pieces about  $\frac{1}{16}$  in. long. Prepare two small boards, about 4 in. square, and glue a piece of fine sandpaper to one surface of each

board. Place a few pieces of the pencil lead between the sandpaper surfaces and roll them gently with a circular motion. When the grains have become round and of the right size, they can be polished by rolling between the uncovered sides of the boards. I have found that granules prepared in this way are superior to some I have bought.—Contributed by C. C. Heyder, Hansford, W. Va.

### Automobile Number-Plate Bracket

A simple and quickly made bracket for holding the number plate of an automobile on the

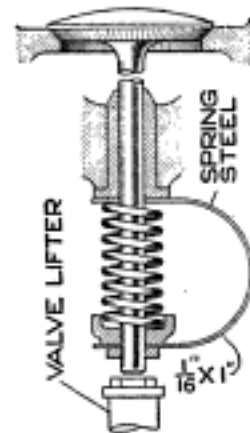


front of the radiator is shown in the illustration. A piece of  $\frac{1}{8}$  by  $1\frac{1}{4}$ -in. cold-rolled steel rod is first annealed by heating it to a red

heat and then allowing it to cool slowly in the open air. It is then forged into the necessary shape and size, after which the holes for the clamping screw and for the number plate are drilled and tapped.

### An Emergency Valve Spring

A case of missing-cylinder trouble developed on the engine of an automobile one day, and the cause was laid



to a weak and defective spring on the inlet valve. The following temporary repair was made by the roadside, and the car was finally driven back to the garage under its own power. A piece of good-quality spring steel, which had been at one time used on the magneto

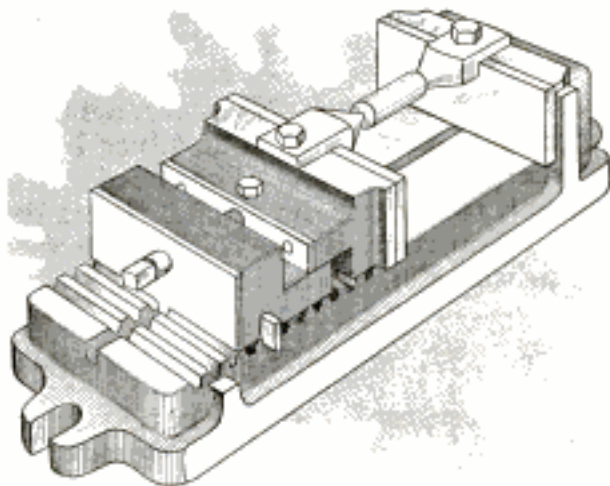
clamp, was cut to a length of 6 in., and two holes were drilled in it, one at

each end, of sufficient size to clear the valve stem. This piece of steel was then placed in position as shown, and upon starting the engine the cylinders all fired regularly.

### Centers for a Machine Vise

Centers have many uses in machine work and are generally a part of the equipment on every milling machine. Such work as cutting flutes in taps and reamers, cutting squares and hexagons, and a variety of similar work on pieces having center holes in the ends, can be best accomplished on centers. If a milling machine is not a part of the equipment, or there are no centers at hand, very good work can be done on the planer, or shaper, by the aid of a vise with a pair of plain centers added.

The sketch illustrates two pieces of square tool steel turned to the regular 60° angle, shouldered out on the lower side and drilled for cap screws. They are then hardened and tempered. The work should be carefully done and the



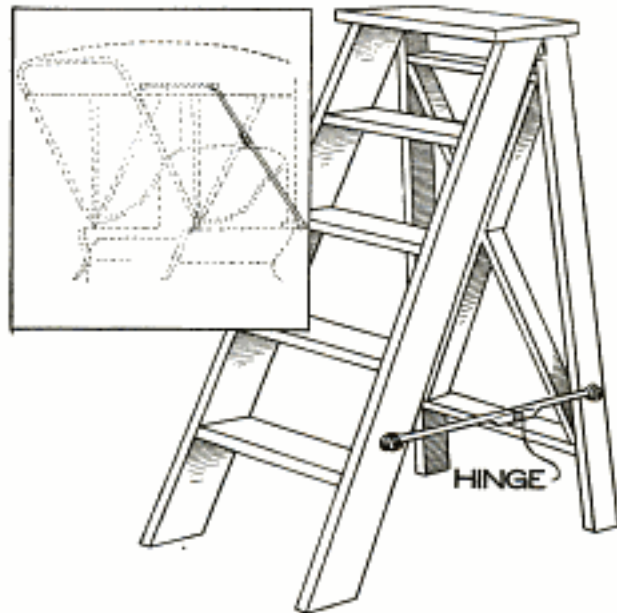
Centers Made of Tool Steel Fitted to Machine-Vise Jaws, Then Hardened and Tempered

position on the vise jaws accurately located so that any work done on the centers will be true.

☞ Before starting to fill a fountain pen, or otherwise to work with ink, wet the hands thoroughly in water, and the ink will not enter the pores, and it can be washed off readily.

### Substantial Stepladder Brace

The ordinary stepladder braces are apt to become loose and cause a rickety affair, unsafe to mount on the top step.



The Buggy-Top Joint Placed between the Stepladder Supports to Hold Them Rigidly

One workman, having a great deal to do on a stepladder, made a much more substantial brace by using a buggy-top joint, as shown. When locked in position, it makes the parts of the ladder very rigid.—Contributed by James M. Kane, Doylestown, Pa.

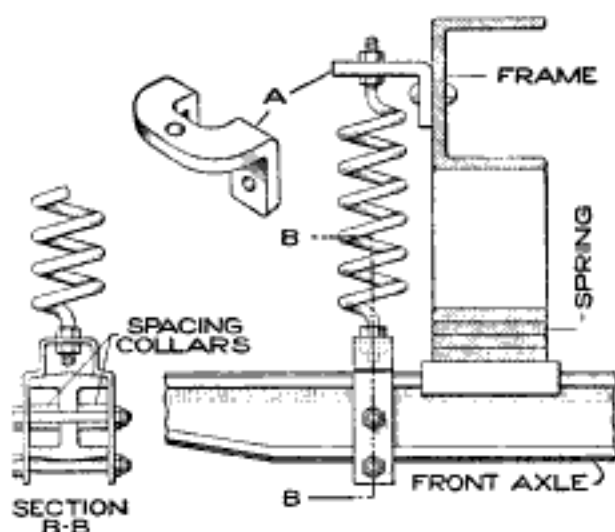
### Hardening Steel without Scaling

To harden polished steel articles without producing a scale, proceed as follows: A mixture of equal parts of table salt and finely ground cornmeal is prepared, and the article to be hardened is first dipped in water and then into the mixture. Place in a fire, and when hot enough to melt the particles adhering to the surface, take it from the fire and roll in the mixture. When all covered, place in the fire again and heat sufficiently for hardening. Be sure to see that no part shows signs of becoming dry. If such spots show up, cover them with the mixture.

This mixture forms a coating that keeps the air from striking the metal, thus preventing oxidation. When cooled in water, the coating readily comes off, leaving the surface smooth.

### Attaching Auxiliary Automobile Springs

A touring car that had been converted into a commercial vehicle had a set of light springs which had lost



Auxiliary Springs Attached to Support Part of the Load of an Automobile Body

their flexibility, due to constant wear, and it was practically impossible to ride in the car with any comfort. The proper solution would have been to insert a complete set of springs, but this being too expensive, it was decided to try out a set of auxiliary helical springs.

Each spring was fastened to the frame side member, at one of its ends, and to the front-axle center forging, at its other end. For the upper connection a bracket was forged, as shown in sketch, at A. A  $\frac{1}{2}$ -in. hole was drilled in the center, after which it was riveted to the frame side member.

For the lower connection, a U-shaped piece of metal was forged to fit over the front axle, where it was held with two bolts.

The springs were made of  $\frac{1}{2}$ -in. spring steel, having a 2-in. pitch diameter with a distance of 1 in. between each coil when the spring was without load. The ends were threaded for nuts. The job took considerable time, but there was a notable difference in the riding qualities.—Contributed by Adolph Kline, New York City.

### A Bronze Surface on Yellow-Brass Castings

Yellow-brass castings may be given a bronze surface in the following manner: Mix together equal parts of sulphuric acid, nitric acid, and water, mixing first the nitric acid and water, then adding slowly the sulphuric acid. The brass castings are first dipped in boiling water, then into the acid solution and back quickly into the boiling water, after which they are thoroughly rinsed in clean water. They are then dried in sawdust. The castings must be clean and free from soldering fluxes. The surface will present the appearance of gas fixtures and will remain so indefinitely if it is given a coat of lacquer.

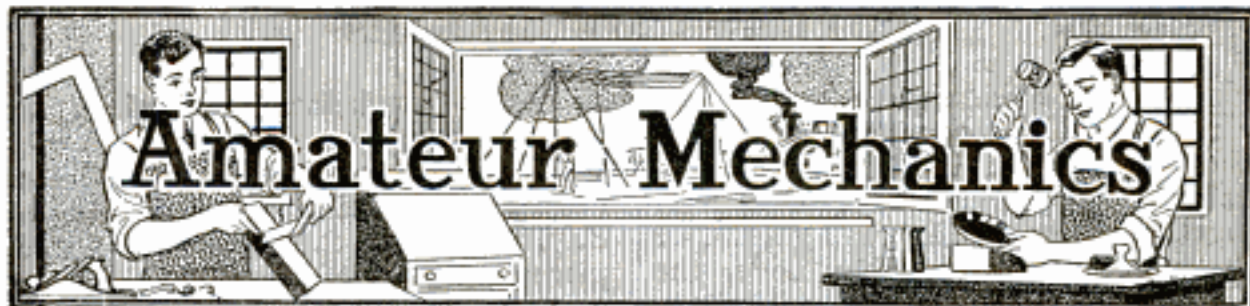
### Locating Water Level in a Locomotive Glass Gauge

It is quite difficult to locate the water level in the gauge glass of a locomotive when on the road, as the constant jostling of the engine keeps the water jumping in the gauge. It happens quite often that the fireman must look for a considerable length of time to determine the water level. To overcome this difficulty I inserted a light silver bead in the gauge glass. The bead will stay at the water level and is easily seen.—Contributed by William Frost, Marathon, Fla.

### Oil and Waterproofing Cork Floats

To waterproof a cork float, coat it with a rubber solution made by cutting crude rubber into small pieces and dissolving it in gasoline. If it is desired to make it proof against oil also, soak the cork in a glue solution made of 2 oz. glue,  $\frac{1}{2}$  oz. glycerin, and 6 oz. water. To keep this solution from spoiling, add a little oil of wintergreen.

ⒸA very effective way to prevent a thief from taking an automobile is to remove the timer cap from the magneto.



## A Miniature Cement Plant

By MORTON SOUTHARD

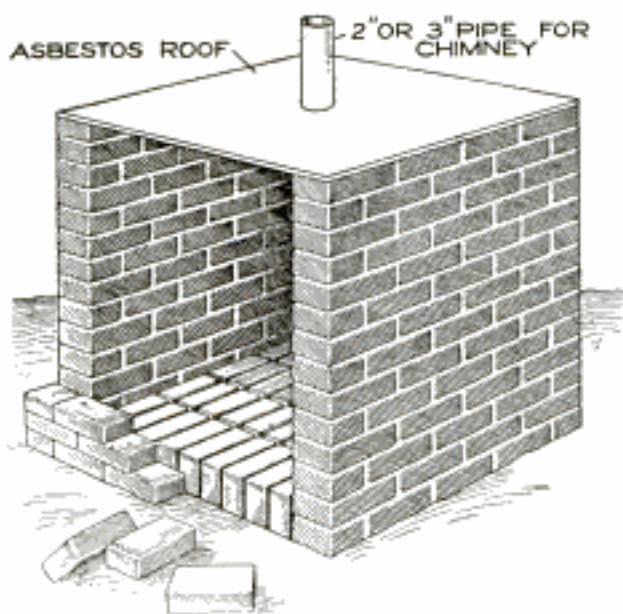
FOR many years geologists searched for a substance which could be molded into any size and form, and would have the hardness of rock. As a matter of fact it was found that limestone was composed of carbonic-acid gas, clay, and lime, and that when great heat was applied the sealing bond was disrupted and the rock was reduced to a powder. When this powder was placed in water the gas was set free so fast that it made the water boil. The powder, or calcined rock, is now known as lime. This action demonstrated that nature used heat and moisture in forming these materials into rock. Knowing that clay contained silica, and that silica furnished the sealing quality of rocks, experiments were made to reverse the order of this rock formation, and a cement was produced. Equal portions of lime and clay were mixed together and stirred until all parts were thoroughly mingled, and then the mixture was subjected to a very high heat, after which the resulting mass was ground to a powder. When this powder was mixed with water, instead of the gases passing off as they did in the case of the lime, they penetrated the clay and the mixture became hard. This was first

called Portland cement, as it was made from Portland limestone.

This discovery partly solved the problem of artificial-rock making, but not wholly, for the best makes will break, peel, and crack without the slightest cause and when least expected, and besides its dark-gray color and rough appearance is unattractive. Much progress has been made with

cement for interior decorations and many of the finest marbles are closely imitated. This grade of cement will not weather and its use is confined wholly to interior work. A white cement is much desired and many of the large manufacturers maintain laboratories where experiments are carried on constantly in the endeavor to produce it.

To build a miniature cement plant, first secure sufficient common brick to make a furnace with an inside cavity, 20 in. square and 24 in. high. Two sides and one back wall are built up, sealing the brick with mortar, clay, or cement. The bottom is covered with bricks standing on edge, and so placed that they will be about  $\frac{1}{4}$  in. apart, to serve as a grate. The top is then covered with a piece of tin, or asbestos, and a hole is cut in its center to receive a



The Furnace is Built Up of Ordinary Brick and Used for Calcining the Lime

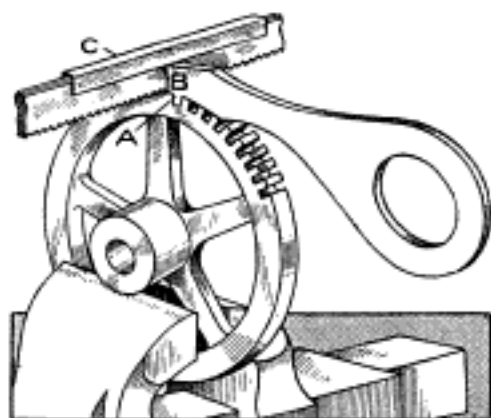
pipe, about 3 in. in diameter, for a chimney. This chimney should be about 15 in. high. Build the front wall halfway up by laying the brick loosely together so that the fire will get the air through the crevices, then cover the grate with kindling, place coal on top of it, and start the fire. When it is well under way, place a few fair-sized lumps of limestone on top of the fire and complete the wall to the top by laying the brick as closely as possible. Use sufficient coal to burn at least two hours.

When the fire has burned itself out and the furnace has cooled, remove the front wall and take out the burned limestone. Some parts of the limestone will be mixed with the coal, but most of it will remain in the lump, which is

known as "black lime," and when it is placed in water it will give off gas very fast. Obtain some fire clay and thoroughly mix equal portions of lime and clay, then place the mixture in a one-piece pan, made of pressed tin or sheet iron, as a soldered-bottom pan will come apart with the heat. Build up the front of the furnace as before, build a fire and place the pan on the fire and let it burn itself out. When the furnace has cooled, remove the front, take out the pan, and pulverize the mass in the pan. When this powder is placed in water it will become hard. If some sand or gravel is mixed with it, and the mortar thus formed is spread out over a flat surface, a miniature cement sidewalk will be the result.

### Gauge for Laying Out Model Gear Wheels

The illustration shows a simple device for making small gear wheels by hand. It is made of a piece of brass,



The Gauge Steps Off Each Tooth Accurately for the Saw to Cut the Next Slot

$\frac{1}{8}$  in. thick and about 5 in. long, shaped as shown, forming a tooth, A, according to the size of the teeth required in the gear wheel, with the end B on a radial line from the center of the wheel. Use one or more hacksaws, according to the size of the slots or teeth to be cut. If one blade is not large enough and two are too large, grind off the teeth on the inner side of the saws, or if two are not large enough, place a thin piece of paper or metal between them to make the thickness required. Make a clamp, C, for holding the blades

together, by using a piece of sheet brass, 6 in. long and  $\frac{1}{2}$  in. wide. This clamp also acts as a depth gauge for the slots.

Place the wheel in a vise and proceed by cutting the first slot very carefully. Place the tooth A of the gauge in this first slot and cut the next by holding the side of the saw close up against the end of the gauge, at B. This keeps all the teeth radiating from the center of the wheel. Cut each slot in the same manner until all of them are formed.—Contributed by George Jupp, New York City.

### Homemade Level

Having need of a level, and there being no place to obtain one within several miles, I constructed one as follows: A long medicine bottle was filled with water and tied to a straight piece of wood, 2 ft. long. After setting it properly by turning the piece end for



A Bottle Filled with Water and Tied to a Straight Piece of Wood for a Level

end several times, I found that it could be used with accuracy.—Contributed by Fred L. King, Islip, L. I.



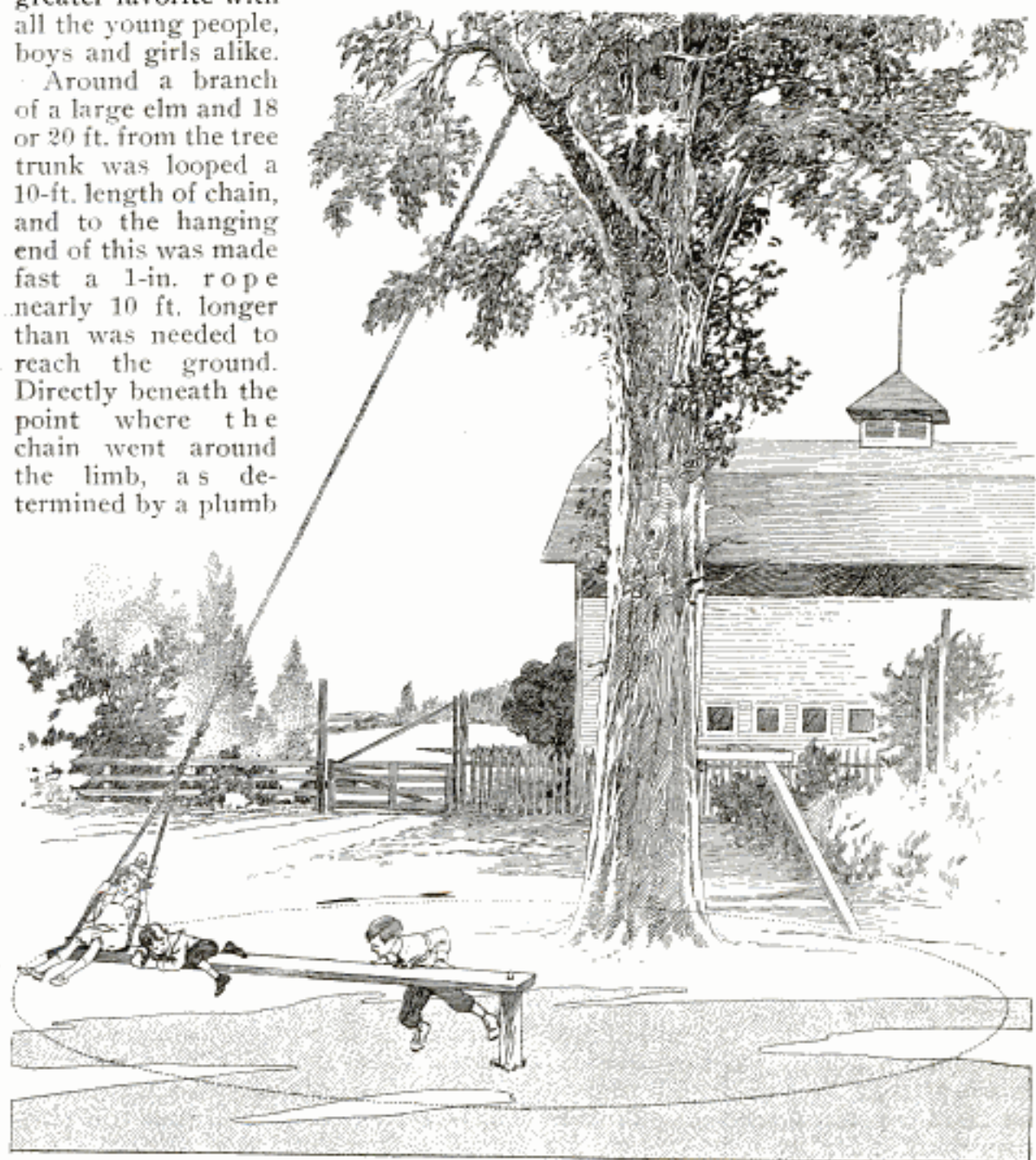
## A Circular Swing

By DAVIS FOSS GETCHELL

**W**HILE on the farm I constructed a circular swing which proved very attractive to my boys and their friends. By its side, and suspended from the same tree branch, was an ordinary swing. During the eight weeks of our stay the latter was seldom in use. The circular swing was a far greater favorite with all the young people, boys and girls alike.

Around a branch of a large elm and 18 or 20 ft. from the tree trunk was looped a 10-ft. length of chain, and to the hanging end of this was made fast a 1-in. rope nearly 10 ft. longer than was needed to reach the ground. Directly beneath the point where the chain went around the limb, as determined by a plumb

bob, was set a 6-in. piece of cedar post  $3\frac{1}{2}$  ft. into the ground. This was sawed off square  $2\frac{1}{2}$  ft. above the ground. Into the top of this post was set a  $\frac{1}{2}$ -in. rod, to serve as a pivot for the swing. It was set in firmly about 6 in. and projected about 3 in. from the top of the post.



The Circular Swing will be Found Very Safe and Pleasurable, but, as in the Case of an Ordinary Swing, Anyone Careless Enough to Get in the Way of It will Get Badly Bumped

A straight-grained piece of pine board, 15 ft. long, 8 in. wide, and 1 in. thick, was procured and a hole bored in one end large enough to make it turn freely on the pin in the upper end of the post. Two holes were bored in the other end of the board large enough to admit the rope. The first hole was 6 in. from the end, and the second hole, 3 ft. The hanging end of the rope was passed down through one of these holes and back up through the other and then made fast to itself about 3 ft. above the board after the board had been adjusted so that it would swing throughout its length at the height of the post, or  $2\frac{1}{2}$  ft. from the ground. The swing was then complete except for a swivel, which was put in the rope within easy reach of one standing on the board, so that it could be oiled.

One good push would send the board with a boy on the end three or four

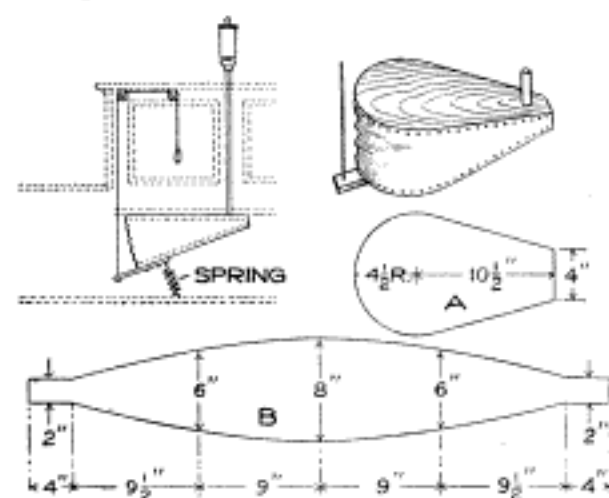
times about the 90-ft. circle. The little fellows would like to get hold of the board in near the post and shove it around. Once started, it could be kept going with very little effort.

In putting up such a swing, make sure to have the post set solidly in the ground, as it has a tendency to work loose. Tie all the knots tightly. Do not look upon the swivel as unnecessary. The first swing I put up was without one, and the rope twisted off in a few days.

It is not necessary to climb a tree; just throw a stout cord over the limb by means of a stone or nut tied to the end, then haul the rope and chain up over the limb with the cord. Before the chain leaves the ground loop the end of it and pass the cord through the loop. The higher the limb from the ground the better the swing will work, but 25 ft. will be about right.

### Hand-Operated Motorboat Whistle

Anyone with a power boat can construct a blower for the whistle very cheaply. The whistle is attached to a



Bellows Operated by Hand for Blowing a Whistle on a Power Boat

suitable length of pipe, threaded on each end. The blower is made of two white-pine boards, 1 in. thick, cut as shown at A; a thin piece of leather is cut like the pattern B, to form the bellows part, and after it is shaped, the edges of the boards are glued and the leather placed in position, where it is

fastened with tacks driven in about 1 in. apart. The bellows are fastened to the under side of a seat with screws, and a tension spring is attached to the bottom of the bellows and the floor of the boat. A cord is fastened to the lower board of the bellows and run up through to the cabin roof over suitable pulleys to a handle within convenient reach of the operator.—Contributed by John I. Somers, Pleasantville, N. J.

### Filling In Broken Places on Enamel

Ordinary putty will not do to fill in cracks or broken spots on an enameled surface, such as a clockface. Fine sealing wax is much better, as it hardens at once, takes color without absorbing the oil, and does not shrink like putty. Use a wax of the proper color to match the surface as closely as possible. Fit it in and smooth with a warm, flexible piece of metal, such as a palette knife. Give it one or two coats of thin color to exactly match the other surface, and varnish. If the article has not a high polish, the gloss of the varnish can be cut a little with pumice stone.

# The Tricks of Camping Out

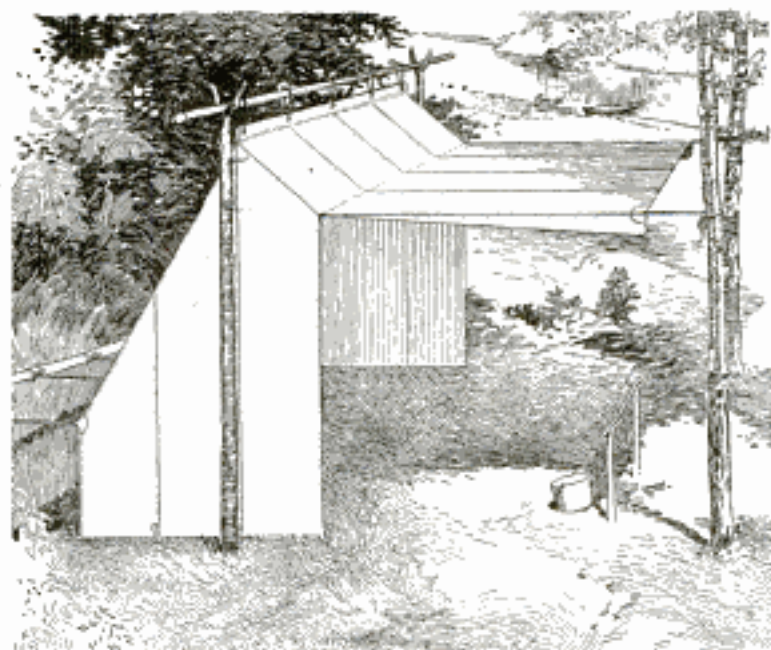
By STILLMAN TAYLOR

## PART I—The Camping Outfit

**T**O enjoy a vacation in the woods thoroughly, it is essential that the outer be provided with the right kind of an outfit. The inexperienced are likely to carry too much rather than too little to the woods; to include many unnecessary luxuries and overlook the more practical necessities. However,

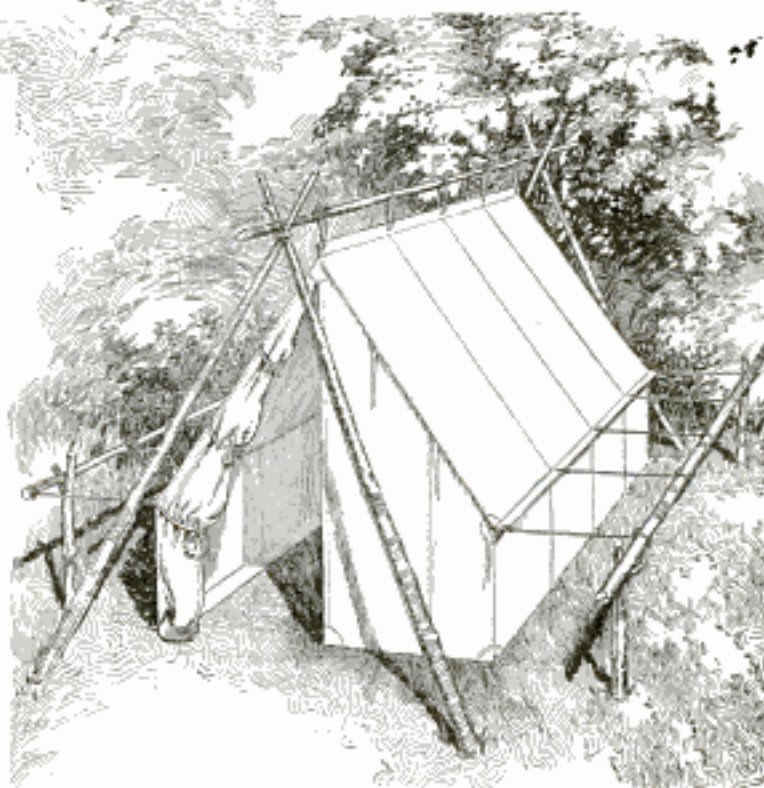
### The Choice of a Tent

There are tents and tents, but for average outings in what may be considered a permanent camp, the regulation wall, or army, tent is generally used to make a comfortable shelter. It is a splendid utility tent, with generous floor space and plenty of headroom. For the permanent camp, the wall tent is often provided with a fly, which may be set up as an extra covering for the roof, or extended over the front to make a kind of porch. An extension may also be purchased to serve the same purpose. The 7 by 9-ft. wall tent will shelter two persons comfortably, but when the camp is seldom moved, the 9 by 12-ft. size, with a 3½-ft. wall, will afford more room. The reg-



The Old Hand at the Camping Game Prefers to Cut Poles on the Camping Site and Set Them Up on the Outside for the Camp-Fire Tent

camp life does not mean that one must be uncomfortable, but rather implies plain and simple living close to nature. An adequate shelter from the sun and rain, a comfortable bed, a good cooking kit, and plenty of wholesome food, are the important things to consider. No man or woman requires more, and if unwilling to share the plain fare of the woodsman, the pampered ones should be left at home, for the grouchy, complaining individual makes, of all persons, the very worst of camping companions.



The Wall Tent may be Erected with the Regular Poles, or, When Ordered with Tapes along the Ridge, It can be Set Up with Outside Tripod or Shear Poles

ulation 8-oz. duck is heavy enough, or the same tent may be obtained in tan or dark green khaki, if preferred. In any case the tent should have a sod cloth, from 6 to 12 in. wide, extending around the bottom and sewed to the tent. An extra piece of canvas or floor cloth is desirable, but this as well as the fly are extras, and while convenient, are by no means necessary. The wall tent may be erected with the regular poles, or it may be ordered with tapes along the ridge and erected by suspending between two trees. The old hand at the camping game rarely uses the shop poles supplied with most tents, but prefers to cut them at the camping site and rig them up on the outside, one slender pole fastened with tapes along the ridge and supported at either end in the crotch formed by setting up two poles, tripod or shear-fashion.

The "Baker" style is a popular tent, giving a large sleeping capacity, yet folding compactly. The 7 by 7-ft. size, with a 2-ft. wall, makes a good comfortable home for two, and will shelter three, or even four, if required. The entire front may be opened to the fire by extending it to form an awning, or it may be thrown back over the ridge to form an open-front lean-to shelter.

The "Dan Beard," or camp-fire, tent is a modification of the Baker style, having a slightly steeper pitch, with a smaller front opening. The dimensions are practically the same as the Baker, and it may be pitched by suspending between two trees, by outside poles, or the regular poles may be used.

For traveling light by canoe or pack, a somewhat lighter and less bulky form of tent than the above styles may be chosen, and the woodsman is likely to select the forester's or ranger types. The ranger is a half tent with a 2-ft. wall and the entire front is open; in fact, this is the same as the Baker tent without the flap. If desired, two half ranger tents with tapes may be purchased and fastened together to form an A, or wedge, tent. This makes a good tent for two on a hike, as each man carries his own half, and is as-

sured a good shelter in case one becomes separated from his companion, and a tight shelter when the two make camp together.

The forester's tent is another good one, giving good floor space and folding up very compactly, a 9 by 9-ft. tent weighing about  $5\frac{1}{2}$  lb. when made of standard-weight fabric. It may be had either with or without hood, and is quickly erected by using three small saplings, one along the ridge, running from peak to ground, and one on each side of the opening, to form a crotch to support the ridge pole, shear-fashion. These tents are not provided with sod or floor cloths, although these may be ordered as extras if wanted.

The canoe or "protean" tents are good styles for the camper who travels light and is often on the move. The canoe tent has a circular front, while the protean style is made with a square front, and the wall is attached to the back and along the two sides. Both tents are quickly set up, either with a single inside pole or with two poles set shear-fashion on the outside. A 9 by 9-ft. canoe or protean tent with a 3-ft. wall makes a comfortable home in the open.

Whatever style of tent is chosen, it is well to pay a fair price and obtain a good quality of material and workmanship. The cheaper tents are made of heavier material to render them waterproof, while the better grades are fashioned from light-weight fabric of close weave and treated with a waterproofing process. Many of the cheaper tents will give fair service, but the workmanship is often poor, the grommets are apt to pull out, and the seams rip after a little hard use. All tents should be waterproofed, and each provided with a bag in which to pack it. An ordinary tent may be waterproofed in the following manner: Dissolve  $\frac{1}{2}$  lb. of ordinary powdered alum in 4 gal. of hot rain water, and in a separate bucket dissolve  $\frac{1}{2}$  lb. of acetate of lead—sugar of lead—in 4 gal. of hot rain water. The acetate of lead is poisonous if taken internally. When thoroughly dissolved, let the solutions



The Forester's Tent is Quickly Erected by Using Three Small Saplings, One along the Ridge, and One on Each Side of the Opening to Form a Crotch for the Ridge Pole

stand until clear, then pour the alum solution into a tub and add the lead solution. Let the solution stand for an hour or two, then pour off the clear water and thoroughly soak the fabric in the waterproofing mixture by rubbing and working the material with the hands. Hang the cloth up without wringing it out.



One Man, or Both Joined Together to Make Room for Two Persons



The Canoe or Protean Tents Are Good Styles for the Camper Who Travels Light and Is Often on the Move, and They can be Quickly Set Up with a Single Inside Pole

#### How to Pitch a Tent

It is, of course, possible to pitch a tent almost anywhere, but for the sake of comfort, it is well to select a site with natural drainage. Many campers dig a shallow trench around the tent to prevent water from running in during a heavy rain. This is a good idea for the permanent camp, but is not often necessary if the soil is sandy or porous, or where a sod cloth is used.

It is rarely necessary to

carry the regular poles to the camping ground, and they may be omitted excepting when en route to a treeless region. The wall and other large tents may be pitched in several ways. In some places the woodsman cuts a straight ridge pole, about 3 ft. longer than the tent, and two crotched uprights, 1 ft. or more longer than the height of the tent. The ridge pole is passed through the opening in the peak of the tent, or fastened to the outside of the ridge with tapes sewed to the

cloth. The two upright stakes are then firmly planted in the ground, one at the back and the other in front, and the ridge pole is lifted and dropped into these crotched supports. Set up the four corner guys first to get the tent in shape, then peg down the side guys and slide them taut so that all of them will exert an even pull on the tent. Another good method for setting up the side guys is to drive four crotched stakes, each about 4 ft. long, somewhere near 3 ft. from each corner of the tent, and drop a fairly heavy pole in the rest so formed, then fasten the guy ropes to this pole. When a sod cloth is provided it is turned under on the inside, the floor cloth is spread over it and the camp duffel distributed along the walls of the tent, to hold it down and prevent insects and rain from entering.

To overcome the disadvantage of placing the poles in the center of the entrance, the uprights may be formed by lashing two poles together near the top to make a crotch and spreading the bottoms to form a pair of shears. Poles may be dispensed with entirely, providing the tent is ordered with tapes for attaching a rope to suspend the ridge of the tent between two trees. In a wooded country this manner of setting a tent is generally preferred.

Where a wall tent is used in a more permanent camp, it is a good plan to order a fly, a couple of sizes larger than the tent. This should be set up by using separate poles and rigged some 6 or 8 in. higher than the ridge of the tent, thus affording an air space to temper the heat of the sun and also serving to keep things dry during long, heavy rains.

#### The Camping Kit

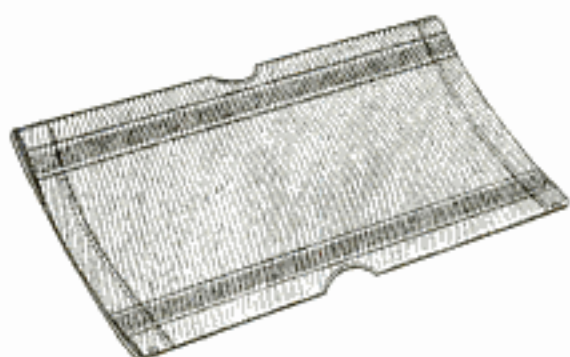
The camping kit, including the few handy articles needed in the woods, as well as the bedding and cooking outfit, may be either elaborate or simple, according to the personal experience and ideas of the camper. In making up a list, it is a good plan to remember that only comparatively few articles

are really essential for a comfortable vacation in the wilderness. A comfortable bed must be reckoned one of the chief essentials, and one may choose the de-luxe couch—the air mattress or sleeping pocket—use the ordinary sleeping bag, or court slumber on one of the several other styles of camp beds. The fold-over combination bed, the stretcher bed, or a common bag made of ticking, 6½ ft. long by 2 ft. wide, which is stuffed with browse or leaves, will suffice for the average person. Folding camp cots, chairs, tables, and other so-called camp furniture, have their places in the large, fixed camps, but the woodsman can manage to live comfortably without them. A good pair of warm blankets should be included for each person, providing the sleeping bag is not taken along. The regulation army blankets are a good choice and reasonable in price, or the blankets used at home may be pressed into service.

A good ax is the woodsman's everyday companion, and a good-weight tool, weighing 3 or 4 lb., and a smaller one of 1½ lb. should be carried. When going light, the belt ax will suffice.

The oil lantern is only suited for the fixed camp, since the fuel is difficult to transport unless it is placed in screw-top cans. The "Stonbridge" and other folding candle lanterns are the most convenient for the woods and give sufficient light for camp life.

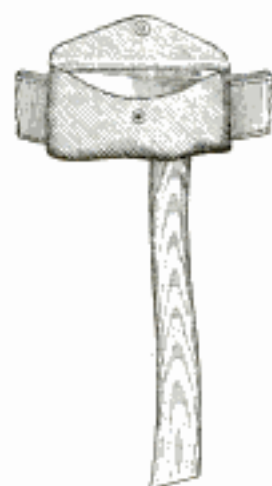
The aluminum cooking outfits are light in weight, nest compactly, and will stand many years of hard usage, but like other good things, they are somewhat expensive. A good substitute, at half the price, may be obtained in tin and steel, having the good feature of nesting within each other, but, of course, not being quite so light nor so attractive in appearance as the higher-priced outfits. Both the aluminum and steel outfits are put up in canvas carrying bags, and an outfit for two includes a large and a small cooking pot; coffee pot; frying pan with folding or detachable handle; two plates; cups; knives; forks, and spoons. Outfits may be bought for any number of persons,



The Stretcher Bed may be Stuffed with Browse or Leaves, or Suspended from Poles and Stakes to Make a Camp Cot



Food Bags with Friction-Top Tins to Fit Them, in Which Lard, Butter, Pork, Ham, and Other Greasy Necessities are Carried



When Going Light the Belt Ax is Used



A Pack Basket with a Waterproof Canvas Lid and Cover, Having Straps to Go over the Shoulders, is a General Favorite with Woodsmen and Guides



The Compass is by Far the Most Useful Instrument for the Woods, but Any Reliable and Inexpensive Watch may be Carried



A Good, Tempered Knife Should be Worn at the Belt



The Cooking Kit may be of Aluminum or Steel, All Nesting within the Largest Pot, and may include a Folding Baker, or Reflector, with Bread Board in Canvas Bag, a Wood Salt Box, and a Water-Tight Can for Matches



Folding Candle Lanterns are the Most Convenient for the Woods and They Give Sufficient Light for Camp Life

and almost all sporting-goods stores carry them. The two-man outfit in heavy aluminum will cost \$9 or \$10, while the same outfit duplicated in steel is priced at \$3.35.

#### The Camper's Outfit

The personal outfit should include only the most useful articles, and each member of the party should be provided with a dunnage bag of canvas to hold bedding and clothing, and a smaller, or "ditty," bag for keeping together the toilet and other personal belongings which most everyone finds necessary for everyday comfort. A mending kit, containing a few yards of silk, linen, and twist; a length of mending cotton; buttons; a few needles and pins, both safety and the common kinds, should not be overlooked. The veteran usually stows away a bit of wire; a length of strong twine; a few nails and tacks; rivets, etc., for emergency use, and it is surprising to the novice how handy these several odds and ends are found while in camp. A compact tin box will form a convenient place to keep them and will take up little room in the dunnage bag. A medicine case and a first-aid outfit are well worth packing; the smallest cases containing a few of the common remedies will fully meet the camper's needs.

When carrying food by canoe or pack basket, the canoe duffel and provision bags are a great convenience, enabling the outer to carry different foodstuffs in a compact and sanitary manner. Food bags may be had in different sizes, and friction-top tins may be purchased to fit them; and one or more of these liquid-proof containers are desirable for transporting lard, butter, pork, ham, and other greasy necessities. The food bags slip into the larger duffel bags, making a very compact bundle for stowing away in a canoe or pack harness.

#### Carrying List for the Camp Outfit

For permanent camps, take the wall tent with fly, although the Baker or camp-fire styles are also good. When traveling light by canoe, the canoe or

protean tents are recommended. When going very light by pack, use the for-ester's or ranger's tent. Sod and floor cloths and mosquito netting are optional.

The cooking kit may be of aluminum or steel, all nesting within the largest pot. Include a folding baker, or reflector, with bread board in a canvas bag, a wood salt box, and a water-tight can for matches.

Furniture for the permanent camp consists of a full-sized ax, double-blade or tomahawk style with straight handle, in a protecting case, whetstone and file for keeping the ax in shape. A shovel and saw will be needed when a cabin is built. A canteen may be included, but is not required on most trips. A folding candle lantern is the best for the average trip, but an oil, or acetylene, lantern may be used in a fixed camp. Cots, folding chairs, tables, hangers, etc., are only useful in fixed camps.

A pack basket with a waterproof-canvas lid and cover, having straps to go over the shoulders, is a general favorite with woodsmen and guides. Canvas packs or dunnage bags may be used if preferred. There are two sizes of food bags, one holding 5 lb. and another of 10-lb. capacity, with drawstrings at the top, and these are the best for carrying provisions.

Pack harness, with a tumpline to go across the forehead, is needed when the outfit must be carried on portages, etc. This may be omitted when pack baskets are used. Packing cases of fiber may be used for shipping the outfit to the camping ground, but ordinary trunks, or wood boxes, will answer as well.

#### The Personal Outfit

An old ordinary suit that is not worn too thin is sufficient. Corduroy is too heavy for the summer and too cold for winter, and canvas is too stiff and noisy for the woods. Cotton khaki is excellent for the summer, and all-wool khaki, or mackinaw, coat and trousers are comfortable for winter. Wool is the best material for undergarments



in all seasons. Two sets of garments will be sufficient, as the washing is done at night. Be sure to have the garments large enough to allow for shrinkage. Light-weight cashmere is the best material for socks during summer, and heavier weight for the winter. Three pairs of ordinary-weight and one pair of heavy-weight will be sufficient. A medium-weight gray-flannel overshirt, with breast pockets having button flaps, is the woodsman's choice. On short and light trips one shirt will do. A light-weight, all-wool gray or brown, sweater is a good thing to carry along. It is easily wetted through and a famous brier catcher, yet most woodsmen carry one.

The regulation army poncho is more suited to the woods than a rubber coat or oilskins. The larger-size poncho is more bulky to pack, but may be used as a shelter by rigging it up with poles, lean-to fashion. A poncho makes a good ground blanket also.

A medium wide-brimmed hat, in gray or brown, is better than a cap. A gray, or brown, silk handkerchief should be included to wear around the neck to protect it from the sun and cold. Only few novices will carry one, but not so with the regular woodsman. The moccasin is the only suitable footwear for the woods. The "puckaway," with extra sole, is known to most woodsmen. A pair of larrigans—ankle-high moccasins with single sole—are suitable to wear about the camp.

Each member of the party carries his own knapsack, or ditty bag, in which such things as brush and comb, toothbrush, razor, towel, medicines, stationery, etc., are kept. The extra clothing is carried in its own canvas bag.

Each member of the party carries a pair of woolen blankets. Army blankets in tan color are serviceable and inexpensive.

A good, tempered knife should be worn at the belt, preferably one without a hilt and having a blade 5 or 6 in. long.

A small leather pouch containing a few common remedies, such as quinine, laxative, etc.; and a small first-aid out-

fit should be included in each camper's personal pack. Also a small leather pouch containing an assortment of needles, darning cotton, buttons, and a length of heavy silk twist is a handy companion.

A few sheets of paper and as many envelopes, a notebook, pencil, and a few postal cards, are usually carried, together with an almanac page of the months covering the intended trip.

The compass is by far the most useful instrument in the woods, but any reliable and inexpensive watch may be carried.

Many woodsmen carry a small hatchet at the belt, and on trips when but the few necessities are carried the belt ax takes the place of the heavier-weight tool. The tomahawk style gives two cutting edges and is therefore the best tool to carry. A leather or other covering case is needed to protect the blades.

A small tin box containing an assortment of rivets; tacks; a bit of string; brass wire; a few nails; a couple of small files; a tool holder with tools; a sheet of sandpaper; a bit of emery cloth, and any other small articles which the sportsman fancies will come in handy, may be carried. It is surprising how often this "what not" is resorted to while in the woods.

The odds and ends of personal belongings, as a jackknife; pipe and tobacco; map of the region visited; length of fishing line and hook; a few loose matches; match box; purse; notebook and pencil; handkerchief, etc., are, of course, carried in the pocket of the coat.

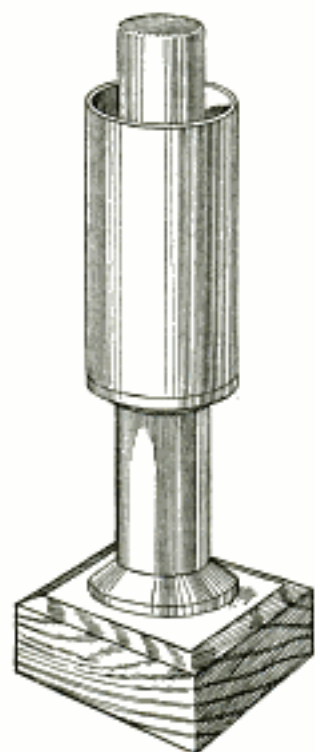
#### A Camper's Salt-and-Pepper Holder

A camper will find a very clever way to carry salt and pepper by using a piece cut from a joint of bamboo. A piece is selected with the joint in the center, and the ends are stoppered with corks.



### A Simple Self-Contained Motor

To say that the subject of this article is the simplest motor in the world is not to overestimate it, for the apparatus



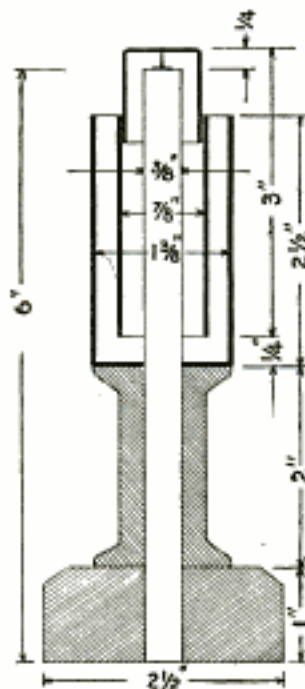
is not only a motor reduced to its essential elements, but combines within itself its own source of electric power, all without the use of a single piece of wire. The experiment is very interesting and instructive and will well repay a careful construction along the lines indicated, even though not in strict accordance with the dimensions given.

The first step is to procure a permanent magnet, about  $\frac{3}{8}$  in. in diameter and 6 in. long. If such a magnet cannot be conveniently secured, a piece of tool steel with flat ends should be hardened by heating it to a dull red and plunging it in water, and then strongly magnetized. This may be readily accomplished by slipping a coil of insulated wire over it through which the current from a storage battery or set of primary cells is passed. If these are not at hand, almost any electrical supply store will magnetize the steel.

A square base block with neatly beveled corners is now in order, which is trimmed up squarely and a hole bored centrally through it to receive the lower end of the magnet. Procure a neat spool and make a hole in it large enough to pass over the magnet. Glue the spool to the base after locating it in the exact center.

The outer and larger cylinder is of copper, or of brass copperplated on the inside. It is cup-shaped, with a

hole in the bottom just large enough to permit the magnet to be pushed through with a close fit, to make a good electrical contact. The magnet may be held in place by having it closely fit the spool and the copper cylinder, and by soldering the heads of a couple of small tacks, or nails, to its under side and driving them into the spool. Coat the magnet with pitch, or paraffin, from the top down, and around its connection with the bottom of the cylinder. The small thimble shown at the top should be of brass or copper, and while one can be easily formed of sheet metal and soldered, it is not improbable that one could be made in seamless form from some small article of commerce. In the exact center of the under side of the top of this thimble, make a good mark with a prickpunch, after which a small steel thumb tack should be filed to a fine needle point and placed, point up, exactly central on the upper end of the magnet, to which it is held with a little wax. The smaller cylinder is simply a piece of sheet zinc bent into a true



cylinder of such a size that it may be sprung over the lower end of the thimble. This done, it is only necessary to slip the zinc over the end of the magnet until the thimble rests on the thumb tack, and then pour some dilute muriatic or sulphuric acid into the outer cylinder, after which the thimble and attached zinc will begin to rotate.

The required strength of the acid and the resulting speed will depend upon the nicety of suspension and the trueness of the rotating zinc cylinder. The zinc will have to be changed, but the copper undergoes no deterioration.

see aug 15  
p 314

# How to Make Hammocks

By CHARLES M. MILLER

M. 8-871

## PART I—A Twine Hammock

**C**ORD hammocks may be made in two or more different ways, the knots being formed by the simple overhand tie, Fig. 1; the flat reef knot, Fig. 2; the Solomon's knot, Fig. 3, or by the triple throw-over, Fig. 4; or they can be knotted by the process known as netting, Fig. 5, in which a special needle, or shuttle, is used.

In using any one of the first three methods of making the knots it is necessary to have cords arranged in pairs

and long enough to reach from one end of the hammock to the other, allowing only sufficient length for the take-up in tying the knots and the spread of the meshes. The overhand knot is large, and the Solomon's knot is a little unwieldy, but is considered more beautiful when tied. The flat reef knot is small, is easily tied and will not slip. The netting process has a good

knot and has the advantage of a short single cord, as the meshes are made independently and the cord is carried on the netting needle.

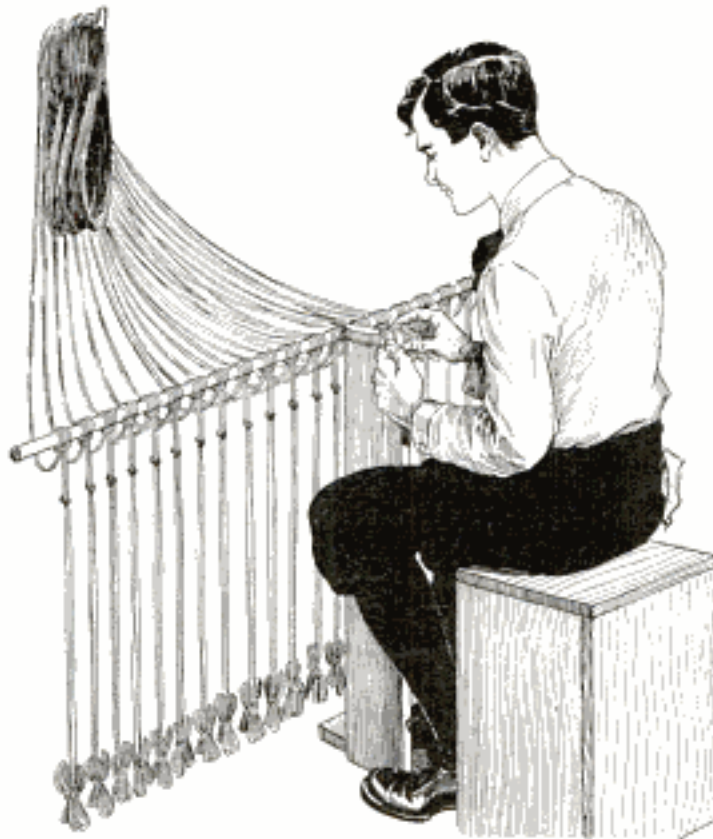
It is a great advantage, when making a hammock with the simple overhand, the flat reef, or the Solomon's knot, to loop all the pairs of cords at the center about a rod, Fig. 6—which may be any stick such as an old broom handle—knotting from the center to-

ward each end, one side being tied, and then the other. When the first pairs are being tied, the opposite ends should be looped up together out of the way. Even half the length of a hammock makes a long cord to be drawn through each time a knot is tied, and each string can be wound about the fingers into a little bundle and secured with a half hitch, using the same cord, and left hanging, as shown in Fig. 7, allowing sufficient cord free to throw large loops

in the tying, and to make about 10 additional meshes. About 3 ft. would be a good length to be left free.

It will be necessary to have 24 pairs of cords—48 cords in all—each 18 ft. long to make a hammock by the first two methods of tying the knots. Seine twine of medium-hard twist and 24-ply can be obtained from a store carrying sporting goods, and is about the best

material to use for this purpose. When these pairs of cords are looped on the center rod, and the rod has been anchored to a wall, as shown in Fig. 8, begin by placing the mesh stick, or rather the mesh post, Fig. 9, between the first pair of cords, A and B, at the left end of the center rod, as in Fig. 8 and Fig. 6. The simple device illustrated in Fig. 9 is very useful for tying any one of the three first-described



When Making a Hammock with the Simple Overhand, Flat Reef, or Solomon's Knot, Loop All the Pairs of Cords at the Center about a Rod

knots. The device needs no explanation other than the illustration. It will be seen that there are two sizes on the top of the post: the smaller is for the



Fig. 1

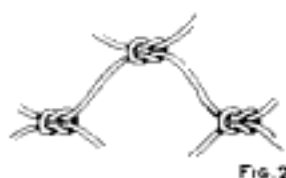


Fig. 2

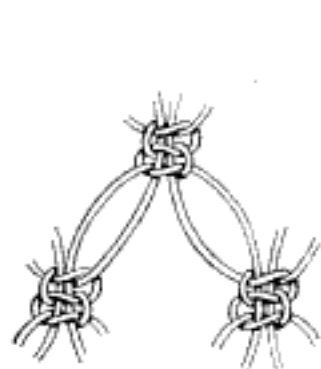


Fig. 4

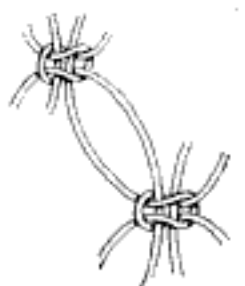


Fig. 3

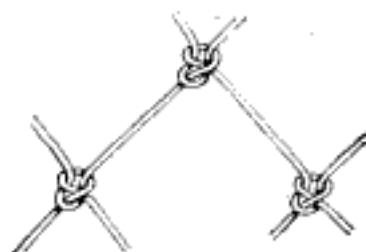


Fig. 5

The Simple Overhand, Flat Reef, Solomon's Knot, Triple Throw-Over, and Netting Ties

first time across only. The mesh post should be of convenient height for a person when sitting on an ordinary chair. One foot rests on the base as the tying proceeds, but there is no pulling over, as the tie draws both ways on the post, this also doing away with the pull on the center rod.

The cord to the right, B, is taken in the right hand and thrown over the left cord A, Fig. 8, and is held by the left hand. The left cord A is then tucked down behind the right, as shown in Fig. 10. If the right cord goes over in making the first loop, the same cord B must also go over in the second throw, as in Fig. 11, in order to have a proper square knot that will not slip. The end of A is then tucked

under B, as shown by the dotted lines. This makes a very serviceable knot for the hammock, but can be also used for other purposes. The knot is shown in Fig. 2. Draw it up tightly, very hard, for knotting is not worth much if it is not tied well.

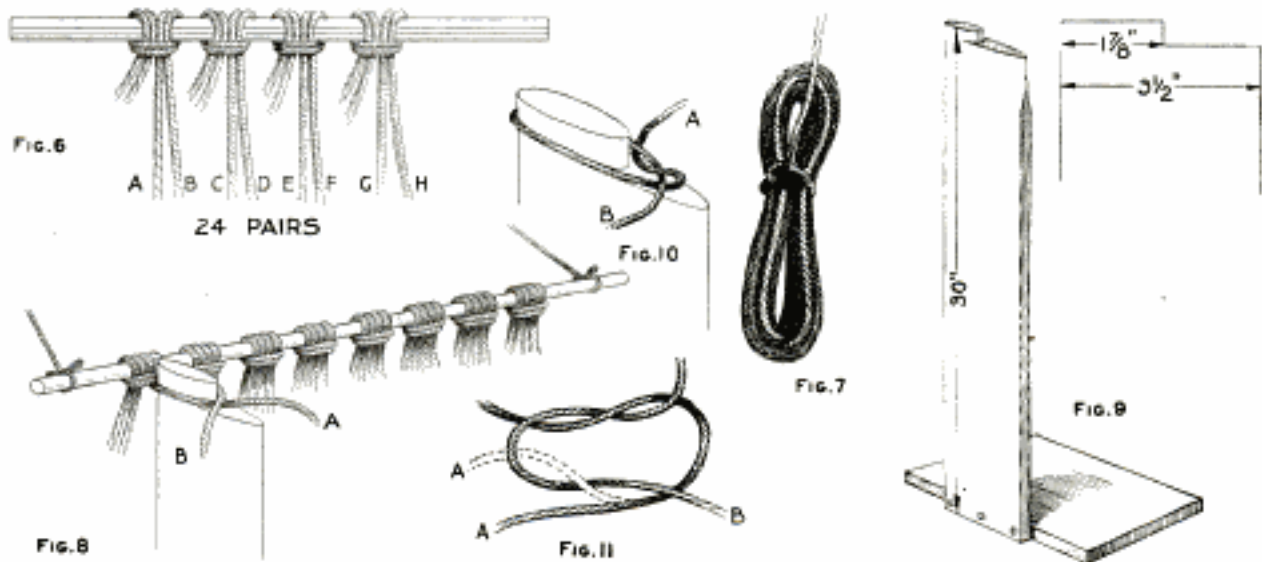
In case the simple overhand knot is preferred, the mesh post is placed between the first pair as before, and cords A and B are brought to the front as in Fig. 12, but are carried parallel into a large loop that is thrown over as illustrated, then tucked up through as indicated by the dotted lines. The thumb and first finger of the left hand now slide up to the point P, while the right hand pulls up the loop as it nears the finish, the thumb and first finger crowding the loop down hard against the mesh post. The small part is used for the first row across. The knot formed is shown in Fig. 1.

After tying the first pair of cords, using the knot preferred, slip the first mesh so made off the tying post and place the post between C and D, which is the next, or second, pair. Tie the second pair and pass on to the third pair, which is E and F. Continue moving and tying until all the 24 pairs of cords have been similarly knotted in their first mesh. The last knotting will be the twenty-fourth pair, which is represented by the cords marked Y and Z. Instead of tying cords of the same pairs on the return trip across, one cord Y of the twenty-fourth pair is tied with one cord X of the twenty-third pair, and the other cord W of the twenty-third pair is tied with the cord V of the twenty-second pair, and so on across the series.

On the second row of tying, the post is first placed between cords Y and X and they are knotted together, but instead of tying about the small part of the post the larger size is used. After cords Y and X have been tied, cords W and V are combined. It will be seen that this is tying the pairs together instead of combining the two cords of the same pair. The third time across the combinations are the same as in the first row. The large mesh is used on

all but the first row. The alternations of rows is continued until the cords are tied to within 2½ ft. of the end.

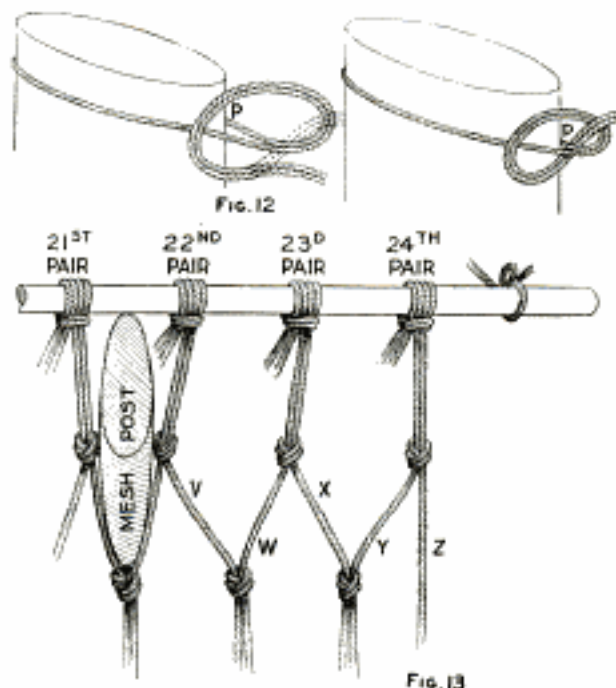
cord, or string, about the whole bundle of cord together with the ends, pulling tightly and tying securely with the



The Mesh Post Has Two Sizes on Its Upper End, the Smaller for Knotting the First Row of Meshes, and the Other for the Remaining Rows. This Illustration Also Shows the Manner of Tying the Knots

Pull out the center rod, insert it in the second row of meshes, loosen the ends that were looped up and begin the knotting of the opposite ends of the cords. When both sides are completed to within 2½ ft. of the ends, the center rod is removed and inserted in the last row of meshes. Another simple device will be found efficient, which consists of a board, 30 in. long, three or more inches wide and 1 in. thick, with three nails driven in slanting, as shown in Fig. 14, to prevent the ring and rod from slipping off as the tying proceeds. One 2½-in. galvanized ring will be required for each end. The ring is attached to the single nail at the end with a string. This will be found better than just slipping the ring over the nail, as it is necessary to have a little more play in putting the cords through for the tying. The distance from the rod to the ring should be 2 ft. The tie is made in pairs as before, one cord going under and the other over the side of the ring, using the flat reef knot. There will be a few inches of ends remaining after the tie is made and these are brought back to the main body of the cord and wound with an extra cord used for that purpose. The winding is started by looping the end of the extra

flat reef knot. This is illustrated in Fig. 15. The winding should be about 1½ in. long where the turned-back ends are cut off. Each time the cord is wound about the bundle it should be



Tying the Overhand Knot and How to Run the First and Second Rows Across

looped through its own winding and drawn tightly. This is practically the buttonhole loop. To finish the winding the cord should be given a double loop-

ing through its own winding; then with an awl, or other pointed tool, work a way through the under side of the

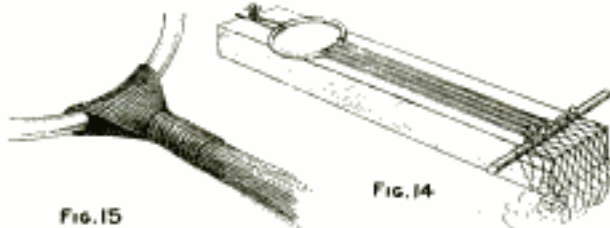


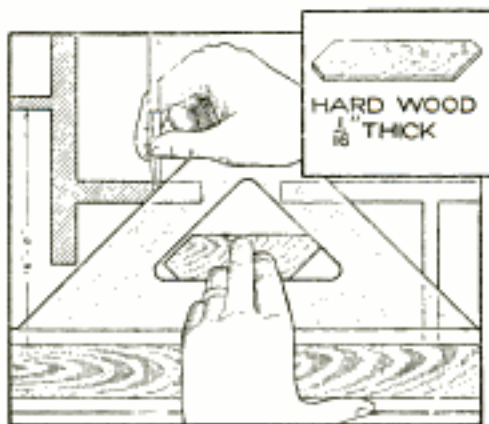
Fig. 15  
Attaching the Rings to the Ends of the Cords and the Binding near the Rings: All the Pairs of Cords are Looped about a Rod in the Center, and the Knots are Made toward the Ends

other windings so that the end may be brought out farther back and pulled tightly, to prevent unwinding when the pull comes on the hammock. Attach the ring to the opposite end in the same manner and the hammock is complete.

The edge can be bound the same as a tennis net, or a rope can be run through the outside meshes lengthwise, as desired. A very pretty effect can be obtained by knotting, in a similar manner to the body of the hammock, an apron fringe for the sides.

### Homemade Section Liner

For the rapid and uniform hatching of cross sections this little device will be found to give results equaling most of the high-priced instruments that can



Block Used in a Triangle to Move It at Equal Distances for Making Section Lines

be purchased. It consists of a hard-wood block used in connection with a 45° triangle. The corners are cut to permit the triangle to slide the desired distance; then, by alternately sliding

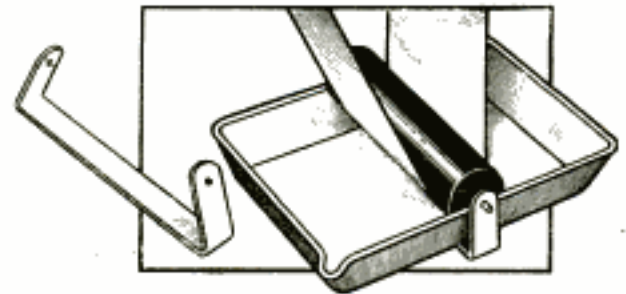
the triangle and block with the left hand, equal spacings can be drawn without measurements of any kind.

Two different spacings may be drawn with one block by reversing it, and two blocks having a different location of the angles will give four spacings, which is about all the draftsman requires in ordinary practice. No alteration of the triangle is required with this device, and it requires but little skill to construct it.—Contributed by J. A. Shelly, Brooklyn, N. Y.

307 12th St.

### Tray Attachment for Developing Films

An ordinary tray can be used for film development, when there is no tank at hand, by the use of the attachment shown in the sketch. It consists of a strip of sheet metal, or tin, bent to fit under the tray and up on both sides, to provide bearings for a roller. The roller is made of hard rubber and should



Roller Attached to a Tray for Use in Developing a Full-Length Film

be of such size that its lower surface will be under the developer in the tray. The film is drawn back and forth under this roller.

### An Automatic Window Closer

The window closer consists of a weight, A, attached to one end of a cord, B, which runs through several pulleys and has its other end attached to a hook in the center of the window sash, as shown in Fig. 1. The weight A is held in an elevated position by a small trigger which is operated with an electromagnet.

The arrangement of the weight and its control is shown in Fig. 2. The latch C is held in a horizontal position

by an extension on the arm D, which in turn is held by a latch, E. The latch C is mounted on the same sup-

is shown in Fig. 3, in which G represents the electromagnet to trip the trigger that supports the weight, and

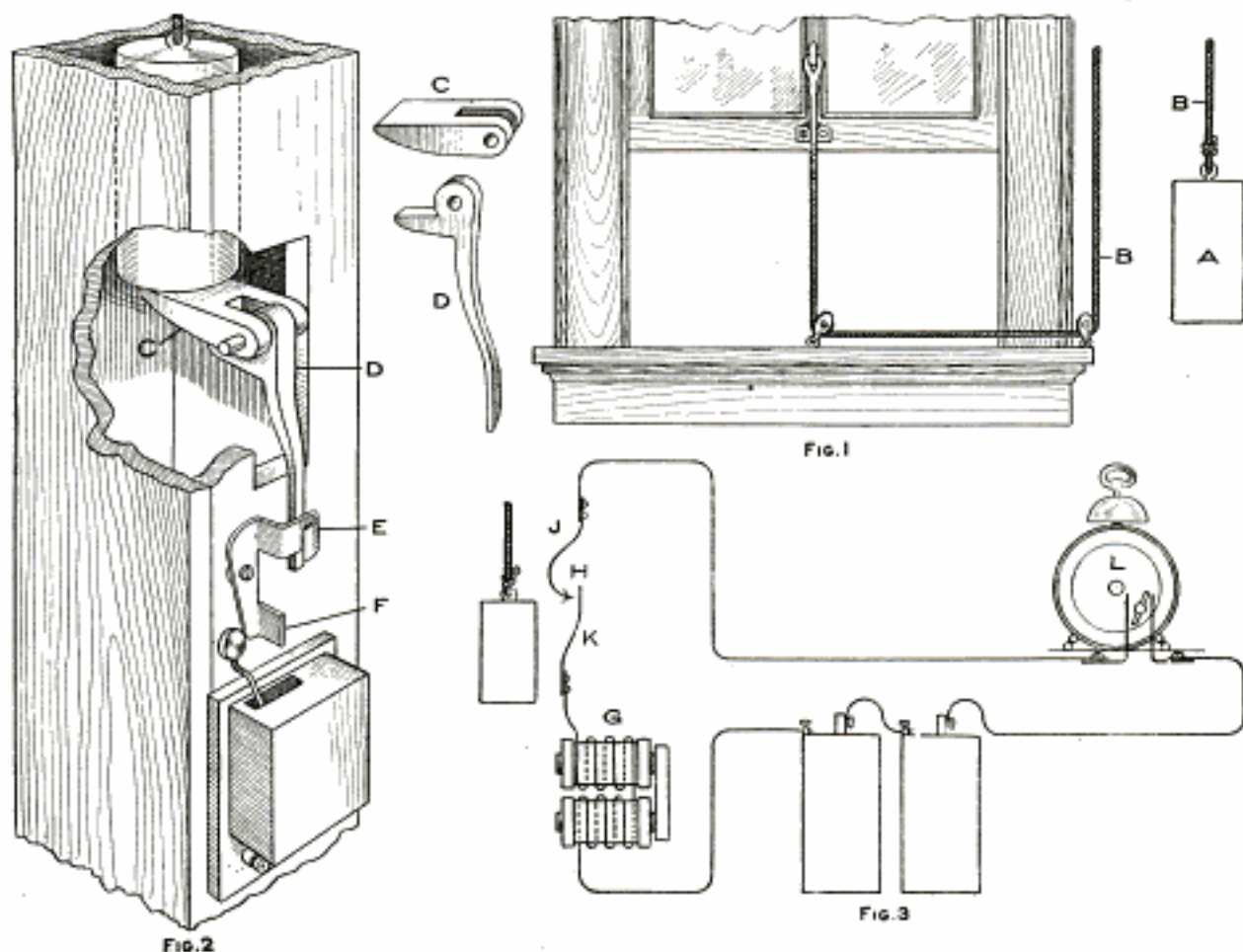


FIG. 2

The Window is Automatically Closed by a Weight at the Time Set on the Alarm Clock When the Key Closes the Electric Circuit, Causing the Magnet to Release the Latch

porting shaft as the arm D, and they are connected with a coil spring having the tension in such a direction that it holds the latch C down on the extension of the arm D. When the weight moves up through the box the latch C will rise and allow it to pass down beside it. The latch holding the lower end of the arm D may be released by means of an ordinary vibrating bell arranged so that its clapper will strike the extension F on the latch and thus cause its upper end to move from the engagement with the arm D. A small coil spring is attached to the arm D so that it will be returned to its vertical position when the weight has passed C and thus make it ready for the next operation without any adjustment except raising the weight and setting the clock.

A diagram of the electrical circuit

H the contact which remains open until the weight is raised to the upper position, when the spring J is forced against the spring K and closes the circuit. The circuit still remains broken until the contact L is closed by the key on the alarm clock, which is set in a vertical position between two springs representing the terminals of the wire. The contact H should be so located on the housing for the weight that it will be closed only when the weight is resting on the latch C. The circuit is then opened as soon as the latch C is released, and the clapper will stop vibrating.

¶When a pencil becomes too short for the hand, apply paste to about 1 in. of the rubber end, roll on a sheet of paper about 6 in. long, and almost all of the pencil can be used.

## INTERESTING NEW PATENTS

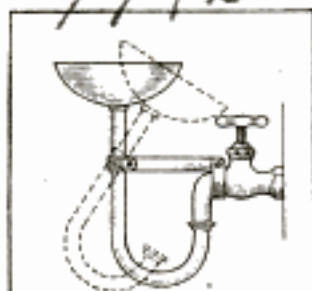


Fig. 1



Fig. 3



Fig. 5



Fig. 7



Fig. 9

**BUBBLING FOUNTAIN ATTACHMENT FOR WATER FAUCET** (Fig. 1)—This attachment is intended to be applied to any water faucet such as is commonly used in lavatories. It is pivoted to an arm which is bolted to the body of the faucet and has at the bottom an inverted gooseneck which fits against the mouth of the faucet when the attachment is in operative position. When not in use it is easily swung out of the way, leaving the faucet clear.

**FOLDING VESTIBULE FOR AUTOMOBILE** (Fig. 2)—The vestibule is formed by the ordinary door of the limousine combined with a false door which is made up of folding sections and is swung back into a recess at one side of the limousine door when not in use. In using, the door of the limousine is first opened at right angles to the car. The top section of the false door is then opened out horizontally, the door is swung to a right-angle position, and the top section is secured in place to serve as a roof for the vestibule thus formed. The bottom section is unfolded and dropped on the running board to give additional protection.

**PERAMBULATOR WITH NURSING-BOTTLE ATTACHMENT** (Fig. 3)—The perambulator consists of a frame mounted on casters and supporting a canvas seat so made that the baby's legs are free for walking. A nursing bottle is mounted on the end of a flexible arm which is supported on the perambulator frame so that it is always within easy reach of the baby's hands.

**KNOCKDOWN COT AND SHELTER** (Fig. 4)—The frame for supporting the cot and canvas shelter is made of tubular sections and can be easily set up or taken down. The cot bottom and shelter are both detachable from the frame so that the whole device can be folded compactly for transport.

**HORSESHOE MADE TO PREVENT SLIPPING** (Fig. 5)—This horseshoe is made with cross ribs and grooves to give the horse a firm hold on slippery roads or pavements. It is made of one piece of steel on which all the ribs and grooves have been made to the same shape, so that when it is bent to the form of a horseshoe, one side prevents slipping forward and the other prevents slipping backward.

**SPRING MOUNTING FOR BICYCLE WHEELS** (Fig. 6)—This ingenious arrangement is intended for absorbing road strains and insuring ease of riding. For accomplishing this, both the front and rear ends of the frame are mounted on leaf springs, as shown.

**COT FOR AUTOMOBILE** (Fig. 7)—The apron forming the cot is carried on two inclined supports which rest on permanent fixtures at the side of the car body. The cot is held securely in place by guy wires attached to the front and rear of the car, as shown. The whole device is taken down and folded compactly when not in use.

**PARCEL CARRIER FOR BICYCLE** (Fig. 8)—The carrier has two openings near the top of such size that it can be slipped over one of the handlebars, as shown. At the bottom is a strap for attaching the bottom of the carrier to the steering post.

**FISHHOOK SPREADER** (Fig. 9)—This device is designed to keep the hooks apart regardless of the way the line is thrown or the force or direction of the current. It consists simply of a wire bent to circular form. The line is attached to the middle of the loop and the hooks to the ends. A weight suspended from the top keeps the device upright.

**FRUIT PICKER** (Fig. 10)—This picker consists essentially of a canvas receptacle equipped at the top with shearing blades for severing the stem of the fruit. The canvas is mounted on a light metal frame, while the ends of the blades are connected by links that keep them always parallel with each other. The device is operated by two extensible handles which are pivoted together just under the receptacle.



Fig. 2



Fig. 4



Fig. 6

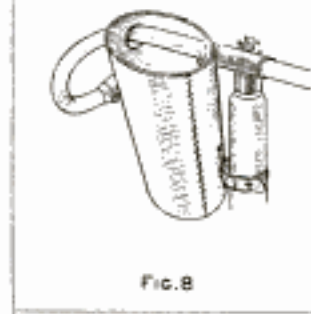


Fig. 8



Fig. 10





Fig. 11

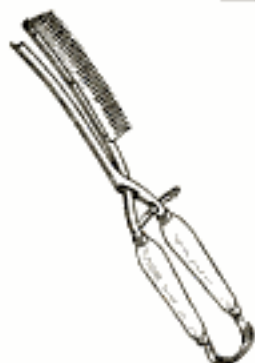


Fig. 13



Fig. 15



Fig. 17



Fig. 19

**ELECTRIC HANDSAW** (Fig. 11)—Power is supplied by a small electric motor carried in the handle, the current being taken from any electric socket through a cable. The shaft of the motor operates the saw through a bevel gear. Both the gear connection and the guard are adjustable for saws of larger or smaller diameter.

**SCOW THAT IS SELF-DUMPING AND SELF-RIGHTING** (Fig. 12)—The hull is divided into two compartments, one placed above the other. The lower compartment is an air chamber, the upper is provided with valves at one side, and above this compartment is the deck for the load. In operating, the valves in the upper compartment are opened, and the water as it enters at one side only causes the scow to tilt. The amount of tilting is limited by a float carried on a pivoted arm. Chains attached to this float release the doors when the scow reaches the extreme position, permitting the load to slide off the deck. The scow then rights itself through the buoyancy provided by the air chamber.

**GAUGE FOR CUTTING HAIR** (Fig. 13)—This gauge can be adjusted to hold the attached comb at any desired distance from the head. The handles are joined by a spring and the adjustment is made by a ratchet that connects the forward ends of the handles.

**FENCE-BUILDING TOOL** (Fig. 14)—The head of this tool comprises a wire stretcher, hatchet, and nail puller, while at the opposite end of the handle is a curved prong that serves as a staple puller. The back of the head is curved to fit the fence post and is worked against the post, as shown. The nail puller consists of a U-shaped plate secured to the side of the head and provided with a triangular slot.

**SHOCK ABSORBER** (Fig. 15)—Each end of the chassis bears on two levers, each of which is supported at one end by the axle and has its opposite end connected by a link with a second lever. The upper end of the second lever bears against a horizontal coil spring carried on the frame, the lever being curved upward and pivoted to the frame, as shown.

**COMBINED RAINCOAT AND LIFE PRESERVER** (Fig. 16)—The feature of this garment is that it has two separate compartments, one being occupied by the body when the garment is used as a raincoat, and the other, when it is used as a life preserver. When it is used as a raincoat, the water-tight gloves and boots are folded in and fastened to the lining. To use as a life preserver, the wearer gets into the other compartment, when the hands, feet, and body are entirely covered, and inflates air-tight compartments at the front and back by blowing through tubes arranged around the collar.

**GOLF CLUB** (Fig. 17)—The purpose of this invention is to provide a means for placing the center of gravity of the head in just the right position to suit the needs of the user. This is accomplished by providing holes in the head and filling these with cylinders made of metal of different weights, such as aluminum, iron, and lead.

**INSECT DESTROYER** (Fig. 18)—This device is intended mainly for destroying the boll weevils that infest cotton plants. Each hood is provided with an opening at front and rear and with a slotted bottom, so that the bolls traverse the interior of the hood. The weevils are knocked off the bolls by flaps inside the hood and fall into oil or other destructive liquid carried in receptacles at the bottom of the hood.

**NOVEL AUTOMOBILE SIGN** (Fig. 19)—This sign is evidently intended for boosting the safety-first movement. It is designed to be mounted on the radiator of an automobile.

**ADJUSTABLE CLAW HAMMER** (Fig. 20)—The claw and hammer portions are separate, the hammer only being rigidly fixed to the handle. The claw may be slid backward or forward and fixed in any position by means of a tongue that engages notches in the handle.

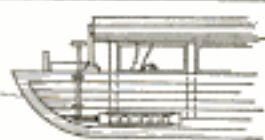


Fig. 12



Fig. 14



Fig. 16



Fig. 18

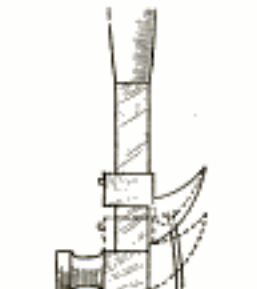


Fig. 20

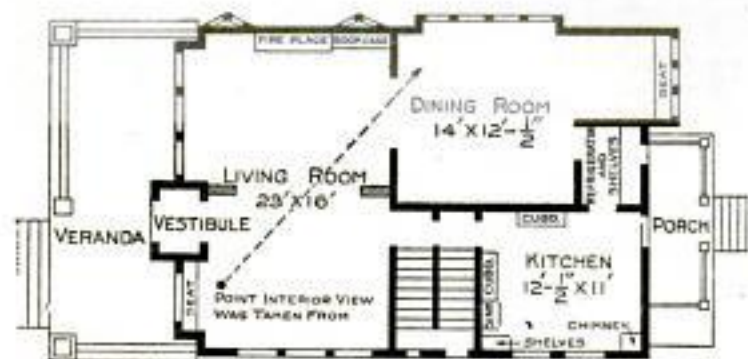
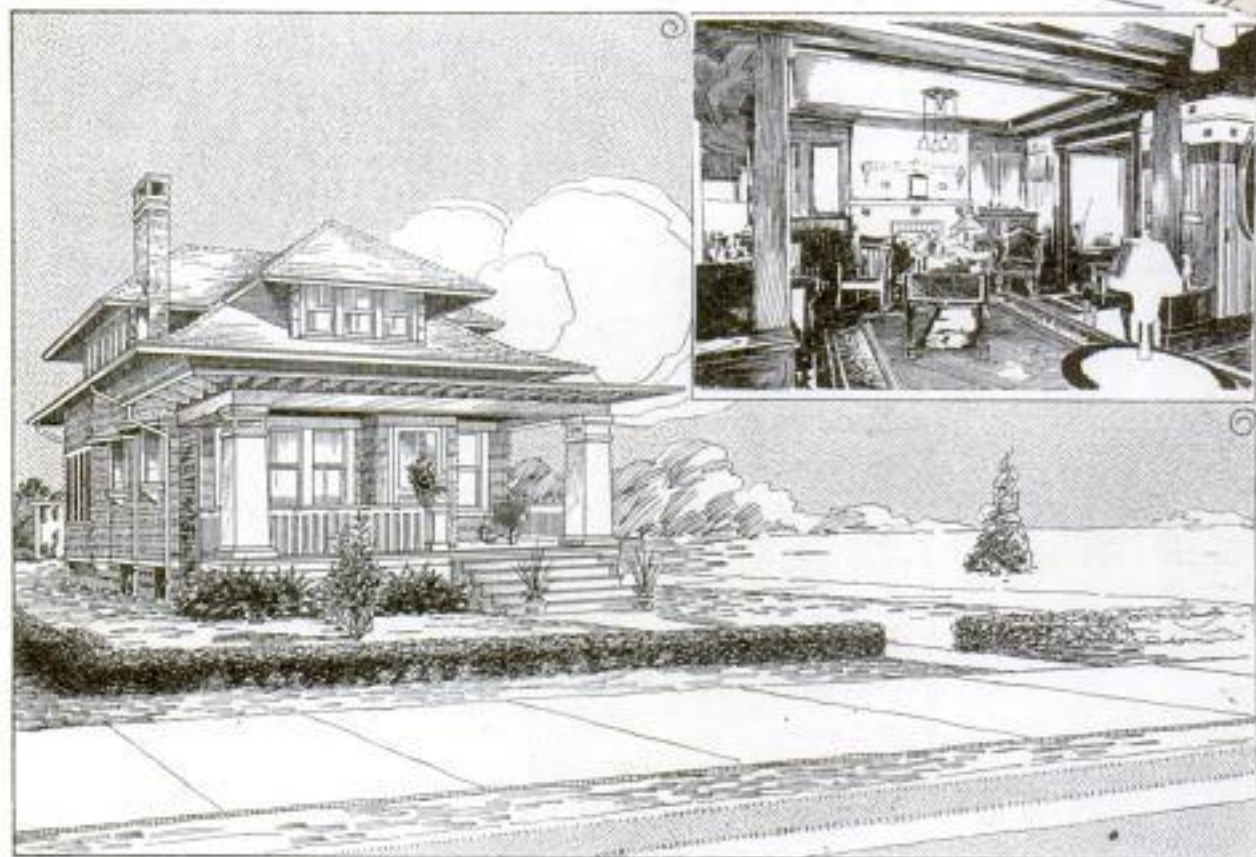
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POPULAR MECHANIC

## A CONVENIENTLY ARRANGED FRAME



First-Floor Plan



Second-Floor Plan

**T**HIS attractive six-room cottage is located in western New York and was designed not only with the idea of obtaining the utmost convenience in arrangement but to suit the climate of that particular section of the country. It is a frame structure resting on stone foundations, with exterior walls faced with double-row shingles. The veranda is in white, while the body of the building is brown with white trimmings and red roof. The chimneys are built of yellow brick. The living room and dining room are finished in chestnut and have beamed ceilings, the kitchen is finished in yellow pine, and the second story, in white pine. All rooms have hardwood floors. One of the unusual features of this cottage is the way in which the corners of the second floor, which would otherwise have been waste space on account of the slope of the roof, have been utilized for trunk rooms, these rooms being in effect equivalent to one good-sized attic. The cottage is heated by steam and was built complete at a cost of approximately \$4,200.

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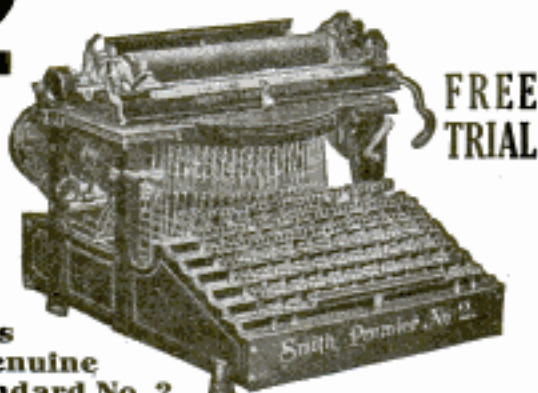
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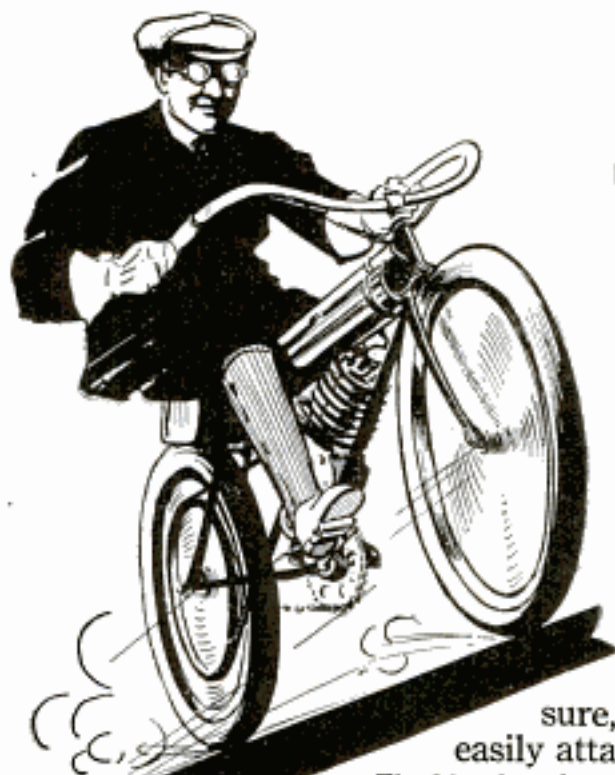
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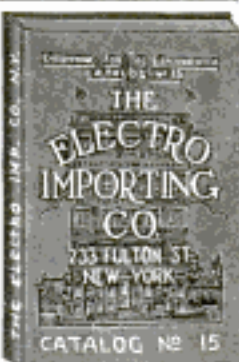
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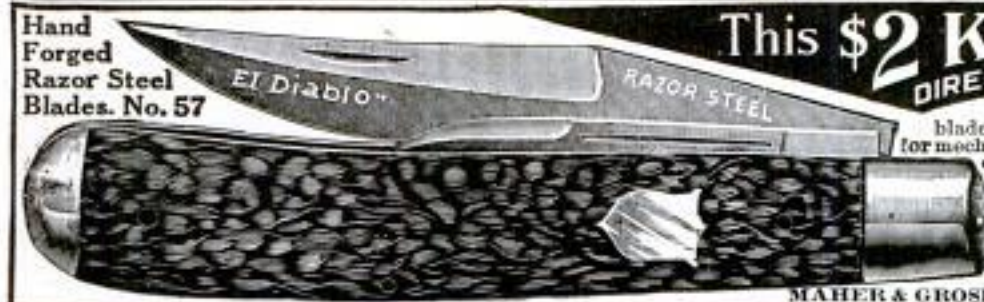
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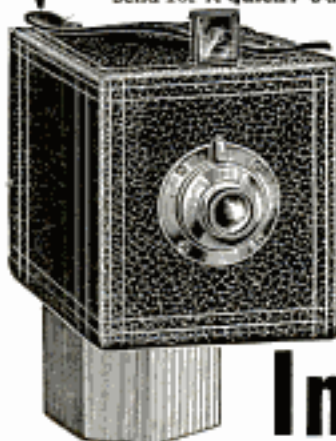
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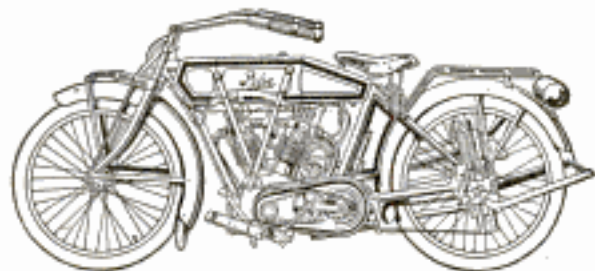
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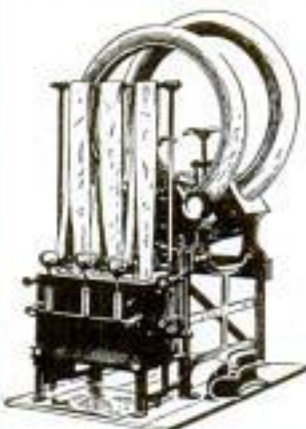
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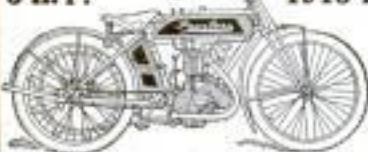
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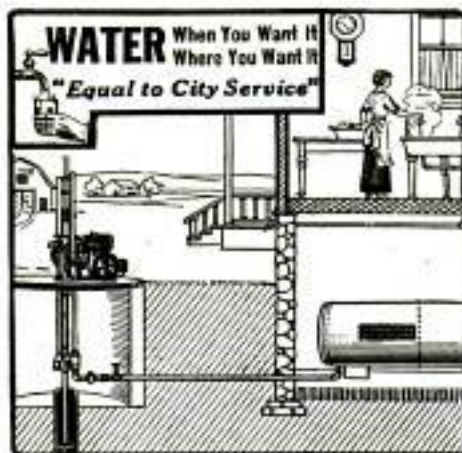
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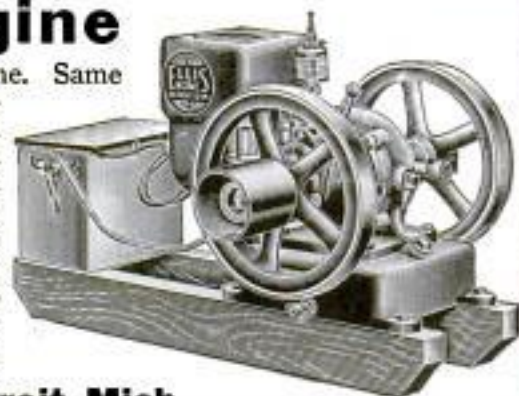
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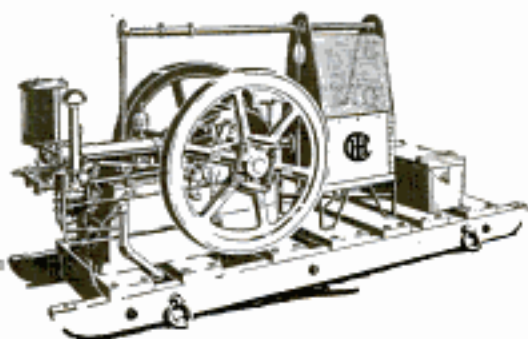
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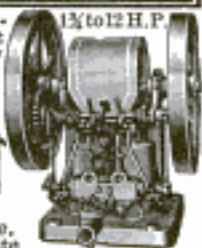


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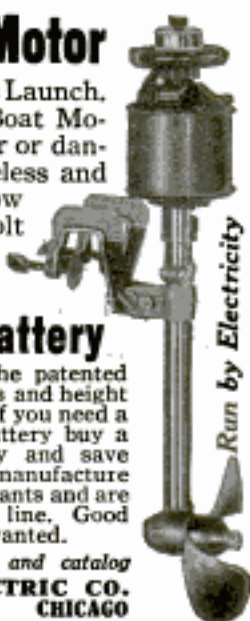
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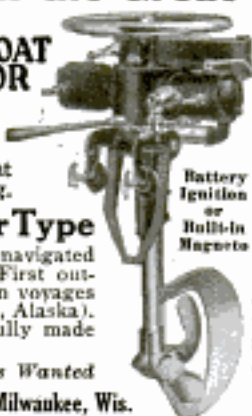
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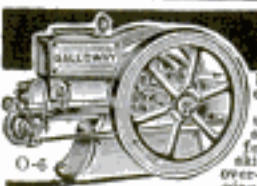
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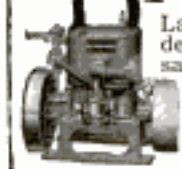
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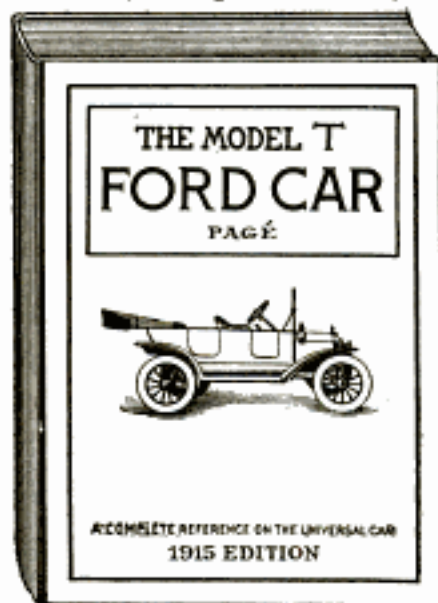
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St. and No. \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_  
Present Occupation \_\_\_\_\_

Please Mention Popular Mechanics



## ONE MAN AND THIS MACHINE CAN EARN \$50 to \$100 DAILY PROFIT

You want a business of your own. Get into the Popcorn Crispette business and make \$2000.00 to \$7000.00 a year. All you need is a machine, a few dollars and a good location. You can learn to make Crispettes in a day. They sell everywhere for a nickel a package. You make almost 4c. profit.

SEND FOR FREE BOOK

It tells the whole story—how and where to start, how to succeed, gives experience of others, etc. It's worth reading, even if you don't start. If you are looking for a good thing and easy money, write us today for the FREE BOOK.

W. Z. LONG CO., 1057 High St., Springfield, Ohio



The handiest, most useful tool made—7 1/2" long; nickel plated drop forging; shears cut stovepipe iron, sheet tin, brass, copper, wire and nails. A whole set of tools—fits your hip pocket. Sent postpaid for a dollar bill. Get yours today, money back if dissatisfied. BIG MONEY-MAKER FOR WIDE-AWAKE AGENTS.

Richmond Sales Co., 889 Richmond Ave., Buffalo, N.Y.



## TYPENWRITERS ALL MAKES

Prices \$15.00 up. SOLD or RENTED ANYWHERE at 1/4 to 1/2 MANUFACTURERS' PRICES, allowing RENTAL TO APPLY ON PRICE. Free Trial. Installment payments if desired. Write for Catalog L.

TYPewriter EMPORIUM, 34-36 W. Lake St., Chicago, Ill.

American merchant shipbuilding declined 33 per cent in point of tonnage in 1914, compared with 1913, and about 23 per cent in the number of vessels. During the year 1,163 vessels of all classes, except warships, were built, compared with 1,501 vessels built in 1913. The 1914 tonnage was 255,630, against 382,569 tons in 1913.

## "Interlox" SAVES TIME, TEMPER AND TROUBLE

MASTER SLIDE RULE

The Only Interlocking Rule made—and the Only one whereby inside measurements of doors, windows, etc., can be taken rapidly and accurately. Also superior to all others for outside measurements of walls, ceilings, etc. If your hardware dealer hasn't this Rule, send us his name and 10c per foot (in any length from 2 to 8 ft.) and it will be sent prepaid.



Liberal Proposition for Dealers and Agents

DAHL MFG. CO., 51P E. 42nd St., NEW YORK

## SEWS THIS DOLLAR AWL FOR

ANYTHING

Makes a perfect lockstitch



49c

Add 6c for postage Agents Wanted

1915 Model

Expressing cut to show position of thread in handle

This Automatic Awl is superior to all others. It is of immense value for repairing all kinds of leather, harness, bags, belts, shoes, etc. THREADED DIRECT FROM THE NEEDLE. So simple a child can use it. Regular price \$1. For a limited time only we will mail it anywhere, with waxed Thread, two Diamond Point Needles (curved and straight), and directions, for Only 49c (postpaid 55c). Extra Needles 5c, Thread 10c. JOHNSON SMITH & CO., Dept. 7, 7th S. Dearborn St., CHICAGO

## Pay as You Wish

We'll send you a genuine Lachnite for you to wear for 10 full days. If you can tell it from a real diamond send it back at our expense. Costs but 1-50th as much. If you decide to keep it pay only a few cents a month. Write for catalog.

Genuine Lachnite Gems

keep their dazzling fire forever. Set in gold, cut by world renowned diamond cutters. Will stand fire and acid tests. All kinds of jewelry of astounding low prices. Easy payments. WRITE TODAY.

H. Lachman Co., 12N. Michigan Av., Chicago Dept. B119



# SPECIAL

## ONLY \$12.75



### EASY TERMS

### 30 Days FREE TRIAL!

Standard of the World. Endorsed by Government and Railway Officials. Harris-Goar's enlarged easy credit plan enables you to own one of these superb Elgin Watches now.

## 17-Jewel Elgin!

Now, during this Special Sale, is the time to buy this elegant 17-Jewel Elgin. Thoroughly factory tested, fitted in a beautiful Gold Strata case, factory stamped and guaranteed 25 years, hand engraved, plain polished or with your own monogram, and our startling offer is to send you this celebrated 1915 Model free of charge for your inspection and approval.

### No Money Down

Because we want to prove to you that the great volume of our business actually enables us to do better by you than any other watch or diamond house in the world and that on this particular watch, we save you nearly half, for it sells regularly at \$20 to \$22, while our

### Special Price is only \$12.75

We don't want you to send one cent. Not a penny. Merely give us your full name and address that we may send you this superb 17-Jewel Elgin on approval, and if after you receive it and want to keep it, then we ask you to pay us the small sum of

**Only \$2 a Month** But, if after you have worn it 30 days free and don't want to keep it, send it back at our expense. You assume no risk whatever. You do not buy or pay one cent until we have placed the watch right in your own hands for your own decision. We want no security, no interest, no red tape—just common honesty among men.



**HARRIS-GOAR CO.** Department 1639  
Kansas City, Mo.

The House that Sells More Elgin Watches than Any Other Firm in the World.

### 3 Fine Books FREE!

Mr. HARRIS wants to send you his three latest BOOKS FREE—one the story of "THE DIAMOND," its discovery, where and how mined, cut and marketed, the other "FACTS VS BUNC" or all about the watch business, both at home and abroad; also our Big Free Illustrated WATCH AND DIAMOND BOOK. Write today—Do it now!

## BUY YOUR FURNACE \$10 DOWN \$10 A MONTH



Our monthly payment plan of selling direct saves you the dealer's profits and charges for installation. The

### JAHANT FURNACE

with the patented "Down Draft System" is best for residences, schools, hotels, churches, etc., because it delivers plenty of heat wherever and whenever desired at a saving of 1/3 to 1/2 in fuel bills. Install the JAHANT yourself. We send complete outfit, freight prepaid with special plans, detailed instructions and all necessary tools for installation. Satisfaction guaranteed or money refunded.

WRITE FOR FREE ILLUSTRATED BOOK  
THE JAHANT HEATING CO.

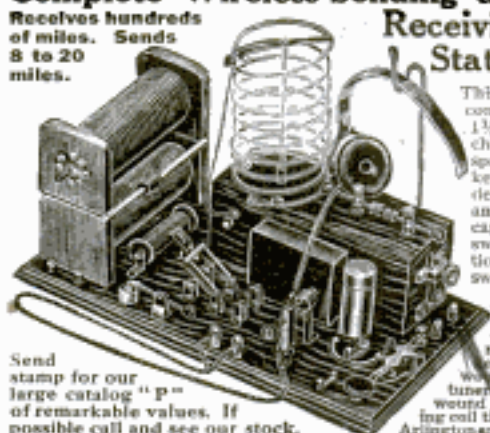
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AKRON, OHIO

## Save 1/3 to 1/2 on Fuel Bills

Complete Wireless Sending and Receiving Station \$10.10

Receives hundreds of miles. Sends 8 to 20 miles.



This remarkable station consists of a guaranteed 1 1/2 in. spark coil, machine turned lined spark gap, 1381 key contact, condenser, mounted in an iron case, a large capacity helix, DPDT switch, 500 ohm potentiometer, buzzer and switch to tell if your 2 detectors are working, buzzer battery in nicked case, tubular condenser, ear phone detector, bare wire wound double slide tuner, number 30 silk wire wound large capacity loading coil that allows you to get Arlington and long wave stations.

Send stamp for our large catalog "P" of remarkable values. If possible call and see our stock.

THE HANDEL ELECT. CO., 138-140 Centre St., NEW YORK

## When You Build

please bear in mind that there is still plenty of

### WHITE PINE

Send for our free booklet, "WHITE PINE IN HOME-BUILDING."

WHITE PINE BUREAU

1626 Merchants' Bank Bldg.

ST. PAUL, MINN.

## Smith & Wesson Automatic

Safe to have around; shoots when you mean to—not before. Booklet on request.

SMITH & WESSON, 814 Stockbridge St., Springfield, Mass.

## Print Your Own

Cards, circulars, menus, newspaper, book, etc. PRESS \$1, larger \$18, Rotary \$60. Save money. Big money printing for others. All sets, rules sent. Write factory for illustrated press catalog, TYPE, cards, paper, samples, etc. THE PRESS CO., Meriden, Conn.

## Waterman PORTO

1915 Model has reversing propeller, high tension magneto and unrestricted speed control. 3 H. P. Wt., 65 lbs. Sold direct from factory to you, freight paid. Original outboard motor—10th year—30,000 in use. Guaranteed for life. Fits any shape stern. Has automobile carburetor, reversible bearings, solid bronze skeg protecting 10 1/2 x 18 in. propeller. Steers by rudder from any part of the boat. Water cooled exhaust manifold; noiseless tubular exhaust; spun copper water jacket. Demand these essentials if you want your money's worth. Write today for free book showing both outboard and inboard engines. Our prices will surprise you.

WATERMAN MOTOR CO.  
230 W. Elliott Ave., Detroit, Mich.



Makes Any Boat A Motor Boat

Please Mention Popular Mechanics



# BE A MANUFACTURER

## OF HAYWOOD RETREADS MAKE \$3,000.00 A YEAR TO START

and more as you get accustomed to the business. The certainty of success is about as sure as anything in this world can be. You let down the DRAW BRIDGE for SUCCESS to enter into your career by getting into business for yourself.

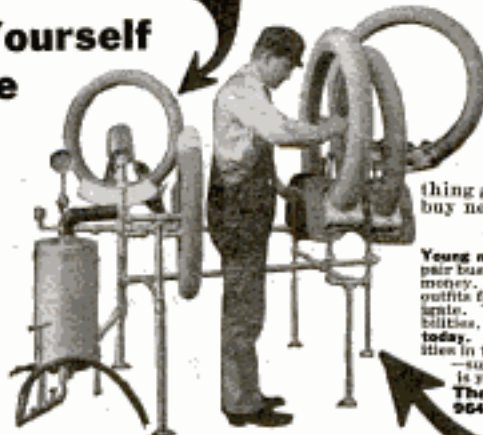
MAKE  
**\$3000.00**  
A YEAR

The business for you is the one where investment is small—the returns quick and for cash—where the margin of profit is large—the demand for your PRODUCT or SERVICE constant and ever on the increase. Each year adds thousands of new Automobile Owners—they need YOU to keep their tires in service.

## HERE IS YOUR OPPORTUNITY!

Put Yourself  
Where  
This Man  
Is

He Is  
Making  
Money



You might just as well be the first to enter this paying business in your town—open your shop and let the money roll in. Every automobile sold means more tires to mend. You start with one machine. The business grows fast. You need another and then another. Soon it gets to be a regular business of adding machine—after—machine until the first thing you know you are running a big shop—you are operating in a big way—you are a real business man and a factor in your community. You know that punctures and blow-outs are common—tires need retreading and vulcanizing every day—something going wrong all the time—owner after owner forced to buy new tires because they cannot get the old ones fixed.

### REPAIR TIRES AT HOME

Young men make money to attend college or start a garage and repair business. Automobile owners—repair your own tires. Save money. Pay for your outfit in a short time. We have special outfits for home use. Mr. Any-Man, it's worth while to invest. There is money in it. It's a field of wonderful possibilities. Make up your mind and send for our catalogue today. Even if the wonderful money making possibilities in this fascinating new business. Make something—supply a want—become a manufacturer. This is your chance.

The Haywood Tire & Equipment Co.  
964 Capitol Ave. Indianapolis, Ind.

HAYWOOD  
TIRE &  
EQUIPMENT CO.  
964 Capitol Ave.  
INDIANAPOLIS, IND.

Without any obligation upon my part please send me your complete FREE catalog of tire repair outfits.

Name .....

Address .....

The U. S. Forest Service estimates that 28,926,552 board feet of lumber are consumed annually in this country in the manufacture of toys.

The land at the head of Wall Street upon which Trinity Church with cemetery stands is a plot 391.5 ft. long by 227.8 ft. broad, valued at \$17,000,000.

## 1915 Harley-Davidson



Winner of the International Grand Prize Race at Venice, California, April 4th.

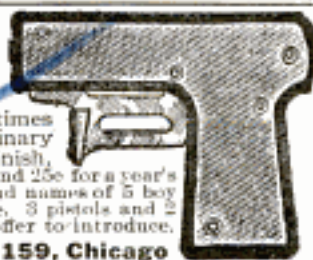
Complete description of various models can be obtained from any dealer or catalog will be mailed on request.

HARLEY-DAVIDSON MOTOR COMPANY  
Producers of High Grade Motorcycles for Fourteen Years  
431 B Street Milwaukee, Wisconsin

## FREE BOYS Get This 20-Shot Pistol

Loads of Fun. Shoots 20 times without reloading. Uses ordinary B. B. Shot. Fine blue steel finish, looks like a regular Automatic. Send 25c for a year's subscription to Every Day Life and names of 5 boy friends and will send pistol free, 3 pistols and 2 yearly subscriptions 60c. This offer to introduce.

Every Day Life, Dept. A. P. 159, Chicago



## Camp Guide FREE

Only \$2.25  
Writes today. Get our great "Camp Guide," which tells all about camp life; how to lay out a camp; what to take along; what to do when you get there. We will send this great book absolutely free. Just send a post card. Do it NOW.  
Army Shelter Tent Order at once—only \$2.25. Some tents that are in active service in U.S. army. Write for details.  
H. Channon & Company—Dept B119—102 N. Market St., Chicago

**BUILD** Accurate scale drawings and knock-down parts of model. Man carrying machines that will surely fly. Every man and boy should build one of these fascinating models.



**PRICE OF 3 FT. SCALE DRAWINGS**  
Curtiss Flying Boat... 25c Wright Biplane... 25c  
Nieuport Monoplane... 25c Curtiss Hydroaeroplane... 35c  
Bleriot Monoplane... 15c Cecil Pull Boat... 25c  
Complete set of six, \$1.25 postpaid

### 3 FT. CURTISS FLYING BOAT

Be sure to read our big advertisements in the May and June issues of this magazine; they will surely interest you.

Price List of Toys and Models FREE

48 pp. Catalog of "Ideal" Model Aeroplanes and Supplies, 5c.

IDEAL AEROPLANE & SUPPLY CO., 82-88 West Broadway, NEW YORK

## Agents \$60 a Week Big Summer SELLER!

### Outdoor Lamp and Safety Lantern

Burns Kerosene. Can't explode. Can't set fire to anything. Burns in all kinds of weather. Rain-proof, wind-proof, bug-proof. Costs only 1/10 of a cent an hour. For farmers, teamsters, hucksters, plumbers, dairymen, campers—everybody needs it.

### Big spare time money-maker

Night time best time to demonstrate. Jennings sold 5 first evening. Your territory open. Write quick for terms and free sample.

Thomas Lantern Co., 448 East St., Dayton, O.



## KEROSENE Gas Lamps

300 to 1000 Candle Power. Guaranteed not to clog, smoke, smell or carbonize. Simplest, safest, most reliable and economical light made for home or business purposes. Nothing complicated. Children can light and operate.

Write for particulars

Brilliant Gas Lamp Company  
10095 So. Wabash Ave., CHICAGO, ILL.



Please Mention Popular Mechanics

## For Merchants

HERE IS A

### Money Maker

\$25 to \$60 extra

profit for you if

you install a Butter-Kist Pop Corn Machine. Hundreds of storekeepers are reaping a harvest of nickels. One of these machines installed in a store last January took in \$2,065 the first five months. Hundreds of like records prove the Butter-Kist Popper nets much more profit per square foot than anything else in the store, for 70¢ out of every dollar's worth of pop corn you sell is clear, clean profit.

Big, constant demand. All-year, spot-cash business. No stock to carry. Butter-Kist is a trade-builder for the entire store.



**Pay From Your Sales** Only \$150 down puts this Butter-Kist Pop Corn Machine in your store with all Butter-Kist privileges; pay balance on easy installments. Soon pays for itself out of the money it earns.

**Get This Book Free** Facts, figures, photographs, proofs of profits, etc., shown in our new book, "The Little Gold Mine." Sent free, postpaid. Every day's delay means lost sales.

HOLCOMB & HOKE MFG. CO.

1695 Van Buren St. Indianapolis, Ind.

## BUTTER-KIST

### The Delicious Pop Corn

*A Flavoury, Savory Confection  
in a Class of Its Own*

Ask for Butter-Kist—the new kind of pop corn. Its appeal is irresistible—once you taste it. Every crisp, crackling, snow-white kernel is perfectly popped and evenly buttered. The kernels at the bottom are like those at the top. No 5c treat so delicious—none so pure and healthful.

**H & H**  
**BUTTER-KIST**  
**POP CORN**

All this is possible only with the Butter-Kist Corn Popper, more accurate than human skill or hands. It feeds itself—pops the corn—sorts it and butters each kernel perfectly. Merchants everywhere are installing Butter-Kist Pop Corn Machines and coining big money. (104)

## EVINRUDE

### Detachable Rowboat and Canoe Motors

The rowboat and canoe motor you see everywhere. Thousands are in use and every user is an enthusiast. Take one with you to lake, river or seashore, clamp it to a rowboat or canoe, and enjoy all the pleasures of motor-boating—without the expense.

The Evinrude drives a rowboat 7 to 8 miles an hour—a canoe 10 to 12 miles—and runs four hours on less than a gallon of gasoline.

Write today for catalog illustrating and describing new features of the 1915 model.

**Evinrude Motor Co.** 31 Evinrude Block  
Milwaukee, U.S.A.

Distributing Branches—69 Cortlandt St., New York, N. Y.; 218 State St., Boston, Mass.; 436 Market St., San Francisco, Cal.; Front and Morrison Sts., Portland, Ore.



**PRIMITIVE SMELTING METHODS USED IN THE PHILIPPINES**—Iron ores found in the Island of Luzon are reduced by the natives in a very primitive manner, according to the Philippine Journal of Science. The blast furnaces are built of soft-clay bricks and cased with bamboo, and are only about 7 ft. 6 in. in height and 3 ft. in diameter; the inner cavity is 5 ft. 9 in. deep and is conical. The furnace is blown with the usual Chinese double-acting hand blower, made from a hollow tree trunk, and fitted with a wooden piston packed with feathers. An average charge for the furnace consists of 55 lb. of ore and 95 lb. of charcoal, no flux being used. Such a furnace produces about 500 lb. of iron daily. The industry is evidently Chinese in its origin, owing little, if anything, to European influences.

## OWN A BUSINESS

**WE WILL HELP YOU**



"I made \$88.16 first three days," writes Mr. Reed, of Ohio. Mr. Woodward earns \$170 a month. Mr. M. L. Smith turned out \$301 in two weeks. Roy Crawford made \$7.00 first day. See what they have done, judge what you can do.

**LET US START YOU**

in Gold, Silver, Nickel and metal plating. Prof. Gray's new electromachine plates on watches, jewelry, tableware and metal goods. Prof. Gray's New Royal Immersion Process latest method. Goods come out instantly with fine, brilliant, beautiful thick plate, guaranteed three to ten years. No polishing or grinding. Every family, hotel and restaurant want goods plated.

### PLATERS HAVE ALL THEY CAN DO

People bring it. You can hire boys to do the plating as we do. Men and women gather work for small per cent. Work is fine—no way to do it better. No experience required, we teach you. Recipes, Formulas, Trade Secrets Free. Outfits ready for work when received. Materials cost about ten cents to do \$1.00 worth of plating. Our new plan, testimonials, circulars and **SAMPLE FREE.** Don't wait. Send us your Address anyway.

**GRAY & CO., PLATING WORKS**

833 Gray Building

CINCINNATI, OHIO

## Trolle Rubber Heels

Trolle instantly adjustable rubber heels and the shoe with the Guarantee Tag. Answer this ad and we will send illustrated catalog showing styles and reasonable prices of most serviceable shoes on the market.

### The Shoe with the Rubber Heel

Latest and Best Thing in Rubber Heels



Sensible. Practical. Easily Put On

Need only a screw driver to fasten on shoe. When heel is partly worn—then interchange—thus getting double the wear. Walk easy—walk softly—save your health—quiet your nerves—by using TROLLE RUBBER HEELS.

Sample pair sent prepaid for 50c

Send diagram of Heel with order or write for full information.

Trolle Shoe Co. 1201 Washington Ave. RACINE, WIS.

Thimbles were first known as thumb bells, from their shape and the place where they were worn. However, the finger was soon found to be a more convenient place for it, and with the loss of its position its name was modified to "thimble."

## FREE TRIAL

Use the **FAMOUS KARNAK RAZOR** for 30 days FREE; then pay us \$1.85, or return the razor. Send your name and this ad, (no money) and get razor by return mail. **MORE COMPANY, 187 More Bldg., ST. LOUIS, MO.**

## AGENTS

The Laws of every State require this Auto and Motorcycle accessory. One of those rare chances must be equipped. Big demand everywhere.

### MAKE \$5 TO \$10 A DAY—EASY

No experience necessary. Auto and motorcycle owners pay no-keep-of their machines and make extra profits beside, acting as our special representatives. Write quick for Special Proposition. A postal will do.

**SEISS MFG. CO., 448 Dorr Street, TOLEDO, OHIO**

## Florida Grapefruit Land

In Hillsboro County near Tampa—fastest growing big city in U. S. Highest grade fruit, truck, poultry and dairy lands. Farms 10 to 100 acres—Lowest Prices—Easiest Terms—Best Location—Best cash markets in all Florida. Thousands of acres now being improved right here in Hillsboro County. Satisfied buyers from every State and Canada. Our high reputation and responsibility guarantees you a square deal. Big profits may be made by those who invest now in this most progressive, liveliest and healthiest district in the entire South. Write today for free Florida Book and full information.

**North Tampa Land Co., 140 S. Dearborn St., Chicago**

## High Grade Violins 30 Days' Free Trial

Your choice from a large and carefully graded stock of representative instruments from the leading foreign violin makers. Strictly hand made and of superior tone, these violins are far superior to the average old violins sold at four times the price.

**Write Today.** Don't fail to send your name and address today for the superb Lewis catalog sent free and postpaid. Of value to everyone interested in high grade instruments. Learn how you can have your choice of these superb instruments on a free trial in your home. Write today. **Wm. Lewis & Son, (Est. 1897) Dept. B119, 225 S. Wabash Ave. Chicago**

**OUR SPECIALTIES:** Imported wood-urnishes and tools for violin makers.



Blue White Perfect Cut

\$88

Per Carat

**NO MONEY IN ADVANCE!**

Send no money, not even a deposit! Just select any diamond, any mounting. We'll send it to you at our expense. Examine, test, compare in any way. If you don't want to keep it simply return. No obligation or even a penny of expense to you.



**SPECIAL**  
Ladies' and child's ring, 14k solid gold band in a d.e. mounting, perfect cut blue white genuine diamond. In velvet Jewel Case, \$10 value. Remit \$2.88 in any form you prefer. Money back any time within 30 days on request.

2.88

Look at these prices for **DIAMONDS**

1/8 carat \$6.25

1/4 carat \$15.50

3/8 carat \$29.00

1/2 carat \$40.25

1 carat \$88.00

Think of it! Only \$88 per carat for Genuine, Blue White, Perfect Cut Diamonds. And small sizes as low as \$50 per carat. Expert comparison proves the value fully \$150 per carat. You keep the difference—no middleman gets it. That's what it means to buy direct from the importer. You get every benefit of our big buying power and small profit plan.

### BANKABLE, LEGAL MONEYBACK GUARANTEE

Permits you to return any diamond bought from us through any bank in America, or direct to us, and receive CASH REFUND. No delay. No red tape. Cash refunded promptly without question. Guarantees also full purchase price in exchange forever. Also legally certifies carat weight, color, and value of the diamond.

### 1916 De Luxe Book of Diamonds FREE!

First to show 1916 styles. Tells all diamond facts needed to buy safely and intelligently. Enables you to judge diamonds like an expert. Write or mail post card. Absolutely Free.

References: Rogers Park National Bank of Chicago, your banker, or any commercial agency will tell you of our high standing.

**BARNARD & CO.**

Dept. 20, N. W. Cor. Mich. Ave. & Adams St., CHICAGO



## A BAD FAILURE

### The Ford Car Company Failed

to equip their car with a device to keep the hot air from roasting your feet and legs. We have invented a device called CAR-COOL that makes the Ford the coolest car on the market. Agents wanted. Sell to every Ford owner that you meet. Drop card today for descriptive circular telling you all about it.

**CAR-COOL CO., 37 W. Van Buren St., CHICAGO**

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This and many others in my new book, Building Plans for Modern Homes, will save you hundreds of dollars. One of the most complete and comprehensive books of plans ever published by any architect. Fifth edition just off the press. Two hundred and fifty floor plans and photographs of bungalows, etc., costing from \$50 up; gives sizes and cost to build. Sent postpaid for \$1.00



**FREDERICK H. GOWING ARCHITECT**

18 Tremont St., BOSTON, MASS.



**ONE MAN AND THIS MACHINE CAN EARN \$50 to \$100 DAILY PROFIT**

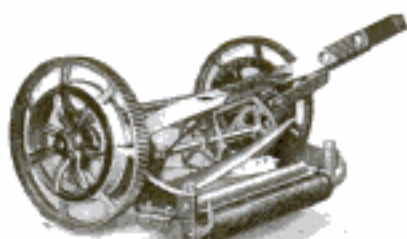
You want a business of your own. Get into the Popcorn Crispette business and make \$2000.00 to \$7000.00 a year. All you need is a machine, a few dollars and a good location. You can learn to make Crispettes in a day. They sell everywhere for a nickel a package. You make almost 4c profit.

**SEND FOR FREE BOOK**

It tells the whole story—how and where to start, how to succeed, gives experience of others, etc. It's worth reading, even if you don't start. If you are looking for a good thing and easy money, write us today for the FREE BOOK.

**W. Z. LONG CO., 1058 High St., Springfield, Ohio**





LAWN MOWERS



METAL FURNITURE



TOYS

**"Made in  
U. S. A."**

## How Good is Your Product?

**"Buy  
Now"**

**H**OW good is your product? Are you making it as strong as you can? Are you making it as light as you can? Are you making it as nice-appearing as you can?

If it's built entirely or even partly of steel, and you want to improve it, maybe Stanweld Cold-Drawn Seamless Steel Tubing is just the thing that will make your article better.

# STANWELD TUBING

Some of our customers buy it in straight lengths, in quantities of a million feet or more. Many buy it bent or formed in hundreds of different shapes. Some buy round tubing; others oval, square, or rectangular. The point is this: We are able to satisfy the most exacting requirements of both large and small users. We've been at it so long, and have done so many different things with Stanweld Steel Tubing, that we know almost offhand just what is needed. Tell us your ideas or needs, and we'll gladly go into the details of requirements, prices, etc. Ask for Folder "A" when you write. It tells considerable about this remarkable steel tubing that is used by so many manufacturers.

**The Standard Welding Co.**

Detroit Ave. CLEVELAND

Branch Offices in  
New York Chicago  
Indianapolis  
Detroit



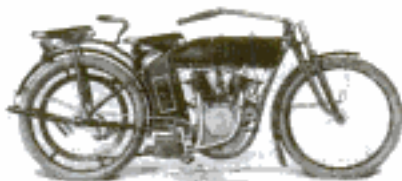
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And they look better. A big list of users throughout the country write that they wouldn't use any other kind. Edwards Metal Shingles stay on—and stay long. Fire can't hurt them. They lock together by the wonderful Interlocking Device, and are weather proofed and water proofed by the Edwards "Tightcote" process. Thus your roof covering becomes virtually one piece the Edwards way.

We are now able to furnish all Edwards Roofing and Siding in tin plate, either painted or unpainted. This is preferred by many who do not care to pay the higher prices for galvanized sheets due to their great scarcity.

**Free Lightning Insurance**

A \$10,000 bond is your protection against lightning loss. This insurance costs you nothing.

So—you save every way, and have a better roof covering when you use Edwards Metal Shingles. Prices are still down, but they must go up very soon because of advancing costs of new materials. Write today for present special prices and Catalog 750. Give size of roof. Everything made easy. Write today—right NOW—before prices advance.

**THE EDWARDS MANUFACTURING CO.**  
700-750 Look St. CINCINNATI, OHIO

**STONE PUT UNDER QUARANTINE**—A quarantine has been declared against stone, and it is now in force against the quarry products of certain parts of New England. The reason for this, in all probability, unique measure is that eggs of the gypsy moth were found to be distributed on quarry blocks from the infected districts to other sections of the United States. The secretary of agriculture, therefore, placed such products under regulation as to interstate movement by a quarantine, effective October 23, 1914.

**"100 Miles for 10 Cents"****MIAMI MOTOR BICYCLE****SAFE—SILENT—CLEAN****PRICE \$125.00 WEIGHT 110 LBS.****SEND FOR CATALOG**

**THE MIAMI CYCLE & MFG. CO.**  
600 Mobile Ave. Middletown, Ohio

**LEARN TO PITCH**

Lessons by "MATTY" ED. WALSH, "DOC" WHITE, WALTER JOHN-SON, "NAP" RUCKER, "SMOKY JOE" WOOD. PITCH THE FADE-A-WAY, SPITTER, KNUCKLER, SMOKE BALL, etc. Clearly described and Illustrated by 56 Pictures. Entire COURSE OF LESSONS SENT POSTPAID for 50 cents.

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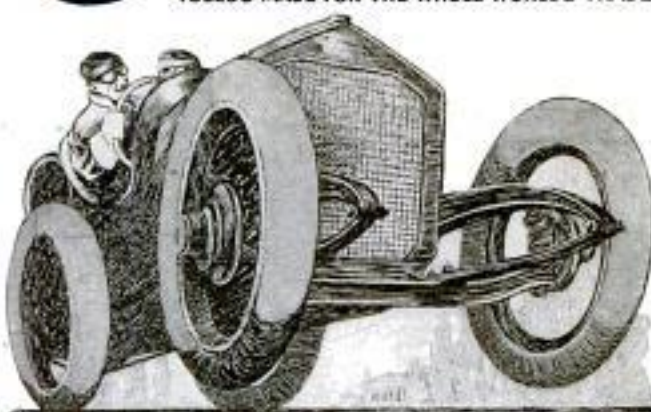
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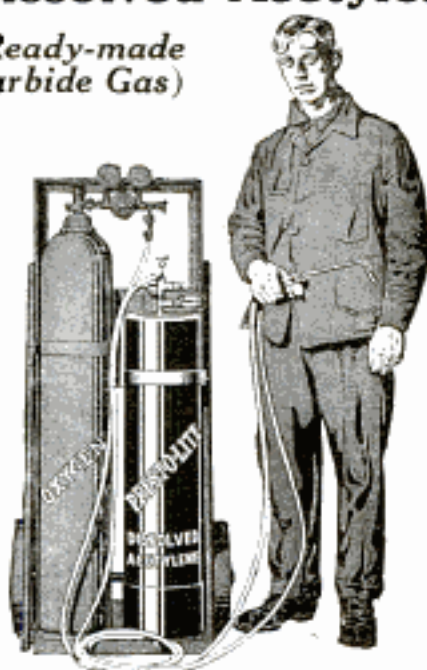
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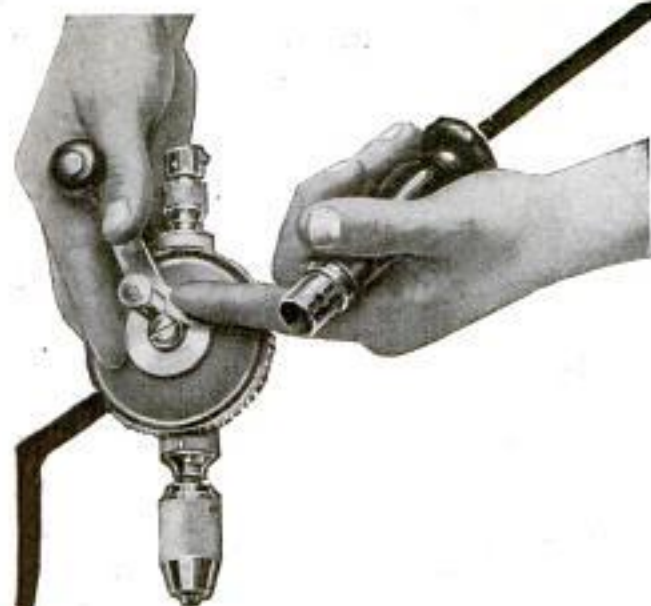
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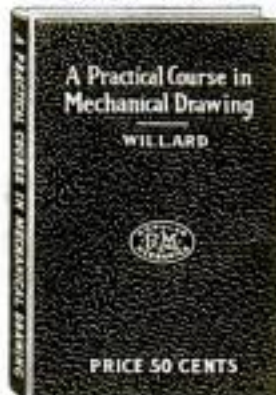
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gives you just the keen, lively relish you want — full of tasty mellow flavor of your favorite tobacco. That's why men who know always use these world-famous cigarette papers — Riz La Croix *Quality* guarantees 100% smoke-satisfaction.

# RIZ LA ☩.

(Pronounced: REE-LAH-KROY)

**FAMOUS CIGARETTE PAPERS**

Rolled in a jiffy—presto! A round, smooth, firm cigarette that holds shape, smokes perfectly and doesn't "come undone" — that's Riz La Croix.

The thinnest, lightest, purest "papers" made. Their combustion perfect — no "paper taste" in the smoke.

Naturally adhesive, because made of best flax-linen — a pure, vegetable product.

You try Riz La Croix—today.



5<sup>c</sup>

**FREE**

Two interesting, illustrated Booklets — one about RIZ LA CROIX Cigarette Papers, the other showing how to "Roll Your Own" cigarettes — sent anywhere in U. S. on request. Address The American Tobacco Company, Room 1124, 484 Broome St., N. Y.

Please Mention Popular Mechanics

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# Commanders of the Highways

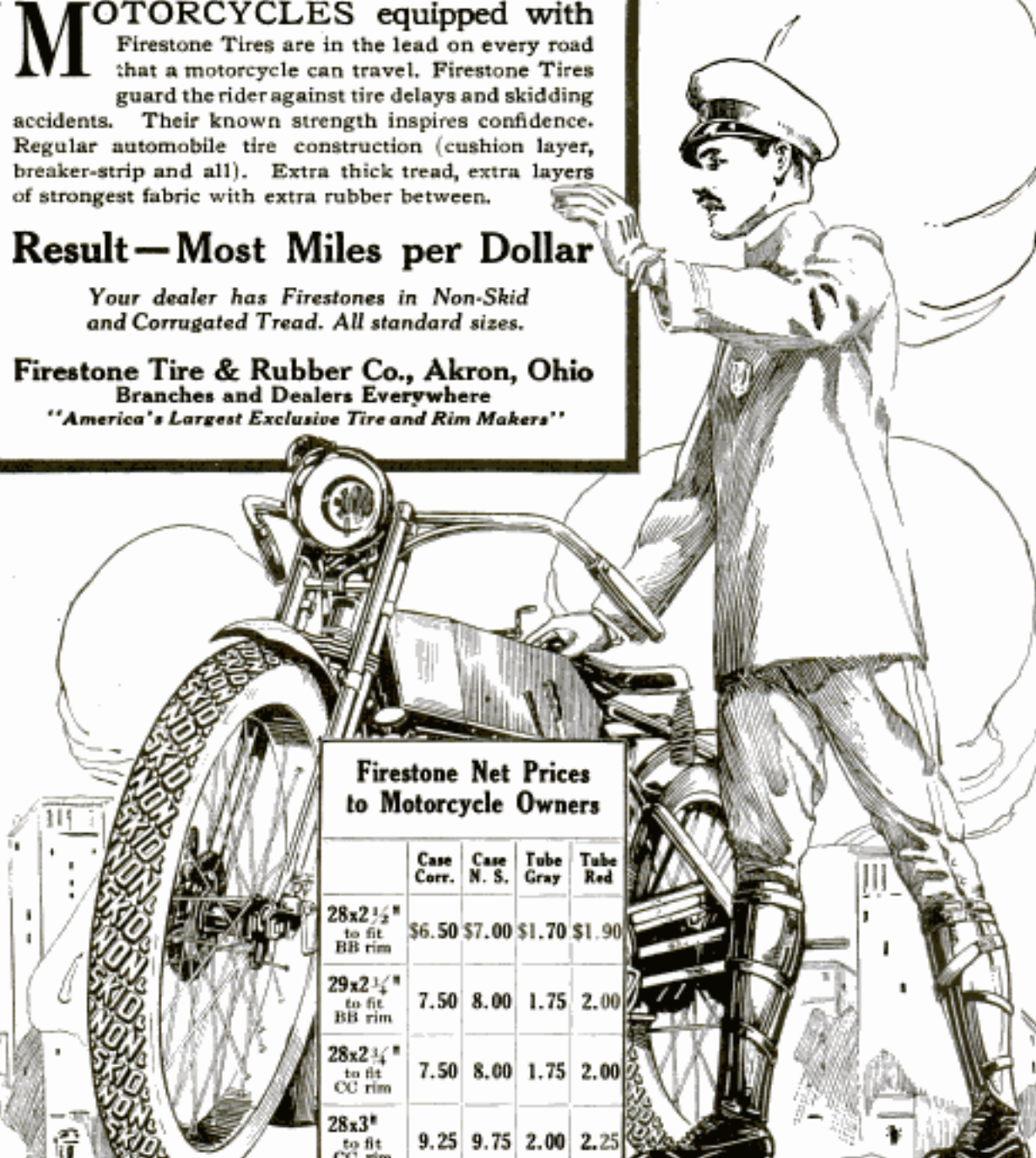
**M**OTORCYCLES equipped with Firestone Tires are in the lead on every road that a motorcycle can travel. Firestone Tires guard the rider against tire delays and skidding accidents. Their known strength inspires confidence. Regular automobile tire construction (cushion layer, breaker-strip and all). Extra thick tread, extra layers of strongest fabric with extra rubber between.

## Result—Most Miles per Dollar

Your dealer has Firestones in Non-Skid and Corrugated Tread. All standard sizes.

**Firestone Tire & Rubber Co., Akron, Ohio**  
Branches and Dealers Everywhere

"America's Largest Exclusive Tire and Rim Makers"



	Case Corr.	Case N. S.	Tube Gray	Tube Red
28x2 $\frac{1}{2}$ " to fit BB rim	\$6.50	\$7.00	\$1.70	\$1.90
29x2 $\frac{1}{4}$ " to fit BB rim	7.50	8.00	1.75	2.00
28x2 $\frac{1}{4}$ " to fit CC rim	7.50	8.00	1.75	2.00
28x3" to fit CC rim	9.25	9.75	2.00	2.25

# Firestone

## MOTORCYCLE TIRES

Please Mention Popular Mechanics

# TEMCO

## Automobile and Garage Necessities



## TEMCO Shock Absorber For FORD Cars

They take all the slight jars which your big springs would pass along to you.

They catch the first shock of all big jars and hand the load to the springs gradually.

They take the rebound from the springs gradually—and you are saved from all sudden or violent jars and jounces.



### TEMCO-ALTA Universal Shock Absorber For All Cars Complete \$12 Rear Set

## 3 Big Features

Combined In No Other Ford Shock Absorber

**1** Telescoping  
Dust Cap

The fender rods on Ford cars would ordinarily strike the top of a shock absorber as tall as the Temco. But Temcos telescope and "duck" the blow.

So we don't have to make them lean over to avoid the fender rod.

Temcos stand erect as sentries and add to the appearance of your car. They are absolutely vertical.

**2** Longer Springs  
Stronger Springs

Even when telescoped, Temcos are as tall as others. When normal, they are the tallest. This is a big advantage.

It lets us use longer springs.

And we make them stronger and more flexible too. We use two Genuine, Crucible, Vanadium, Helical Steel Springs in each shock absorber.

They couldn't be longer—they couldn't be stronger.

**3** Radius Links  
To Prevent side-Sway

Temco Shock Absorbers never lean one way or the other. They stand uncompromisingly erect—always absolutely vertical—giving full spring action.

Radius Links hold them straight.

This prevents that tiring side-sway.

And side-sway is the beginning of the dangerous skid.

By preventing side-sway, Temcos minimize skidding.



### TEMCO Improved Master Vibrator For FORD Cars \$12.50



Write  
for full  
Information about  
**TEMCO**  
Portable  
Electric  
Drill

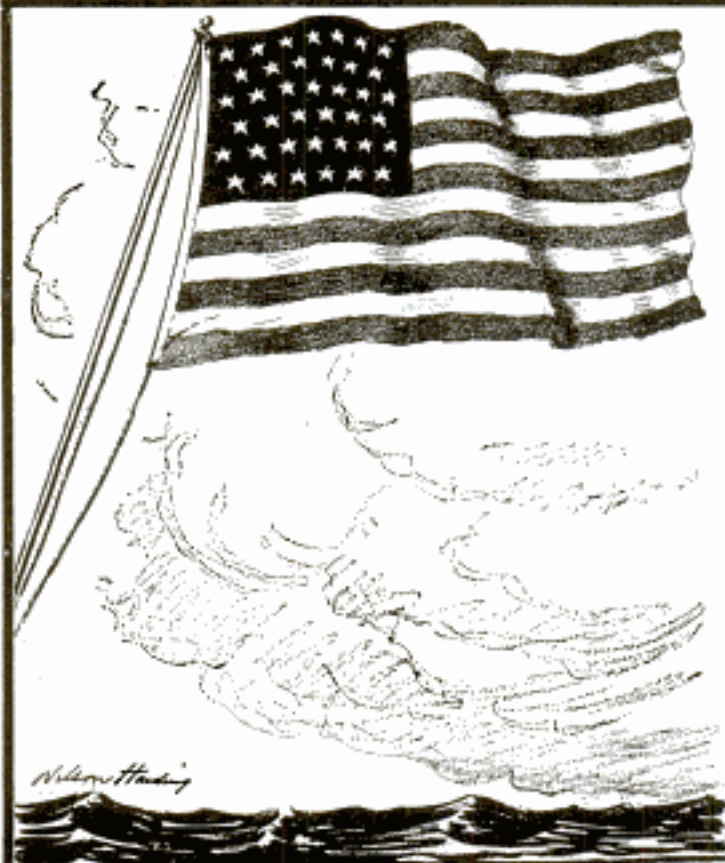
### Unlimited Guarantee

Temco Shock Absorbers must fully, thoroughly and completely satisfy you in every way, or you may return them and get your money back.

See your dealer at once and insist on having the best. He has Temcos or can quickly get them for you. If you have any trouble getting Temcos, write to us at once. We will see that you are supplied. Write today for descriptive printed matter.

\$15 Complete Set of 4

The Temco Electric Motor Co., 116 Sugar St., Leipsic, Ohio



*Hoisting to Brooklyn Eagle*

**HANDLE WITH CARE**

# America First!

The United States, caught between two fires, has been led to the very water's edge of War. A crisis, possibly the gravest in the nation's history, is impending.

The Cartoonists of the country have interpreted the spirit of the times. At last they have found a subject on which they can turn loose, unhampered by the necessity of remaining neutral.

## Cartoons Magazine

(Published by H. H. WINDSOR, Publisher of Popular Mechanics Magazine)

In its July issue will present the cream of this work—a collection of cartoon masterpieces which will become historic. The greatest events thus far in the war—the Lusitania disaster, the note to Germany, Germany's reply, the plunge of Italy, the backdown of China—will be chronicled. Cartoons on these situations will be supplemented with world comment representing the viewpoint of all nations.

Are we prepared for war? See what the cartoonists have to say about it. Is the nation back of President Wilson? Again the cartoonists answer the question. Under which flag do the German-Americans stand? Let the cartoonists reply. What are Japan's intentions in the Orient? Their own newspaper artists leave you in no doubt.

### *What is the Sentiment of America?*

The Cartoons tell a Wonderful Story; they reflect the Burning Wrath and Indignation of America called forth by the Massacre of Innocents. The Cover Design itself is a Masterful Indictment of a Deed that will go down into History with Herod's.

There is no space here to outline other features of the July number.

**FOR SALE AT ALL NEWSSTANDS**  
or at 6 N. Michigan Avenue, Chicago

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A dollar bill and the attached coupon will bring you a four months' trial subscription



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6 N. Michigan Ave., Chicago

Enclosed find \$1.00 for which please send Cartoons Magazine to my address for four months.

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**GRADE "A"**  
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**MANUFACTURER**

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**WE SELL DIRECT TO YOU**

**PLUMBING**  
**HEATING**  
**LIGHTING**

**COMPLETE \$15.25**



No. 800

**Bathtub**

Highest-grade porcelain enameled. Has the latest designed body and  $3\frac{1}{2}$ " roll rim. Legs with our non-come-off attachments. Has heavy patented N. P. Fuller Bath Cock. Heavy adjustable N. P. waste and overflow and N. P. iron pipe supply conn. Width 30"; depth inside 17 $\frac{1}{2}$ ". Complete as shown and described. 4 ft. \$15.25, 4 $\frac{1}{2}$  ft. \$15.50, 5 ft. \$15.90.

**Complete \$12.90**

**Vitreous Closet Outfit**



No. 820

Highest-grade vitreous china tank with improved trimmings. N. P. supply to floor. China lever. N. P. 2 in. conn. Highest-grade vitreous china siphon W. D. bowl. Reinforced mahogany fin. seat with bar hinge. Complete as shown and described. \$12.90.

forced mahogany fin. seat with bar hinge. Complete as shown and described. \$12.90.

**Complete \$8.00**

**Drop Apron Lavatory**

Size 18 x 21"; back 7"; basin 11x14". Highest grade porcelain enameled one-piece lavatory on concealed hanger. Integral over-flow; heavy low chin indexed faucets; heavy 1 $\frac{1}{2}$ " N. P. adj. trap to floor or wall. Iron pipe supply connections. Complete as shown and described. \$8.00.



No. 808



**Complete \$12.90**

No. 156

**One-Piece R.R. Sink and Back with R. R. Revs. Drainboard**

Highest-grade porcelain enameled sink on concealed hanger. Two N. P. flanged faucets. 20x24" porcelain enameled R. R. revs. drainboard on concealed bracket; heavy 1 $\frac{1}{2}$ " N. P. adj. trap to floor or wall. Size of sink 20x30"; length over all 50". Complete as shown and described. \$12.90.



C. H. BRECHLE

**Our New Combination Shower and Shampoo**, with self-closing thumb valve and automatic relief in tub. No pressure on hose when not spraying. We furnish two lengths of hose. All parts heavily nickel-plated. Will fit any faucet. Extra attachments, douches, syringes, etc. **Complete \$6.00.**

**SAVE  $\frac{1}{3}$  TO  $\frac{1}{2}$  ON YOUR STEAM HOT WATER OR HOT AIR HEATING PLANT**  
**WE GUARANTEE EVERYTHING**  
**OUR \$400,000.00 PLANTS BEHIND OUR GUARANTEE**  
**MONEY REFUNDED IF GOODS ARE NOT AS SHOWN AND DESCRIBED**



Remember, we have been in the plumbing and heating supply business at our present location for over 39 years.

Bear in mind the fact that we handle absolutely everything in highest grade, guaranteed plumbing and heating supplies exclusively and sell **DIRECT TO YOU.**

Our goods are the highest grade manufactured.

Any handy man can install our plants with our free, simple working plans. **WE FURNISH THE NECESSARY TOOLS.**

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**J. HARDIN CO., Chicago, Ill.**

Please send me your Catalogs, Nos. 65 and 66.

NAME .....

ADDRESS .....



## The Price of Progress

**T**HE Panama Canal stands as one of the most marvelous achievements of the age. Into its construction went not only the highest engineering skill, but the best business brains of the nation, backed by hundreds of millions of dollars.

Suppose conditions not to be foreseen made it necessary to replace the present canal with a new and larger waterway of the sea-level type, to be built in the next ten years.

Also suppose that this new canal would be the means of a great saving in time and money to the canal-using public, because of the rapid progress in canal engineering.

This sounds improbable; yet it illustrates exactly what has happened in the development of the telephone, and what certainly will happen again.

Increasing demands upon the

telephone system, calling for more extended and better service, forced removal of every part of the plant not equal to these demands. Switchboards, cables, wires and the telephone instrument itself were changed time and again, as fast as the advancing art of the telephone could improve them.

It was practical to do all this because it greatly increased the capacity of the plant, reduced service rates and added subscribers by the hundred thousand.

In ten years, the telephone plant of the Bell System has been rebuilt and renewed, piece by piece, at an expense exceeding the cost of the Canal.

Thus the Bell System is kept at the highest point of efficiency, always apace with the telephone requirements of the public. And the usefulness of the telephone has been extended to all the people.



**AMERICAN TELEPHONE AND TELEGRAPH COMPANY  
AND ASSOCIATED COMPANIES**

*One Policy*

*One System*

*Universal Service*

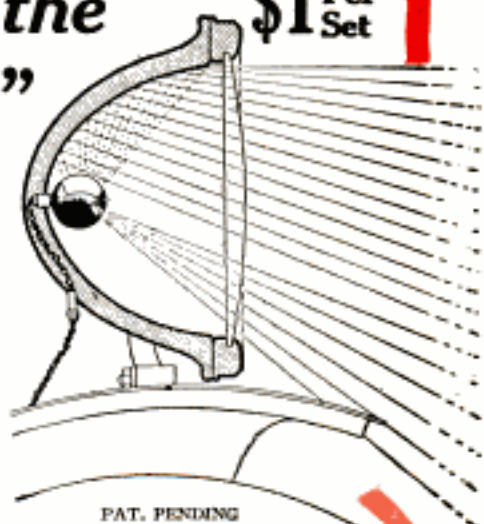
*Please Mention Popular Mechanics*

# DRIVE AT NIGHT IN SAFETY

Equip Your Car with the  
**PERRIN "NO GLARE"**  
For Automobile Headlights

\$1 Per Set

Concentrates all the light out and down on the road. Does not blind other drivers or people walking. Better than a dimmer because safer. Recommended by Police Departments everywhere.



**Does Not Dim**  
**the Light**

With the "No Glare" the beam of light is not over 4 feet above the road. See illustration below.

Made of aluminum — snaps around the bulb. There are no levers to turn — no buttons to push.

Insist on having the Perrin "No Glare."

**PERRIN MFG. COMPANY, Detroit, Mich.**

Sold only by Dealers and Garages. Price \$1 per set (one for each headlight). If your dealer will not supply you, write direct.



Gibmil Rear Apron  
For Fords, \$1.50

Takes away that spindly appearance and gives the high-priced look. Made of heavy steel with baked-on enamel. Will not rattle. Is everlasting.



# White Cross Breezer 8 inch Electric Fan

**\$6.50**  
Complete

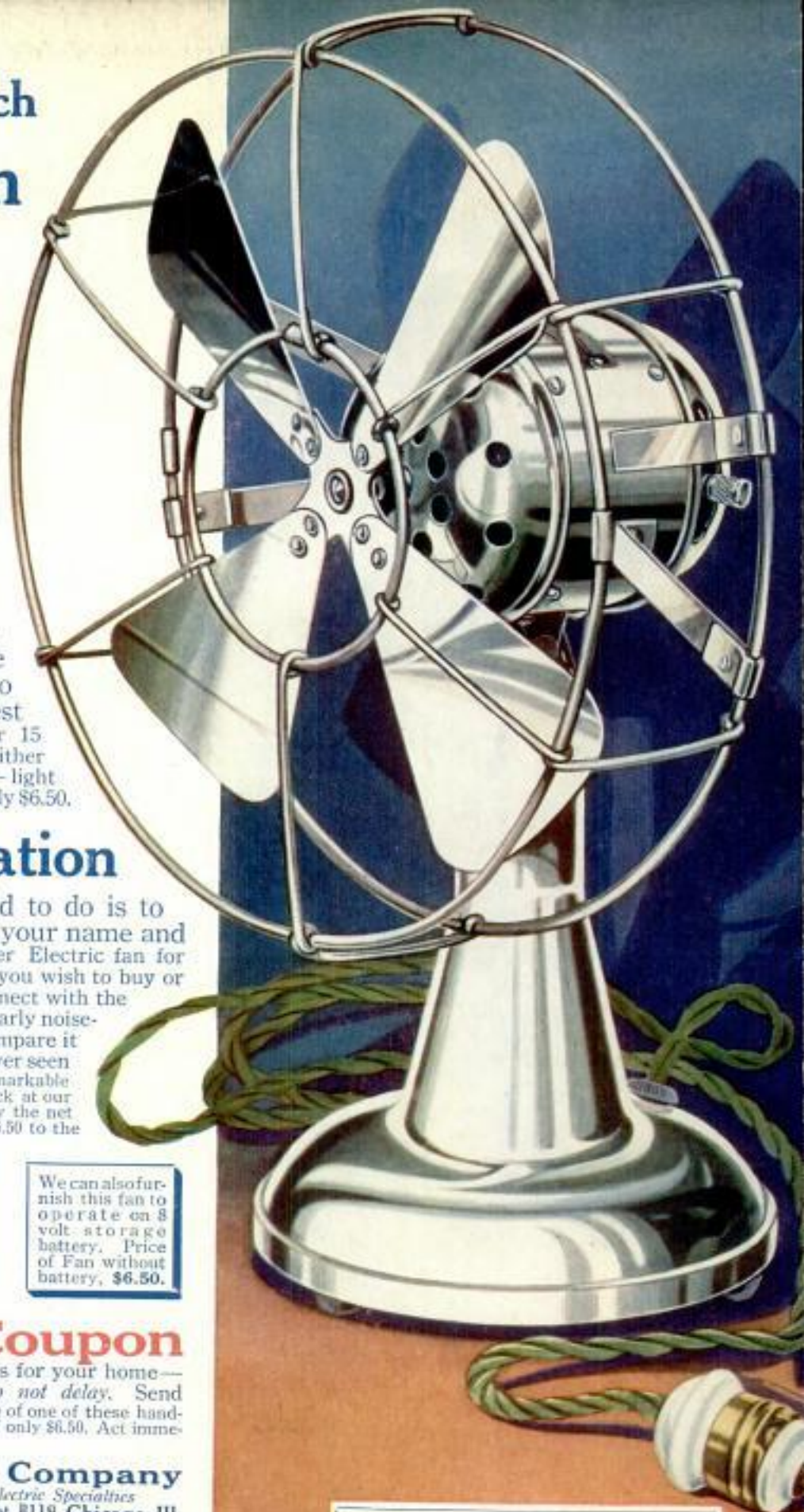
HERE is a remarkable value. This handsome electric fan, nickel plated or oxidized, only \$6.50 complete with cord and plug all ready to run. Powerfully made of finest materials. Will move the air over 15 feet. Three speeds. Can be used either as table or wall fan. Handsome—light—strongly built—guaranteed. And only \$6.50.

## Free Examination

To get this fan all you need to do is to send the coupon below, with your name and address. See this handsome Breezer Electric fan for yourself before you decide whether you wish to buy or not. See how it is built to last. Connect with the electric light socket (you will find it nearly noiseless) and feel its cooling breeze. Compare it with any other electric fan you have ever seen—then if you do not think it is the most remarkable electric fan value ever offered—send it back at our expense. If you decide to keep it, pay only the net transportation charges and the price of \$6.50 to the express agent.

If you send the price of \$6.50 with the coupon we will send you the fan express charges prepaid, right to your own home. After you have examined it return it at once if you are dissatisfied and we will refund your money.

We can also furnish this fan to operate on 8 volt storage battery. Price of Fan without battery, \$6.50.



## Mail This Coupon

Get one of these handsome fans for your home—your office or your store. *Do not delay.* Send coupon today if you want to be sure of one of these handsome fans at the rock bottom price of only \$6.50. Act immediately. The output is limited.

**Lindstrom-Smith Company**  
*Manufacturers of Guaranteed Electric Specialties*  
1100-1110 So. Wabash Ave., Dept. B119, Chicago, Ill.

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1100-1110 So. Wabash Ave., Dept. B119, Chicago, Ill.

Gentlemen:—Please send me a { nickel plated / oxidized } Breezer 8 inch Electric fan complete with cord and plug ready to be connected. To be operated on .....volts.....cycles (state here voltage and cycles it is to be operated on). After I have seen and examined it, I will either return it to you or pay the express agent the net transportation charges and the price of \$6.50.

NAME .....

ADDRESS .....

My Electrical Dealer's Name is .....

P. S. If you enclose the price of \$6.50 for fan (of course you retain the privilege of examining it in your own home) we will prepay the express charges. In ordering by mail to states where mail orders are not permitted.

### Nickel Plated or Oxidized

Size 12 inches high; 8 1/4 inches wide.  
May be used as wall fan.  
Operates on direct or alternating current, 8 to 220 volts. Any cycle.  
Can be adjusted to any angle.  
3 speeds regulated by lever in back of fan. Base provided with rubber feet; guard made of heavy drawn metal.  
Heavy substantial blades