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Please Mention Popular Mechanics

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

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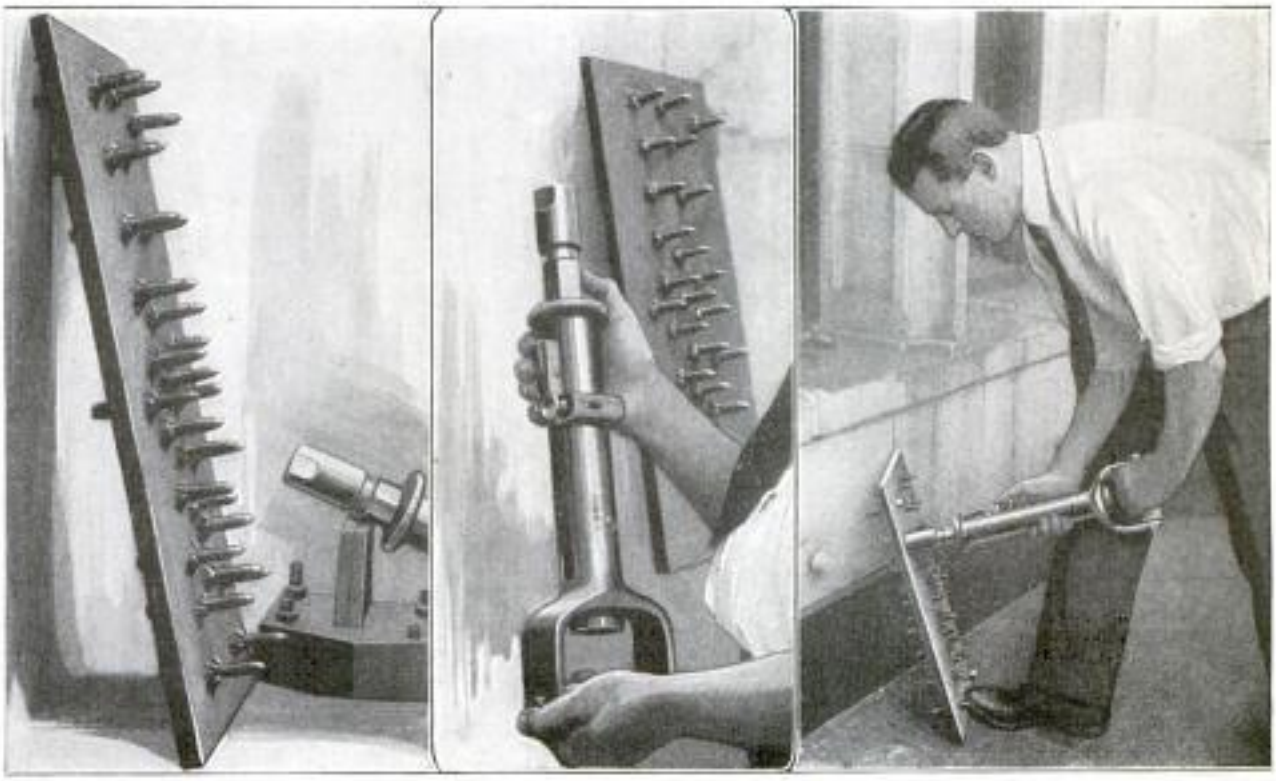
Vol. 36 SEPTEMBER, 1921 No. 3

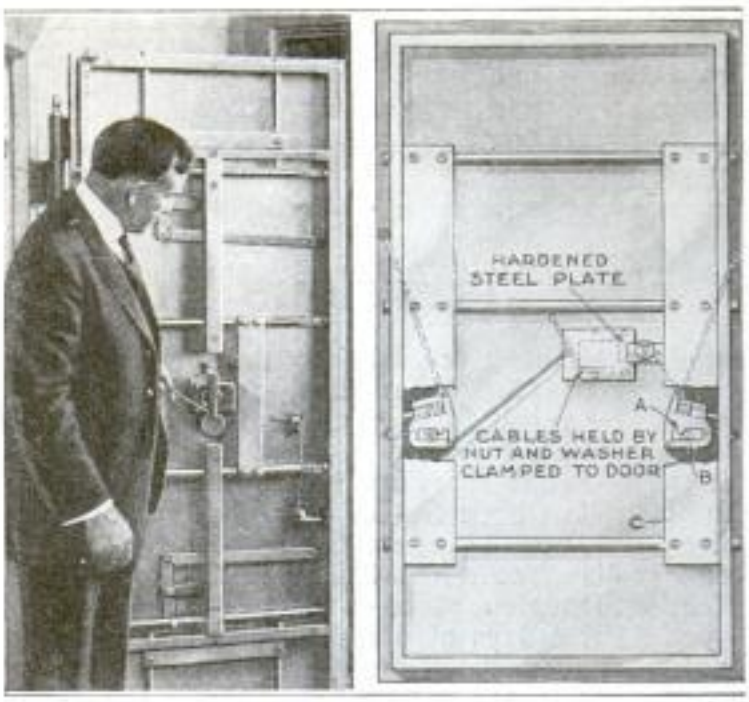
Hand-Gun Riveter Has Marvelous Power

DURING the war, the Germans had a gun that did actually fire a projectile 75 miles. Up to the present that has been considered the very limit possible in long-range weapons. But there is no limit to modern progress, and now there is a new development in this line that has inspired the inventor and others to claim a possible range for a projectile of 300 miles. The new principle has been embodied, as yet, only in a device resembling the ordinary hand-gun riveting machine. In place of the hammer of the riveter, steel slugs are dropped into the barrel of the machine, which is charged with some special smokeless explosive, and fires these slugs into a steel plate ¾ in. thick. Tests of this machine were made in New York by engineers of repute, and their report of the results, if it came from any other source, would sound like a paradox. For instance, in spite of the enormous power developed by the explosive that makes possible a penetrability that drives a steel slug into a boiler plate, there is practically no recoil to the gun, and no more noise than the click of a typewriter.

Apart from its possibilities as a gun, it has been tested, with highly encouraging results, as an underwater riveter. A diver, at a depth of 35 ft., shot a slug through a plate of steel ⅜ in. thick. In these days of promised disarmament that sounds like a more practical field for its application than a gun with such extravagant possibilities as a range of 300 miles. If used to do the work of a pneumatic hammer, or riveter, it would possess the disadvantage of having to be loaded before each shot, instead of being able to strike, as the pneumatic tools do, hundreds of times a minute. But there may be other kinds of work where great power would be an essential element and high speed a minor one, wherein this device would excel.



From Left to Right: The Three-Quarter-Inch Plate with the Slugs Shot into It by the New Hand Gun That Has Such Marvelous Characteristics; a View of This Machine Which Resembles a Hand Riveter, but Fires Steel Slugs from Its Barrel; the Gun in Operation, Firing Slugs into a Steel Plate



Left: Photographic View of Auxiliary Lock on Vault Door. Right: The Hook A Drops Down over Bolt B, Fastened to Underside of Plate C, Thus Holding All Locking Bars In Place

AUXILIARY LOCK MAKES SAFES SAFER

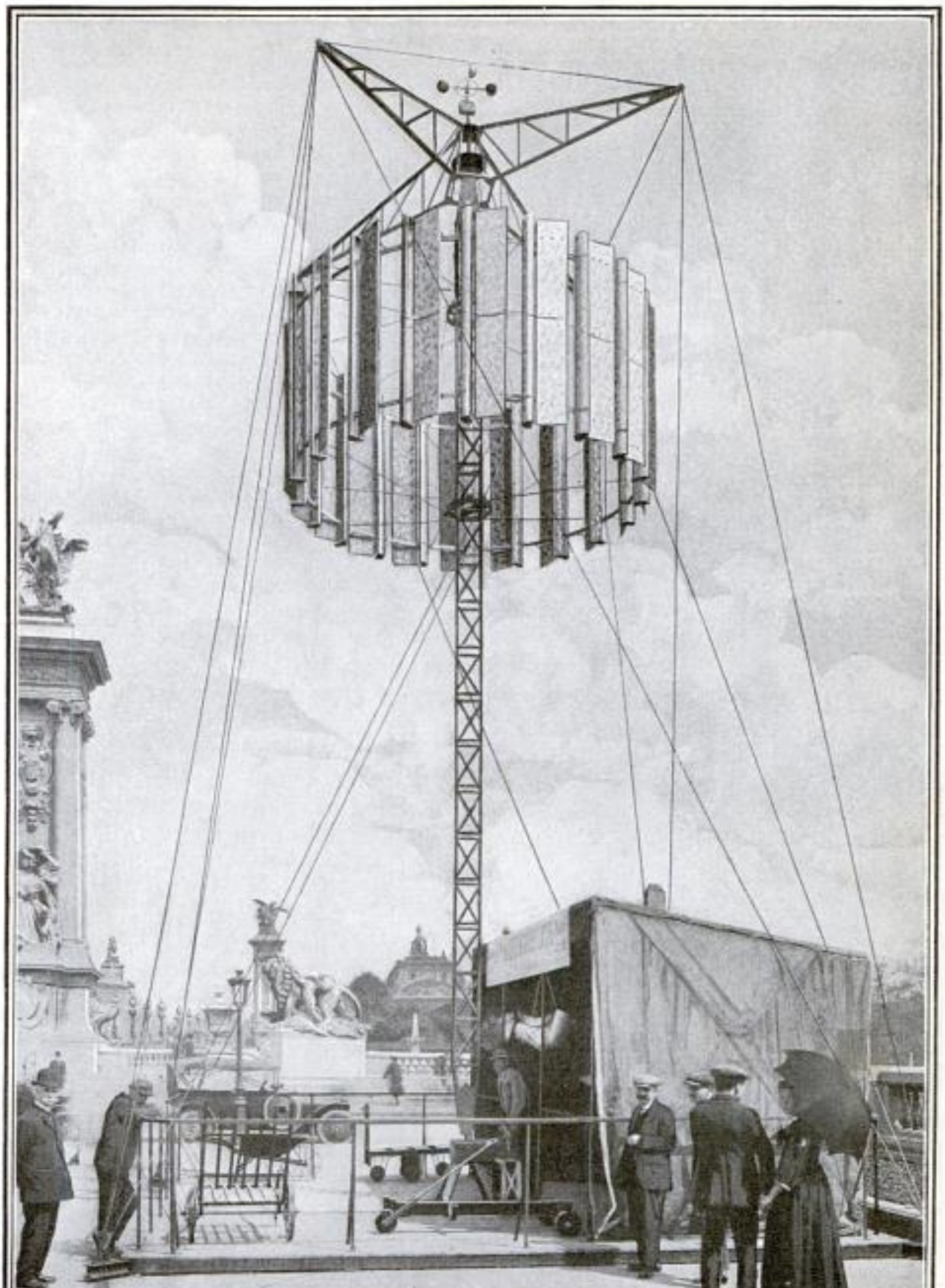
Armed with modern tools, such as the oxyacetylene torch, the cracksman of today finds it comparatively easy to upset the combination, and undo the locks of any safe or vault that has not some auxiliary equipment that automatically goes into action when the ordinary locks are tampered with. An automatic auxiliary locking device of this nature, now being manufactured, consists of an offset lock hidden inside the door, and impossible to locate from the outside. This lock remains neutral as long as the ordinary lock is operating, but the moment this is tampered with, the auxiliary lock automatically controls the complete bolt mechanism, holding all bars locked in position.

DOUBLE-DECK FOLDING LIFEBOAT CARRIES SEVENTY

Material increase in the capacity of a lifeboat, with an even greater saving of ship space, is accomplished by a recently developed collapsible lifeboat, 30 ft. long and 11 ft. wide. It can carry 70 persons, while the ordinary lifeboat carries about 40. The upper part of the boat folds inward and rests upon the seats when the boat is not in use. Thus a shallow boat results, two of which can be placed under one set of davits. The upper boat rests upon small chocks fastened at either end of the lower boat. The sides can be raised in a few moments, bringing into position a second tier of seats for the use of the oarsmen. The rowlocks are on the top edge of the collapsible sides. Eighteen air tanks, under the seats, carry 6 cu. ft. of air for each passenger.

Upper View Shows the Collapsible Boat with the Sides Up. The Seats for the Oarsmen Are Visible. The View to the Right Shows the Boat in the Collapsed Form, Launched to Show How High It Rides in the Water

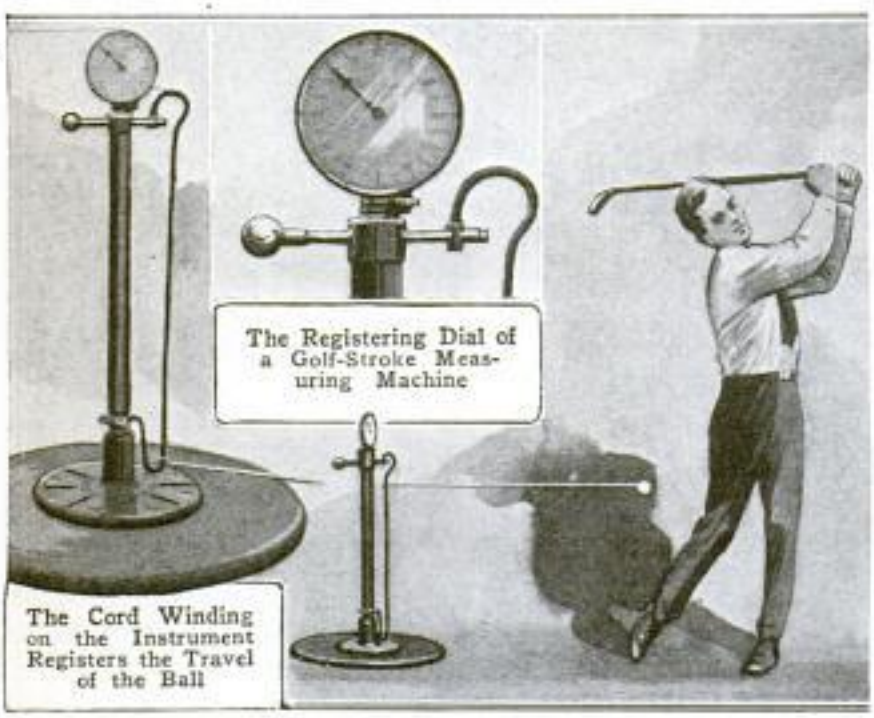
NOVEL WINDMILL UNAFFECTED BY WIND DIRECTION



AT a recent fair in Paris there was exhibited a novel windmill. Around the top of a light, trussed-metal mast are disposed, at a considerable distance circumferentially, a series of propelling blades, parallel with the mast to which they are connected. These blades, of about one-fourth the length of the mast, are each formed of a semitubular piece with its open face radial to the mast, and bisecting this face is a thin flat blade of equal length. By this arrangement the propelling effect of the wind on these blades is the same no matter what its direction. The vertical mast is supported by guys connected to radial arms that contain the upper pivotal bearing. At the bottom of the mast is a footstep bearing.

MACHINE RECORDS LENGTH OF GOLF-BALL DRIVE

To those who aim to keep up on their favorite sport, golf, and who cannot always find it convenient to adjourn to the links, a stroke-measuring device which may be used on the home lawn will be of interest. Mounted on a pedestal is an upright shaft which supports a recording dial and its complement of gears. Parallel with this upright is a small rod which carries the looped end of a wire attached to the golf ball and which also communicates with the dial through the gearing. The captive ball is laid on the floor or lawn, and when the player strikes it, its momentum carries it round and round the upright stand. During the turning motion, the number of yards that such a stroke would net on the links, is recorded on the dial.



SOUND AMPLIFIER AUGMENTS RELIGIOUS SERVICE

The Powerful Sound Amplifier Housed in This Stand in Portland, Oregon, was Used Recently to Convey Church Services to Crowds Assembled in a Park Extending for Four Blocks from the Church

A sound amplifier or so-called "Magna Vox" (meaning "big voice") was the means of conveying a complete religious service to crowds in a park extending for four blocks from the church itself in Portland, Ore., recently. The amplifier had been previously installed in a special stand and had been used in connection with the annual Rose Festival for public speaking, music, and other entertainment features. On Sunday hundreds of people were attracted by the novelty of hearing a service in a church some distance away. Every part of the service — music, sermon, benediction — was heard distinctly.

A novelty of the day was the special chime ringing. While the church supplied the service through the amplifier, the amplifier separately furnished the chimes by means of a phonograph attachment. This was accomplished by playing a record of church chimes in the amplifier stand and carrying the sound over a wire to the church belfry where it was released through a megaphone. The chimes were heard coming from the church tower as clearly as though actual bells were ringing. The sound carried over a radius of two miles.

This Log and Hand-Hewn-Shingle Building on Lookout Mountain, Colorado, was Erected in Memory of Colonel Cody, the Great Western Scout and Indian Fighter. The Structure Contains Relics of the Famous Plainsman, and Is Open to All Visitors. Besides Colorado, It Overlooks Wyoming, Kansas, and Nebraska

SHRINE TO BUFFALO BILL ON LOOKOUT MOUNTAIN

By E. C. MacMechen

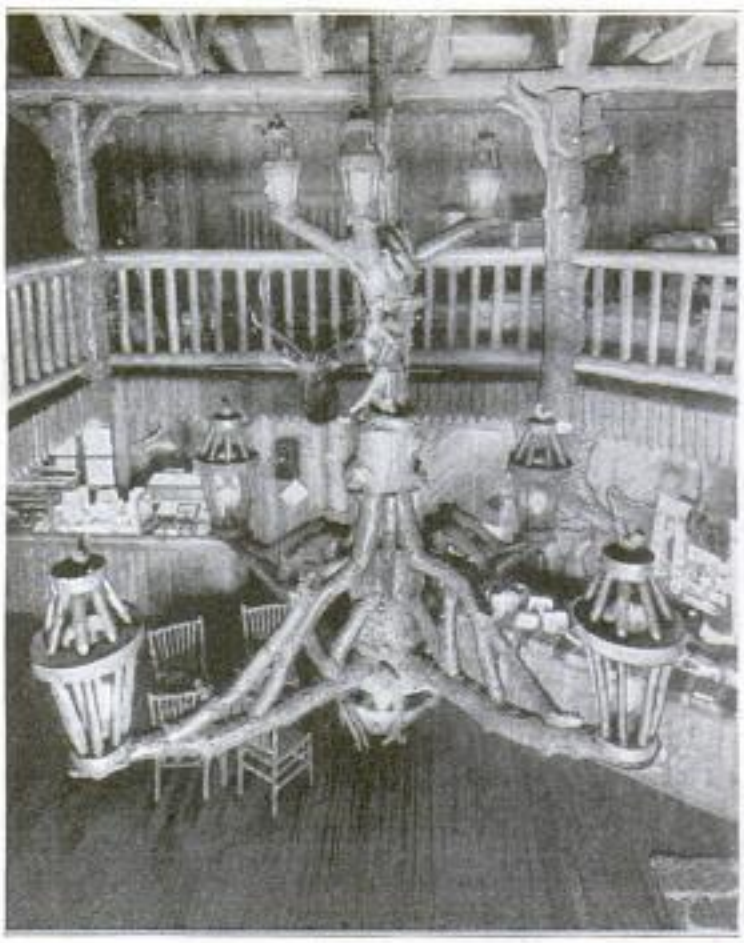
THE shrine of American boyhood will henceforth lie upon the summit of Lookout Mountain in the Denver Mountain Parks system, where the city of Denver has recently completed a museum building to hold the relics of Col. W. F. Cody (Buffalo Bill). The building stands within 200 ft. of Colonel Cody's grave on the top of the mountain, at an elevation of 7,300 ft. The building is one of the most unusual in America. It is constructed entirely of logs with the bark still adhering, and of hand-cut shingles. From a wide veranda one may see with a telescope into the states of Wyoming, Kansas, and Nebraska. Visitors have declared it one of the best scenic views in the country.

One of the Several Veranda Archways through Which the Grave of Buffalo Bill can be Seen Only 200 Feet Away: The Arch is Formed by the Curve of the Log Just as It Came from the Forest

A feature of the building is the utilization of tree trunks, twisted limbs, gnarled knots, and stumps. The chandelier, suspended from the roof, is constructed in this manner, and probably there is nothing like it in the world. A huge pine blister, hollowed out, gives inverted lighting. Frosted globes are contained in lanterns resembling huge bird

cages. The wiring is buried in conduits hollowed out beneath the natural tree bark.

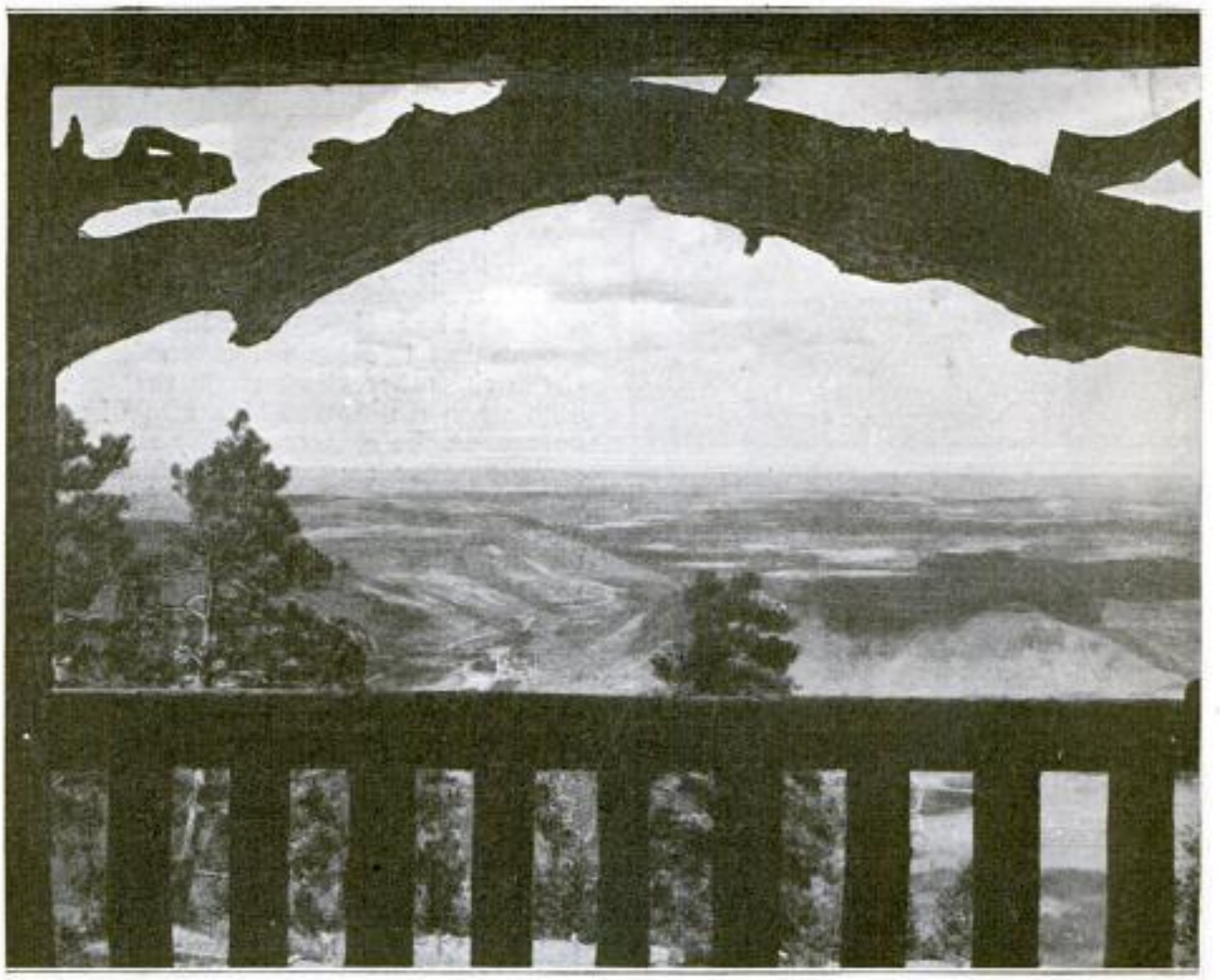
The museum contains Colonel Cody's wearing apparel, saddles, bridles, guns, Sitting Bull's scalp shirt and peace pipe, and the gun used by Sitting Bull in the Custer massacre; Short Bull's ghost shirt; the knife with which Yellow Hand was killed by Cody; Yellow Hand's scalp, taken by Cody 10 days after the Custer massacre; presents made



to Colonel Cody by European monarchs and Indian chiefs, and a host of paintings, prints, Wild West posters, and relics of Cody's show days. One of the most interesting relics is "Lucretia Borgia," the gun with which Colonel Cody killed over 4,000 buffaloes in one year for the Union Pacific and gained his sobriquet of Buffalo Bill.

The museum and building are in charge of Johnny Baker, Colonel Cody's

Above: Chandelier Formed by the Twisted Growths of Tree Limbs. Electric Bulbs are Contained in the Cages at the Ends. Below: The Natural-Log Construction of the Walls and Rafters; in This Room are Contained Some of the Hunting Possessions of Colonel Cody, among Them "Lucretia Borgia," the Rifle with Which He Killed 4,000 Buffaloes in One Year



Remarkable View Obtained from the Veranda of the Cody Memorial Building on Lookout Mountain, Colorado: The Building is so Positioned as to Overlook the Territory Roamed Over by Buffalo Bill in His Frontier Days. In the Background may be Seen the Foothills, and the Plains Stretching Beyond

foster son, the world-famous shotgun and rifle shot, who lived with Cody from the time he was seven years old. The building is operated as a concession, but the museum is free to all visitors, as the city made this stipulation when it erected the building. The collection belongs to Colonel Cody's widow.

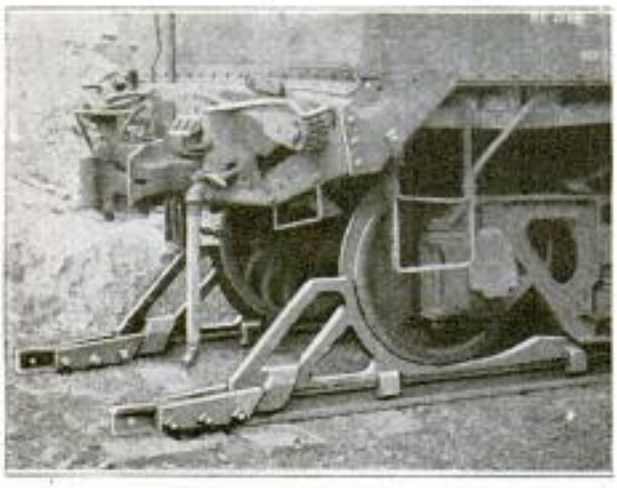
NEW MACHINE DETECTS LIARS SCIENTIFICALLY

An instrument has been developed by Wm. M. Marston, lawyer, scientist, and member of the Harvard faculty, which, it is claimed, will scientifically detect lies. The detector is based on the principle that the effort to tell a lie positively affects the blood pressure and breathing and can be traced by the stethoscope. The instrument is attached to the left arm of the subject and frequent measurements of the blood pressure are taken while he is being examined. The questioner and subject speak into small receivers which record the time between question and answer.

This Picture Shows the Questioner, at the Right, Speaking His Questions into the Little Mouthpiece of the Lie-Detecting Apparatus. The Subject, at the Left, Replies in the Same Manner

END-OF-TRACK BUMPERS STOP CARS WITHOUT BUMPING

A bumper for track heads that stops the cars, while at the same time absorbing most of the bump, will save a great deal



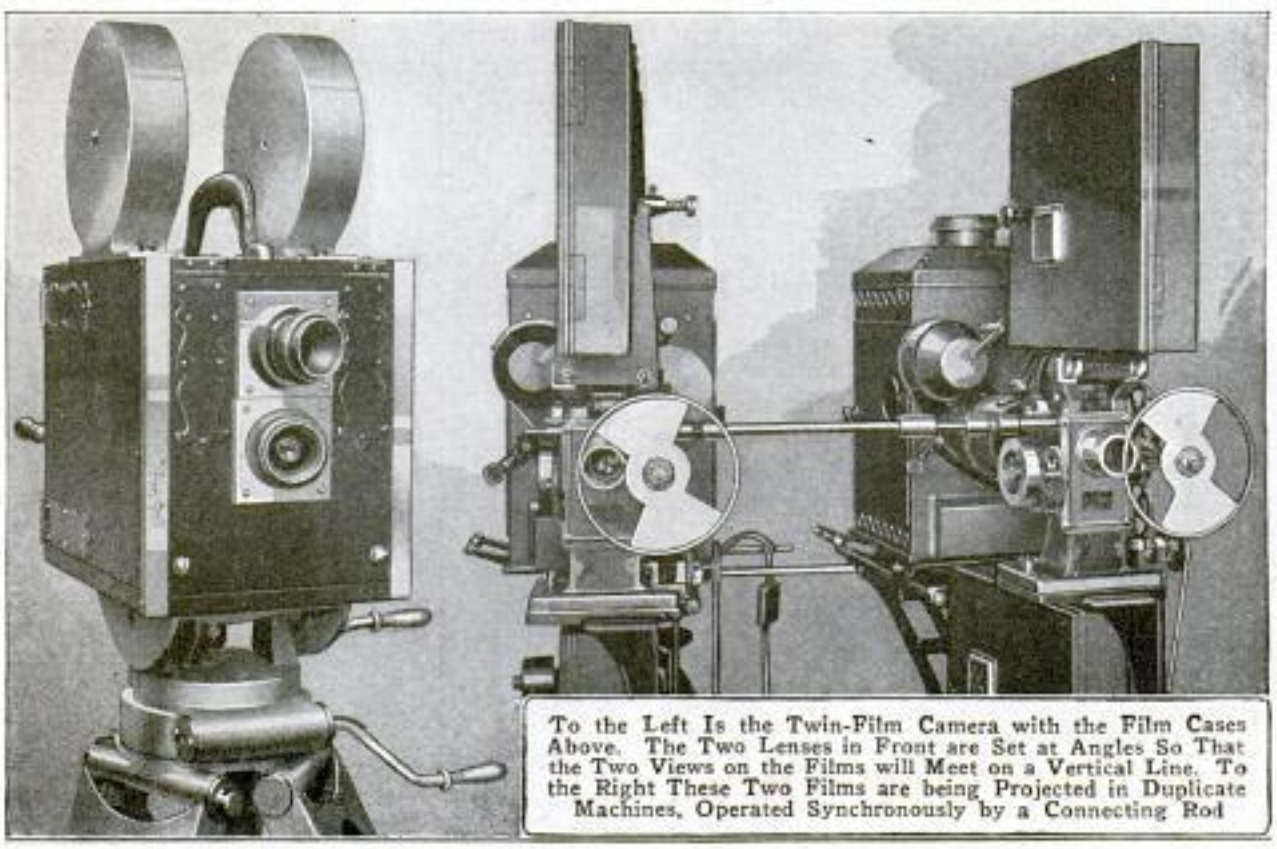
End-of-Track Bumpers That Stop Cars by Sliding along the Track for Some Distance After the Wheels Roll onto Them, Thus Acting as a Brake to the Car

of damage to the cars. With this object in view a bumper has been designed that consists of a pair of well-braced cast-steel wheel stops that, by means of flanged lugs, are slidably mounted on the rails, some distance from the track head—10 ft. at least. The front wheels of the car roll into the stops which are shaped to fit them, and by the weight thus put upon the stops, make them act as brakes when the moving car pushes them along the rails. Thus the stoppage is gradual, and there is no sudden shock.

TWIN-FILM CAMERA DOUBLES WIDTH OF MOVIE PICTURES

A motion-picture camera with a photographic range twice the width of the present cameras has been successfully demonstrated by a New Jersey inventor. The camera has two lenses set vertically one above the other at an angle that focuses each upon a different film, two of which operate in the camera side by side, in the same manner as the single film of the ordinary camera. The angles of the lenses are such that the two views meet exactly on the same line—so exactly that if it ran along the center of a vertical fine wire half the wire would be on one film, and the other half on the other film. When projected on the screen these two views thus combine to form a picture twice as wide as is possible with a single film.

The projecting is done in duplicate machines standing side by side, with the films driven in unison by means of a rod connecting them, which transmits to both alike the propulsion of the one motor. The advantage of such a wide photographic range is that where an extended view is required, it is not necessary to take it, as with the single-film camera, from such a distance that the principal



To the Left Is the Twin-Film Camera with the Film Cases Above. The Two Lenses in Front are Set at Angles So That the Two Views on the Films will Meet on a Vertical Line. To the Right These Two Films are being Projected in Duplicate Machines, Operated Synchronously by a Connecting Rod

The Upper Pictures Show a Reproduction of Two Standard Films Taken Simultaneously with a Twin-Film Camera. Below are Shown the Same Pictures Thrown on a Screen by Using Two Projectors, Driven in Unison by Means of a Rod Connecting Them, Thus Making One Picture from the Two Films

objects are uninterestingly dwarfed. The double film is equivalent to doubling the range of vision, and enables a wide scene to be taken from a distance that resembles the single-film camera's close-ups.

THAWING FROZEN GROUND WITH COLD WATER

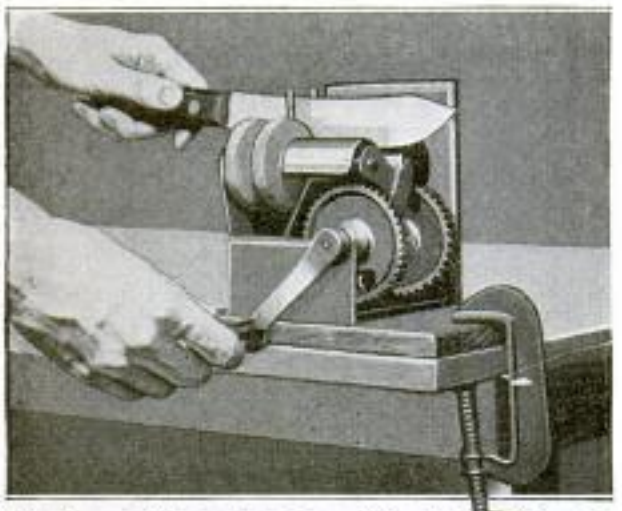
A method of cold-water thawing of frozen ground is being successfully applied in preparation for mine dredging operations in Alaska, according to a report from Fairbanks, in that territory. The method consists in placing 4-in. riveted steel pipes, having eight holes each drilled in the side intermediate to the bore outlet, at 5-ft. intervals vertically in the ground. On being pumped continuously full of water, the pipes sink gradually into the ground by their own weight, at the same time thoroughly disintegrating the earth between them. The geological formation of the country where the dredges are in operation embodies a layer of fine frozen gravel, about 14 ft. thick, with 12 or 13 ft. of muck above it. The pipes sink the full depth of approximately 26 ft. Cold-water thawing is said to be not only much cheaper, but also much more thorough than steam. In one case two adjacent sections of ground were thawed out, one with cold water and the other with steam, and after the work was completed the ground surrounding the steam pipes was still ribbed with frozen blocks of gravel, while the other section was ready for dredging.

FOOT-LEVER MACHINE PUNCHES TRANSFERS

A transfer-issuing machine for the purpose of speeding up fare collecting on street cars has been designed. The punching and issuing of the transfer is done by a mechanism contained in a boxlike form at the top of a pedestal and operated by a foot lever. Each transfer is punched with the date, destination, minute and hour time, a. m. or p. m., and in or outbound. A set of push buttons at the top of the machine enables the conductor to set the machine to punch the transfers in the form desired. Dials on the side permit the punching mechanism to be set to the hour and minute. The capacity is 60 transfers a minute.

KNIFE OR SHEARS SHARPENER WORKS RAPIDLY BY HAND

For sharpening knives and scissors rapidly a machine is now on the market that is compact and easily operated. It



High-Speed Knife and Scissors Grinder Operated by Turning the Crank with One Hand. While the Knife, or Other Object, is Moved Back and Forth between the Grinding Wheels

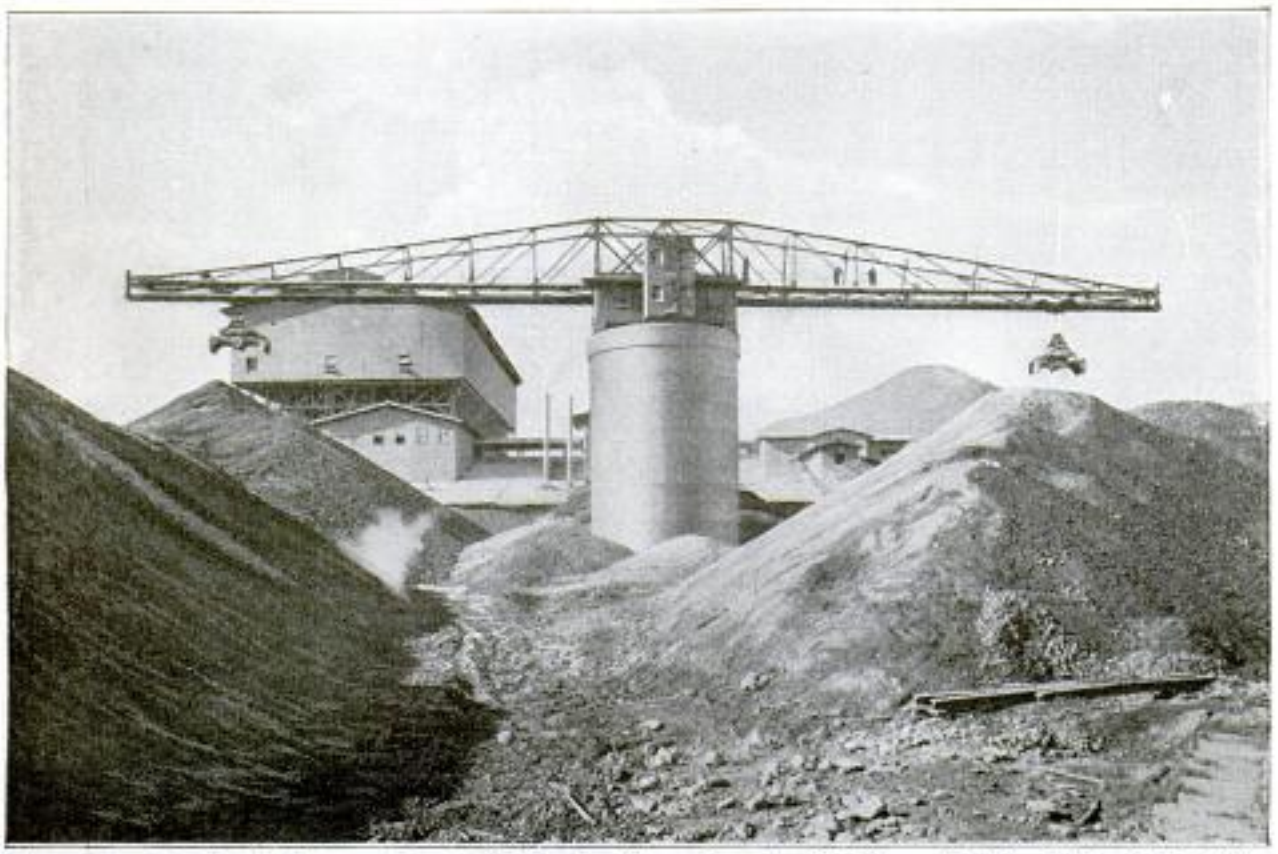
can be clamped to any table or bench by means of a projection on its base, on which are mounted supports for a couple of sets of worm gears that drive the grinding wheels in opposite directions. The knife, or other object, is placed between a pair of guide posts, and is moved back and forth, while the wheels are revolved at high speed through the gears by means of a crank handle.

CONCRETE TOWER SUPPORTS HUGE CRANE

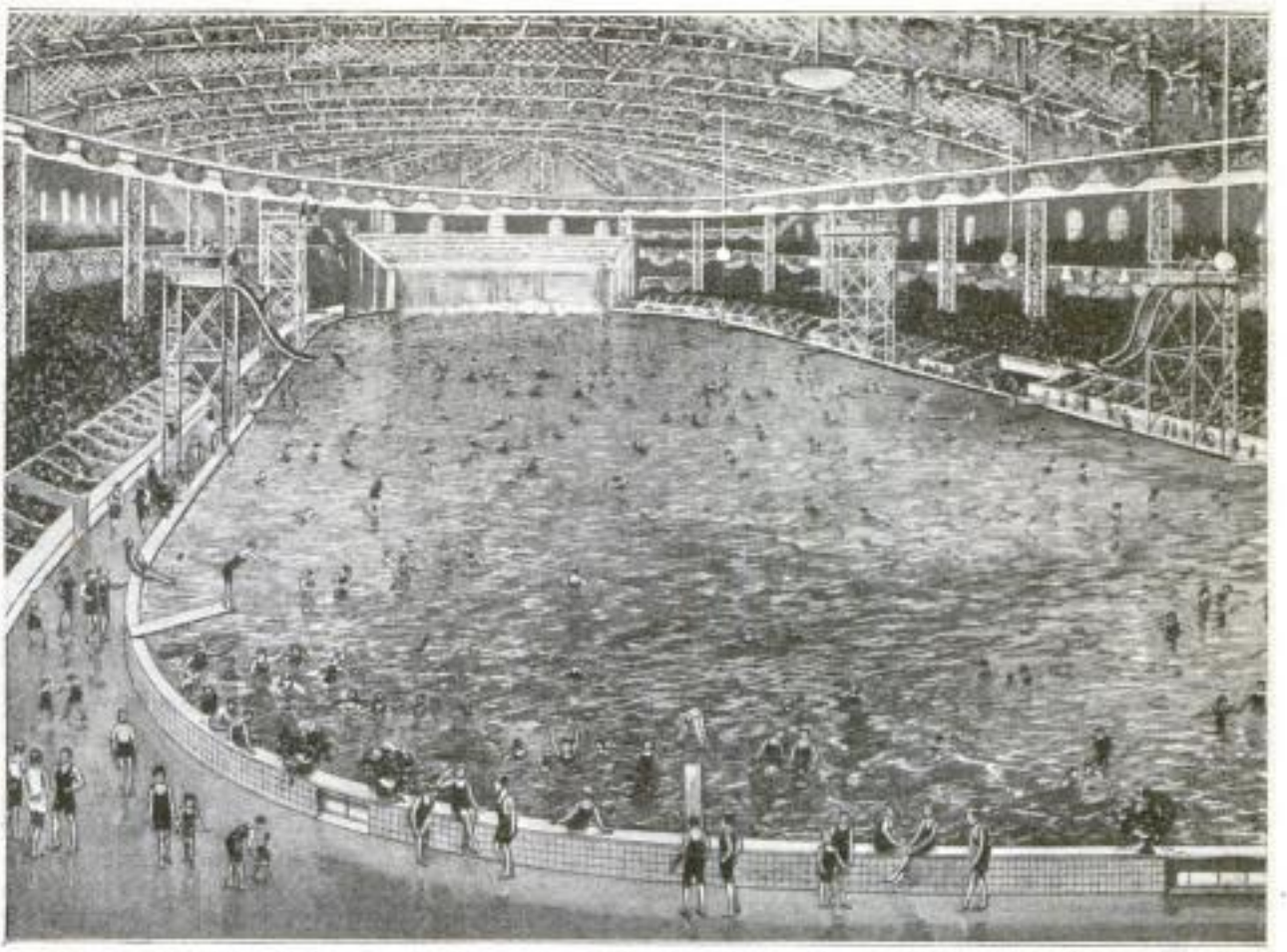
A reinforced-concrete tower recently built in the center of the clinker-storage yard of a California company serves the unusual purpose of supporting a cantilever crane used to pile cement clinker, or to deliver it to a belt conveyor.

The revolving part weighs 140 tons, and is supported on a track laid on ties that are placed around the parapet of the tower. Each end of the crane is 110 ft. long and from it is operated a 50-cu.-ft. grab bucket. When both buckets are being operated, the crane has a capacity of 6,000 bbl. every 10 hours. Seven motors, ranging up to 40 hp., are used on the crane.

The tower is 55 ft. high and has an inside diameter of 30 ft. Seven feet below the top of the tower is placed a reinforcing floor, or diaphragm. The tower was built of concrete instead of structural steel as there would be less damage done to the concrete by the hot clinker piled high around the base; the concrete was also cheaper.



This 55-Foot Reinforced-Concrete Tower with Its Cantilever Crane is Used in a Yard in California for Piling Clinker. A 50-Cubic-Foot Clamshell Bucket Travels Back and Forth under Each Beam and Deposits the Cinders in Any Position Desired, as Demonstrated by the Surrounding Piles



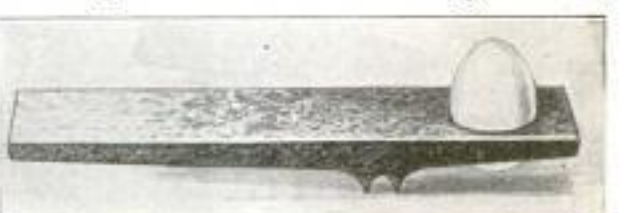
Showing the Enormous Swimming Pool Recently Provided in Madison Square Garden, New York: The Pool will Accommodate 4,000 People at One Time. At the Farther End of the Pool Is a Waterfall 25 Feet High. Seats Accommodating Thousands of Spectators Line the Sides of the Pool

MADISON SQUARE GARDEN POOL HAS SPECIAL FEATURES

A swimming pool in Madison Square Garden, accommodating 4,000 people at one time, has been recently added to the list of New York's popular public attractions. The pool is unique not only for its size but also for the many accessory pleasure features and sanitary equipment afforded. Diving platforms of different heights, springboards, and chutes line the sides of the oval tank. The main dimensions are 250 by 110 ft., with a depth of 2¼ to 3 ft. at the western and eastern ends sloping down to 5½ ft. in the middle. The deep diving section runs the entire width of the pool in the center and is 15½ ft. deep and 25 ft. wide. At the eastern end of the great tank is a cascade and waterfall 25 ft. high, a thing not often found in structures of this sort, and which adds measurably to the sporting and outdoor effect. The 1,500,000 gal. of water which fill the tank are pumped through filters and heaters twice during the 24-hour day and sterilized by ultraviolet rays. Seats accommodating thousands of spectators line the sides of the pool.

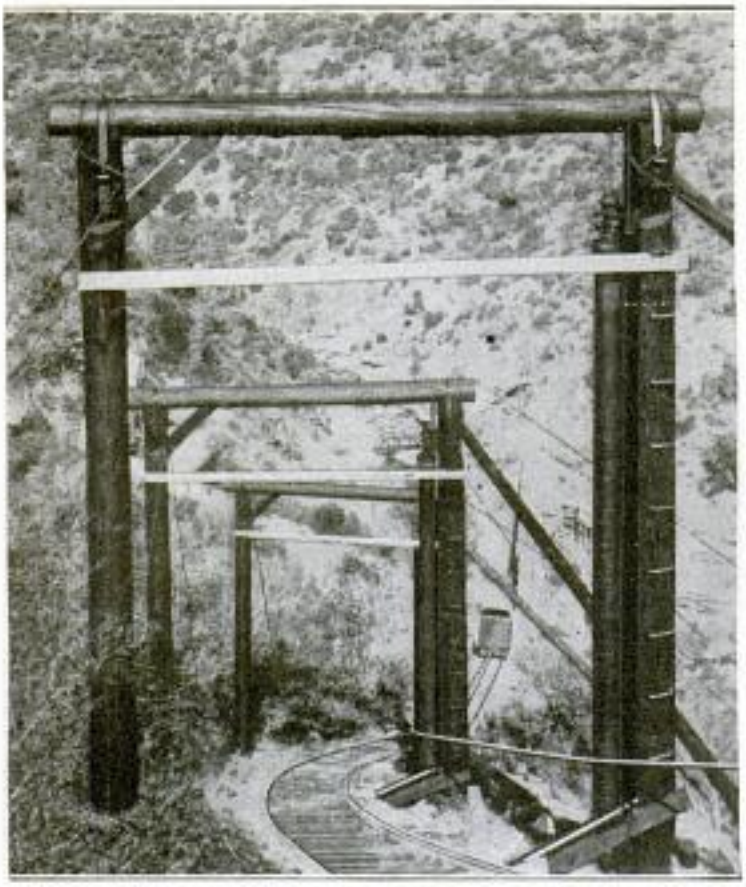
SIMPLE EGG SCALE GRADES EGGS INTO THREE CLASSES

A simple and inexpensive device, made of galvanized iron sheeting and used for grading eggs, is the invention of a California produce dealer. It consists of a bar, about 9½ in. long with the sides turned down. Four prongs divide the bar into a long and short section. The shorter end has a hole for receiving the egg. The large end of the egg is placed in the hole. If the grader remains stationary, that is,



Egg Scale, Resting on Its Four Prongs, Indicating That the Egg Tested Is of the Second Class

with the long end touching the table, the egg is of the third class. Should the grader come to rest on its four prongs, the egg is of the second class. A tilt toward the hole end places the egg in the first class.



The Upright Rollers Guide the Cable around Sharp Curves on the Steep Inclined Road. The Rung Ladder is Used for Access to the Ball Bearings at Top of the Rollers

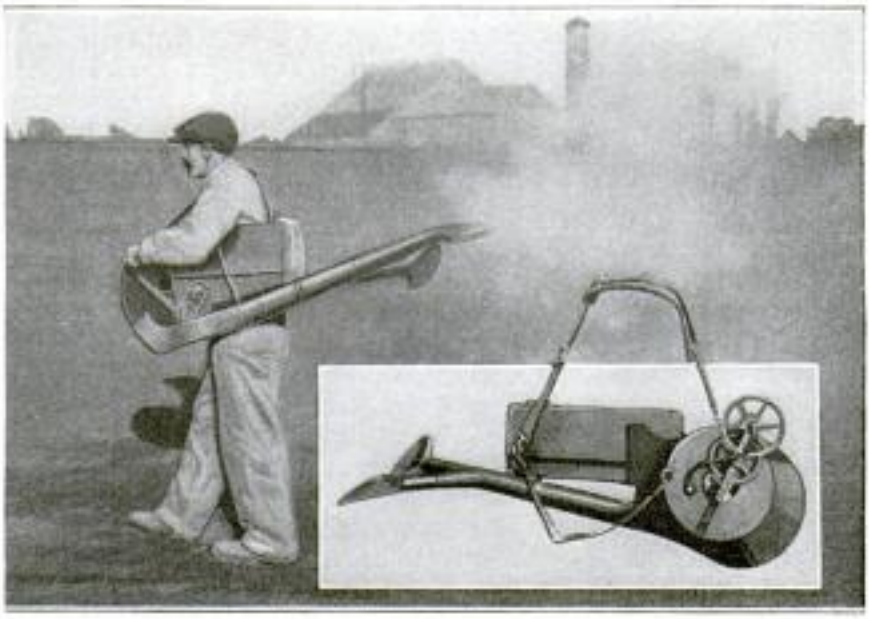
ROLLERS GUIDE CABLE CARS AROUND CURVE

The sharp curves on a 7,000-ft. incline, with grades up to 75 per cent, necessitated the use of heavy vertical rollers to guide the cable of the cars used in delivering materials and supplies to the site of a power house in southern California. The rollers used are fastened to well braced and guyed timber frames. Ball bearings were placed at the upper end of the rollers so as to permit them to move freely and prevent the loaded cable from cutting into them. Short inclined rollers were placed at the bottom to prevent cutting the lower brace. Twenty-ton loads were carried.

¶A number of American fruit vessels have lately been preserving their cargoes in transit from California to New York via the Panama Canal by means of forced air ventilation through the holds, thereby eliminating the usual refrigeration machinery and insulation.

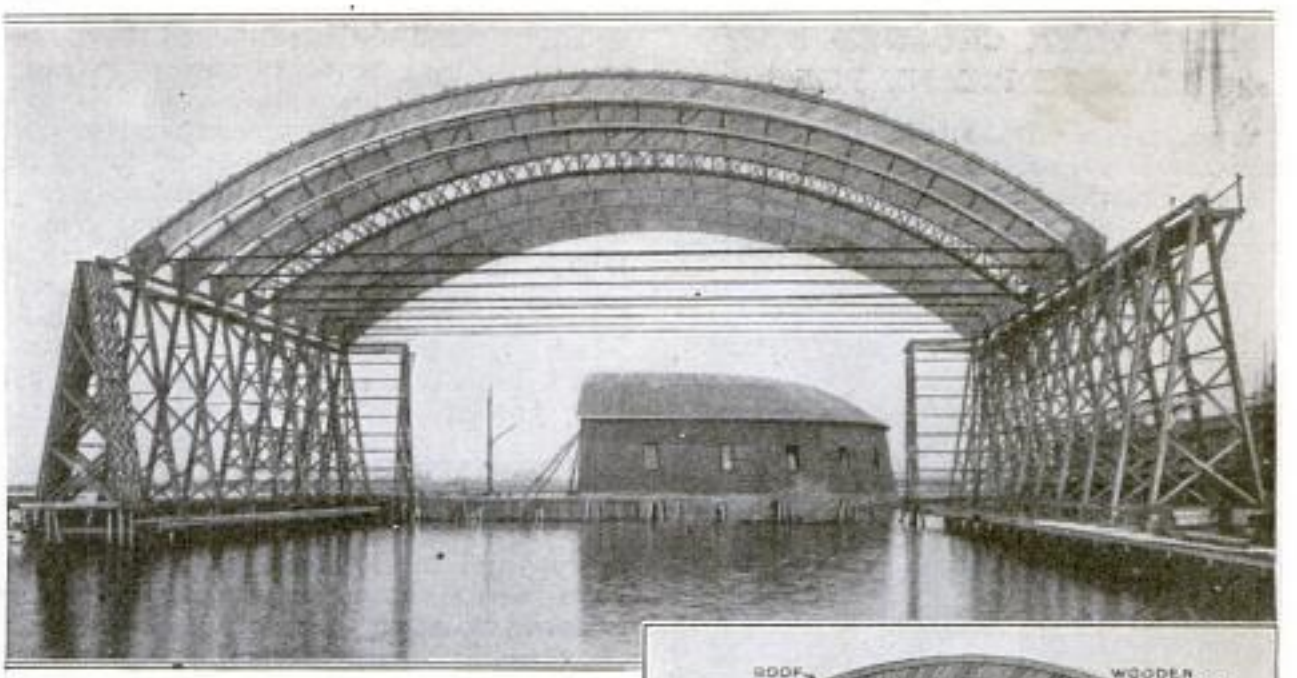
LATE-MODEL COTTON SPRAYER SPEEDS DUSTING OPERATION

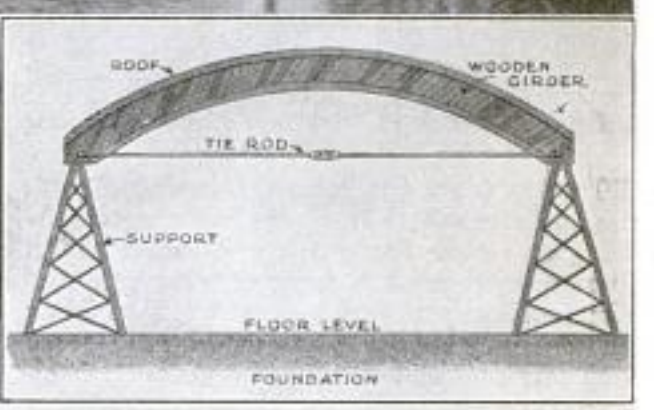
Enlisted for service in the war against the cotton boll weevil is a poison-spraying, or dusting, apparatus of late design. It differs somewhat in construction from its competitors in that it can dust four rows at a time and has a differently situated dust-supply compartment. In the former case, a double outlet of noncorrosive metal is provided which throws the dust cloud two ways and consequently covers twice the space. The dust is dropped into the hand-produced fan draft in the new machine, which is a reversal of methods heretofore used. Convenient belt and body attachments as well as rear dust outlets make for the comfort and safety of the wearer, as the latter arrangement keeps the poison cloud always behind the operator. The new device is made in styles to be worn by either a walking or mounted operator.



This Boll Weevil Destroyer is Carried about the Neck and Shoulders of the Operator. It Points in the Opposite Direction from the Line of Walk and Allows Four Rows at a Time to be Dusted with the Poison Powder. Insert Shows a Detailed View of the Apparatus

NEW-TYPE SHED FOR HOUSING GIANT FLYING BOATS





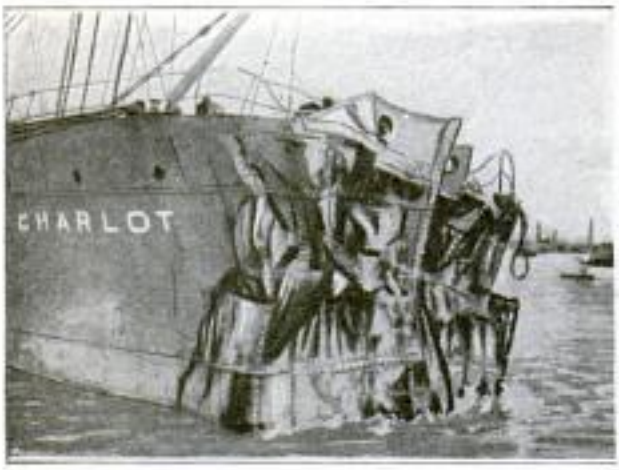
New 500-Foot Shed Constructed in Germany to House Four of the Largest Flying Boats Built. The Upper Picture Shows the Shed in Process of Construction, with Roof Trusses in Place on Trestles, Ready for Roof and Side Covering. The Sketch at the Right Shows New Type of Roof Truss Used. The Lower Picture Indicates the Immense Size of Completed Structure

THE design and construction of sheds for housing large flying boats, is as great an engineering problem as the design and construction of the ship itself.

The largest shed ever built for flying boats was erected in Germany for the housing of four machines measuring over 200 ft. from wing tip to wing tip. An interesting feature of the design is the use of the minimum amount of steel in the construction of the heavy roof trusses, where weight had to be used sparingly. A solid arched wooden girder, tied at the ends by means of a heavy steel tension rod, was used, developing the best use of wood and steel. The opening for entering and leaving is closed by a floating section which adjusts itself to the tide. The length of the shed is 500 ft., the width, 200 ft., and the door opening is 170 ft. in the clear. Four of the largest flying boats built can be housed in this shed. The boats may be lifted off the water for repairs.

SHIP WITH CRUSHED BOW MAKES DISTANT PORT

A remarkable feat of good seamanship was recently successfully undertaken by the crew of the steamer "Charlot." About



Crumpled Condition of Steel Bow Plates of Steamer in Port, after Fouling an Iceberg

130 miles from St. John's, Newfoundland, the ship crashed into an iceberg, crumpling the bow like so much matchwood. It remained on the berg several minutes after striking and then managed to back off under its own power. Signals were sent out and the crew prepared to desert at a moment's notice. An examination showed that the steamer was able to float and in no immediate danger of sinking, and the crew, working the pumps continually, managed to reach St. John's.

BASEBALL UMPIRE USES CAGE AS SAFETY-FIRST DEVICE

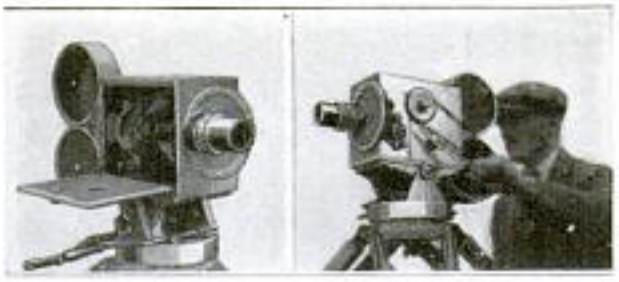
Safety first, the oft-repeated warning, was very religiously heeded by the umpire at a recent benefit ball game on the Pacific coast. He appeared at the park with a large wire contrivance that looked like

Contrivance, like an Exaggerated Birdcage, Used by a Baseball Umpire Who Announced His Decisions by Means of the Semaphores Mounted on Top of the Cage

an exaggerated birdcage. When the game started, he took his stand inside the cage. On top of the cage were mounted semaphores, lettered very plainly with the usual umpire's verdicts, "ball," "strike," "out," etc., and his decisions were announced by raising the necessary semaphore. Thus, he was not only safe from unintentional foul balls, and the intentional pop bottles of irate fans who differed from his judgment, but he also saved himself from much expenditure of lung power.

NEW HIGH-SPEED CAMERA FOR SLOW PICTURES

Slow-motion pictures, pictures which have been taken extremely rapidly so as to project much slower on the screen than reality, have heretofore generally been taken by means of an ordinary motion-picture camera geared up to a high rate of speed. This practice soon wore out the camera. To overcome the difficulty, an eastern inventor evolved a machine with the working parts arranged to eliminate as much of the lost motion as possible. The film magazines are located

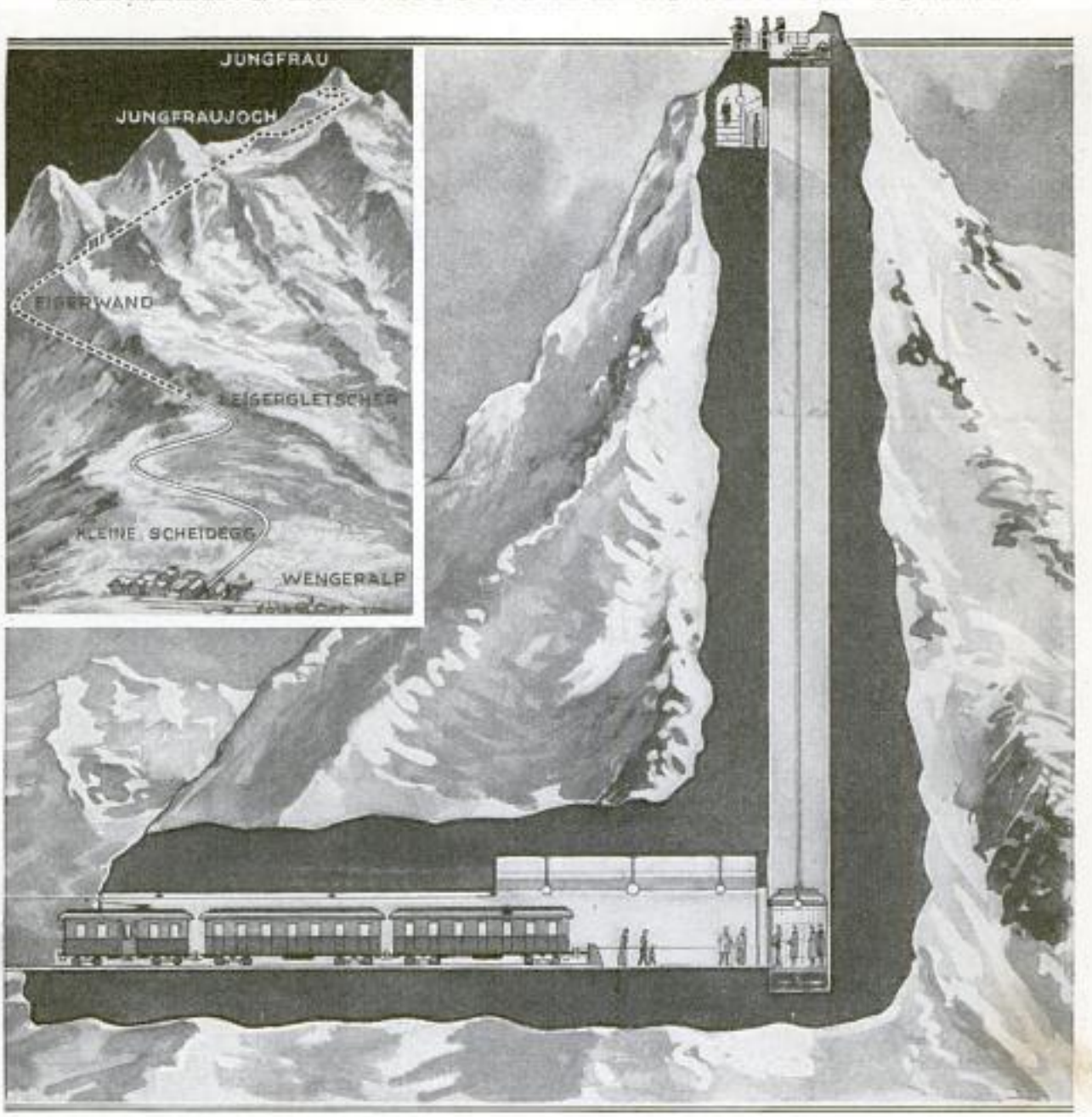


Left: The New Speed Camera with Side Door Open. Right: The Reels are Located at the Rear, to Reduce Pull on the Film

at the back instead of the top of the camera, to bring the film in direct line with the pull of the handle. The machine is capable of recording 14 ft. of film per second, or 224 individual pictures. In a recent instance the new camera was used to film an auto jump-off. The car was run up an inclined plane and propelled into space. Between the time it left the ground and the time it landed again, which was about two seconds, the camera had ground off 25 ft. of film, enough to last 25 seconds when the speed is reduced for the screen projection.

¶By placing one pipe inside the other and filling the space between the walls with water at half the pressure of the water contained in the internal pipe, concrete has been used in Germany as a material for water pipes under high pressure.

THRILLING ELEVATOR RIDE TO ALPINE SUMMIT



The Proposed Extension of the Jungfrau Cog-Rail Road in the Alps will End in a Tunnel Running to the Center of the Cone-Shaped Summit of the Mountain, and Here Comfortable Elevators will Take the Sight-Seers to an Observation Platform at the Very Top. The Extension will Begin at Jungfraujoch

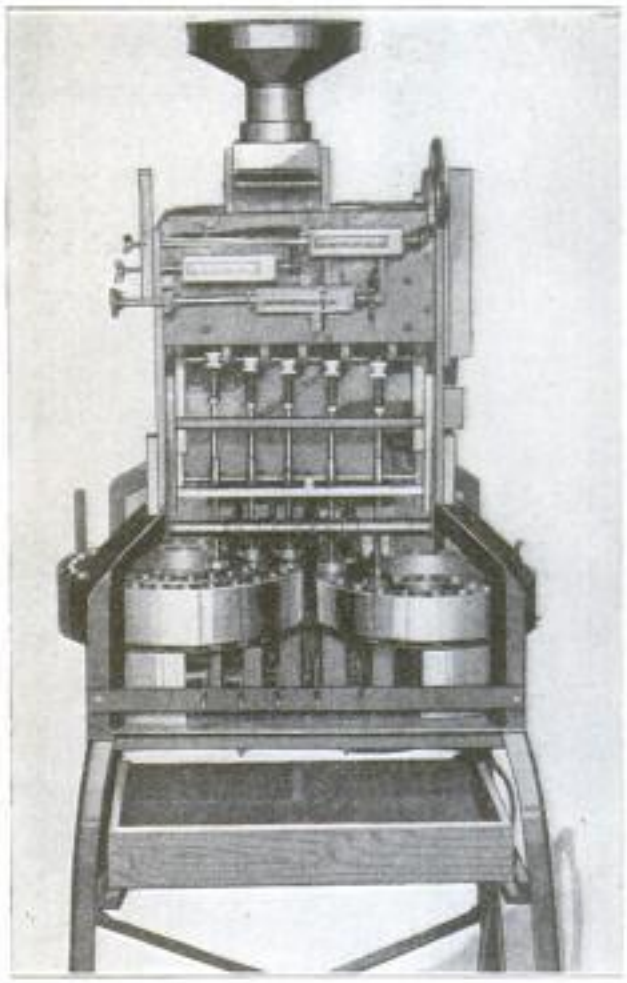
FOR years one of the most thrilling incidents of a visit to the Alps has been the ascent of the Jungfrau on the cog-rail road that starts from Kleine Scheidegg, at an elevation of 6,711 ft. and climbs the mountainside at the startling grade of 25 per cent, or an angle of about 22°, till it reaches Jungfraujoch, at an elevation of 11,339 feet.

It is now proposed to add to this wonderful experience in mountain climbing a still further thrill, by comparison with which the former will appear quite insipid. From the present end of the track the mountain soars another 2,206 ft. to the summit at an elevation of 13,547 ft. By means of excavations and tunnels the track will be extended until it reaches a spot in the center of the conical summit directly below its highest point. From the end of this tunnel a shaft will be bored vertically to the summit itself, and in this shaft passenger elevators will be installed, so that Alpine mountaineers will end their long thrilling railroad climb with an elevator trip like an exaggerated ride to the top of the Woolworth Building in New York City.

The climax will find them landed at the extreme summit of one of the highest peaks in the Alps, with a view of a world of snow-clad craggy mountain tops around them, such as could only be witnessed, hitherto, after a climb on foot, with alpenstock and guides, that involved hours of unlimited physical exertion.

AUTOMATIC MACHINE COUNTS AND WRAPS COINS

A coin-handling machine, which is entirely automatic in action after the coins are dumped into the hopper, has been



Coins from the Hopper, at the Top of This Machine, are Counted as They Fall into Receiving Pockets of the Sizes of the Different Coins, Where They are Automatically Wrapped

developed by an eastern inventor. The machine sorts, counts, and wraps coins at the rate of 100 per minute. There is a movable bottom with coin-receiving pockets, and a fixed bottom with apertures of approximately the same size as the pockets. The movable bottom rotates so that the receiving pockets successively register with the apertures, to allow coins to fall through from the feeder into the proper receptacles. In this position, they are wrapped by an automatic mechanism which is controlled by means of a reciprocating bar, operating after a set number of coins has been deposited.

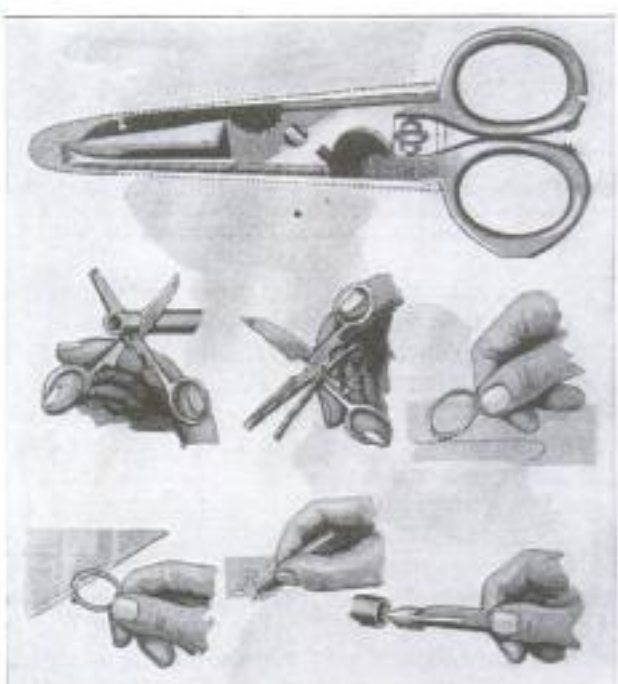
¶Congress recently voted to rename Grand River the Colorado River, so that now, from source to mouth, the stream bears the same name.

GROWING POPLAR TREE DRAINS WELL

Growing trees absorb great quantities of water in their struggle for existence, but it remained for the accident of planting a poplar tree near a well in Ohio to demonstrate this in a forceful manner. Shortly after the tree had attained a healthy growth, the well, 35 ft. deep, was observed to suffer loss of water, and finally ran dry. No one connected the growth of the tree with the condition of the well for several years. Finally a suggestion was offered to that effect, and the owner, partly convinced, had the tree removed as an experiment. In a short time the well filled up nearly to the top, and has not failed to give a steady supply since.

NEW DESIGN SCISSORS WITH EIGHTEEN USES

The elements embodied in the design of a multiple-purpose pair of scissors give it 18 different uses. By rearranging these elements, one can make of it a plain pair of scissors, a buttonhole scissors, a gas-pipe tong, cigar cutter, wire cutter, ruler, measure, nail file, screwdriver, cigar-box opener, cartridge extractor, hammer, pen-knife, glass cutter, glass breaker, marking wheel, erasing knife, and stereoscope. The scissors are a German invention.



Eighteen Different Uses can be Made of the Tool-Scissors Shown Above. From the Plain Scissors Arrangements, at the Top, to the Erasing-Knife Position, in Lower Section, Each Operation is Said to Work Efficiently

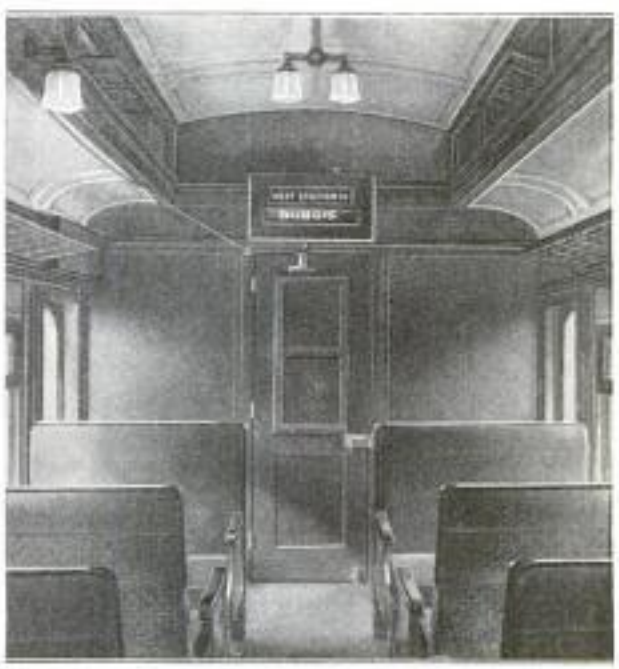
The Front Steps of This Home on Wheels Fold Up into the Porch, Creating a Closed-Porch Effect, and Making the General Resemblance to That of a Two-Room Cottage Very Striking

MANY MODERN IMPROVEMENTS IN HOME ON AUTO CHASSIS

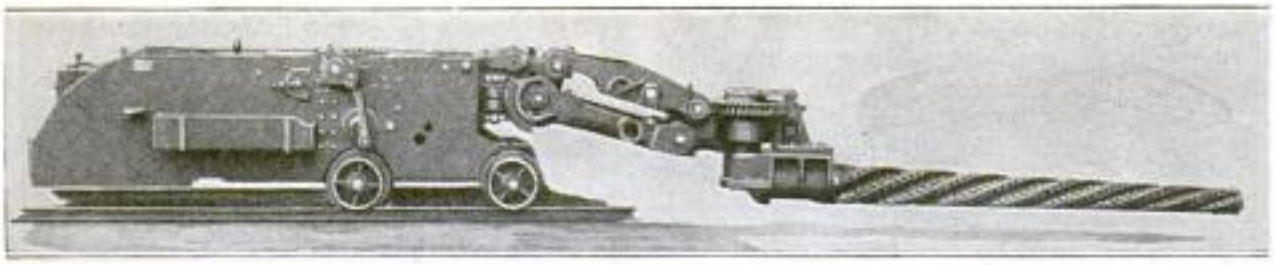
Many houses have been built on auto trucks, but C. P. Latham, of Lincoln, Neb., has constructed a real home on wheels in which he travels about the country with a party of four. The home has the appearance of a frame cottage with front porch, built-in windows, drop siding, and chimney. The main portion of the house is at the rear, and is separated from the porch end by a partition. A bed in the main room swings against the partition during the daytime, and in its place an adjustable table is set up for meals. A small sink, fed from a tank on the roof; a small ice box and pantry; space for clothes; a small gasoline stove for cooking when the weather is bad, and electric-lighting equipment complete the home. While on the road, the stairway to the porch is folded up, giving the latter the appearance of being inclosed.

ELECTRIC ROLL ANNOUNCER NAMES STATIONS

A new method of announcing a station to passengers in a railroad coach is by means of a mechanical announcer which is located above the doorway of the car and unrolls a web, on which are printed the names of the stations in their successive order, behind a small glass window. At the same time that the sign is unrolling, an electric bell rings to draw the attention of the passengers to the change. One of these mechanical announcers is located in each coach, and the series is started simultaneously by an



The Boxlike Affair above the Doorway of the Coach Is a New Station Announcer. A Continuous Roll Displays the Names of the Successive Stations

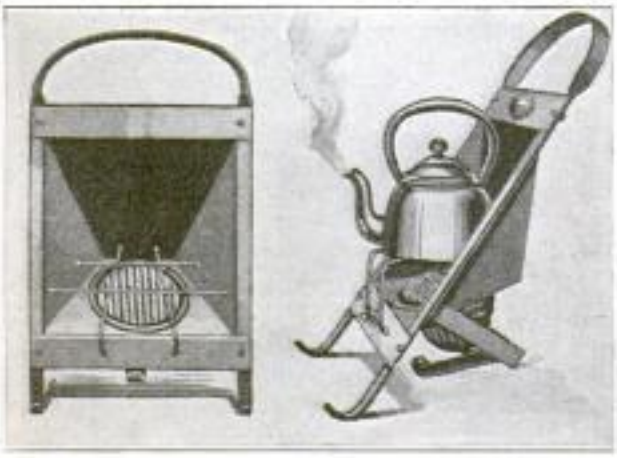


New Coal-Mining Machine That Cuts Rifts, or Kerfs, in Any Direction: The Cutting Bar, at the Right, is Rotating on the End of the Linklike Arms That are Pivoted to the Forward End of the Self-Propelling Truck

electric push button operated by the conductor from any one of the coaches. Each roll is individually driven by an electric motor through a train of gears, the unit being contained in a box 2½ ft. long and 8 in. high. When the end of the line has been reached, a central driving gear is shifted by means of a lever attached to a cord running through the coaches, for rotation of the roll in the opposite direction. An electromagnetic contactor completes the circuit to the motor when the push button is operated, causing the motor to revolve for presentation of the station name. After rotating the web the proper distance, the end of the contactor engages with a two-notched disk at the side of the central driving gear, interrupting the electric circuit and stopping the motor.

TWO-POSITION ELECTRIC HEATER

A portable heater has been placed on the market by an English company, the



This Portable Heater may be Used for Heating a Room or for Cooking. A Wire Guard Supports a Kettle over the Polished Heating Element

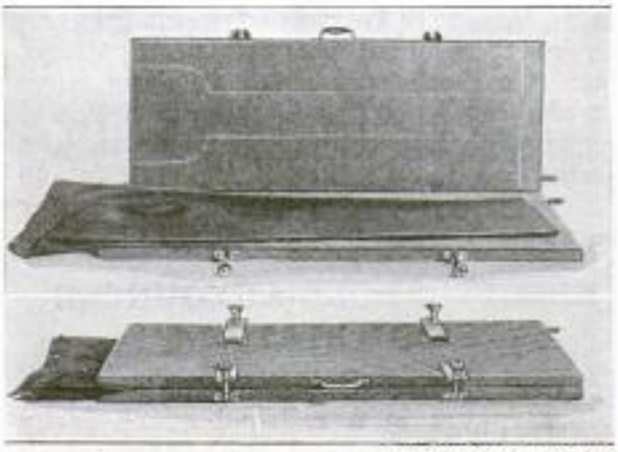
housing of which may be raised or lowered either for heating the room or for cooking purposes. The back leg is fitted with a spring hinge, and a slight pressure on the handle causes the leg to be folded so that the guard on which are placed the cooking utensils becomes horizontal.

NEW CUTTER FOR COAL MINES CUTS IN ANY DIRECTION

A new coal-mining machine, adapted to cut rifts or slots—known technically as kerfs—into the walls or floor of a drift in widely varying directions, has been recently patented. It will cut horizontally along the floor level, and in parallel lines above this level, also vertically or obliquely, and along any circle with its horizontal axis as a center. The cutting apparatus is mounted on a self-propelling truck, which has a speed of from one to six miles an hour. Forward of this truck are mounted linklike arms that extend to the cutter support, and that are pivoted at the truck so that they swing radially up or down. The support for the cutter holds it horizontally, and is provided with means for rotating it around a vertical axis. Any suitable form of cutter may be used, which can thus be moved in any direction, horizontally, obliquely, or vertically.

TROUSERS NEATLY CREASED BY ELECTRICAL PRESS

A French invention now gives a clean, simple, and effective means to the man who likes to have his trousers neatly creased at all times. The press is electrically heated and requires no moisture.



The Electric Trousers' Press, Showing the Trousers Placed So That the Pockets Lie in the Recess. Below: The Press Closed

The trousers are placed between two sections which contain recesses for the pockets. The sections are then clamped together, the current—obtained by connecting to any socket—turned on, and after 15 minutes of heating, the trousers are as sharply creased as if handled by the best clothes presser.

VARYING RIVER WATER LEVELS NECESSITATE FLOATING WHARF

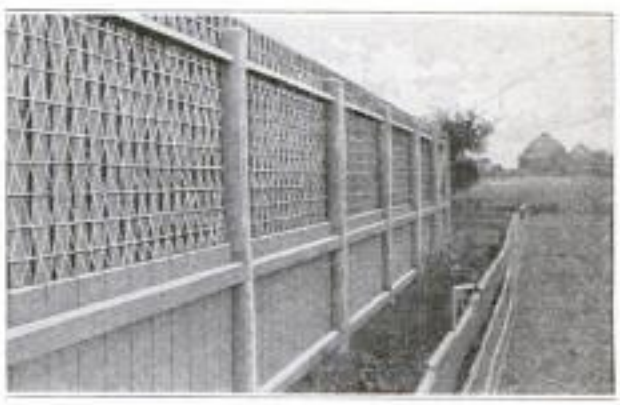
As part of the plan which the government has inaugurated for the encouragement of traffic on inland waterways, a large floating wharf has been constructed at Dubuque, Ia., for use on the lower Mississippi River. It is destined for Memphis, where it will provide terminal facilities for a fleet of government-owned, but privately operated, freight barges. A wharf that floats is of great advantage on the lower Mississippi, on account of the great variation in the water levels.

The wharf is 320 ft. long, 75 ft. wide, and is built entirely of steel, weighing 900 tons. On its deck are three standard-gauge railway tracks that accommodate 12 cars. Over these tracks is a steel-trussed roof the full length of the structure, upon which are transverse crane ways, housed the full width of the wharf, and continuing beyond as four well-braced booms. The cranes operating on these runways, like all the other machinery, are electrically driven. Below the deck is a hold that is divided into oil-tight compartments, and one of the functions of the wharf will be to act as a storage warehouse for oil, and a supply station for oil-burning steamers. The wharf loads or unloads four barges at a time, moored alongside, and the difference of level with the shore is taken care of by a cradle arrangement.

Above: Floating Wharf for Loading and Unloading Freight from Barges to the Shore in the Greatly Varying Water Levels of the Mississippi River. At the End can be Seen the Bumpers for Three Tracks, on Which Cars are Loaded and Unloaded by the Four Cranes on the Runways Above. Left: View of the Other Side of the Wharf

SPECIALLY CONSTRUCTED FENCE CONSTRAINS WILD HORSES

Properly to fence in wild, vicious horses, keep them confined, and prevent them from injuring themselves or other horses, is the problem of a stock farmer. An Illinois farmer has designed a fence which, it is claimed, will effectively resist the efforts of the horses to demolish it, and will give the open fence desired in handling wild horses. Ten-foot posts, 9 ft. from center to center, are buried in 3 ft. of concrete. The lower 3 ft. of the fence is made up of 1½ by 8-in. boards tightly nailed to four-by-four stringers. Above this, heavy woven-wire fencing is strung tightly and reinforced by 3 by 1-in. wooden strips nailed vertically, to prevent the horses from tearing it down.



Outside View of Fence with Tight Board-Bottom Section and Reinforced Woven-Wire Upper Section, Resists Efforts of Wild Horses

Bathers at Wilson Beach, Chicago, Indulge in a Thrilling Amusement While Keeping Cool. This Sea Swing is Operated by Electricity, Has a Capacity of 18 Persons, and Spans a Space Wide Enough to Reach Both Shallow and Deep Water. It Gives the Bather a Ride in the Air or a Ducking When Tipped into the Lake. A Stunt That Is Most Popular and Thrilling Is to Drop off the Sling into the Crest of a Wave When Surf is Running

WATER SUMMER SPORTS MORE DELIGHTFUL

These Collapsible Paddles Fastened to the Feet of the Swimmer, are Intended to Take the Work Out of the Sport. The Swimmer is Moved Forward Rapidly by the Backward Movement of the Feet. The Paddles Fold Up on the Forward Stroke

A Very Unusual Photograph of High Diving Taken at the Balboa Swimming Pool, Canal Zone: The Boy and the Girl in the Picture have Just Taken Off from the Same Springboard

This Bather Fashioned His Bicycle into a Contrivance for Traveling about Lake Michigan with His Best Girl. The Bicycle is Supported on the Surface by the Two Air-Tight Pontoons. The Rudder is Attached to the Handlebars, and the Bike can Travel at a Lively Clip. Some Exciting Races between Craft of This Nature Are a Possibility of the Near Future

The College Interclass Sport of Climbing the Greased Pole for Underclass Honors, has been Varied by Iowans along the Mississippi into a Popular Beach Contest. The Pole, Liberally Treated with Liquid Soap, is Placed Horizontally Out over the River. The Object of the Contest Is to Walk to the End of the Pole and Capture the Flag

SIMPLE WINDOW BARRING PREVENTS ACCIDENTS

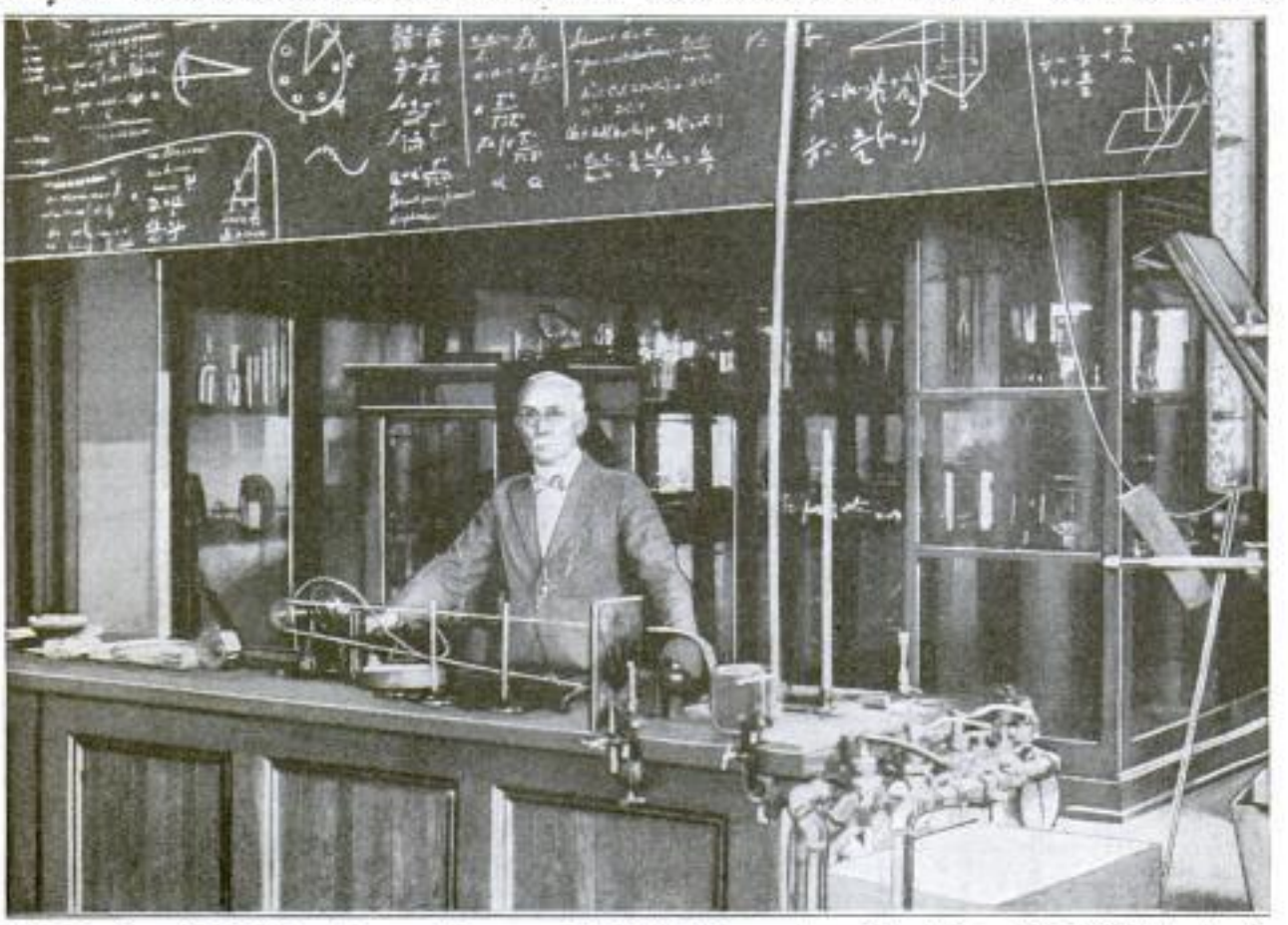
A simple arrangement of pipes into an adjustable barrier that will fit any win-

A Bar Arrangement Fastened into Any Window, by Means of the Turnbuckle of the Middle Bar, Prevents Accidents

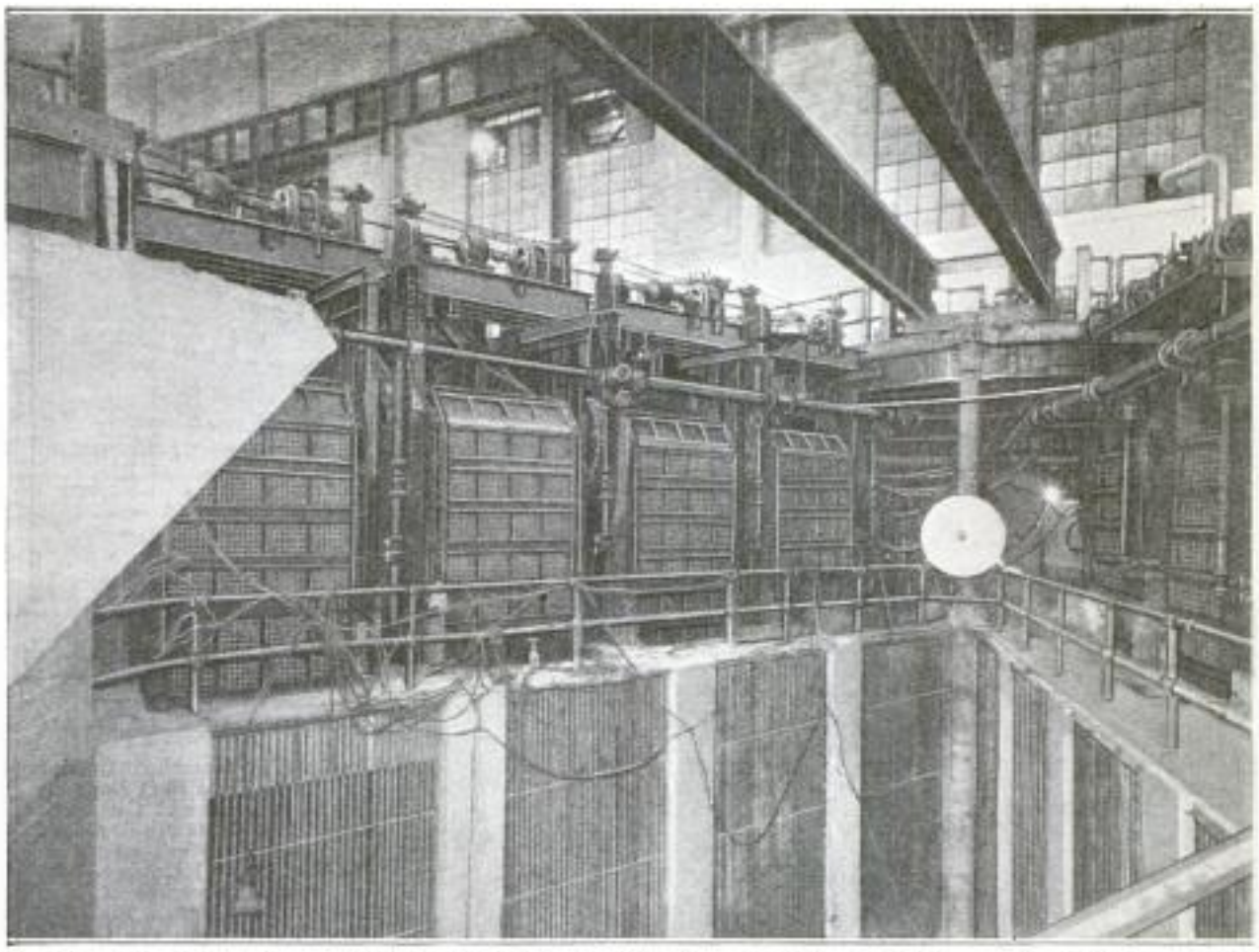
dow, is a late invention to prevent the large number of warm-weather fatal accidents that occur annually through babies falling through open windows. Three sets of pipes are fastened to two upright bars. The upper and lower sets each consists of two pipes of different diameters sliding into one another like the ordinary curtain rods. The middle pipes are fastened by a turnbuckle, by means of which the frame can be tightened to fit the window snugly.

COLLEGE LABORATORY ROOM HAS ELEVATOR BLACKBOARD

The blackboard used in demonstrating problems in the physical laboratory of the Indiana University, at Bloomington, is divided into three sections which may be individually or collectively raised or lowered by means of water pressure. This is a great help to Prof. A. L. Foley, the designer of the apparatus, in displaying a problem so that the entire class may see it after it has been previously worked out in the lowered position of the board. Immediately behind the board is the laboratory storeroom which contains the various utensils used in the laboratory in demonstrating lectures. These are rendered quickly available when the board is in the raised position. A faucet valve at the side of the laboratory desk is the means of controlling the water pressure.



This Blackboard, Used in a Lecture Room, can be Raised, Lowered, or Placed Out of Sight Quickly by the Operation of a Faucet Valve on the Side of the Desk



The Four Cagelike Inclosures behind the Railing Are the Tops of Endless-Belt Screens Used in Cincinnati to Cleanse the River Water for a 30,000-Horsepower Steam Turbine. Each Screen Is 91 Feet High and 5 Feet 8 Inches Wide, and is Individually Driven by an Electric Motor

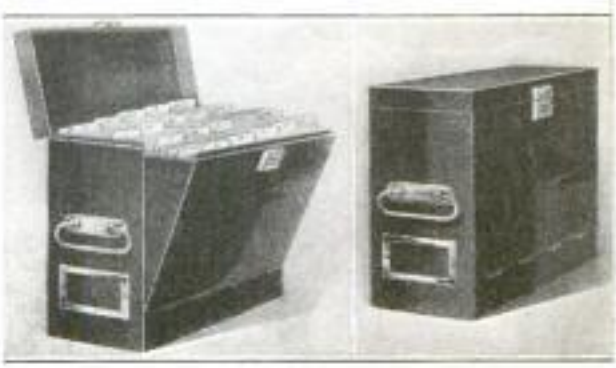
TRAVELING SCREENS CLEANSE WATER FOR STEAM TURBINES

To insure a continuous supply of fresh water for an immense steam-condensing turbo-generator in the city of Cincinnati, Ohio, a system of traveling screens was installed which cleanse 90,000 gal. of water per minute from the muddy Ohio River. The screens are chainlike in form and operate on the endless-belt principle. The system comprises 16 screens, each 91 ft. high and 5 ft. 8 in. wide. They are arranged in groups of four, sunk in a circular well. In normal times, only one pair of the four groups is used, but in times of flood when the river is choked with débris, the four groups working together insure a sufficient supply of strained water for the turbines. Each screen is driven by a 7½-hp. electric motor.

¶At a point in Scotland, on the north Girvan shore, between which and the U. S. Atlantic coast there is no intervening land, two masts, for this reason made only 70 ft. high, are being tried out as an experimental wireless receiving station.

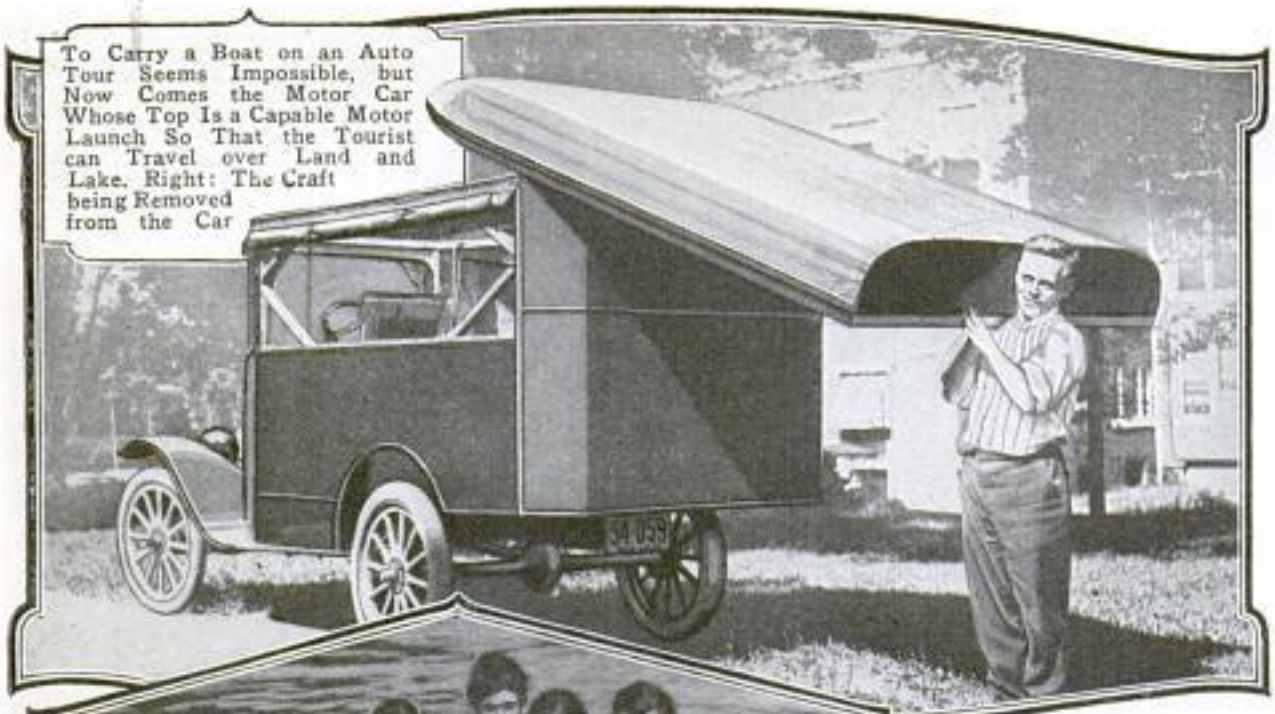
STEEL FOOL-PROOF FILING CABINET FOR THE HOME

One can file one's important personal documents in a new 1,000-letter capacity filing case, with the assurance that they will be reasonably safe from fire and tampering. Very little space is required for this safe, a black japanned box, 6 by 10¼ by 12¼ in., weighing only 4 lb. when empty. The box is closed with a tumbler lock, preventing the accidental destruction of important documents by mischievous children or grown-ups.



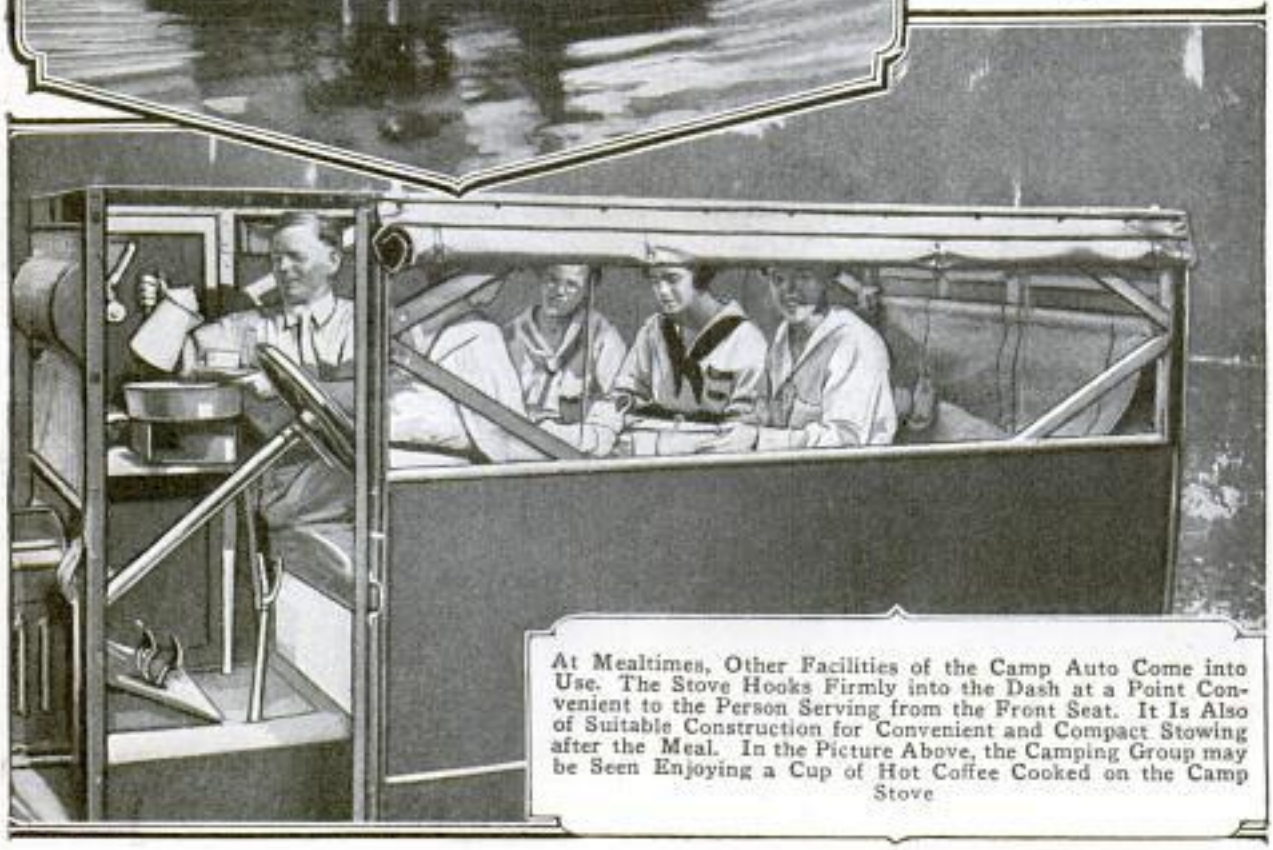
Left: The Steel Filing Cabinet for the Home Open for Filing and Carrying a Full Standard Index. Right: The Cabinet Locked

BOATING AND TOURING COMBINED



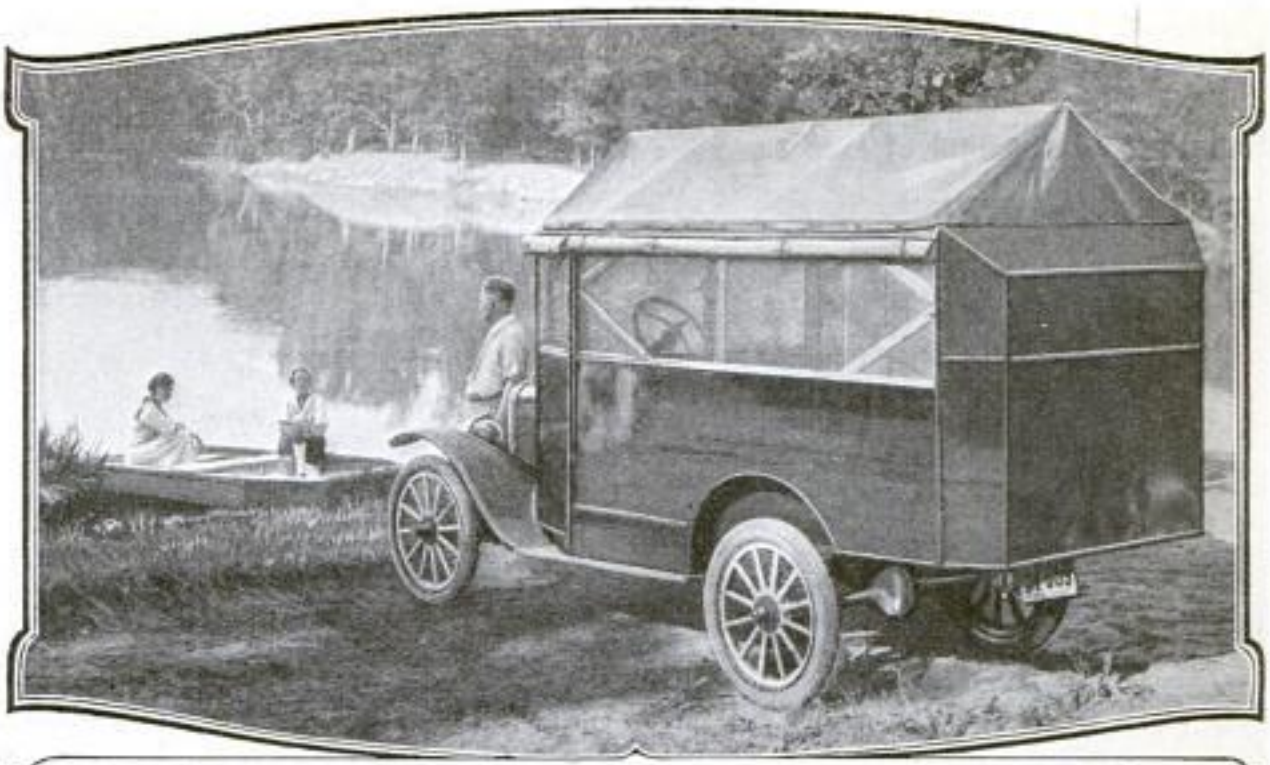
To Carry a Boat on an Auto Tour Seems Impossible, but Now Comes the Motor Car Whose Top Is a Capable Motor Launch So That the Tourist can Travel over Land and Lake. Right: The Craft being Removed from the Car

The Car-Top Motorboat Carries Six. It Is Nine Feet Long by Five Feet Wide and One Foot Deep. Two Seats are Arranged to Accommodate the Passengers. The Boat Has a Reinforced Lattice Frame Stretched with a Canvas. To Assure a Perfectly Water-Tight Hull, the Canvas is Given a Coat of Airplane Varnish and a Coat of Asphalt Paint. At the Left is Shown a Party Boating in the Top

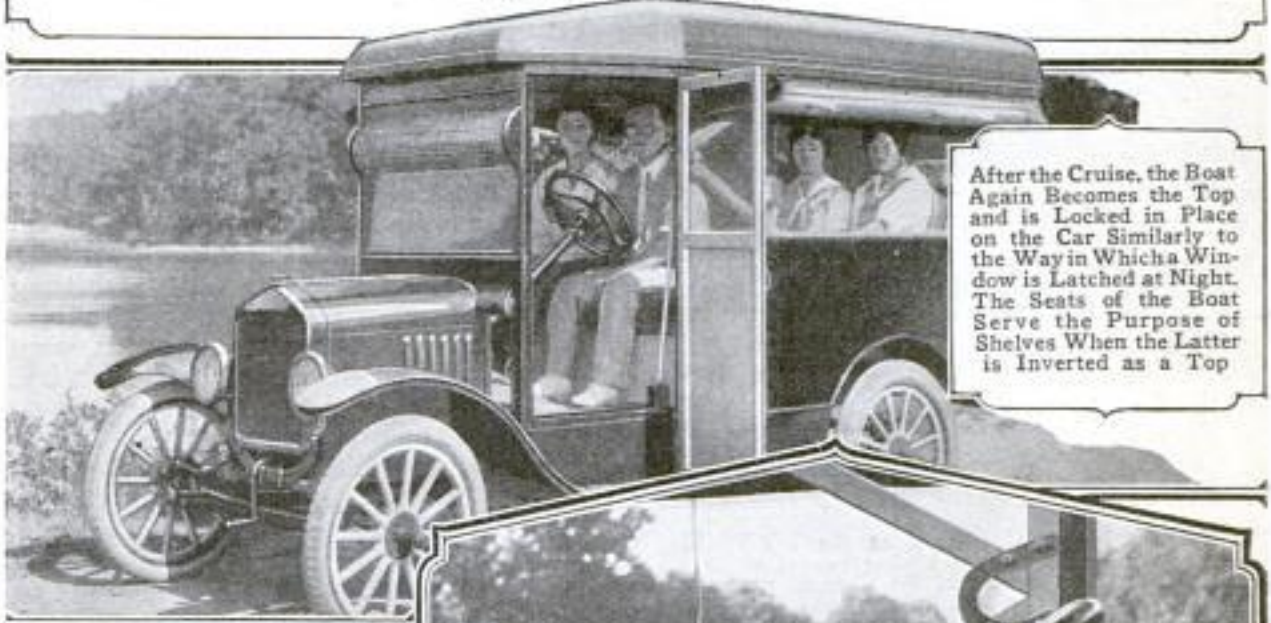


At Mealtimes, Other Facilities of the Camp Auto Come into Use. The Stove Hooks Firmly into the Dash at a Point Convenient to the Person Serving from the Front Seat. It Is Also of Suitable Construction for Convenient and Compact Stowing after the Meal. In the Picture Above, the Camping Group may be Seen Enjoying a Cup of Hot Coffee Cooked on the Camp Stove

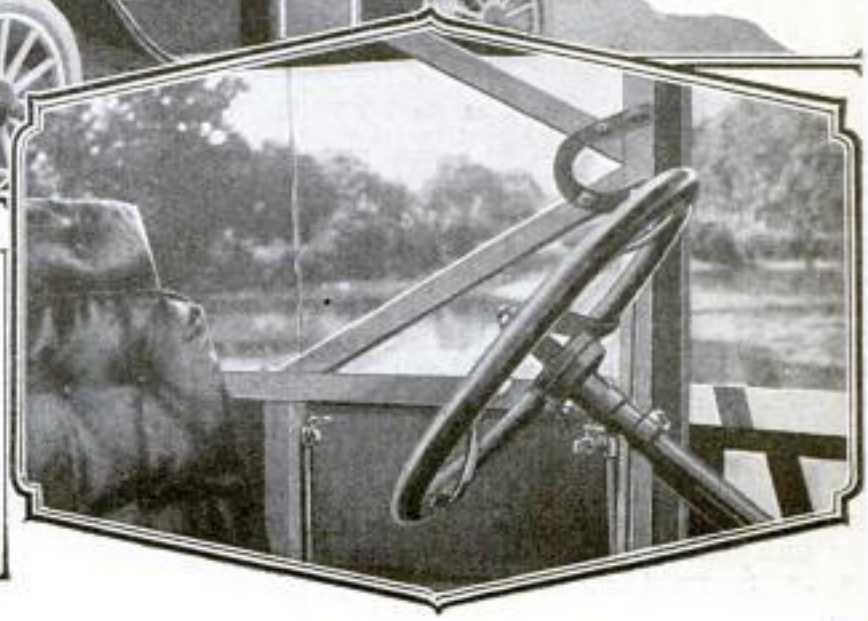
IN CAMP AUTO WITH LAUNCH TOP



In Order to Protect the Equipment from the Weather While the Boat Part Is Away on a Cruise, a Temporary Canvas Tent Designed to Take Its Place, is Provided. This Fastens in Place over the Auto and Serves as a Very Good Shelter. Above: A View of the Auto with the Temporary Tent in Place. The Boat Is on the Edge of the Lake



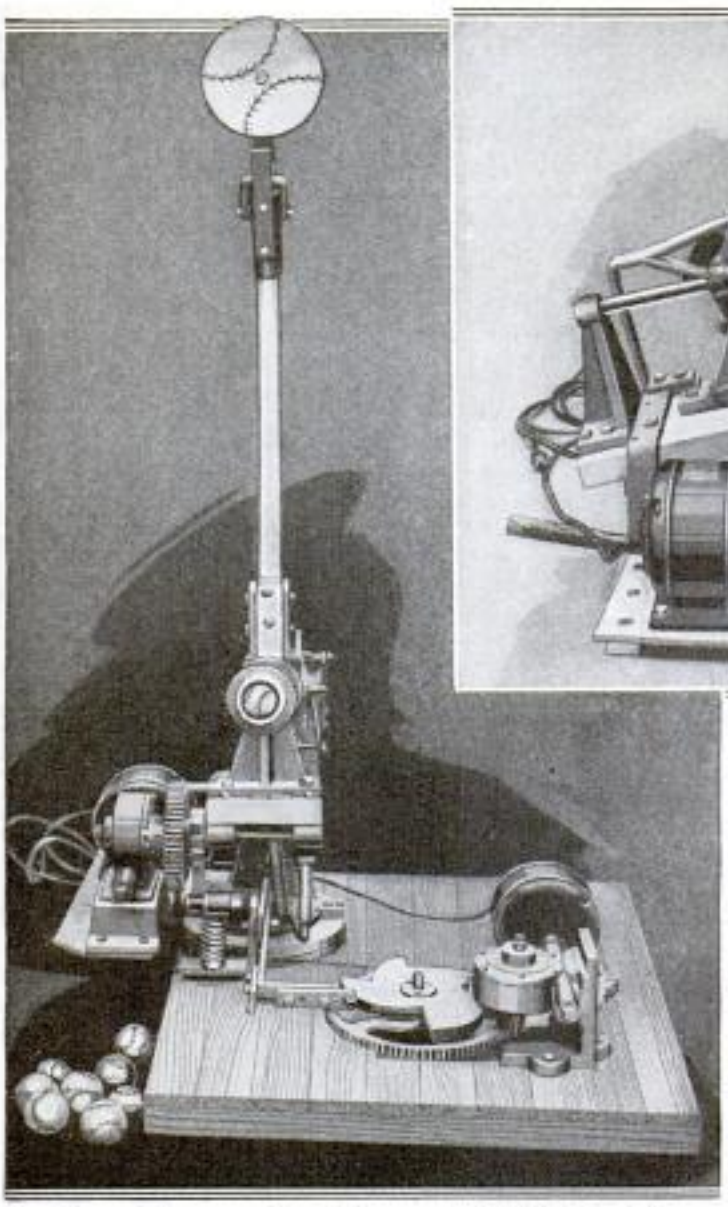
After the Cruise, the Boat Again Becomes the Top and is Locked in Place on the Car Similarly to the Way in Which a Window is Latched at Night. The Seats of the Boat Serve the Purpose of Shelves When the Latter is Inverted as a Top



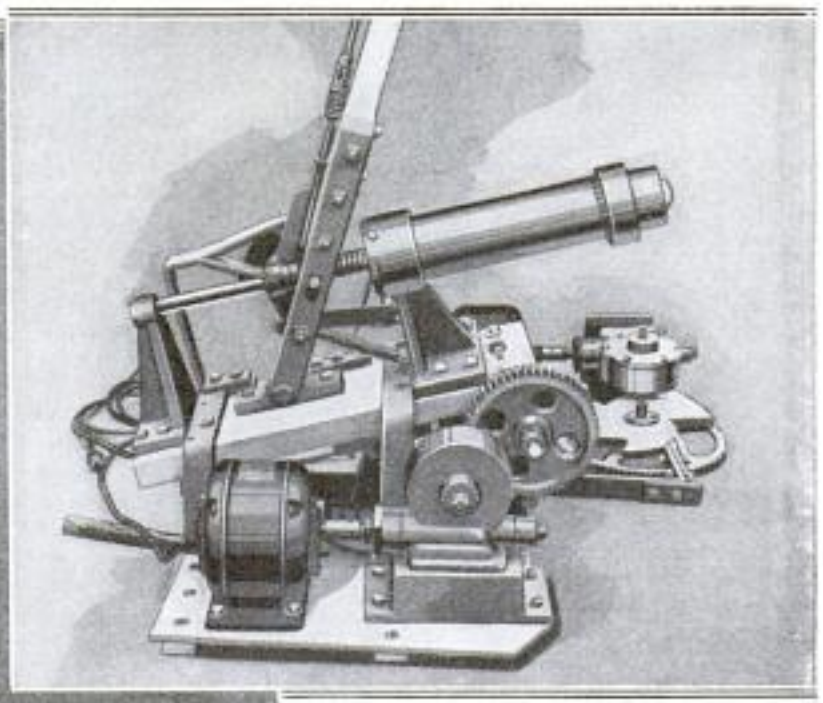
Beneath the Driver's Seat Is a Water Tank, Whose Contents are Forced by Compressed Air to the Faucets Shown under the Window Sill. From These Faucets the Driver may Draw Water as Desired. To the Hook Shown on the Side above the Steering Wheel, an Upper Berth for Sleeping at Night is Attached. The Entire Unit When Packed for Shipping Requires Only Nine by Five by Two Feet of Space

BALL-PITCHING CANNON TESTS PLAYER'S SKILL AT CATCHING

A new indoor ball game which, it is claimed, tests the skill of even the most expert of major-league pitchers and catchers, is the invention of a resident of Ohio. Regulation baseballs are used to pitch at a target attached to the trigger release of a compressed-air cannon, which shoots soft-rubber balls back to the players. This permits the use of standard-weight balls for pitching and prevents injury to players and spectators. The target is placed on the end of a long lever, used to compress a powerful spring, in the gun barrel, which drives an air-tight piston forward when released by the trigger. As the soft ball is larger than the muzzle, it is necessary to compress it when inserting. This makes an air-tight joint which results in compressing the air to a high point before the ball is fired. A speedy delivery and a loud report confuse the player and make him miss the catch. Two electric motors keep the whole device in a constant swinging and up-and-down motion, so that not only is hitting the target difficult, but the player can never be certain at just what angle or elevation the return ball will be pitched.



The Player Throws a Baseball at the Ball-Pitching Cannon Target, Represented by the Disk at the End of the Upright Arm. When This is Struck, the Cannon Below Throws Out a Soft-Rubber Ball



Side View Showing the Cannon-Target Trigger in a Cocked Position: The Unit Sways Slightly to Confuse the Pitcher and to Make Him Exercise When the Rubber Ball is Returned

PLANET VENUS PHOTOGRAPHED IN DAYLIGHT

For the first time, the planet Venus has been successfully photographed in daylight at the observatory of the University of Utah. This unprecedented feat was made possible by placing over the camera lens a series of special screens, which filter and neutralize the bright illumination of the daylight, and yet preserve the image of this brilliant planet. It is thought that this method of photographing astronomical objects by daylight will extend the usefulness of the observatory, as atmospheric conditions are more favorable in the daytime than at night, and apart from this it adds to the hours when work is possible.

COMMENT AND REVIEW

[These pages were printed July 25, 1921]

THE war which for us technically ended three years ago is at last, by act of congress, a legal fact. This removes many barriers, some official and others psychological. The promise of bountiful crops throughout the land is almost fulfilled. We have managed to reduce our debts to one another nearly a billion dollars within the past 12 months. Wage disputes are being adjusted in many sections, and building—that great stimulant to so many other industries—is gradually being resumed after five years of inactivity. The number of idle freight cars, which a few months ago totaled 500,000, the largest in our history, is steadily growing less. The railroads, while by no means recovered from the blighting paralysis of government control, are commencing to see light ahead, and orders for material and supplies are beginning to appear in a small way. The shelves and counters of the merchants are but scantily stocked. These will have to be replenished before long, which means resumption of production of raw materials and resumed activity in mills and factories. These will not all start at once on full time, but they will start.

Better Business Near

The task of reorganization and readjustment is colossal. Very few realize how badly shattered business has been. It still suffers from shell shock, although it was several thousand miles removed from exploding shells. The stock-market quotations tell the story of billions of lessened values, and dividends passed. Yet we are not in panic, and our banks are not closing their doors. The new administration has promised to economize and give business a chance. That business incubus, the excess-profits tax, is soon to be repealed. We are at peace with all the world and expect to remain so.

Losses incident to the drop from war prices to peace values are being rapidly adjusted. Every day brings us nearer convalescence and a revival of industry and business. Improvement already begins to appear; the worst is past; very soon we shall again be working with old-time energy.

AT LAST the biggest business in the world has adopted the plan which corporate and individual businesses have to follow—or go broke. Outside of the army and navy, there is no good reason why thousands of employes in excess of actual requirements should be carried on the payroll year after year. The majority of clerkships, numbering thousands, do not involve years of training. Any average clerk in the average business office throughout the country can as acceptably perform the work required in departmental offices. Moreover, most of the government work does not involve a nervous strain which necessitates shorter working hours than civilian business. Long vacations, additional time allowance for sickness, taken advantage of by those who are not sick, lax rules as to punctuality; all combine to lower the spirit to work with a will.

The National Budget

Appointments by congressmen, largely the result of paying, directly or indirectly, for help in elections back home, and which carry with them a large degree of immunity from discharge for the appointees, help to paralyze efficiency. Superintendents and chief clerks hesitate to jeopardize their own positions by discharging incompetents. And so the sluggish, irresponsive-to-action morale spreads year after year.

There is no earthly reason why a government employe should not give just as fair a day's work for his pay as civilian clerks in Boston, Atlanta, Kansas City, and Seattle. But most of them don't, and they very well know it. As an illustration, I have had more than one department employe say to me, "Ten years of this life unfits a man to take a civilian position." But why should it? Ten years in a bank, a law office, a wholesale or retail establishment, more often than not make the man sought after by competitors alert for good men. A vigorous office atmosphere is better equally for the business and the employe himself.

The task which has been assigned General Dawes, of reorganizing the multitudinous ramifications of bureaus, is both difficult and unpopular, and requires a lot of perseverance and backbone. It is one man against thousands, each of

whom considers himself or herself the indispensable one. The taxpaying public, however, is entitled to a square deal, which it has not had in many years, and will back General Dawes to the limit. Fortunately, he is a man of experience, who can distinguish between the industrious and the slacker, and for once, in Washington, the prospect is that the earnest, conscientious worker will be recognized and kept in the class where he belongs, while a lot of chaff will find itself separated from jobs it failed to appreciate.

The War Incubus

IT HAS recently been computed that the money loss, due directly and indirectly to the war, and making no allowance whatever for the loss of human life, is $350,000,000,000. Like the number of miles to some distant star, the amount is so staggering as to cause a sort of mental insensibility; because even great financiers, accustomed to thinking in large amounts, can but feebly sense this vast amount.

It is good for us to reflect on the price we are all paying for Germany's war. But for that war the three hundred and fifty thousand millions would have been spent for churches, houses, roads, schools, presents for little children, savings against old age, comfortable clothes for the old, and pretty dresses for the young. Millions of comforts the world would have had during the seven years past. But it is all gone, and billions of it yet unpaid, which will tax the world for at least two generations.

Ten years ago we spent less than $250,000,000 on our army and navy. This year we are spending close to $1,375,000,000, and have just emerged from a war on which we spent $24,000,000,000, and have now on hand, left over, much of it unused and still in original packing cases, millions upon millions of supplies, ready to use and already paid for. In spite of this, we are spending nearly a billion and a half on the War Department; nearly 50 per cent more for this department alone than all the expenses of government combined, 10 years ago. The people of the whole world are crushed under the burden of taxation, the most of which is for or because of war. It will startle most people to learn that of all the taxes we are now paying, out of each dollar 87 cents are spent for war. With the world war-sick; with no one in position to really jeopardize us; with other nations nearly or practically bankrupt, our liability to dangerous attack was probably never less than now, or for a good many years to come. With most of the world anxious to reduce the burden of armament, let us hope that the effort of President Harding to secure even a sort of gentlemen's agreement, which would be a first and long step, will receive the outspoken support of every citizen. When public sentiment really insists upon disarmament it will come.

Getting Automobile Sense

TIME was, not so very long ago, when thousands of men were crippled or killed while coupling freight cars. It was considered unavoidable. Circular saws, planers, and all sorts of sharp-cutting, swiftly moving machinery took their annual toll in lives and limbs. It, too, was "unavoidable."

With the perfection of motor vehicles came high-powered, quickly responsive engines, and the natural impulse of most people, especially the younger, to travel faster and faster. To one who reduces his auto speed from 35 or 40 miles an hour to 20 it seems as if he were barely moving; yet his car is traveling 29 feet a second. Even an active, alert person does not go very far in five seconds, but the car, if unchecked, will have gone 150 feet. With the demand for speed ability in a car, manufacturers increased performance, until now even a moderate-priced car is guaranteed to do its 60 or 80 miles an hour, and some, 90 or 100 miles. With improved roads also came the temptation to "step on it." However, rate of speed is a relative thing, for at times and places 40 miles an hour is safer to the public than 20 miles a few hours later. The earlier restrictions as to speed have therefore, wisely, been revised in many cities and states, and especially outside corporate limits, to read "at a safe rate of speed."

The ordinary passenger train does not average over 40 miles an hour, and its engineer must have several years of careful training, and possess certain

abilities of judgment and skill before he is entrusted with a train; yet practically any one with at least one good eye is permitted to drive an auto. An hour or two is sufficient to master the shifting of gears and applying the brake; but by no means all drivers have the necessary alertness of decision in an emergency, and others are careless, indifferent, or preoccupied. Hence, with nearly nine million automobiles and hundreds of thousands of motor trucks, we now have a condition where more people are killed every year by motor cars in a single city than are killed by all the railroads in the United States.

Coroners juries, police and other courts, have been so lenient, imposing at the most a fine of a few dollars, that the death rate is increasing by leaps and bounds. Something has to be done to check the unnecessary slaughter. In New York State the penalty for inexcusable driving is now the curtailment or revocation of the offender's license to drive a car. Already this year 5,700 drivers' licenses have been canceled; some for a few weeks, others for six months or a year, and some forever. Massachusetts has also started on the same policy, and other states would do well to follow without delay. There is no injustice nor hardship whatever in this; the unworthy are deprived of a privilege they scorned to appreciate, and the public is safeguarded against a repetition and the carelessness of others who are thus made more cautious. France has recently found it necessary to revise its motor regulations to meet its increasing death rate from this source.

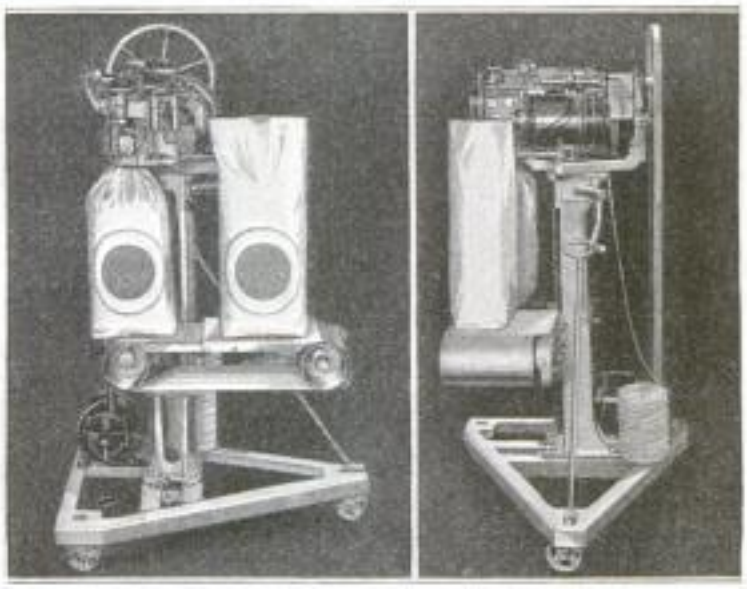
The automobile has not only come to stay, but to increase; like all other good things it is easily abused, and the surest, quickest, most effective way to reduce its dangers to a minimum is to withhold its use from the dangerous and undeserving.

Automatic safety couplers have reduced the railroad casualties from thousands to scores; dangerous machinery has been safeguarded to a great extent. In every plant in the country safety first is taught constantly. The wild men and women driving motor vehicles can also be tamed, and must. Then why prolong the slaughter?

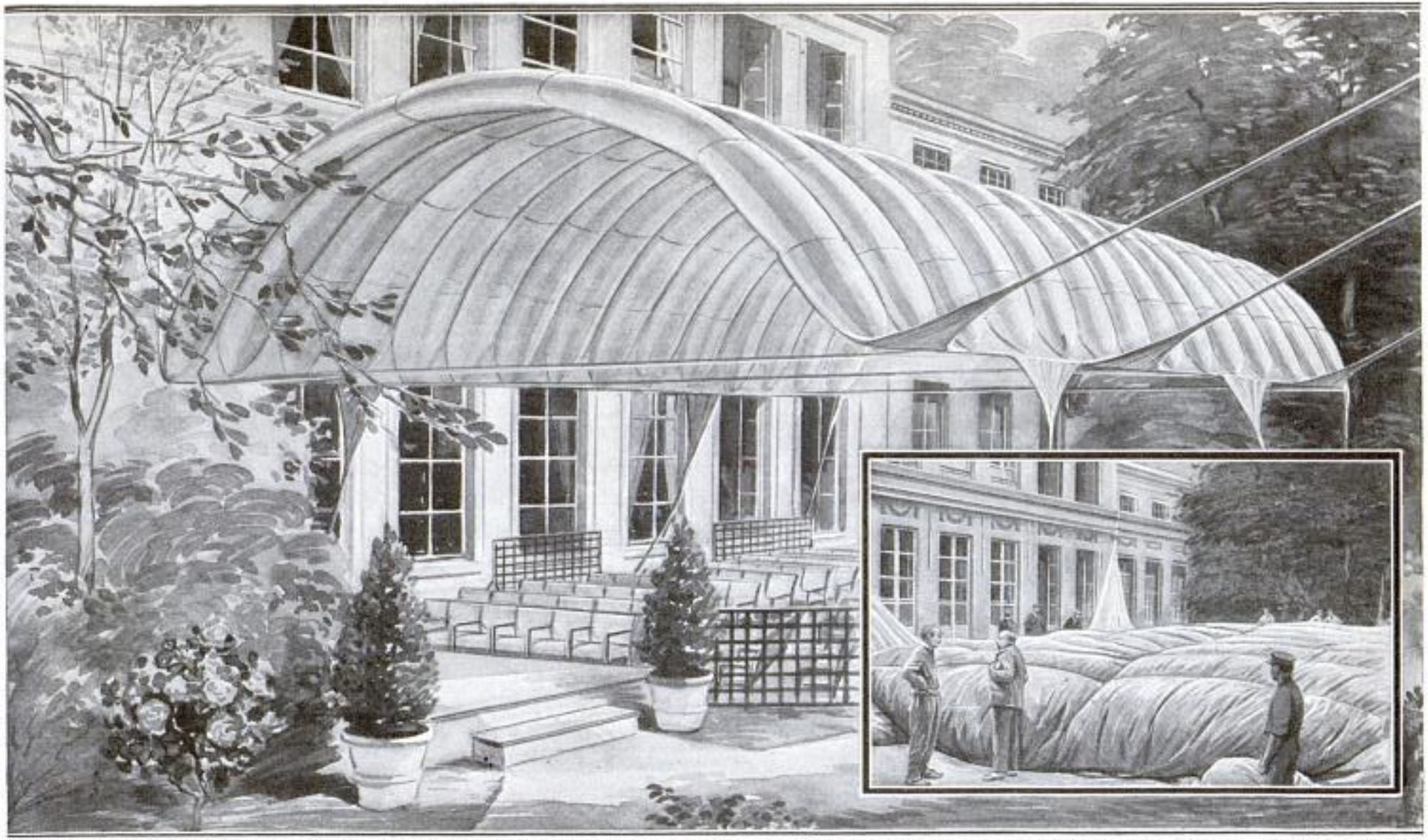
H. H. WINDSOR

ELECTRIC MACHINE WILL TIE PAPER BAG IN A SECOND

At Minneapolis, the world's greatest flour-milling city, anything that promotes this industry is eagerly adopted, and at one of the largest mills all paper bags of flour are now being tied mechanically by means of an electric tying machine. For the present the bags must be fed to the machine by hand, but it is intended to add a conveyor, which will feed them automatically. Using hand feed, one young woman, in an eight-hour day, has tied as many as 12,000 bags, and it is expected that with automatic feed the machine will tie nearly four times as many, or about 100 paper bags a minute. Little more than half a second for each operation is certainly the limit of speed for tying any kind of a knot, and also cutting the string. When bags are tied by hand a fairly heavy twine has to be used so as not to cut the fingers of the tier, but the machine has no vulnerable fingers, and it uses a much lighter twine, thus saving not only time but also cost. A 5-lb. spool of cotton twine has been sufficient in the machine for 9,000 bags, while the jute string that is used for hand tying the same number of bags would weigh about 30 pounds. Thus there is a saving of five-sixths of the weight.



Electric Paper Flour-Bag Tying Machine, from Two Points of View, Showing the Belt Conveyor That Moves the Open Bags to the Tying Device: It Closes and Ties Them in Less Than a Second



Pneumatic Roof That Nightly Transforms a Verdant Lawn, beside the Palatial Home of a Parisian Merchant Prince, into a Theater, with Raised Stage and Luxuriously Seated Auditorium: This Roof Is in the Form of an Envelope, of Such Light and Fine Material, That When Deflated It Rolls Up Small Enough to be Disposed of in a Light Motor Truck. When Unloaded It is Laid upon the Ground, and Inflated, as Seen in the Inset. This Inflation Gives It the Arched Form Shown Above, Where It Is in Position, Suspended and Anchored by Light Guys

BY COURTESY OF L'ILLUSTRATION

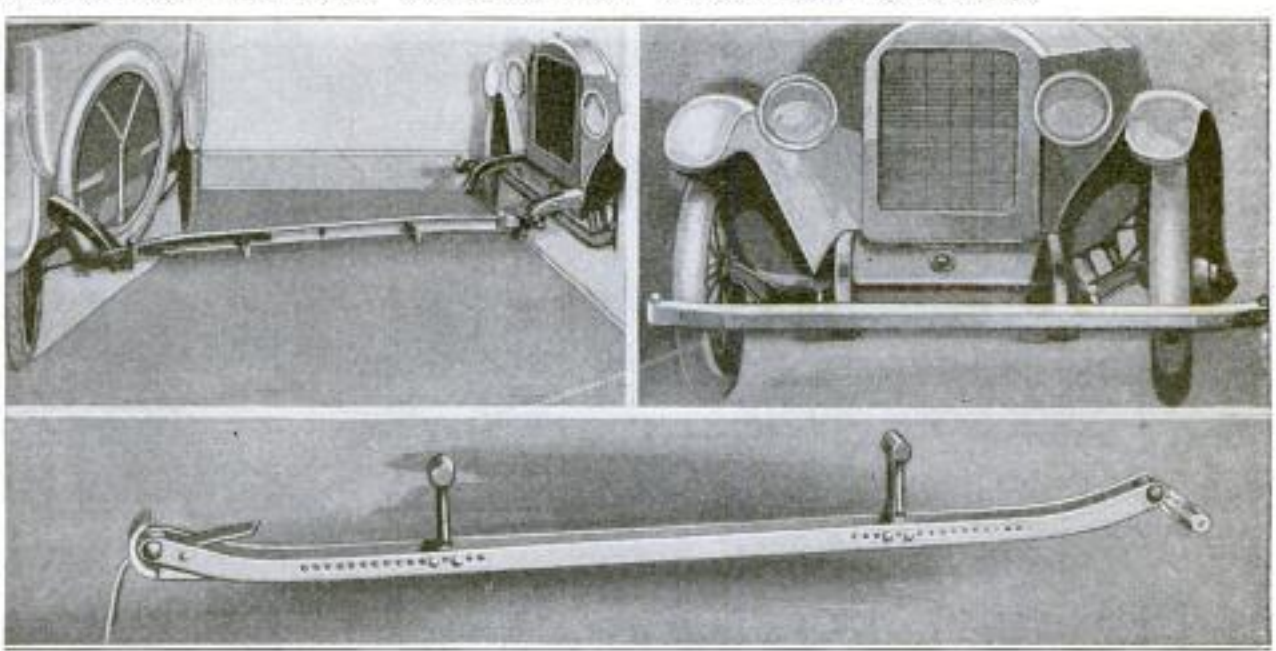
PNEUMATIC ROOF TRANSFORMS LAWN INTO THEATER

By HENRY S. WHITE

IN the heart of a fashionable quarter of Paris, surrounded by six-story masterpieces of architectural art, stands a merchant prince's palatial home, half-hidden in the verdure of its wooded garden that stretches luxuriously before it, with the flower beds among the trees and an ample velvety lawn. Every night, during the summer, this little oasis of verdure is transformed into a luxurious theater, with raised stage and comfortably upholstered armchairs arrayed in rows in the manner of an auditorium, all shrouded and sheltered beneath a transitory floating roof. This—the roof—which disappears with the dawn of day, and shrinks to such proportions that it can be disposed of in a small truck, is the outstanding feature of the interesting arrangement that transforms nightly an open garden into a closed theater. This is made possible by the fact that the roof is pneumatic—is, in fact, only slightly heavier than the atmosphere. It is composed of a large airtight silk envelope so shaped that when inflated it forms itself into an arch, like the groined roof of a vault, long enough and wide enough to cover both auditorium and stage. It requires very little support, and with guys and light cables it is retained in place. The silk fabric of which it is made is so transparent that it permits the penetration of the light from surrounding lamps, and with its roselike color imparts to this light a dainty hue that greatly enhances the beauty of this fascinating alfresco pleasure resort, which adds one more to the many charms of the world's most popular playground—a fitting haunt for the end of a perfect day.

AUTO BUMPER CONVERTIBLE INTO EMERGENCY TOW BAR

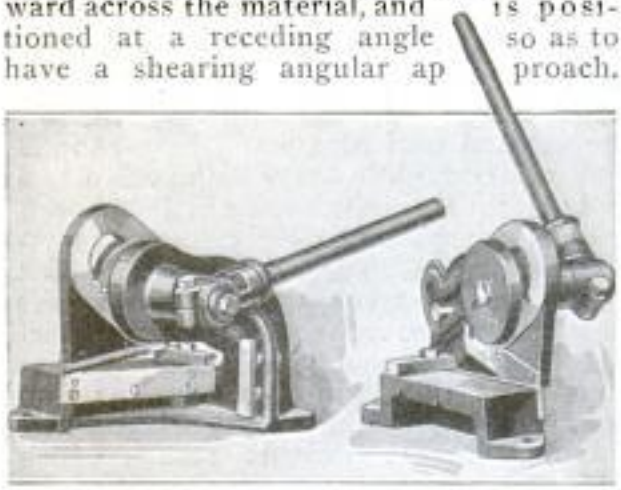
Motorists have observed that the best way to avoid trouble is to be prepared to combat it. This idea is carried out in the design of a new bumper which, on occasion, can be converted into a towing bar. The device is a simple bar of channel steel, made up and finished in the usual way. It is attached to the car-spring hangers by two short arms, ending in round, tapered parts like those on the ends of steel bed rails. These fit into tapered sockets, bolted to the spring hangers, in which they are held by plates bolted across the tops. A universal, hingelike fitting, at one end of the bar, ends in another of the tapered parts. At the other end of the bar is attached a 14-in. length of woven-wire belting, which normally lies concealed in the channel. To use, the bar is removed and the single taper fitting at the end inserted into one of the frame sockets. The belt is then wound around the rear-spring hanger of the towing car and brought back to the bar where its free end is locked by a clamp.



Below: Auto Bumper That can be Used as a Towing Bar; at the Left-Hand End Is the Towing Belt. The Two Arms at Right Angles to the Bar Fasten It to the Car When Used as a Bumper. Above, Left: The Bar When Used for Towing; Right, as a Bumper

BRAKE-LINING CUTTER HAS TRANSVERSE MOTION

The knife of a new brake-lining and belting cutter is driven transversely downward across the material, and is positioned at a receding angle so as to have a shearing angular approach.



Rear and Front Views of Cutter: It Makes a Clean Square Cut, Requiring No Trimming

It is operated by means of a rack and pinion, the rack, to which the knife is bolted, having teeth cast integral in a line angular with the shearing table when the unit is assembled, and meshing with a gear keyed to the shaft of a hand-operated lever. A pin pressed in the base and fitting loosely in a slot at the farther end of the rack is an element in the angular motion. The table is stated to be sufficiently long to insure the material being cut at right angles to the upper surface as it comes off the roll. The complete outfit weighs 22 lb. and is adapted to go in a space 8 by 12 by 20 inches.

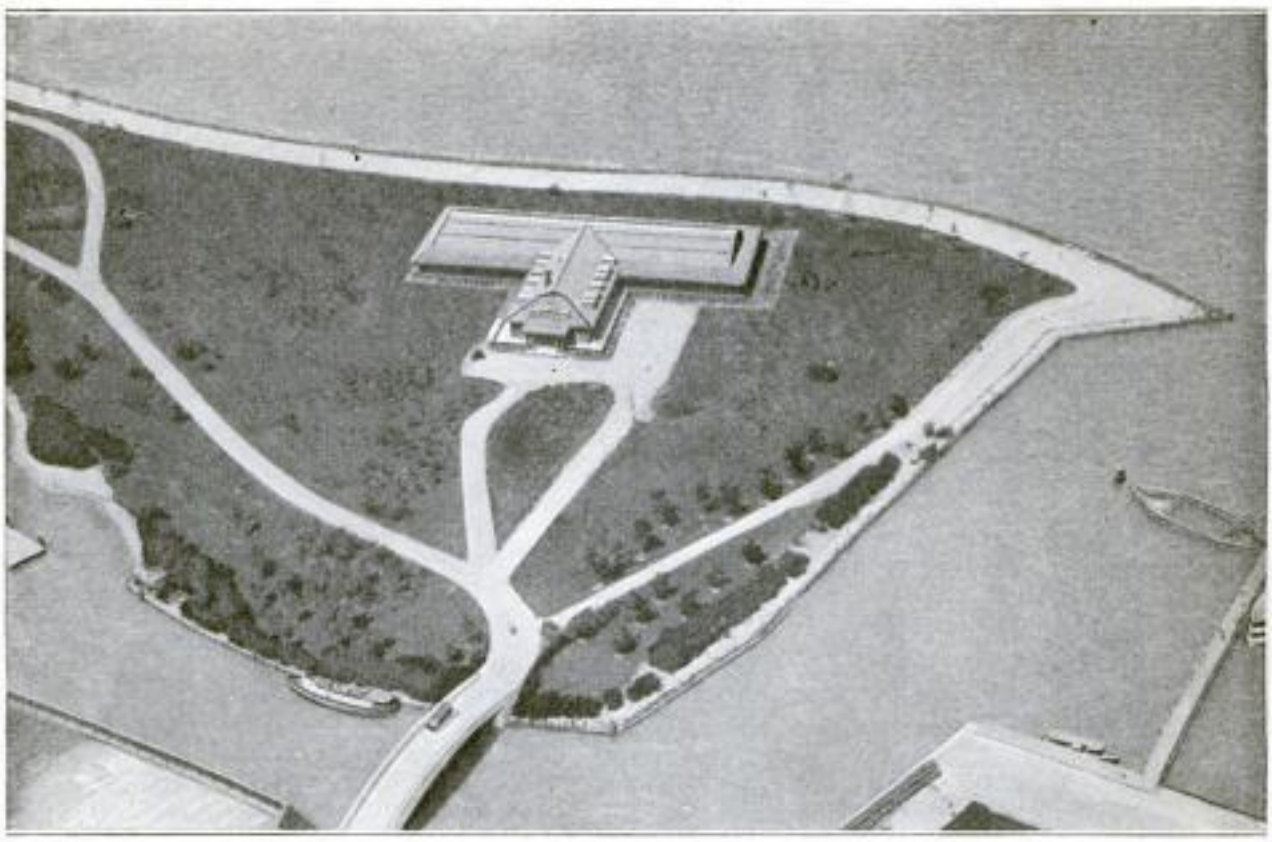
¶Swimming has been recommended as a form of exercise that can be taken by crippled war veterans suffering from injuries to the legs. The tendency of cripples to neglect their exercise is the cause of the development of chronic diseases, and a consequent undermining of health.

HUGE STEEL DOME FORMS LARGEST BIRDCAGE

Heavy steel netting supported by large steel arches and girders, forms a huge and palatial birdcage for the St. Louis collection of feathered beauties. Proud peacocks and hump-billed pelicans, curious cranes and cackling geese strut about the novel birdhouses built in the form of miniature palaces, citadels, towers, and rocky caverns; or swim in the beautiful artificial pools within the inclosure, which is 262 ft. long, 100 ft. wide, and 100 ft. high. A vaulted passageway, 10 ft. wide and 12 ft. high, forms a walkway through the center of the cage, affording visitors means for a closer inspection of the birds and their habits.

There are at present nearly 300 birds, gathered from all over the world, housed in the enormous cage.

Above: The World's Largest Birdcage, 262 Feet Long and 100 Feet High. Left: One of the Beautiful Pools Providing Sports for the Aquatic Birds. Right: Miniature Buildings Which Are the Homes for the Birds



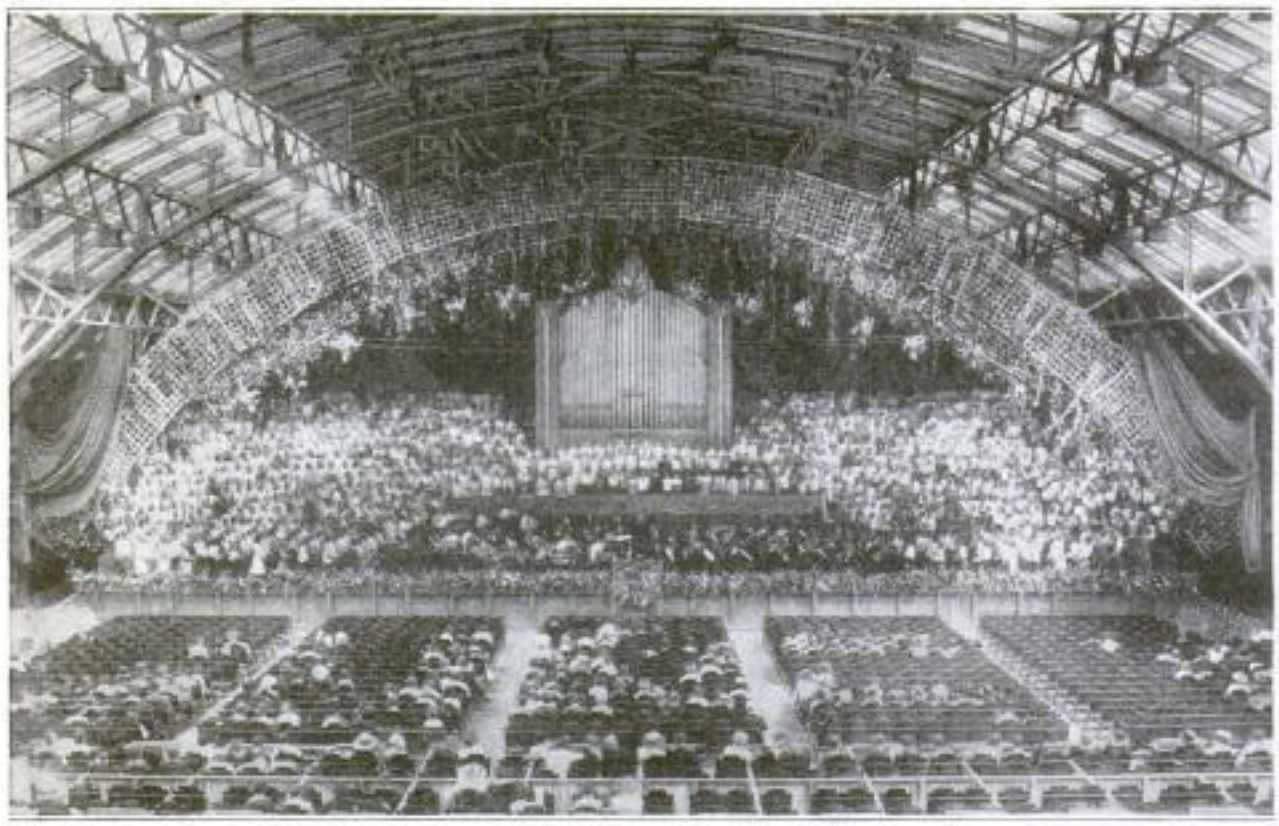
Airplane View of Open-Air Hospital on Simmons Island: The Upper Part of the "T" Is the Open-Air Portion of the Hospital Where Hammocks are Swung; the Lagoon and Bridge are Seen in the Foreground

OPEN-AIR SANITARIUM HAS SPACE FOR 300 BABIES

For a number of years, a fresh-air-for-babies institution has been supported through the public-spirited efforts of the Chicago Daily News. Recently, a modern open-air sanitarium with a capacity of 300 hammocks, replaced an old building on Simmons Island, Lincoln Park. The pavilion, which is open on all sides, faces Lake Michigan, and is built entirely of steel and concrete, making it a thoroughly safe and fireproof structure. There is a section for the more serious cases in a closed ward of the hospital building. The hospital is most modernly equipped to meet without cost all the needs of ailing babies of a great city. A new concrete footbridge has been erected to span the lagoon which separates the island from the mainland of Lincoln Park.

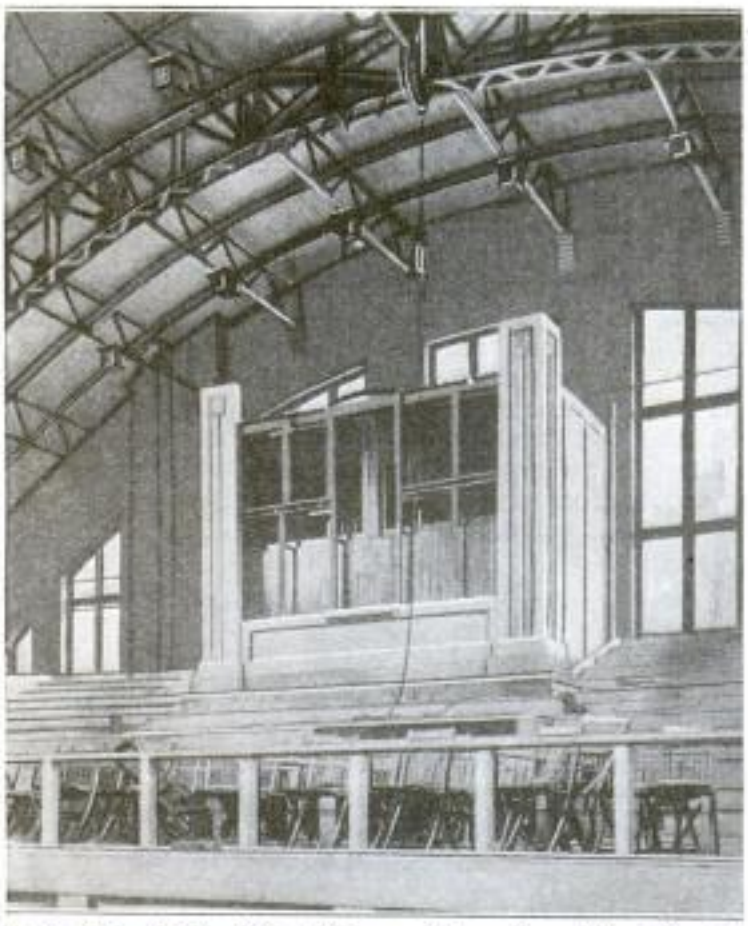
¶By means of a special valve which drains the water when the outside temperature reaches the freezing point, a French engineer has evolved a method of preventing frozen automobile radiators. The valve is actuated by water congealing in an exposed copper tube, which happens before the water in the radiator freezes.

Entrance to New Open-Air Sanitarium in Lincoln Park, Chicago, Facing Lake Michigan: The Center Portion Is the Closed Ward of the Hospital, While the Main Open-Air Wings Are to the Rear in the Picture. The Sanitarium can Care for 300 Babies at the Same Time



The Patten Gymnasium, Northwestern University, Evanston, Illinois, Annually Converted for One Week into a Concert Hall for the North Shore Musical Festival; This Year, for the First Time, There was Installed an Organ, Weighing 14 Tons, Which at the End of the Festival was Taken Down and Stored until Next Year

ORGAN PUT UP FOR CONCERTS, THEN TAKEN DOWN



Part of the Work of Installing an Organ for a Week for the North Shore Musical Festival Was the Erection of This Double-Stuffed Swell Box, Which Incloses All Speaking Pipes, Including Heavy Pedal Diaphones and Tubas

The Chicago North Shore Musical Festival has been held annually for some years in the Patten Gymnasium, Northwestern University, Evanston. This is the only available hall on the north shore of a sufficient size for the accommodation of the huge chorus and orchestra, and of the audience of over 3,500 people.

Hitherto the concerts have been given without any pipe organ, but this year for the first time adequate support for the large chorus, especially in the bass in which any orchestra is lacking, was supplied by an exceptionally fine organ. The great gymnasium building is converted each year for a week into a concert hall, which in itself entails a vast amount of work, and now added to this, will be the installation, regulation, and subsequent taking down and storage of this large organ. The instrument weighs about 14 tons, and it takes a staff of four organ men, and some laborers, two weeks to install it.

Included with the organ is a 3-in. double-stuffed swell box, which incloses all speaking pipes as well as the heavy pedal dia-

phones and tubas. Very high wind pressures are necessary to get the massive tone required for the support of such a large orchestra in a building of the size of this hall, and for this purpose a 10-hp. blower was used. This is now permanently installed in a special chamber in the gymnasium. The console was mounted on ball casters, so that its position could be changed to suit the disposition of the orchestra and chorus, which varied at the different concerts.

SUBMERGING BOAT ENLIVENS FROLIC OFF BEACH

There are boats that travel afloat and boats that travel submerged, and now there is being introduced a sort of link between the two—that is to say, a boat in which the passenger rides submerged to the shoulders with the head constantly above the surface. It is exclusively a pleasure craft, and is intended to furnish sport particularly suitable to the bathing beach.

The main body of the boat consists of a steel cylinder, 18 in. in diameter and about 10 ft. long, pointed at both ends. Suspended from one side is a hollow keel, 14 in. wide and 52 in. long. Inside this are installed storage batteries and a motor, together with a rheostat control of the motor, similar to that of a street car. Behind the keel is the propeller, and behind that a rudder. On the opposite side of the cylindrical body is fastened rigidly a seat, and stationed in front of it, a steering wheel for operating the rudder. On the wheel is a quadrant with a lever that controls the motor through the rheostat. Mounted in front of the wheel is a searchlight. On either side of the boat, conveniently within reach of the rider's feet, are pedals which control the inclination of four planes, pivoted, two in front of and two behind the rider's seat. These planes, in coöperation with the propulsion of the motor, control the depth at which the boat rides in the water. With power enough, and enough inclination of the planes, the boat could be submerged to a great depth, but this is prevented by a buoyant ball that rises on a tubular guide at the stern of the boat as it sinks. On top of the guide is a switch, which, when struck by the rising ball, cuts out the motor, preventing the boat from submerging more than to the rider's neck.

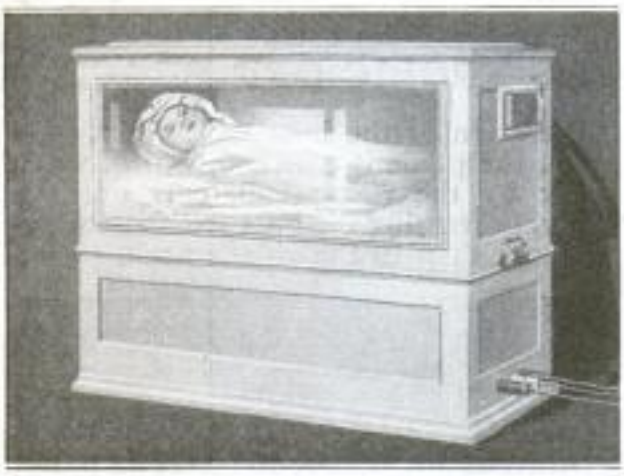
The Submerging Boat That Travels on the Surface, or below the Surface, as Shown, with the Rider's Head and Shoulders above the Water: The Propeller is Electrically Driven by a Motor and Storage Batteries Installed inside the Hollow Keel

With a little practice, it is claimed that the operator will be able to keep the boat at any depth in the water, from afloat on the surface to the depth that leaves the head just above it.

¶So-called "refresher courses" in flying are offered to veteran airmen in Canada, during a month's stay at Camp Borden, near Toronto, at government expense.

BABY INCUBATOR HEATED BY ELECTRICITY

An electrically heated incubator for babies, regulated by means of switches to four different temperatures, has been used

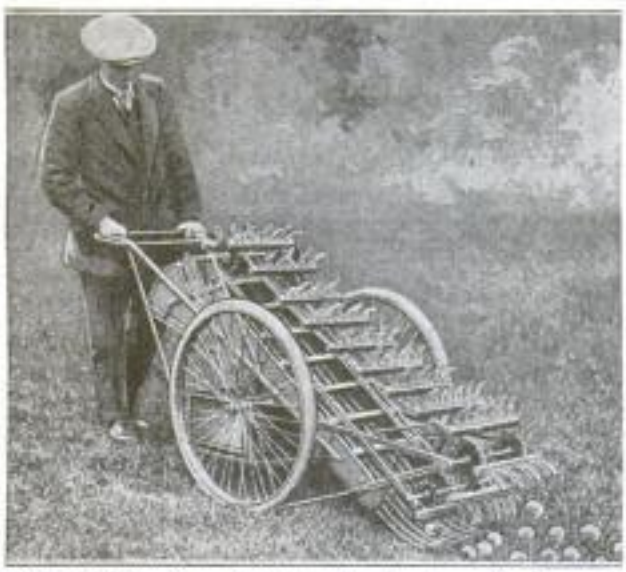


The Lower Section of This Incubator Contains an Electrical-Heating Apparatus Which can be Regulated to Four Different Temperatures

for some time in French maternity hospitals. The heated air reaches the incubation chamber through small ducts, in the corners, leading from the lower chamber that contains the heating apparatus and air intake. The temperature, which is observed on a precision thermometer, can be further regulated by means of valves at the top of the chamber.

MECHANICAL RAKE PICKS UP APPLES

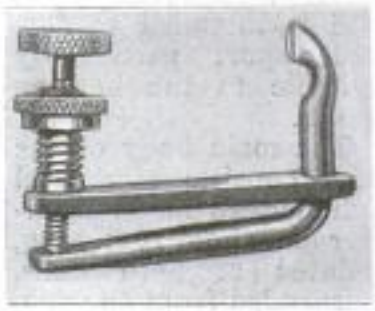
An ingenious hand-propelled apple picker is trundled over the ground and picks up apples and casts them into an underslung basket by means of an endless rake chain which is geared to the two side wheels. The endless rake revolves in a forward direction, picking up the apples and rolling them along an inclined grate into the basket. The device is propelled over the ground much like a gocart. With the aid of this apparatus one man is said to be able to pick 30 lb. of apples per minute. The rake has been used to some extent in British orchards.



The Rakelike Arms Pick Up Apples from the Ground and Deposit Them in the Basket at the Rear

STEEL VIOLIN STRING CHANGED QUICKLY BY NEW ADJUSTER

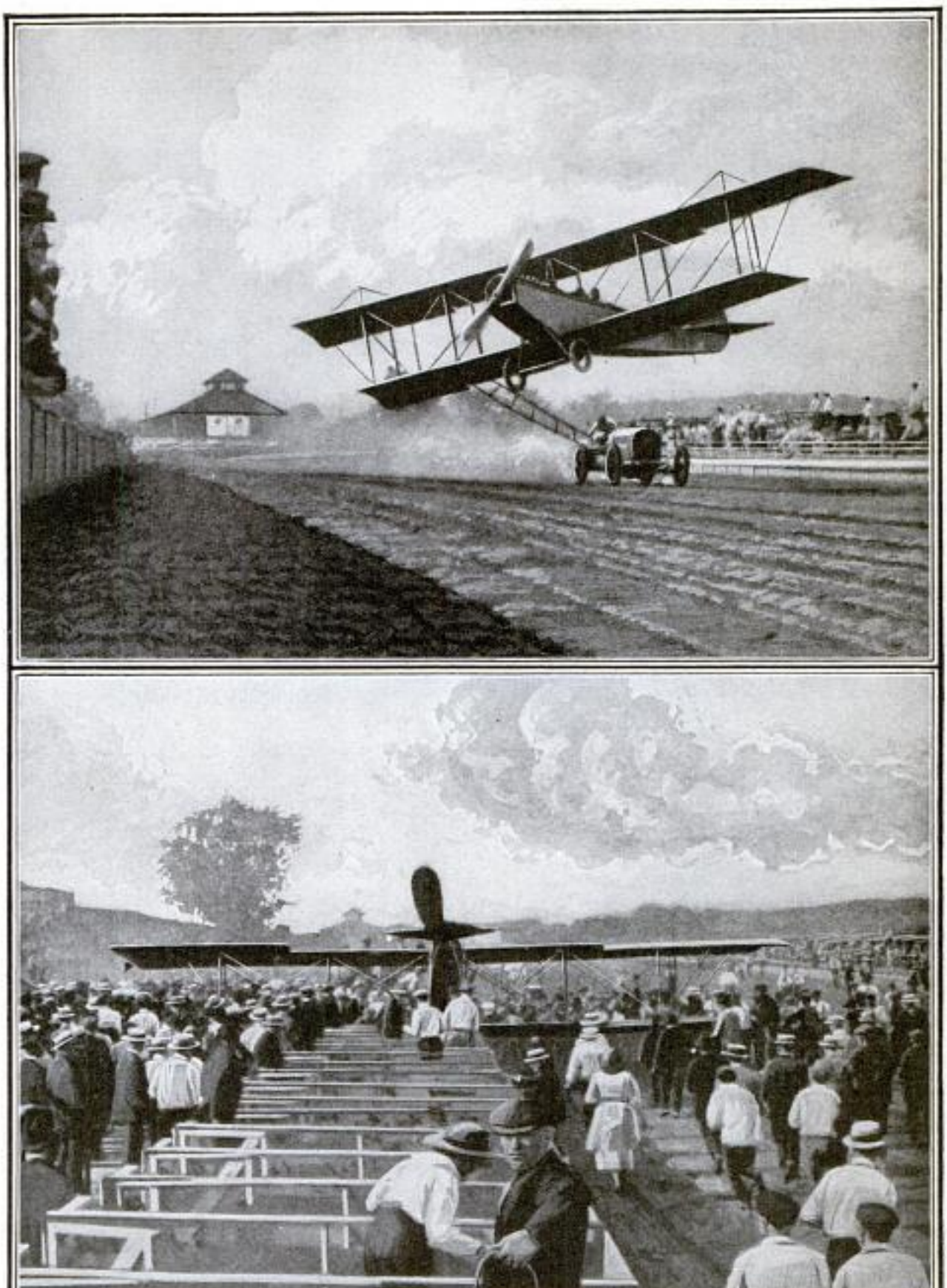
The increasing use of the steel E-string on the violin has created the necessity of an anchorage for this string by which it may be readily changed. In an adjuster recently designed for attachment to the tailpiece of the violin, the elements for quick and convenient removal are embodied. It consists of a metal strip which forms a base, and through one end of which is fitted a curved lever. At the opposite end of this base is a screw arrangement that provides means for adjusting the curved lever. The lever is hooked to receive the loop of the string, and as the screw is turned, the hook of the lever describes a backward movement tightening the string. The hook is slotted for strings that are made with a knot instead of a loop.



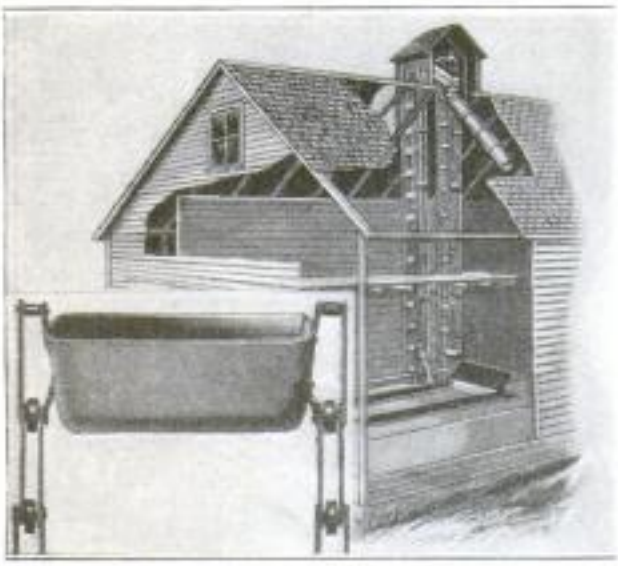
LARGEST OF REDWOOD GIANTS PRESERVED IN SEQUOIA PARK

The National Geographic Society recently presented the United States government with the title to the last 640 acres of land which complete the "big tree" stands forming Sequoia National Park. The park, established to preserve the most massive trees in the world from being converted into lumber, totals 1,916 acres. It was purchased in three sections, during 1916, 1920, and 1921, for a total of $146,330, only $50,000 of which was contributed by the government. The remainder was contributed by the members of the National Geographic Society, their friends, and by a tax levy of Tulare County, California.

STUNT FLIER MIRACULOUSLY ESCAPES DEATH



WHILE an airman was attempting to change from an automobile, running 75 miles an hour on a Milwaukee track, to an airplane traveling at an even greater speed, the rope ladder, suspended from the plane, caught in the exhaust of the automobile. The upper view shows the airman leaning from the speeding car in an unsuccessful effort to loosen the entangled ladder. The ladder being attached to the right wing, the plane was spun around, and in a moment was a wrecked heap in the grand-stand boxes, as shown in the lower picture. The flier saved himself by a 40-ft. jump from the car, which was also spinning around.



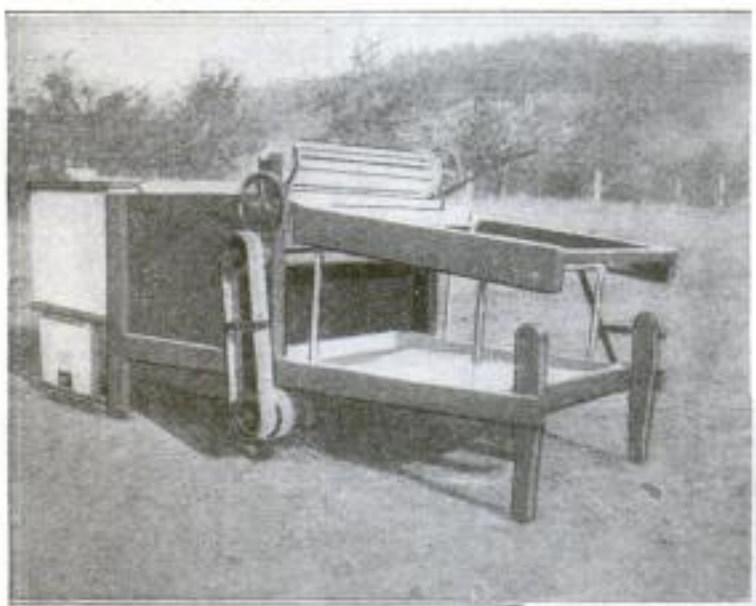
The Steel Used in the Late Chain-Cup Grain Elevator Is Heavier and Wears Better. Insert: Cup in Roller-Bearing Links, Which Reduce Friction and Dragging on the Guides. Though Light, the Elevator Stands a Breaking Strain of 16,000 Pounds

A CHAIN-CUP GRAIN ELEVATOR OF IMPROVED DESIGN

The heavy cups, made of a double thickness of No. 16 gauge steel where the wear comes, and roller-bearing links, characterize an improved grain-elevating apparatus recently offered on the market. The rollers are placed on each of the link pins and have the effect of preventing the chain from dragging on the guides. In this way the friction is greatly reduced and power saved. It is also claimed for the apparatus that, owing to the generous size and smooth finish of the cups, ear corn is handled with very little shelling. Only a small cupola, 6 by 6 ft. square, is needed for the top frame and shafting of the installation. In spite of its apparently light construction, the elevator will stand the enormous breaking strain of 16,000 pounds.

NEW APPARATUS USED TO TREAT PRUNES

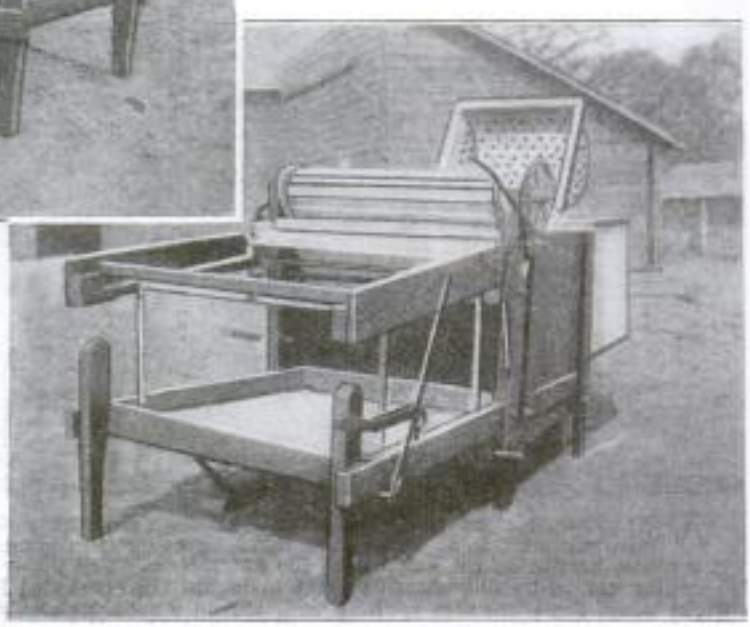
Shipping of prunes from the orchards where they are grown, to some distant treating plant, is expected to become unnecessary if a new treating device which will perform this work on the property of the grower is adopted.



This Prune-Handling Device Is a Washing, Drying, and Rinsing Machine. It is Used on the Property of the Grower and Eliminates Shipment to Packing Plants

This device is a veritable washing, drying, and rinsing machine. The prunes are first deposited in its heating compartment, where they are brought to the right temperature, and are then dumped into a tub for rinsing. This is accomplished by dashing the prunes through the water in the tub, on a hinged pan, which is raised and lowered by a rope. Scrapers then engage single rows of the prunes at the bottom of the tub, and deliver them in layers to a shaker frame, where they are dried.

¶ After sinking a shaft 500 ft., a rich copper lode has been discovered in the island of Yell, of the Shetland group.



A View of the Rinsing Pan in a Raised Position: From This Fitting, the Prunes are Moved to the Drying Frames

STAMPING OUT HYDROPHOBIA IN CHICAGO

By ROBERT H. MOULTON

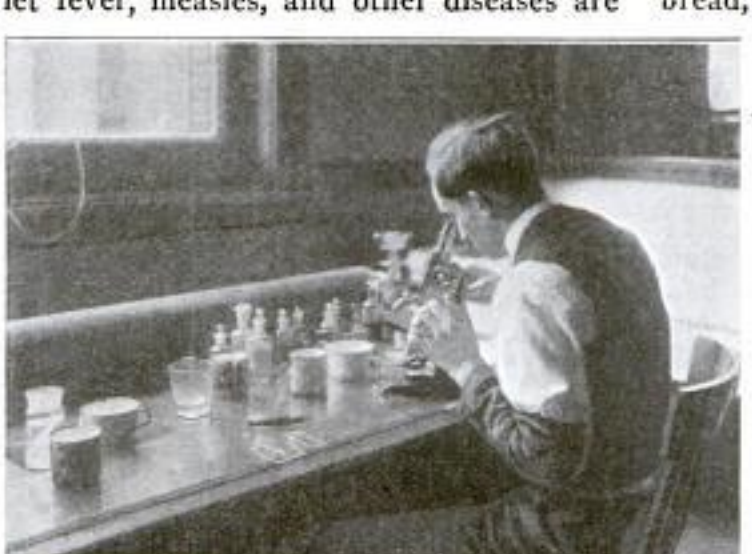
GUINEA pigs, rats, mice, and rabbits are the guardians of Chicago's health, according to the director of the city laboratories. In the city hall is a small menagerie of these prolific little animals, hundreds of which become martyrs to science every month.

These laboratories are among the greatest and best equipped of any city in the world. They contain every known scientific appliance, and a corps of bacteriologists, chemists, and assistants are here engaged both day and night looking for the deadly microbe and trying to check its ravages. There are millions on millions of germs held captive by the physicians for experimental purposes. But without the guinea pigs, the rats, mice, and rabbits, the scientists would be helpless and contagion would spread in every direction.

Part of the Zoo in the City Hall, Chicago: In These Cages are Kept Guinea Pigs, Rats, Mice, and Rabbits, Hundreds of Which are Experimented Upon Every Month in the Adjacent Health Laboratory, Mainly in the Fight against Rabies

The benefits that come to human beings from experiments with these humble rodents are really astonishing in their number and character. By their aid hydrophobia is discovered, the deadly tetanus, or lockjaw, bacillus is found, the germs of tuberculosis in a human patient are detected, the ravages of diphtheria, scarlet fever, measles, and other diseases are checked. They also aid in unraveling murder mysteries by enabling the scientists to identify human blood stains.

The principal part of the city zoo is located in a little room on the same floor as the laboratories. Here numerous cages containing the little animals are ranged along the walls. All the animals are kept under charge of an experienced keeper, and are cared for as painstakingly as if they were being prepared for prize shows. The rats and mice are fed with oats, bread, and milk, and occasionally a little cheese. The guinea pigs are kept fat on carrots and other guinea-pig dainties, and the rabbits rejoice in green lettuce and cabbage. The animals are kept in perfect health, and as far as possible, in good spirits, in order that the diseases given to them may be directly diagnosed and studied.



Examining Specimens of Brain Matter from a Dog Suspected of being Infected with Rabies: The Dangerous Germ, Known as the "Negri," Appears as a Black Spot in the Brain Cells

Probably the most interesting test is that for rabies, in connection with the effort now being made to stamp out hydrophobia in Chicago. In the examination for rabies, the suspected dog's brain is examined and a portion of it injected into a guinea pig. If rabies existed, the effect will be apparent in the guinea pig in a couple of days. Measures are

then taken to safeguard any person who may have been bitten by the dog, or otherwise brought into contact with the germs.

Of course every dog that bites a person is not mad; the important thing is to find out whether it is or not. If a dog bites a person, it is taken in charge by the police, but never killed if it can be avoided. It is taken to the city dog pound and put in a cage in a room set aside for such suspects. It is then carefully watched for thirty days. If it is mad, it will die before that time expires. In this case, its head is cut off and sent to the city laboratories, and the brain examined under the microscope for germs. These germs, called "negri" because of their discovery by Professor Negri of the University of Pavia, Italy, are in the form of little spots or bodies, located in the nerve cells of the brains of rabid animals. If they are found in the brain of a suspected dog, it is certain that the animal had rabies. Persons bitten by the dog are then communicated with and urged to go to the hospital for treatment. Twenty-five treatments must be given to the patient within the first 40 days following the bite. In order to do this, it is sometimes necessary to give four or five treatments in a single day.

After a Dog has Bitten Someone, It is Confined in a Cage in the Dog Pound and Watched for 30 Days. Should Rabies Develop, Any Persons Bitten by the Dog are Notified to Take the Proper Treatment

Marks Left on the Leg of a Man Who had been Bitten by a Mad Dog: A Dog Suspected of being Rabid should Never be Killed If It can Possibly be Avoided

To secure the serum used in treating the patient, the spinal cord of a mad dog is taken out, a mixture made, and this injected into a rabbit. Then, when the rabbit dies, its spinal cord is taken out and hung up to dry at room temperature. After eight days, and not later than twelve days, it is cut up, and a quantity sufficient to treat one person is culled. The serum is injected into the patient by means of a needle syringe.

The behavior of suspected dogs which eventually turn out to be mad varies with the individual. Some of them remain passive throughout their period of confinement, others are sullen and growl at persons approaching their cages, while a few keep up a continual barking, snapping, and snarling as long as anyone is in sight. There is a common idea that a mad dog shows an intense fear of water, and in case such an animal is seen to ford a creek or lake, this is taken as proof that he did not have rabies. Authorities declare, however, that this is a fallacy. The fear of water is a symptom usually marked in human cases, but is never present in the dog at any stage of the disease. Animals in the early stages, when running about the country, will cross bodies of water without the slightest fear. Even after the throat becomes paralyzed, the animal will often constantly attempt to drink water from a pail or bucket if placed within its reach, but owing to the paralysis of the throat muscles, which may not occur until late in the course of the disease, it is impossible for the animal to swallow.

Signs are Posted about the Pens of the Inoculated Rodents to Warn of the Danger of Rabies

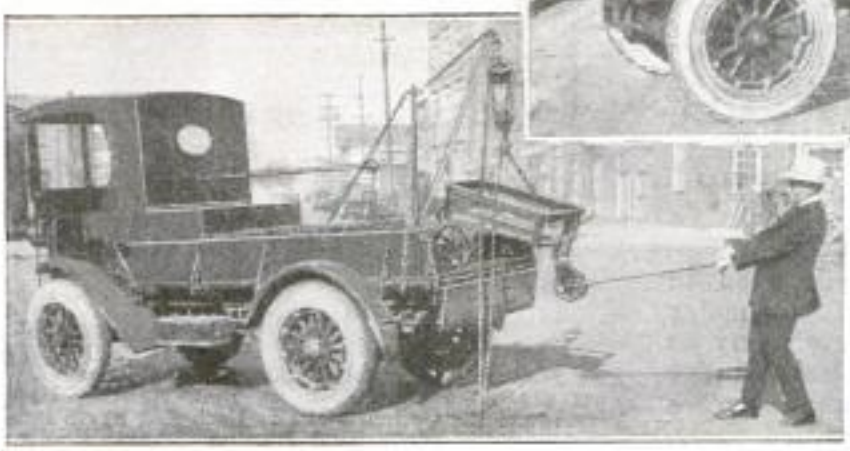
After a person is bitten by a dog, it frequently occurs that some friend will immediately look into the mouth of the animal. In case the mucous membrane is black, he will at once conclude that the bite is dangerous, even though the dog appears perfectly normal; but if the mouth happens to be red, he thinks there is no danger from the bite. This is entirely erroneous. The black color is due to a normal deposit of pigment in the mucous membrane of the mouth. It has no connection with rabies, and is present in a certain percentage of all dogs.

Equally general is the erroneous idea that a mad dog is necessarily violent. The fact is that there are two forms of the disease: the quiet or dumb form, and the active or violent form. In the first, the dog is quiet and drowsy, and shows little or no tendency to bite or run away. The lower jaw is slightly dropped and in this form of the disease, although the animal laps liquids, it is unable to swallow them. Weakness of the hind legs sets in, and the animal dies within a few days after this symptom has developed. In the second form, the animal is restless, sometimes irritable, and sometimes unusually affectionate. Frequently the dog runs away from home and returns in an exhausted and emaciated condition.

It should be remembered that secretions from the mouth of a rabid dog are poisonous whether it shows any tendency to bite or not, and if these secretions come in contact with a sore or an open wound on the body of a healthy animal or human being, they transmit the disease. The only safe rule to follow in handling a sick dog is to wear heavy gloves and to avoid secretions from the mouth. It is commonly supposed that the danger from hydrophobia comes from the roving, ownerless, stray dogs of the city. This is not the real truth. Most of the victims of hydrophobia are bitten by dogs or cats that are household pets. For this reason, until it is absolutely certain that one's sick dog has not hydrophobia, the only safe thing is to assume that it has, and act accordingly. The dog should be kept under observation and out of the way of human beings and other animals for thirty days. If it has the disease, it will succumb to it in that time.

TRUCK FOR TESTING SCALES ELIMINATES HEAVY WORK

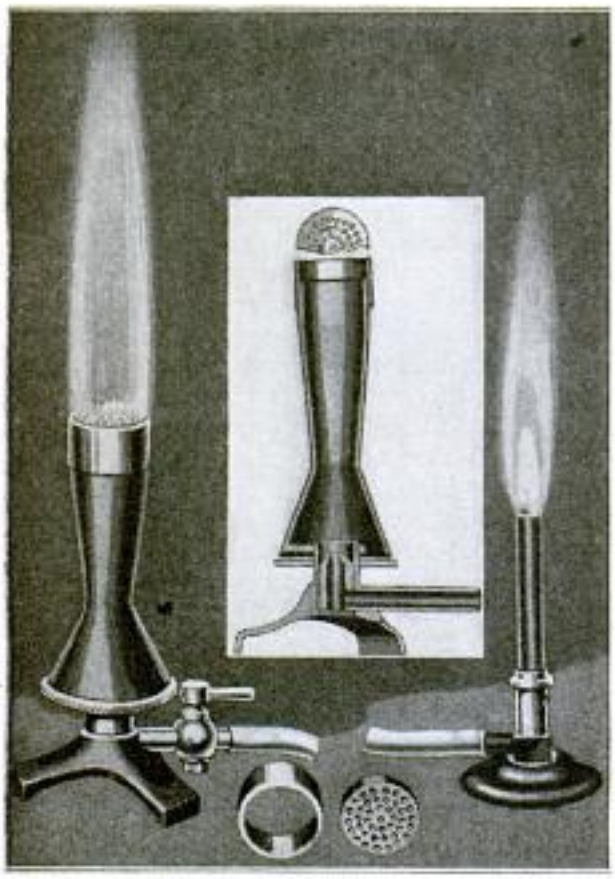
Testing wagon scales and other heavy-capacity weighing apparatus involves much back-breaking work on the part of the inspector, and Alameda County, California, has lessened the work by the use of a labor-saving test truck. This truck, loaded with 10,000 lb. of 50-lb. test weights, is driven first on one end of the scale and a reading taken, after which the operation is repeated on the opposite end. In case it is necessary to check the individual corners of the scale, a hand truck is lowered from the motor-truck bed to the ground by the use of a winch. The necessary test weights are placed on this hand truck or "dolly" and drawn about from corner to corner, thus relieving the weighing officer of the heavy labor. The hand-truck weight is considered in the test-truck load when the larger truck is used as a standard for a test.



Wagon-Scale Testing Outfit. Large Truck for Testing Ends of Platform. "Dolly" for Testing All Four Corners. Left: Lowering Dolly from Truck

NEW BURNER INCREASES SIZE AND HEAT OF FLAME

A new type of burner, intended to replace the familiar Bunsen burner, has for its object the increase in size and heat of the flame. This is accomplished by two main fitments of special design—a top piece with numerous small holes to increase the pressure and cause a more complete combustion, and a body portion which is narrowed in the middle, to permit nice adjustment of the pressure. In this manner the size and heat of the flame, and the efficiency, for amount of gas used, are greatly augmented. Temperatures reached by the new burner have been checked as high as 1,450 to 1,850° C. (2,640 to 3,390° F.). The headpiece is made of a refractory material.



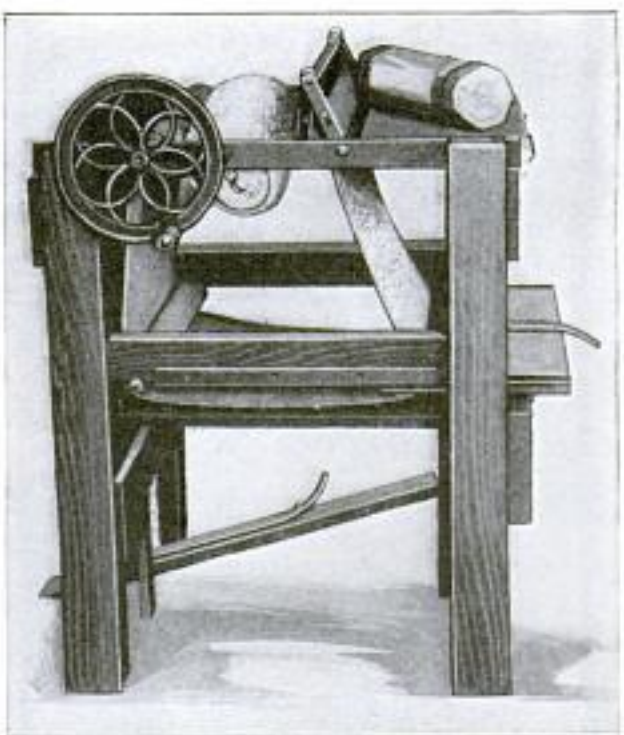
Left: A New Gas Burner Which Throws a Much Larger and Hotter Flame than the Old-Style Burner at the Right. Center: A Section of the New Burner

PENNIES USED TO BLOCK UP MOTION-PICTURE SEATS

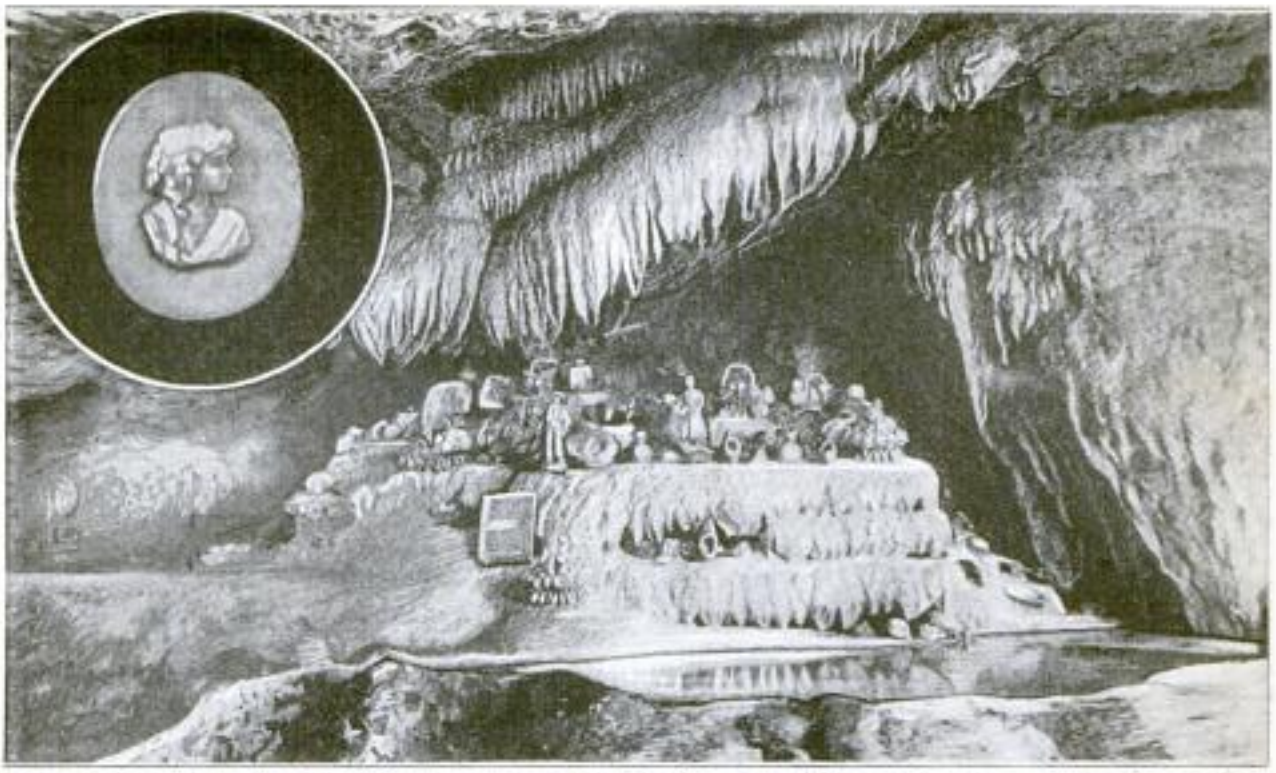
Nine thousand pennies were used in blocking up the seats of a movie theater in Madison, Wis., recently. As many as eight to ten pennies were required under some of the seats. The chairs were originally screwed to the inclined floor, but the slanting bottoms proved uncomfortable, so the manager finally decided to block up the front ends and throw the bottoms back to a level position. Two long screws hold each set of pennies in place and the seat to the floor. It is believed that the difficulty of removing the pennies will deter petty thieves from stealing them.

MACHINE ROLLS COTTON LIKE CIGARETTES

A hand-operated machine which rolls cotton into bundles much after the fashion that tobacco is rolled into the form of a cigarette, is used by the U. S. Bureau of Markets in preparing the article for delivery to dealers during the buying season. Formerly the product was packed by hand, the result appearing generally in unshapely bundles, no two of which were of the same size. By the old hand method a man required 10 minutes to roll a 1-lb. bundle of cotton. The machine cut the time to two minutes. It is operated by means of a handwheel which rolls a belt back and forth part way round a mass of cotton until it becomes cylindrical. A foot treadle, which works against a spring, enables the operator to keep the belt in tension against the cotton during the rolling process. In this manner packages of symmetrical form and uniform size are obtained.



This Machine Rolls Cotton in Much the Same Way That Cigarettes are Rolled. A Belt, Running Part Way round the Cotton, Rolls It Back and Forth into Cylindrical Bundles



View of Cavern Showing the Dripping Pendants Hanging from the Roof: Below These Are Various Articles in the Process of being Crystallized; the Insert Shows One of the Cameos Made by the Dripping Process

CAMEOS FORMED BY MINERALS DRIPPING FROM CAVERN ROOF

A French engraver is making nature supply a trade in commercial cameos that is becoming of considerable importance. Water dripping from the stalactites or pendants, hanging from the roofs of caverns, contains a great amount of minerals in solution; so much so that things placed in one of these caverns will be covered with a mineral deposit in a few days. This engraver places a block of steel securely fastened to the floor, and having a figure engraved on its upper surface, under a dripping pendant. Due to the intense humidity, evaporation and crystallization are very slow. It takes about six months to fill the steel die, after which the hard mineral mass may be removed with the point of a knife, yielding a beautifully formed cameo.

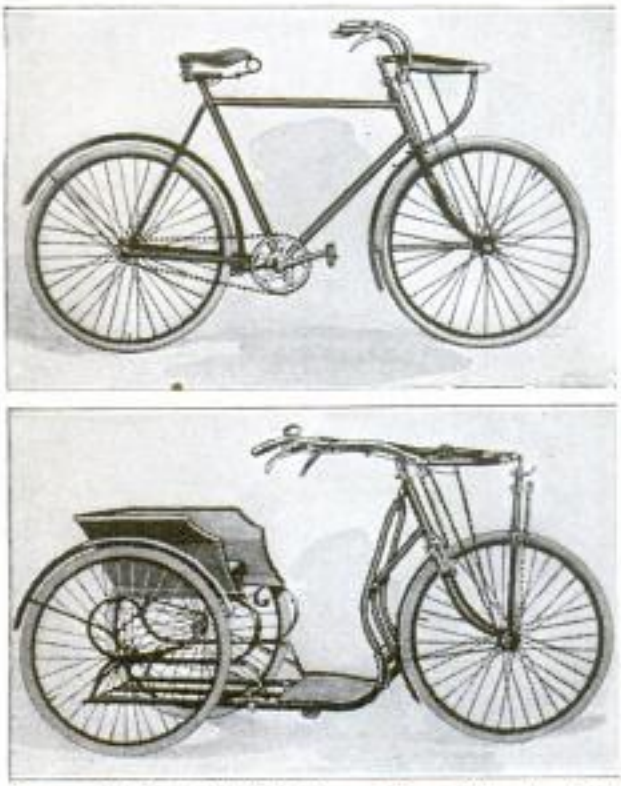
ELECTRIC-MOTOR DRIVE FOR MOVIE CAMERA

In the taking of moving pictures one of the chief requirements is to keep up an even turning of the handle. Normally this is not hard to do, but in airplane work the vibrations of the motor and the awkward working position forced by the clumsy tripod offer serious difficulties to steady turning. An electric drive for the cameras is claimed to overcome these difficulties. A 1/20-hp. motor is mounted on top of the camera, and operates on an 8-volt, 60-ampere battery. The operator holds the camera firmly against a vibration-absorbing air cushion on his chest.

The Airman is Grasping the Movie Camera by the Side Handles. A Small Electric Motor Drives the Camera

FRONT DRIVE FOR BICYCLES UTILIZES ARM POWER

A front drive for bicycles, developed by a Belgian inventor, is said to add materially to the tractive power of the vehicle. A sprocket on the front axle is driven by a chain operated by the handlebars in much the same manner that the pedals propelling the rear wheel are operated. When used in tandem, it is claimed that much greater speed may thus be effected. In addition, the principle has been applied to a tricycle, also developed and tried out in Belgium.

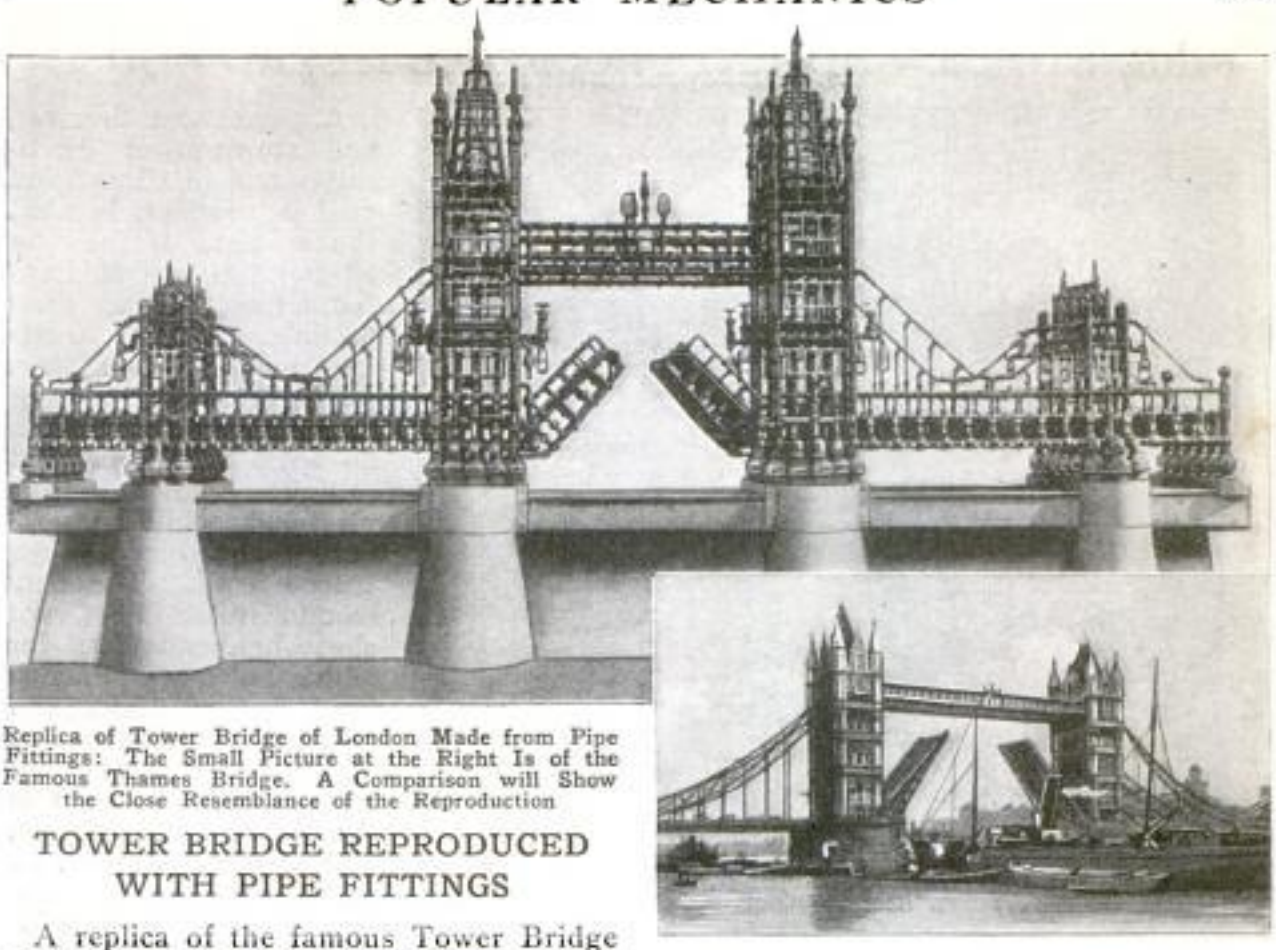


Above: A Bicycle Which Has a Front Drive in Addition to the Regular Pedal Drive; the Handlebars Operate Similarly to the Pedals. Below: The Principle of the Handlebar Drive Applied to a Tricycle

WHEELED STORE SELLS SHOES BY WINDOW DISPLAY

A portable shoe store, fitted up by an enterprising Pennsylvanian, consists of a large boxlike frame, inclosed in plate glass and mounted on a light truck chassis. Both sides of this special body are divided into rows, so as to form showcases containing shoes of various styles and prices. Through the center of the body and accessible by means of a rear step, runs an aisle furnished with chairs, so that customers attracted by the window display may be fitted with the desired footwear. With this device the owner covers the entire state of Pennsylvania, retailing shoes to both country and townspeople, and is thus enabled to reach territory not otherwise easily accessible. Moreover, the open display combined with the novelty of a portable store naturally possesses great drawing power.

This Portable Shoe Store is Used by an Enterprising Eastern Salesman in Retailing Shoes throughout the State of Pennsylvania. The Body of the Car is Inclosed in Plate Glass and the Shoes are Displayed on Three Rows of Shelves on Either Side. Fitting is Done in a Central Aisle



Replica of Tower Bridge of London Made from Pipe Fittings: The Small Picture at the Right Is of the Famous Thames Bridge. A Comparison will Show the Close Resemblance of the Reproduction

TOWER BRIDGE REPRODUCED WITH PIPE FITTINGS

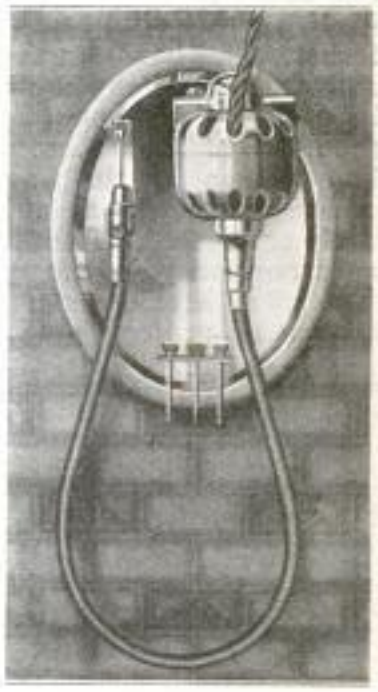
A replica of the famous Tower Bridge of London has been made with 15,358 pipe fittings taken from the regular stock, and comprising 230 different kinds of elbows, tees, crosses, nipples, valves, caps, etc.; all this without the use of one left-hand thread. The replica is approximately 19 ft. long by 11 ft. high and 4 ft. wide, and is complete in detail and mechanism as to towers, cables, roadway, elevators, roller lift bridge, and traffic-regulating lights. The lifts and elevators are raised and lowered by specially devised machinery. The lights flash automatically as traffic is closed or open.

USE METALLIC MAGNESIUM FOR INSULATORS

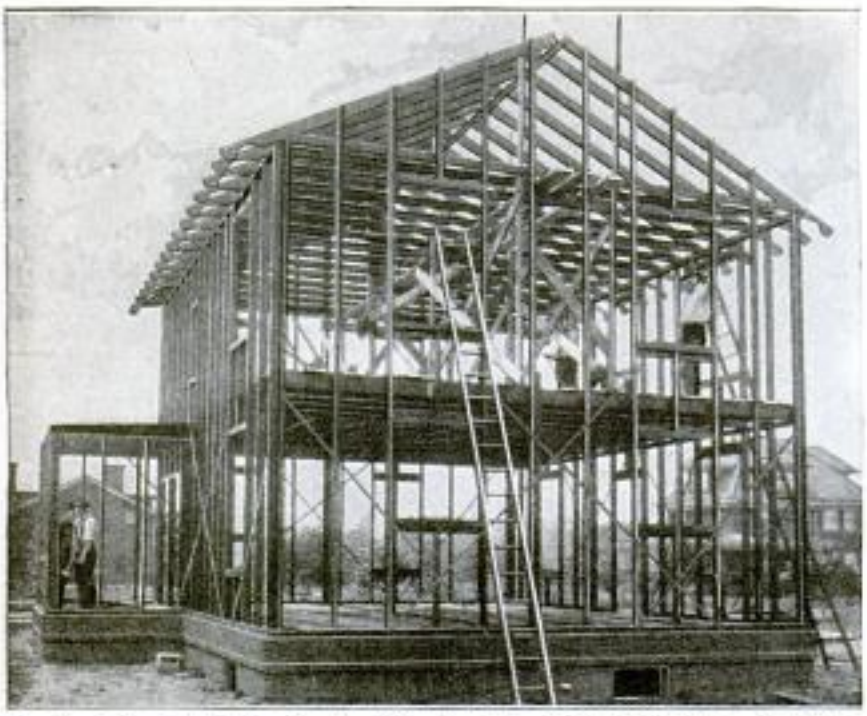
The fact that high-pressure steam creates a firmly adhering, protective and highly insulating surface oxidation on metallic magnesium, which can only be removed by heavy hammering, is the basis for the manufacture of electrical insulators for high-pressure transmission lines from this metal and its alloys. Fifteen minutes' exposure of the metal to steam at 20 atmospheres will form a layer of the oxide thick enough to resist a pressure of 20,000 volts. Electric-heating appliances, made from steam-treated magnesium, have thrice the radiating power of similar devices made of ordinary metal.

ELECTRICAL TOOTHBRUSH FOR HOME USE

The modern bathroom can now add a standard toothbrush to its list of electrically operated toilet devices. A small 110-volt motor, using either direct or alternating current, and carrying a small flexible shaft which rotates the brush, is mounted on an oval, ivory-framed mirror, 8½ by 6½ in. The speed of the brush is controlled by pressing the thumb on an hexagon button, making its use simple for the novice. In appearance, the equipment adds materially to the neatness of the bathroom. Separate individual brushes are provided.



FIRE, STORM, AND RAT-PROOF ALL-METAL HOUSE

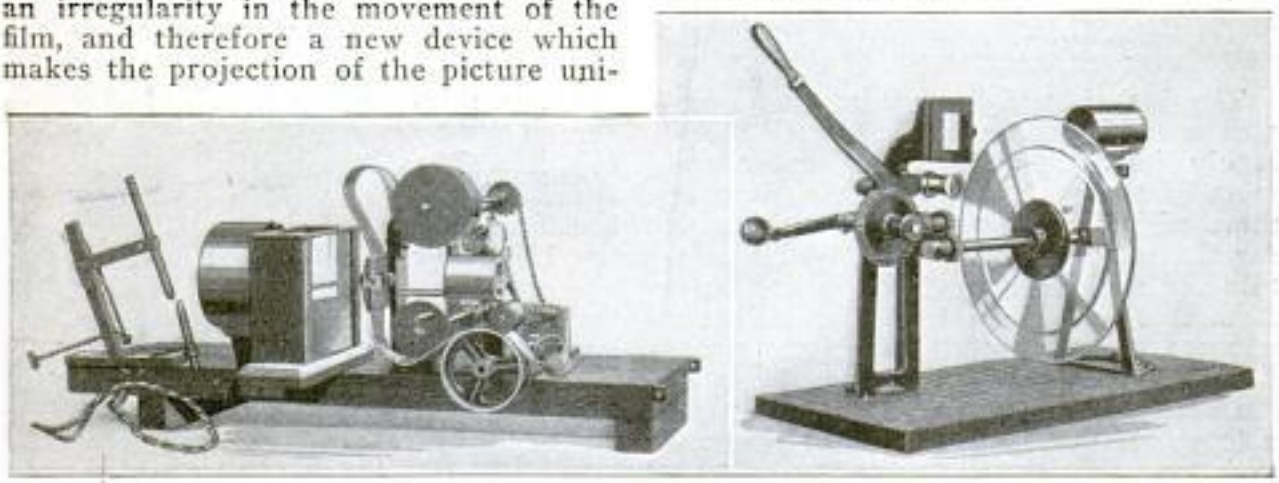


Showing the Metal Framing in Place for the All-Metal House: The Possibilities for Development of Porches, Bays, Alcoves, and Exterior Finish Are Apparent. The Only Wood That Enters into the Construction Is in the Flooring, Roof Sheathing, and Trim

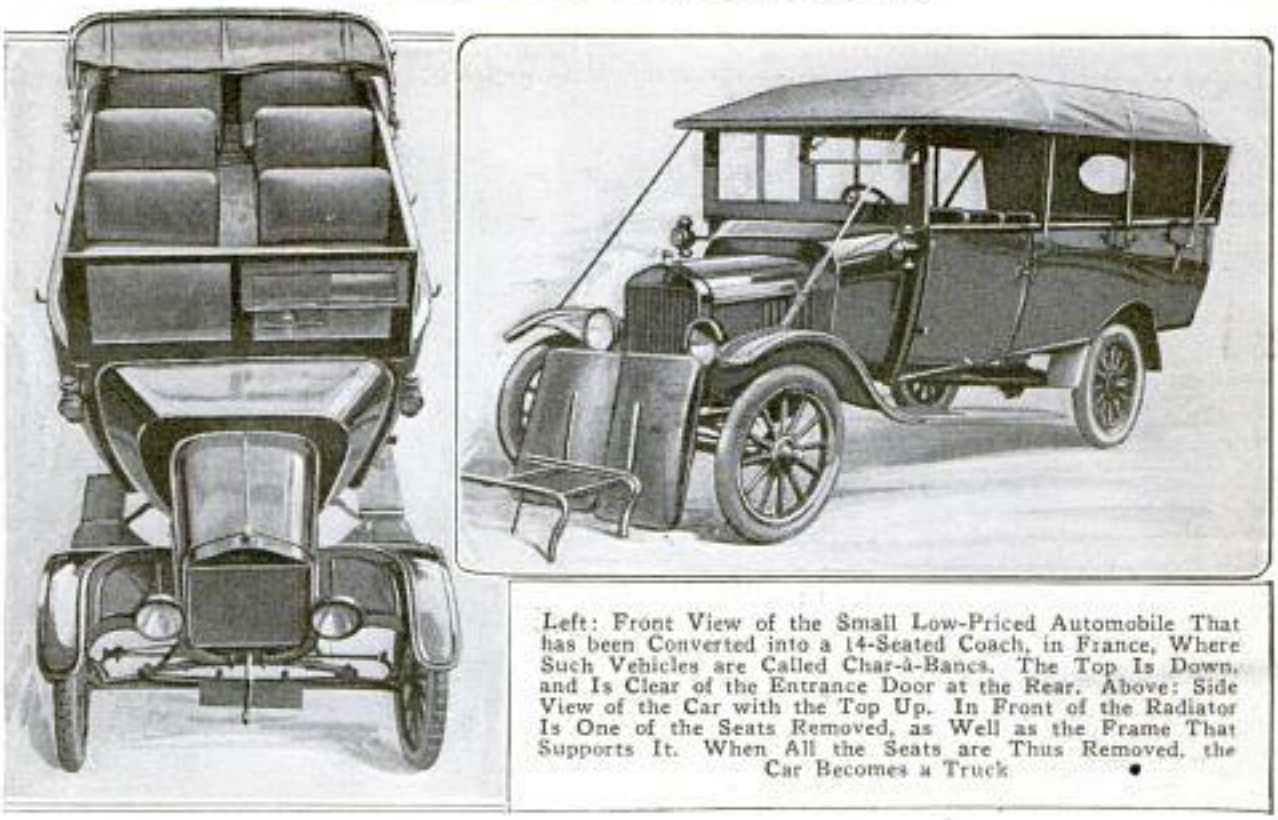
A permanent fire, rat, and storm-proof dwelling, warm in winter and cool in summer, is what the builders of the first all-metal house at Canton, Ohio, claim for their product. All the framing, including studding, joists, and rafters, is of metal. Metal lath covers all walls, partitions, and ceilings. The interior is plastered, while the exterior is to receive a stucco finish. The only wood is in the floors, roof sheathing, and trim, for which holes are punched in the steel shapes to take the nailing strips. The steel structure is imbedded and anchored in the masonry foundation. The steel units are to be standardized.

MOTION PICTURES PROJECTED WITHOUT ANY FLICKER

In the projection of motion pictures, if the motion of the objects in the pictures of the film could be registered alone without any irregular movement of the film itself, there would result movies without flicker. This has been the most objectionable feature of the motion picture from its earliest days, about 30 years ago, and though there has been, since then, great improvement in the way of modification of the flicker, it has never yet been entirely eradicated. The flicker is caused by an irregularity in the movement of the film, and therefore a new device which makes the projection of the picture uniformly continuous has removed the flicker, and also concurrently allowed the projection to take place at a slower speed. This has been effected by the use of a glass disk with a prismatic rim that passes by the aperture through which the picture is projected, and changes the angles of the projected light rays so as to render them uniformly consecutive, without any pause in motion at any point in the projection. The result is entire absence of flicker, and the elimination from the projecting machine of any necessity for a shutter, which up to the present has been the only means of modifying the flicker.



Machine That Projects Motion Pictures without Flicker by Means of a Prismatic Glass Disk, Shown to the Right on a Larger Scale: The Disk Passes the Aperture through Which the Pictures are Projected and Permits the Film to be Moved at Uniform Speed



Left: Front View of the Small Low-Priced Automobile That has been Converted into a 14-Seated Coach, in France, Where Such Vehicles are Called Char-à-Bancs. The Top Is Down, and Is Clear of the Entrance Door at the Rear. Above: Side View of the Car with the Top Up. In Front of the Radiator Is One of the Seats Removed, as Well as the Frame That Supports It. When All the Seats are Thus Removed, the Car Becomes a Truck

SMALL LOW-PRICED MOTOR CAR MADE INTO 14-SEATED COACH

There has been built in this country for a long time a light, low-priced car that is convertible, at any time, from a pleasure car into a 1-ton truck by a change of the body. In France, one of these cars has been altered, in much the same manner, into a 14-seated coach, or as such vehicles are universally known in Europe—a char-à-bancs. Moreover, it can also be used as a truck, for the seats are all removable. There is a door at the front for the driver, but the entrance for the passengers is at the back. Connected to the car is a large top, which when not in use swings down to the rear, clear of the entrance door. The seats have angle-iron frames with loose tops, each accommodating two passengers, and are in two rows with a gangway between them.

ANTIQUATED CORN SHELLER SERVES IN DESERT PLACE

A rancher, isolated from modern improvements and methods on a desert stretch in Lower California, is using a very old method of shelling corn. A high platform of logs is built to receive the cornstalks. These are laid on the floor of the platform and their ears beaten until they are cleaned of their kernels. The logs are spaced to permit the grain to drop into a pan below and still retain the stalk above. This old-time threshing floor has a reed railing around it to prevent the wind from blowing the grain away.

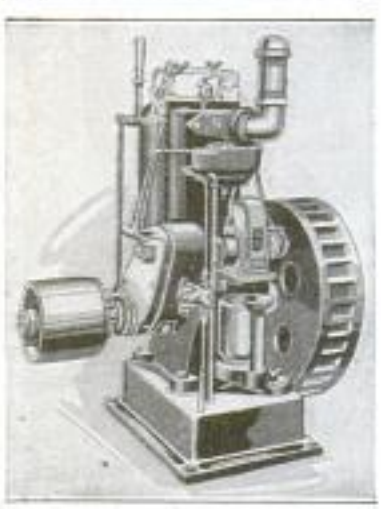
Primitive Method of Shelling Corn upon a Raised Platform of Logs, Made by a Settler in Lower California

SHEET-METAL BASEBALL MASK MAY REPLACE OLD WIRE MASK

A new kind of baseball mask that is said to be lighter, cooler, stronger, and to provide more unobstructed vision than the old wire masks is the result of the work of a New Jersey inventor. The mask, made of an aluminum alloy, is shaped to fit the head, with ample ear protection, and has opposite the eyes an opening that is small enough for safety, and yet is so large that there is a very wide range of vision. There are other openings for breathing and coolness. It is made in three sizes that weigh from 17 to 25 oz., and therefore is lighter than corresponding sizes of wire masks. At present the metal of the new mask is a little more than ⅛ in. thick, but the inventor claims that it would be amply strong at one-half that thickness. The mask has been put to many tests, and is used to some extent in the big leagues.

MOTOR HAS ROTARY RADIATOR THAT IS ALSO ITS FLYWHEEL

Instead of depending upon a rotary fan to cool a gasoline engine's radiator, it would seem that it should be more effective to rotate the radiator itself. This is actually being done in a motor that is used mostly in connection with grain and rice harvesters. It is indeed more than a rotary radiator, for it also takes the place of the flywheel. This flywheel-radiator, as it might be called, is in the form of two contiguous disks mounted on the crankshaft, with the space between them made cellular, and having a large radiating area. Through the interior of these cells the water circulates, and the hub of the flywheel-radiator is connected by pipes to the water-jacketed cylinders, and to the source of water supply. Its rotation not only helps to cool the water, but on account of the difference in weight of hot and cold water, its circulation is aided by centrifugal force.



AUTOMOBILE ASH TRAY HOOKS TO UPHOLSTERY ANYWHERE

A pleasing little motor-car refinement is a combination cigar-ash receptacle, drinking cup, and vase holder, which can be instantly attached to the upholstery of the car in the most convenient location, by means of two sharply pointed hooks, projecting from the back of the bracket. This construction permits the beautifully nickel-finished ornament to be shifted from place to place as desired. The ash cup may be removed from the bracket, leaving the latter available for the installation of a small vase.

MOLD OR DECAY IN WOOD PULP PREVENTED BY ANTISEPTICS

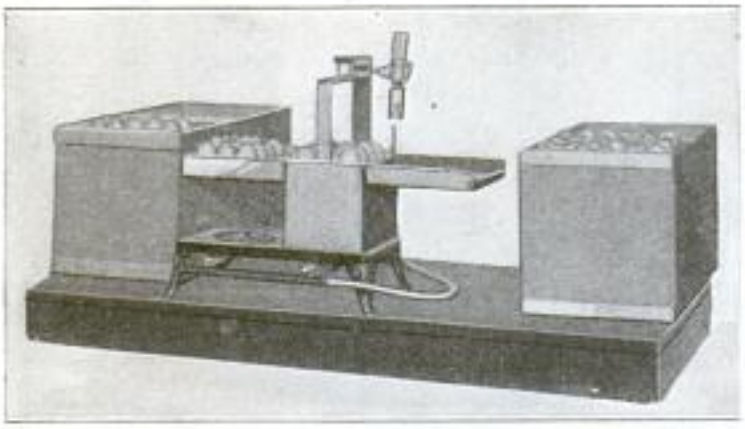
During storage wood pulp is subject to serious losses on account of decay and the formation of mold. It has been proved that this can be prevented by treating the pulp with certain antiseptics. In tests made at the Forest Products Laboratory, at Madison, Wis., several preservatives were found which kept ground wood pulp clean for a year under the most severe conditions. In these tests the pulp was actually inoculated with active mold spores, and wood-destroying fungi, and yet the antiseptic prevented infection. Several different chemicals were tried, many being excellent antiseptics, but having either poisonous properties or other objections, and finally it was found that, all things considered, sodium fluoride gave the best results, with borax a close second.

BLASTING SNOW FROM ROAD OVER MOUNT RAINIER

Blasting Snow from the Roadway at Rainier National Park, Washington: The Official Photographer for the Park Approached Almost Too Close, and Came Near Going Up with the Blast. Charges of T. N. T. were Resorted to in Clearing the Road to Paradise Inn This Spring After Snowplows had Proved Ineffective

Giving an Idea of the Depth of Snow Which Collects on Mount Rainier during the Winter: In Clearing a Path to Paradise Inn, Which Is 26 Miles from the Park Entrance, 35 to 50 Pounds of T. N. T. were Shot Off Every 10 Feet. In This Manner 25 Tons of the Explosive were Used in Clearing Four Miles of Road

NOVEL MACHINE STERILIZES AND SEALS EGGS



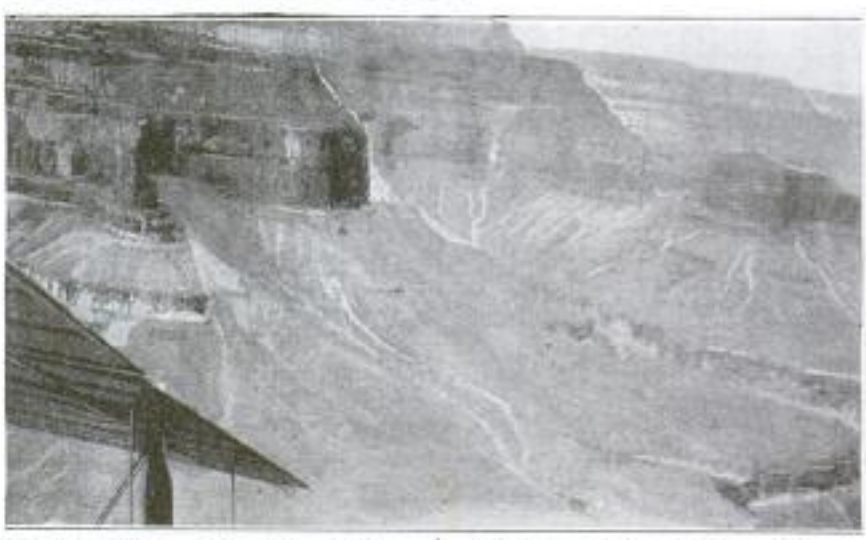
By Means of a Rack in the Middle of This Machine, Eggs are Lowered into a Hot Oil Solution for Hermetic Sealing and Sterilization

A machine which not only sterilizes but hermetically seals the eggshell, making refrigeration unnecessary, is now being manufactured by a middle-west concern. The eggs are immersed in a solution of oil at or above the boiling point of water, 212° F., for five or six seconds; and it is said that the contents are in no way modified or injured by this method. The eggs are transferred, three dozen at a time, from case to rack and lowered by hand into the sterilizing fluid, which is entirely taste and colorless.

RIDING THE GRAND CANON BY AIRPLANE

Negotiating the Grand Cañon by airplane has been accomplished recently by Lieut. Alexander Pearson of the army in a DH-4 plane equipped with a 400-hp. Liberty motor. Lieutenant Pearson flew down the great gorge from Williams, Ariz., making numerous excursions to Marble Cañon, Supai, Cataract Cañon, and other localities famed for their stupendous and awe-inspiring scenery. On his second trip out he found a field in the forest of Kaibab which is about 18 miles north of the north rim of the cañon and 9,000 ft. above sea level. Without previous study of the place, the lieutenant landed and took off again, thereby establishing what is thought to be a world's record for starting from the ground at such an altitude. Lieutenant Pearson afterward expressed himself as surprised at the ease with which he rose into the air as it is generally difficult to take off in rarefied atmosphere. The survey was made at the instance of the Department of Interior to ascertain the air conditions and possible landing

Lieutenant Alexander Pearson and the 400-Horsepower DH-4 Plane with Which He Recently Explored the Grand Cañon to Study Air Conditions and Find Landing Places

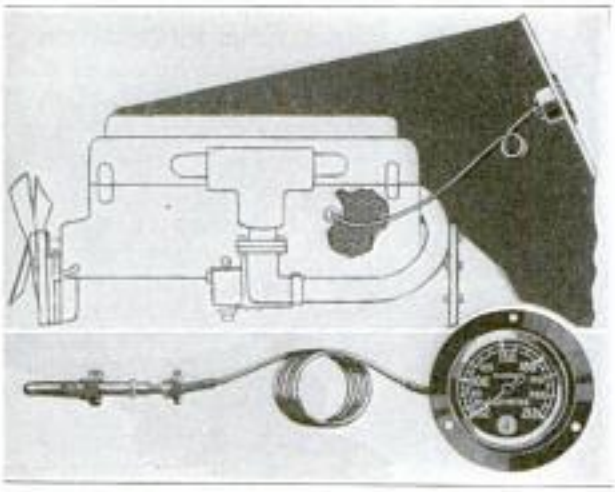


The Grand Cañon Is Thirteen Miles across the Top in This District and Seven Miles at the Bottom. A Wing of the Airplane is Shown in the Left Corner

places between the Union Pacific in Utah and the Santa Fe in Arizona in preparation of mail and passenger service between these two lines.

DASH THERMOMETER FOR CARS ELIMINATES THIEVERY

To prevent ready access to thieves, a feature common to radiator-cap devices, a dash thermometer for automobiles has been devised which, because of its positional insertion, is designed to eliminate this possibility. It is stated also to be more accurate, being calibrated within two degrees. It consists of a short cylindrical bulb, inserted in the water jacket of the motor, containing a liquid such as ether, which expands upon application of heat. The bulb is connected to the instrument head on the dash by a thin hollow tube so that pressure is transmitted to an S-shaped hollow spring sealed at one end and contained in the dash casing. The resultant movement of the spring is



Above: Diagram of Bulb in Motor Casing Transmitting Heat to the Dial in the Dash. Below: Close-Up of New Dash Thermometer for Automobiles

transferred by means of two small gears to a pointer which moves over the face of the dial and indicates in degrees the change in temperature.

BOX WITH ONE GRAM OF RADIUM PRESENTED TO MADAME CURIE

The one gram of radium presented to Madame Curie by the women of America was contained in a solid mahogany box, inclosing a steel cylinder, with a wall one inch thick and a heavy lid that screws into it. This contains 10 small tubes, each of which safeguards a portion of the precious gram of radium, and which are imbedded in lead with which the cylinder is filled. The case weighs 130 lb., or nearly 60,000 times the weight of the radium. This is on account of the mass of lead that is necessary to prevent the radium rays from escaping, and even this envelope, it is said, is penetrated by a

The Box Containing the One Gram of Radium Presented to Madame Curie by the Women of America, One View Showing the Cylinder for Safeguarding the Radium with Its Lid Off, the Other with It On

small percentage of the rays. The radium is valued at $120,000, as may be easily understood, when it is realized that its production required 500 tons of ore, 500 tons of chemicals, and 1,000 tons of coal, and entailed labor equivalent to that of 350 men for a month. On top of the box is a plate, on which is the following inscription:

"PRESENTED BY THE PRESIDENT OF THE UNITED STATES OF AMERICA ON BEHALF OF THE WOMEN OF AMERICA
TO
MADAME MARIE SKLODOWOSKA CURIE IN RECOGNITION OF HER TRANSCENDENT SERVICES TO SCIENCE AND HUMANITY IN THE DISCOVERY OF RADIUM.
THE WHITE HOUSE, WASHINGTON, D. C.
MAY TWENTIETH,
NINETEEN TWENTY-ONE"

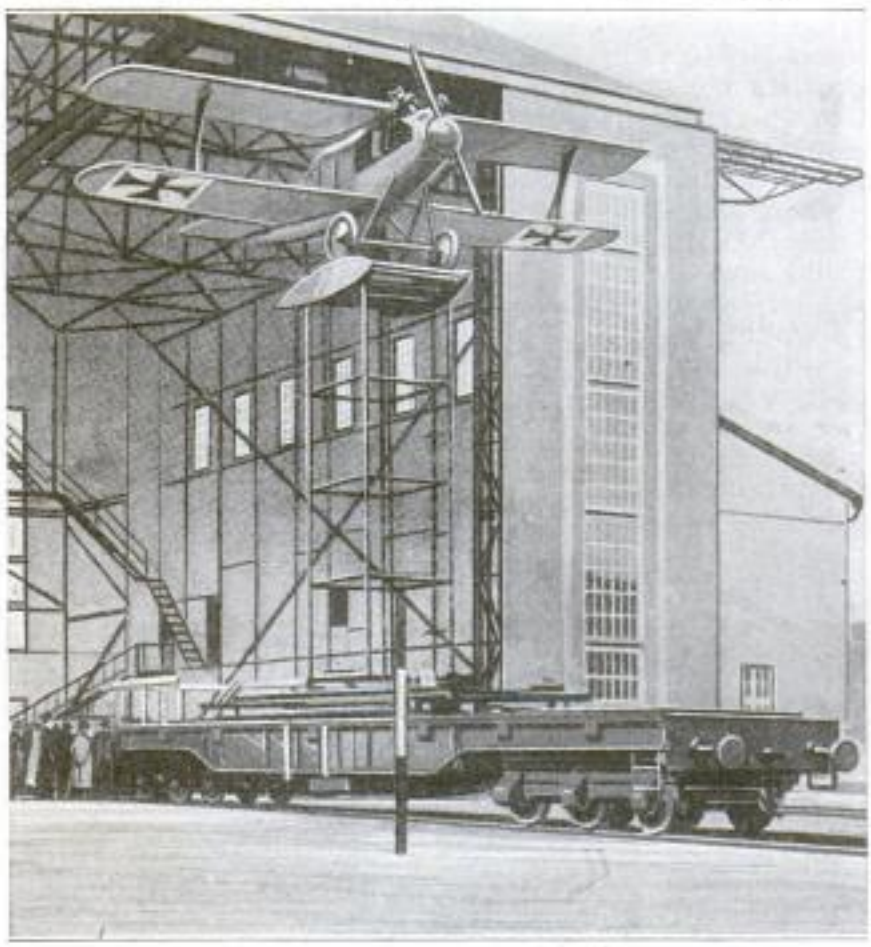
CONCRETE RURAL MAIL BOX STRONG AND ORNAMENTAL

Roadside rural mail boxes are subject to collisions from careless driving, and a box of such a nature that it will do more harm to a colliding vehicle than it will suffer itself, will make the driver more careful. A receptacle of this kind being used in the western states, is one in which both the box and the support are solid concrete of substantial proportions. It is also ornamental, being formed to represent a tree trunk with the box resembling two small logs.

EFFECTS OF AIR CURRENTS TESTED WITH AIRPLANES

By E. H. LEMONON

UP TO the present, the experiments to determine the resistance, lift, and conditions of stability of air craft in aerodynamic laboratories have been carried out by the use of reduced-scale models exposed to an artificial air current, in a wind tunnel proportionately small.



Apparatus for Testing Full-Sized Airplanes: The Plane is Mounted on Top of a Steel Tower on the Deck of a Railway Truck; the Connection of the Plane to the Tower Leads to Hydraulic Dynamometers on the Truck That Register the Stresses on the Plane When It is Drawn by a Locomotive at Various Speeds

But such tests only provide results which need corrections before they can be applied to full-sized machines and the calculation of such corrections for machines built to certain scales from the model.

This fact made it seem desirable as far back as 1916, to make tests on a full-sized aeroplane, drawn through the air by some suitable form of tractor, a railway locomotive, for instance. The main difference between the wind tunnel and the aeroplane-testing railway is that, in the latter, the scale effect is eliminated. Also, certain flight conditions can be studied which are difficult or impossible to reproduce in the tunnel, and which are dangerous to study in the air. Further, the effect of such parts of the aeroplane as body, chassis, trussing, radiator, and airscrew, with the engine in action or at rest, can be studied more exactly than with a wind-tunnel model. The effects of change of wing surface, and other deformations, under load, are also brought into play, and can be better studied.

The German official testing station, at Adlershof, near Berlin, had even in 1912-1914 considered such a scheme, but it was not till later that it became possible to put the plan into execution, and in 1916 work was started on the equipment necessary for these trials.

The site chosen was the Schönberg-Zossen-Jüteborg railway line. Upon a special railway truck there was erected a tower of steel tubing, 30 ft. high, upon which the full-sized airplane under test was mounted. The plane was attached to the tower through hydraulic dynamometers, which gave readings, on the truck itself, from which the lift, drag, and other moments exerted on the aeroplane could be accurately measured.

The tower could be turned at will so that the machine could be made to face the air current, resultant from the speed of the truck and any wind blowing at the time. The tower was also equipped with air-speed-measuring appliances.

Generally speaking, the tests were made in the early morning or evening hours, when the steadiest wind conditions may be expected. The test truck was drawn by a locomotive at speeds limited by the condition of the track to a maximum of about 37 miles an hour, or considerably lower than that of modern aircraft, but still sufficient to obtain results of considerable value.

From 1916 to 1918, a number of difficulties were encountered in the efforts to use the apparatus, and it was not found possible to carry out as many tests as it had been hoped.

Nevertheless, the tests actually made sufficed to prove the value of such full-

scale measurements, and to indicate that the plan, properly carried out, would be of great value in the development of aviation.

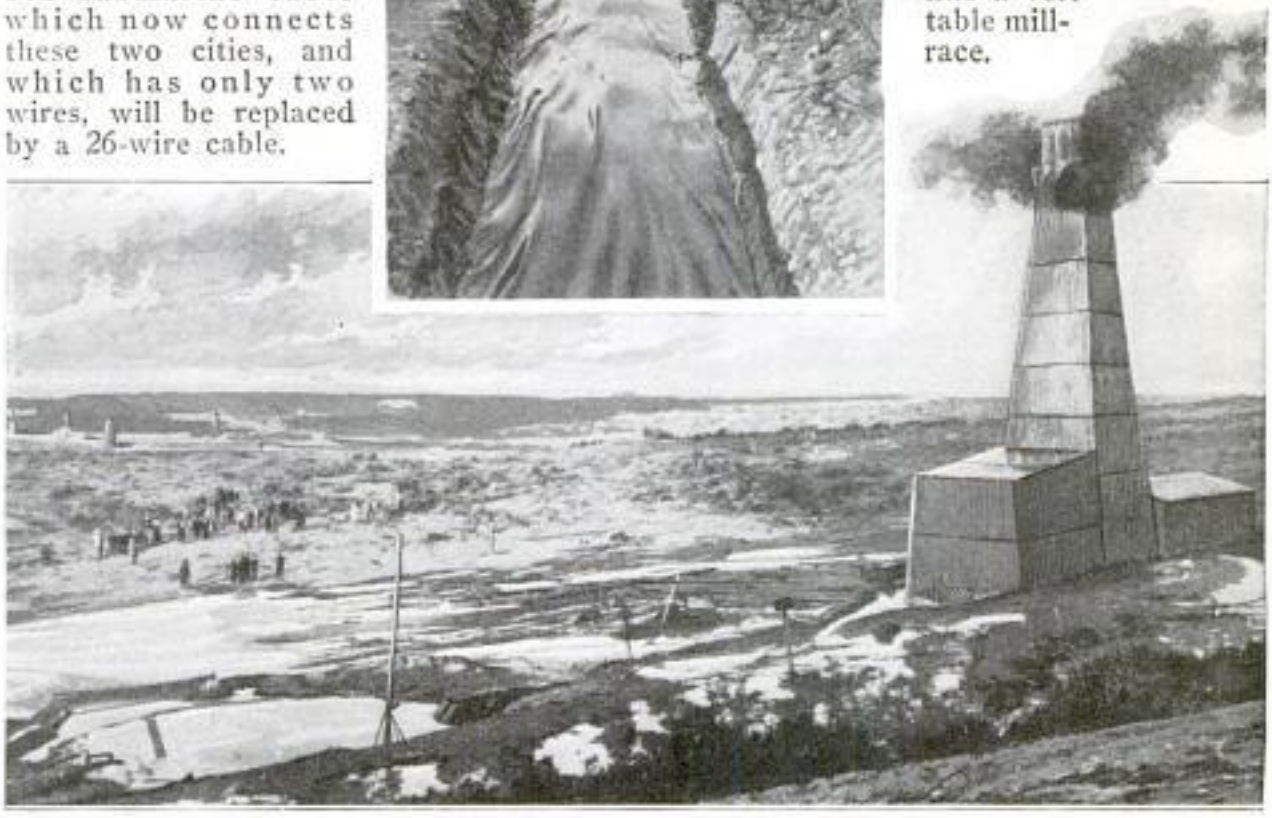
The railway for testing full-size aeroplanes was in satisfactory working order toward the end of 1918, but under the provisions of the peace treaty, it was dismantled, and the experimental work was discontinued.

EXTENDED TELEPHONE SERVICE FOR CHINESE PROVINCE

Telephone extensions, including both local and long-distance service, are well under way in the province of Kiangsu, China, according to a late report from that part of the world. Long-distance lines between all the important towns of the province are planned. It is figured that telephonic connections between Nanking and Shanghai will be completed before the end of the year. Service extensions between Pukow and Nanking are now being actively carried on. The old submarine cable which now connects these two cities, and which has only two wires, will be replaced by a 26-wire cable.

PATAGONIAN OIL WELL GUSHES 1,300 BARRELS PER HOUR

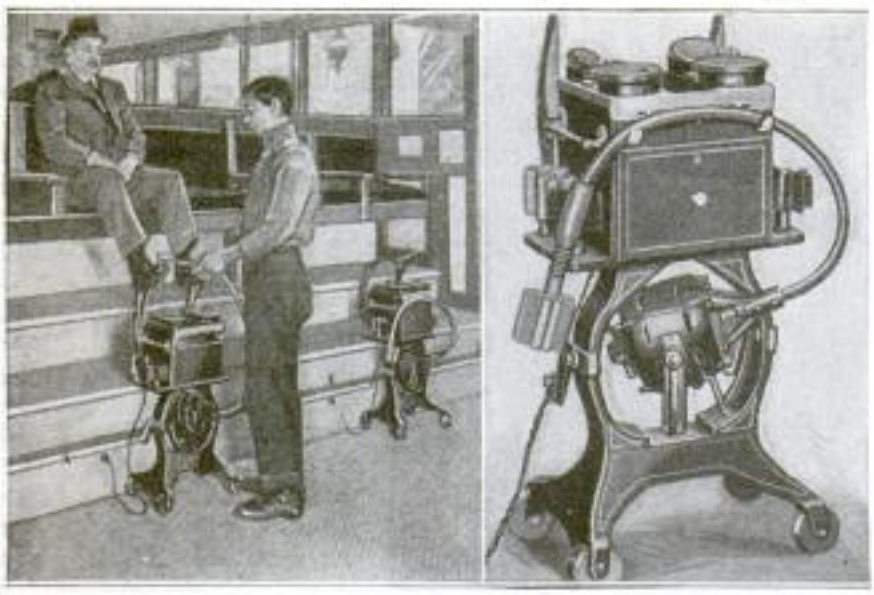
Situated in one of the most desolate parts of the east coast of Patagonia, some 1,000 miles south of Buenos Aires, are the oil fields of Comodoro Rivadavia. Oil was struck there in 1907 by Argentine government engineers when they were drilling for water. Immediately the government prescribed a fiscal reservation of 12,300 acres, where they have developed the oil fields so extensively that there are now 90 operating wells, and 15 more being drilled. The production, last year, was 1,540,000 bbl. On February 18, this year, an exceptional gusher was struck, producing 1,300 bbl. per hour for some days, until it was brought under control. The wells are all designated by numbers, and this particular gusher is known as No. 128. Before the overflow could be brought under control, the oil had spread over the adjoining ground, forming into ponds and pools, and at one point it was conducted into a ditch where it looked like a veritable millrace.



Above: The Oil Overflowing from a Gusher in the Patagonian Oil Fields, after being Conducted into a Ditch, Where It Looked like a Millrace. Below: View of the Comodoro Rivadavia Oil Fields in Patagonia, Showing in the Foreground a Recent Gusher Overflowing, and Forming Ponds in the Adjacent Low Ground; the Overflow Was at the Rate of 1,300 Barrels an Hour

ELECTRICAL MACHINE SHINES SHOES BETTER AND FASTER

An apparatus which polishes shoes twice as fast as by the hand method; uses less paste, thus preserving the leather; produces a more lasting gloss, and saves the feet from jarring, is being used in New York. The shining is done with a revolving, winged felt brush, operated by a flexible shaft attached to a motor which swings in a yoke. The brushes are replaceable, and there are several for cleaning purposes. The shoe is first prepared with a cleaning brush, after which the paste is applied and the winged air brush does the polishing. The brushes can reach every part of the shoe, and the operation of cleaning, buffing, and polishing takes only two minutes. The brush has only a slight vibratory effect upon the feet. After a customer is served, the machine can be rolled to one side.



Left: The Electrical Shoe-Shining Machine in Operation. To the Right: View of the Machine Showing the Extra Brushes and Compartments for Paste

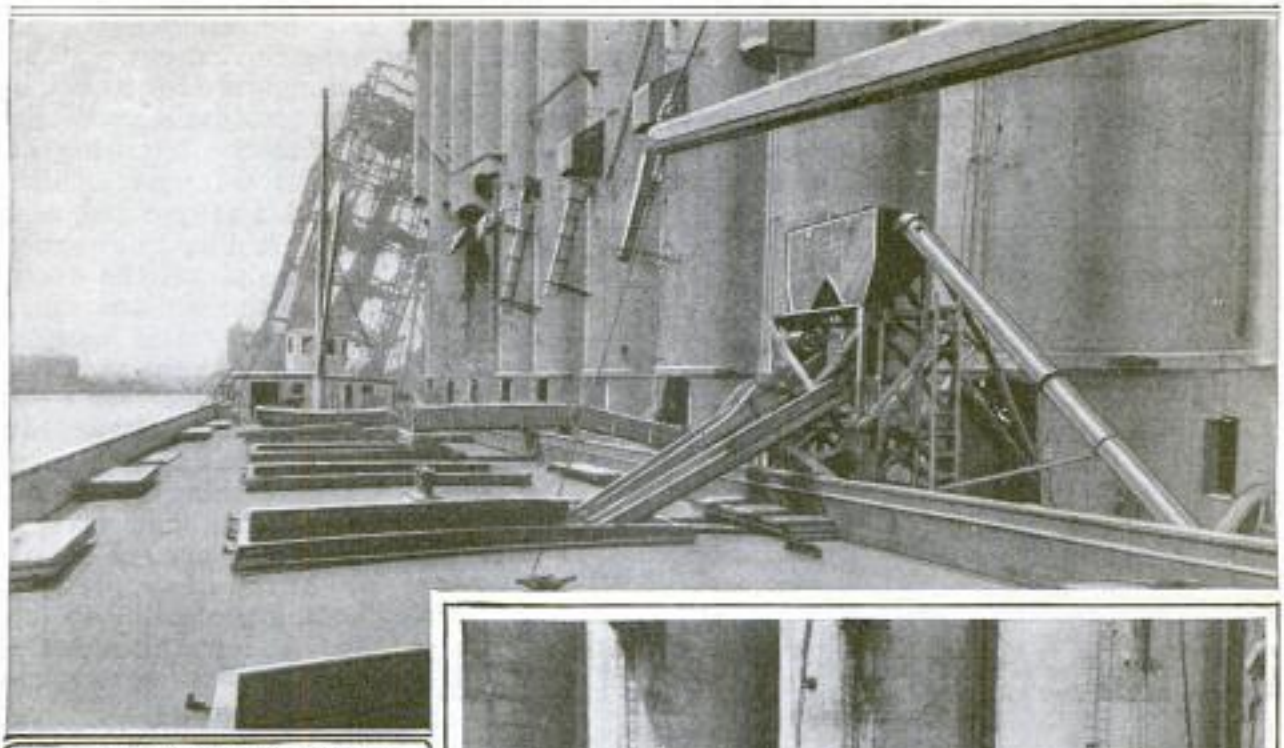
RUBBER TUBE FOR USE IN SWIMMING

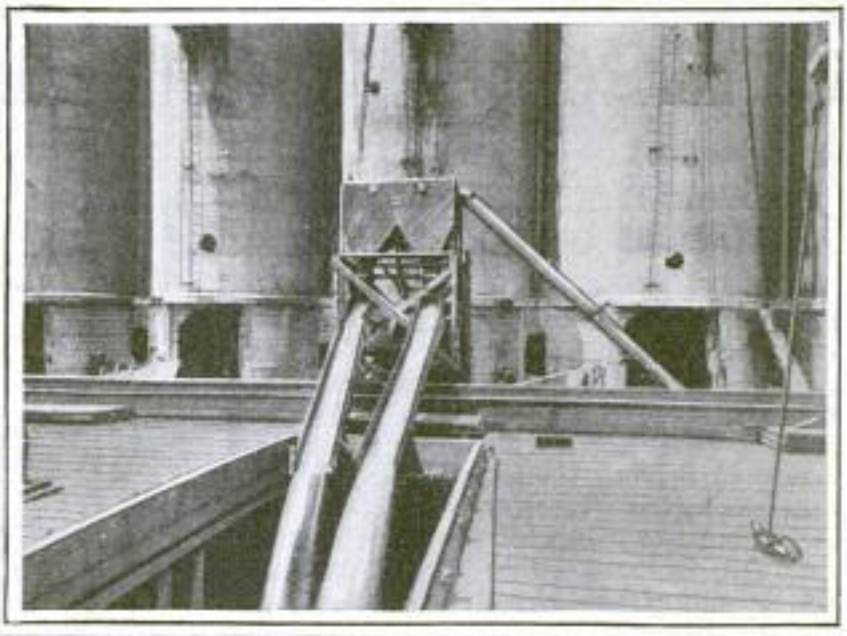
A rubber tube, made purposely for use in swimming, very much resembles an inner tube of a tire except that it is much smaller in diameter. It is provided with a special low-set air valve which is covered with a wide band of rubber to protect the body of the swimmer. The tube's bright green color makes it very appropriate for use in water.

¶The largest supply of gasoline on record was on hand at the refineries April 30, 1921, according to a report just issued by the Bureau of Mines. The report shows a stock of 755,000,000 gal., a considerable increase—no less than 42,000,000 gal.—over the preceding month.

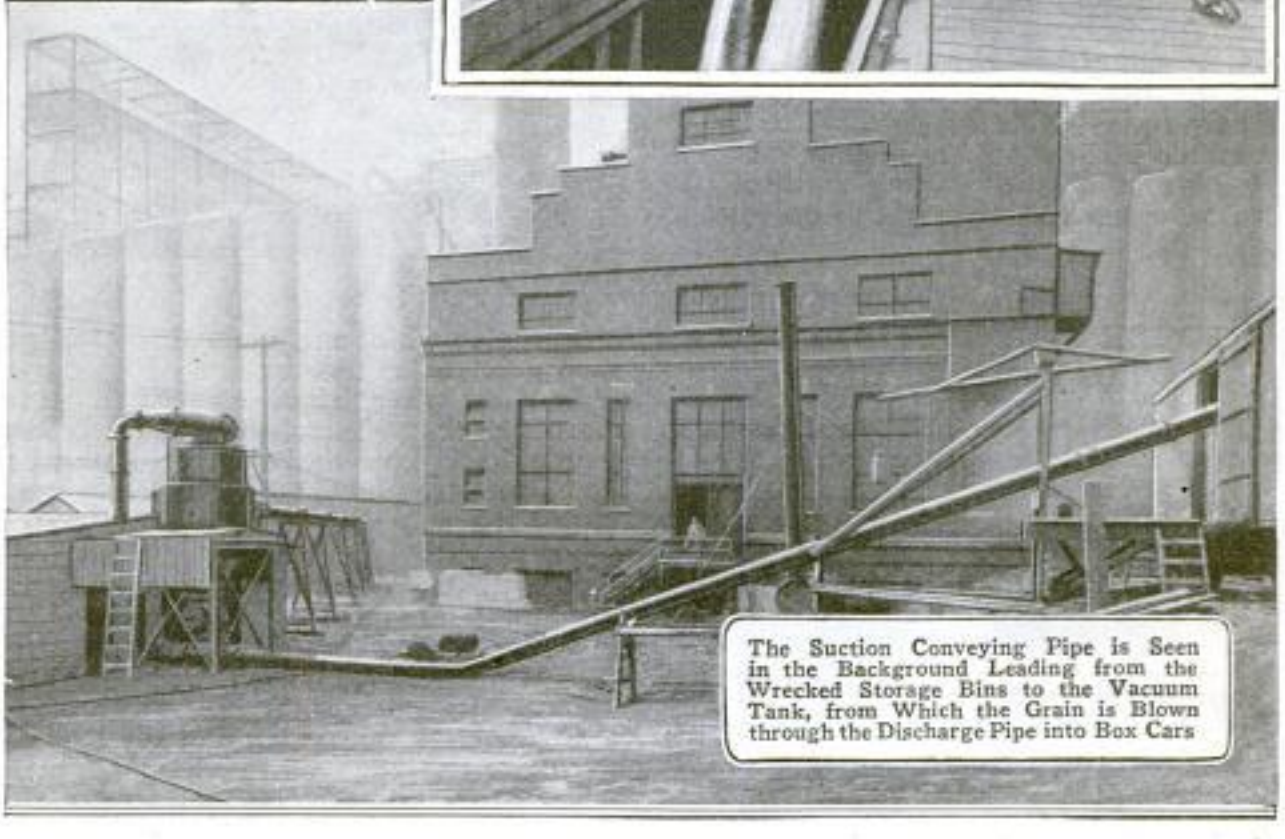
GRAIN IN WRECKED ELEVATOR PNEUMATICALLY SALVAGED

After the wreckage by a dust explosion of the great grain elevator at Chicago, there remained in the bins 6,000,000 bu. of grain, which had to be salvaged. All of the elevator's loading, unloading, and conveying machinery had been wrecked, and consequently an entirely new equipment had to be provided for conveying the grain from the wrecked bins to the ships on the water front at one side, and to the railroad cars on the other side. The problem was very successfully solved by the adoption of a method of loading and unloading grain that has recently become almost universal in Europe, and is becoming more and more generally adopted in this country, namely the pneumatic method. At the wrecked elevator the grain was sucked through pipes to a vacuum tank, where it passed through discharge gates into a pipe line that disposed of it as desired. Two such equipments were installed, one for loading into ships, and the other for the railroad box cars. The former was movable from point to point on the wharf, and was capable of salvaging grain at the rate of 3,000 bu. an hour. The railroad equipment was much larger, and the box cars were loaded at the rate of 30 minutes each.





Part of the Great Grain Elevator, at Chicago, That was Wrecked by a Dust Explosion: The Views Show the Water Front and a Steamer Moored Alongside being Loaded with Grain That is being Sucked from Wrecked Elevator Bins into the Vacuum Tank, Seen from One Point of View Above and from Another to the Right, and from Which the Grain is being Discharged into the Ship's Hold. In Both Views the Grain-Conveying Pipe is Seen to the Right of the Tank. In the View Above the Demolished Superstructure of the Elevator is Seen in the Background



The Suction Conveying Pipe is Seen in the Background Leading from the Wrecked Storage Bins to the Vacuum Tank, from Which the Grain is Blown through the Discharge Pipe into Box Cars

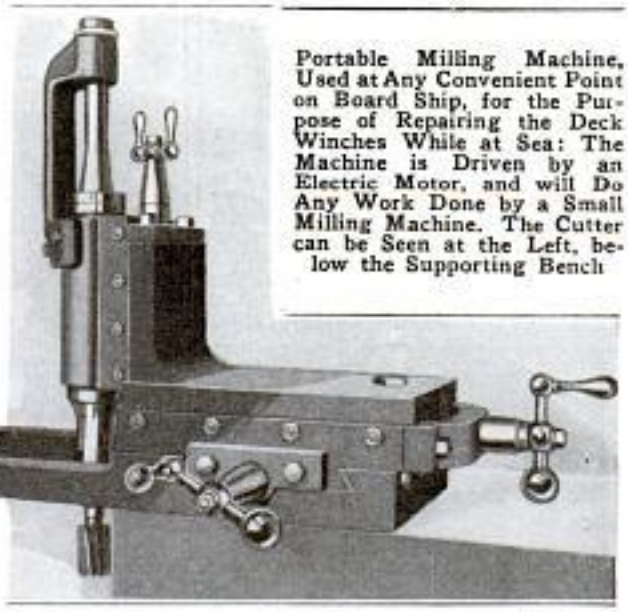
AIR STUNT THAT IS EQUALLY ORIGINAL AND DARING

Air stunts have of late been so numerous and varied that it is becoming difficult to conceive anything original in that line. One dare-devil has, however, not only conceived, but actually carried out, a stunt that is certainly distinguished for its originality as much as for its daring. While in flight, he ascends to the top wing of an airplane, carrying a 6-ft. pole which he holds at one end, and using it like a jumping pole, he places the other end on the airplane wing, and then raises himself until he and the pole are upright, and he with his feet upmost above his head. This is not such an easy thing to do on terra firma, and is certainly a remarkable feat on the top of an airplane, floating unsteadily in the air. At low altitudes the effect is startling to spectators below.

An Air Stunt That is Distinguished Equally by Its Originality and Daring: On Top of the Wing of an Airplane in Flight the Performer Holds Himself Upright, at the End of a Six-Foot Pole, with His Feet in the Air above His Head

PORTABLE MILLING MACHINE FOR USE ON BOARD SHIP

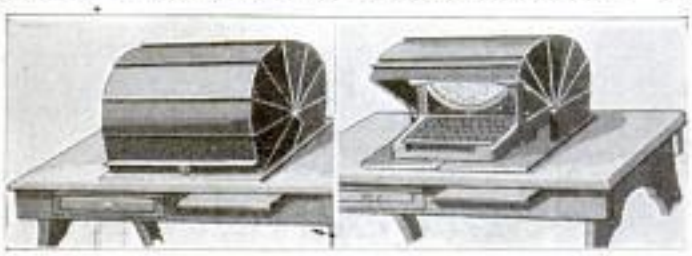
A desirable adjunct to a ship's equipment is a means of repairing the deck winches while at sea, when they are not needed, instead of while in port, when they are needed all the time. This work is done with a portable milling machine which is driven, through a flexible connection, by an electric motor. It is used for facing the valves of the deck winches, and this is done while the vessel is at sea, avoiding the necessity of removing the winches, and sending them to repair shops while in port. The machine will do any work that can be done by a small milling machine. It can be set up on horizontal or on vertical supports.



Portable Milling Machine, Used at Any Convenient Point on Board Ship, for the Purpose of Repairing the Deck Winches While at Sea: The Machine is Driven by an Electric Motor, and will Do Any Work Done by a Small Milling Machine. The Cutter can be Seen at the Left, below the Supporting Bench

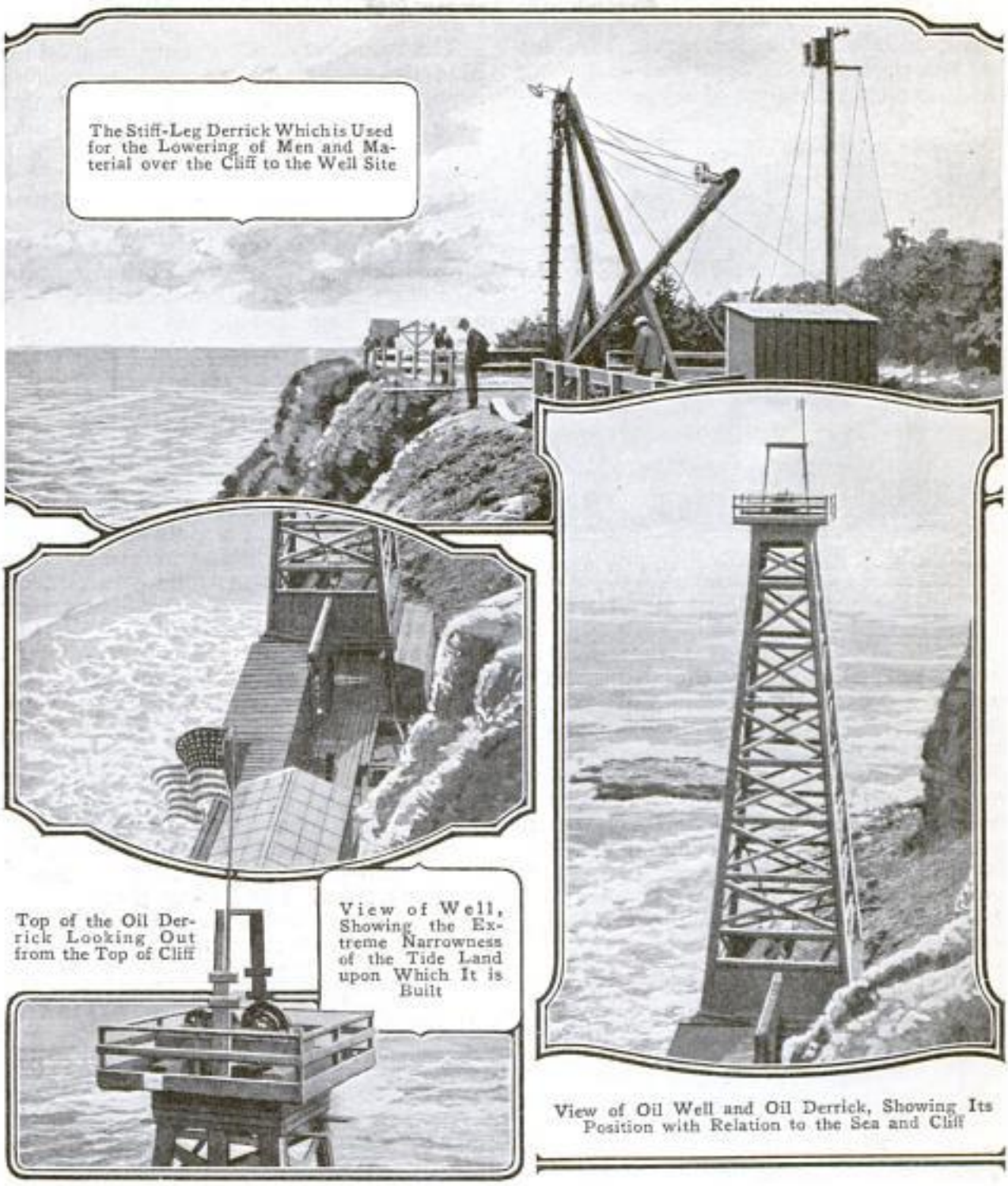
COVER FOR TYPEWRITERS FOLDS LIKE DESK

A typewriter cover of French design is a sheet-metal structure consisting of segments pivoted about a fixed center at such a height as to completely incase the typewriter when shut. The action is much like that of a roll-top desk. When swung back into the open position the cover section is so completely out of the way that there is no interference with typewriter action, and for that reason need not be removed. A base is provided which is fastened to a rear siding that forms a bearing for the pin center, so that the whole forms an integral enveloping unit when closed. A snap catch and key lock at the front edge of the base engages the forward cover segment in closing.



Left: A Telescoping Typewriter Cover in the Closed Position. Right: The Cover Partly Open to Show the Action of the Sheet-Metal Segments

THE WORLD'S MOST INACCESSIBLE OIL WELL



The Stiff-Leg Derrick Which is Used for the Lowering of Men and Material over the Cliff to the Well Site

Top of the Oil Derrick Looking Out from the Top of Cliff

View of Well, Showing the Extreme Narrowness of the Tide Land upon Which It is Built

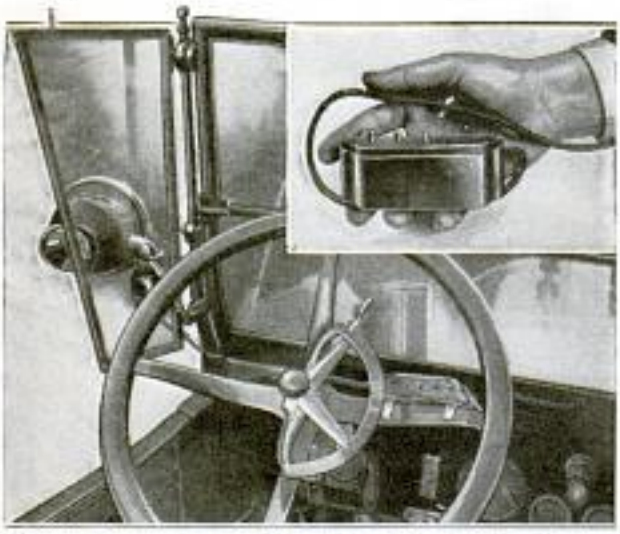
View of Oil Well and Oil Derrick, Showing Its Position with Relation to the Sea and Cliff

An oil well that can be reached only by swinging in a rope sling operated from a stiff-leg derrick at the top of an 107-ft. cliff, was recently completed at Point Firmin, Calif. The well is located on a narrow ledge of tide land, and at the bottom of the cliff. The ledge is so narrow that, at high tide, the water rises to within a foot of the rig. Despite the fact that all material and workmen had to be lowered and hoisted from above by means of the derrick and sling, the well was completed without a mishap. This remains still the only way to reach the well. As one looks out from the top of the cliff, the top of the oil derrick is level with the eye of the observer, giving it a rather curious appearance.

¶The city of Madrid, Spain, is planning to supply its markets with fresh fish daily by means of airplanes. The time required by air from the coast is only three hours as compared with 24 hours by rail.

SAFETY SWITCH FOR LIGHTS MOUNTED ON STEERING ARM

A headlight control for automobiles has been devised that is described as having the paramount features of safety and convenience. It consists of a three-button switch unit operated by thumb pressure, and is mounted directly on one of the steering-wheel arms, working independently of the dash switch. In changing the lights from bright to dim, and vice versa, the operation is practically instantaneous. When parking the car where only a tail light is needed, one of the buttons is raised, the other two remaining in a lowered position, leaving off all headlights and causing the tail light only to burn.



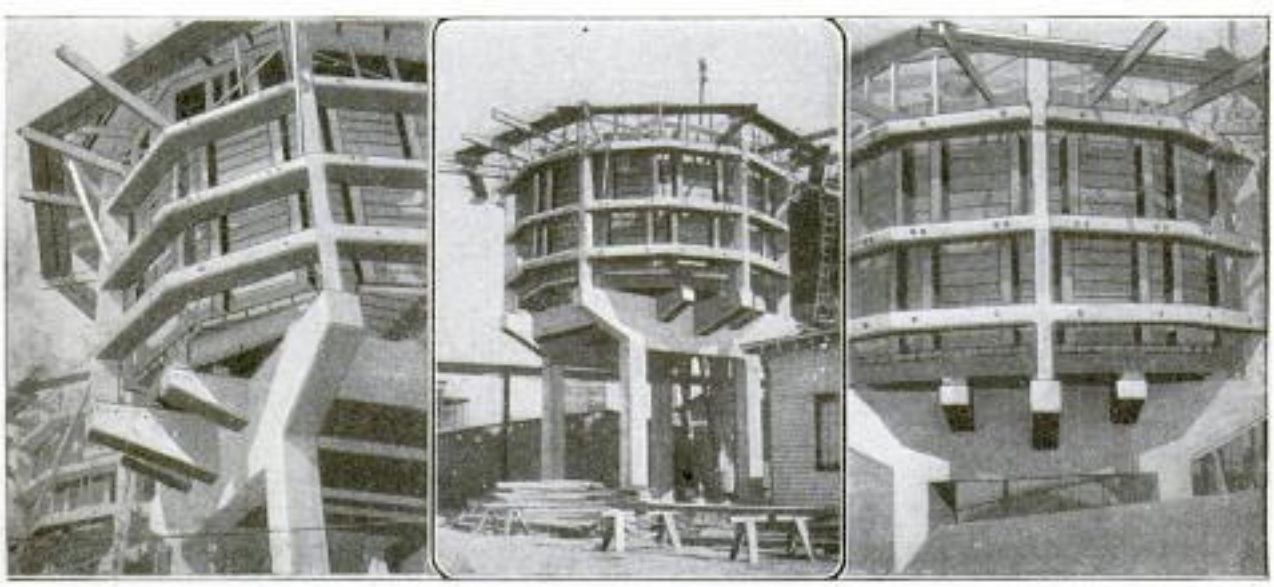
Upper Insert: A New Headlight Control for Automobiles Consisting of a Three-Button Switch Operated by Thumb Pressure. Below: Switch Mounted on the Steering Wheel

WORLD'S SUPPLY OF RADIUM NOT EXACTLY KNOWN

The discovery of a new mineral in Madagascar adds to the world's available supply of radium-bearing ores, according to a late report. The amount of pure radium now scattered about in hospitals and laboratories throughout the world is not exactly known, but it has been estimated at 100 grams. Of this amount the greater part, 60 grams, is held in the United States. The New York Memorial Hospital possesses the comparatively large amount of four grams.

SULPHURIC-ACID TANK HAS SPECIAL CONSTRUCTION

Two tanks, interesting because of their unusual construction, were erected at Newport, Del., for the purpose of holding sulphuric acid at a time when a particularly safe and rigid structure for containing that dangerous fluid was desired. The tanks proper are of 3 by 8-in. yellow pine, and have an inside lead lining. They are bound by reinforced-concrete hoops and supported on girders of the same material together with a concrete roof, the unit structure being so built as to form a 12-sided block inclosure supported on four concrete columns, 20 in. square and 16 ft. high. In this manner the heavy side ribs and columns form an important factor of safety against tank pressure, the unit structure being of such durable and rigid construction that after several years of continuous service no cracks or blemishes of any sort have developed.



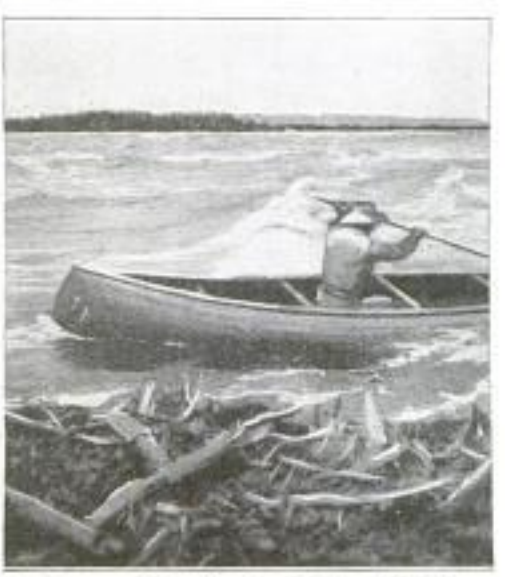
Left: Close-Up of Sulphuric-Acid Tank. Center: The Columns, Hoops, and Girders Cast of Reinforced Concrete; Forms for the Roof are being Put in Place. Right: A Close-Up Showing One of the Main Girders and a Roof Column

In Taking the Canadian Census This Year Spots had to be Visited That Were So Far North That They Looked like This in June. Here Some Indians, Still in Their Winter Quarters, are being Called Upon by the Indian Agent Who Asks Them Questions Enough to Enable Him to Fill in the Census Forms

CANADA TAKES HER SIXTH DECENNIAL CENSUS

BY FRANCIS DICKIE

ON June 1, 1921, the Dominion of Canada began taking her sixth decennial census since the confederation. Officially the entire population is supposed to be counted between sunrise and sunset of that day. In reality the census in the cities and suburban communities was completed in from three to four weeks. In the far wildernesses the work took from five to eight weeks, and some returns from within the Arctic Circle required about four months to reach the capital, Ottawa. The general estimate in advance of the compiling of the figures is that these will show Canada to have 9,000,000 population. On this basis, the dominion with an area of 3,729,665 square miles, has a little more than two inhabitants to the square mile.



The Census Taker in the Wilds of Northern Canada Had Many Rough Trips to Make in a Very Primitive Manner. Here Is One in His Canoe Shooting the Rapids of a River

No other country in the world's census taking nearly approaches to that of the dominion in magnitude, as the few cities lie along a fringe 3,800 miles long. The total cost of the sixth census was a little over $2,000,000. The work required 240 commissioners and 11,500 enumerators. In the far-northern regions the Royal Canadian Mounted Police, the Hudson Bay factors, and the missionaries acted as enumerators, and every Eskimo that could be located was put down. The Indians were enumerated by the Indian agents. Six official forms were used for the census, designated as follows: population; animal, animal products, fruits, etc., not raised on farms; agriculture; individual-population form; census of manufacturing, trading, and business establishments; supplementary sheet for deaf-mutes and the blind. Among the chief questions asked each resident of the dominion for the form entitled population, were name, place of abode, personal description, nativity of parents, birth place, citizenship, number of languages spoken, occupation, employment, earnings for last year, time sick, time idle, if immigrant, year of coming to Canada, date of taking out naturalization papers, whether owner of house or lodger, if latter rent paid, material in house, number of rooms, married or single,

whether can read or write. The farmer had the hardest task, having to answer no less than 220 questions, some of which were: amount of improved land, waste land, cost of labor, number of fruit trees, domestic animals, tractors, automobiles, etc., amount of all products sold during year. The census sheet covering manufacturing, trading, and business merely called for firm name, address, and nature of operations.

A fine of not less than $20 and not more than a hundred, or from one to three months' imprisonment, was proclaimed against any person refusing to give information to the enumerators, but considering the size of country and population, the prosecutions were very few.

Canada can claim the distinction of being the first country in modern times to inaugurate a census taking. This took place in the year 1666, in New France, as Canada was at that time known. The result showed a white population of 3,215. The original manuscript of this is in the archives at Paris, and one copy is at Ottawa.

The following figures show increase in population in Canada and the United States during the last 30 years, from which it will be seen Canada's growth has been slower; but this will likely change in the near future, with her great system of railways and waterways offering easy access to the land.

Population, Canada:
1891 4,833,000
1901 5,371,000
1911 7,206,643

Population, United States:
1890 62,947,000
1900 75,994,000
1910 91,972,000

In the settled communities the enumerators received five cents per head. In the wilderness regions, where long distances had to be traveled between places of abode, the rate was a straight salary of $10 per day. The writer spent three weeks with one of the census takers traveling through part of the wildest and most inaccessible regions of British Columbia, the journey being made by motorboat, afoot, and in rowboats. The enumeration of people in

A Typical Settler's Home on the Coast of British Columbia: As These Homes Are from 10 to 20 Miles Apart Census Taking There Was a Long, Costly Process

Fort Churchill, on Hudson Bay, an Old Hudson's Bay Company's Trading Post, and Now Also a Royal Canadian Mounted Police Post: From Here Officers of This Force Enumerated the Eskimos for the Census

these regions he estimated cost the Canadian government $2 per head.

In making an estimate of 9,000,000 for Canada in advance of the present census, there is a possibility that Canada's population has been placed too high, for it must be remembered that she lost no less than 55,000 men in the war. During the period of the war the immigration from Europe was also greatly lessened. However, this to a certain extent was offset by the influx of Japanese, of which people in British Columbia alone, according to a recent statement given by Consul Utika to the government, there are 15,000. The Chinese, too, are rapidly increasing. In British Columbia, between the years 1910 and 1920, there were 1,620 Canadian-born Chinese. The Indian population of Canada from last reports was 105,998, of which 25,694 are in British Columbia.

The result of the sixth decennial census will likely be made public by the end of August.

FEATURES OF BRAZILIAN WOOD FOR FURNITURE

Nine Brazilian woods, tested at the Forest Products Laboratory, at Madison, Wis., to determine their value for furniture, have been found to have the following characteristics: cabreuva, resistance to saw similar to American larch, no stain needed; cedro, resistance to saw similar to Spanish cedar, finish similar to Spanish cedar; embuya, resistance to saw similar to birch, with dark stain would resemble walnut; ipe, resistance to saw similar to greenheart, no stain needed; jacaranda, resistance to saw similar to walnut, with dark stain would resemble walnut; jatahy, resistance to saw similar to American elm, could be substituted for mahogany unstained; jequetiba, resistance to saw similar to rock elm, could be stained to imitate mahogany; marfim, resistance to saw similar to greenheart, requires color; peroba, resistance to saw similar to walnut, might be used unstained in place of rosewood.

LORD'S PRAYER ON TINY SLUG IS NOVELTY IN TYPE MAKING

The Lord's Prayer has been written on postage stamps and engraved on other small surfaces, but it has remained for an eastern photo-engraving concern to imprint it on the face of a small type slug known among printers as an 18-point em-quad. This type is ¼ in. square and, allowing for margins all round, offers a space only 15/64 in. square for the somewhat lengthy writing. So accurate is the work that the tiny letters stand out clearly, and persons with good sight can read the text without the aid of a glass.

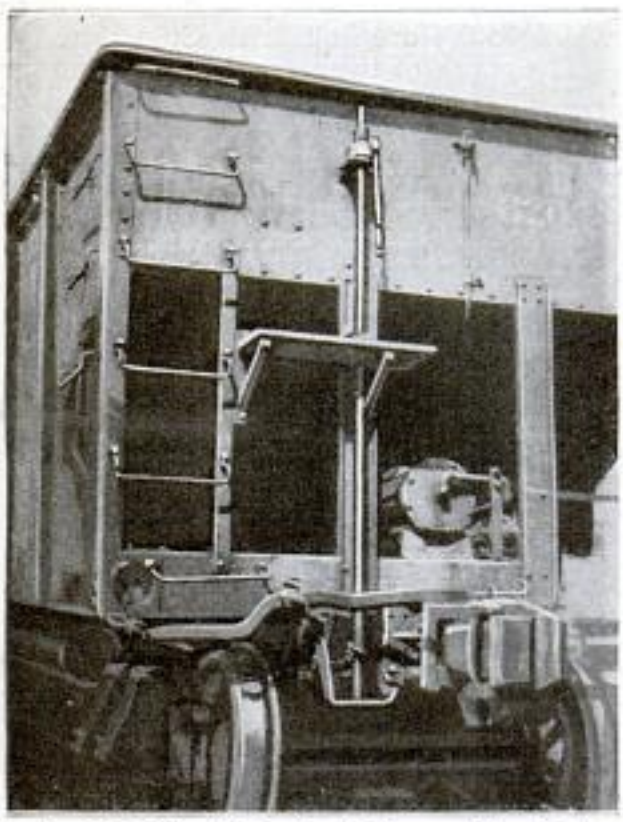
NEW EXTENSIBLE GUNSTOCK HAS NO RECOIL WHEN FIRED

There need be no more sore shoulders for the sportsman, and more particularly, the sportswoman, from the "kick" of a gun, for there is a gunstock now available that absorbs 70 per cent of the recoil. It also furnishes a means of adjusting the length of the stock to fit any shoulder. The adjustment is done with setscrews in the stock, and the recoil is absorbed by springs, which are suitably arranged in the stock together with the setscrews.

Left: The Gunstock Closed, Showing the Setscrews by Means of Which It can be Extended, as Shown to the Right. Springs, Not Visible, Absorb the Recoil

HAND-LEVER BRAKE FOR FREIGHT CARS

A new hand-braking device, designed to eliminate some of the danger of the old handwheel brake, is now rapidly coming into use on railroad freight cars. It consists of a ratchet operated by a lever in place of the handwheel. This allows the brakeman to grasp the lever with one hand and hold on to the car with the other. Formerly he had to hold on to the wheel with both hands, to gain leverage and a foothold. Many accidents were caused in this manner by the brake slipping and throwing the man from the car.



At the End of the Freight Car is Shown a New Ratchet Braking Device, Operated by a Hand Lever Instead of the Old Handwheel

UNTENDED LIGHTHOUSES HAVE VERY CURIOUS MISHAPS

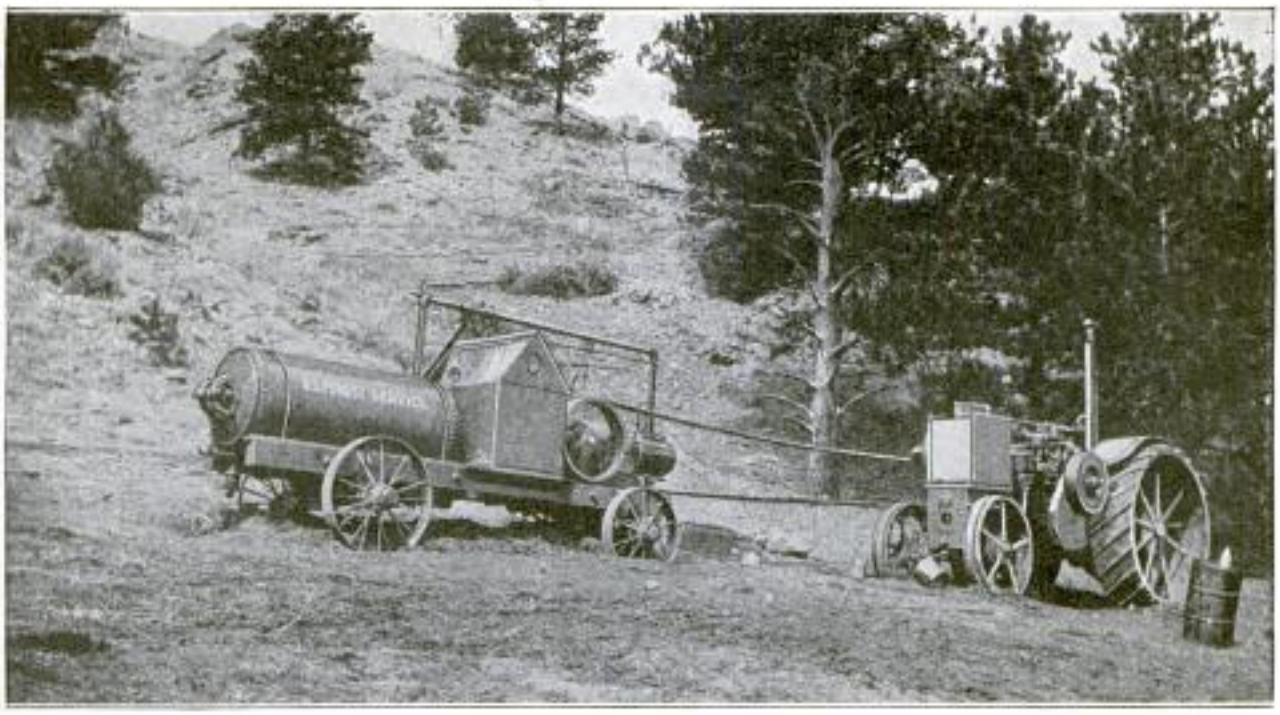
Untended lighthouses are now becoming comparatively common. In this modern type of lighthouse everything is mechanical and automatic, and all the human supervision it requires is a visit of inspection about once every six months. A light of this description on a desert island near the tropics had been working in perfect order for some months, when one night a vessel reported the light to be invisible. A visit of investigation to the island was made, but no trace of the lighthouse could be found for a long time, when finally it was discovered completely hidden by a rank growth of vegetation. When this was torn away the light was found to be in perfect order, and burning brightly. In another instance of a similar nature, the floor of the cage containing the lamp was found to be six inches deep with dead flies. The flies almost covered the burner, and some of the dead bodies had choked off the gas.

NEW EXPANDING BULLET IS NOT SOFT-NOSED

A new form of expanding bullet for big-game hunters is now upon the market. It is for rifles of .30-caliber. It supersedes the old soft-nosed bullets to which there were many objections. In the new bullet, the tip is made of tinplated gilding metal, and upon impact is forced back into the cover, expanding the point of the bullet, which is slotted in such a manner that it retains its pointed shape until this impact occurs. This is unlike the old soft-nosed bullets which, from their nature, were liable to be deformed by handling before they were loaded into the rifle. The weight of the new bullet is 180 gr., which is generally considered ideal for big-game shooting.

NEW BATTERY METER TESTS BATTERY THREE WAYS

A battery-testing device, which, in addition to giving readings for the rate of discharge, has a spiked third terminal for the purpose of making what is known as the cadmium and open-circuit voltage tests, has lately been placed on the electrical-accessory market. One spike of the fork is for voltage testing and the other for the cadmium readings, in determining the condition of the battery without dismantling it. A flexible cord connects the third terminal to the dial of the instrument.



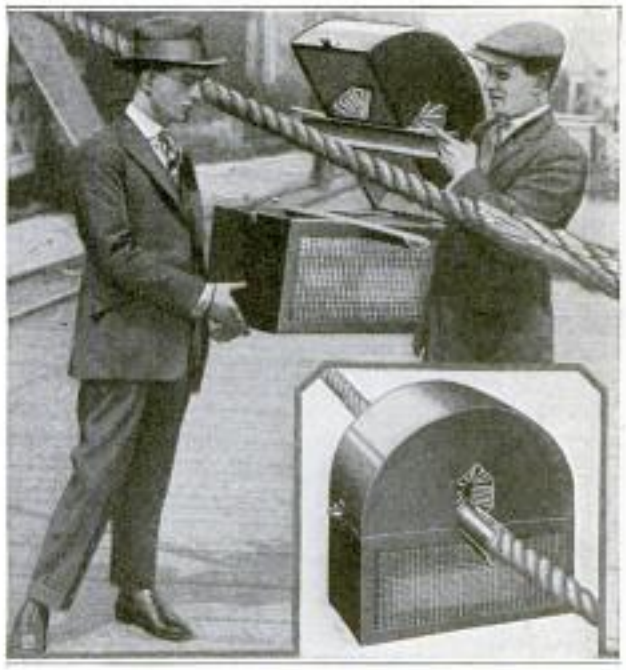
This Air-Compressing Unit, Made Up of a Gasoline Tractor Engine Belted to an Air Compressor, is Located on a Hillside in Colorado. It is Used to Drive Rock Drills Utilized by the Government in Constructing Roads to the National Forest Reserves. Flexible Hose Pipe the Air to Any Desired Location

AIR-DRIVEN DRILLS BLAZE NATIONAL FOREST ROADS

In the construction of avenues of approach to the national forest reserves where much drilling and blasting of rock is necessary, portable tractor-powered air compressors driving the rock drills are replacing hand-manipulated implements. The particular device utilized by the United States Forest Service in Colorado is a reciprocating air compressor pumping the air into a large steel tank, the unit being mounted on a special truck drawn about by the tractor. In action the pump is belted to the tractor engine, and the air is conducted by long flexible hose from the tank to the drills in any desired location. This is the method employed in connecting 156,000,000 acres of forest reservations.

HAWSER TRAP CATCHES AND CAGES SHIP RATS

A hawser rattrap, differing from earlier devices in that it not only prevents the rat from crossing over the ship cable but in addition cages the animal for later dispatching, has been designed as a progressive attempt to eliminate the bubonic-plague-spreading pest. It is a two-compartment box, hinged at the middle; it surrounds the cable and is provided with openings on either side that have inwardly pointing steel prongs which are sufficiently flexible to let the rat enter, but spring together immediately afterward. Two holes trap the rodent in either leaving or entering the ship. A halved metal tube protects the rope. The device has been tried out with success at a New York landing.



Above: Showing Trap Which Not Only Catches, but Cages, Ship Rats. Below: Trap Mounted on Hawser

¶A novel form of inking pad for rubber stamps is composed of a solid impervious platen, overlapped on the top side with an absorbent ribbon which inks itself by capillary attraction from a felt ink container on the under side of the platen.

TENTLIKE SHELTERS PROTECT LAMBS FROM WEATHER

Some western and southern sheepmen are using curious three-sided shelters

Shelters for Lambs on Sheep Ranches to Protect Them from Adverse Weather: Shaped like Small Dog Tents, They Consist of Three Wooden Boards, and Are About Two Feet High and Eighteen Inches Wide

to protect young lambs from adverse weather. The shelter resembles a dog tent, is constructed of three pieces of board, is about 2 ft. high and 18 in. wide, and accommodates one lamb. When the bedding place of the herd is changed, the shelters are simply taken apart and moved to another location. In the event of a storm, the lambs take refuge in the tiny houses and are spared the exposure which ordinarily kills so many of them.

FRESH-WATER LABORATORY IS AGENCY FOR PUBLIC SERVICE

A fresh-water laboratory that combines in an unusual manner the functions of a fisheries biological station and a fish-cultural experiment station, has been established as an agency for public service at Fairport, Iowa. This station is the first permanent fresh-water biological laboratory established by the government, and it is intended to become, not only the leading laboratory in America for the study of fresh-water biology, but one of the most important biological stations in the world. Besides its biological functions, as a fish-cultural experiment station it is concerned not so much with fish alone as with everything associated with the fishpond, such as the conditions of the water, and the insects, mollusca, crustacea, and all animals and plants associated directly and indirectly with fish culture.

PRODUCER GAS ON AUTO TRUCK REDUCES COST AS ONE TO FIVE

A novel English gas producer for automobiles and launches was described in the June issue of Popular Mechanics. At that time there was information at hand only as regards its application on autos and launches, but now there are available data regarding the performance of a producer plant on a three-ton motor truck. As pointed out in the June article, the particular object in using producer gas, instead of gasoline, is reduction of cost. It was demonstrated in a run of 10) miles, under exactly similar conditions of load and speed, the producer plant using 300 lb. of coke, whereas the gasoline consumed was 17 gal. At English prices for these fuels, the relative cost was nearly five times greater for the gasoline.

PUMP IN ITS COOLING SYSTEM MAKES MOTOR MORE EFFICIENT

More rapid circulation of the water in the cooling system of an automobile motor is obtained by installing a small centrifugal pump with its intake connected to the outlet from the motor's water jacket, and its discharge end connected by a short piece of hose to the top of the radiator. This small pump, made of brass, has a pulley on its impeller shaft by means of which it is driven by a belt from the fan pulley. The pump circulates the water through the cooling system much more rapidly than is possible without it, and consequently if the radiator is proportionately well cooled, an overheated motor should be an impossibility. In cold weather danger from water freezing is reduced.

Illustrating the Return of the Packet as a Freight Carrier and Tugboat: One of the Smaller Packets, the "Lafourche," Battling a Storm on Lake Salvador, in Louisiana, Towing a House Barge, Two Barges of Crude Oil and a Crippled Tug, and Getting Away with It

THE PACKET COMES BACK

BY H. H. DUNN

LIKE shadows out of the past, like the ghosts of the "Robert E. Lee," the "Natchez," and scores of other floating palaces that ran up and down the waterways of the lower Mississippi Valley a third of a century ago, the river steamboat—better known as the "packet"—has come back. Confirming the faith of the old river captains, some of whom have died in that faith, but most of whom have held onto life at New Orleans, and Memphis, and Natchez, and St. Louis, and other river ports, the day of the sternwheeler has returned. And, oddly enough, most of these revived packets of other days, as well as the new ones, are commanded by those men who have been waiting, uncomfortable and cramped in their shore quarters, all these years for the steamboat to return to its own.

Within the past 18 months, since the first of January, 1920, forty-seven of these packets have returned to work on the Mississippi, the Red, the Atchafalaya, Bayou Lafourche, Bayou Terrebonne, the Warrior, the Tombigbee, and other streams of the South, wherever there is water enough to float their flat bargelike hulls, or to give their slowly revolving paddles grip enough to drive them ahead. That they are here, every town along these rivers knows, but where they came from not even the oldest "river man" can tell. Some have been laid up for 15, 20, 30 years, in the ports of missing boats, idle but beloved and hopeful; some have been sunk in lonely bayous, not being considered worth the raising; some have been working, in desultory fashion, on small inland streams, eking out an existence in competition with motorboats, and a number, possibly one-third of the total, have been built new for this revival.

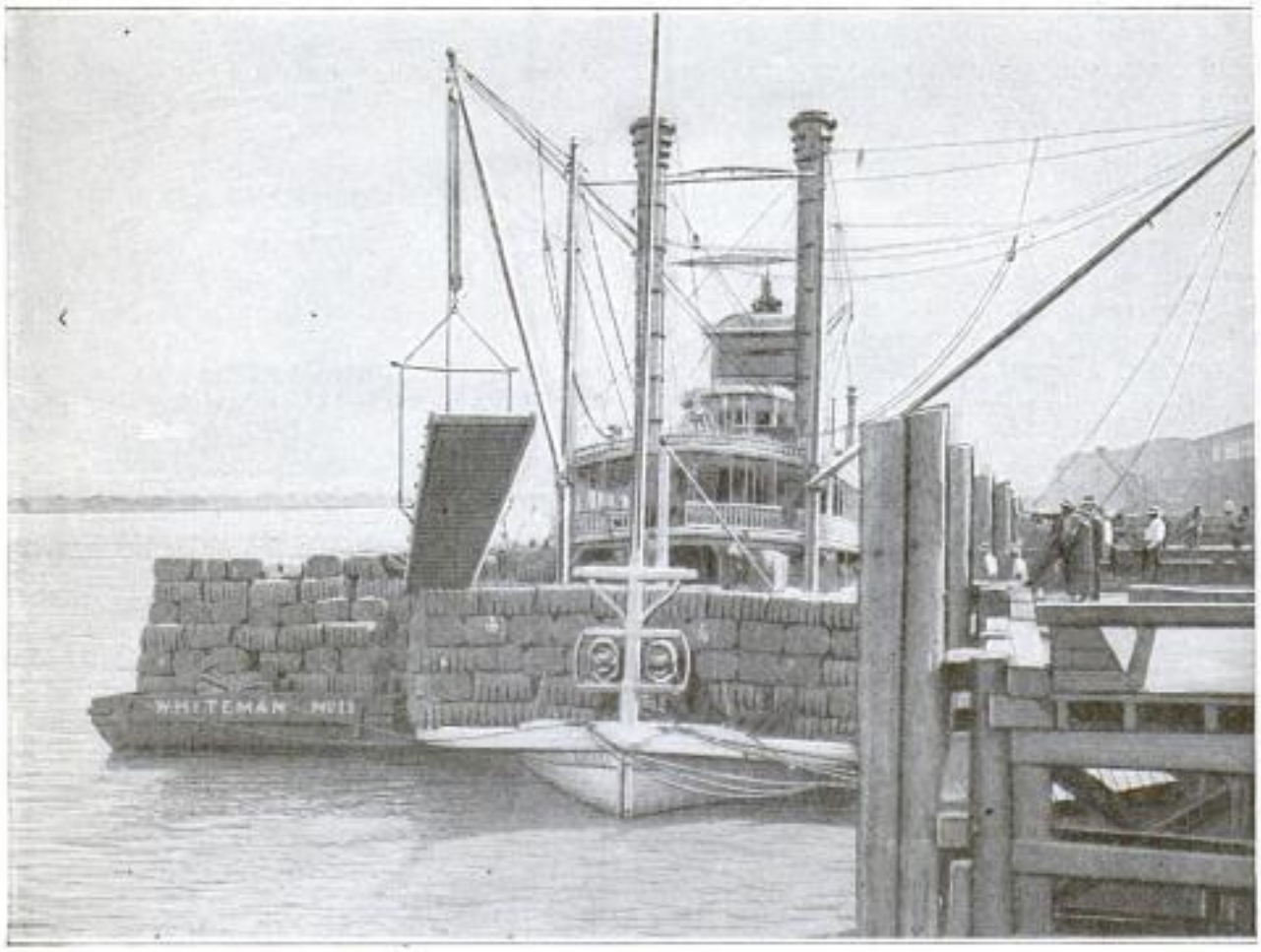
The Interstate Commerce Act of 1887, giving the railroads the right to charge less for a long haul, provided the long haul was in competition with water carriers, put the packets out of business. The

The Small Steam Packet, for Use on the Narrower and Shallower Inland Waterways: This Happens to Be the "Jess Willard," Tied Up at Lafourche, on the Bayou Lafourche, in Louisiana

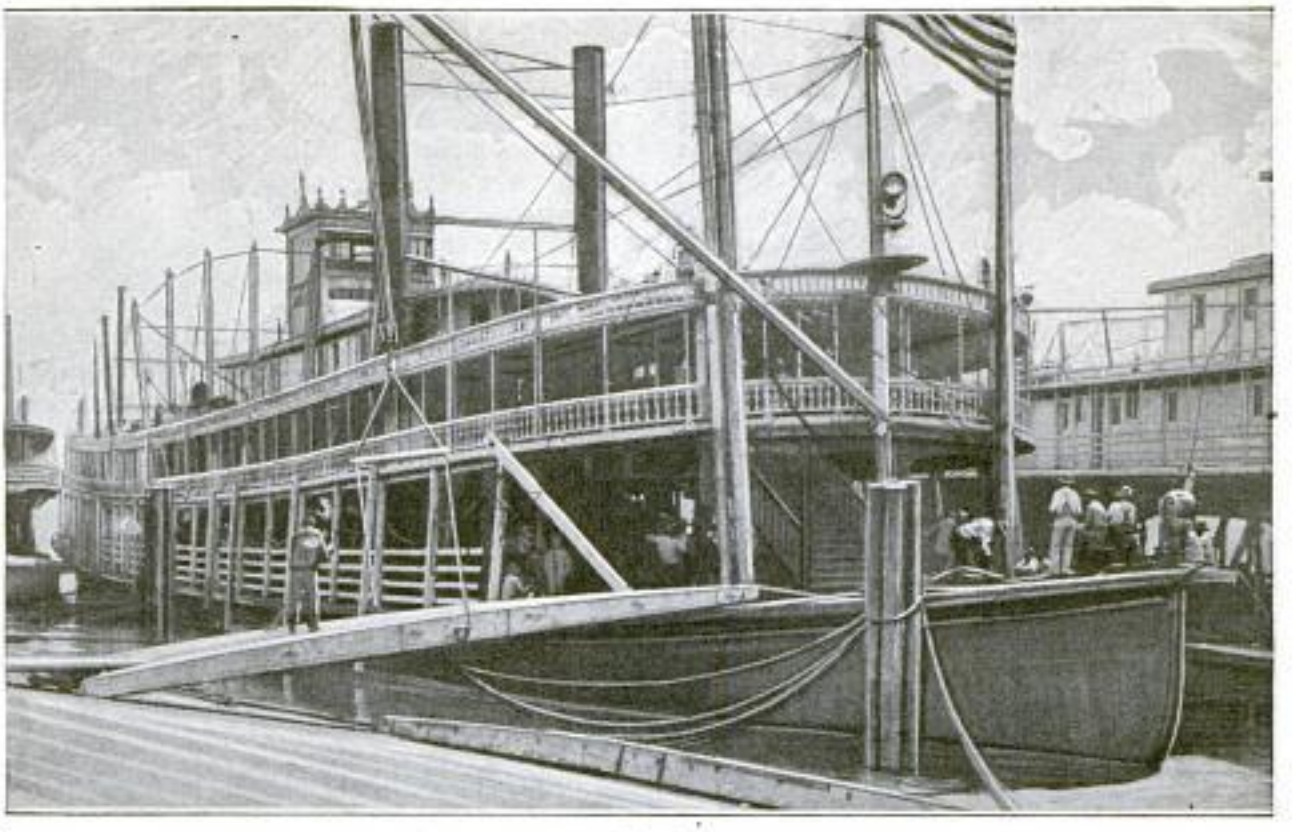
act of the Interstate Commerce Commission of 1919-1920, allowing the railroads to boost their rates to new high levels, brought back the packets into a more profitable business, mile for mile, than they had 35 years ago. The Federal government, with its barge lines on the Mississippi and Warrior rivers, showed the way to the owners and builders and operators of the packets, and the old river captains, many of whose names had been all but forgotten, suddenly stood once more in the glass-fronted cabin, just beneath the twin gilded eagles, and squarely between the towering smokestacks, heading once more into the stream.

Today, the New Orleans waterfront, which has been bare of these packets for many years, so bare that the incoming of one was described in all the newspapers, holds from three to a dozen or more every morning, and, by afternoon, on most of these days, this fleet has been replaced by newcomers, alike save for size—so much alike that only by looking for the name engrossed on a scroll across the front of the cabin can one tell which is which at the Bienville Street landing. No boat in the history of the world ever had the romantic career of the old river packet, with its sturdy hull, its "gingerbread" superstructure, its blazing furnaces, fed by sooty blacks, its belching stacks, its gilded ballrooms, and its staterooms done in blue and pink and yellow, to suit the tastes of the rich rice and sugar and cotton planters and cattlemen. The races of these boats are matters of history, and thousands of dollars changed hands on contests such as those of the "Robert E. Lee" and the "Natchez," from New Orleans to St. Louis, or of the "Liberty" and the first "America," from Memphis to New Orleans, nearly half a century ago.

But, with the return of the packets, the romance has gone from their service. They have come back for work and not for play; they are now freight carriers, with passenger traffic only an incident, whereas they once carried passengers, and handled freight as a matter of accommodation to the last of the American barons who lived on their principalities in huge, pillar-fronted palaces, beneath the oaks and cypresses up and down the great streams of the lower Mississippi Valley.



"America," the Oldest and Largest Packet on the Mississippi River, Delivering a Cargo of Cotton—with a Barge Load in Tow—at New Orleans for Shipment to the Cotton Mills of Middle Europe: It is Owned and Operated by Captain L. V. Cooley, the Oldest Active Captain on the Lower Mississippi and Brother of Captain G. B. Cooley, Who Retired Some Years Ago from River-Packet Service



The Last of the Old "Floating Palaces" of the Mississippi, Which Reached Their Highest Development in the Historic "Robert E. Lee" and "Natchez" of a Quarter-Century or More Ago: This Is the "Steel City," Recently Placed in Service between Chicago and New Orleans, and Modernized to Suit Twentieth-Century Conditions

With railroad freight rates 20 to 40 per cent above those at which freight can be handled profitably by these steamboats, those who have watched the trend of transportation in the United States have seen that the money lies in the freight. The men who have brought back the packets realize that, while they can make 175 freight miles a day, against the railroad average of 25 miles, they cannot compete with the 300 to 350 miles a day of the passenger train, and so the passenger must seek the packet, for the packet does not care for the passenger.

No more, however, will any modern namesake of the "Lee" or the "Natchez" or the "America" race up and down the streams of the South, for the modern packet owner is a business man, and a gambler only in so far as it is business. The cost of one of these packets of medium size is about $30,000; of the larger packets up to $100,000, while fuel today is coal or crude oil. No longer is it wood cut from the river bank while the passengers held a picnic on shore. But if the romance is gone from the packet itself, it still remains in the men who brought it back, for they are the river captains who once before operated these steamboats, and their sons, and their sons' sons, all experts in river craft, all thoroughly acquainted with the vagaries of the streams, a class of water men peculiar to themselves, the best of the type, who have survived the vicissitudes of time, largely on the strength of the hope that their own ancient profession, or their fathers' trade would come back to them.

How strongly it has come back may be judged from the fact that almost every town from St. Louis to New Orleans, and some even farther north, is providing terminals and port facilities—if it is so fortunate as to have a river in front of it—to handle the up and downstream traffic of these stern-wheelers. New Orleans is devoting a large part of the 1,500-ft. Bienville Street landing to the accommodation of the packets; Lake Charles, a town in Louisiana 200 miles west of New Orleans, is putting $4,000,000 into a navigable channel, 60 ft. wide and 9 ft. deep, which will bring these packets in from the Gulf of Mexico, and also give them free access to the Intercoastal Canal. Memphis is putting in floating terminals, rising and falling wharves, so that the landing stage always will be at the deck level of the packets. Vicksburg has commenced work on similar landings. The new terminals at St. Louis provide for abundant space at the packet landings. Biloxi, Miss., is seeking Federal aid to deepen her harbor and widen its channel, so as to bring in the packets. Mobile is putting several

hundred thousand dollars into port improvements, largely for coastal traffic, while Morgan City, 100 miles west of New Orleans, located on the Atchafalaya River, one of the ancient mouths of the Mississippi, is preparing a bond issue for port improvements, and asking Federal aid to improve the channel to deep salt water. Greenville, Ark., has developed lines up and down and across the river, and now has six packets operating into and out of the port.

Thus it is, all up and down the Mississippi River from McGregor, Iowa, once a center of packet and packet-ferry traffic, clear down to Buras and Port Eads, well south of New Orleans. One of the big packets, carrying about 1,200 tons of freight, has been operated from Chicago to New Orleans; another has been put on between Cincinnati and the Louisiana port, while service between New Orleans and other Louisiana and Mississippi towns by packet is as regular as, and a great deal cheaper than, freight or passenger-train service between the same points.

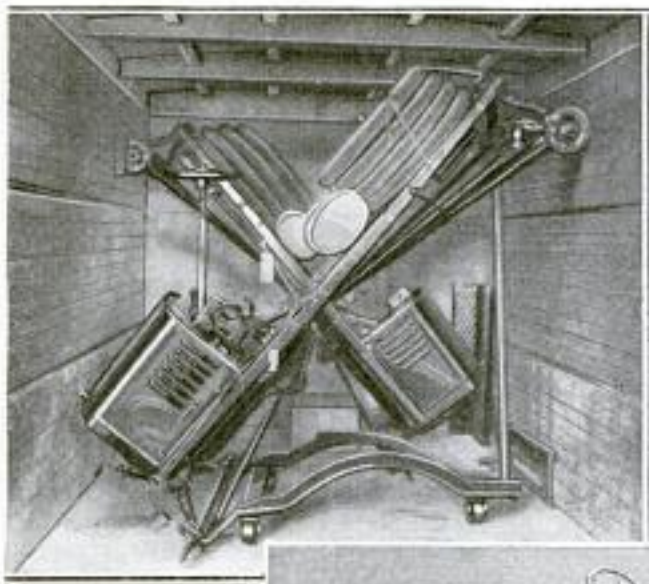
And there is another difference: The packet of today is adapted to the service it performs, big river, little river, bayou, lake, long haul, and short haul. There is the huge river packet, as large as in any of the days of the seventies, like the "America," owned and operated by Capt. L. V. Cooley, who was in command of her when the act of 1887 put the packets out of business, and is again at the wheel up and down the Mississippi, out of New Orleans. There is the middle-sized packet—so called for want of a better name—which handles freight and excursions on shorter hauls, and is a man of all work, towing barges, hauling crippled schooners, ready for charter for hunting and fishing expeditions, or river dances, or any other odd job in sight. Third, there is the little, ever busy passenger and freight packet, scarcely larger than a good-sized motorboat, which often is the only connection between some remote settlement on the inland waterways of the South and the market at New Orleans or Lake Charles or Morgan City or Houma, or any one of a score of other towns.

Built alike, operated alike, usually owned by the man who stands in the wheelhouse, or by him and his sons or brothers, these packets still represent, as they did in the old days, the wealth of families, or the skill of their men on the rivers. They are doing what no other form of transportation ever has been able to do—delivering passengers and freight, river or bayou side, in districts where there are no railroads, and where the soft soil of the delta is too shifting to bear the weight of highways and the modern motor-truck trains.

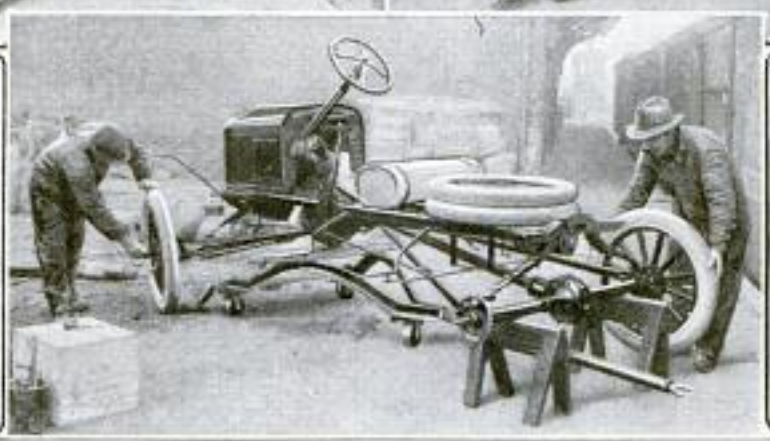
TRUCK FOR UNLOADING LIGHT CARS

An unloader for light automobiles, designed to replace former cumbersome methods of unloading from box cars, consists of two principal elements, a triangular-shaped caster-mounted truck, and a rear collapsible elevating post provided with an inner tube with a fork at the end which slips under the rear axle of the car and is adjusted for height by means of a pin inserted through drilled holes. In use, the truck is wheeled under the chassis, which is leaning in an angular position against the side of the box car, and the rear or point end is raised. This allows two hook supports riveted to the front bar of the truck to slip under the

The Packet Fleet has to be Kept in Repair, and the Small Boat Yard Follows the Packet Just as Rapidly as This Craft Follows the Development of Inland Waterways. Here Is Such a Yard at Lockport, Louisiana



Above is Shown How Stacked Chassis are Removed from a Box Car by the New Unloader. The Truck is Rolled under the Chassis and the Hooks Slipped under the Front Axle, Raising the Chassis onto the Truck. A Bar Supports the Rear Axle

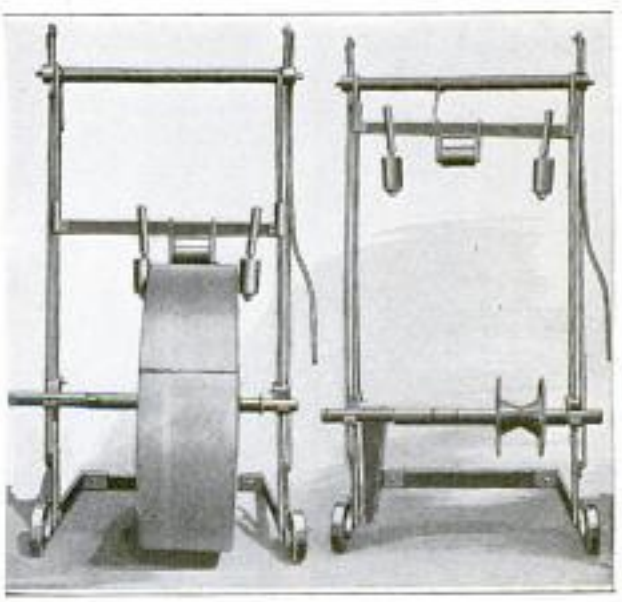


Above: Demonstrating How Chassis is Rolled Out of Box Car by Means of the New Truck Unloader; the Rear Bar Swings Out of the Way Allowing Chassis to be Lowered to Supports, Where the Wheels are Put On, as Shown at the Left

front axle. The rear end of the truck is then pressed down, raising the front axle three or four inches off the floor. The post fork is placed under the rear tube shaft of the automobile, and set to a height sufficient to clear the chassis from the sides of the box car. It is trundled out in this position, and assembled on blocks on the platform, the truck being readily lowered and withdrawn.

DEVICE UNROLLS LONG BELTS IN SMALL FLOOR SPACE

It is a common practice in stores where belting is sold to cut the length of belting required to fill an order by stretching the full length of it on the floor. This is possible where there is enough floor space, though it is at best a rough-and-ready method. A Texas company dealing in machinery has constructed for its own use a device that is independent of floor space, and that enables one man to take a big roll of belting out of its bin, and unroll it, a little at a time, till he has the length required to fill an order. The roll is placed on a spindle of the device which is supported on a frame on which are mounted small wheels, making it easily movable. To unroll the belt all that is required is to hold one end of it and move this frame along a short

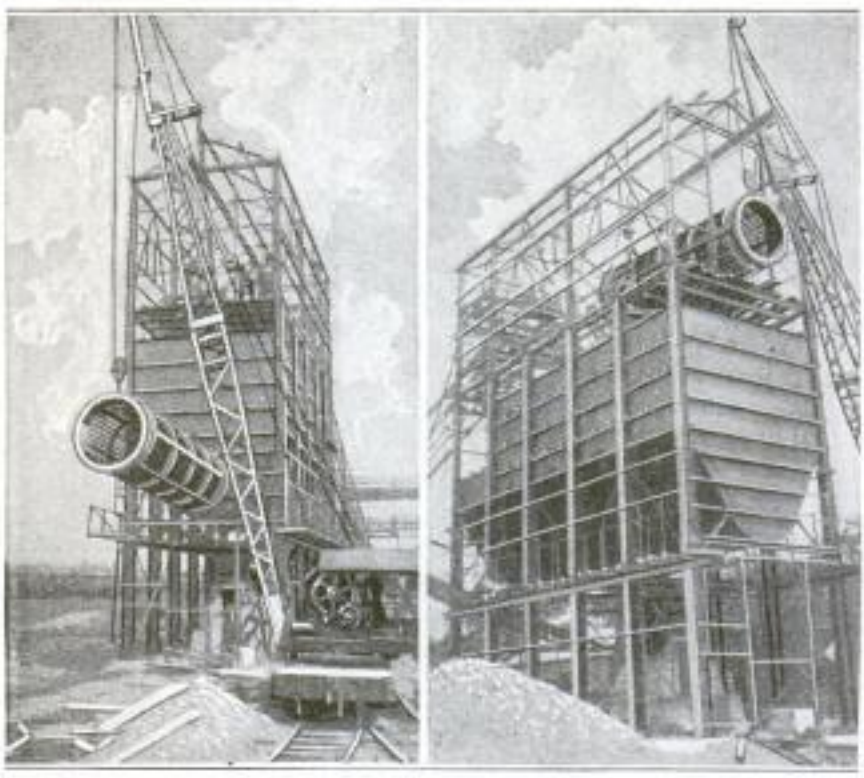


To the Left the Belt-Unrolling Device is Shown with a Big Roll on Its Spindle. Suspended above the Roll Are Guides for Keeping the Belt Straight. Right: The Device without the Belt Roll

distance backward and forward, rolling up the belt as it is measured, until the length required has been obtained.

ERECTION OF A LARGE SCREEN IN STONE-CRUSHING PLANT

A 26-ton screen, part of the equipment of a new limestone-crushing plant, was erected by connecting one end to the overhead trolley hoist that formed part of the plant, while the other end was attached to the 90-ft. boom of a large locomotive crane. Thus the screen was raised horizontally, and when it was high enough to be moved to its frame, the crane moved along its track pushing the screen along the trolley track until it reached the spot where it could be finally set upon its frame.



Left: The Screen is being Hoisted with One End Connected to the Boom of a Locomotive Crane, and the Other End to the Trolley Hoist of the Plant. Right: The Screen has been Hoisted, and is being Moved into Place

MANUFACTURE OF BEET SUGAR A NEW INDUSTRY IN ENGLAND

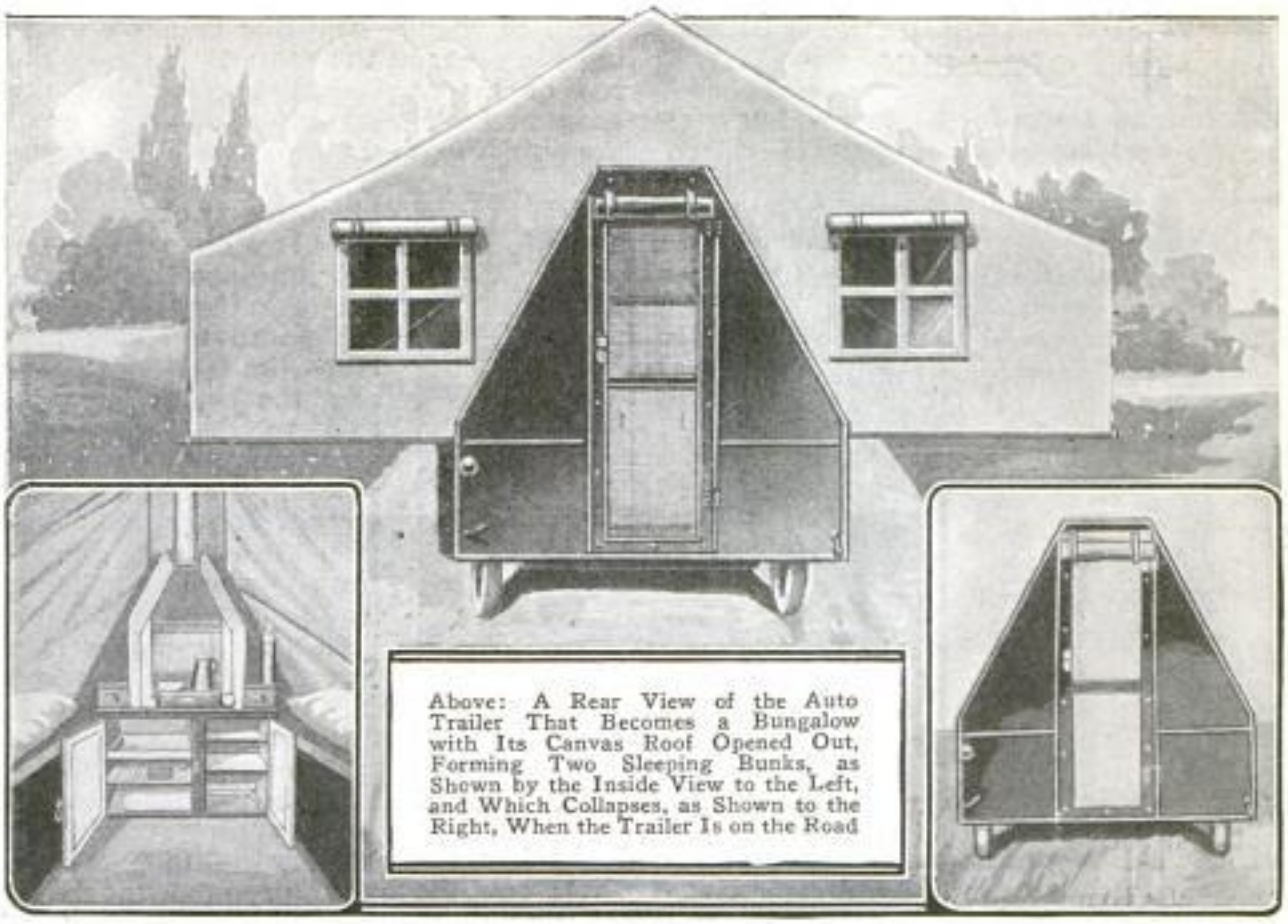
An entirely new industry in England is the production of beet sugar. Already 20,000 tons of sugar beet have been grown by farmers there, and this year a big factory is being completed which by the fall will be ready to manufacture sugar for the first time in England. It is expected that next year's output will be at least 60,000 tons. The industry is such a novelty in England that it has been necessary to engage a staff of French chemists to train the workers in the factory. The importation of sugar into England will in the future be greatly reduced.

NEW ANTIFEBRILE DRUG FOUND IN INDIA

Medicinal properties of great value in the cure of malignant malaria and blackwater fever have been found to exist in the leaves of a tree indigenous to parts of Bihar, and Bengal, in India. The botanical name of the tree is Vitex peduncularis, and it is known locally by various vernacular names. As a drug in the cure of fever, it is used by making an infusion of 1 oz. of the leaves to 40 oz. of water. Where this has been found ineffective, larger doses or stronger infusions have always proved effective, when all other treatment had failed. It has been found by microscopic examination that all malarial parasites disappear from the blood in the presence of the drug. Up to the present the leaves have been used only in their natural form, and it is expected that in a more concentrated form they will be even more effective. It is possible that the new drug may displace the old sovereign remedy of fever —quinine, over which it has the advantages of having no bitter taste, and being a stimulant rather than a depressant.

OPERA GLASS MAY BE FOLDED TO FIT VEST POCKET

A handy little opera glass may be folded up into such small space that it may be carried about in the vest pocket. This is achieved by the hinged construction of the lens tubes, which are separately pivoted at each end of an outer inclosing frame. In folding from the open to the closed position, the tubes are first telescoped and then swung back into the frame. In this manner the frame forms a guard to the lenses, and may also be used as a handle.



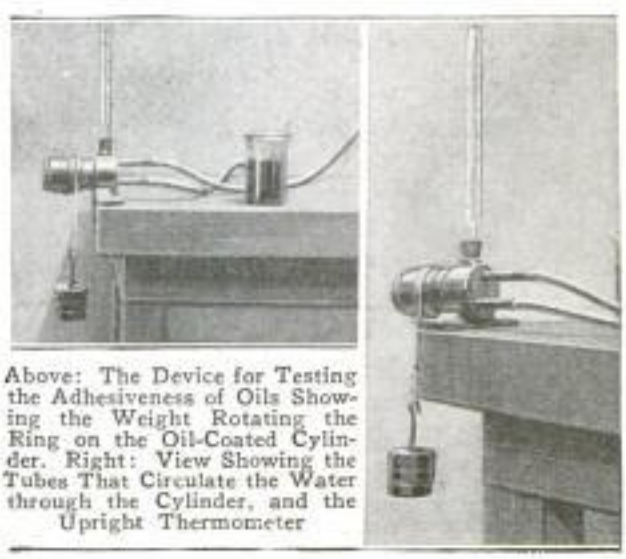
Above: A Rear View of the Auto Trailer That Becomes a Bungalow with Its Canvas Roof Opened Out, Forming Two Sleeping Bunks, as Shown by the Inside View to the Left, and Which Collapses, as Shown to the Right, When the Trailer Is on the Road

ELABORATE AUTO BUNGALOW IS OFFICIAL'S QUARTERS

In touring the state of New Jersey for inspection of posts of his organization, Capt. Charles G. Percival, Chief of Staff of the U. S. Veterans of Foreign Wars, uses an elaborate auto bungalow. Over a trailer body of hardwood which holds a built-in refrigerator, sink, kitchen cabinet, water tank, typewriter table, etc., is a waterproof roof of 15-oz. canvas. Two sleeping chambers which will comfortably accommodate two persons are divided by a 4-ft. aisle and each compartment carries a 6 by 4½-ft. spring bed. Complete, the trailer weighs but 750 lb., and is easily pulled along by the heavy motor car, as it is fitted with roller bearings throughout.

SIMPLE DEVICE FOR TESTING ADHESIVENESS OF OILS

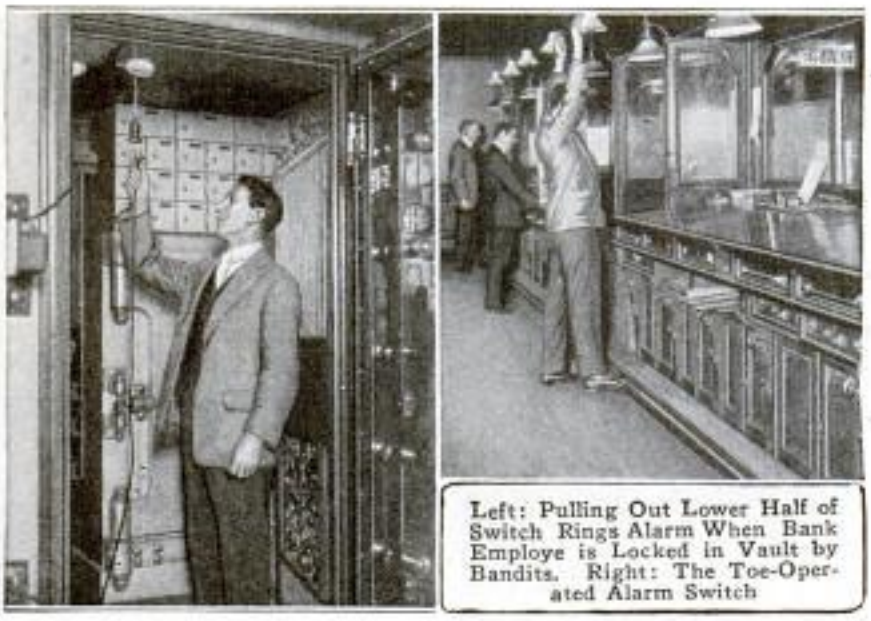
When heavy oils are used as a binding agent in road making, it is necessary to be able to determine the degree of adhesiveness inherent in the oil. A special instrument has been devised for this purpose. It is composed of a brass cylinder that is kept at any desired temperature by circulating water through it. A thermometer on the cylinder records the temperature. The outside of the cylinder is coated with the oil to be tested, and over this is slid a ring that fits the cylinder close enough to allow a fine film of the oil to remain between the inside face of the ring and the outside face of the cylinder. Connected to this ring is one end of a cord that encircles it, the other end carrying a weight. The adhesiveness is measured by observing the time it takes the weight to fall a given distance, which depends, of course, upon the resistance to the rotation of the ring on the cylinder caused by the adhesiveness of the oil. The oil is tested at different temperatures.



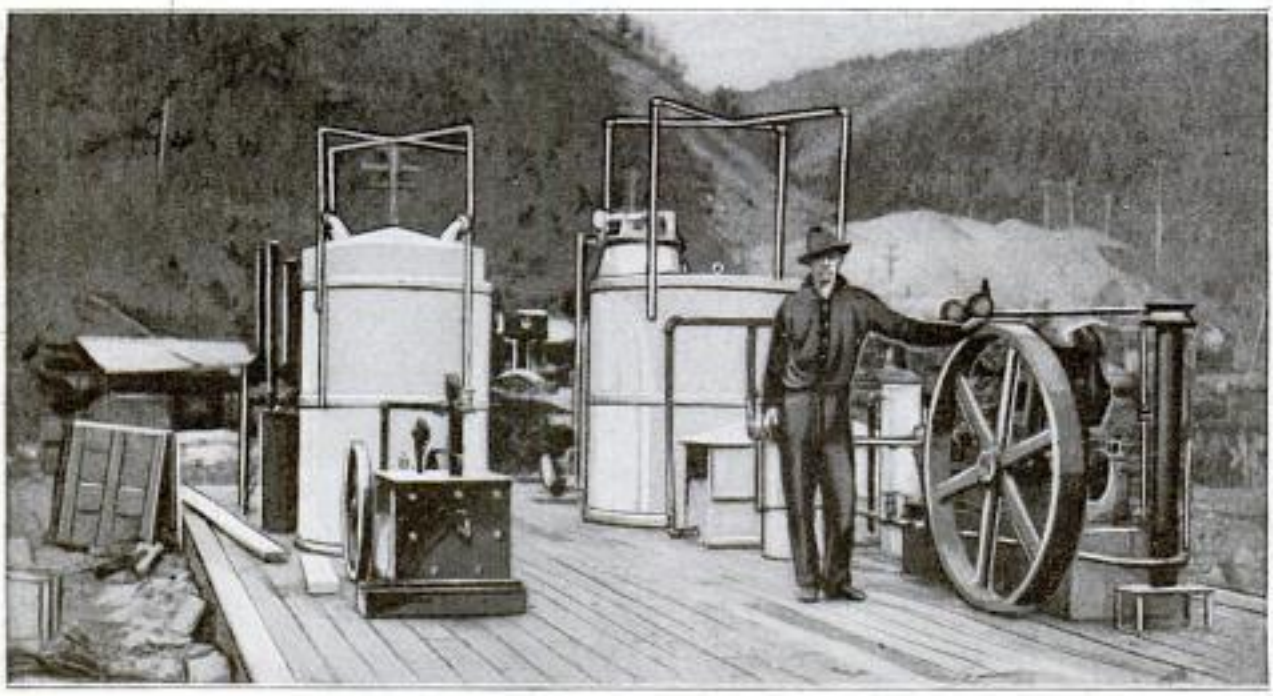
Above: The Device for Testing the Adhesiveness of Oils Showing the Weight Rotating the Ring on the Oil-Coated Cylinder. Right: View Showing the Tubes That Circulate the Water through the Cylinder, and the Upright Thermometer

BANK BURGLAR ALARM WORKS ON OPEN CIRCUIT

A burglar alarm for banks and business houses consists of a toe-operated switch which lies along the floor similar to molding. In response to the robber's command of "hands up!" the employe obeying the order at the same time places the toe of his shoe in the crevice of the strip and by exerting a slight upward pressure throws in the alarm. The system works on the open-circuit principle, electricity continuously holding open the electromagnetic connections until purposeful pressure stops the flow and operates the signal. This is said to do away with annoying false alarms possible with the closed circuit. Primary cells furnish the current. Statistics show, it is stated, that in 70 per cent of bank hold-ups, employes are forced into, and locked in, the vault. To outwit this ordinarily effective trick of the bandits, the vault is provided with a two-part plug switch that looks like the ordinary lighting variety. Pulling out the lower half sounds the alarm.



Left: Pulling Out Lower Half of Switch Rings Alarm When Bank Employe is Locked in Vault by Bandits. Right: The Toe-Operated Alarm Switch



ACETYLENE AND OXYGEN PLANT IN KLONDIKE

BECAUSE of its usefulness as a salvager of broken mechanical parts, welding is employed as a repair medium in connection with the gold dredges at work in the far-northern fields of the Klondike. The oxyacetylene process is used in one community near Bear Creek, Yukon Territory, Canada, and by its application 68 buckets of 17-cu.-ft. capacity each have been reclaimed, enabling the operation of an additional dredge. Being so far from gas-cylinder supply stations throughout the United States and Canada, the installation of generating units for both of these gases was decided upon. A 200-lb. acetylene generator with its complement of compressor and holder as well as an oxygen generator-holder-compressor unit, were installed forthwith. The electrolytic method of manufacturing oxygen was displaced in this construction by the old-time chlorate-of-potash process, as the latter is considered more practical for a remote installation of this kind.

MOTOR-CAR GASES IN TUNNEL CREATE PROBLEM

By JOHN ANSON FORD

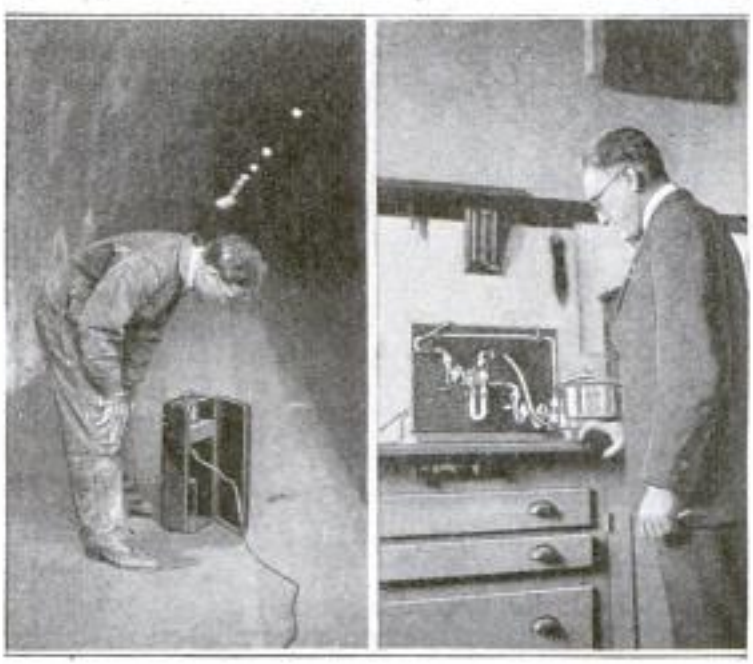
AUTOMOBILES are now used in such great numbers that cities maintaining street-traffic tunnels are finding in many instances that they have a new and difficult problem on their hands because the poisonous gases from the motor cars have so increased in amount as to almost fill the passageways. The situation is one that was unknown to the engineering world a few years ago. The lack of precedent to guide officials in handling this problem was forcefully brought to the attention of the engineering department of the city of Los Angeles when it was discovered a few months ago that the Third Street tunnel, near the heart of the retail district, had become a menace. Tests showed that carbon monoxide accumulates in this 1,050-ft. bore in such large quantities during rush hours, as to seriously endanger the health of persons passing through the tunnel. The fear has even been expressed that some person with a weak heart may some day suffocate while passing through this tunnel when it is filled with slow-moving machines.

Inquiry by Maj. John A. Griffin, city engineer, revealed that while other cities, notably New York and Philadelphia, were working on the problem of keeping tunnels free from automobile fumes, no city yet feels that it has fully solved the problem, nor is the best method of remedying the new evil definitely known.

What is of particular interest at this time are the methods which have been followed in investigating this new problem and the new data obtained as to the condition of the atmosphere in this tunnel (which may be regarded as typical of many), and the effect of traffic on the temperature, etc. Facts regarding four important aspects of the problem have been gathered: the amount of carbon monoxide in the bore when traffic is heavy, the amount of dirt and other foreign substance found in suspension in the air, the effect of motor traffic on tunnel temperatures, and the variations in traffic during different times of the day.

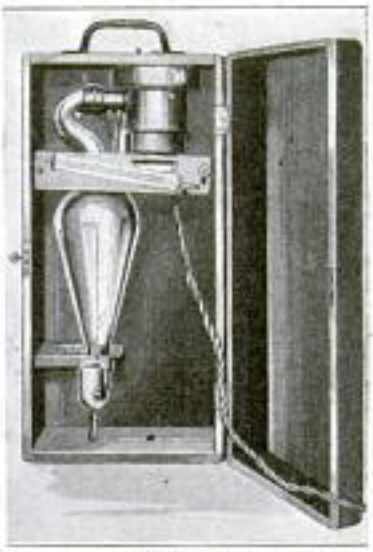
In making tests to determine the amount of carbon monoxide

East Entrance to Third Street Tunnel, Showing the Manner in Which Motor Vehicles Line Up in This Poorly Ventilated Passageway When Traffic Is Heavy



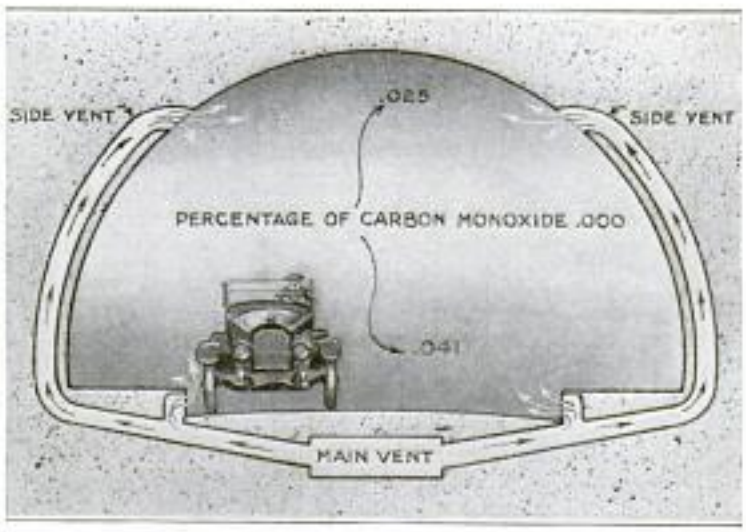
Left: Illustrating the Method of Testing the Air in the Tunnel to Determine the Amount of Foreign Substances (Solids) Which It Carries. Right: Making a Laboratory Test of a Sample of Air to Determine the Amount of Carbon Monoxide It Contains

in the tunnel it was found, rather strangely, that the stratum of air next to the floor of the bore showed the highest content, the test showing .041 per cent, or approximately 4 parts in 10,000. (Pure CO is lighter than air.) At the height of 7 ft. there was no appreciable amount of carbon monoxide, while within a few inches of the top of the tunnel the carbon monoxide content was .025 per cent. While the engineering department of the city does not accept these figures as final, since it proposes to continue its tests over a considerable period, they undoubtedly give approximately the condition of the atmosphere as it is much of the time during a week day.



Apparatus Which is Used to Determine the Amount of Solids and Soluble Matter Floating in the Air in the Third Street Tunnel at Los Angeles

These percentages do not mean anything to a layman, however, until it is learned that .05 per cent, or 5 parts of carbon monoxide in 10,000, is sufficient to produce giddiness after breathing for half an hour; .10 per cent will make the breather unable to walk, and .20 per cent will cause a person to lose consciousness. In other words, the condition as shown by the preliminary tests of the air is dangerously near the point at which pedestrians or automobile passengers in delicate health might suffer serious results from passing through the tunnel. While no laboratory tests yet show higher tests, there is reason to suppose that heavy auto traffic, when stalled in the tunnel for several minutes, as is often the case during rush hours, pollutes the air to a point where it is even more poisonous.



Cross Section of Third Street Tunnel, Showing Installation of One of the Proposed Ventilating Systems: Percentages Show Amount of Carbon Monoxide at Various Levels, Revealing the Unexpected Fact That It Is Higher at the Ceiling than at the Floor

This phase of the question is being studied with particular care. The length of the tunnel is 1,050 ft., and its air content about 600,000 cu. ft. A careful count showed that approximately 13,500 motor cars pass through every 24 hours and that during the rush hour in the evening they utilize the passage at the rate of 950 per hour. These cars travel at an average speed of six miles per hour, and the average gas consumption, according to careful estimates, is at the rate of only six miles per gallon. Using these figures as a basis of computation, it is found that 31½ gal. of gasoline are consumed in the tunnel per hour. This large total explains why there is such a very dangerous carbon-monoxide content found in the passageway. The fact that carbon monoxide is slightly lighter than air would lead one to suppose that the tests would show the most of this poison gas at the top of the tunnel. That the contrary is the case is due, it is believed, to the presence of other and heavier foreign substances diffused in the air. These result, in part at least, from imperfect combustion in the automobile cylinders.

In addition to the serious menace resulting from the constant discharge of such large quantities of the poisonous carbon-monoxide gas in the tunnel, there is the problem resulting from increased temperature. Fortunately, if the wind is in the right direction, the resulting movement of the air keeps the tunnel cool and automatically drives out the foul air. But much of the time, notably night and morning, there is little or no wind and the tunnel becomes suffocating. If 31½ gal. of gasoline were burned in the bore after both ends had been sealed up so that there could be no change of air, the combustion would theoretically raise the temperature 283°F. As a matter of

actual experience the excess above normal amounts to only about 40°, according to temperature tests made at various points in the passageway. Calculating the normal at 70°, this is sufficient to make the tunnel almost unbearable. Reports received by Major Griffin from engineers in other cities indicate that the increase in motor traffic is also resulting in similar temperature problems in other much used vehicular bores.

The serious effect of the carbon monoxide in the air and the high temperature resulting from so much combustion is illustrated in the experience of workmen who undertook to plaster part of the tunnel's surface. These men were made sick within periods of one to three hours. When it is remembered that an average passenger automobile discharges approximately one cubic foot of carbon monoxide per minute (as shown by tests made for the New York and New Jersey Tunnel Commission, which data were kindly furnished Major Griffin) it is easy to see why workers in the Third Street tunnel were overcome.

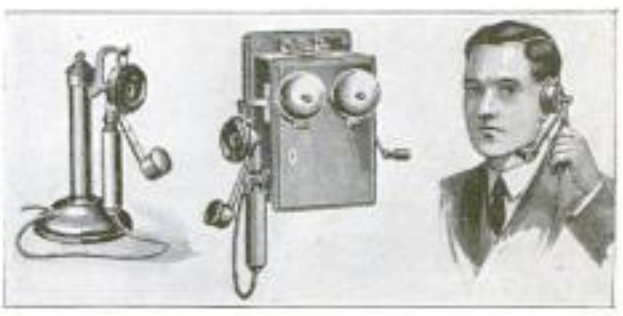
Next in importance to the question of poison in the air and abnormal temperatures resulting from heavy motor traffic, is the question of pollution of the air with various solids, minute particles of which are constantly agitated by the movement of automobiles through the tunnel. By using a special piece of motor-driven apparatus, designed for determining the foreign content in the air, it has been possible to gauge the extent of undesirable material in this tunnel. What the Los Angeles investigators used was rather roughly made, but it proved satisfactory. In making these tests, the device is set down in the tunnel and allowed to run the desired length of time, current for operating the motor which draws the air through the apparatus being secured from near-by electric lines. Within the case holding the apparatus is a glass bulb with a curved neck and immediately above it is the electric motor, which drives an air pump. The latter draws the air through the neck of the bottle which is partly filled with water. The air is thereupon mixed with the water, forming a fine spray when it reaches the enlarged section of the glass flask.

The apparatus operates somewhat like a common air washer. All foreign matter and soluble matter is taken out of the air by the intimate contact with the water. A meter indicates the cubic contents pumped through the neck of the flask. The apparatus can be operated until one feels that he has secured a truly representative sample of air. The next step is to determine the quantity of foreign matter in the water, either by evaporating the water and weighing the balance, or by comparing it with previously prepared turbidity standards. This equipment is known as the Palmer air-spray apparatus.

After careful investigation the city engineering department has drawn up general specifications for different means of remedying the bad ventilation. The selection will be up to the city council, and its choice will depend on the amount of money that it is willing to spend. One proposed expedient which undoubtedly would improve, if not entirely rectify, the present evil, is to install a series of electric fans close to the top of the tunnel, all pointing in one direction. These would materially aid ventilation. Another and more expensive proposal is to construct a ventilating duct beneath the floor of the tunnel and connect it with the bore by gratings installed at suitable intervals. Supplementing this main vent for foul air would be branch vents connecting openings in the sides and top of the tunnel, with the ducts below the floor. Electrically driven fans would force the air through these vents.

THROAT PHONE TRANSMITTER DISPLACES THE MOUTHPIECE

One of the most recent developments in the art of telephony is a telephone without a mouthpiece. Moreover, the substitute for the mouthpiece is also an improvement, as it is entirely unaffected by external noises, and with it a telephone transmits and receives messages just as audibly in a boiler shop as in a parlor. The transmitting is done by means of a small microphone that rests lightly against the side of the throat, and is connected to



Reading from the Right: The New Telephone Transmitter That Has a Microphone Resting against the Side of the Throat Instead of a Mouthpiece, Shown in Use, and Successively as Part of a Wall-Type and of a Desk Phone

the receiver by a bar of suitable length. Where this bar joins the receiver is a short bracket from which is suspended an ebonite handle, the lower end of which is connected by wires to the telephone. On the receiver is a suspension ring for hanging it on the telephone switch as of old. This throat-microphone transmitter is of British origin, and it was used extensively during the war by the Royal Air Force.

RUBBER STRIP MENDS WORN TIRE TREADS

By means of a rubber strip, the inner side of which is in the raw state and the outside cured, a San Diego inventor claims a quick and effective repair for worn tire

Winding a Patented Rubber Strip Circumferentially about the Casing Is a New Method of Repairing Worn Tire Treads

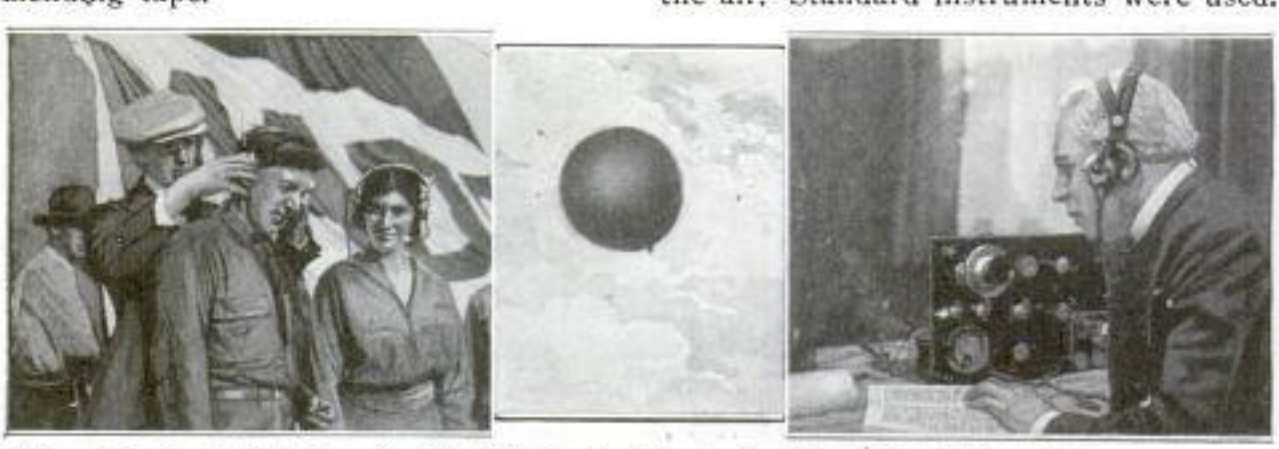
treads that will increase the life of the tire by 1,000 miles. The strip is wound circumferentially around the casing like mending tape.

BUILDING TO WITHSTAND EARTHQUAKES

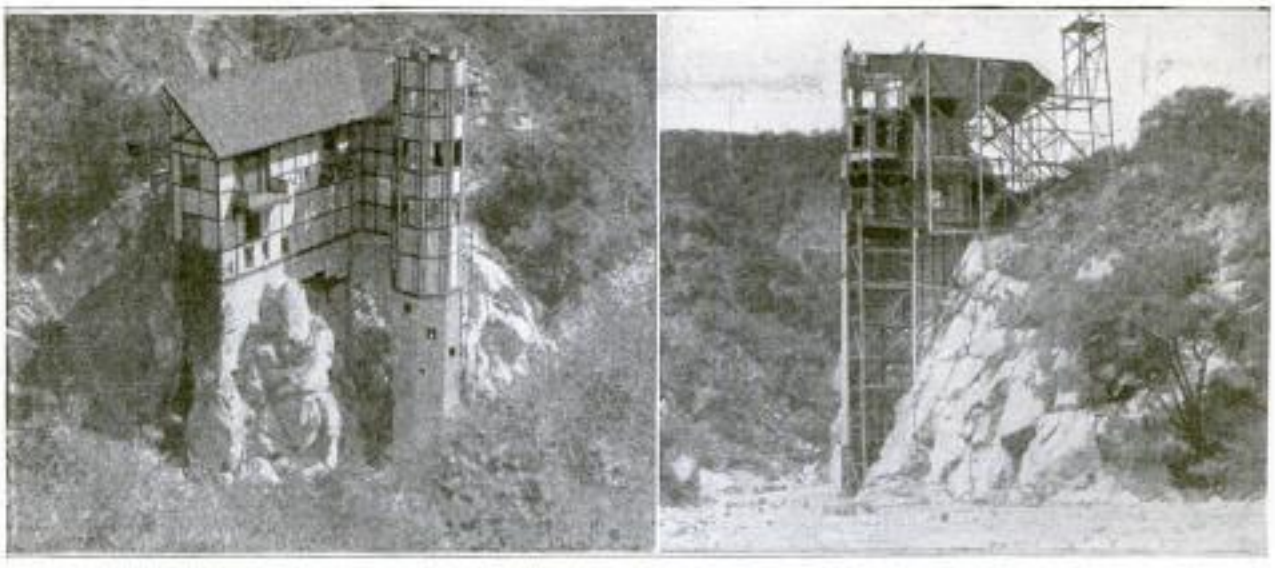
In discussion of building in countries subject to earthquakes it has been suggested that the form of the structure should be that of the inverted box so that all parts will vibrate as a unit rather than each part separately. Attention is called to the wonderful resisting power of the old Japanese temples which, because of their elaborate interlocked construction, have been able to stand the vibratory strain of earth tremors for ages. In some districts of Japan the houses are built entirely without foundations. The suggestion has been made that unit dwellings might be positioned on rollers with special concrete flooring. In general, construction demands that the walls be as homogenous as possible, having their greatest length in the direction known to be coincident with vibratory travel. Chimneys should be independent of the rest of the structure. Rounded windows are less liable to transmit cracks than rectangular ones. The practically monolithic houses of the island of Santorini, in the Ægean Sea, are said to embody these principles to some extent.

COUPLE MARRIED IN AIR BY WIRELESS PHONE

A brand-new use for the wireless telephone was discovered recently when a minister could not be found to brave a balloon ascension for the purpose of marrying two air enthusiasts who had decided that they wanted to be married in the region of the clouds. Accordingly the wireless telephone was hit upon as a solution of the problem, and the minister was enabled to read the service in his study while the couple soared a thousand feet in the air. Standard instruments were used.



Left: Adjusting the Wireless Receiving Sets to the Heads of a Prospective Bride and Groom Who were Married Recently While Suspended from the Balloon Shown in the Middle Picture. The Man at the Right with the Receivers Strapped to His Ears Is the Parson Who Conducted the Service from His Study



Scenic Creation of a Movie Manufacturer to Give a Photographic Reproduction of a Castle on the Bank of a Gushing Stream: To the Left Is the View That Faced the Camera, and to the Right Is a Side View Showing the Skeleton Nature of the Structure

MOVIE PHOTOGRAPHERS ARE TRANSFORMERS OF NATURE

Many ingenious expedients have to be resorted to by movie manufacturers to depict scenes altogether foreign from their actual surroundings. This art of photographic reproduction involves a species of landscape transformation compared with which the most elaborate landscape gardening is mere child's play. In one case the effect desired was a castle located on the bank of a gushing stream. Nature had not provided the stream, so art had to do it. Advantage was taken of the existence of an outlet from a dam, with a steep rocky hill beside it. Against this hill the castle was built in skeleton fashion, only the front that had to face the camera being finished. Behind this the actors, standing at different levels on the hillside, appeared to be in the rooms at various parts of the castle. Then the water was allowed to rush from the opening in the dam, and the result was the picture desired.

BY SPRAYING PLANTS UPWARD THEY ARE WELL DISINFECTED

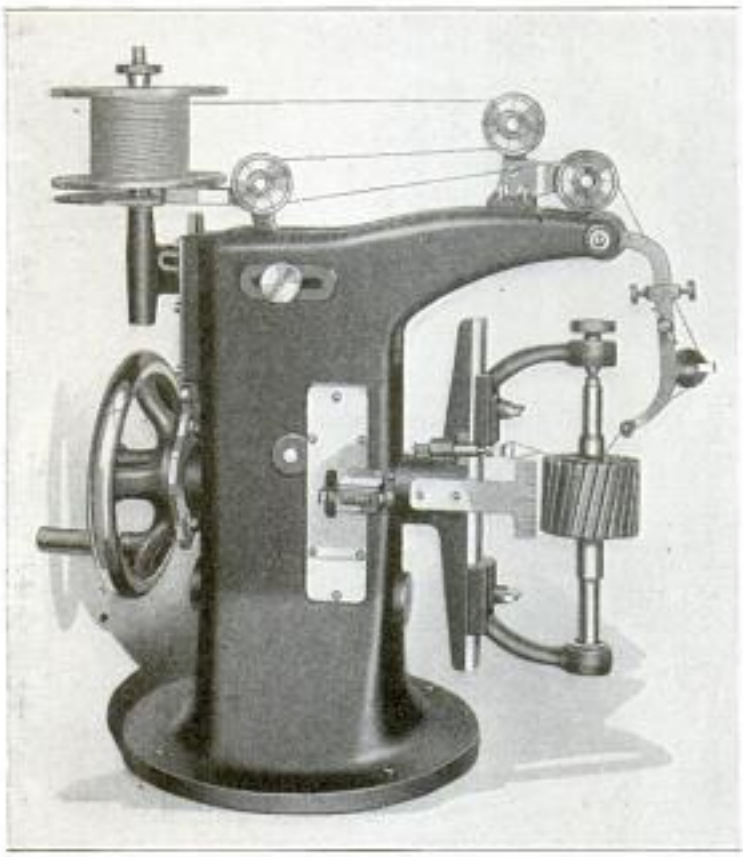
Insect pests that do most harm to food plants generally attack the underside of the leaves, and therefore in spraying such plants with insecticide it is much more effective if the spray strikes upward than if it falls downward, as from the nozzle of an ordinary hose. There is now on the market an implement which sprays from the ground upward against the lower sides of the leaves, and the solution, in falling back to the ground, also sprinkles the upper side. The double nozzle of the sprayer runs on a small wheel at the end of a pipe boom, the other end of which is connected to a small tank containing the insecticide under pressure. Between the two nozzles at the wheel is a steel share that lifts trailing vines from the ground into a position for receiving the spray on the underside.

The Implement Sprays Plants from the Ground Upward. The Two Nozzles at the Wheel are Connected by the Pipe to the Tank That Contains Insecticide under Pressure. A Valve in the Pipe Controls the Spray

¶A tablet which renders water safe for drinking has been prepared by the Chicago Health Department for the use of campers.

MACHINE WINDS ARMATURE IN TWENTY MINUTES

A machine that will wind a 1-hp. armature in 20 minutes is the claim that is made for a new armature winder. If this claim is substantiated, it will certainly be a great time and labor saver in repair shops and small factories. The machine weighs only 65 lb., and may be fitted with either a wheel or a pulley to be operated by hand or by power. It is made to wind any standard make of armature up to 1 hp. without removing the commutator.



This Machine, Operated by Hand or Power, Winds a One-Horsepower Armature in 20 Minutes. The Armature Is in Position on the Right, the Wire Spool and Winding Apparatus above It

TUNNEL OF TWIN STEEL TUBES UNDER THE ELBE AT HAMBURG

A tunnel composed of twin tubes, 20 ft. in diameter, 26 ft. 3 in. center to center, and 1,500 ft. long, has been recently constructed under the river Elbe at Hamburg, Germany. The tubes are built of six steel segments, each of a girderlike cross section with a web, 10 in. high, and two flanges, the bottom one wider than the top, having side flanges for riveting them together to complete the circumferential wall of the tube. These are in lengths convenient for handling, and have end flanges for riveting one to the other. In all the connecting flanges are grooves into which lead is poured to calk them. Each tunnel has a central roadway 6 ft. wide, and two sidewalks. The traffic is in one direction only. At each shore end of the tunnel there is a circular shaft of 72-ft. inside diameter, sunk from the surface, and containing three elevators 10 by 33 ft. for vehicles, and three others for passengers with a capacity of 7,000 in each direction every half hour. The shaft at the city end of the tunnel is built of reinforced concrete, with a circular superstructure roofed in with a glass dome, under which is the hoisting machinery for the elevators. At the harbor end of the tunnel, the shaft had to be sunk through water-bearing sand and gravel by means of compressed air, and is composed of a double-walled steel cylinder of 85-ft. outside diameter, the space between the walls being filled with concrete. These walls were built in sections which were riveted together as the work proceeded.

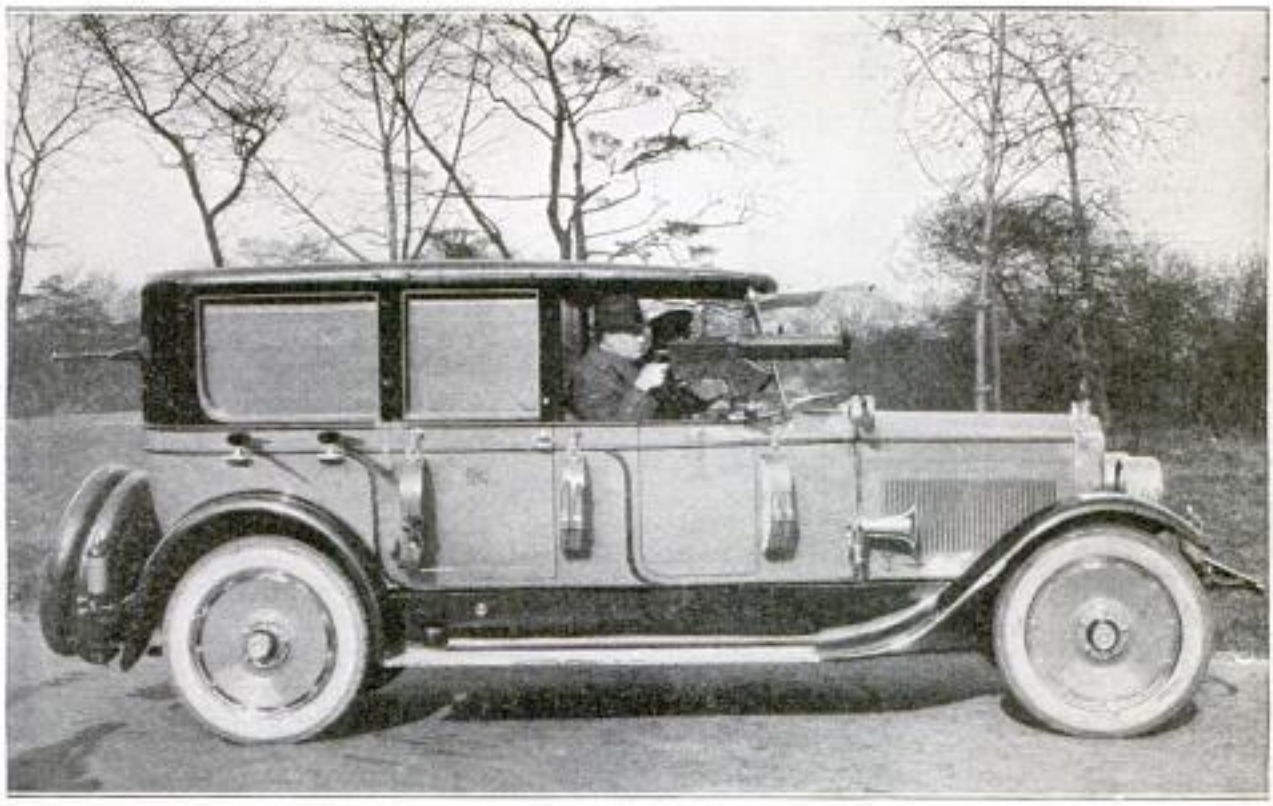
MANCHURIAN GOVERNOR'S AUTO STEEL-WALLED FORT

BY GEORGE F. PAUL

WHEN the governor-general of Manchuria rides abroad in his land, he does not select an easy-going carriage in which he might become an easy target, but instead he summons a luxurious limousine that in an instant can be converted into a steel-walled fort proof against bullets and bombs.

The interior of the car presents a most luxurious appearance, for the panels are of inlaid mahogany; the fittings and all metal of the tonneau are of silver and cloissonné, and the upholstery is purple and gold mohair.

But when it happens that his excellency General Tsan-Tso-Lin is in danger, the car can be quickly transformed into a speedy citadel. The body itself is built of chrome-nickel steel, and inside the top are chrome-nickel steel shutters that slide



Limousine of the Governor-General of Manchuria Which, as Shown, has been Quickly Converted from a Luxurious Pleasure Car, with an Interior of Inlaid Mahogany and Silver Trimmings, Upholstered in Purple and Gold Mohair, into an Armored Car with Exterior Steel Bullet-Proof Walls, Armed with a Colt Machine Gun

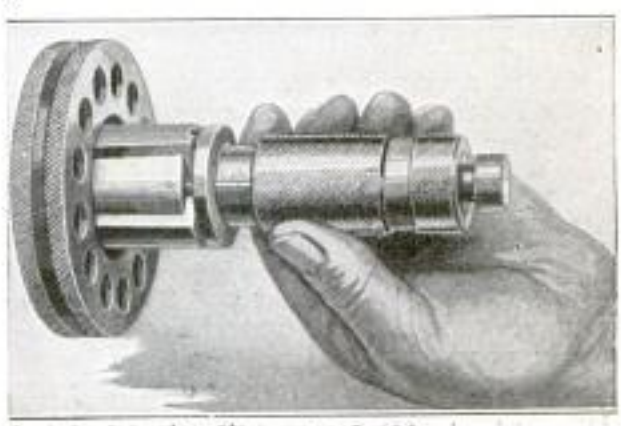
down on roller bearings and cover the windows. Another steel shutter rises from the partition between the tonneau and the driver's seat. A Colt machine gun can be taken from under the driver's seat and fastened to a special bracket built at the right-hand side of the cowling. Two loopholes open on each side and two more at the rear, and automatics or rifles can be fired through them.

Swivels are fastened above the running board with belts provided, so that three soldiers can be strapped to each running board with their hands free to handle weapons.

Because of the great weight of the car, it was necessary to strengthen the whole frame of the vehicle. All windows were made of a glass that will not splinter when struck by a bullet. The total cost of the machine was in the neighborhood of 35,000 dollars.

MICROMETER REPLACES PLUG GAUGES

A micrometer has been devised which enables the operator to measure directly internal cylindrical surfaces to .0001 in., thereby eliminating the blind working of holes as is ordinarily obtained with "go" and "no go" plug gauges in production work. Four measuring jaws resting on flat inclined surfaces are supported and held in alinement by close-fitting dovetail slots in the micrometer body, which is movable by means of a micrometer screw. The jaws are so ground as to give a line contact on the surface being measured. A longitudinal movement of the body of .005 in. increases or decreases the diameter of the jaws .001 in. A knurled cap at the rear end of the sleeve is graduated into 100 parts. Rotating the cap so that one serration passes out of alinement with a zero notch on the stationary part of the sleeve and the next is brought into alinement, increases or decreases the diameter of the jaws .0001 in. A full turn of the dial changes the jaw diameter .010 in. which is further indicated by .010-in. graduations on the shank of the handle.



Internal Micrometer and Master Ring Gauge: Micrometer Readings Up to .0001 Inch, for Inside Measuring, are Afforded

TURBINE AUTO WASHER CLEANS WITHOUT HARMING FINISH

One of the deleterious effects of cleaning an automobile by means of a hose has been that when a stream of water is

Upper Right Corner: Turbine Auto Brush. Center View: Force of Water from Garden Hose Revolves and Sprays Brush for Cleaning. Bottom Picture: Brush Disassembled

plied directly against the car the dirt and grit are forced in grinding action over the surface, dulling and destroying the finish. A new device attached in place of the ordinary nozzle consists of a small turbine motor which sends a spray of clean water through the exhaust over a revolving brush, eliminating any abrasion, and softening and removing the mud more quickly and easily than by hand-sponging methods. Brushes of various textures are furnished for different parts of the car. It is claimed to be especially useful in reaching corners and the ordinarily inaccessible places of wire wheels and other parts of the machine.

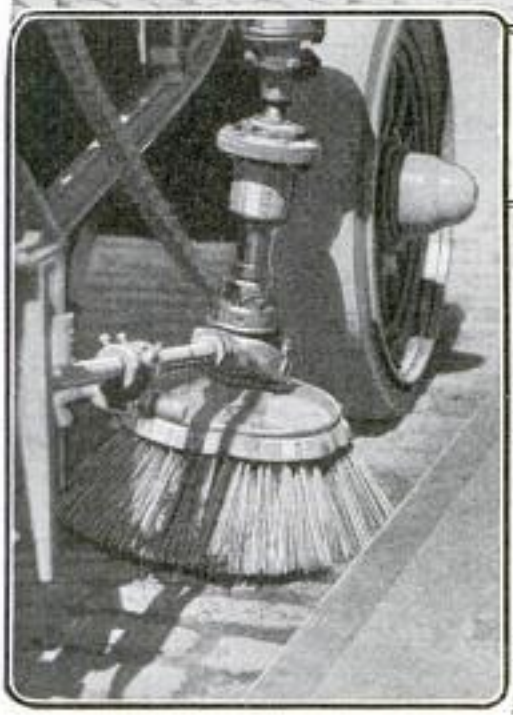
UTILIZING RUBBER SEED FOR OIL

With a view to making commercial use of rubber seed for other than planting purposes, a mill has been established in the Dutch East Indies for crushing the product and thereby grinding out the oil. While experiments conducted many years ago by the Imperial Institute determined the fact that the oil has many of the properties of oil of linseed, and is therefore useful as a component part of paint, and for other purposes where linseed oil is used, it was not until last year that any commercial use of the discovery was made. As there are now more than 1,000,000 acres under cultivation of the rubber plant in the Dutch East Indies, production of the seed is much greater than is needed for extension planting. In determination, therefore, of making further commercial use of the seed, an oil mill was built at Malaya, and during the last year several consignments of the product were shipped to Europe and sold at good prices. The new utilization is expected to increase.

REMARKABLE PHOTO OF TOWER IN THE ACT OF FALLING

As part of the work of razing a church in Toronto, Can., to make way for a street extension, the old tower had to be demolished. It was a very substantial structure, with walls two feet thick, which were undermined so as to cause the whole tower to fall at one time. An enterprising photographer made preparations for the event, and succeeded in obtaining a very remarkable picture of the tower in the act of falling, showing the heavy walls crumbling and the tower leaning over in the first stage of its collapse.

Church Tower at Toronto Photographed Just as It Began to Fall: The Walls had been Undermined in Connection with Street Improvements Requiring the Razing of the Church



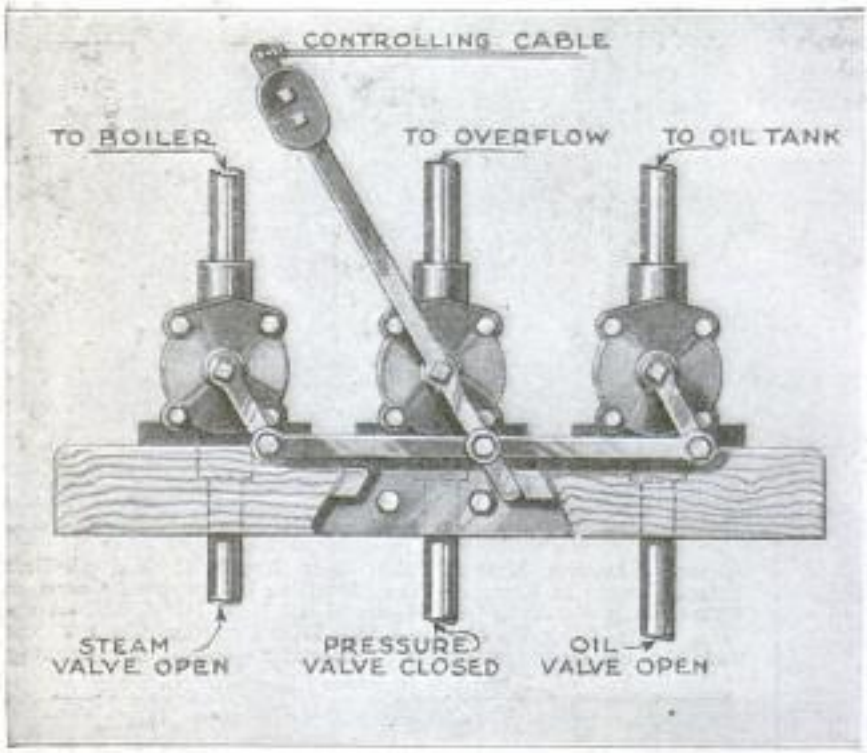
Above: Showing How Vertical Side Brush of Multiple-Unit Street Cleaner is Elevated When Machine is Sweeping Center of Street. It is Controlled by Means of the Bent Hand Rod on the Side. Left: Close-Up of Side Brush Demonstrating Yoke Throw and Flexible Coupling. Below: Sweeping near Curbing

MULTIPLE-UNIT SWEEPER CLEANS STREETS

A motorized street cleaner, operated by the street-cleaning department of Cincinnati, has the special feature of a gutter brush which rotates at the side of the machine in a plane parallel with the walk, insuring that those portions of the pavement adjacent to the curbing are swept clear of dirt. The brush is raised or lowered by the driver by means of a hand lever accessible from the seat. This side sweeper is in addition to a regular revolving brush beneath the machine, which sweeps the dirt into a pan leading to a large tank mounted over the front axle. The cleaner is also equipped with a motor-driven pump which forces powerful jets of water to either side of the machine to a radius 40 ft. wide for flushing the street. Still another feature is a sewer dredge by means of which sewers are cleaned of impeding débris. A large suction hose is inserted into the street aperture by the driver, while a second man stands by and directs a stream of water from a pressure main into the hole to stir up the sediment. In this manner two men with the machine suffice to do in half an hour the work done formerly by six men in a full day. The device is three-wheeled and is steered from the rear.

VALVE FOR FIRE PROTECTION IN OIL-BURNING SYSTEMS

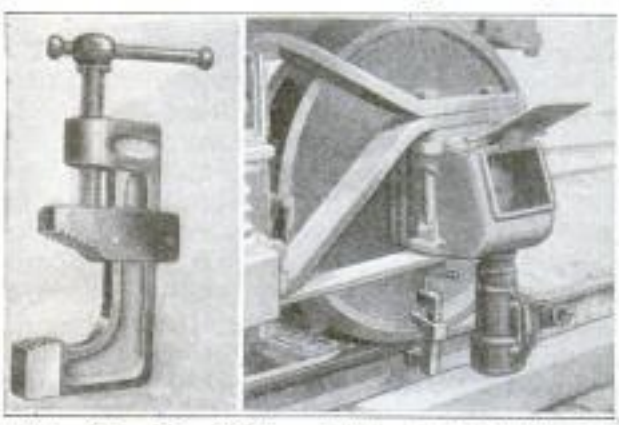
In oil-burning boilers, more particularly fluid-fuel pressure systems, there is always a possibility that the fuel pipe may burst under excessive pressure, with a resultant leakage of oil that is a frequent cause of fire. It is for this reason that there has been devised a new safety valve that will instantly stop the flow of oil, and that can be controlled from a distance. It is specially adapted for use aboard ships where oil-burning power plants are becoming so common. In this case it is controlled by a cable which is connected to a lever on the valve that makes three movements at one and the same time, shutting off the steam and the oil, and relieving all pressure. The other end of this controlling cable may be in the wheelhouse, and therefore within reach of the officers or men on watch, and at the same time may be reached from other parts of the ship, either forward or aft. One jerk of the controlling cable is enough.



Safety Valves for Fire Protection Shown in Neutral Position: Valve to Left Is Wide Open; Center One is Closed to the Relief Line and That to the Right Is Open between Pump and Oil Tank

CLAMP BINDS RAILROAD-CAR WHEEL TO RAIL

A clamp, designed as an adjunct to the rebrassing of railroad-car hot boxes, consists of a C-shaped frame having a lower jaw which is serrated and an upper arm through which passes a rotatable screw acting on a sliding member that forms the upper jaw. In the process of rebrassing a journal, the lower jaw of the clamp is placed under the outer flange of the rail and the sliding jaw screwed down on the car wheel, thereby eliminating the dislocation of the wheel from the track ordinarily caused by jacking up the journal box. With the aid of the clamp one man is said to be able to change the brass in less than five minutes.

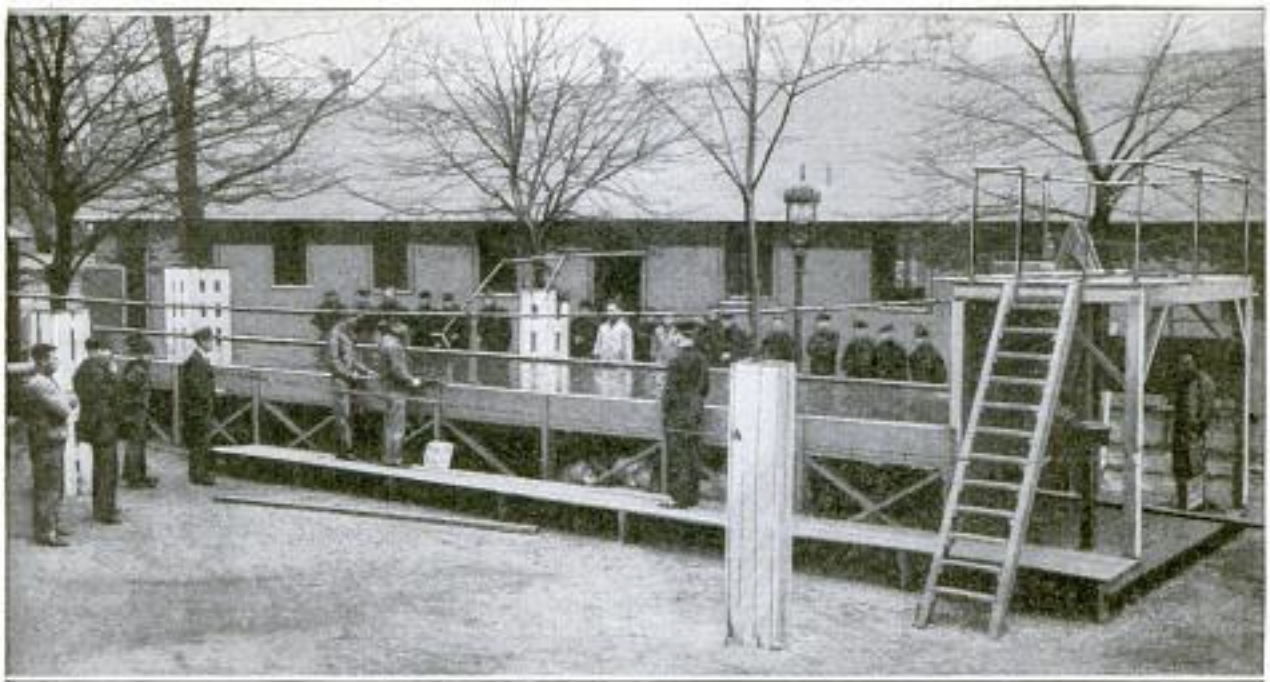


Left: Close-Up of Clamp Used to Bind Wheel of Railroad Car to Track When Jacking Up Journal Box, as Shown at Right, for Rebrassing

NAVAL GUN-FIRE "SPOTTERS" TRAINED ON MINIATURE SEA

Distinctively American methods of training are given credit for the remarkable accuracy of gun fire exhibited by our sea fighters during the late war. It is asserted that in over 100 surface engagements not one American vessel was worsted. Two "dry-land" systems, one of which was described in the March, 1919, issue of Popular Mechanics, are used. In both of these, the principles are the same, but the later method is the more realistic.

A tank, representing the ocean, contains a movable target in the form of a miniature submarine which can be made to submerge, suddenly appear in unexpected quarters, navigate the surface, and, in short, perform all the evolutions of



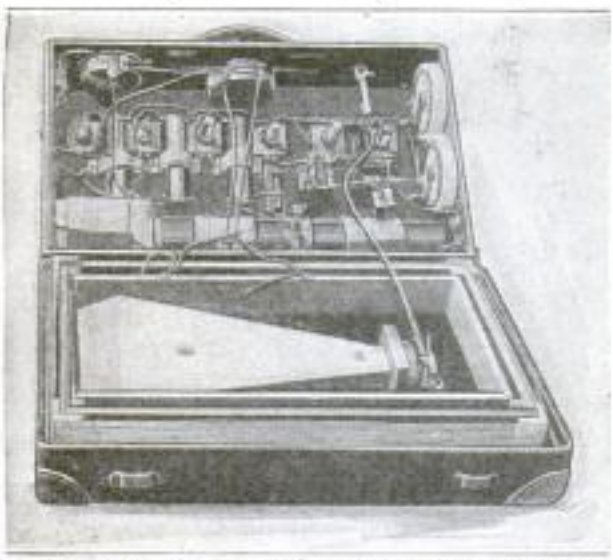
The Dry-Land Method of Training Naval Gun-Fire "Spotters" for Fighting Submarines: The Platform at the Right-Hand End of the Long Tank Represents the Bridge of a Ship, Where the Spotter is Stationed

which a U-boat is capable. The "spotter" undergoing training is stationed on a platform slightly above one end of the tank, so that the optical effect is similar to that produced by looking across a wide expanse of water from the bridge of a vessel. The target is caused to emerge suddenly in an unexpected place, upon which the spotter must instantaneously calculate its range and deflection —distance straightaway and to the right or left—and call the result of his calculations to a "gunner." The latter then "shoots" a bubble of air beneath the surface of the water, at the point designated, a submerged movable air tube being used as a "gun." The bubble, breaking the surface, indicates the accuracy of the "shot." Seldom is the first shot a "hit," and it is the spotter's duty to estimate the distance that it is "off the target," and call the necessary corrections to the gunner. The spotter is credited with a hit when the bubble rises directly under the submarine.

The Men at the Sides are Using the Submerged Movable Air Tubes to Show with a Bubble the Range and Deflection Called by the "Spotter." Left: The Movable Air Tube Shown in the Empty Tank

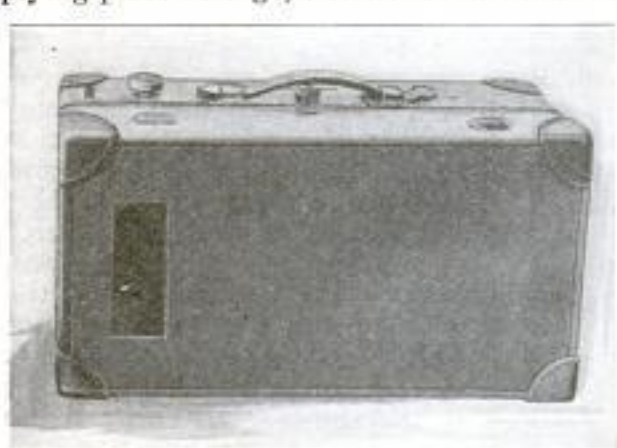
A PHONOGRAPHIC SUITCASE REPRODUCES DISTANT MUSIC

Music by wireless is nothing new, but up to the present it has been necessary to go to a receiving station to hear it. Now the receiving station can be carried to the



Phonographic Suitcase Open, Showing the Electrical Equipment Which Makes It a Complete Radio-Receiving Outfit, as Well as Its Means of Amplifying the Sound Waves Received

hearer, so that the music is not only wireless but also transportable. This novel kind of receiving station outwardly exactly resembles a suitcase, and is equally portable, weighing barely 30 lb. Inwardly, however, it is altogether different, being fitted with a complete radio outfit, consisting of six electron tubes of special design, two filament rheostats, a stabilizer for adjusting the device to maximum sensitivity, a tuning condenser for adjustment to the wave length of radio-telephone transmitter, an A-battery of two 1½-volt dry cells for supplying filament current, two 20-volt B-batteries for supplying plate voltage, three tuned radio-frequency transformers, grid leak and condenser, and two audio-frequency transformers. Inside the suitcase cover, acting as an antenna, is a receiving coil of No. 28 gauge copper wire with 21 turns, as well as a horn and a telephone receiver. The device has a range of about eight miles. The phonographic suitcase performs when closed, and it is started by turning a button near the handle that is connected to the inside switch. Another button outside the suitcase adjusts the stabilizer to maximum sensitivity.



The Phonographic Suitcase Closed as It Operates, the Rectangular Opening in the Side Being All the Exposure That Is Necessary: It is Started by a Button near the Handle

COMPRESSED-AIR CONNECTION AT SWITCH IS CLEANING AID

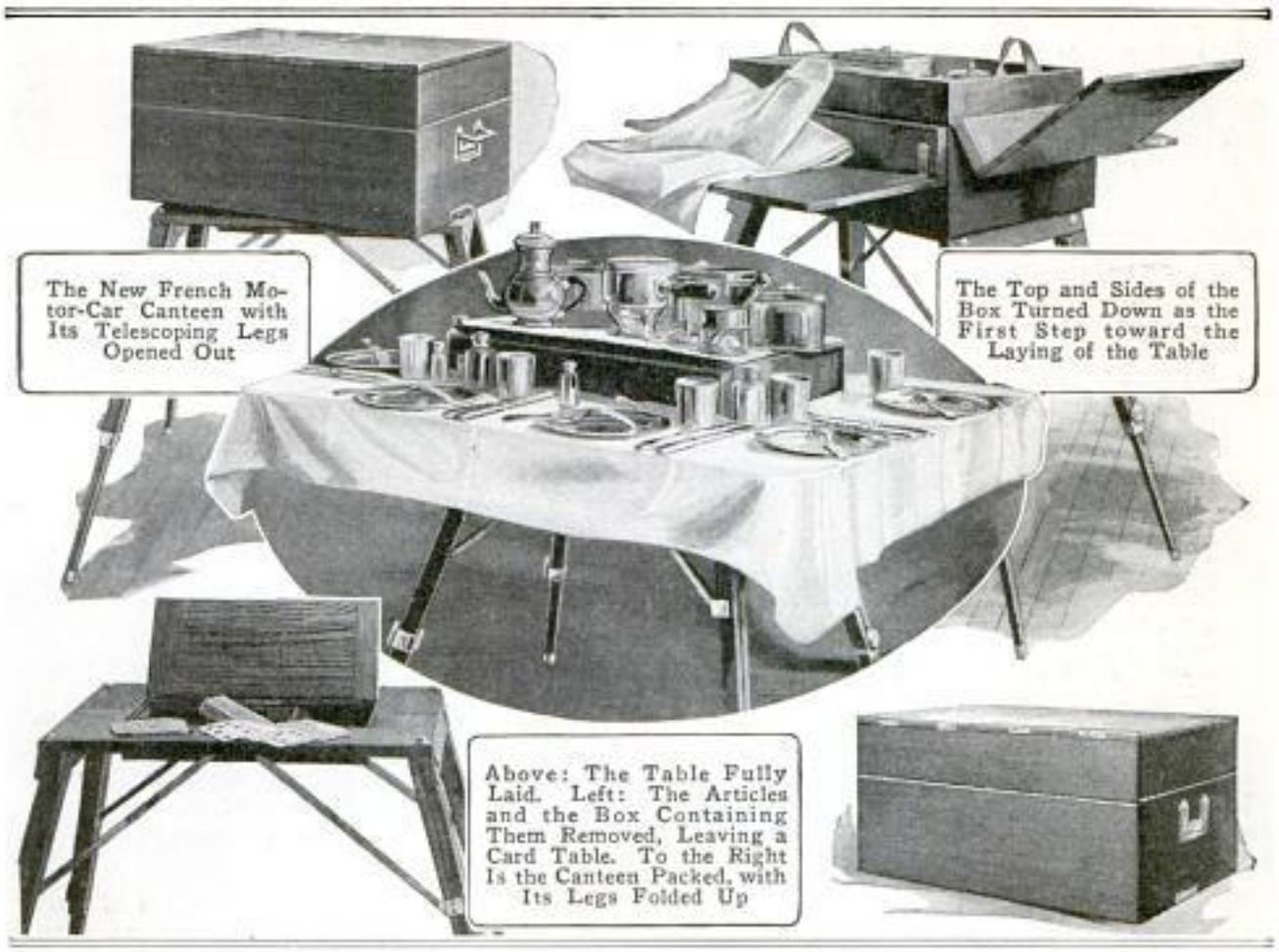
Although compressed air has been used as a cleaning medium for years on industrial motors, its application to automatic switch mechanisms is new and interesting. The car lines of Oakland, Calif., are equipped with electro-pneumatic switch controls, and accompanying the switching mechanism is a compressed-air connection. To this, a hose with a small pipe nozzle is attached. The operator directs

Air Hose and Compressed-Air Mechanism Used for Cleaning Switches in Oakland, California, in Connection with Electro-Pneumatic Switch Control

the pipe into the tighter places about the device and accomplishes a very thorough job of cleaning. After the surface coat of dust has been blown away, a film of oil is applied and then similarly removed.

MOTOR-CAR CANTEEN FURNISHES A WELL-LAID DINNER TABLE

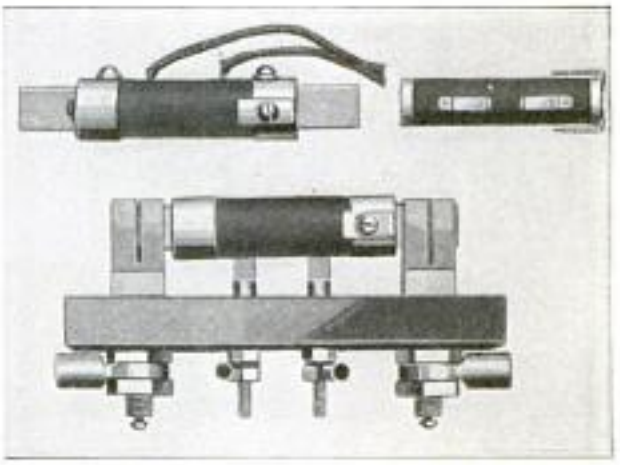
Long motor trips will be made with more luxury and independence in the future by the use of a new motor-car canteen, recently brought out in France, the tourists' happy hunting ground. When not in active service it is a plain square wooden box, about 3 ft. long, 2 ft. high,



and 18 in. wide, with a substantial metal handle at either end. Directly below each of these handles is a small metal bar which, when pulled out, releases from underneath the box four telescoping legs, strongly braced to the box. The top and sides of the box are then turned into a horizontal position, revealing in the interior all the paraphernalia necessary for a full-sized meal for a full complement of car passengers. The equipment includes an embroidered tablecloth, a complete dinner service in silver; in short, everything necessary to furnish, beneath the shade of the old oak tree, the most delightful kind of alfresco repast. After the meal the box containing these articles can be repacked and removed, leaving then a perfect card table for a fitting accompaniment to the after-dinner smoke.

RENEWABLE FUSE HAS AUXILIARY COIL

A renewable time fuse has been developed which embodies a powder-packed element, gas vents, and metallic indicator, with the addition of an auxiliary coil inclosed in a renewable cartridge, fitting into the fuse case so that connection is made with outside terminals which are wired for front connections, with knife blades for circuit completion on panels and switchboards. The auxiliary is readily installed, and the unit snaps into place in the standard fuse block. The fuse is for the purpose more particularly of assuring positive protection to multiphase motors and circuits, and to eliminate possibility of a multiphase motor running as a single-phase. In this manner positive protection is afforded on all loads.

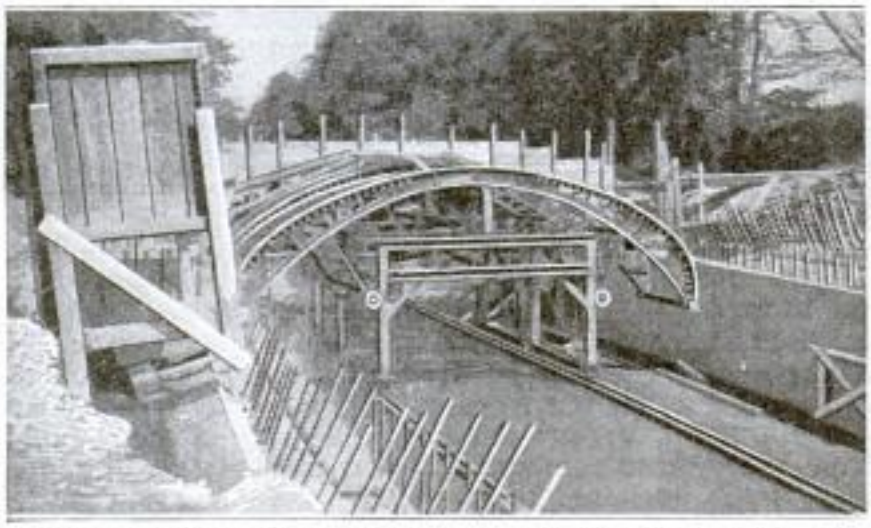


Above, Left: Renewable Fuse Wired for Front Connections; Right: Replacement Cartridge. Bottom Picture: Fuse Fitted in Standard Block for Back Connections

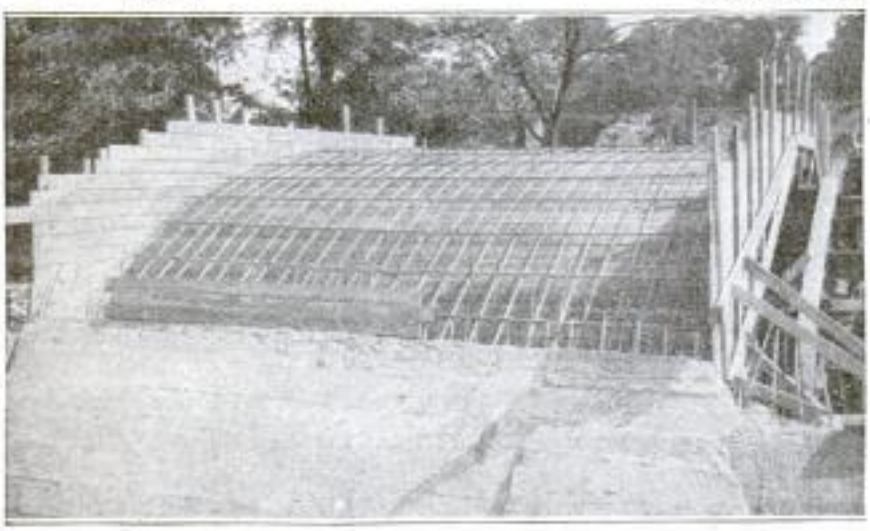
CREEK IN BUFFALO MADE INTO CLOSED SEWER

A VERY unusual civic enterprise is being undertaken in Buffalo, in the form of the transformation of a rocky creek into a city sewer or drain. The undertaking involves the conversion of a winding rocky-bedded open creek into an inclosed rigidly constructed flume, 20 ft. square, which has to be properly graded and directed for miles through a new residence section of the city, involving in some places deep excavations, and in others the erection of large concrete tunnels. There will be an enormous amount of blasting and dredging under most difficult conditions, both on account of the hard rocky nature of the bed of the creek, and also on account of the volume of the water in it, which is constantly varying with the changing weather conditions. The construction of the concrete tunnels will be a comparatively simple matter as this is being greatly facilitated by the use of a device, in place of the customary wooden forms for the concrete, that may be described as a permanent steel form for a section of the tunnel, and is moved along from point to point so that, in effect, the tunnel is constructed in consecutive sections.

An Entire Street That had to be Excavated to Accommodate the New Drain or Sewer: This Condition of the Street Puts the Residents to Temporary Inconvenience, and Particularly Subjects Them to Danger in Case of Fire



The Permanent Movable Form for Pouring the Reinforced-Concrete Arches, Composed of Structural-Steel Trusses Supported upon a Movable Carriage, Which Runs upon Steel Rails: The Trusses Are Pivoted on Their Supports for Adjustment Purposes



The Permanent Movable Steel Form Is Ready for Pouring One Section of the Concrete Tunnel Roof. The Reinforcing Steel Rods Are All in Place, and the End Boards Form the Boundary of This Section

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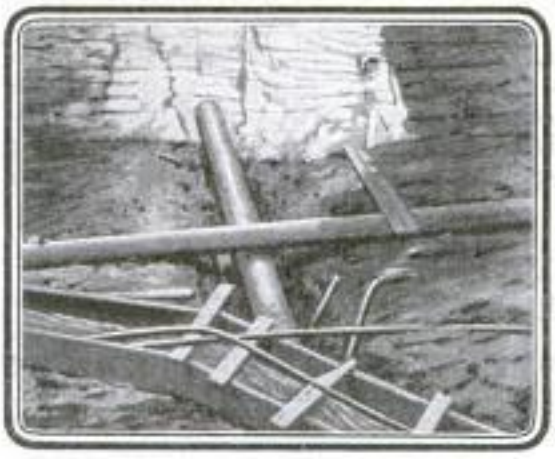
¶It is proposed to dredge the Great Pass at Alexandria, Egypt, to a depth of 45 ft., to accommodate seagoing vessels up to 1,000 ft. in length. The present docks are long enough to take care of boats of this length, but the depth of the water cannot be increased beyond 32 ft., which is less than that required by the larger cargo vessels when loaded.

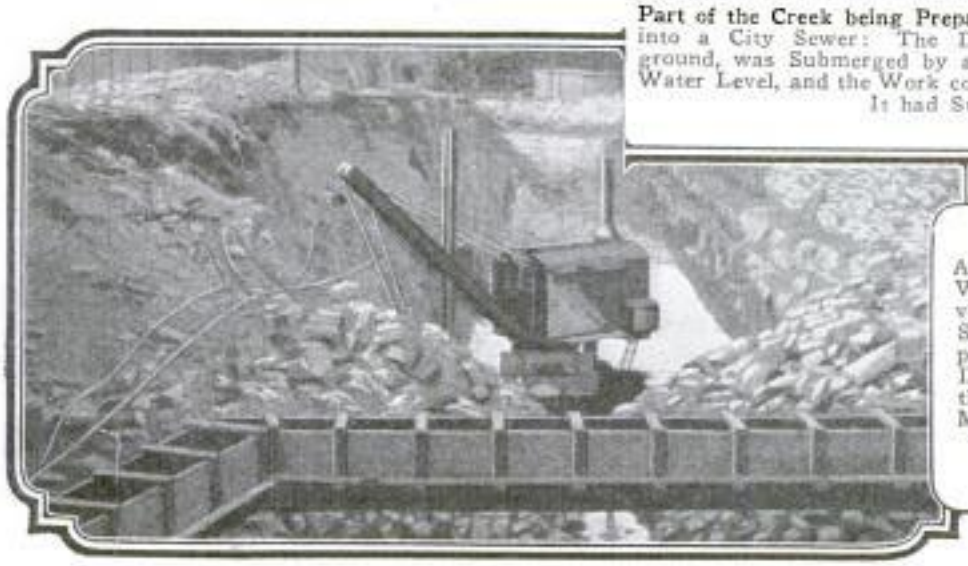
One of the Difficulties Encountered in Blasting and Dredging the Creek: A Sudden Rise in the Water Level Swamped This Excavator, and Put It Out of Commission

The Flume Which will Form a Sewer or Drain, Extending for Miles through the City of Buffalo, is Seen Partly in a Deep Excavation, and in the Background, Entering a Concrete Tunnel Which had to **be Constructed for It**



An Example of the Rocky Excavations That had to be Made in Places by Means of Heavy **Blasting. The Side Walls and the Floors of These Excavations have to be Trimmed**

Part of the Creek being Prepared for Its Transformation into a City Sewer: The Dredge, Seen in the Foreground, was Submerged by a Sudden Rise of the Creek Water Level, and the Work could Not be Continued Until It had Subsided



Another Part of the Creek Where the Work of Converting It into a City Sewer is About Completed. This has been Done by the Excavator in the Foreground, Which Moves Along as the Work Progresses

TESTS DETERMINE EXPLOSIVE PRESSURES OF DEPTH BOMBS

Depth bombs proved to be the most effective weapon of attack against submarines during the war, and the navy is doing a great deal of experimental work with them. These bombs explode from the pressure of the water, and they have a timing device that can be set to fire them at any depth according to the pressure. At an isolated point in a forest, near Tacoma, Wash., experiments are being made to check the pressures for which this timing device is set. Two high vertical guides are erected between trees, with a hard block at the bottom of them. Between these guides there is a weight that can be allowed to fall from varying heights. The bomb to be tested is placed directly beneath this weight on the block at the bottom and the weight is allowed to fall on it. From the amount of the weight, and the height it falls, the pressure on the bomb is easily calculated.

The Testing Device for Depth Bombs, Showing, near the Top of the Guides, the Weight That Falls upon the Bomb, Which is Placed on the Block Below

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¶Utilizing the fact that floating oil kills vegetation, a British oil company is about to carry out an exploration trip in the delta of the Orinoco by means of airplanes.

IMPROVED TRUCK FOR CARRYING AND DELIVERING ICE CREAM

In transporting ice cream from the factory to the retailer there has always been trouble in preventing the salt that is used in the freezing mixture from getting into the cans containing the ice cream, and adding a decidedly undesirable flavor, besides tending to melt the cream. To make this impossible, a Chicago manufacturer has constructed a delivery truck wherein the freezing materials never come in contact with the ice-cream containers. The truck is divided into two compartments that are surrounded and separated by walls, lined with asbestos, and built hollow and air-tight, and that hold a partial vacuum, which adds to the nonconducting property of the asbestos. One of these compartments is for the freezing mixture of ice and salt, which is sufficient to keep all the surrounding hollow walls at a very low temperature. The other compartment is packed solidly with the cans of ice cream, which are accessible through two small doors in each of its outside walls. This arrangement makes it impossible for any contamination to get into the cream, and the inventor claims that it also furnishes means for carrying a larger load, and delivering it more rapidly.

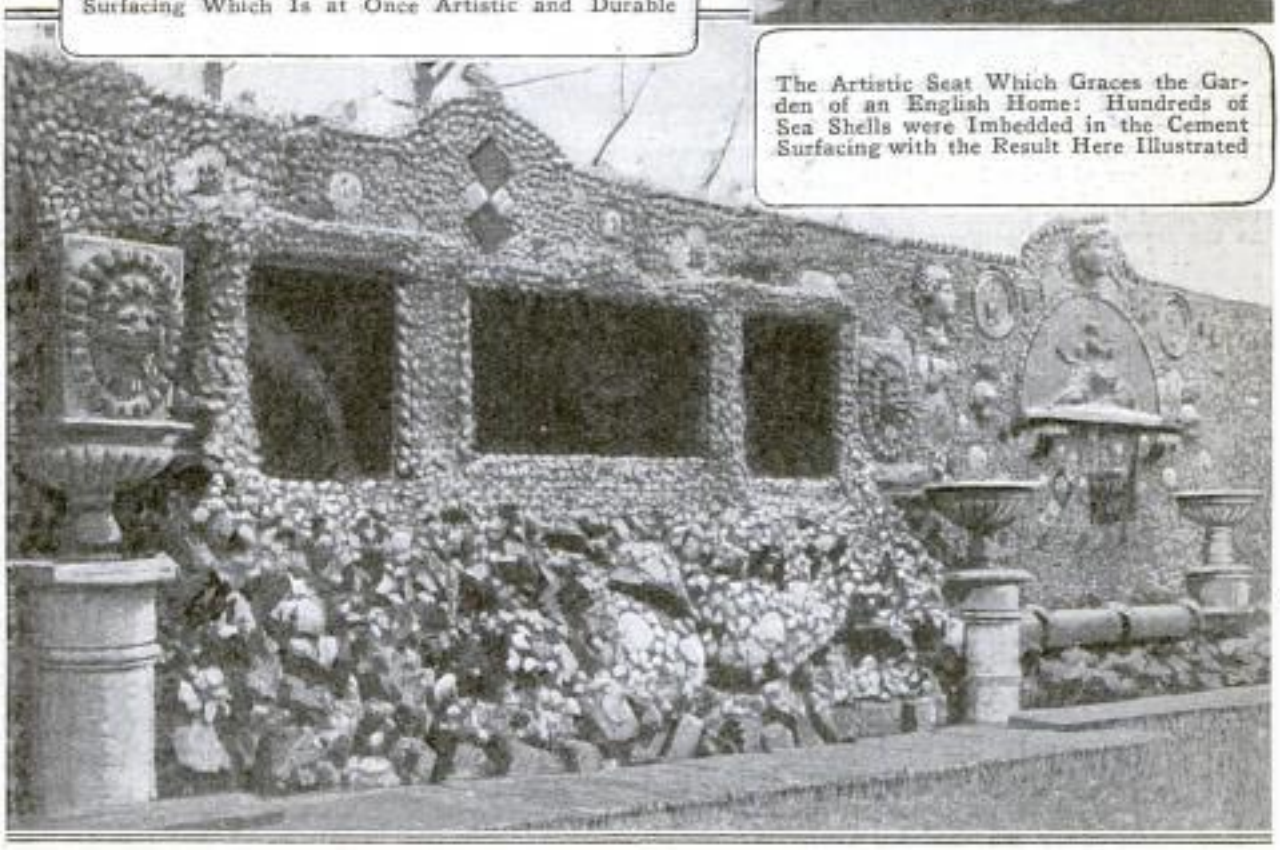
COVER FOR DRINKING GLASSES HAS SANITARY PROPERTIES

As a means of keeping dust, flies, or any other contamination out of a glass or other container filled with a potable liquid, there has been produced in France an elastic cover. It consists of a card disk that fits the top of a glass, and which is attached to a larger disk of paper with corrugations outside the card disk, so that it can be folded down over the top of the glass and form a dust-proof skirt around it. When not in use the cover is flattened, and can be carried in an envelope. In the cover there is a small orifice, closed when not in use, with a piece of tissue paper. This can be opened, and a drinking straw can be inserted through the orifice. This sanitary device is of special advantage at public drinking places, such as soda fountains.

NATURE LOVER BUILDS HOUSES OF SEA SHELLS

The Entire Surface of This English Summerhouse is Imbedded with Shells of the Whelk, a Sea Snail Found on All Temperate-Zone Coasts. Thus is Formed a Surfacing Which Is at Once Artistic and Durable

The Artistic Seat Which Graces the Garden of an English Home: Hundreds of Sea Shells were Imbedded in the Cement Surfacing with the Result Here Illustrated

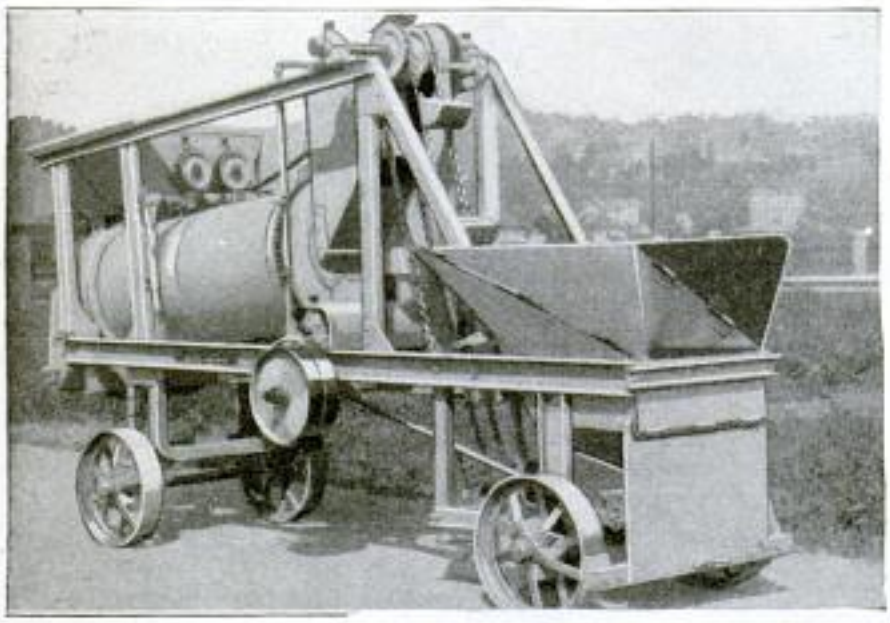


The Shell-Adorned Aquarium and Wall Surrounding the Garden of an English Nature Lover: On Sunshiny Days the Smooth Mother-of-Pearl Surface Gives Rise to Beautiful Color-Lighting Effects

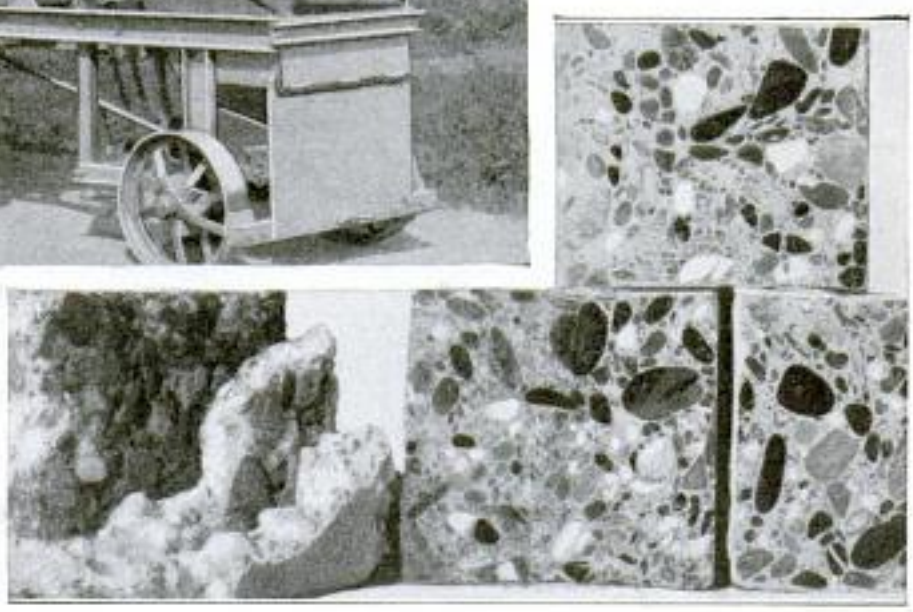
A summerhouse, aquarium, elaborate garden seat, and other novel structures with exterior finishes of whelk shells grace the grounds of the residence of a nature lover of Kingston, England. The whelk is a sea snail found in abundance on the coasts of all countries in the temperate zones. There are many species which differ greatly in size, most of them closely resembling the conch shells to be found in thousands of American homes and gardens. The owner has long made a hobby of collecting the shells, of which he now has hundreds of thousands, and imbedding them in the concrete walls of his buildings. They make a good building material, as durable as the concrete, as they are practically solid stone of great density and hardness. On sunshiny days the smooth mother-of-pearl surface reflects the light in myriads of beautiful color tones, giving rise to dazzling effects.

CONCRETE MIXER BLOWS CEMENT OVER WET MIX

A concrete mixer of Swiss origin, into which the batch of stone and sand is emptied wet and which is equipped with an air-blast arrangement for spraying the batch with cement, is a new product. At each end of the inclined mixing drum is located a hopper. The hopper at the upper end holds the sand and stone, while the lower one retains the cement. At the base of the cement hopper is a compressed-air inlet, and as the upper hopper allows the wet batch to drop into the revolving mixer, the cement drops into the air blast and is sprayed over the whirling mixture, giving each particle the proper amount of the binder. The resultant concrete is consequently free from air holes, is absolutely homogeneous, and shows remarkable strength.



Concrete Mixer of Swiss Design: It Has the Feature of an Air Blast Forcing Cement into the Gravel and Coating It Completely



Concrete Produced by New Process: There Are No Air Holes, the Homogeneity of the Mixture is Accounted for by an Air Blast Which Sprays the Revolving Mass of Sand and Stone with Cement, Insuring the Proper Amount of Binding Material for Each Particle of Gravel

HOOK LOCKS FOR LOGGING CABLES

In the extremely heavy logging operations of Washington and Oregon, it is desirable that a hook be used on the hauling cables that can be easily, quickly, and safely locked, and that can be readily unlocked when desired. A hook designed for this purpose is unlocked by pressing forward a spring under the thumb of the operator. Releasing the spring closes and locks the hook.

New Logging Hook, in Open and Closed Positions, Used on Steel Cables in Western Logging Operations: A Spring Keeps the Catch in Place

PLANT THAT MAKES GAS FROM STRAW ON FARMS

With fuel oils and gasoline constantly increasing in price, it is encouraging to note that the production of gas suitable for motor fuel from what is practically waste vegetable material, continues to make progress. In August and November, 1918, Popular Mechanics Magazine described the work that had been done in Canada, where the idea originated, and in November, 1920, an account was given of work being done on the experimental

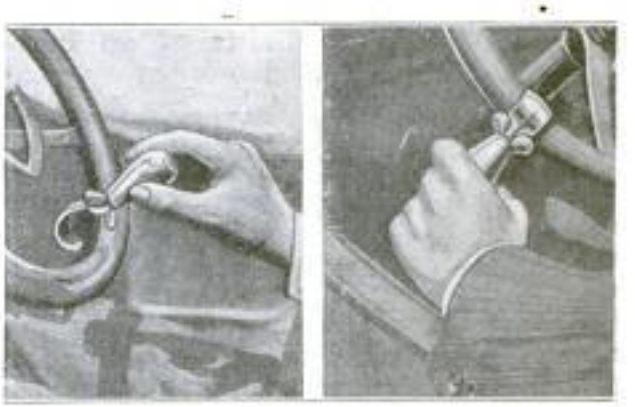
farm at Arlington, Va. These gas producers, like any other still, consist mainly of a retort heated by a furnace, with a condenser, or means of cleansing the first products from the retort, and a storage tank to which the gas passes.

In North Dakota there is now being put upon the market a producer specially designed for farm use, made of steel lined with asbestos, and entirely inclosed in brickwork. Behind this are the storage tanks. It has been found by actual test that these outfits will produce as much as 12,000 cu. ft. of gas per ton of straw; and that the gas will have a heat value of as high as 469 B.t.u. The fact that it burns with a clear blue flame shows that the combustion is complete.

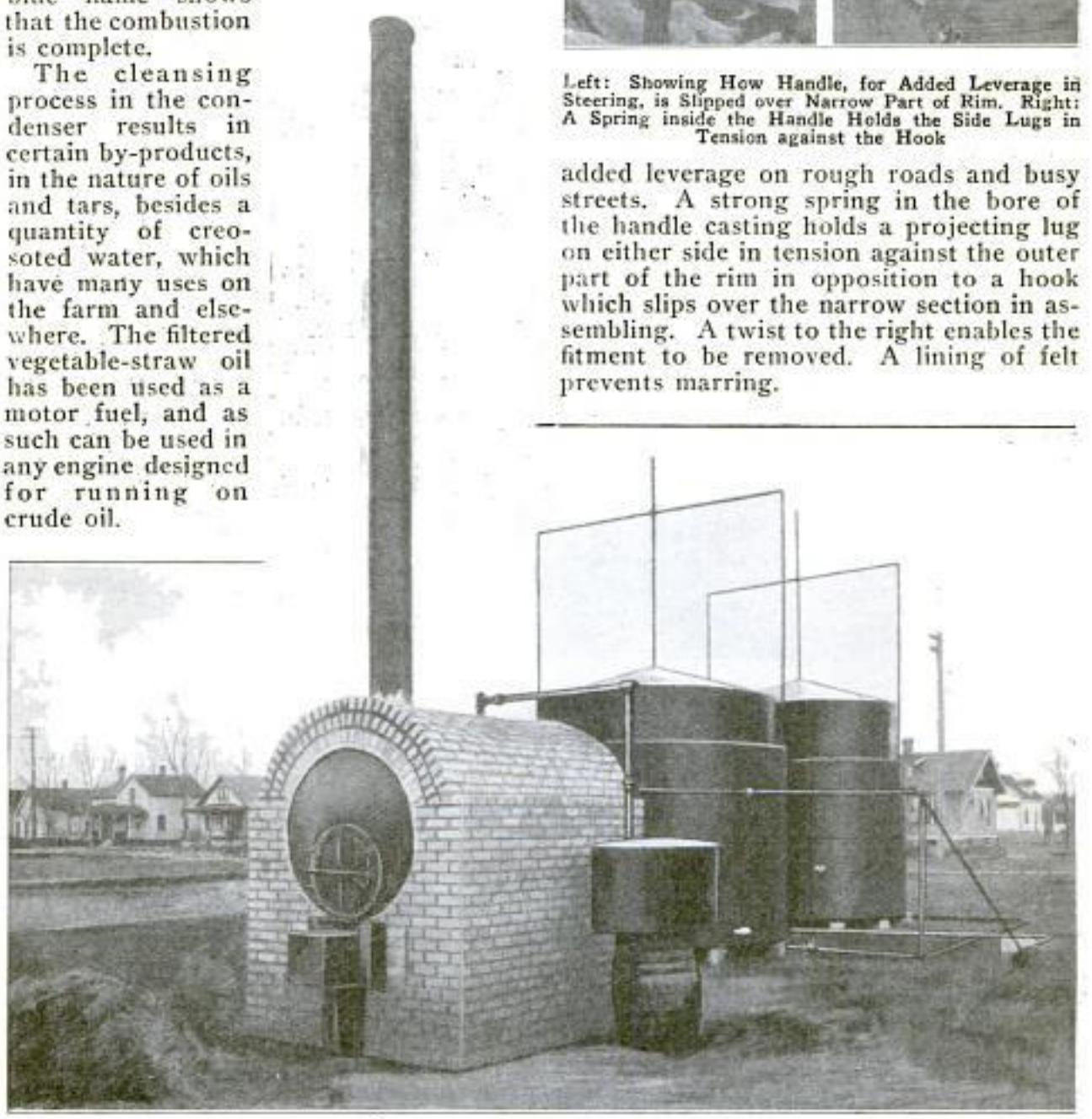
The cleansing process in the condenser results in certain by-products, in the nature of oils and tars, besides a quantity of creosoted water, which have many uses on the farm and elsewhere. The filtered vegetable-straw oil has been used as a motor fuel, and as such can be used in any engine designed for running on crude oil.

STEERING-WHEEL HANDLE GIVES ADDED LEVERAGE

A handle attachment for the steering wheel is adjustable to the most comfortable driving position, and is intended for added leverage on rough roads and busy streets. A strong spring in the bore of the handle casting holds a projecting lug on either side in tension against the outer part of the rim in opposition to a hook which slips over the narrow section in assembling. A twist to the right enables the fitment to be removed. A lining of felt prevents marring.



Left: Showing How Handle, for Added Leverage in Steering, is Slipped over Narrow Part of Rim. Right: A Spring inside the Handle Holds the Side Lugs in Tension against the Hook



The Plant That Makes Gas from Straw on Farms: The Steel Asbestos-Lined Still Is inside the Brick Housing. At Its Side Is the Separator or Condenser That Retains the Heavy Oils, and Which is Connected by Pipes That Stand behind the Still to the Storage Tanks for the Gas

POINT-CONTACT MAGNET PICKS UP PHONOGRAPH NEEDLE

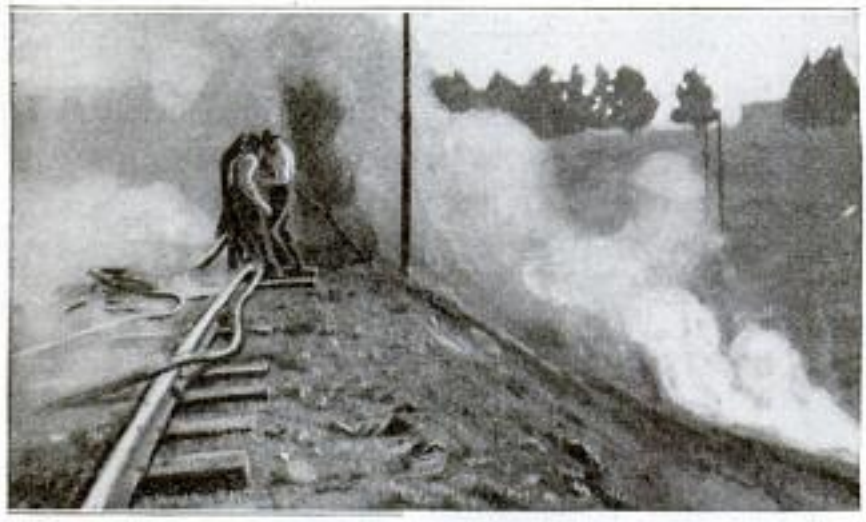
A clever little device, designed to facilitate the picking up of needles from the holder cup of the phonograph, consists of an insulated bar magnet with only the point exposed. It is mounted in a support hinged to the side of the cup, normally in a vertical position. Swinging down the magnet among the needles, as a rule one only at a time is picked up because of the point contact.

COMMON BAKING SODA WHIPS STUBBORN FIRES

Plain baking soda mixed with water proved highly effective in extinguishing a stubborn fire at Chardon, Ohio, after other methods to subdue it had failed utterly. A pine trestle, 300 ft. long and 30 ft. high, had later been filled with 200 cars of cinders, which contained much charred and unburned coal. Furnace slag hermetically sealed this embankment. When it was decided to use baking soda in fighting this fire, the entire fill was a roaring caldron. A regular 2½-in. hose was used with a nozzle 10 ft. long. The soda solution was pumped into the burning fill under high pressure.

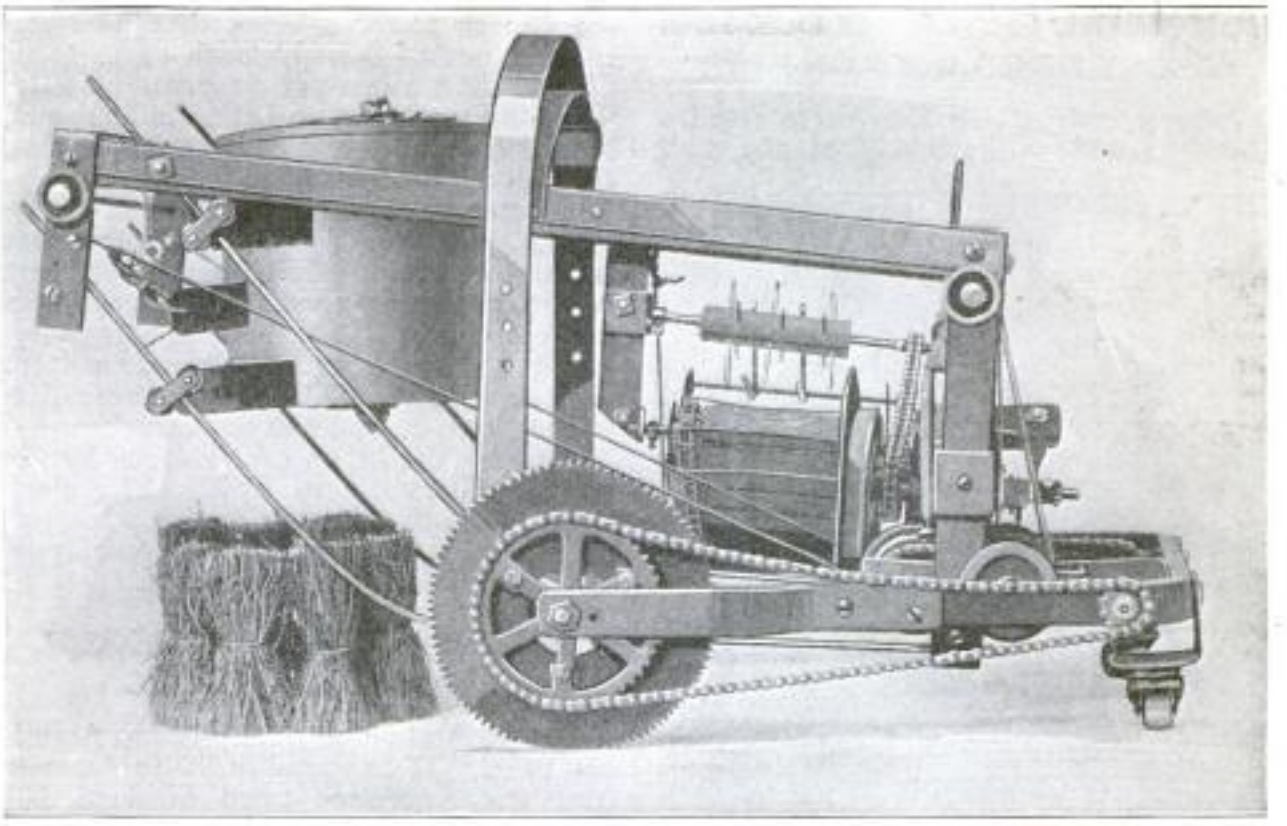
The moment the chemical struck the fire there was a terrific explosion that threw tons of cinders high above the trolley wires. Geysers of black smoke and steam shot up to a great height. It took a total of about 50 hours to subdue the stubborn fire, some 16,000 lb. of baking soda being required. By the use of this method the roadbed was saved. If water alone had been used, the entire fill would have been washed down into the valley, but as it was, the fill was held practically intact. The amount of water available from the village equipment was strictly limited, far from enough to quench the fire of itself. It was pointed out in this connection that 1 gal. of the soda solution is equivalent in fire-extinguishing effect to 100 gal. of plain water in fighting fires in coal piles or fills, or free-burning material, such as merchandise or buildings. The soda solution is mixed and applied by a simple mechanical device that may be installed on any ordinary pump.

In a fire at Nassau, N. H., where 6,000 tons of coal had been burning for three months, the men trying to reclaim the coal were wearing gas masks. Carbon-monoxide gas filled the atmosphere. Conditions were like those of a coal-mine fire. On the first application of this bicarbonate-of-soda solution, the fire and heat were at once conquered and it was no longer necessary to use the masks.



The Railway Embankment of Inflammable Material Is Ablaze, and the Fire is being Subdued with a Mixture of Baking Soda and Water Pumped through the Hose at High Pressure

This Is How the Railway Embankment Looked after the Extinction of the Fire. It will be Seen That There Was Not Much Destruction of Material



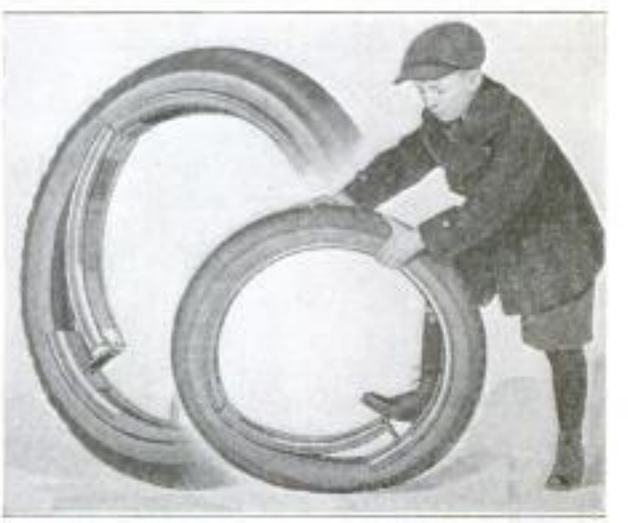
The Grain-Shocker Model has Delivered the Eight Bundles of Grain in the Form of a Shock Out of the Cylindrical Cage Seen Above. This Cage, Directed by the Guides at Its Side, has Moved from the Conveyor in Front, That Delivers the Bundles from the Binder

MODEL OF NEW GRAIN SHOCKER OPERATES SUCCESSFULLY

Grain shockers, like corn huskers and cotton pickers, have been a popular subject of invention for a long time, and complete success does not seem to have been yet attained. A new grain shocker has recently been patented that has already been demonstrated very successfully in model form. The shocker operates in combination with any ordinary harvester and binder, attached to which it moves over the field. The harvester cuts and binds the grain in the regular manner, and delivers the bound bundles to the shocker, which is connected to it directly, and runs along with it on a wheel mounted on the farther side of the shocker, and on a pair of casters at its forward end. A series of pulleys and chains operate an endless conveyor that receives the bundles from the binder and carries them to a sheet-steel cylindrical receiving cage on the shocker. When eight bundles have been delivered, the cage is automatically caused to travel to the rear of the machine along two tracks, which are so shaped that they simultaneously raise the cage and rotate it so that it deposits the eight bundles on the ground vertically arranged in the form of a shock. The cage then returns to its starting point.

QUICK-CHANGE TIRE RIM FOR STUBBORN TIRES

The new way of removing a tire from the rim is to give it a bounce on the road and off it comes, no tools being necessary, it is claimed. A set of two steel hinges is riveted to the inside of the rim, converting it into an expanding joint. When assembling, a kick on the three-part hinge toggles it back into its normal flat position, expanding the rim into the tire.



The Hinged Section of This New Tire Rim Is for Ease in Assembling. The Tire is Readily Slipped On and Off When the Rim Is in the Collapsed Condition Shown

HOMEMADE CHURCH CLOCK HAS "GLORY BE TO GOD" ON DIAL

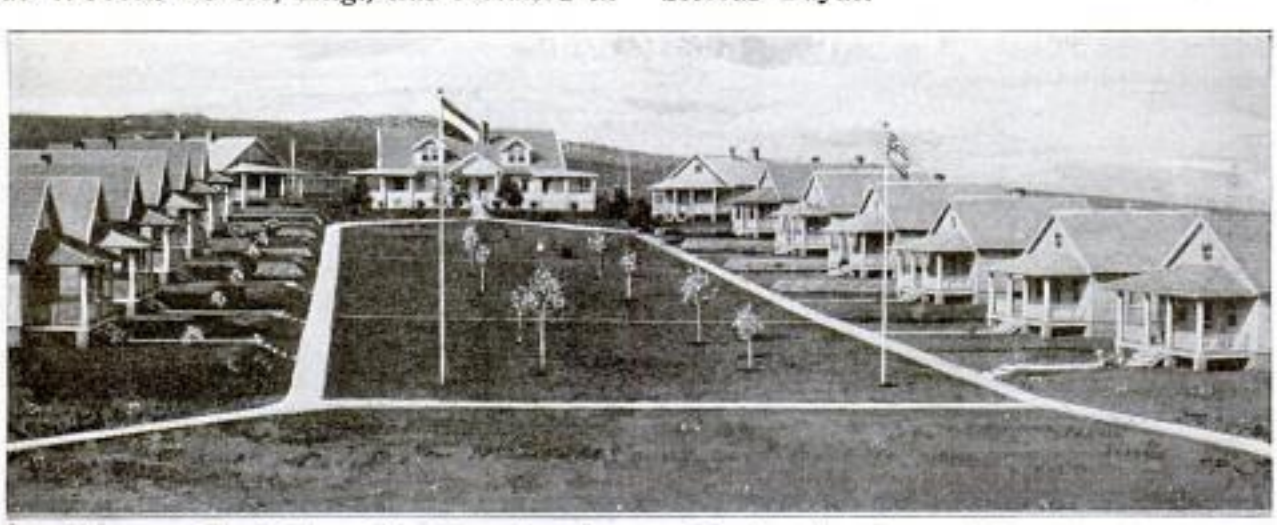
Among instruments timepieces require about as fine workmanship as any, and

Country Church in England with Clock, Homemade from Scrap, and "Glory Be to God" in Place of Figured Hour Numbers on One of Its Dials

even a large church clock must consist of high-class material, finely fitted and finished. In spite of this, a member of the congregation of a small country church at Wooten Rivers, Eng., has installed in the church tower a clock that he made entirely out of "scrap," such as parts of disused and worn-out reapers, mowers, threshing machines, and other implements, besides such odds and ends as old bicycles, separators, bedsteads, and almost everything connected with the home and the farm. With the help of a foot lathe, that was devoid even of a slide rest, every part of the clock was homemade, excepting a few castings specially made at a foundry, and two large gear wheels, taken from disused separators. There are three dials to the clock, and on one of them the usual figures for the hours are replaced by the phrase "Glory Be to God." The clock strikes the hours on a bell with what was originally a blacksmith's sledgehammer. The clock keeps very good time.

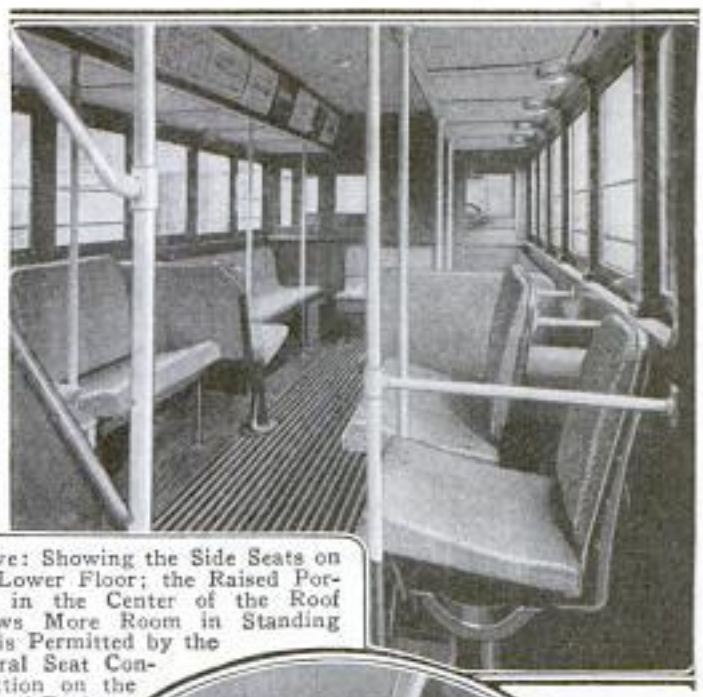
NORTH AMERICAN VILLAGE IN SOUTH AMERICA

The farthest south of any North American town is to be found in South America near the Argentine town of Azul, 200 miles south of Buenos Aires. About three years ago certain financial interests of this country decided to build a factory on a ridge of limestone hills, which runs through the center of the great Argentine plains, for the purpose of manufacturing cement to be marketed at Buenos Aires. One thousand barrels of the product are now being turned out per day. In connection with the work a little village was constructed to house the company's foremen and local officials. The dwellings are of a standard semibungalow type built almost entirely of cement. At one end of the single street stands a community clubhouse. The village flies both the United States and Argentine flags. It is called Sierras Bayas.

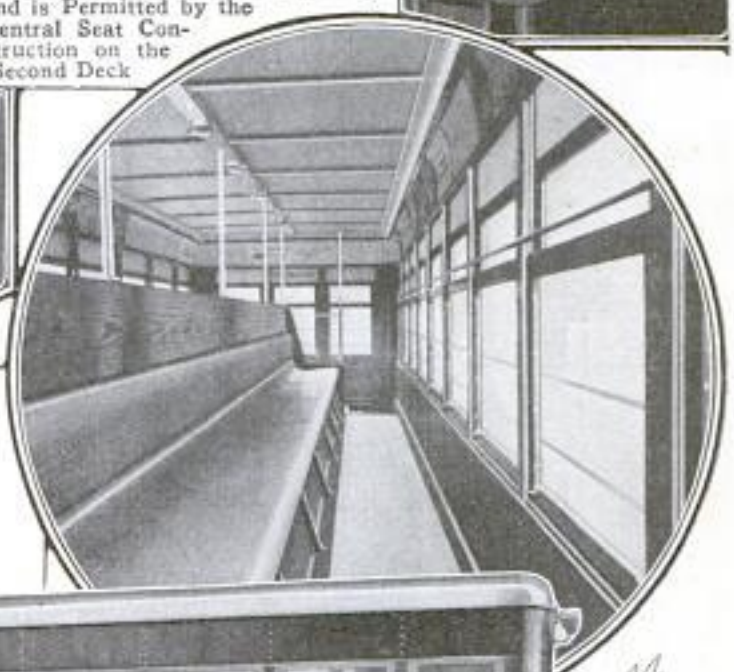


This Village was Founded by a North American Company, Manufacturing Cement in South America, to House North American Workmen. In the Background Stands the Village Clubhouse

DESIGN INNOVATIONS MARK DETROIT PASSENGER BUS



Above: Showing the Side Seats on the Lower Floor; the Raised Portion in the Center of the Roof Allows More Room in Standing and is Permitted by the Central Seat Construction on the Second Deck

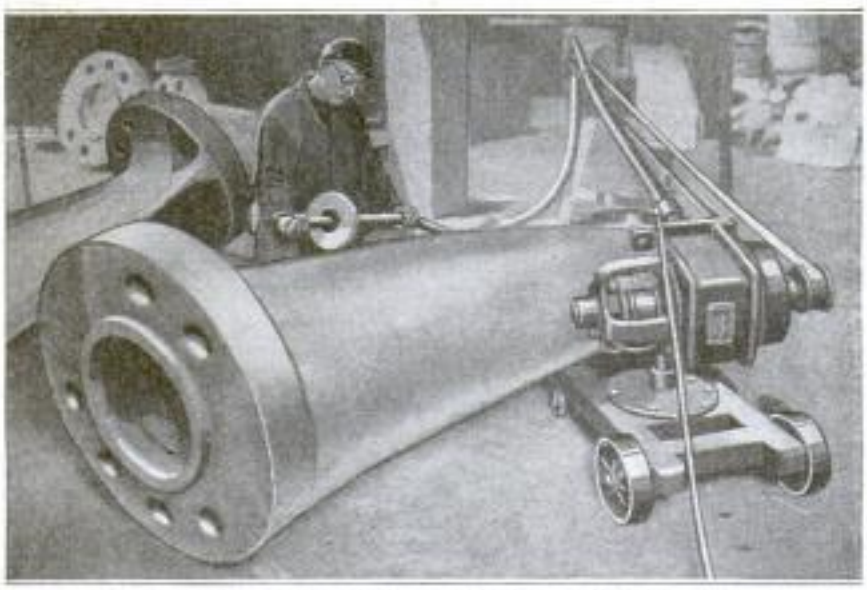


The Inauguration of This Bus into Service on the Streets of Detroit Marks a New Step in the Design of Passenger-Carrying Vehicles. Right: The Seating Arrangement on the Upper Deck; Two Opposite-Facing Benches, Running Lengthwise through the Middle of the Car, Give the Passengers an Outer View. Above: The Swinging Street-Car-Type Door and Straight Stairway

An Electric Generator Driven by the Gasoline Engine Transmits Power to Four Electric Motors Connected to the Four Wheels of This New Double-Deck Bus. The Car Holds 56 Passengers

GRINDER WITH FLEXIBLE SHAFT GRINDS PROPELLER BLADES

It is essential that the blades of ship propellers should be well finished, with as smooth a surface as possible. On account of their very irregular shape it has always been difficult to obtain this finish by use of a grinder—the most efficient finishing means. There is now on the market a flexible-shaft grinder specially designed for that purpose. It consists of an electric motor mounted rotatably on a portable base, and having an arm projecting from it, on the end of which is a small pulley driven by a belt from the motor pulley. The shaft of the small pulley is connected to a flexible shaft of ample length which is in its turn connected to the shaft on which the grinder wheel is mounted, in such a manner that it drives this wheel from any angle, and allows it to be moved backward and forward as much as is necessary to follow perfectly the irregular contour of a propeller blade.



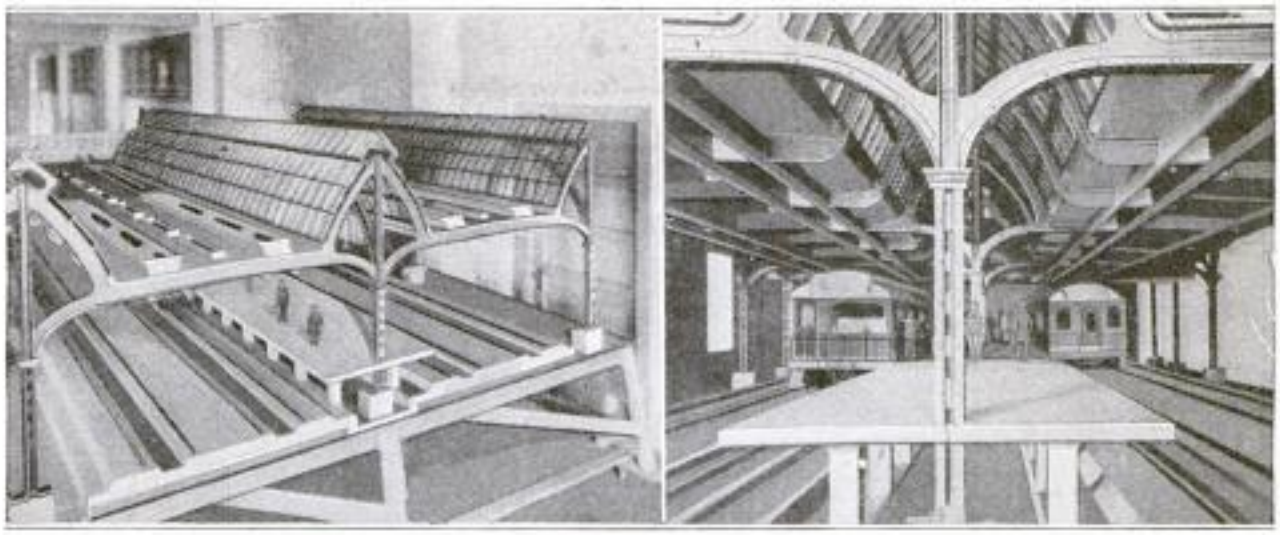
A Propeller Blade being Finished by the Grinder Which Is at the End of a Flexible Shaft, at the Other End of Which Is a Pulley Driven by a Belt from an Electric Motor on a Portable Base Which Supports One End of the Propeller Blade, and Facilitates Its Movement

DANCE HALL ILLUMINATED BY ELECTRIC MOONLIGHT

Searchlights are flashed from the surrounding hills into a dance pavilion in a Pacific coast town. Two large spotlights are placed high on the hills, and the beams shot through the glazed sides of the room. This is said to have all the effect of moonlight, and is a popular substitute for the ordinary lighting system. The lights are electric, centrally controlled from the building by means of a switch.

The Popular Beach Dance Hall, Shown Above, Located in One of the Pacific Coast Towns, is Illuminated at Night by Artificial Moonlight Flashed from a Near-By Hill

Situated on a Near-By Rocky Promontory These Two Searchlights Illuminate a Western Dance Pavilion, Giving the Effect of Moonlight



Two Views of the Experimental Model of the Train Shed That will Form Part of the New Union Station at Chicago: The Left View Shows the Outside Construction, and the Right View the Inside Details, with Exact Models of Coaches, Passengers, and Trainmen

MODEL OF TRAIN-SHED DESIGN FOR CHICAGO UNION STATION

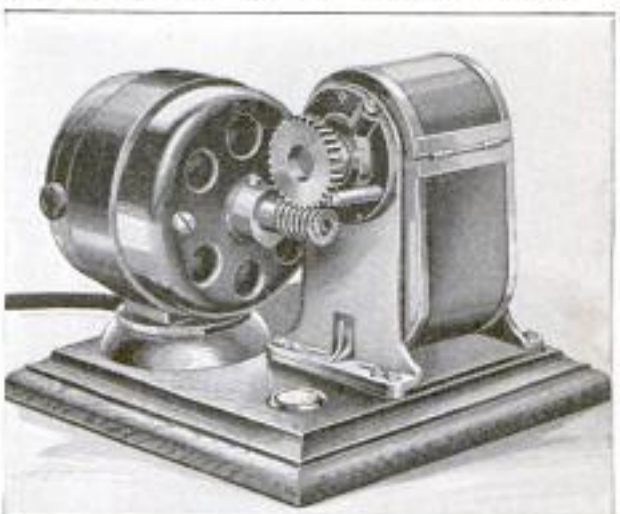
In order to determine experimentally the best possible arrangement in a train shed for overhead lighting, and freedom from locomotive smoke, in connection with the projected colossal Union Station at Chicago, very elaborate models have been built. These models are exact reproductions, inside and out, of the train sheds which will ultimately form part of the new station. Included with the models are miniature standard coaches and locomotives, as well as dummy doll-like figures of people. The final design has now been determined upon, which is the result not only of what has been learned from these experimental models, but also from visits to, and exhaustive studies of, all the large railroad terminals in this country and abroad.

CARDBOARD REPLACES WOOD FOR BERRY BOXES

One-piece boxes made from folded cardboard are now being used as berry containers in the West. The cardboard container was originated to relieve a shortage of wooden boxes. The surface is given a coating of paraffin, forming a receptacle that is said to be in every way sanitary and satisfactory.

MOTOR-DRIVEN PENCIL SHARPENER

The familiar pencil sharpener, revolving two cylindrical cutters about a cone, is now driven by electrical power. Such a



Designed as a Time-Saver This Pencil Sharpener, Having Two Cutters Revolving about a Cone, is Driven by an Electric Motor. A Push Button Starts and Stops the Motor

machine recently placed on the market combines with the standard sharpener a 1/50-hp. motor which drives the cutters through direct worm gearing, reducing the speed to a rate consistent with good sharpening qualities. A push button starts and stops the motor. The whole is mounted on a 6-in. square wood base.

¶In disjointing some old water mains recently, 50 lb. of lead was recovered from each joint by means of the oxyacetylene blowpipe. A long flame was used, and the circumference of the lead calking followed for about two-thirds of the way until the pipe units could be separated.

HARTFORD VETERANS' BIG DRUM TAKES FOUR MEN TO CARRY IT

A huge drum, one among the largest in the world, has just been completed for Post No. 254, Veterans of Foreign Wars,

One among the Largest Drums in the World, Just Made for Hartford Veterans: It Is 48 Inches in Diameter and 48 Inches Wide, and Makes a Noise like Thunder

of Hartford, Conn. It is 48 in. in diameter and 48 in. long, and on parade requires four men to carry it, while the drummer walks at the side producing a sound that announces his approach to everyone within a mile of him.

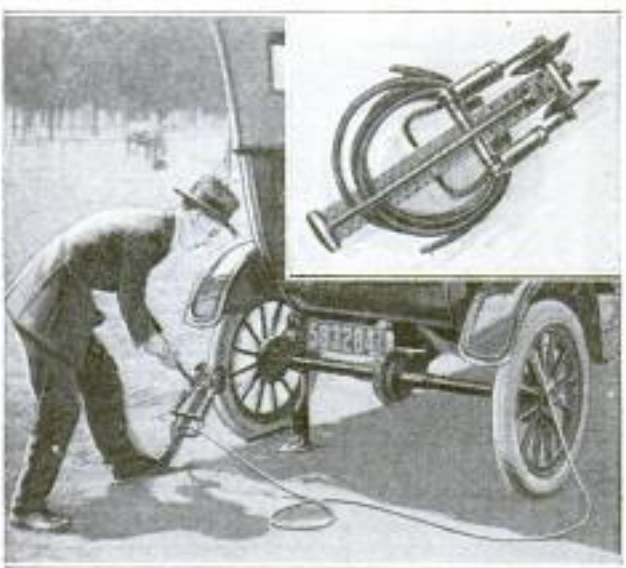
WATER CHISELS LETTERS FROM ROCK

The artful hand of nature and man have combined in one instance and the result is an attractive sign whose letters are part of a great rock. They project upward from the rock surface about 3/16 in. and are painted white. Twelve years ago, a Pennsylvania druggist painted the word "Cigars" on the rock, which reposes on the bank of a river. The wash of the river wore on the rock at all points except where the paint was applied. The letters now stand out in bold relief against the rocky background.

Twelve Years After This Sign was Painted on a River Rock It Stands Out in Bold Relief. The Rock Wore Away but the Paint-Protected Parts Remained

NEW ROLLER TIRE PUMP FOR LIGHT CARS

A tire pump, operated by the friction between the tire and two beveled rollers, has been designed as a quick-operating labor saver in inflating the tires of light cars. The compression unit consists of two parallel cylinders in which are reciprocated, alternatingly, two pistons driven by the beveled rollers. The unit is mounted on a rigid frame. In pumping up a tire, one of the rear wheels of the car is jacked up and thrown into gear, and the rollers pressed against the revolving tire. The pump stands on the ground with the operator bracing it with one foot



Showing How Motive Power for a New Tire Pump is Obtained by Pressing Two Beveled Rollers, Which Operate the Pump, against a Revolving Rear Wheel of the Car

and applying the pressure by means of a handle. A long rubber hose leading from the compression cylinders enables the motorist to reach any valve stem from the rear of the car. The handle may be swung out of the way in storing. The outfit weighs 7 lb., is 21 in. long, 7 in. wide, and may be carried under the rear seat.

¶A new spark plug has the feature of a fanlike electrode rotated by the movement of the gases in the cylinder, said to give a circular flame instead of a line spark for increased efficiency in a poor mixture.

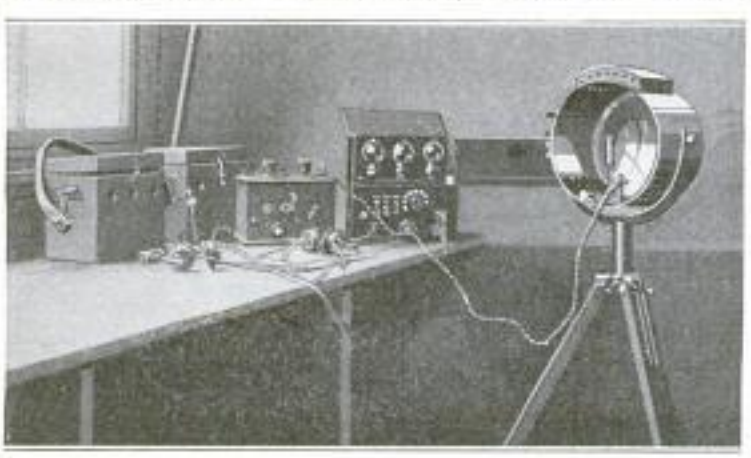
LOCATING ICEBERGS AT SEA

By G. F. LEES

WITH the recollection of the "Titanic" disaster still fresh in our memories—a disaster which, in 1913, cost the lives of no fewer than 1,465 passengers—everybody is aware of the great danger which ships crossing the Atlantic run through floating icebergs. For a very long time scientists have been seeking for a means of warding against this peril, but up to the present without success. One of the methods imagined by these searchers was based on the reflection of sound waves, another on a measurement of the temperature of the water, which was naturally lower in the neighborhood of one of these floating islands of ice, while other experiments have been made with the object of finding out whether fog is transparent to the radiations of melting ice, radiations which are rich in infrared rays.

The Operator is Guiding the Parabolic Gilded Mirror with His Right Hand, and with the Telephone Receivers on His Ears He Detects the Approach of an Iceberg

These infrared rays are invisible to the human eye, just like the ultraviolet rays which we find at the other end of the spectrum. In the case of the latter rays the photographic plate and certain phenomena of fluorescence take the place of human vision. But the means of investigating the infrared zone are much more limited. Certain electric cells, however, are known to be more or less sensitive to these radiations. In practice, the measurement of the infrared rays consists almost always in thermometric measurement, in which the delicate means furnished by the phenomena of thermoelectricity must be given the preference.



The Complete Apparatus in the Inventor's Laboratory: On the Tripod Is the Parabolic Mirror Which is Connected to a Thermo-electric Element Affected by the Infrared Rays from an Iceberg

It was on this principle that various means of secret signaling depended during the war. There was, in fact, substituted for the ordinary optical telegraph, which has been used for so long, certain apparatus which assured secrecy of communications and enabled the place where the transmitting post was situated to be hidden from the enemy. Infrared rays had an additional advantage over visible waves, inasmuch as they were less absorbed by fog, which so often interferes with optical transmissions.

Official experiments with the infrared telegraph were made by the French navy in the Mediterranean in September, 1918. With a mirror of only 25 cm. (about 10 in.) in diameter, objects such as ships could be detected at a distance of 14 km. (about 9 miles).

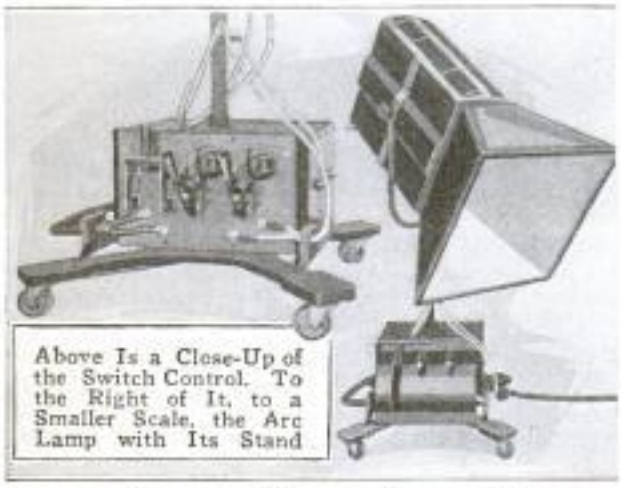
Interested in the results obtained in this new branch of telegraphy, the French naval authorities have given the greatest facilities to a young Parisian engineer and electrician, M. A. Larigaldie, for the construction and trial at sea of an apparatus intended to locate icebergs. This apparatus was tried a short time ago to the north of the fishing banks of Newfoundland, on board the patrol boat "Ville d'Ys." The apparatus, as will be seen from the accompanying photographs, taken on board the "Ville d'Ys" and in the inventor's laboratory in Paris, consists of a parabolic gilded mirror moving freely round a horizontal axle. With the focus of the mirror is connected a special thermoelectric element. When an iceberg crosses the field of the mirror within a distance of about

six nautical miles, a diminution of the current of the element is detected by means of telephonic receivers.

The inventor modestly declares that his apparatus is but the first step toward the solution of the difficult problem of the location of icebergs, and that it must be brought to greater perfection before it is universally adopted, but he does not hesitate to declare that the time is not far distant when a disaster similar to that of the "Titanic" will be an impossibility, provided ships are furnished with an infra-red-ray signaling apparatus.

NEW STUDIO LIGHT REGULATED BY TRIPLE CURRENT CONTROL

A studio-light control that will prime an illuminating arc to three intensities and which is mounted on the lamp base,



Above Is a Close-Up of the Switch Control. To the Right of It, to a Smaller Scale, the Arc Lamp with Its Stand

is now in use. The unit consists of a combination of three resistances operated by a switch and two circuit breakers fixed to a single panel and covered by a suitable case. When the primary, or two-pole, knife switch is closed, all the resistances are in the circuit and a current of 50 amperes flows to the carbons. By successively closing the two breakers, one or two resistances are cut out, and a current of 100 and 150 amperes, respectively, is released. In case the arc should fail or the current discontinue, the breakers are tripped out and the whole resistance is switched back into the circuit. The 50-ampere current causes the arc to glow with a mellow light, and this is gradually increased in intensity with the closing of the successive breakers. The working parts of the switches and breaker elements are made accessible by the removal of the protective casing, which is held by screws. The equipment is very compact.

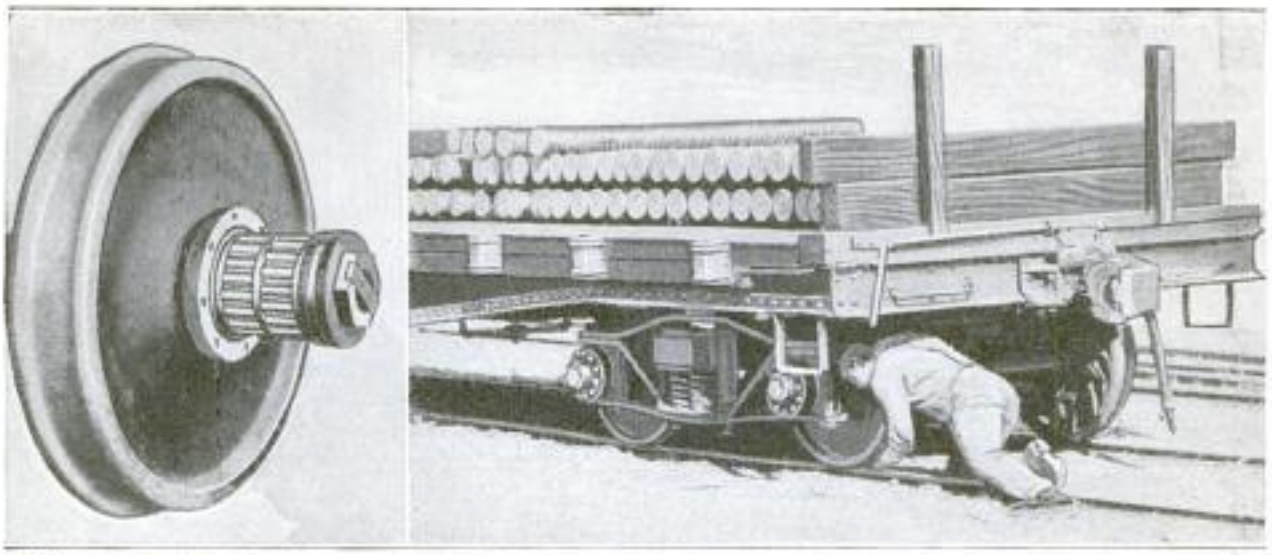
AUTOMOBILES NOW FERRIED OVER LAKE PONTCHARTRAIN

Auto tourists can now leave New Orleans on the road to Chef Menteur, on the south shore of lake Pontchartrain, and there transfer their cars over the lake to Slidell by ferry, enabling them to reach the Gulf coast the same day. A ferry-boat company has been incorporated and has just started a regular daily service which will soon be increased. Two power boats, the "Mollie Lee" with a capacity of 12 cars, and the "Winnie Davis" accommodating eight, compose the fleet. The service began with one boat leaving the Slidell landing at 9:00 a. m. and returning from Chef Menteur at 2:00 p. m. The "Winnie Davis" makes the run from Chef Menteur to points on the Mississippi coast.

BILGE PUMP FOR LAUNCHES ELECTRICALLY OPERATED

A launch and tugboat company on the Pacific coast has installed at one of its landing floats an electrically operated pump for emptying the bilges of its numerous motorboats. A pivoted iron pipe extends beyond the edge of the float. The projecting end of the pipe is provided with a hose which is inserted into the bilge, the float end being connected to the pump.

An Electrically Operated Centrifugal Pump, Mounted on One of the Landing Floats of a Pacific Coast Towing Concern, Eliminates the Difficulty and Inconvenience of Pumping Out the Bilges of Launches with Hand Pumps



PHOTOS BY THE GILLIAMS SERVICE
Left: Showing a New Roller Bearing Adapted to a Railroad-Car Axle. The Special Feature of the Bearing Lies in the Staggered Rollers, Which Permit a Vertical Disposal of the Load in All Positions of the Wheel. Right: One Man Pushing a Load of 45½ Tons of Steel Loaded on a 15½-Ton Car, Equipped with These Bearings

STAGGERED ROLLER BEARINGS FOR RAILROAD CARS

By staggering the rollers of a new-type roller bearing, a Detroit inventor is said to have produced an efficient practical substitute for the present railway-car plain journal bushing. By virtue of this arrangement the entire weight of the car is distributed vertically over the rollers in all positions of the wheel, this being accomplished by double parallel-row construction. To demonstrate the effectiveness of the new bearing, a flat car so equipped and weighing 31,000 lb. was loaded with 91,000 lb. of steel axles; one man was able to start and push along at a walking speed, unaided, the total 61-ton load. Sixteen men with crowbars would ordinarily be required to do the job. The bearing has been in use for several months in test railway service, fulfilling, it is said, all the claims of its inventor. It is 6 in. across the inside diameter and is adapted to fit the standard 6 by 9-in. shaft. The rollers, arranged in the two staggered rows of 18 each, are ¾ in. in diameter, of chrome-nickel steel, heat-treated, case-hardened, and ground. For speeds below 20 miles per hour, there is claimed to be a 50-per-cent reduction in total friction with a 90-per-cent reduction at the journal box, about doubling the pull of the locomotive. For speeds above 20 miles per hour, wind resistance must be taken into account, but always there is a considerable lessening of power required with a resultant saving in fuel. Stud bolts at the end of the journal box permit the bearing to be adjusted to within 1/32 in. for side wear.

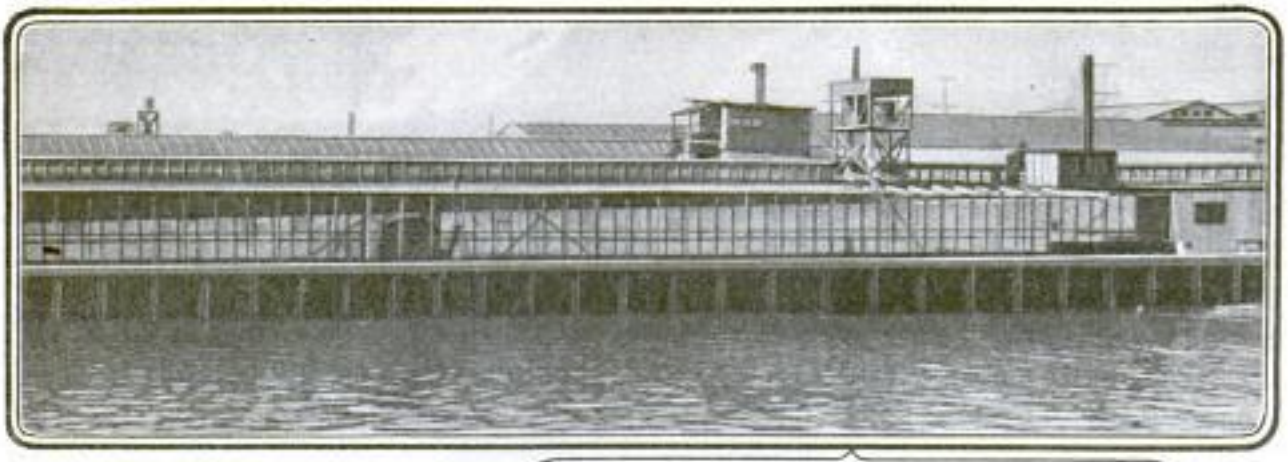
ELECTRIC SEDAN IS DESIGNED FOR INVALIDS AND SHOPPERS

There has been put upon the market a novel type of electric sedan, designed specially for use of invalids, and for shopping trips. It is a three-wheeled vehicle, with a body somewhat reminiscent of the old hansom cab of pre-motor-car days. The new sedan, like the old hansom, is entered by doors at the front, where are windows, as well as at the sides, that can be closed

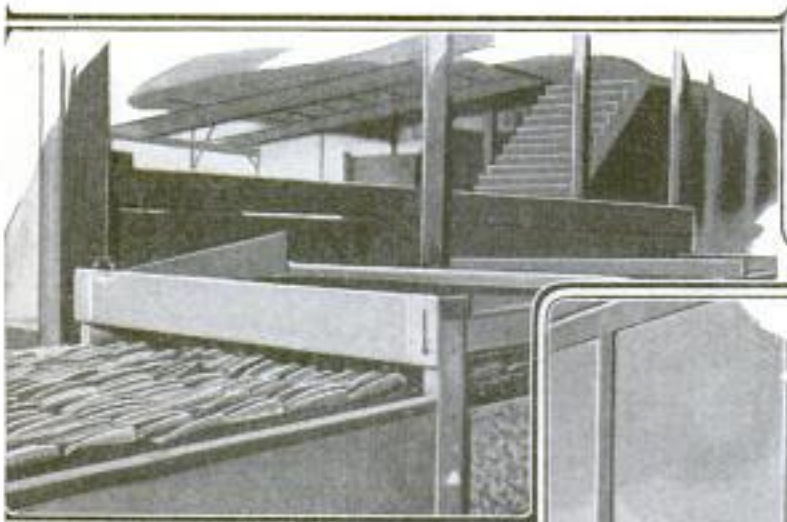
An Electric Sedan for Invalids or Shoppers That Runs on One Rear and Two Side Wheels, Accommodates Two Passengers, and is Entered from the Front

or opened. It accommodates two passengers comfortably, and three at a pinch. Its electric motor gives it a speed of 10 miles an hour, and it will run 70 to 80 miles on one charge.

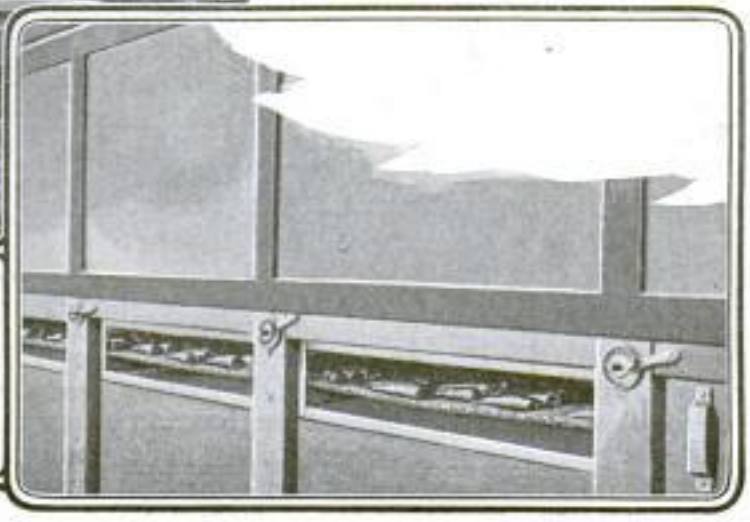
FISH, FRUIT, AND VEGETABLES DRIED BY



A Side View of About Three-Quarters of the Total Length—265 Feet—of the Structure at San Diego, California, That Contains the Apparatus Used for Drying Fish, Fruit, and Vegetables by Means of a Current of Warm Air Which is Conducted over Conveyors Carrying the Food through Ducts, at the End of Which They are Delivered Dried

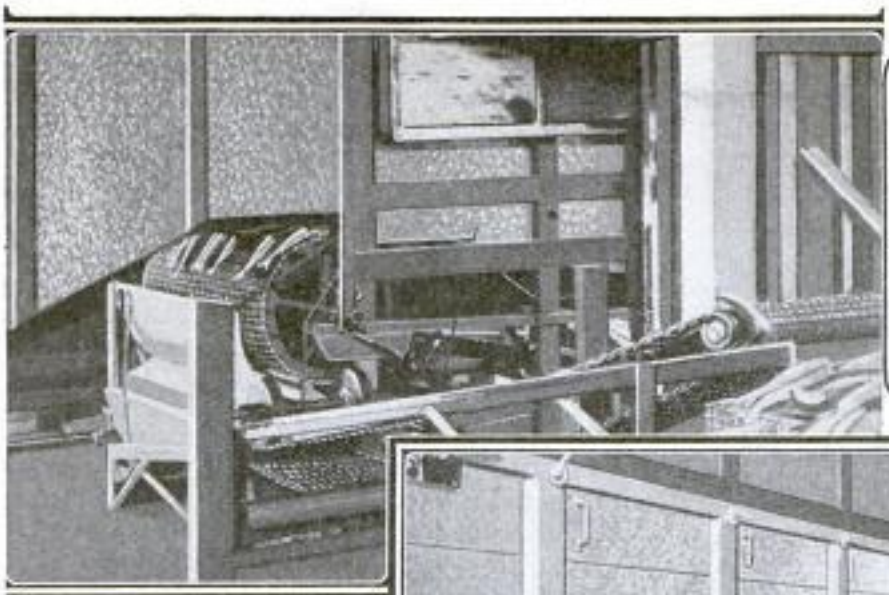


Above: At the Beginning of the Drying Process the Fish are being Spread upon the Conveyor Belt Which Draws Them into the Drier, as Shown to the Left, Where They are Just Entering It, Traveling toward the Right, Where the Beginning of the Long Horizontal Drying Duct can be Seen, with One of the Side Inspection Plates Removed

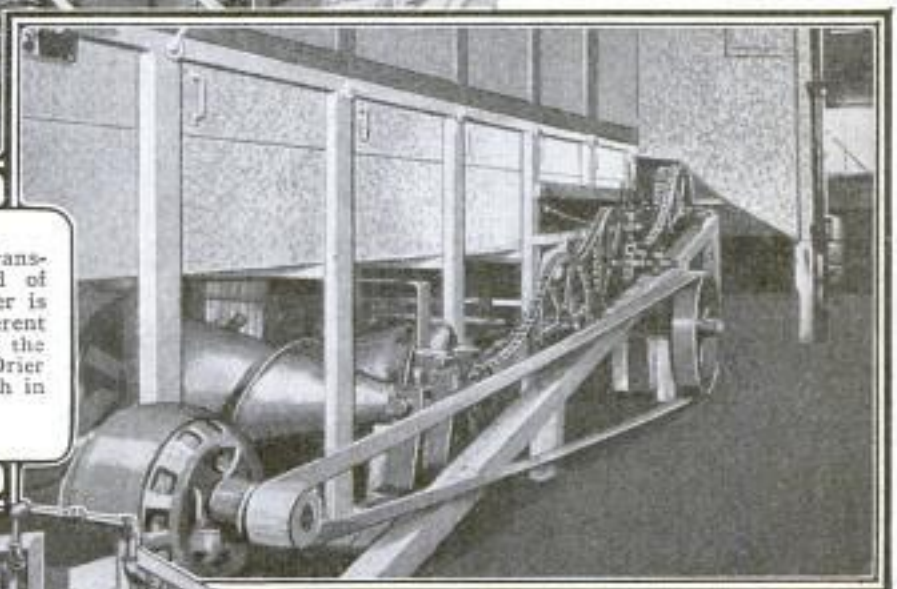


Right: Part of the Drying Duct Which is Divided Horizontally into Two Compartments, the Upper One Being the Warm-Air Duct, and Having a Number of Openings in the Partition That Allow the Warm Air to Pass into the Lower Compartment, Where the Fish are Carried on the Conveyor Belt and Inspected by the Removal of Side Plates

HEATED AIR IN CONVEYING APPARATUS

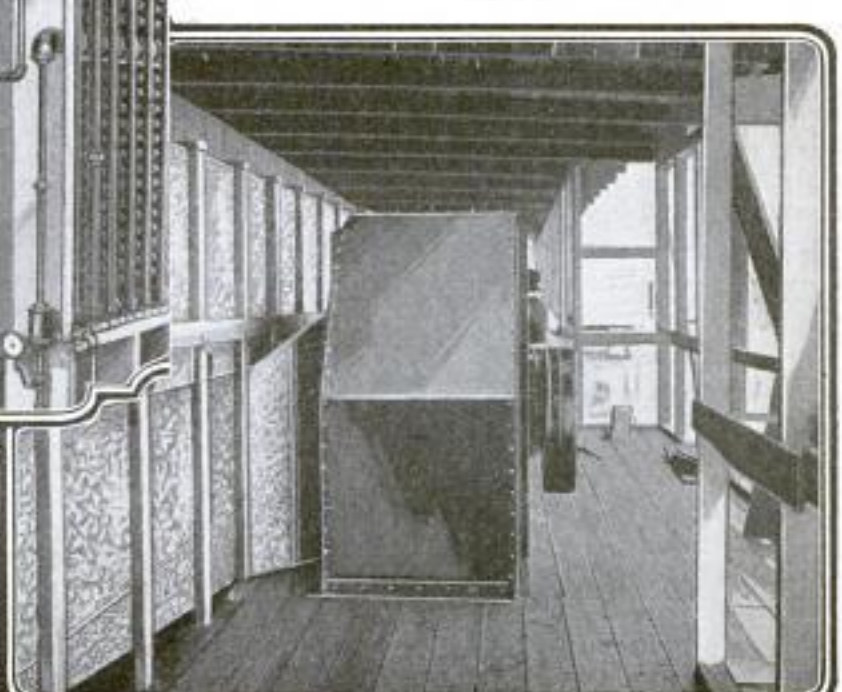


Left: The End of the Drying Process, Showing the Fish being Discharged from the Drier Conveying Belt to Another Belt, at Right Angles to It, Which Raises Them to a Bench Where They are Placed in Wire Baskets for Future Disposal. The Belts are More Distinct in This View, and It is Seen That They Are of Wire Construction



Right: The Variable-Speed Transmission by Which the Speed of the Conveyor Belt in the Drier is Controlled to Suit the Different Kinds of Fish. For Sardines the Belt is Timed to Traverse the Drier in 45 Minutes, for Larger Fish in 28 Minutes

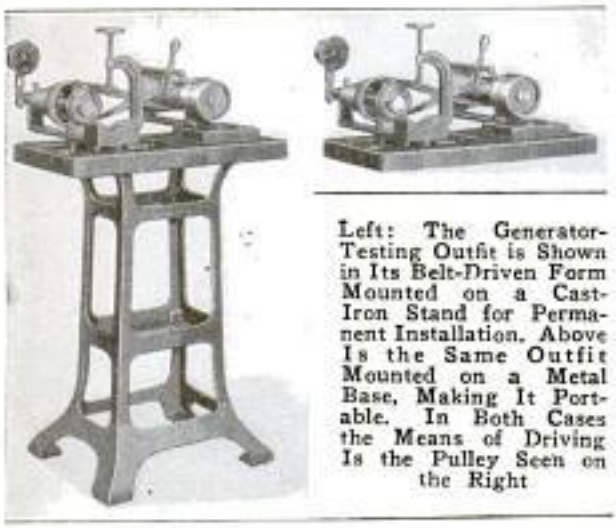
Left: The Steam Heaters for Warming the Air Before It is Drawn into the Drier. The Capacity of This Drier Is One-and-One-Half Tons of Fish at Each Operation, Equivalent, Therefore, to That Weight of Sardines in 45 Minutes, and of Larger Fish in 28 Minutes



Right: One of the Fans Connected to the Lower Duct for Drawing the Warm Air over and through the Fish. At the End of the Duct This Air, Which has Then Become Moist, is Discharged through the Floor. There Are Two of These Fans, Each 110 Inches in Diameter

GENERATOR TESTING OUTFIT CHANGES SPEEDS RAPIDLY

A very compact and easily operated outfit has been developed for testing small generators. It is mounted on an iron

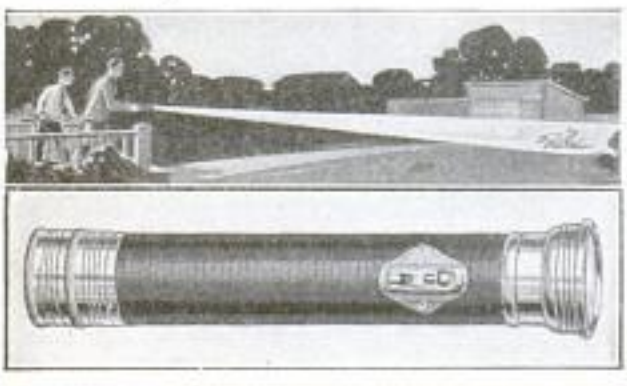


Left: The Generator-Testing Outfit is Shown in Its Belt-Driven Form Mounted on a Cast-Iron Stand for Permanent Installation. Above Is the Same Outfit Mounted on a Metal Base, Making It Portable. In Both Cases the Means of Driving Is the Pulley Seen on the Right

stand, and is belt-driven from any source of power, such as a line shaft or a motor. It has a special speed-changing device, consisting of reverse cone pulleys that make these changes possible while the machine is running, and has a speed range from 500 to 2,500 r.p.m. The generator to be tested may be driven either by means of a belt or by direct connection to a flexible coupling which forms part of the outfit, as well as the belt and belt tightener, for conditions where direct connection is not possible.

FLASHLIGHT REFLECTS BEAM THREE HUNDRED FEET

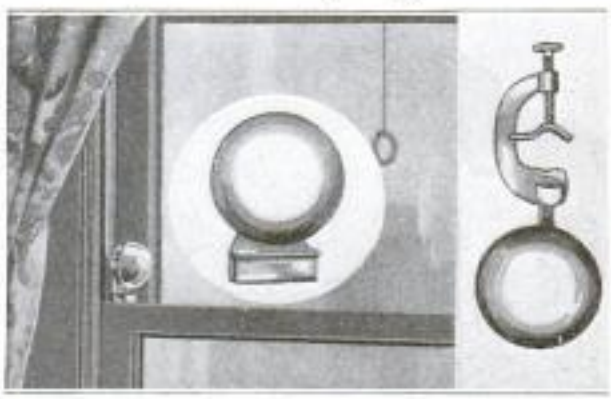
A flashlight which throws a beam of light to a distance of 300 ft. has recently been placed on the market. The appearance is that of the standard tubular design. By turning a cap at the end of the tube the light is focused to the correct angle for a long beam or diffused illumination. A special reflector intensifies the light. An end compartment holds two extra bulbs for substitution when one burns out.



Upper View: Giving an Idea of the Penetrating Beam Flashed by the New Spotlight. Lower Insert: Close-Up of the Spotlight

SPRING-OPERATED ALARM FOR WINDOWS AND DOORS

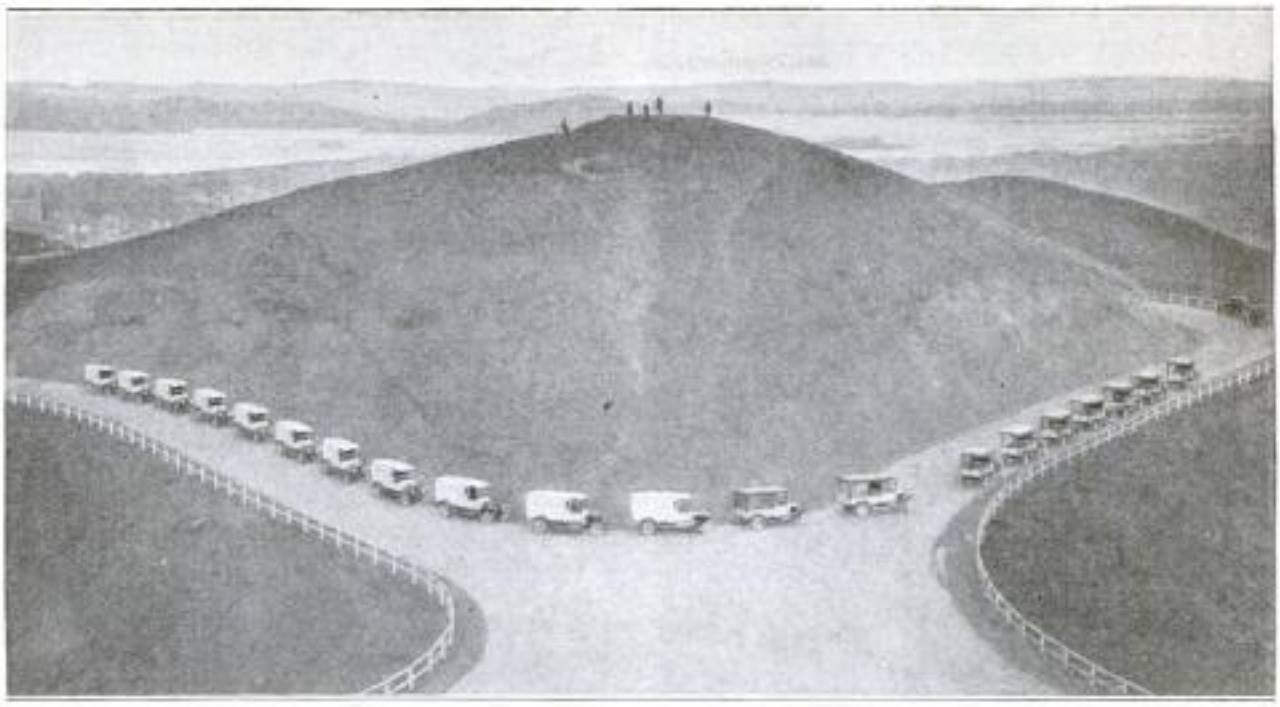
A new burglar alarm is instantly set off by the slightest movement of the door or window to which it is attached. It operates by means of a spring which is set off by movement of the object to which the signal is attached and thereby rings a bell. Ordinarily the signal is attached to a door by means of a thumb-screw clamping down on the door-knob sleeve, but where the spindle is of such design that the outer knob may be turned without turning the inner one, the bell is fastened to the back of the door near one of the hinges by means of a special frame fitment. As a window alarm, the device is fastened to the top of the lower sash by means of wood screws.



Circular Insert: Close-Up of New Window Burglar Alarm. Shown at the Left Attached to a Window. Right: The Alarm Adaptable to a Door Knob

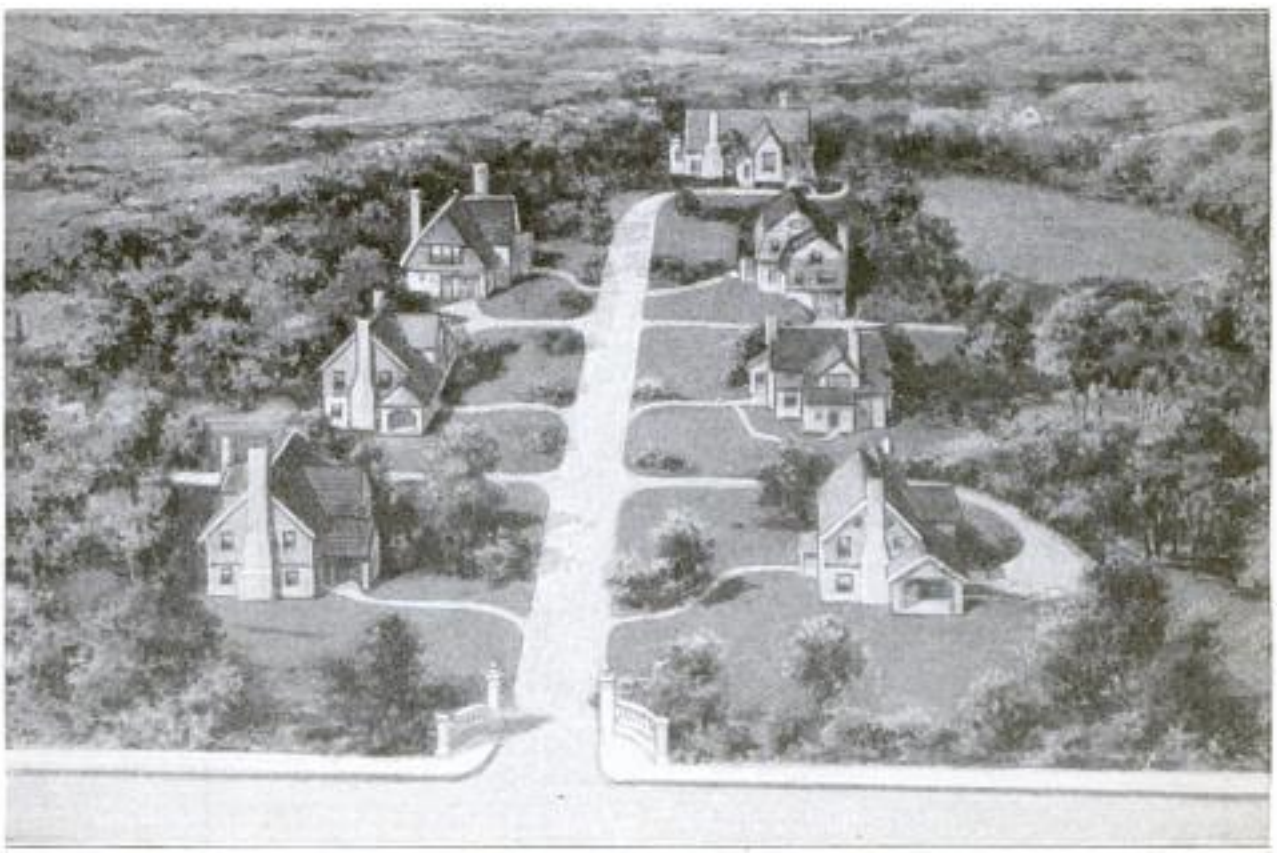
WET GRINDING PROVED TO BE A DANGEROUS OCCUPATION

It has been thought that if there is enough moisture employed in connection with grinding and polishing, the dust could be precipitated. The U. S. Public Health Service finds that this is not so, and that, on the contrary, grinding and polishing by wet process in factories may be exceedingly harmful. In a large ax factory it was found that among the workers in the grinding and polishing shops, operating in an air of high humidity, the death rate from tuberculosis was 19 per thousand, and from other pulmonary infections 4.3 per thousand, which rates are very much higher than among other mill workers.



MOTOR-TRUCK FLEET POSES FOR ITS PHOTOGRAPH

THE winding drive about the Twin Peaks, overlooking San Francisco and the majestic Golden Gate, makes an ideal setting in which to pose large groups for the taking of photographs. It would be difficult to imagine a better arrangement for a fleet of motor trucks than the one pictured above. Each car stands out distinctly, and one does not realize that the group contains 20 machines, for the broad reaches of the natural background dwarf the man-made objects into semi-insignificance.



MAKING SEVEN HOUSES GROW WHERE ONLY ONE STOOD BEFORE

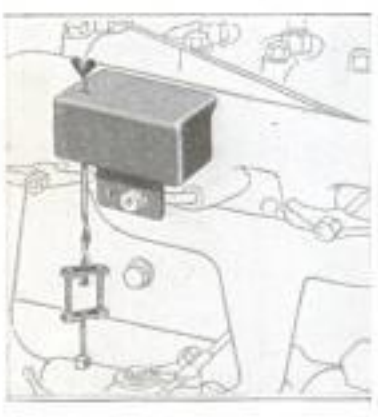
"THE Gables," an old aristocratic home in Clifton, a residential suburb of Cincinnati, is to be demolished, and in its place are to be erected seven homes. Leading from the main thoroughfare, a trunk road will enter the grounds that surrounded the old home, and will have three main branches on either side, each leading to a home, while the main road will continue to the seventh home. The buildings will all harmonize in the English Tudor style of architecture. They are designed to cost about $20,000 apiece, so that the project will involve a total expenditure of about $150,000.

LIGHTHOUSE IS SAILOR'S MODEL FOR READING LAMP

It is not surprising that an old mariner, old in sea service, that is to say, though not perhaps in years, should choose a lighthouse as his model when he wanted to make for himself a reading lamp. That is exactly what an officer of the motorship "Pacific," trading into Tacoma, Wash., did with a result that was the object of great admiration among his fellow mariners. The lamp is only 16 in. high, with a base 6 in. in diameter, but what it lacks in size it makes up for in beauty. It is made of polished brass, finished to resemble cut stone, and from the platform at the bottom to the lens and railed gallery at the top, every detail of a lighthouse is reproduced on a minute scale. The light is electric, and is turned on and off by a switch that is reached by opening the door at the bottom platform.

THERMOSTAT ON AUTO ENGINE HELPS SAVE GASOLINE

Automatically opening the carburetor needle valve when the automobile engine cools, and closing it as the temperature rises, a thermostatic regulator, designed for attachment to the engine-exhaust pipe, is claimed to effect fuel economy of from 20 to 25 per cent. The active element is a simple thermostat-metal arm, which, as it bends in expanding and contracting, lowers and raises a spirally twisted rod which works in a slotted fitting attached to the needle valve. Contracting as the engine cools, the thermostat raises the spiral, which causes the needle valve to be turned toward the left, or opened. As the exhaust pipe heats, the thermostat expands and, acting upon the needle valve, closes it one-fourth turn, thus cutting down the strength of the mixture.

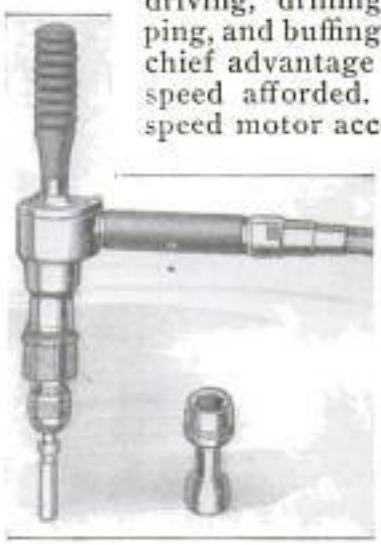


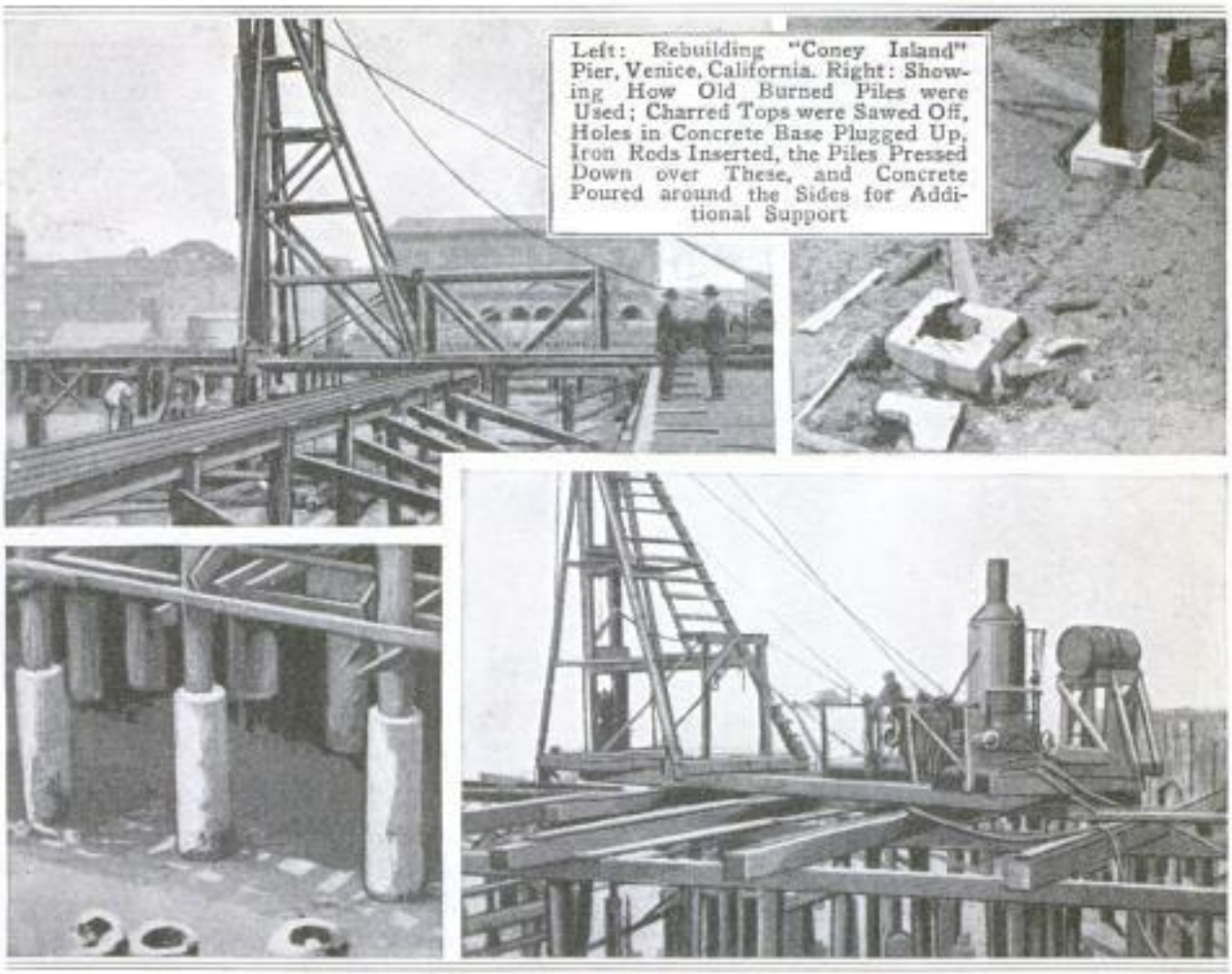
FORCE OF OIL TANK EXPLOSION FRACTURES CHAIN REMARKABLY

The enormous force exerted by the explosion of a large body of oil confined in a tank was recently very palpably demonstrated by the effect of such an explosion upon a very heavy chain. The explosion occurred in an oil-tank barge on the river Thames, in England, and the chain was a set of 1½-in. slings hanging from the end of a derrick in such a manner that the ends of the slings were resting freely upon the port side of the top of the tank. After the explosion it was found that the chain was badly fractured in several spots, and the large top ring from which it hung, which was of 3½-in. metal and 12-in. inside diameter, was cracked. It is estimated that a total pull by the chain of at least 135 tons was necessary to fracture this large ring.

FLEXIBLE-SHAFT SCREWDRIVER AND NUT SETTER

A new flexible-shaft-driven chucking apparatus is adapted for nut setting, screw-driving, drilling, reaming, tapping, and buffing operations. The chief advantage is the increased speed afforded. A small slow-speed motor accelerates through a three-speed countershaft driving a long spring-core shaft that terminates in the chuck. Two handles are provided for ease of control in difficult places. Because of the type of belt drive, it is claimed that there is no chance of burning out the motor in turning nuts and screws to a dead stop. Moreover, a friction device in the spindle may be set to the desired torque by a knurled nut on the sleeve.





Left: Rebuilding "Coney Island" Pier, Venice, California. Right: Showing How Old Burned Piles were Used; Charred Tops were Sawed Off, Holes in Concrete Base Plugged Up, Iron Rods Inserted, the Piles Pressed Down over These, and Concrete Poured around the Sides for Additional Support

Left: Illustrating Reuse of Old Piling Which was Burned at Top in Fire at Venice; Burned Portions were Sawed Off, and Piling Placed on New Concrete Base. Right: Support for Pile Driver

UNUSUAL PIER-CONSTRUCTION WORK

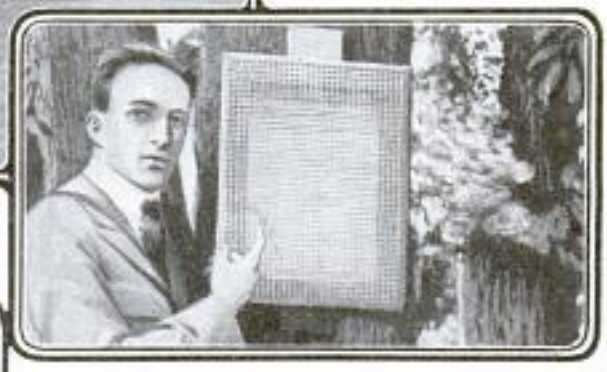
It will be remembered that some months ago the burning of the nationally famous "Coney Island of the Pacific Coast"—the huge amusement pier at Venice, Calif., was recorded. This pier was almost as well known as its eastern contemporary and was the victim of a fire which completely destroyed the structure with a loss that exceeded $1,500,000.

Work was immediately started on the rebuilding of the pier, and novel methods were adopted to reduce the cost. Since the fire came from above, the piling supporting the pier was not burned, except for the tops, which were burned down a few feet, and the sides, which were scorched. The injuries were not such, however, as to impair the strength of the piling. To enable the use of all this good timber in the new pier, an ingenious scheme was worked out. The piling had been set in concrete, and each pile was pulled out, cleaned, and the charred top sawed off. The hole in the concrete was then filled in with more concrete, and short iron rods, such as are used in reinforced-concrete construction, were set in the new concrete so that they protruded 6 to 8 in. above the cement. When this had dried, the piles were put back in place, but this time, of course, instead of going down into the concrete base, they were set on top of it, with the iron rods sticking into the base of the piling. Additional concrete was then run up the sides a little way to brace the piling. As a result, the top of the sawed-off piling is at the same level it was before, and all the old timbers were used, thus effecting a saving of a considerable amount.

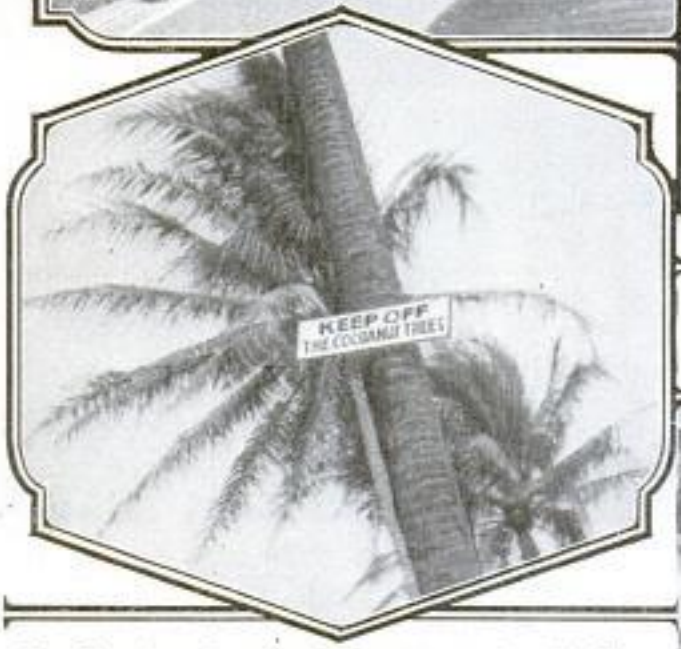
An interesting method was also used in supporting the hydraulic pile drivers used in setting the underwater piling at the outer end of the pier. Instead of working from the shore end and building the pier out, driving piling and laying a floor to support the pile driver as it went along, a sort of suspension bridge of heavy timbers was thrown across the old burned piles, and the pile driver crawled around on this latticework. The heavy machine is supported by only the spanning timbers.

CIVIC FEATURES THAT PROMOTE THE COMFORT

Hitching Posts Are the Latest Means of Guarding against Theft of Parked Automobiles in Whittier, California. They Are a Car Length Apart, and So Low That the Wheels of the Cars can be Chained and Padlocked to Steel Rings at the Top

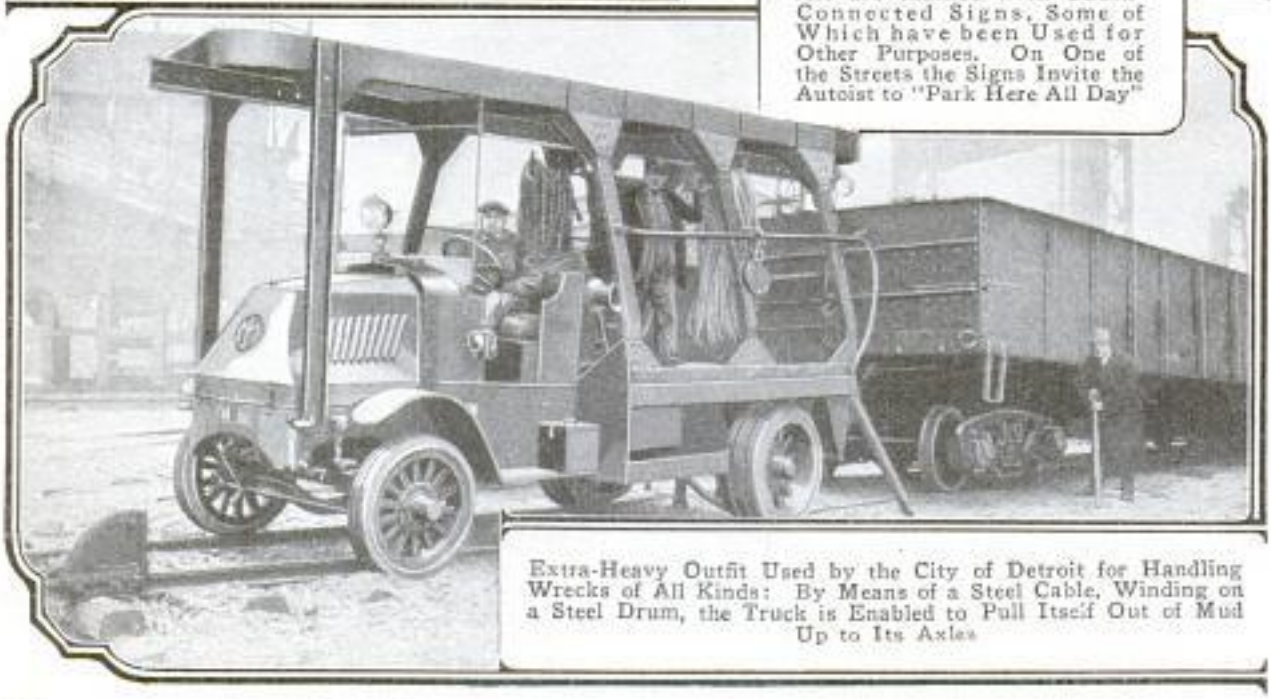


Because Small Boys do Not Seem to Be Able to Refrain from Throwing Stones, the Los Angeles Park Commission has Protected the Glass Covered Rules and Regulations by Heavy Wire Screens



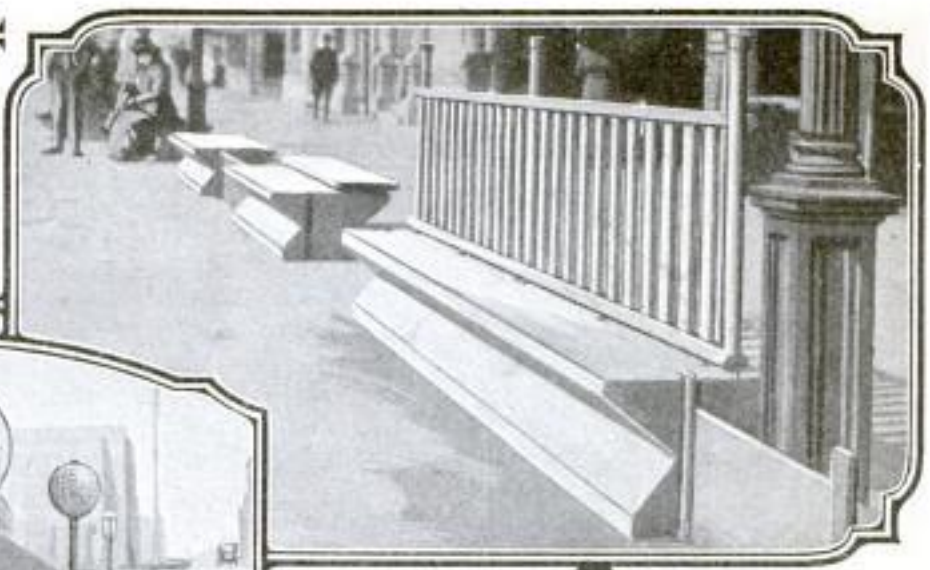
Not Often is a Sign Found Warning the Possible Trespasser to Keep off the Trees, but Such a Notice is Posted on One of the Perennial Growths of Honolulu. It Bears the Label "Keep off the Cocoanut Trees"

Downtown Safety Zones of Buffalo are Marked with Chain-Connected Signs, Some of Which have been Used for Other Purposes. On One of the Streets the Signs Invite the Autoist to "Park Here All Day"

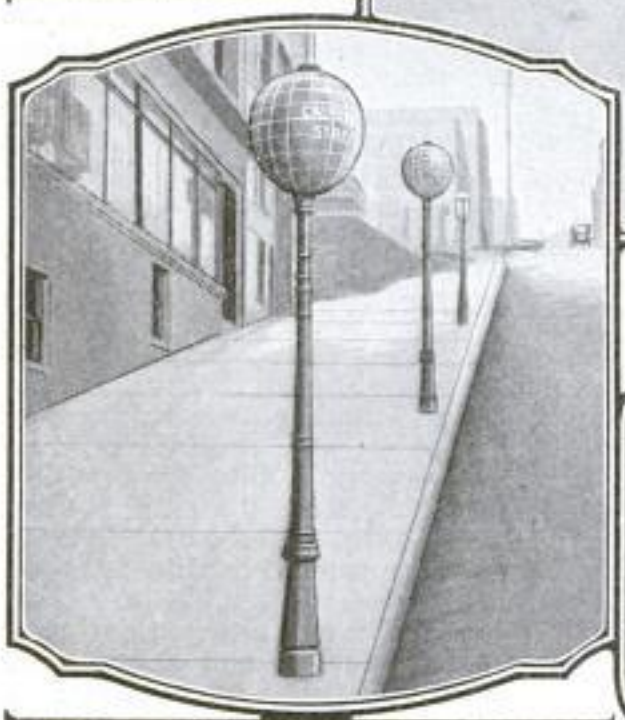


Extra-Heavy Outfit Used by the City of Detroit for Handling Wrecks of All Kinds: By Means of a Steel Cable, Winding on a Steel Drum, the Truck is Enabled to Pull Itself Out of Mud Up to Its Axles

AND ENJOYMENT OF VISITORS AND RESIDENTS

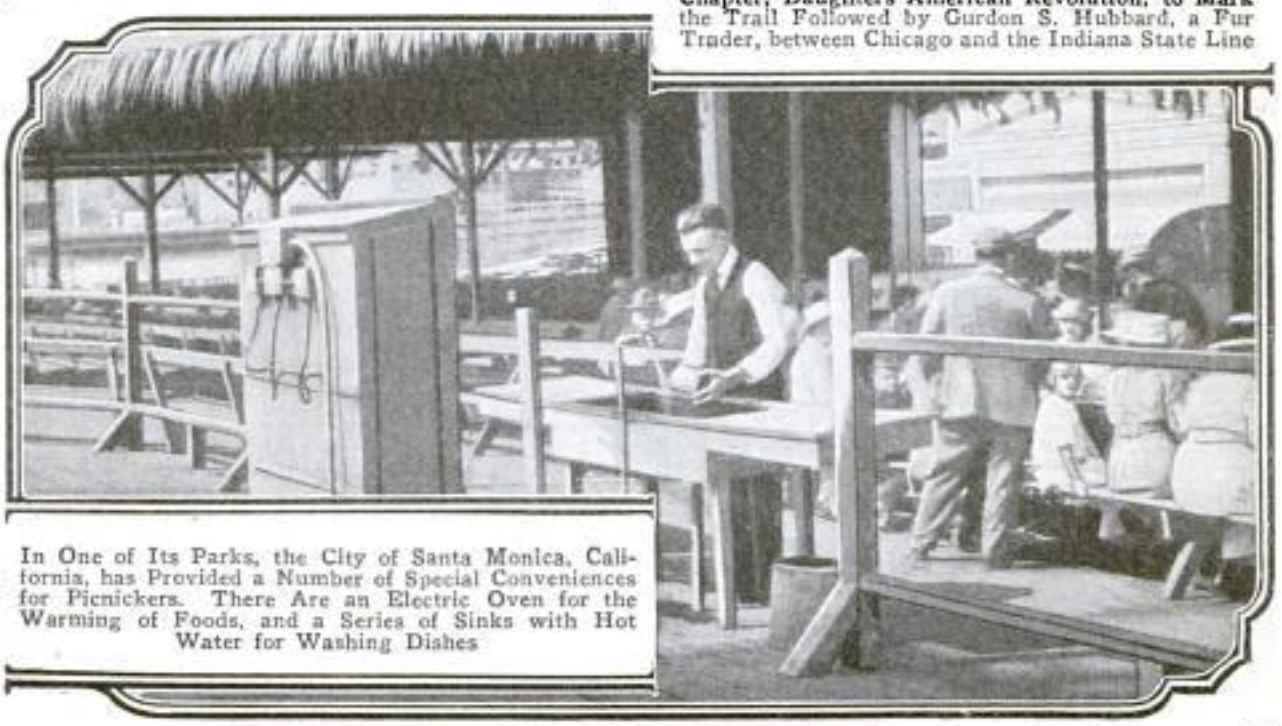


Concrete Seats along the Shores of Southwest Coast Towns Have Wooden Backs Made Detachable So That They may be Stored during the Season of the Year When There Are Few Visitors. Iron Piping Fits in Holes in Both Parts



The Proprietor of a Store in Chinatown, San Francisco, was Given Permission to Erect a Street Sign in Keeping with the Atmosphere of the Locality. Large Balls of Heavy, Inlaid Brown Glass Surmount the Usual Iron Posts

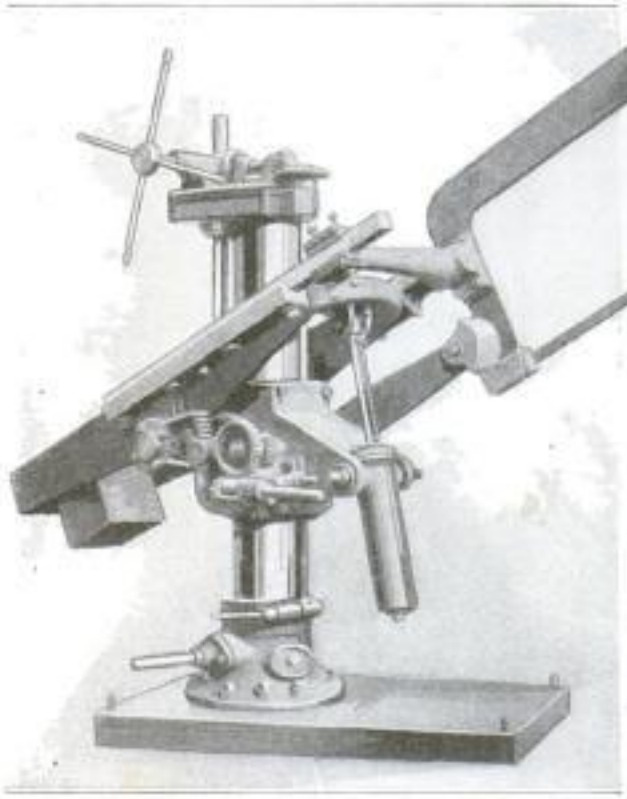
This Tablet was Erected by Barbara Standish Chapter, Daughters American Revolution, to Mark the Trail Followed by Gurdon S. Hubbard, a Fur Trader, between Chicago and the Indiana State Line



In One of Its Parks, the City of Santa Monica, California, has Provided a Number of Special Conveniences for Picnickers. There Are an Electric Oven for the Warming of Foods, and a Series of Sinks with Hot Water for Washing Dishes

RADIAL GATE-SAWING MACHINE CUTS PIECES HIGH IN AIR

Hacksawing high in the air is now being accomplished by a motor-driven radial saw, marketed in Great Britain. Risers, gates, and runners are cut off heavy castings by this machine. It is practical, too, from the point of view that it will cut flush because there is no interfering projection on the blade side. The propelling action is the same as that of the usual power hacksaw, but the sawing rig is movable in a circle, being mounted on a large pivot post set vertically on the floor plate. It is also adjustable up and down, from the floor to a 6-ft. level, which would enable it to reach the gates on some very large castings. The feed of the saw is by gravity aided by counterbalancing.



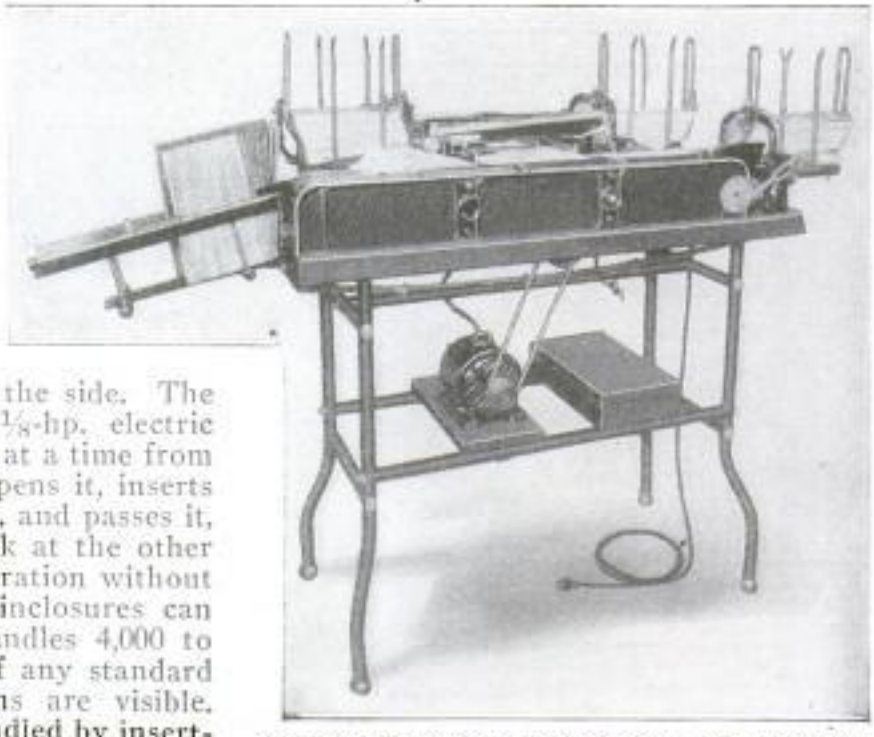
The Radial Gate-Sawing Machine That Cuts Iron or Steel: It Swings around the Supporting Post and Also Slides Vertically upon It

MARINE STAR SHELLS FIRED FROM GUN WITHOUT A FLASH

Very promising experiments in the development of a star shell that will be more effective than searchlights in scouting for the enemy at sea are being made by the Navy Department. The powder that drives the shells from the guns is flashless, so that, unlike the case of the searchlights, the enemy will have no means of detecting from what direction they come. When the shells burst they light up a large area of the sea, and keep up the illumination for several minutes, like the old trench star shells.

MACHINE INSERTS TWO INCLOSURES FOR ENVELOPES

Putting letters and other inclosures into envelopes, the only surviving manual operation in the modern mechanical system of mailing, at last has surrendered to machine methods. In a new office appliance, the empty envelopes are stacked in a holder at one end, and two kinds of inclosures in similar holders at the side. The mechanism, driven by a ⅛-hp. electric motor, draws one envelope at a time from the bottom of the stack, opens it, inserts the two inclosures in order, and passes it, sealed, to the delivery stack at the other end. By repeating the operation without sealing, a second pair of inclosures can be used. The machine handles 4,000 to 4,500 envelopes an hour, of any standard size, and all its operations are visible. Three inclosures can be handled by inserting only one in the second operation.



The New Envelope-Stuffing Machine: The Envelopes, Drawn from the Right, are Delivered at the Left

The Officer at Fanning Island, after the German Raid and Destruction of the Cable Station, is Seen Raising One End of the Cable with a Pickax, the Only Form of Grappling Hook Available, Which He Later Spliced to the Other End, Previously Tied to His Improvised Raft

WAR SECRETS GOOD SUBJECTS FOR PEACE PUBLICITY

War secrets are no longer secrets after the war is over. One such secret lost its secrecy at a recent meeting of the London Telegraph and Telephone Society. Early in the war, while there were still a few German cruisers at large, one of them attacked Fanning Island, a small coral island in mid-Pacific, valuable only as a cable station. The officer in charge hid himself during the raid, and escaped notice. As soon as the enemy retired he built a small raft, and with a pickax, as the best thing he could find in the way of a grappling hook, he fished up the two ends of the cable, cut by the Germans, and made them fast to the raft. In the ruins of the station he found a long piece of copper, which he insulated the best way he could, and out of it formed a coupling for the cable, and a connection to a primitive keyboard that he made out of odds and ends picked out of the wreckage. The nearest station was at Suva, and he got into touch with the authorities there, who in the meantime had been groping in the dark to locate the break in their communications. Thus the officer saved not only himself, but also a serious loss through interference with government traffic.

DISK STROPPER IS LATEST FOR SAFETY RAZORS

New and more practical devices are being produced almost daily for the care and upkeep of razor-blade edges. One of the latest of these devices is a disk and rotating-clamp combination for honing safety-razor blades. The disk is covered with a layer of fine-grained leather, and the clamp part is pivoted to a central post on the disk. At the end of the clamp is a cup-shaped fitting to receive the tip of the right index finger. To operate, a blade is placed in the clamp and the unit pressed by that finger against the leather-coated disk, at the same time turning the clamp and blade around the disk in a clockwise direction, until the blade is sufficiently stropped. The other side of the blade is brought into contact with the disk by pressing a lever back of the clamp. To strop the opposite edge, the blade must be taken out of the clamp and reversed.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

New Design in Electric Heaters: It Gives Out Heat in Much the Same Way as a Fan Gives Out Coolness, and It Is Also Adjustable

A Safeguard against Pickpockets: It Is an Adjustable Catch That is Attached to Any Pocketbook, as Seen Below, and Has a Safety Pin for Securing It to the Pocket, as Seen Above

An Attachment for Men's Suspenders That Provides a Means of Temporarily Lengthening the Suspenders

Churning is Made Easy by This Newly Invented Churn, Which Makes Butter from Sweet or Sour Milk in from One to Three Minutes, at the Most, and is Said to have Actually Produced Butter in as Short a Time as 14 Seconds

A Wicker Breakfast Tray and Secretary, Neatly Decorated, with the Tray Protected by Glass, and with Handy Side Pockets

The Serrated Edge on This Bread Knife Cuts Rapidly, and So Cleanly That Practically No Crumbs are Produced

Guards for Shoe Soles Made of Sheet Steel, Light Enough to be Bent by the Fingers So as to Fit a Toe or Heel of Any Size or Shape

This Is a Receptacle for Ordinary Kitchen Refuse, with a Lid That is Perforated and Forms a Strainer, as Shown in Use Above

Three Household Necessities in One: An Ironing Board, a Table, and a Stepladder. When in Use as the Two Former, the Stepladder is Folded

A Basket Weighing Only Four Pounds, and Yet Strong Enough to Carry a 25-Pound Child Around While Shopping

Hot-Pan Lifter Made Especially for Lifting Pans from a Pressure Cooker: One Handle can be Used for Several Pans

Combination Heel Plate for Automobiles, Equally Suitable for Male or Female Drivers, Depending upon the Style of Heel

Very Handy for Cooking over a Camp Fire: The Steel Skirting on Its Sides Keeps the Fire in Good Order in Windy Weather. Its Sturdy Legs Fold Up, When Not in Use

Spring Floor-Brush Handle Keeps the Brush Face Always Flat on the Floor, No Matter at What Angle It is Held

This Centrifugal Wringer Dries Clothes of Any Description Very Quickly. The Cylinder with Perforated Walls is Rotated Rapidly by an Electric Motor, Squeezing the Water in the Clothes inside the Cylinder

A Double-Duty Dish Drainer, Used on the Table for Cooling Hot Dishes, Pies, or Cookies from the Oven, and Used in the Sink for Draining Dishes

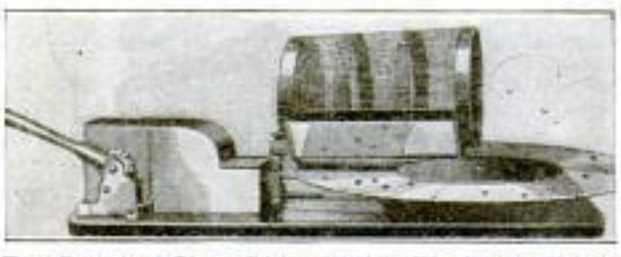
This Safety Rubber Mat for a Bathtub Has Suction Recesses on the Underside That Hold It Securely to the Bottom

WHIRLING HEAD OF SPRINKLER MAKES IT SELF-PROPELLING

It will not be necessary to run out on the lawn periodically to change the position of the sprinkling apparatus when a sprinkling device of late design which propels itself about, is used. The new device comprises a wheeled base, a standpipe, and a fan-blade sprinkling head. Two water lines enter the wheeled base and throw a stream through it up the standpipe to the sprinkling head. As the water strikes the blades in the head, it whirls the head and is itself thrown about the lawn. Meanwhile the whirling motion is transmitted from the head through the standpipe by a rod, to the base where it is again transmitted by chains and gearing to the wheels. Thus, as sprinkling takes place, the sprinkler travels. Of course, the working of the sprinkler is entirely dependent on the availability of a water supply of sufficient pressure.

ROTATING TRAP FOOLS FLIES BY MIRRORS

An ingenious flytrap, rigged up with parts of an old phonograph, an alarm clock, bits of glass, and various other odds and ends, by an Iowa farmer, is said to have been remarkably successful in harvesting the pests about his house and barn. A dried-blood and sugar mixture attracts the flies to a slowly revolving horizontal glass disk which carries them up to a thin mirror suspended slightly above. This is the point of the plot: The flies see themselves in the mirror and have no fear. They think their reflections merely other flies approaching, and are carried through the small opening into an ante chamber. They travel on for an inch or so until they collide with another mirror suspended directly above the revolving disk so as to leave little or no space between. This disturbs them, so they rise in flight and strike against the glass ceiling. They are now thoroughly confused. A small hole has been purposely provided near the top. Having lost all sense of direction, the flies crawl through this into a cylindrical screen cage, where they remain until the houseman comes along and drowns them in a pail of water. The disk is rotated by clockwork, one winding being sufficient to keep it running for 24 hours. Neighborhood storekeepers became so interested in the device for advertising purposes that the inventor decided to apply for a patent on the trap.



The Rotating Glass Disk of This Flytrap is Driven by the Clockwork on the Left. The Flies Light on the Disk and are Carried under the Screen Cage

TOOL FOR REMOVING PISTON RINGS

A device put out by an English concern assembles, as well as disassembles, piston rings to the piston. The purpose is to eliminate the difficulty and the liability to breakage of hand assembling. A steel ring of channel section passes easily over the piston. On the inside of the ring are two lugs, operated by a toggle joint, which fit between the ends of the piston ring. The toggle is depressed, causing the piston ring to expand into the channel section of the tool, whence it is easily removed. The same process may be used in assembling the ring to the piston.

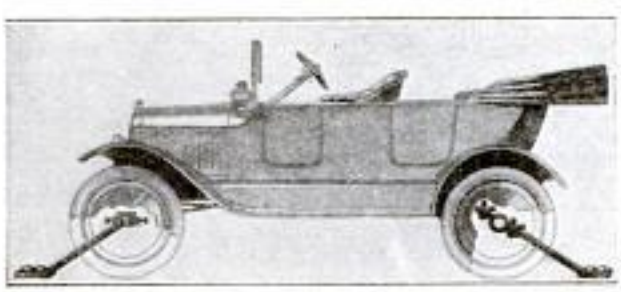
For Assembling Piston Rings to the Piston, a Ring is Contained inside This Tool and is Expanded from the Ends by Means of Two Lugs Operated by the Toggle Lever

COLOR GIVEN TO GEM STONES BY EXPOSURE TO RADIUM

Attempts, with every prospect of ultimate success, are being made to impart color to colorless gem stones. The stones are exposed to the rays of radium, and already a colorless Colorado topaz has been tinted yellow, although it was found that the coloring was not permanent on exposure to light. The experiments were made at Reno, Nev., by the Bureau of Mines, and are being continued in the expectation that ultimately a means will be found for making the coloring permanent. If it is proved in the end that gems can be permanently tinted by exposure to radium, there will be a great increase in the value of much material in the West that is not valued by gem fanciers now on account of its lack of color.

NEW AUTO-ANCHORING STRAPS REDUCE DAMAGE IN TRANSIT

To displace the grooved wooden block, commonly used as a blocking medium for preventing automobiles from shifting

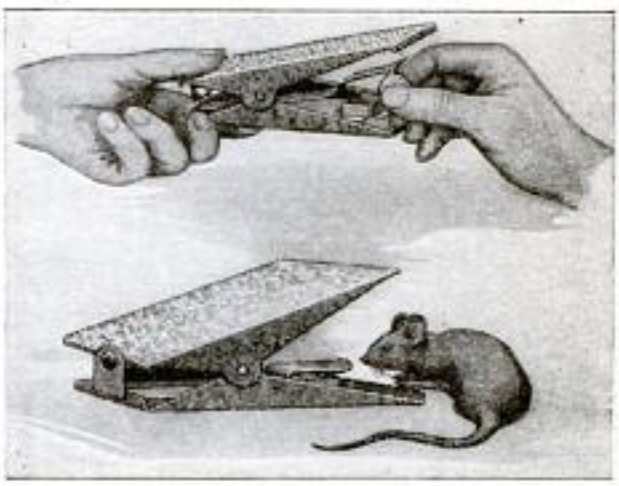


Straps Attached to the Automobile Axles and Bolted to the Floor to Prevent Motion of the Car in Transit

while in transit, a metal anchoring strap has been devised. Four of the straps of broad drawn metal are bolted in place over the axles of the automobile. They are anchored at their opposite ends by lag screws driven into the floor of the freight car, bringing the strap into a slant of about 45° from the axle. Two are applied to the rear axle and two to the front, and the front and rear pairs tightly drawn into diametric opposition to prevent the car from the slightest movement. Because of their stout and removable construction, the anchor straps may be used many times.

SHEET-METAL MOUSETRAP RARELY REQUIRES BAITING

Rebaiting the mousetrap is not necessary when a new sheet-metal device is used for the apprehension of these rodents. The trap mentioned consists of a base and a spring-actuated lid. A lever-like copper tongue which the mouse raises with his head, releases from a hooked position on the lid, permitting it to slam down on the mouse's neck. Under this tongue is a little bait box which the mouse



Upper View: Placing Bait in Box under Trigger of New Mousetrap. Lower Picture: Trap Set for Action

strives to reach, but ere he has achieved the desired objective, his neck has precipitated his dispatch and he leaves his coveted meal to another victim. To drop the body from the trap, the ends of the base and lid are squeezed with the fingers, with the result that the trap end is opened.

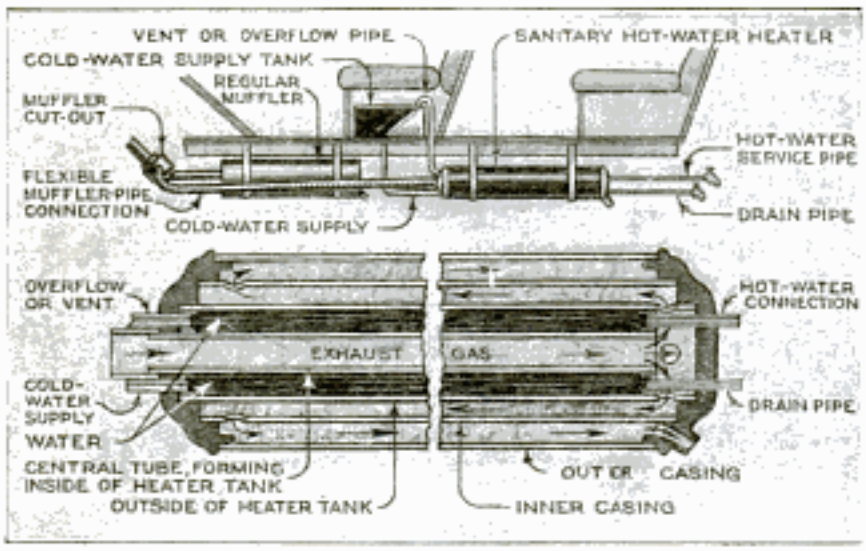
SPACER RING IN BEARING KEEPS ROLLERS APART

Bearing rolls are kept properly spaced and receive an equal amount of wear when held in place by a coglike ring, designed for the purpose by a western inventor. The space between the teeth in the ring are slots so designed in depth and distance apart, that the rollers cannot crowd into one another, and that the weight of the load is on the roller and main bearing casting instead of on the ring. When this casting is turned in the lathe, a slot is cut deep enough to fit the ring and allow it to lose contact with the bottom of the bearing roller when the load presses the latter to the casting.

Left: Bearing Assembled with Rolls Spaced by Coglike Ring. Center: Cog Ring. Right: Sectional View

AUTO EXHAUST HEATS WATER FOR MOTOR TOURISTS

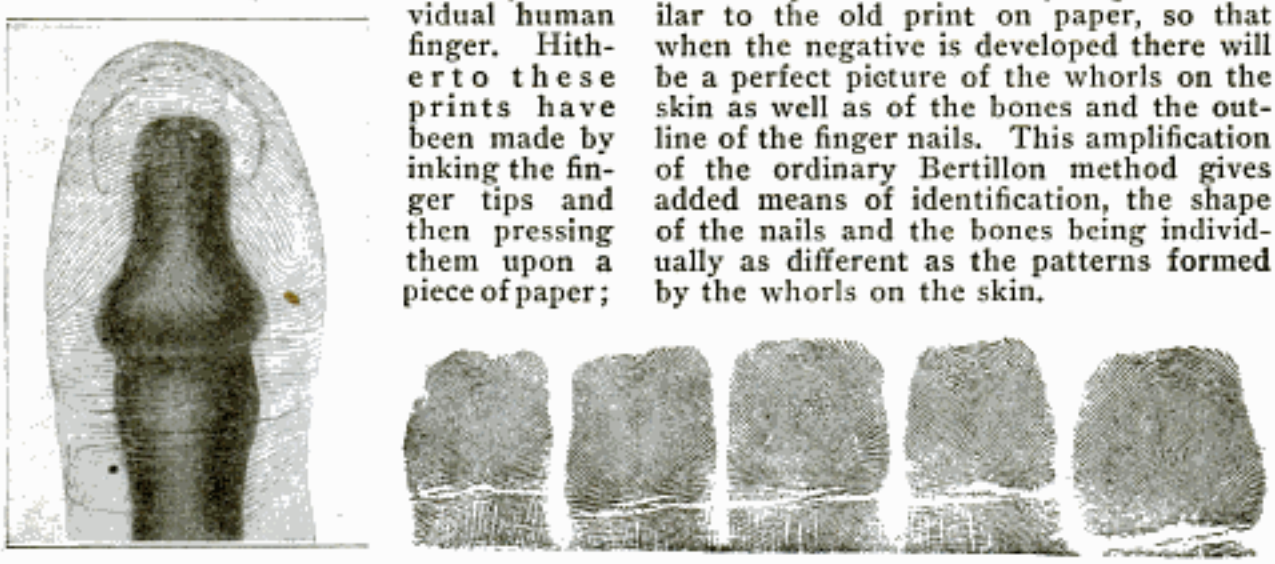
Motor camper-tourists who have had occasion to wash dishes, shave or bathe with cold, though sparkling, spring water on a frosty morning will doubtless be interested in a patented device which, it is claimed, will supply all the hot water needed, utilizing the waste heat of the engine exhaust gases. In general appearance the apparatus is very like a muffler and is slung under the car alongside that member. Inside are three drums, one of which contains the water, arranged in such a way that the hot gases are forced to pass first through the center of the water chamber and later around the outside of it. This arrangement presents a large area to the action of the gases and quickly transfers their heat to the water. The heater is connected to a supply and storage tank, placed anywhere in the car, by means of two pipes, as in a kitchen hot-water system, and as the water heats, it rises in the tank by natural circulation. The gases are led to the heater by a flexible steel tubing connected to the exhaust pipe ahead of the muffler. A special valve directs the gases through either the heater or the muffler, as desired. From the rear of the heater extends a hot-water service pipe with a faucet.



Below: A Sectional View of the Water Heater Which is Mounted on the Chassis of an Automobile. Above: An Elevation Showing the Complete Arrangement of Heater and Muffler Connection with All Parts Notated

FINGER PRINTS AMPLIFIED BY X-RAY PHOTOGRAPHY

Everybody has heard of the Bertillon method of identification by means of finger prints. It is made possible by the fact that the whorled grain of the skin forms different patterns on every individual human finger. Hitherto these prints have been made by inking the finger tips and then pressing them upon a piece of paper; in fact, by what might be compared with the printing-press method. It is now proposed in France to add to this means of taking merely superficial prints by means of X-ray photography. Instead of with ink, the finger tips will be coated with a salt, such as carbonate of bismuth, which makes a print on an X-ray negative similar to the old print on paper, so that when the negative is developed there will be a perfect picture of the whorls on the skin as well as of the bones and the outline of the finger nails. This amplification of the ordinary Bertillon method gives added means of identification, the shape of the nails and the bones being individually as different as the patterns formed by the whorls on the skin.



BY COURTESY OF LA NATURE, PARIS

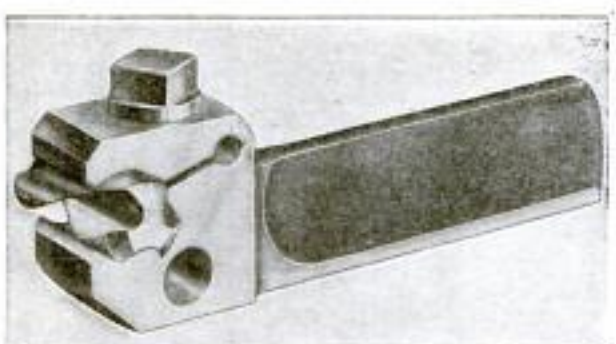
To the Left Is a Radiographic Finger Print, Showing the Grain of the Skin, as in the Ordinary Finger Prints, and Besides, the Bones and the Outline of the Finger Nail. To the Right Is an Ordinary Bertillon Print of the Finger-and-Thumb Tips of the Left Hand

TAMED GOPHER USED TO SHOW TUNNEL-BUILDING METHODS

A tamed gopher is used by the Department of Agriculture in demonstrating before western farmers the burrowing habits of the animal which, because of its crop-destroying tendencies, has become a menace to western agriculture. In sight of the audience the gopher is taken from his cage and put to work digging to show how he constructs his tunnel, how the mound is built, and how the entrance is stopped up. After the job is completed, the gopher is replaced in the cage, and an explanation of the best trap-setting and bait-placing methods is given as a part of the general plan of eradicating the pest.

TURNING TOOL RESEMBLES TWIST DRILL

A novel tool bit, closely resembling a three-fluted twist drill, is provided with a special holder which clamps it rigidly by circumferential pressure for its greatest length in production work. The bit has three cutting edges on each end ground on a helix, the similarity in design to a



The Bit of This Turning Tool and Holder Combination Has Three Cutting Lips at Each End to Achieve the Efficiency of the Outer Edges of a Twist Drill

twist drill being for the purpose of achieving the efficiency of the outer cutting edges of that tool. The regular length of the bit is 2 in., and because of its double three-lip design a cutting-edge length of 6¾ in. is effected.

HAMMOCK BED CAN BE FOLDED INTO SIZE OF A GOLF BAG

A folding bed has been patented in England that, it is claimed, can be packed up so that it is no larger than a golf bag. It is, moreover, convertible into a portable stretcher bed by the application of a pair of detachable wheels, and has supporting rods for carrying a completely inclosing canopy for sleeping out of doors, or as a mosquito curtain. It is built of strong steel tubing, rendered rust-proof with a coating of aluminum, and calculated to carry a weight of 350 lb. on

Below: The Hammock Bed with Its Removable Wheels in Place being Used as a Portable Stretcher. Above: The Hammock, Arranged for Sleeping Out of Doors, with Its Inclosing Canopy

the hammock, which is made of rot-proof canvas of ample strength.

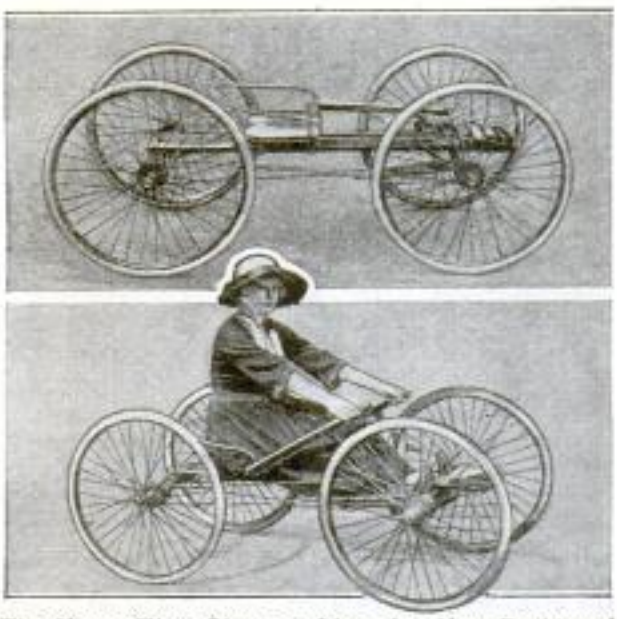
SMALL DYNAMO FURNISHES POWER TO CYCLE LAMP

Further use of the generator as a source of power for small electric lights, is its application to a bicycle lamp of German invention. The reflector and bulb unit is attached to the bicycle frame at a convenient point to throw light on the route of the cycle and is connected to the generator by wiring. The armature of the generator is driven by a friction-wheel that presses against the tire of the front wheel of the bicycle, furnishing current for illumination of the light bulb.

¶Recent tests made with ball-bearing army vehicles by the Swedish government has disclosed the fact that steel balls substituted for plain bushings effect a tractive-resistance reduction of 30 per cent with a possible proportionate lessening of horsepower required.

NEW VELOCIPEDE APPEARS ON STREETS OF PARIS

A hand-propelled, four-wheeled scooter is the latest Parisian method of street travel. It is driven by an oar-action de-



The Upper View Gives an Idea of a New Buckboard Scooter Now Frequently Seen in Paris. Below, the Young Lady is Demonstrating the Oar Action Which Drives the Wheels

vice in which a cable attached to a hand lever passes around a pulley and terminates in a stationary fastening at the rear axle. To the cable block is secured a second cable which makes a half turn around a loose pulley on the front axle and continues back to a pulley driving the rear wheel, passing over and around it, and ending in a coil-tension spring at the front shaft. The scooter is steered with the feet, and is equipped with pneumatic rubber tires.

CARELESS MOTORISTS WARNED BY CARDS THROUGH MAIL

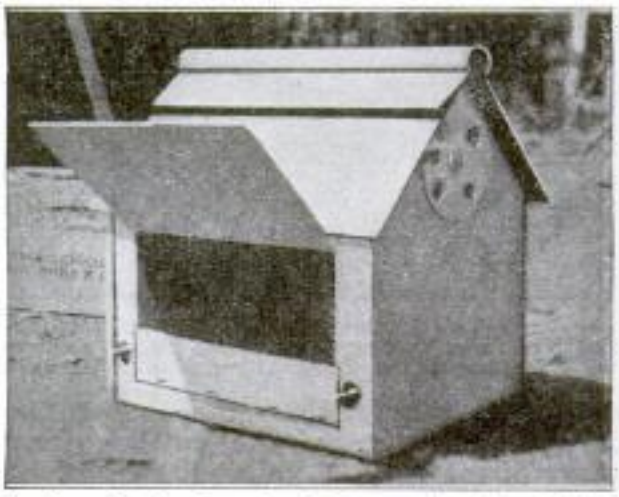
Because of the great increase in railroad-crossing accidents this year, the Pennsylvania Railroad is taking special preventive measures through its safety-first department. At each road and rail intersection, an observer is stationed for the purpose of taking the number of any automobile whose driver persists in taking chances by failing to slow down. A few days later the owner of the car receives through the mail a warning in the form of a card bearing the statement that he has been under observation, and having on the reverse side a photograph showing the result of careless driving in a particular instance in which one person was killed and four others badly crippled.

EIGHT THOUSAND MILES COVERED IN CANOE

Completing what is probably the longest continuous canoe voyage ever made, William A. Good, of Harrisburg, Pa., recently arrived at the Knickerbocker Canoe Club, New York, having followed an 8,000-mile river-and-ocean route from Chicago. Starting from Chicago, Oct. 11, 1919, Good paddled down the Mississippi River in a 17-ft. canoe to the Gulf of Mexico, and thence around the coast of Florida along the Atlantic coast to New York, the entire trip having occupied a period of one year eight months.

INDIVIDUAL BROOD COOP IS LATEST FOR CHICKS

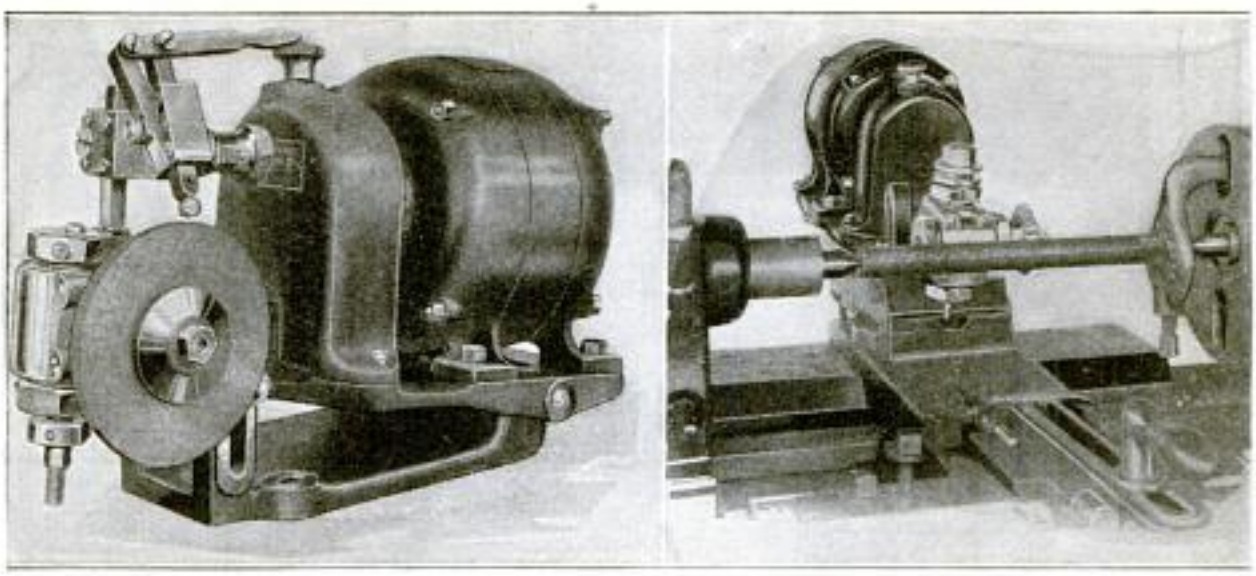
Another new and practical device for the upkeep and care of poultry, is the individual brood coop. Having a hinged sheet-metal flap to cover its carefully screened door, the coop is a veritable paradise for the hen and her flock of chicks. Ventilation is maintained through small holes directly under the roof on the coop ends. These are closed by the turning of a disk, much as a spice box is



A Sheet-Metal Coop for Poultry: A Hinged Flap Covers the Front Screening. Holes Directly under the Ends of the Roof Insure Proper Ventilation

closed. These holes together with the open screened end provide abundant air without dangerous drafts.

¶Burning holes by means of an oxy-acetylene torch starting from the bottom side instead of the top, is the new method of boring through concrete. Six holes per hour can be put through 12-in. concrete in this manner, it is claimed. This forms cone-shaped apertures, 6 in. in diameter at the bottom and 1 in. at the top.



Left: Close-Up of a New Thread-Milling Attachment for Lathes, Which is Bolted to the Tool Block. It is Electrical-Motor Driven, and Swings through a Limited Vertical Arc for Adjustment to Various Center Distances. A Carborundum Wheel Provides for Both Internal and External Grinding. Right: Demonstrating a Set-Up for Thread Milling

UNIVERSAL THREAD-MILLING ATTACHMENT FOR LATHES

A lathe attachment, bolting on the cross-slide tool block and designed primarily for thread milling and grinding, is adaptable also for cutting gears and ratchets, splining shafts, and for grinding both internal and external surfaces. It will mill, flute, and grind a tap at one setting. A unit consisting of a small electric motor and gear housing is mounted on a leaf, which swivels through a limited vertical arc for adjustment to different heights. The head containing the cutter spindle may be accurately indexed through 360°. All bearings and gears are inclosed in oil housings, and the spindles run in adjustable bronze and ball-thrust bearings. A diamond truing device dresses the grinding wheel to any desired angle.

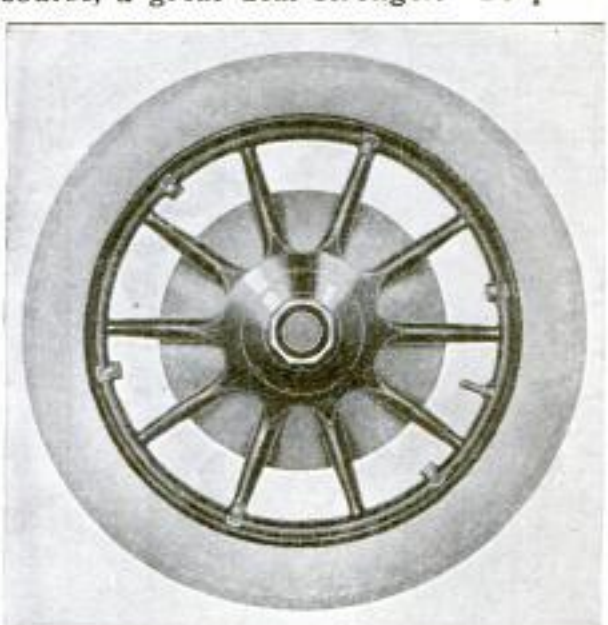
COURTHOUSE TO BE PROVIDED WITH ROOMS FOR JURY WOMEN

Rooms specially for the accommodation of jury women are being built in the courthouse at Lewiston, Pa. Locally the women have expressed much appreciation of this consideration of their comfort and privacy, and, in future, no doubt, there will be little trouble in getting women there to serve on juries.

¶On the historic site of the old Fort Dearborn blockhouse, and adjacent to Chicago's most notable civic work in the form of the Michigan Avenue viaduct, there is to be erected a 21-story office building, at a cost of about $4,000,000, covering an area of 13,000 square feet.

ALL-STEEL ONE-PIECE WHEEL MADE BY DROP FORGING

The making of lightweight, boltless, one-piece, all-steel wheels by the drop-forging process is now a reality, thanks to the ingenuity of a Michigan inventor. Designed especially for use on motor vehicles, the rims, spokes, hubs, and brake drums are forged integrally, so that no bolts or rivets are required to hold them together. It is claimed that they are as light as the conventional wooden wheels and, of course, a great deal stronger. To prove



A Few Blows of the Drop-Forge Hammer Form the One-Piece, Boltless, Steel Wheel from a Thick Plate of Solid Metal

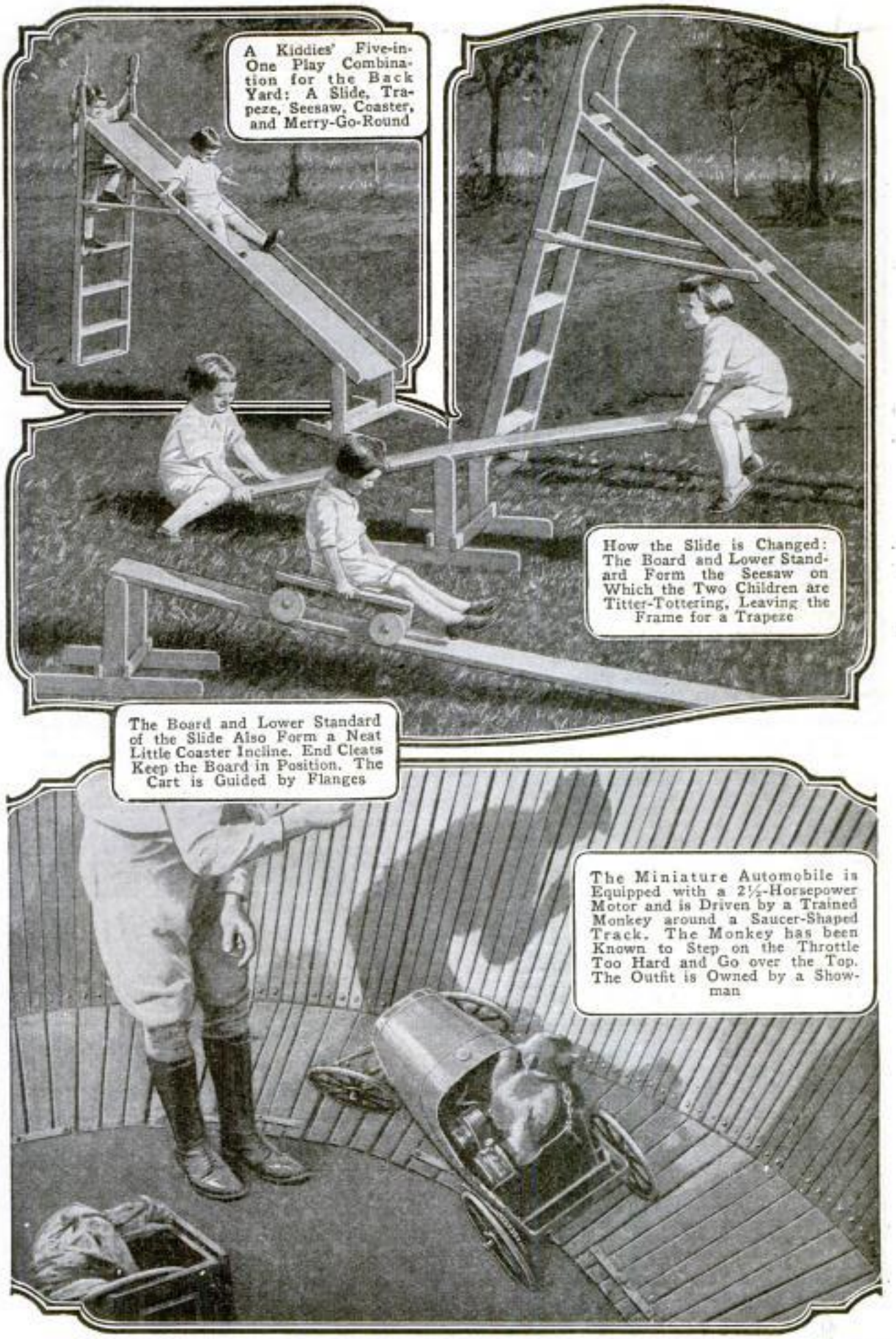
the latter claim, they have been repeatedly "skidded" against curbs at varying speeds without showing evidences of springing.

The Cat Climbing up the Ladder Is a Great Pet with the Sailors of the U. S. "Mississippi." "Cleanface" Is His Name and He Retires at Night to His Own Hammock

"Bing," a Fox-Terrier Army Mascot, is Shown Here with His **Master, Sergeant A. G. Shoemaker, Ready to Leap from the Wing** of an Airplane. He Recently Made a 1,000-Foot Parachute Jump at Chanute Field, Illinois, and Delivered a Message to Headquarters

Toy Novelties of Straw and Weeds Made by the Indians Are in Great Favor with Mexican Children. The Horse and Rider Here Displayed are Woven of Straw and Stuffed with Grass

Bathtub Dollies That Float Around in the Water While the Child is being Bathed Are a Great Delight to Smaller Children. The Playthings are Made of Medicated Rubber and are Clothed in Bright-Colored Detachable Dresses



A Kiddies' Five-in-One Play Combination for the Back Yard: A Slide, Trapeze, Seesaw, Coaster, and Merry-Go-Round

How the Slide is Changed: The Board and Lower Standard Form the Seesaw on Which the Two Children are Titter-Tottering, Leaving the Frame for a Trapeze

The Board and Lower Standard of the Slide Also Form a Neat Little Coaster Incline. End Cleats Keep the Board in Position. The Cart is Guided by Flanges

The Miniature Automobile is Equipped with a 2½-Horsepower Motor and is Driven by a Trained Monkey around a Saucer-Shaped Track. The Monkey has been Known to Step on the Throttle Too Hard and Go over the Top. The Outfit is Owned by a Showman

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

By C. A. BRIGGS

INSECTS APPEAR TO BE CHEMICAL MACHINES

Insects are nothing more nor less than chemical machines, and the law that governs the effect of temperature on their activity is precisely the same as that which controls the speed of reactions in a test tube. This is indicated in experiments made on ants by Dr. Harlow Shapley, of the Mt. Wilson Observatory.

In California there is a variety of "patrolling" ants whose habits render them especially good subjects for study. It is their custom to establish regular trails which they patrol in rather regular fashion by groups, whose object appears to be a sort of inspection carried out by traveling along these well-established paths. Observations were made on the speed with which they moved along these trails under all conditions of weather, temperature, humidity, sunlight, wind, etc., which might be imagined to affect the speed. After collecting and studying the data, it appears that temperature is the controlling factor, the other things being of little importance. These ants are active night and day, and both in hot weather and very cool weather. The patrols operate when the temperature is as low as 46° F., and the effect of temperature is very marked, the speed increasing fifteenfold with an increase of 72°. The response of the ants is very exact, as it is possible to determine the temperature to within less than 2° by measuring the speed of a single ant. On plotting the speed observed for the patrolling ants against the corresponding temperature, it was found that the relation was given by a curved line which turned out to be the same as that which gives the relation between the temperature and the velocity with which chemical reactions take place. Thus, it appears that the activity of ants is determined by temperature in the same manner as are chemical changes taking place in nonliving matter.

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SURVEY MARKS DESTROYED BY TREASURE HUNTERS

In the past, the United States Coast and Geodetic Survey lost many of its monuments and station marks through the acts of seekers after buried treasure. It was then the custom to try as effective a concealment as possible of the marks made to establish and identify the stations. Now and then these would be discovered by someone who, on seeing the cross marks and a few cabalistic signs, would conclude that a treasure lay beneath. The result was that in the middle of the night, with occasionally a companion sworn to secrecy, he would feverishly dig up the marker and excavate prodigiously, convinced that a chest of gold would be found below.

There is scarcely a section of the country but has its legend of buried treasure. In certain parts of Texas every cañon and hill has a story of treasure hastily buried by monks or other travelers when attacked by Indians, and which was never recovered. In this section of the country the "mortality" of markers was especially high. A number of survey marks in the South were lost in the Civil War, being dug up by Union soldiers who seemed to think that the coast was girdled like a necklace with Captain Kidd's buried treasure.

As a result, the practice is now to mark very plainly, and in as conspicuous a manner as practical, the stations, taking pains to tell in clear language just what purpose the marker serves.

*

SOFT STEEL IS AS STIFF AS TEMPERED STEEL

Highly tempered steel is no stiffer than soft steel; it will just carry a greater load before it gives way. This statement will seem strange to many readers, but it is an established fact. For instance, if two bars of steel 10 in. long are taken, one of highly tempered steel and the other of soft steel, each having a cross section of 1 sq. in., it will be found that for each pound weight hung from the lower end, the bars will stretch .000,003 in. The soft steel does not stretch any more than the other.

After several thousand pounds have been added, however, a difference will develop; it will be found that when the load is removed, the soft steel does not return so precisely to its original length as the tempered steel. If the load is increased still more this difference becomes greater, and when a load of 40,000 lb. is reached, the soft steel will start to stretch rapidly and be permanently deformed. If the load is increased to about 65,000 lb., the bar will break. The same thing occurs with the tempered steel, but for very much greater loads. For the strongest of modern alloy steels, the bar may not indicate much of permanent elongation until a load of 215,000 lb. is reached, and it may not break until a pull of 240,000 lb. is exceeded.

The hardness of steel, the ability of one kind to cut another, does not come from the fact that the one is stiffer than the other. Hardness and cutting power do not depend on the elasticity but upon the yield point and the ultimate strength. None of the properties ordinarily associated with steel, and which distinguish one kind from another, as tempered from annealed steel, is materially influenced by the elastic properties that come into play with stresses of but a few thousand pounds per square inch.

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UNKNOWN MOSQUITO CAUSES TROUBLE IN ALASKA

In portions of Alaska thousands of mosquitoes put in an appearance at a certain time of the year, and it is necessary to take extreme measures to obtain protection from their bites. In spite of this well-known fact, the particular mosquito which proves so obnoxious has not been satisfactorily identified. The specimens obtained so far were all females, and in order to settle many points it will be necessary to secure males. Also, the specimens sent from Alaska have not been very well preserved and are not as suitable for study as is desired. The best specimen secured so far is one that was trapped by accident between the lenses of a camera when it was taken apart for cleaning. In a scientific trip to be made to Alaska this summer, it is expected among other things to determine the exact kind of mosquito there.

*

PECULIAR RELATION BETWEEN WIND DIRECTION AND OCEAN CURRENTS THAT THEY SET UP

The currents produced by the wind acting upon the surface of the sea are not in line with the wind but are at an angle to it—in a direction forward to the right. This fact has been determined from studies made by the U. S. Coast and Geodetic Survey of the waters off our coasts. These results are in accord with an imperfect theory that also indicates that in the southern hemisphere the deflection of the current would be to the left of the action of the wind.

Similarly to the effect of the wind, the upper currents of the water act upon the layers below, and the lower current thus set up is inclined to the right as compared with the movement of the water above. In this manner the currents in the ocean set up by the wind will vary in direction according to depth. The studies now being made will help solve the riddle of the ocean currents, a matter which has puzzled men for hundreds of years.

*

STARS APPEAR AS POINTS OF LIGHT IN THE LARGEST TELESCOPES

Most people are disappointed when they get their first view through a large telescope. They expect to see the stars showing up as objects of sensible size, but as a matter of fact the larger and better the instrument the smaller and brighter do the stars appear. The planets can be seen as small disks, but these do not impress the novice by their size. The best appreciation of the advantages of a large telescope can be obtained by looking through a series of three or four of them of progressively greater power. In this case, the successive spreading out of the stars and the appearance of new ones give the observer an insight and appreciation of what large instruments really mean.

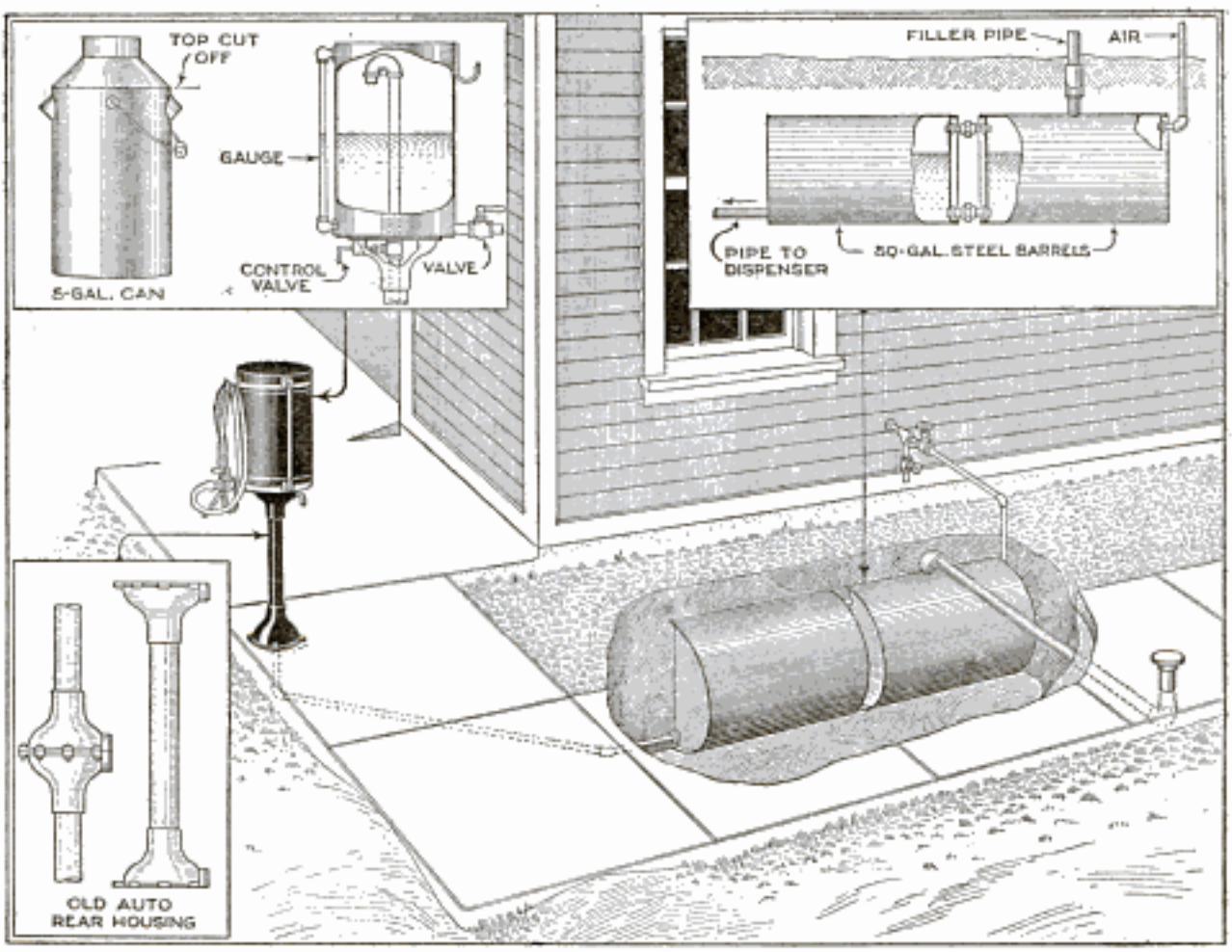
Pneumatic Gasoline-Measuring and Storage System

BY RALPH ODIORNE

A TEXAS garage proprietor, selling gasoline and supplies to motorists, like all of his tribe, felt the necessity for some sort of measuring and dispensing system. He considered, however, that his purse would not stand the strain of buying one of the numerous outfits on the market. Having both time and ingenuity, he built, and has for some years used with satisfaction, the plant described and illustrated, with no repairs save a new hose and gauge glass.

He began by digging a hole in the ground, about 6 ft. deep, and, instead of a regulation storage tank, used two steel oil drums connected together as shown, extending a pipe to the curb for filling. It might be mentioned that, before imitating this method, local ordinances regarding the storage of gasoline should be referred to in order to guard against their violation, should storage tanks of some particular specification be required. A line from the garage air compressor was connected to one barrel at the top, and a 2-in. pipe was run from the bottom of the opposite barrel to the dispenser.

The dispenser consists of a standard, made from the ends of the rear-axle housing of a light automobile, riveted to a



A Gasoline-Storage and Dispensing Outfit for Garages and Filling Stations, Built from Easily Obtained Materials at Insignificant Expense, Adds to the Convenience of Dispensing Motor Fuel and Greatly Reduces the Losses from Waste

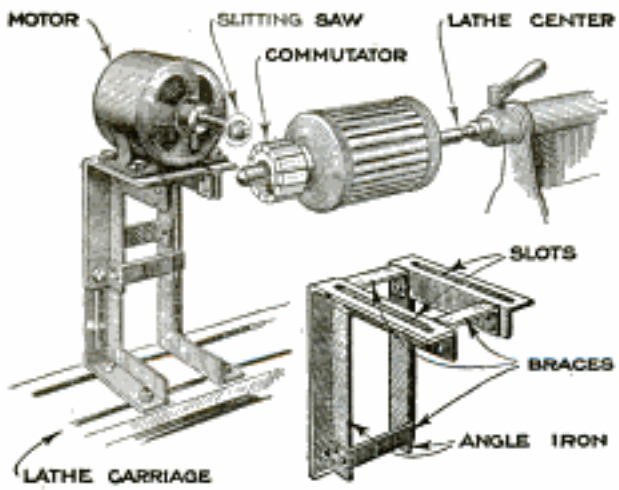
suitable piece of pipe and bolted to the pavement. A heavy 5-gal. oilcan was used for the dispensing tank, being converted to the purpose by removing the top and handles, the open end being closed by soldering a disk of sheet metal over it. The open top of the can was not closed until after the curved inlet pipe and gauge fittings had been attached and tested for leaks. The flow of gasoline into the reservoir is governed by the control valve.

The gauge glass is marked to indicate the quantity of gasoline in the dispenser. When the proper level has been reached, the outlet valve is opened and the fluid run into the tank of the car.

It should be noted that air pressure from the garage free-air supply is used, and that this pressure must be maintained in the storage tanks at all times. The dispenser should be tight and free from leaks, as otherwise the outfit will not operate to its full efficiency. Some form of separator should be installed in the air line between the compressor and storage tanks to prevent the condensed water inside the air line from entering the motor fuel and causing trouble.

Commutators Slotted in the Lathe

Where much repair work is done on direct-current electric motors some rapid means of slotting the commutators is a necessity, and the method illustrated was developed to meet the requirements of a traction company.



A Method Used by an Electric Company to Slot the Armature Commutators of Its Direct-Current Motors, with a Minimum of Time and Labor

A shunt motor from an old air compressor was fitted with a slitting saw, 1⅛ in. in diameter, mounted on the armature shaft. The motor was fastened to an adjustable angle-iron stand, made as indicated, so that the motor can be adjusted both horizontally and vertically, the whole arrangement being bolted to the lathe carriage.

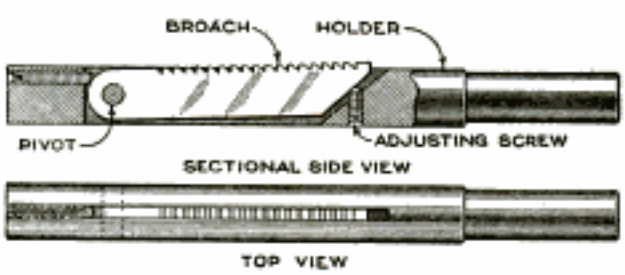
In use, a dog was clamped to the pinion end of the armature shaft, the commutator of which was to be slotted, and suspended between the lathe centers. The dog lug was clamped firmly in the chuck so as to eliminate play, and the lathe put into back gear to keep the armature from rotating from the side thrust of the saw. The saw was centered and the motor adjusted so that the depth of cut would be about 1/16 in., whereupon the motor was started. By pulling the lathe belt by hand, a mica strip in the commutator was brought into line with the saw, the carriage was then fed across until the slot was completed, then backed out.

After slotting, it is necessary to inspect the slots to make sure that no bars are shorted by burrs or copper dust, as this would mean "roasted" coils when the armature is put into service. If alcohol, applied with a little waste, is used, this inspection will be made much easier, since the bright copper is dulled and the mica darkened in color by this application.—Edwin M. Love, Alhambra, Calif.

An Adjustable Keyway Broach

A novel broach, that can be adjusted to make cuts of varying depth, from a thin shaving to the full depth of the slot, is particularly designed for use in broaching keyways.

A slot with an angular end, to take the broach, is cut in the holder, and a hole is drilled and tapped, as shown, to take a grub screw, having a pointed end, for regulating the height of the broach; the opposite end of the broach is pivoted inside the slot. After the adjustment of the broach is made by turning the adjusting screw, a screw in the forward end is tightened against the broach to hold it in place. By making the holder as shown, the tool can be used in the drill-press spindle.—Harry Moore, Montreal, Que.



An Adjustable Broach for Keyways: It can be Used in the Drill Press

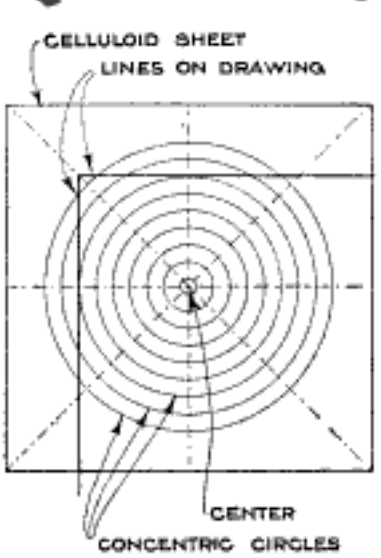
Rewinding Flat Tape

The cardboard ends of several spools of flat wrapping tape were broken off in storage, and the tape, thus loosened, became badly tangled. An effort to rewind it upon another spool resulted in more tangles and twists, and it looked as though the tape would have to be scrapped.

By removing the guard and blades from an electric fan, placing one end of a new spool on the armature shaft of the fan and supporting the opposite end with a pencil, all the tape was wound without twists or snarls in a short time. One man controlled the speed of the fan and held the pencil, and another guided the tape as the spool revolved. Rubber bands, wrapped about the end of the armature shaft, formed an effective friction "clutch."

Radius Finder for Draftsmen

Very often, when working on a plan, it is necessary to locate centers for fillets and other curves when only tangent lines are given, and to get the proper compass adjustment for drawing them in takes considerable time.

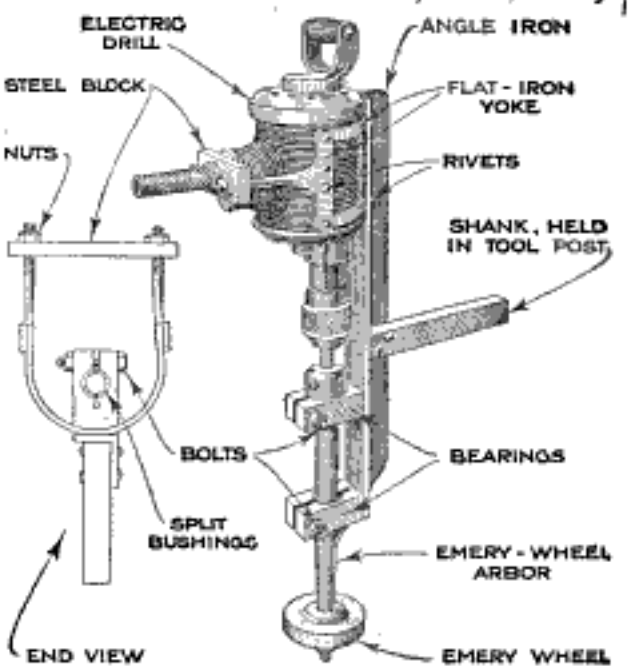


The drawing shows a center finder that will be of material help to the draftsman on such work. It is made from a sheet of transparent celluloid, on which a number of concentric circles, up to about 4 in. in diameter, are inked, a small hole being punched at the center point; diagonal and center lines are also provided.

In use, the celluloid sheet is laid over the drawing and adjusted so that the two lines of the drawing to be joined with a curve become tangent to some one circle of the template sheet, meeting, of course, a curve of the required radius. Make a mark through the center hole with a sharp pencil, or prick with a needle point. On large machine-detail work much time can be saved by locating fillets and other curves with a finder of this type.

Center Grinder Made from Drill

By using a simple fixture made from a few odds and ends of metal, an ordinary portable electric drill can be fitted with a grinding wheel and used to grind the centers of a lathe as well as for other kinds of external grinding.



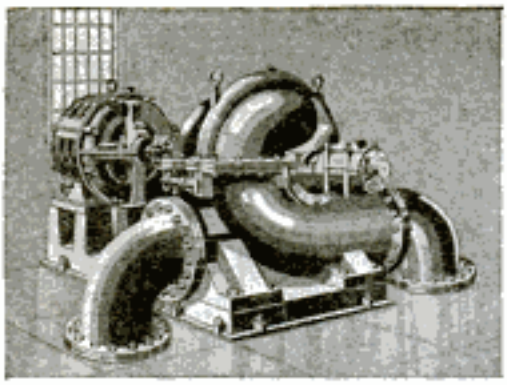
An Arrangement by Means of Which an Ordinary Portable Electric Drill can be Conveniently Used to Grind Lathe Centers as Well as for Many Other Kinds of External Grinding

A square shank to hold the device in the lathe toolpost is fastened at right angles to the strip of angle iron forming the foundation. Also, the U-shaped clamp or yoke that holds the drill rigid is bolted or riveted to the angle iron. A pair of suitable bearings are provided to support the grinding-wheel arbor, and these are fastened to the angle iron with machine screws. One end of the arbor is shouldered, to bear against the lower bearing, while the other end is turned down to fit in the drill chuck, a collar, pinned to the shaft, being provided at this end.—Wm. Madison, Oshkosh, Wis.

Bearing Scrapers from Piston Rings

In most automobile-repair shops, bearing scrapers are abused by being placed with other tools where the scraping surface is soon scratched or chattered, and if not properly sharpened, which is by no means a simple trick, and protected, they become dull and unsatisfactory.

The most perfect tool for scraping a bearing, and one that will do the work quickly, easily, and correctly, is an old piston ring. The whole ring may be used, or it may be broken into halves.



PUMP TROUBLES

By A. P. Blackstead and G. R. Hardis

[In this, the last of a series of articles, the writers touch upon a few troubles which, although slight in themselves, often prove puzzling to inexperienced operators. A description of the method of testing a pump is appended, as many of the incidents recorded in the articles have happened during shop or field tests.—Editor.]

IT has been the intention in the preceding articles to warn interested readers against possible pitfalls in handling pumping equipment, by utilizing as illustrations a number of cases of trouble actually encountered in the writers' experience in this field. There is still available from the portfolio an abundance of notes on matters pertaining to the subject, which would furnish interesting and instructive reading to those concerned with topics of this nature. It may not be amiss to recite, without a great amount of detail, a few of the heretofore untouched incidents, some of which were really ridiculous or absurd.

That a pump expert traveled all the way from Philadelphia to Mexico, only to find that a Mexican operator was running a centrifugal pump in the wrong direction, may seem incredible, yet this actually occurred. The pump was of the two-stage type with circular casing (not volute shape), and, viewed from the end, the discharge nozzle was in center of the case, and pointing vertically upward. Unfortunately, the usual arrow, indicating the direction of rotation, and invariably made a part of or secured to the pump body, was not in evidence when the pump man reached the point of installation. The motor, an alternating-current machine, had been wired up, and the unit started, with apparently no attention whatever given to the direction of turning.

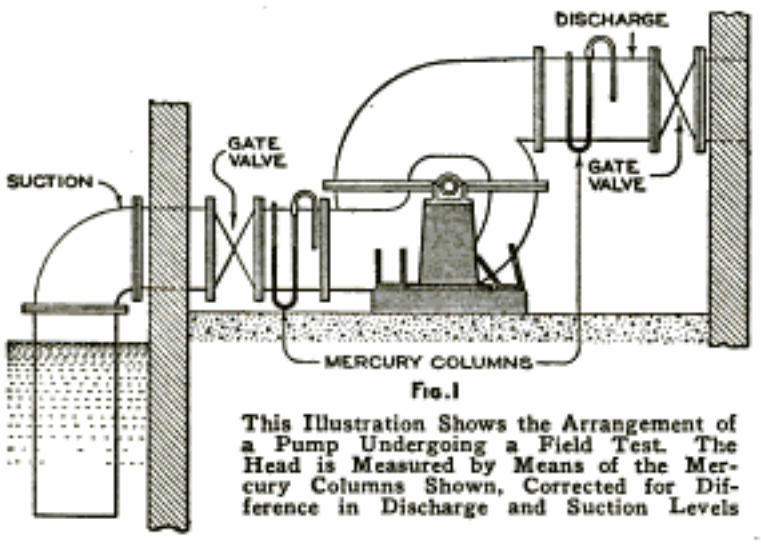


Fig. 1

This Illustration Shows the Arrangement of a Pump Undergoing a Field Test. The Head is Measured by Means of the Mercury Columns Shown, Corrected for Difference in Discharge and Suction Levels

Trouble developed immediately; the motor heated almost to the melting point, and the output was under the quantity specified. The purchaser appealed to the builder, and agreed to stand the expense of an engineer's trip to Mexico, provided the trouble was not due to a fault of the pump. A reversal of the wiring connected to the motor leads changed the direction of rotation and entirely relieved the situation—and the purchaser paid an expense bill nearly equal to the first cost of the pump.

A fault frequently encountered is the placing of the impeller backward on the shaft. This often happens in the field when an impeller is removed from the shaft and replaced by a new one. Ordinarily, a double-suction impeller can be used for either a right or left-hand pump, and unless the operator is quite familiar with the centrifugal pump, definite instructions for the placing of the impeller on the shaft, with reference to the direction of rotation, should be provided.

Two distinct cases are known, in municipal waterworks, where an apparent shortage in capacity nearly caused the rejection of the pumps or the imposition of a severe penalty. In both instances, the apparent deficiency was due to water being drawn from the discharge line between the pump and the Venturi meter used to ascertain the quantity pumped, although all minor outlets were declared to be closed. In one case, this discovery showed that one factory alone had been drawing water from the main at will, and without charge,

for a number of years. The quantity "poached" approximated 500,000 gal. daily. This disclosure, apart from gaining acceptance of the machinery for the pump man, revealed a precious secret, and was gratefully received by the city.

In numerous complaints pertaining to heating of thrust bearings, it has developed that the troubles have been due to the driving medium throwing additional thrust on the bearing, and when this condition occurs, it is generally found that electric motors are used for motive power. The usual remedy is to run the motor light, uncoupled from the pump, and let the rotor find its magnetic center; then the utilizing of a flexible coupling, properly alined from the observations taken, will generally remove the difficulty.

Quite ridiculous occurrences are uncovered occasionally; one being recalled where a shop mechanic, well versed in building pumps, was sent out with a helper to install new parts on an old 4-in. pump working under about 20-ft. total head. It was necessary to dismantle the old pump, fit the repair parts, and reassemble. On starting up after the changes were made, no water could be pumped, and before the trouble was discovered it was found necessary to dismantle again. The mechanic had instructed his helper to cut out and insert a new rubber gasket in the discharge-flange joint of the pump and piping, and the helper cut out the holes for the bolts—and left the center solid! The pump pressure was not great enough to break through the gasket, hence no water.

Another case, which nearly ended seriously, pertains to a direct-acting waterworks pumping engine, which took its suction from artesian wells and was seriously hampered by air carried into the pump with the water. It was decided, in order to remove the air, to connect a vacuum pump at a high point of the suction air chamber, as the air chamber was made with a 4-in. hole at the top, closed by a small cover. Another cover was made, with a 1-in. nipple and valve screwed into its center, and a shop mechanic with wide experience in pump building sent to exchange the air-chamber cover. The pump was running when the mechanic arrived, and for some reason, probably to save time, and not to interfere with the operation of the pumping plant, he decided he could change the covers quickly without shutting down the pump, despite the fact that high suction lift existed, and air troubles were already present. This nearly resulted in wrecking the pump, for the instant the air-chamber cover was removed the suction dropped, and with no resistance acting against the water plungers, and full steam pressure behind the pistons, the moving parts almost smashed through the cylinder heads.

A momentarily bewildering incident happened with a motor-driven pump on the shop test block. The design was such that the shaft did not pass through both ends of the pump, which had a closed

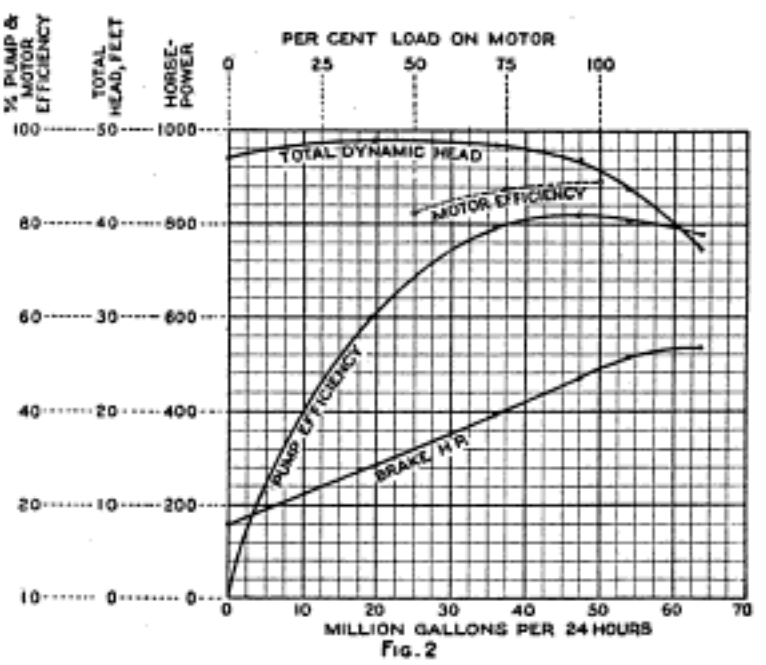


FIG. 2

This Chart Shows Graphically the Results of the Tests: Note That at Capacities of from 40 to 55 Million Gallons the Pump Efficiency Is over 80 per Cent

end at the outboard side, in order to dispense with the suction packing box, and the shaft extended only on the inboard side far enough to take the coupling. The unit was pumping smoothly when suddenly the discharge of water ceased; still the motor was running and the pump shaft rotating at about normal speed. Such a sudden occurrence was confusing, but an examination of the interior of the casing showed the shaft snapped off neatly, through a flaw in the metal just inside the journal box.

Inasmuch as many of the foregoing events have been disclosed during the preparations for testing, it may be well to pay some attention to this very interesting part of the pump business. Therefore, let us select a concrete example of an actual field test.

Arranged as shown in Fig. 1 is a 36-in.

motor-driven centrifugal pump installed in the municipal plant of an eastern city, and used for raising unfiltered water to the filter beds. The pump was designed to operate over a range of head to cover the range of capacity the city required, when operating in conjunction with other pumps. In order to test over this range, it was found necessary to throttle the 36-in. discharge gate valve, and readings were taken, besides, at wide-open and fully closed valve, at four intermediate points, as given in Table 1. Capacity was

VALVE OPENING, INCHES	MILL. GAL.	SUCT. LIFT FT. WATER	DISCH. HD. FT. WATER	GAUGE CORR. FT. WATER	TOTAL HD. FT. WATER	KW. INPUT	HP. INPUT
36	63.5	9.9	21.72	5.85	37.47	453.7	608.1
20	54.1	7.95	29.9	5.85	43.73	436.8	594.2
15	47.0	7.25	33.71	5.85	46.81	401.6	538.37
10	36.0	5.40	36.81	5.85	48.06	336.0	450.4
5	19.5	4.31	38.95	5.85	49.11	254.7	341.4
0	0.	3.88	37.28	5.85	47.01	140.8	188.7

TABLE 1

MOTOR EFF. PER CENT.	BRAKE HP.	WATER HP.	PUMP EFF. PER CENT
88.35	537.3	417.56	77.61
88.10	514.7	415.2	80.65
87.4	470.5	386.1	82.05
85.6	385.5	303.64	78.75
82.3	281.0	166.06	59.62

TABLE 2

MILL. GALLONS PER 24 HOURS	PER CENT PUMP EFF. GUARANTEED	PER CENT PUMP EFF. OBTAINED
54.0	77	80.7
46.1	80	82.0
33.1	75	76.8
	232	239.5
	AVERAGE 77.3	79.8
	EXCESS ABOVE GUARANTEE	2.5

TABLE 3

determined by means of the station Venturi-meter water manometer, which was carefully calibrated. The total head was measured by mercury U-columns attached to the suction and discharge nozzles as shown, with a correction added for the difference in the level of the suction and discharge columns. The power consumed by the unit was measured by a carefully calibrated portable wattmeter, and the motor efficiencies used to determine the power consumed by the pump were obtained from data furnished by the motor builder. The observations made are as shown in Table 1.

The results calculated therefrom are as given in Table 2; the data from the two tables being used to plot the curves shown in Fig. 2. By plotting the curves and reading off the values at the points guaranteed, we arrive at the comparison of guarantee and results shown in Table 3. From the curve it can be seen that over a capacity range of from 40 to 55,000,000 gal. per 24 hours, the pump shows an efficiency of over 80 per cent, which is to be looked for with pumps of this size and of proper design.

The total head is obtained by adding the height of the mercury in the suction column to that of the discharge column in inches, and multiplying by coefficient 1.13, which will give the equivalent height in feet of water; then adding to this value the correction for gauge levels. Brake horsepower is the product of horsepower input and motor efficiency taken from curve, and is designated as B.H.P.

Water horsepower (W.H.P.) is obtained from the following formula:

$$\text{W.H.P.} = \frac{\text{Gal. water per min.} \times 8.33 \times \text{total head in feet}}{33{,}000},$$

in which 8.33 is the weight in pounds of one gallon of water, and then the pump efficiency is the ratio between B.H.P. and W.H.P., or $= \frac{\text{W.H.P.}}{\text{B.H.P.}}$

In concluding these articles, it is the writers' desire to state that the intention of these papers is to familiarize the readers with troublesome situations incident to the operation of pumping machinery, and particularly pertaining to centrifugal pumps, which have rapidly replaced, in many branches of pumping service, the plunger-type steam pump. It is a certainty that centrifugal pumps are here to stay, which is evidenced by the progress made in the past decade. Hence it is advisable for all owners, and others interested, to pay some attention to the peculiarities of this type of equipment, and accordingly it is trusted that the information contained herein will prove of benefit in the solving of perplexing problems.

Mixing Concrete

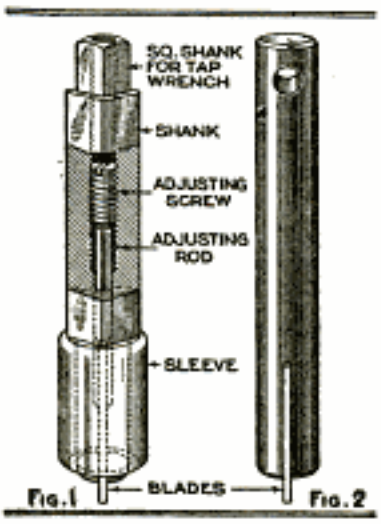
In tests carried out by the Bureau of Standards, it has been found that the workability of concrete, as measured on the flow table, increases with the time of mixing. The quantity of water beeing kept constant, the change is particularly apparent between 30 seconds and one minute, not changing much thereafter.

It is possible, for instance, to obtain the same ease of working by mixing for one minute with a given amount of water, as by mixing one-half minute with 25 per cent more water. This information should prove of value to contractors in locations where water is at a premium.

¶A good paste filler, for use on hardwood floors, may be made of 2 lb. cornstarch and 2 lb. best gilders' whiting. Thin with equal parts of turpentine, japan, and raw linseed oil, and tint to suit the desired floor finish.

Screwdrivers for Heavy Service

When inserting large screws or trying to remove tight ones, it is customary to apply a monkey or pipe wrench to the screwdriver shank, which commonly results in bending or breaking the blade without materially altering the position of the screw. The drawing shows two types of all-steel screwdrivers with inserted adjustable and renewable blades for heavy service. In Fig. 1 the shank is made of square cold-rolled stock, and an alternative design, suitable for lighter work, is shown in Fig. 2, that is made from round stock and used with a rod handle.

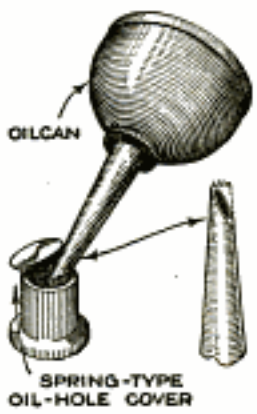


One end of the square bar used to make the type illustrated by Fig. 1 is turned down to a diameter equal to the width across the flats, and is slotted to take the blade. A steel sleeve, made a light driving fit over the cylindrical portion, prevents horizontal movement of the blade. The upper end may be squared off so that the device can be held in a tap wrench, or drilled for a rod handle. A hole is drilled through the center of the stock from the upper end, for about half its length, and this is tapped for the adjusting screw; a smaller hole is drilled through the stock the remainder of the distance, and a piece of drill rod is inserted. This rod, when forced in by the adjusting screw, will push the blade farther out to adjust for different screw heads or in case of blade breakage.

Ordinarily, only enough of the blade projects to fit into the screw head. This blade cannot bend, and if broken, another is quickly adjusted. A flat blade of this kind will grip the screw head much better and with less slippage than the ordinary tapered blade. The square shank permits the application of either a monkey wrench or an end wrench; it may be held in a four-jawed lathe chuck while the work is brought up by a drill pad on the tailstock, and fed in by the tailstock screw to give pressure on the screwdriver blade.—H. H. Parker, Oakland, Calif.

Oilcan for Spring-Cap Oilers

Many of the spring-cap oilers on the automobile chassis are in positions somewhat difficult of access, and in lifting the cap with one hand while using the oilcan with the other, the sleeves are apt to receive a coating of grease or oil. A simple kink to prevent this trouble consists in beveling the spout of the oilcan, as shown. The beveled lip permits the cap to be raised and the oil applied while holding the can in one hand.—G. A. Luers, Washington, D. C.

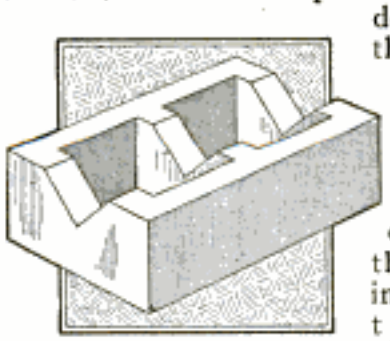


Making Dowel Holes in Patterns

When making parted patterns, it often occurs that one cannot bore through one piece into the other to set the dowel pins. A quick and easy way to locate the points at which to drill the holes is to gauge a fairly heavy line on the pieces, and lay two small brads in these lines. Then place the pieces one upon the other and press them firmly together or strike a blow with the hammer. The heads of the brads will mark the spots where the holes should be drilled.—Elmer J. Miller, Cincinnati, Ohio.

An Improved V-Block

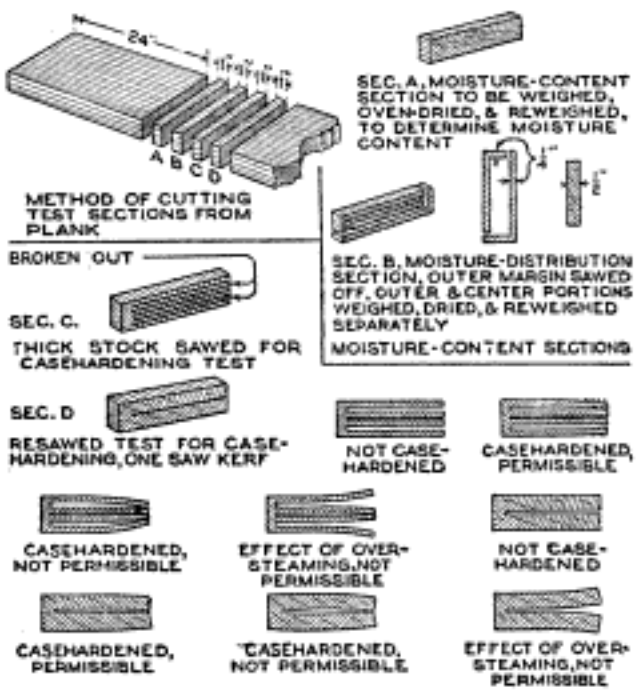
A V-block, very useful when drilling holes in round stock, is shown in the illustration. The usual practice, where it is desired to keep the faces of the "V" free from drill marks, is to clamp the work upon two blocks, drilling between them. By making cast blocks of the design shown, the necessity of using two blocks is eliminated, as the recesses provide plenty of clearance below the work if the drill is fed down a little too far. For drilling short pieces especially, this type of block will be found very useful.—A. C. Cole, Chicago, Ill.



Testing Kiln-Dried Lumber

Two things that a dry-kiln operator must be able to prove at the end of a run are, that his lumber is as dry as required, and that it is free from invisible seasoning stresses that would cause warping when the wood is resawed and shaped into furniture or other products. Neither of these points can be proved by examination of the outside of the lumber. They are, however, easily determined by the following test, devised by the U. S. Forest Products Laboratory:

Before the lumber is removed from the kiln, choose a fairly representative board from each truck load of stock. Cut four 1-in. cross sections, A, B, C, and D, from the board at least 2 ft. from the end.



CASEHARDENING-TEST SECTIONS

A Method of Definitely Ascertaining Whether a Charge of Lumber has been Properly Kiln-Dried, Showing in Detail Just How the Sections are Cut for the Various Tests

Use section A to find the average moisture content of the dried stock. To do this, weigh the section immediately after cutting, on a balance accurate to .1 per cent, and then dry it on a steam pipe or in an oven at 212° F. until it reaches constant weight. The weight lost during this drying is the weight of the moisture that was present in the section. Divide the weight of the moisture by the weight of the oven-dried section and multiply by 100. This will give the percentage of moisture in the section and also in the stock in that part of the kiln from which the sample was taken.

For furniture manufacture and other high-grade uses, the moisture content of any board in the kiln should not vary by more than two or three per cent from the final moisture content specified.

Section B is used to find whether the stock is uniformly dry from center to outside. In order to do this, the section must be cut apart and the moisture content of the inside and the outside found separately. If the stock is 1½ in. or more in thickness, cut the section parallel with its edges to get an outer shell of material ¼ in. thick. Trim the remaining block equally on all four sides to leave a core ½ in. thick. If the stock is less than 1½ in. thick, cut section B so as to get an outer shell and inner core each one-fifth the total thickness of the section. Find the moisture content of each piece by the method used for finding the moisture content of section A.

The moisture content of the inside and outside of the stock should be equalized, by steaming if necessary, to within two per cent, before the lumber leaves the kiln.

The third and fourth sections, C and D, are for casehardening and steaming-treatment tests. Saw section C parallel with the wide faces of the original board to form tongues or prongs, leaving about ½ in. of solid wood at the end of the section. If the stock is less than 2 in. thick, make two saw cuts; if it is more than 2 in. thick, make five saw cuts. From sections having six prongs break out the second prong from each side, leaving the two outer and two central prongs. From sections having only three prongs remove the center one. In section D, saw one central saw kerf to form two prongs. Stand the sections on end in some convenient place in the shop to dry.

Observe carefully the action of the prongs from the moment of sawing. Do they bow in or out or remain straight on the saw? Do they change shape after room-drying?

If the prongs remain straight, both on the saw and after room-drying, the lumber is perfectly seasoned, being free from stresses and uniformly dry throughout.

If the prongs remain straight on the saw, but turn in after room-drying, the moisture distribution is uneven, the surface being drier than the inside. A short steaming treatment to balance the moisture content should relieve all stresses.

If the prongs turn in on the saw and do not turn out after room-drying, the lumber is "casehardened," and is drier outside than inside. Use a steaming or high-humidity treatment to moisten and soften the surface.

Copperplating Nonmetallic Articles

Many nonmetallic and perishable articles may be preserved by a simple copperplating process; flowers, leaves, insects, leather and wood objects, and the like, may be metallized and fashioned into striking jewelry and other novelties.

The article to be treated is first given a coat of thin shellac; if the object is very fragile, such as a flower, the shellac should be sprayed on. An atomizer may be used if the shellac has been well thinned with alcohol. The article is allowed to dry hard, and precaution must be taken that the desired shape will be maintained while drying.

A second coating of shellac or electrotypers' varnish is necessary. The latter is much to be preferred, and can usually be bought locally. When this last coating is almost dry, cover the surface with powdered graphite. Using a soft camel's-hair brush, smooth the powder over every portion of the article, for it is upon this graphite surface that the copper will be deposited and any part not so covered will not be plated.

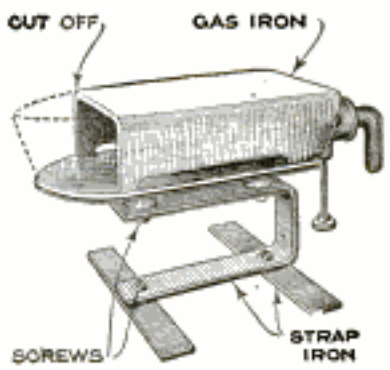
Obtain a glass, or earthenware, jar of sufficient size to hold the article during the plating process. Prepare an acid copper solution in the following proportion, by weight: water, 100 parts, copper sulphate, 5 parts, and sulphuric acid, 1 part.

Working carefully, so as to prevent breaking or damaging the graphite-covered surface, attach a fine copper wire to the article and suspend it in the plating solution. Connect this wire to the negative terminal of a battery. A sheet of copper connected to the positive terminal of the battery is also suspended in the solution, bringing it as close as possible to the article being plated without actually touching it. For small work a single dry cell will be sufficient.

It will soon be noticed that fine lines of red metal will appear on the surface of the article, radiating from the connecting wire. Gradually a copper network will be built up until the entire graphite-coated surface is covered. The thickness of the metallic coating will depend upon the length of time the article is permitted to remain in the plating bath and the strength of the current. Experience will probably show that a strong current is not desirable, as it makes the deposit rough and granular. A small rheostat may be used to vary the current as required to gain the desired results.—Kenneth Coggeshall, Webster Groves, Mo.

Gas Iron Used for Tinners' Furnace

A serviceable heater for soldering coppers can be made from an old gas iron, such as can usually be picked up at most junk shops for a few cents.



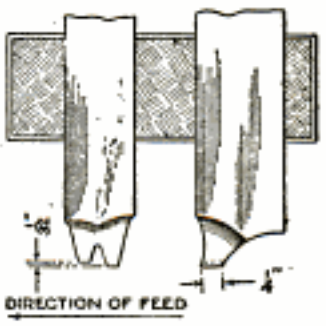
With a hacksaw, cut off 1 or 2 in. from the pointed end, the amount depending upon the size of the iron; remove the handle, and substitute a U-shaped support made of strap iron, drilled to take the screws of the old handle and with suitable holes for attachment to the bench. The soldering coppers are inserted through the open end and the flat top makes a convenient stove for heating a glue pot, or coffee for lunch.—J. Splan Dwyer, Buffalo, N. Y.

Barbed Wire as Concrete Reinforcing

Barbed wire should not be used as reinforcing for concrete. It is difficult to handle and keep in position while the concrete is being placed, and it lacks the qualities that reinforcing steel should have for best results.

Checkering Flat Surfaces

When checkering toolholders, or on similar work, while the spacing of the cuts is not held to extreme accuracy, it must be reasonably uniform, to make the job look neat.

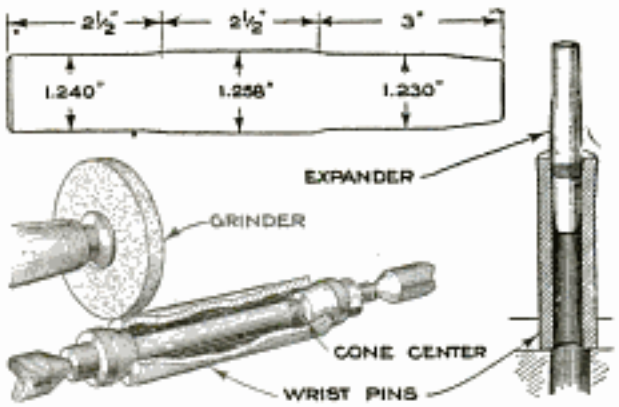


A tool that will hold the spacing regular, while allowing quick time to be made, is shown in the drawing. The nose of an ordinary shaper tool is ground and filed to the shape shown, one point being 1/32 in. shorter than the other; the tool is then hardened and ground.

The longer point is the finishing tool, the shorter one the roughing one, and as the longer point is finishing one cut, the location of the next one is accurately marked by the short point.

Expanding Worn Wrist Pins

On an automobile repair that was undertaken by a general machine shop as a



A Method of Expanding Worn Connecting-Rod Wrist Pins That Is Economical and Saves Time When Stock Parts cannot Easily be Obtained

"rush" job, it was found impossible to obtain new wrist pins, and it was decided that it would be more economical and quicker to expand the old ones than to make new ones.

On removing the pins from the pistons, it was found that they were rather badly worn on the bearing portions. The pins in question had been 1⅜ in. in outside diameter with a 1-in. hole through the center, but the outside diameter was found to be some three or four thousandths less than the original diameter.

A broach was made, as indicated in the drawing, from a piece of crucible-steel bar, the largest diameter being highly polished. One of the wrist pins was brought to a bright red heat, and after the broach had been dipped in thick tempering oil, for lubrication only, it was inserted into the wrist pin and driven through, on a hollow block, with three or four quick blows of a sledge. A flatter was held against the end of the broach, and the operation was completed before the pin had lost its heat. Before cooling, the pin was reheated to a dull red and quenched in oil, to temper it and eliminate the possibility of cracking. After the work had cooled, it was carefully measured and found to have been expanded about .012 in., and that it was perfectly parallel.

The job was completed by placing the pin on cone centers on a hardened and ground mandrel and grinding it to size. All the other pins were similarly treated, and the result was entirely satisfactory.

¶The oxygen and acetylene valves at the foot of welding torches should be examined daily for leaks.

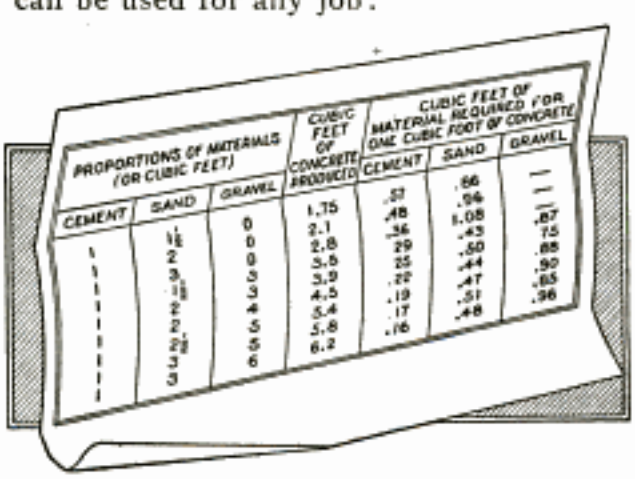
Copper-Coloring Brass

To obtain the color of copper on brass it is necessary that the articles be electroplated, this being the only method by which the work can be done. First, the work should be dipped in an acid solution, composed of equal parts of nitric and sulphuric acid, to which a tablespoonful of salt is added. Immerse the articles in this solution for a few seconds only, and then rinse them thoroughly in clean water. Have the pieces strung on a copper wire so that they will not be touched by the hands, as any grease will cause faulty plating.

The plating solution to give the copper deposit is made of 3 oz. sodium cyanide, 2 oz. sodium carbonate, and ¼ oz. sodium hyposulphite, dissolved in 1 gal. of water. A current pressure of only three or four volts is required.

Estimating Concrete Materials

This system of estimating the materials required for various concrete mixtures disregards the dissimilar terms of barrels and cubic yards that have always made calculations of this kind more or less perplexing. All quantities are kept in cubic feet, with the bag of cement equal to 1 cu. ft. as the basis. The following table can be used for any job:



PROPORTIONS OF MATERIALS (OR CUBIC FEET)			CUBIC FEET OF CONCRETE PRODUCED	CUBIC FEET OF MATERIAL REQUIRED FOR ONE CUBIC FOOT OF CONCRETE		
CEMENT	SAND	GRAVEL		CEMENT	SAND	GRAVEL
1	½	0	1.75	.57	.66	—
1	1	0	2.1	.48	.94	—
1	2	0	2.8	.36	1.08	.87
1	3	0	3.5	.29	.43	.75
1	½	3	3.9	.25	.50	.88
1	1	3	4.5	.22	.44	.90
1	2	4	5.4	.19	.47	.85
1	2	5	5.8	.17	.51	.96
1	2½	5	6.2	.16	.48	
1	3	6				
1	3					

A Simple Table Used for Figuring the Amount of Sand, Cement, and Aggregate for Concrete: This Does Away with the Complications Introduced by the Use of Dissimilar Terms

The quantity of cement required for a job is obtained by multiplying the cubic feet of finished concrete by the cement factor in the table. The quantities of other materials are found by multiplying this result by the terms of the proportion.

For example, a certain job will contain 600 cu. ft. of concrete of a 1:2:4 mixture. In the fifth column of the table the cement factor for this mixture is

found to be .22. Multiplying 600 by .22, the product will be 132, or the number of bags of cement required; that is the base figure. For the quantities of sand and gravel, multiply by 2 and 4, thus:

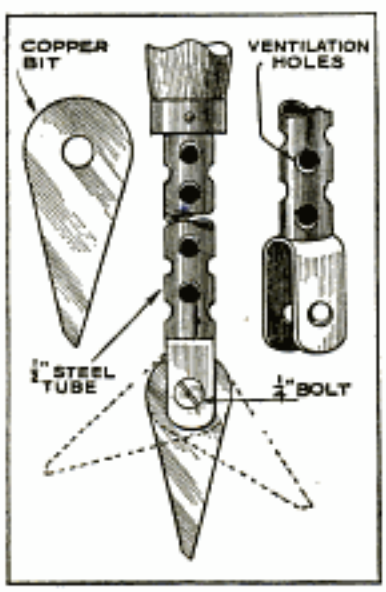
Cement required.....132 bags.
Sand required, 2×132.....264 cu. ft.
Gravel required, 4×132....528 cu. ft.

If it is necessary to change the cubic feet of sand and gravel into cubic yards, divide by 27. A ton of either material will vary from 19 to 22 cu. ft. A cubic yard of sand or gravel will weigh from 2,400 to 2,900 lb. A sack of cement weighs 94 lb., and four are counted to a barrel of 376 pounds.

The advantage of using the unit system is that any terms may be used, such as cubic feet, cubic yards, pounds, or tons. The factors in the table will serve with any units of measure, giving the results in the terms used.

An Adjustable Soldering Bit

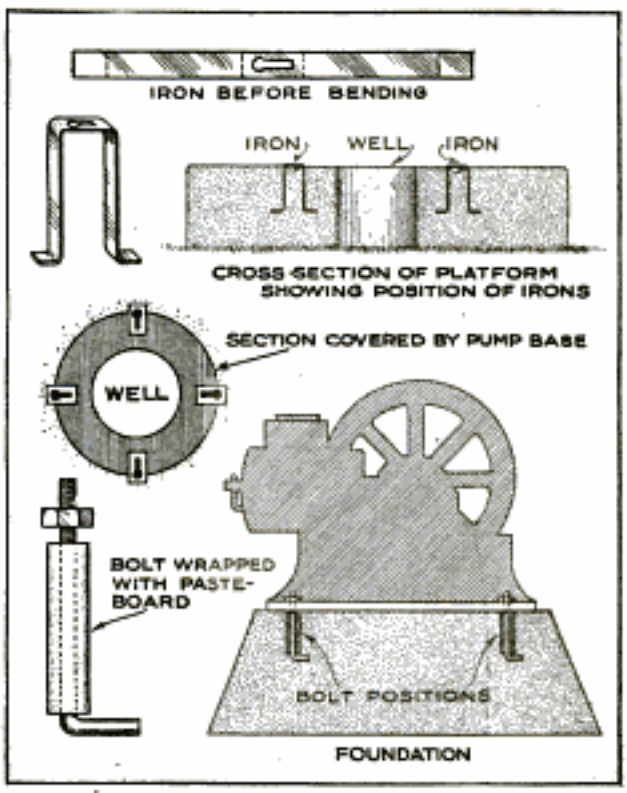
The need for a variety of different shapes of soldering irons manifests itself when working in awkward corners, or on electrical work when soldering connections. Also, after the bit has been used for long periods, the handle becomes too hot to be comfortable. With these disadvantages in mind the bit shown in the drawing was produced.



In the tool illustrated, the copper bit is ½ in. thick, 1¼ in. wide at the widest point, and 2¾ in. long. The handle extension is a piece of steel tube, 6 in. long, one end being split and forked to take the bit and the screw that holds it in position. Holes are drilled along the tube to permit circulation of air and to prevent, as far as possible, heat from reaching the handle. The clamping bolt is tightened sufficiently to keep the bit in position when ordinary pressure is applied, but permitting the position to be altered by tapping on the bench.—H. Mayer, London, Eng.

Setting Bolts in Concrete

When pumps and gas engines are set on concrete curbs or bases, some means



Two Methods of Setting Bolts into Concrete Foundations That Permit a Wide Range of Adjustment: The Method Shown in the Upper Drawings Is Particularly Practical When Applied to Pumps

must be provided for bolting them down, and as pumps, particularly, are often removed for repairs, the threaded part of a protruding bolt is often damaged. As there is no way of renewing such a bolt except by tearing up a part of the concrete, the method illustrated in the drawing has considerable merit. It allows the pump to be easily replaced and also does not require the bolts to be set to such close limits as when cast into a solid base.

Four pieces of flat iron stock, about 18 in. long—an old wagon tire can be used—are each bent into the U-shaped form shown. Holes large enough to permit the entrance of the bolt heads are drilled in each piece, and from this hole a slot just a trifle wider than the shank of the bolt and about 1⅛ in. long is cut. The four U-shaped pieces are suspended within the form with the slots pointing toward the center, and in such positions that the center of the slots will be in line with the holes in the pump base. After making sure that the supports are stationary and that the irons will not be moved out of alinement, the concrete is poured and the top finished smooth and flush. As soon as the cement has set suf-

ficiently to prevent flowing, the bolts are placed in position and worked back and forth in the slots to remove some of the cement and form a cavity for the bolt heads.

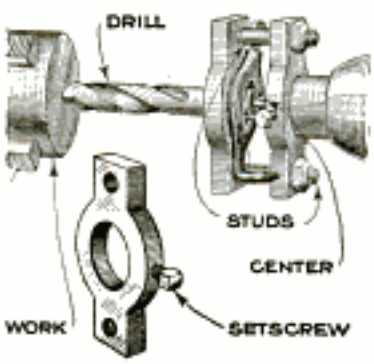
As it is hardly required to remove an engine from its base except at rare intervals, it is not necessary to use the method described above. However, there is one difficulty in setting the bolts, and that consists in spacing them properly so as to enter the holes in the engine base.

An electrician who installs numerous farm-lighting plants makes use of a method for setting engine bolts that is most practical.

Pieces of ½-in. rod, about 12 in. long, are threaded on one end, and about 3 in. of the opposite end is bent at a right angle. These bolts are suspended from stationary wooden strips, laid across the form in positions corresponding to the holes in the engine bed; but before the cement is poured into the form, the shanks of the bolts are wrapped with heavy pasteboard, or corrugated cardboard, to make cylinders about 1 in. in diameter. After the cement has hardened, the pasteboard cylinders will still be soft from the moisture they have absorbed, and can be easily removed, leaving holes in the base that permit a fair range of movement of the bolts, without sacrificing their grip in the foundation.

Drilling without a Drill Chuck

Drilling holes in work on the lathe, when there is no drill chuck at hand or when the drill used is beyond the capacity of available chucks, is a proceeding attended with no little danger, when the shank end of a tool is gripped in the toolpost just ahead of the carrier on the drill. The danger is, of course, that when the drill goes through, it is very likely to slip off the center and break in the hole, damage the work, or injure the operator.



The device shown in the drawing is designed to keep the drill close up to the tailstock center, so that it cannot slip off at any time. The two pieces may be formed from a single piece of stock of suitable thickness, the parts being separated with a hacksaw or on the miller. Afterward the two parts are connected with ⅜-in. studs. The center hole is drilled to fit the tailstock spindle, and this will be found large enough to receive the largest drill the lathe will take. The tightening setscrew has a brass plug underneath with the same radius as the spindle; this will be found to give sufficient grip without marring the spindle.

In use, the drill is inserted through the open end of the device and secured in a suitable dog, the studs being drawn up to bring the center hole of the drill against the center.

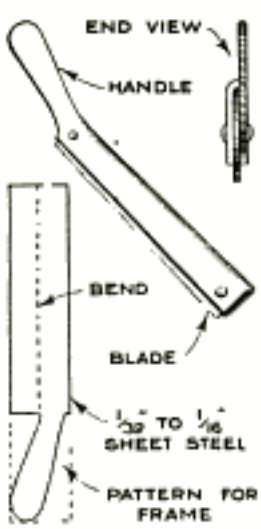
Preventing Cold-Saw Breakage

In a circular saw of any nature there is a tendency of the teeth to clog up, and this is especially true of a saw used in cutting cold steel stock. The result of clogged teeth is poor work and a great chance for tooth breakage, and generally several teeth are broken, rendering the saw practically worthless.

Being up against just such a problem, a certain shop largely eliminated saw breakage from this cause by fastening a wire brush underneath the saw in such a manner that the brush kept the teeth clear of chips. It was found that the wire brush lasted a very long time, and that it could be applied to any saw.

Rigid Hacksaw Frame for Shallow Cuts

It is rather difficult to make a long, shallow slot with the regular hacksaw frame, on account of the tendency of the blade to bend. The drawing shows a rigid handle and frame made of sheet steel, bent together so as to fit closely around the blade, which will obviate this trouble. The blade may be full length or a broken piece, and is held in place by rivets or small machine screws. Such a tool is useful for undercutting commutators, and similar work, for which it is much better adapted than the usual makeshift tools.



A Homemade Ellipsograph

By EDWIN M. LOVE

FOR those who have occasion to draw many ellipses, such as artists, and draftsmen in certain lines, a simple ellipsograph is not only of much convenience, but a great saver of time and patience as well.

The homemade ellipsograph shown in the drawing may be made of metal, fiber, or hardwood, according to individual preference, and to the service for which it is intended.

The main part of the instrument consists of two pieces fastened together at right angles to each other to make a T-shaped member, as shown. The longer member is designated as the beam, while the short crosspiece merely serves for securing the supporting legs. A bearing boss is provided in the beam, a little over 3 in. from the crosspiece, and a ¼-in. hole is drilled through this boss to take the crankshaft. The outer end of the beam is provided with a knife-edge, as shown, while the opposite end is fitted with a metal point for obtaining accurate placement on the longitudinal axis of the ellipse to be drawn. The instrument is supported upon the work by the knife-edge and metal point, and by short legs on the beam crosspiece. The ⅛-in. slot in the beam, which serves as a guide for the connecting rod, should be made as smooth and straight as possible.

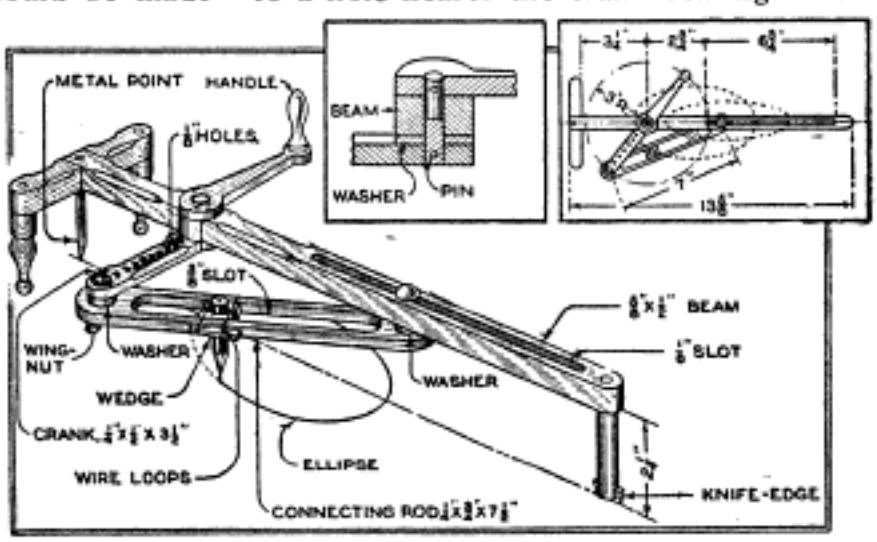
The connecting rod is made to conform to the measurements indicated, and a ⅜-in. slot is provided for holding the pencil or scriber, which is held vertically between two small blocks, although these may be omitted if desired, and the slot cut to fit the pencil. Wire loops and a wedge are provided for holding the pencil or scriber rigid. Each end of the connecting rod, and the outer end of the crank, are drilled with ⅛-in. holes to take the small bolts used in assembling. The opposite end of the crank is drilled with a ¼-in. hole to accommodate the crankshaft.

A piece about 3½ in. long is used for the crank, and a series of ⅛-in. holes is drilled along a center line, at intervals of ¼ in. from center to center. By staggering the holes they may be placed at distances varying ⅛ in., so that the range and usefulness of the instrument is correspondingly increased.

One-quarter inch fiber, wood, or metal rod, about ⅞ in. long, is used for making the crankshaft, as shown in the detail drawing, the crank and crank handle being secured with pins through holes drilled after assembly.

The ellipsograph is assembled as shown in the drawing, using a wingnut on the bolt connecting the crank and connecting rod, so that the latter can be adjusted for making ellipses of various dimensions.

To use the machine, draw the longitudinal, or major, axis of the ellipse, extend it in both directions, and place both pointer and knife-edge on the line. Loosen the pencil, place the crank at right angles to the beam, and shift the pencil along the slot until the distance between the point and the center of the beam is equal to half the minor axis of the ellipse. Tighten the pencil in position by inserting the wedge between the crank and the wire loops, and proceed with the formation of the ellipse by turning the crank handle. The point of the pencil should just graze the surface of the paper. If it is desired to decrease the length of the ellipse, shift the connecting-rod pin to a hole nearer the crank bearing.



An Easily Made Ellipsograph That will Produce Perfectly Formed Ellipses of Any Length and Width within the Capacity of the Instrument

The accuracy of the results obtained with this instrument, as with any other, will be affected by the workmanship and care used in its construction. See that all joints, pivots, etc., while working freely, have no perceptible shake, and that the pointer, knife-edge, and pencil, when the crank arm is on dead center, are all truly in line.

Making the Farm Sign "Pull"

In the farm signs used to make sales of produce to passers-by, usually motorists from the cities, as in advertising of other commodities, it is possible to obtain the maximum "pull" by exercising ingenuity and doing something "different." A poultry breeder realized that a sign with the simple statement that he had cockerels for sale, without giving the price, as so many similar signs are displayed, would not pull as a sign should. Price is a matter of deep interest to prospective buyers, most of them at least, and is an evidence that the same price is quoted to all. This poultry breeder decided to set a price on his sign, and this is the first principle that should be observed in advertising farm products by the sign method; the amount should be displayed conspicuously.

A second principle to observe is the attractive display, whenever possible, of the produce to be sold. The sight of an article will often make one want to buy it when mere words would fail utterly—what would happen to a fruit store that tried to substitute signs for its plenteous and tastefully arranged display?

The farmer with the surplus cockerels got up a sign that was well calculated to sell his stock. He built an attractive pen, about the size of the exhibition cages used at poultry shows. The back was made easily removable, and the top and sides were covered with wire netting. Out by the gate, he erected a platform, about 3 ft. high, upon which the pen was supported and then he painted his sign—black letters against a white background. He could have used a blackboard sign, as so many farmers do, but he had a lot of cockerels and pullets to dispose of, and reasoned it would pay to make a special sign. A blackboard sign, at best, has its disadvantages, as it is usually hard to read, and is seldom any too legible, consequently it is an easy matter for such a sign to lack "pulling power."

The sign read: "For Sale. Pure-Bred S. C. Rhode Island Reds; Great Laying Strain; Cockerels and Pullets—Like These; Take Your Pick—$1.60."

A trio, that is, a cockerel and two pullets, was exhibited in the cage in favorable weather—they were handsome birds, and the passer-by could size up the fowls and price instantly. In the course of a few weeks the sign and display had sold all his surplus breeding stock, a large number of the sales being made to brother farmers.

Hence, it can almost be accepted as an axiom that the thing for sale should be displayed in connection with the sign, whenever practicable.

Farmers, like merchants in the city, have found that the familiar words, "low-priced," "cheap," "a bargain," etc., are much more effective in attracting patronage and arousing desire through the appetite than such adjectives as "luscious," "delicious," and the rest. In other words, the bargain instinct is so firmly ingrained in most of us that it requires will power to resist it. Consequently, when a bargain is advertised, make the buyer feel and see that he is getting a bargain. Buyers, as a rule, will pay no more for produce "right from the farm" than they will at the store, and if the farm price is the same or higher than the store price, there is slight possibility of sales.

To date, the "free" appeal has been little used by farm sellers, but it is a powerful agent for stimulating trade. The farm sign should have the word "free" prominently displayed along with "buttermilk," "berries," or anything else of which there is either a surplus or for which there is no market. Buttermilk, on the farm, is usually worth only a few cents a gallon, or used only for hog feed, and a gallon will make many free glasses. So it happens with other products—a variety of apple for which there is no satisfactory market, or an excess crop of anything. Let the recipients do the picking; the exercise, in most cases, will do them good, and a feeling of cordiality will be established. Of course, when a motor party has been refreshed with free, cool, buttermilk, sales usually follow.

Novel farm signs are always at a premium. A farmer whose sign had always been stationary, was caught unprepared for the Sunday traffic past his place, when a wagon backed against his signpost and broke it off. In the emergency, the farmer had his boys and girls take turns at the roadside, at holding the post and sign up, pointing it in the direction of the oncoming car. He did, that day, the biggest business he had ever done, and thereafter it became the duty of one of the youngsters to stand out at the roadside with the sign during the hours of heaviest traffic.—Oscar C. Place, Boulder, Colorado.

¶As a broach becomes dull, a tendency to drift may develop. This is overcome by sharpening the teeth on the opposite side to that toward which the broach tends to drift.

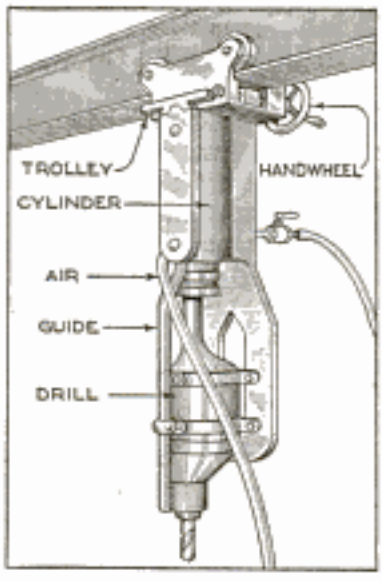
Split Posts and Round Posts

The question is often asked whether a split post is as durable as a round fence post. The fact is, that one kind will last about as long as the other if the amount of heartwood is the same in both. But if the percentage of sapwood is increased by splitting, the split post will be less durable, and if the percentage of heartwood is increased, it will be more durable than a round one. Posts of spruce, hemlock, or any of the true firs are exceptions to this rule, because their heartwood and sapwood are about equally durable.

When posts are to be treated with creosote, or other preservative, a round post is preferable to a split one, because of the comparative ease with which the sapwood can be treated. Split red-oak posts will take treatment because the wood is very porous, but the heart faces of split posts of any other species resist the penetration of preservative, even under heavy pressure.

Drill Mounted on Air Cylinder

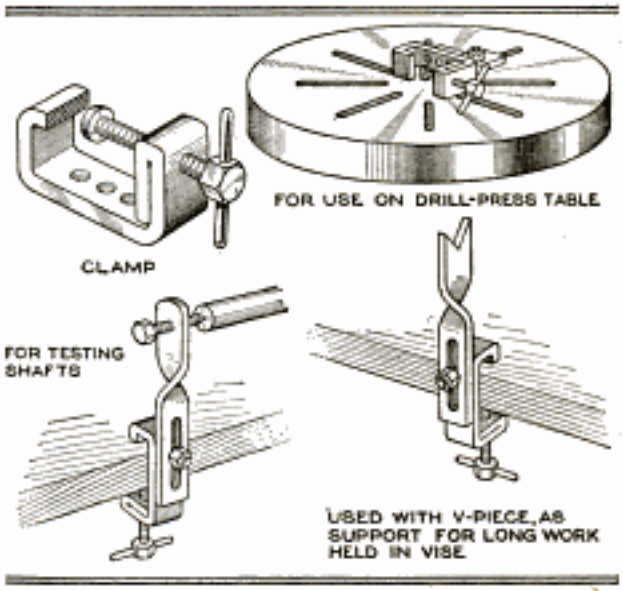
A west-coast shipyard makes use of a rather novel mounting for electric and air drills used in drilling ship and boiler plates. The drill is mounted on the end of the piston of an air hoist, being guided on one side by a round spindle flattened at one end and bolted to the cylinder, and on the other by flat guides bearing on a special bracket, which is slotted to allow the drill handle to project.



The cylinder is carried by a trolley running on an I-beam, which swings radially so as to cover a wide plate. A handwheel and screw on the trolley enable the operator accurately to adjust the lateral motion of the drill. Two or three drills are suspended from each beam, thus making rapid production possible. Feed and withdrawal of the drill are effected by means of the air cylinder.

A Clamp of Many Uses

A shop mechanic, during his spare time, has made from a piece of ½ by 2½-in. cold-rolled steel a clamp and several attachments that he finds exceedingly useful and efficient.

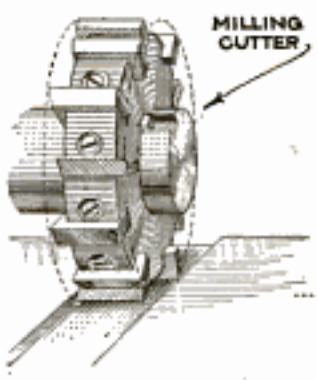


An Easily Made Clamp for the Use of the Shop Mechanic

The clamp is U-shaped, with the screw end doubled as in the drawing, and several holes are drilled and tapped in the back for attaching it to angle plates and for the attachments mentioned. The attachments, of course, may take any of a variety of forms to meet special requirements, but those made for the original device were used for testing and straightening shafts, or as supports for long work held in the vise, the clamp being fastened to the edge of the bench.

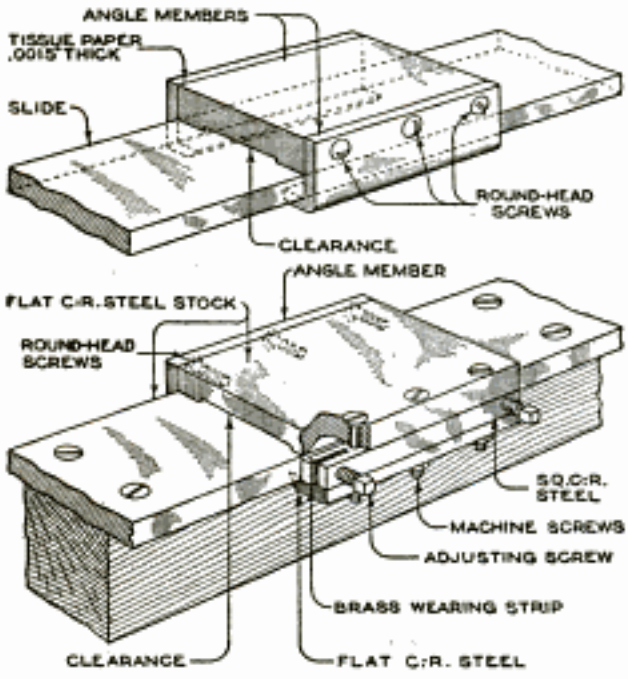
Milling Oversize Slots

Inserted-tooth milling cutters can be used in an emergency to mill slots of greater width than the capacity of the cutter when used for ordinary operations. For example, suppose it is desired to mill a 1 7/16-in. slot and the only cutters approximating this dimension are 1¼ and 1½ in. wide. Clearly the 1½-in. cutter cannot be used, but by staggering the blades of the 1¼-in. cutter the expense of a new cutter or a double milling operation is avoided.



Machine-Tool Slides for the Home Shop

The subject of machine-tool slides is one of great importance to the man who likes to build his own small machine tools, not alone from the standpoint of strength and accuracy, but also



Methods of Constructing Machine-Tool Slides That will Appeal to the Man Whose Equipment does Not Allow the Use of More Conventional Designs

on the basis of ease in construction. Such a man is limited in his choice of machine-construction methods by the fact that usually he has not the equipment necessary to perform other than very simple machining operations on his work. There are, however, several methods of slide construction open to him. Using round cold-rolled steel for the ways, and drilling and reaming holes in carriage or slide to fit, is the simplest way, but great care must be exercised to keep all the holes in perfect alinement, and even then, with everything perfect, the slide is subject to vibration, with consequent chatter marks on the work, when the carriage is in the center of suspension.

The best types are those built up of flat cold-rolled steel, the only machine work necessary being the drilling of a few holes, and even this may be done with the breast drill, if a drill press is not available. The cold-rolled steel may be obtained from any steel merchant, and, as it is rolled very close to size, and is usually straight, expensive shaper or planer work is eliminated.

One method of making up a slide and carriage is shown in the upper detail. Two angle members are employed to hold the body of the carriage to the slide, or cross slide to carriage, these members being filed and scraped to a perfect fit on the slide. They are held to the body by means of round-head screws, the holes in the angle members being a good fit on the bodies of the screws, to prevent any shifting. If a nice sliding fit is wanted, file the body until, when the angles are screwed up tight, they just bind on the slide. Then loosen one, and insert a piece of tissue paper, about .0015 in. thick, between angle and body. This will allow the carriage to slide without any sideplay.

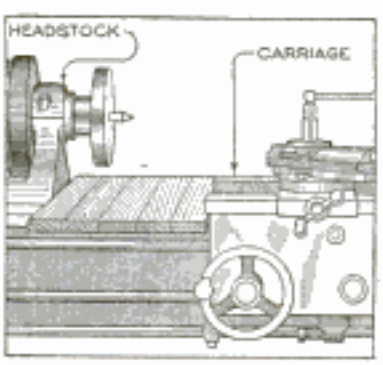
The type of slide and carriage assembly shown in the lower detail drawing is very suitable for a small lathe, miller, or grinder, and is adjustable for wear. The rear guide member is a piece of angle iron, fitted as described for the simpler type. The front guide member is built up, using a piece of square stock and a flat lower shoe, held in position by means of machine screws and nuts, the heads of the screws being countersunk, as shown. Tissue paper is used to provide the necessary clearance.

A space is left between the square stock and slide, about .01 in. larger than the brass wearing strip that goes between. The square piece is slit, at each end, with a narrow hacksaw, and fitted with set-screws, which will take care of any slight inaccuracy in the drilling, and also provide adjustment for wear.

The wooden base shown screwed to the slide is merely a suggestion. This part of the work will depend on the design of the machine, as, for example, the small bench miller described on page 449 of the March, 1921, issue of this magazine.—J. V. Romig, Allentown, Pa.

Using Lathe as Clamp

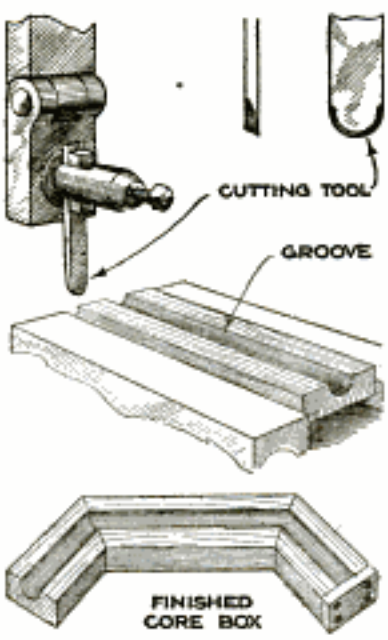
When making and gluing small plate patterns, or other woodwork, or even for emergency repairs on doors and window frames in the small shop, a long carriage clamp is often required. If the work can be glued and allowed to stand overnight, the bed of an engine lathe makes an accurate and quickly applied clamp. The work is simply held against the headstock, resting



on the ways, the necessary pressure being applied by bringing the carriage against the opposite side, with a block, if necessary, between. The work is tightly clamped between the carriage and headstock by means of the carriage traverse wheel and locked in place. Weights may be applied to the upper surface to hold the work down against the ways and prevent bulging. As the lathe ways are, or should be, parallel, the work pressed against them uniformly will be held true until the glue sets.

Shaper Used to Make Core Boxes

When making a pattern for a short piece of bent cast-brass pipe in a machine shop, difficulty was experienced in cutting out the small core box by hand. One of the cores was to be ½ in. in diameter and another ¾ in., and it was decided to see what results could be obtained by using the shaper to form the grooves in the pattern.

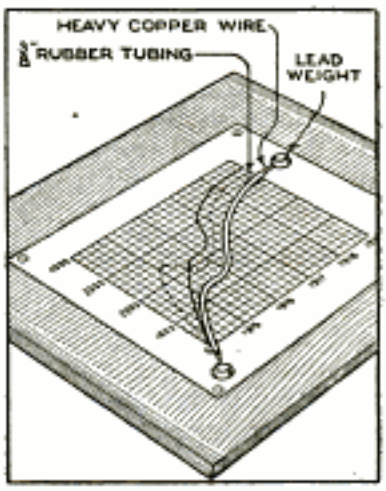


A piece of ½ by ⅛-in. steel was scribed with a ½-in. circle at one end, the end being ground off along the line of the circle and the back relieved to form a sharp cutting tool. A similar tool was made for cutting the larger groove. One of these tools was fastened in the toolpost of the shaper, and a piece of white pine was adjusted in the vise. By running the shaper and feeding the tool down a little at each cut, a perfect semicircular groove was formed in the wood. The ends were to be bent at an angle of 45°, so, at the proper length for the center of the bends, the core box was cut off at that angle. The ends were then glued as shown, and a perfectly formed core box was the result. —Homer S. Trescartin, Wakefield, Mass.

¶Never use ells or quarter bends on underground sewer work. Use one-eighth bends and 45° bends.

Flexible Curve for Draftsmen

Having occasion to draw a number of curves and not having a complete set of curves to do the work with, a draftsman tried various expedients for making a smooth curve, such as cutting them out of cardboard, rubber sheeting, etc. The difficulty was finally overcome in a simple way, and the results were so good that the device has been in constant use ever since first made.

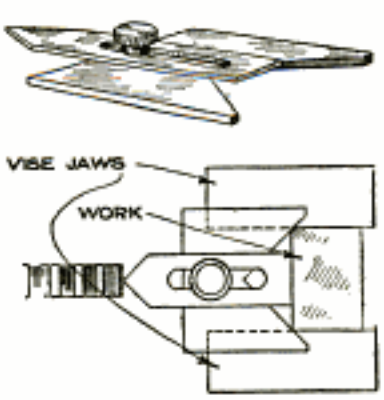


A piece of heavy copper wire, about 1 ft. long, was obtained, and after annealing by heating and plunging into water, it was inserted into a piece of rubber tubing so that several inches protruded at each end. The wire, when bent, will never assume any other shape than a smooth curve, no matter how sharp it may be, and when so bent, it is naturally prevented from rolling.

As a later improvement, the wire ends were weighted with small lead weights to cause the curve to remain wherever it was placed. The lead weights are covered with cloth to prevent marks on the paper.

Finding Center of Work Held in Milling-Machine Vise

Designed with the object of simplifying the operation of finding the center of work held in the vise of a milling machine, the device illustrated makes it possible to cut a slot in a piece of work without the usual preliminaries, that not infrequently require more time than the actual operation.



The V-piece is made from a flat ¼-in. stock and is drilled and tapped to take the knurled screw that holds the center piece. In

operation, the "V" is held against the work, and the center piece is pushed down until it butts against the piece held in the vise, when the screw is tightened. It is obvious then, that, if the cutter is lined up centrally with the point of the center piece, the slot will be cut exactly through the center of the work. This handy little helper can also be used in milling a tongue centrally, with straddle mills, by adjusting the table until the cutters touch each side of the center point.

Seed-Testing and Germinating Device

Many devices for germinating and testing seeds have been made and experimented with, but most of these have been designed to test fairly large seeds, such as corn, beans, peas, and the like, while the seedsman interested in the quality of small seeds has been left to shift for himself.

The illustration shows a seed tester that will meet the demands of plant breeders, and others, who wish to make tests of seeds that are exceedingly small; it is not only a seed tester but a germinator also, for as fast as the seeds germinate they can be removed and planted in pots. As the seedsman or breeder often wishes to examine seeds that fail to sprout, he can easily do so with a tester of this sort and accurately determine the percentage of viable and nonviable seeds.

The materials needed are a wide-mouthed pint-size fruit jar; a strip of ordinary paper towel, 11 by 13 in., folded four times to produce a strip, 13 by 2½ in.; a 4 by 4-in. glass plate cut from ordinary window glass, and a Petri-dish cover, about 3 in. in diameter. The glass plate is laid on the folded paper, the two ends of which are then brought together, the whole turned over, and the ends of the paper placed in the jar, which has been filled with water. The seeds are placed on top of the paper-covered glass plate and covered with the Petri-dish cover, forming a moist chamber about the seeds.

The seed labels and other marks can be made on both the glass plate and cover, by using a china-marking pencil.—J. L. Collins, Berkeley, Calif.

Machining Casein-Glue Joints

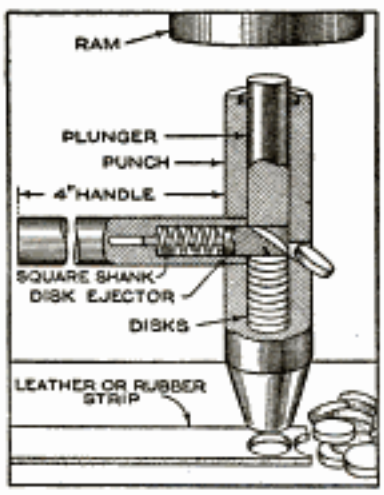
Casein glue sets very quickly and produces a joint strong enough to be machined in a few hours. In tests at the U. S. Forest Products Laboratory, casein glue joints in spruce proved as strong as the wood after four hours, and in hard maple after six hours. When maximum speed of production is essential, such woods may be machined at the end of the period stated, without sacrificing the strength of the joint. In some kinds of work, however, machining so soon after the gluing is inadvisable, because of the danger of warping or the production of sunken joints, as the moisture content of the wood equalizes.

Another important fact brought out by the tests on joint strength is that joints released from pressure at the end of two hours, and then allowed to season for 22 hours, proved as strong as those that had been pressed for 24 hours. Joints pressed for only a half hour and seasoned, although of good strength on the average, were somewhat erratic in this respect and probably would not be dependable where maximum strength is important.

Automatic Ejector for Hollow Punch

The punch, shown in the drawing was designed as a hand tool to cut disks of rubber and leather in a punch press. The size of the disks to be cut will determine the dimensions of the device.

The punch is cut away on one side to provide an opening through which the disks are ejected. Directly opposite this opening a hole is drilled and tapped to take the combination handle and ejector. The disk ejector is provided with a square shank that fits into a broached hole in the handle, and a spring serves to keep the ejector against the side of the punch. The addition of the plunger that bears against the ejector completes the tool.



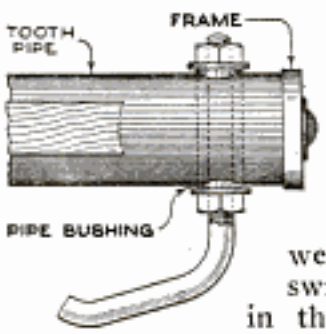
In use, the punch is held by the operator and when the ram is on the upstroke a disk is ejected through the opening. On

the downstroke the ram strikes the plunger which, pressing against the tapered ejector, pushes it back until pressure on the plunger is released.

The ram of the press is set so that the punch will be forced a little way into a block of wood, or similar soft material, underneath the stock from which the disks are being punched, to make sure that each disk is cut out cleanly. After a little practice, the operator of such a tool can cut out disks as fast as the press will run.

A Swivel Runner for a Harrow

A farmer who used a tractor for drawing his harrows, connected six harrow sections to one evener, making the entire implement 28 ft. wide. As this was too wide to permit the harrow to be hauled through gates and over bridges, it was necessary to pull it endwise, using plank skids. In order to avoid difficulty and loss of time in placing the skids, the four corners of each section were fitted with the swivel runner shown in the drawing. When the harrow teeth are raised, the weight of the implement rests on the runners, which permits movement in any direction without injury to the teeth.



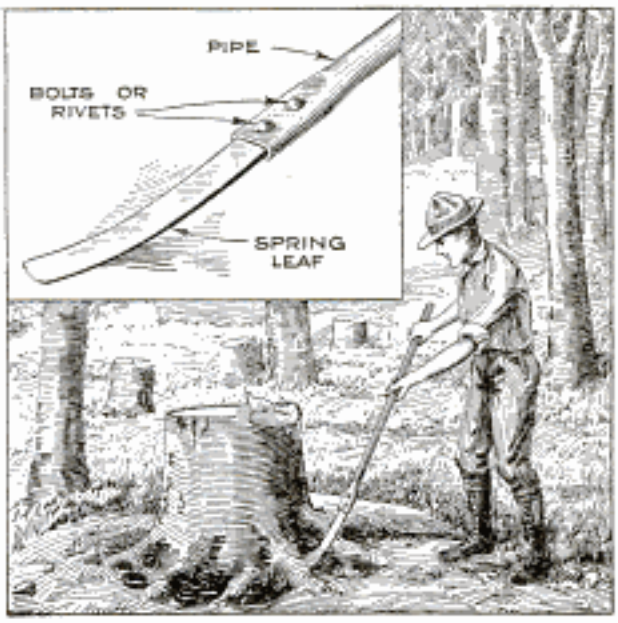
A ¾-in. hole is drilled through the harrow bar, and this is bushed with a piece of ½-in. pipe, ⅛ in. longer than the thickness of the bar. The runners are made of ½-in. round rod forged to the shape indicated. The upper ends are threaded and nuts above and below the bar hold them in place. When the teeth of the harrow are lowered the runners are elevated from the ground and do not interfere with the operation of the harrow.—G. G. McVicker, North Bend, Neb.

Fitting Welding and Cutting Hose

When fitting up welding and cutting hose, spread shellac on the nipples before forcing them into the hose. The shellac makes not only a tight joint, but a cemented one, joining the rubber to the metal. Use wire clamps and special pliers, hammer down, and wind with adhesive tape. This will make a leakproof joint.—A. MacCullough, Chicago, Ill.

Tool Removes Earth from Stumps

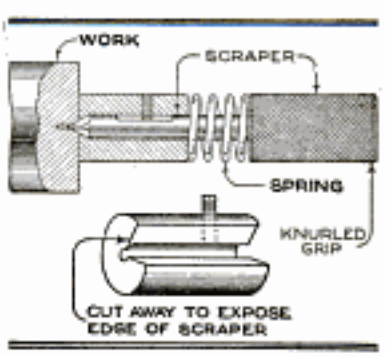
The drawing shows a tool that is exceptionally useful when clearing cut-over land of stumps, for removing the earth around the stump preparatory to burning. An old spring leaf has a piece about one-third of its length cut off, the cut end then being inserted into a pipe handle which has been flattened to hold it, as shown. The spring leaf is held in place in the handle by means of two bolts, as indicated. With such a tool the earth can be removed from around roots and cavities that would otherwise be inaccessible.



A Tool, Made from an Old Spring Leaf, That Is Very Useful for Preparing Stumps That are to be Burned Out

Scraper for Truing Center Holes

It sometimes happens that a piece of shafting, or other cylindrical work being turned in the lathe, will not run true, because the center hole is not exactly parallel with the longitudinal axis of the work. When this occurs, it is a common practice to tool the center, with a hand scraper, until the work runs true. It is, however, almost impossible to keep the cone of the center hole at the correct angle while scraping, and it not infrequently happens that, while the work runs true for a time, it is merely running on one or



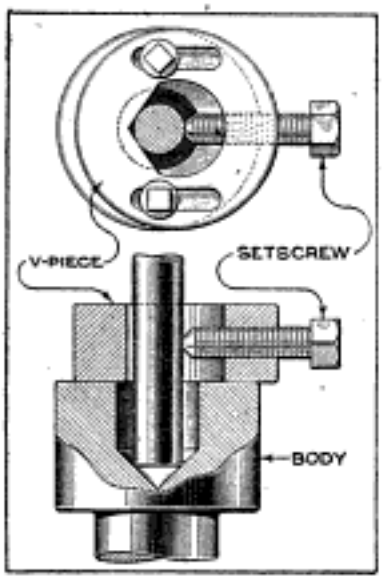
two high spots in the center hole, and, when those wear down, the work will "run out" again.

The scraper shown in the drawing compels the operator to scrape always at the same angle. It is made in two parts; the scraper proper is provided with a knurled grip, the opposite end being turned down for a few inches, and machined at a 60° angle; three flutes are cut in it, and two of the lands thus produced rounded off, so as to leave only one cutting edge. Over the cutting end of the scraper slides a sleeve, tapped for a screw that bears on a flat cut on the scraper; between sleeve and scraper grip a fairly stiff spring is placed, and a sector of the sleeve is cut away so as to expose the cutting edge, thus enabling the operator to observe how much metal the scraper is removing.

In use, the work is placed between centers, the high spot marked, and, as that side of the center hole is the one to be scraped, the cutting edge of the scraper is placed on that side, and the scraper pushed in and rotated until the desired result is obtained.

Turret-Lathe Drill Holder

It is unnecessary to have a collection of holders for the various sizes of drills used in a turret lathe, if the holder shown in the drawing is used. This device will take care of drills up to 1 in. and over but is not recommended for drills smaller than ¼ in., as these will be held better in an ordinary drill chuck.



The holder is made in two pieces; the body is turned to fit the turret and drilled at the front to the size of the largest drill it is to take. The V-piece is turned to the same external diameter as the body, the center hole machined and the piece slotted for the screws as indicated, then drilled and tapped to receive a suitable setscrew for clamping the drill. Holes are drilled and tapped in the end of the body to take the clamping screws, so that the opening can be adjusted to different-sized drills.

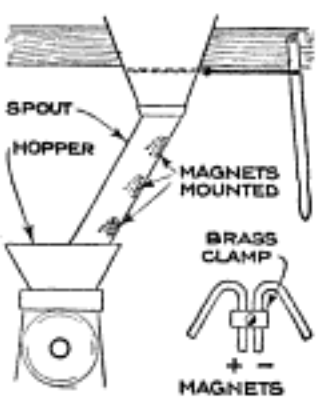
When setting for any size of drill, the screws are loosened, the drill is placed on the "V" so that it extends back to the conical end of the hole in the body. With a center hole already in the work held in the chuck, advance the turret slide until the point of the drill enters the center hole and the drill is held tightly between it and the conical end of the hole in the body; the V-piece is drawn against the shank, the screws are tightened, and the drill is ready for work.

Soldering Gold

Before undertaking to solder gold, paint over with a paste made by mixing yellow ocher, ground up with water, and a small quantity of borax. This paint will protect the surfaces somewhat from oxidation. After soldering, the gold should be placed in a pickle, composed of 9 oz. of water and 1½ oz. sulphuric acid. It is best to throw the gold into the pickling solution while still hot from the soldering operation. Very often the soldered and pickled gold will show whitish in streaks; this is caused by the silver in the alloy. If this occurs, dip the work for a moment in a hot solution of sulphuric acid and saltpeter; then dip in cold water, wash clean, and polish with oil and rotten stone. Then wash again, and complete the polishing with rouge.

Auto Magnets Make Magnetic Separator

The magnets from a magneto of a well-known type of automobile can be used for many purposes, and perhaps one of the most original to which they have been applied is in the construction of a magnetic separator for preventing bits of the ferrous metals from getting into a feed grinder.



A Minnesota miller has arranged three pairs of such magnets, with their negative and positive poles together, at intervals in the bottom of the grain spout that leads to the hopper of the feed mill. The upper part of the spout is hinged so that it can be lifted and the metal bits removed.

Building a Pergola

By ROY BROWN

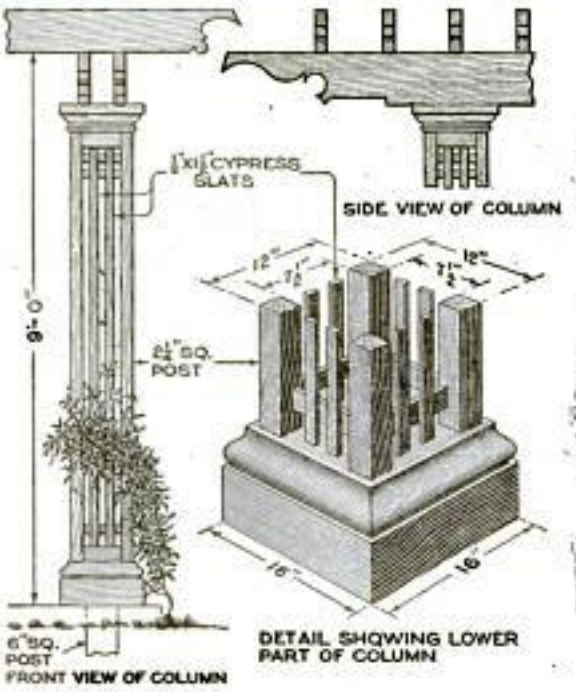
THE growing popularity of the formal garden has aroused an increased interest in every feature that adds to its attractiveness. Of these, the pergola is one of the most beautiful, and forms so admirable a covering for a favorite walk that the cause of its popularity is easily understood.

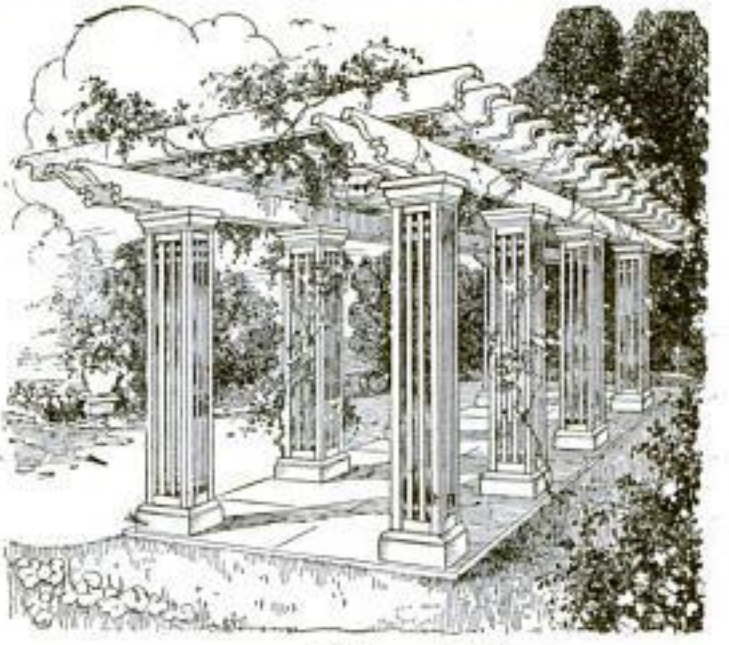
The illustration shows a pergola that is at once pleasing in appearance and easily built, dispensing, as it does, with elaborate columns, and employing only easily obtained lumber.

The most satisfactory stock from which to build a pergola is cypress, because of its nonrot quality, and resistance to weather, even when unpainted.

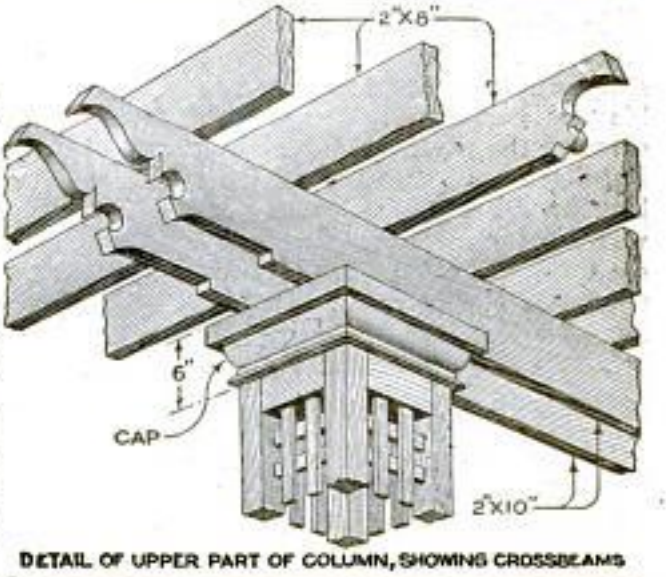
Piers should be placed under each column, excavating to a depth of 3 ft. and tamping into place, in the center of each pier, 6 by 6-in. cypress posts. The piers should be spaced 10 ft. on centers longitudinally, along parallel lines, 7 ft. apart. If a cypress walk is to be laid, this should be of 2 by 4-in. boards laid crosswise on bearing plates resting on the piers, the boards being spaced ½ in. apart. A concrete walk will prove rather more satisfactory, perhaps, and excavation for it should be done at the same time as for the piers.

The columns, stringers, and beams are





An Attractive Pergola, Built of Stock Sizes of Cypress, will Add Considerably to the Appearance of the Formal Garden



DETAIL OF UPPER PART OF COLUMN, SHOWING CROSSBEAMS

built up of No. 1 dressed cypress, with molding profiles and other details according to the drawing. The stringers are 2 by 10 in., joined directly over the column caps by nailing to a 4 by 10-in. block. The crossbeams are 2 by 8 in., 1 ft. on centers. All nail heads should be countersunk, and the holes puttied.

The woodwork must be thoroughly dry before being painted or stained. Give all the parts a priming coat of paint or stain before assembling. If paint is to be used, mix as follows: white lead, 100 lb., boiled linseed oil, 4 or 5 gal., and japan, not to exceed ½ pt. For the priming coat, use 1 gal. of this mixture to 1 gal. pure linseed oil.

If the work is to be stained, use a good quality of creosote shingle stain, and allow one week to elapse between coats.

Sweeping the Lawn with Water

Sweeping the leaves and litter from a lawn with a strong water spray is better

A Water Broom That Keeps the Lawn of the California State Capitol Free of Leaves and Litter

than using a rake, in the opinion of those responsible for the care of the acres of grounds surrounding the California state capitol.

The "water broom," as it is called, was made by one of the gardeners from an 8-ft. length of 1-in. pipe, with the ends bent in opposite directions so that the whole has approximately the shape of the letter "S." One end of the pipe is provided with a suitable hose connection while the other is flattened down so that it delivers a wide sheet of water over the surface of the lawn. The man operating the device simply turns on the water and then swings his "broom" about, with the flattened end close to the surface. The leaves and other light material are tossed into windrows, leaving the lawn as clean as desired and watering it at the same time. The accumulated litter is gathered up by other workmen and removed.—Allen H. Wright, San Diego, Calif.

Clearing Point of Refillable Pencil

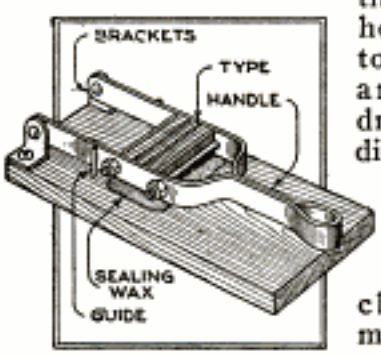
When inserting a new lead into the usual type of refillable or so-called automatic pencils, it is often found that a piece of the old lead remains in the point and is difficult to remove. If the user depends upon the new lead to force the remnant out of the tip, the result often is that the necessary pressure will cause the new lead to crumble.

To force the small bit of lead through the tip, take a common pin, and after cutting off the head and point, insert it in the pencil in the same manner as a new lead. A few turns of the cap will bring the pin into contact with the old lead, and a turn or two more will force the lead out, leaving the pencil clear and in readiness for the new lead, which can be inserted without difficulty after the pin has been removed.—W. A. Kimball, New Bedford, Mass.

How to Make a Stationery Embosser

The cost of having letterheads and other stationery printed is high, while an embosser will make any number of readable and good-looking letterheads at a very small cost.

Obtain a piece of ½-in. lumber, about 3 by 5 in. in size. Then, a piece of light flat iron, about ½ in. wide and 12 in. long, is obtained, and bent to form the combination handle and type holder shown in the drawing. The holder is hinged to the board base, and holes are drilled, the proper distance apart, for the bolts which hold the type in place.



The necessary characters for making up the name and address are made by using ordinary printers' type. Every printer has some old worn type that he is going to sell for junk, or, at any rate, he can probably sell the few characters needed without depleting his font. New type, if used, must have the sharp edges rubbed off with fine emery cloth; old type is best. Set up the desired lettering and make sure that every line is

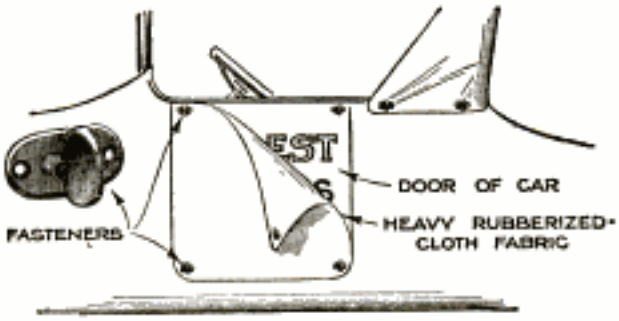
"justified," or filled out to the same length. Then fasten the type in the holder by drawing up the two bolts.

A little melted sealing wax is poured on the wood directly under the type, and while the wax is still soft the type is pressed into it, but not too hard. It is best to dust talcum powder over the face of the type before making the impression in the wax, to prevent sticking. When the wax has hardened, the type is lifted, leaving a clear and distinct impression in the wax.

Place a piece of paper directly over the sealing wax and by means of the handle press the type down against it. This operation will emboss the letters on the paper. The paper should be inserted face down, and by driving small nails into the base they can be used as guides to insure that each impression is properly located.—Frederick C. Davis, St. Joseph, Mo.

Sign for Combination Business and Pleasure Car

A businesslike sign on the salesman's private automobile is an advertisement that identifies him as a practical business



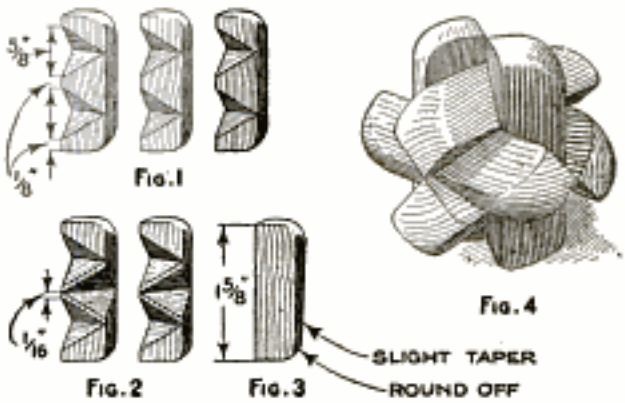
An Eastern Salesman Uses His Automobile to Advertise His Wares with a Sign Painted on the Door Panels. When the Car is Used for Personal Purposes the Sign is Concealed under a Waterproof Cover

man and advertises his "line." However, for reasons of economy many salesmen use the same car for both business and recreational purposes. An eastern salesman has a suitable sign advertising his wares painted on the door panels of his car. When the car is used for purely personal purposes, the sign is concealed under a neat cover of rubberized fabric. This cover is fastened at each corner with ordinary top-curtain fasteners in the manner shown in the drawing. If desired, the sign may be painted on the cover.

¶Extra weight, which may consist of a ring, shrunk on, added to the rim of the flywheel of a hand washing machine, will make operation of the machine much easier.

A "Block-Ball" Puzzle

Considerable amusement may be had in working out the solution to the "block-



This "Block-Ball" Puzzle, Which is Whittled in a Few Minutes from a Pine Stick, like Most Puzzles, Is Difficult to Solve Because of Its Simplicity

ball" puzzle shown in the drawing. Six pieces, each 1⅝ in. long, are cut from a ½-in. square stick of white pine. Two corners of each piece are rounded off and three are notched twice, as in Fig. 1, leaving a space of ⅛ in. at the center and ends. Two of the pieces are notched in the same manner, but a third notch is added in the center as in Fig. 2. The sixth piece is the "king-pin" that holds the assembled puzzle together; it has no notches but is slightly tapered so that it can be pushed in place and hold the other pieces rigid.

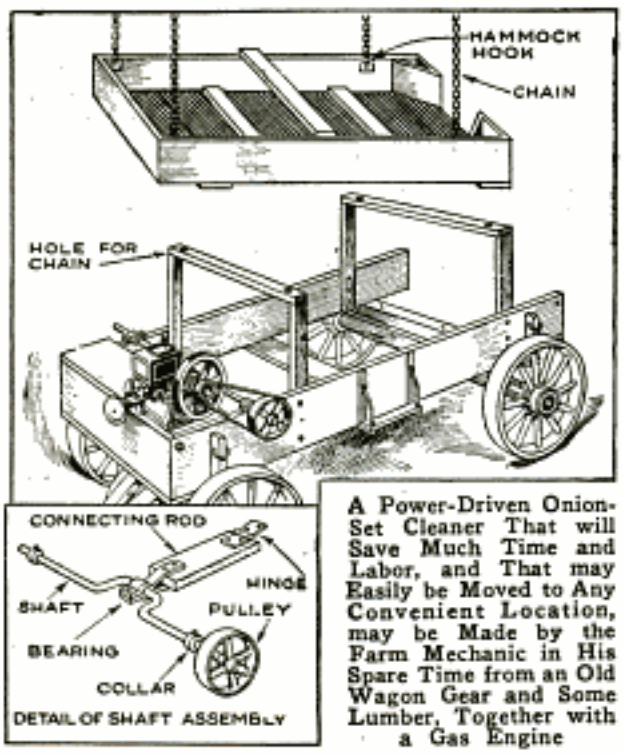
The five pieces shown in Figs. 1 and 2 are put together, and the tapered piece is inserted last, the taper serving to wedge the other members apart and hold the block ball solid.—Elmer O. Tetzlaff, Milwaukee, Wis.

A Simple Window Catch

A handy catch, that will hold the window open or prevent it from being opened, can be made from an iron washer. The washer is cut in half, and a small hole is made at its center for attachment to the window sash with a screw. One edge of the washer is provided with a series of notches, to provide a better grip. These are cut with a three-cornered file. The location of the catch, and the position of the notches will be determined by whether it is to be used for holding the lower sash open or to prevent either sash from being opened.

Cleaner for Onion Sets

In some parts of the country, where onion sets are grown commercially, the customary method of cleaning them for



A Power-Driven Onion-Set Cleaner That will Save Much Time and Labor, and That may Easily be Moved to Any Convenient Location, may be Made by the Farm Mechanic in His Spare Time from an Old Wagon Gear and Some Lumber, Together with a Gas Engine

the market consists in running them through hand sieves, at the expense of much time and labor.

A power-driven machine that can be moved about to any location only requires the uncleaned sets to be placed in one end of the cleaner, the cleaned bulbs being caught at the rear of the device and removed.

A bottomless box, mounted on a low wagon gear, has a suitable crosspiece at the front end for bolting the small gas engine used. A similar, though somewhat smaller, box, as shown in the sketch, is provided with a screen bottom to form the sieve, or shaker. To each of the four corners of the shaker, a hammock hook is attached as shown, and a short length of link chain is provided for each hook. The shaker is supported from horizontal pieces, which are fastened to the uprights on the wagon box. Holes are drilled in the crosspieces, through which the chains are inserted and held in place with a long spike, so that the shaker can be made adjustable. In use, the open end of the shaker should be at a lower level than the closed end into which the sets are dumped.

A stout wooden brace is bolted securely across the shaker near the closed end, and this is connected to the wooden connecting rod by means of a heavy strap hinge, which is attached to both members by bolts. The opposite end of the connecting rod is fitted with a plain bearing, made of flat iron, for the crankshaft.

The crankshaft is made from round steel, and must be true and properly balanced, otherwise the shaft will cause vibration that would be troublesome. Provision is also made for attaching a pulley to the crankshaft to take the power from the engine, a belt being used.

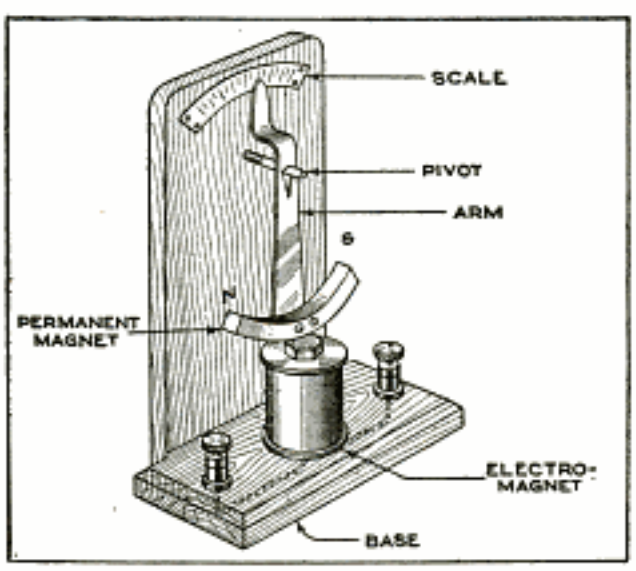
Plain bearings are bolted to the sides of the wagon box for the crankshaft, and collars are provided on the outside of the bearings to prevent sideplay in the shaft.

One or more strips of wood are placed across the bottom of the shaker, so that they will be above the surface of the screen and offer a barrier to the too rapid passage of the sets down the inclined plane.—George L. Emerson, Chicago, Ill.

How to Make a Simple Ammeter

Sometimes, for experimental purposes or in order to get a rough idea of comparative amounts of current flowing through a circuit, a simple ammeter is necessary; where a regular ammeter is not available, the one shown in the drawing will answer all requirements.

It is based on the well-known physical



A Homemade Ammeter by Means of Which the Electrical Experimenter Is Able to Make Reasonably Accurate Readings of the Amount of Current Flowing through a Circuit

principle that an electromagnet will attract either the north or south pole of a permanent magnet, according to the direction in which the current is flowing through the electromagnet.

Make a suitable wooden base and attach to one edge an upright board, about 6 by 10 in. In the center of the base, and close

to the vertical piece at the back, place an electromagnet, either bought for the purpose or made by winding a number of turns of wire around an iron bolt; this need not be elaborate so long as it creates magnetism.

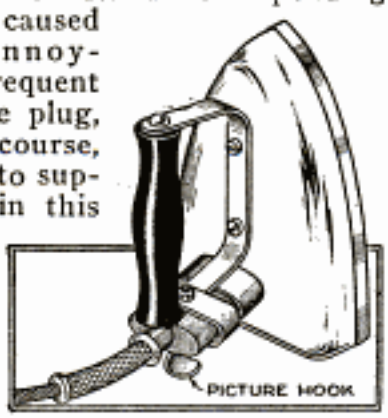
Next, cut out an arm about 6 in. long, of stiff brass; point one end and cut an opening in the arm, wide enough, and of such a shape as to permit the arm to swing without sliding, 4 in. from the lower end. The bottom, or blunt end, of the pointer is fastened to the center of a piece of magnetized steel, formed in the shape of an arc with a 4-in. radius. Then hang the arm in position by placing the slot over a screw driven into the back board, in such a position that the steel magnet will swing about ⅛ in. above the coil. The screw should have its top surface filed down to a knife-edge so that the pointer can swing with the least possible amount of friction.

Connect the electromagnet to the two binding posts and then make a scale which can be tacked to the back under the end of the pointer. The instrument should be tested with a regular ammeter and the readings marked accordingly on the scale.

When using, set the instrument in a steady position so that the pointer will be at the center of zero point of the scale, and connect the magnet to the source of current; the action of the electromagnet will then pull one end or the other of the magnet down to it, which will swing the pointer either to the right or left and indicate the amount of current.—L. B. Robbins, Harwich, Mass.

Stand for an Electric Iron

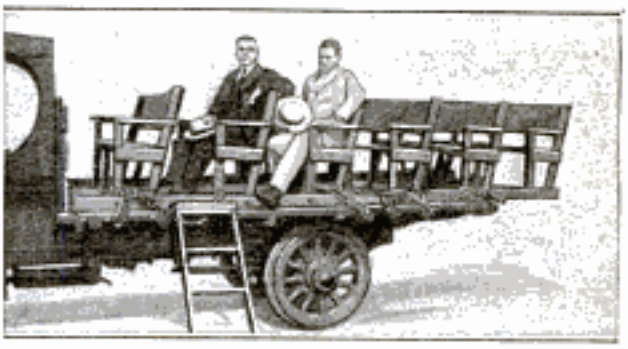
An electric iron that was not provided with any form of stand for upending while heating, caused considerable annoyance through frequent breakage of the plug, which was, of course, never intended to support the iron in this manner.



The cause of the trouble was quickly eliminated by drilling a hole in the rear handle support and bolting a simple guard to it in the manner indicated. For this purpose an ordinary brass hanger, such as used to hang pictures, was found to answer very well.

Detachable Seat Unit for Trucks

Every owner of a motor truck has a potential "rubberneck wagon," with which



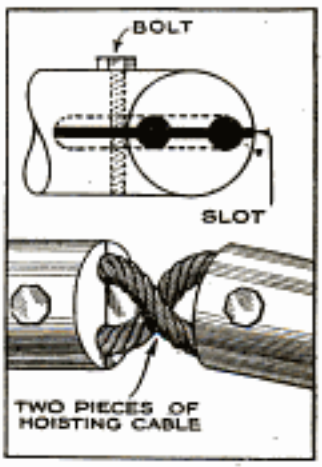
Every Owner of a Motor Truck can Convert His Vehicle into a Passenger-Carrying "Rubberneck Wagon" for the Conveyance of Sight-Seers and Outing Parties

he can earn extra money by hauling outing and sight-seeing parties.

The photograph shows a detachable seat unit which is set on the regular truck body as the occasion may demand. The whole arrangement is made of wood bolted together and lashed to the body with ropes, although a neater effect would be obtained by using bolts. In figuring the seating capacity, 18 in. should be allowed for each passenger.—Geo. B. Morris, Pasadena, Calif.

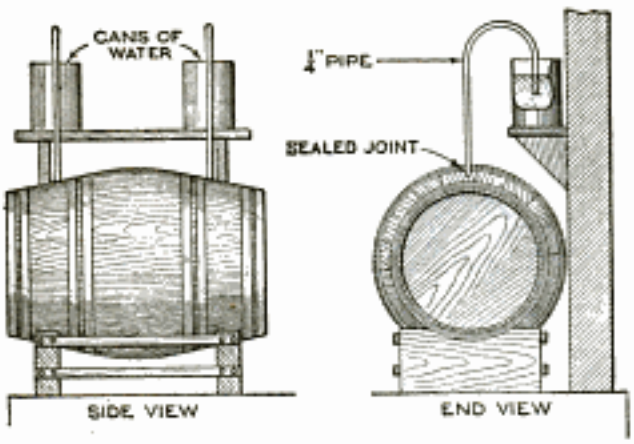
An Emergency Universal Coupling

Having need of a universal coupling, I made one by connecting the ends of two shafts with short lengths of wire hoisting cable. This was done by drilling holes in the ends of the shafts, as indicated, and then slitting through the centers of the holes with a hacksaw. A tapped hole in each shaft was fitted with a setscrew for tightening up the cables, as shown in the drawing. The cable should be lubricated with graphite grease. This may be done by untwisting the cable slightly, before assembling, and forcing the grease between the strands. This will aid materially in lengthening the life of the coupling, and in decreasing the possibility of breakage when used in locations where it may be exposed to rust.—Irvin T. Fox, Richmond, Ind.



Keeping Cider Barrels Air-Tight

Anyone familiar with the action of cider, and similar fruit juices, knows how important it is to use care in permitting



A Simple Method of Keeping Air from Spoiling Cider, and Similar Fruit Juices, Utilizes an Easily Made Water Seal, Which Permits the Gases within the Barrel to Escape Freely without Admitting Air

the gas developed by the initial fermentation to escape, without admission of air, if the product is to be kept in good condition.

The simplest method of doing this is shown in the drawing. Place the barrel on its side, as indicated, and drill a hole in the side near each end; insert a short length of ¼-in. pipe into each hole, and make the joints air-tight with melted paraffin or sealing wax. The outer ends of the tubes are submerged under water in the manner shown. The pressure which develops inside the barrel will be strong enough to force the gas out through the water, but none of the outer air can get in. Barrels of cider can be kept for long periods in good condition without blowing up or turning into vinegar by this method.—L. H. Georger, Buffalo, N. Y.

Laying Oak Flooring

Oak flooring should never be laid in a new building while the walls and plaster are damp; in fact, it should be the last thing installed in a house. It is most important that brick, stone, concrete, and all similar materials, be dry before the flooring is laid.

In winter building, flooring should never be laid without heating the rooms, as trouble will be encountered, due to dampness, should this be neglected; where ⅜-in. flooring is laid during the summer months, with the first chill or dampness, the rooms should be heated at least once each week. This is particularly necessary with this thin flooring, as it is subject to greater shrinkage than the 13/16-in. material. Through prolonged cold, wet spells, during any season, heat should be introduced into the rooms at least once a week. A subfloor should be used under both 13/16 and ⅜-in. thicknesses; this should be reasonably dry and laid diagonally. Shiplap, 6 or 8 in. wide, is preferred. It should not be put down too tight, and should be thoroughly dried and cleaned before the oak flooring is laid.

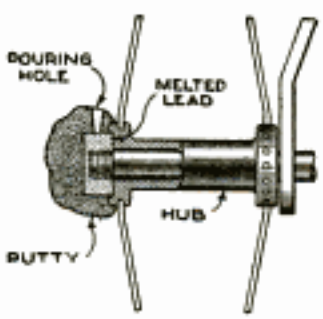
It is well to use damp-proof paper between the oak and the subfloor. This must not be ordinary building paper, or resin-sized stock; only a small quantity is required, and the very best damp-proof stock should be used.

Allow about ½ in. space on all sides between oak flooring and the baseboard, to allow for expansion, should any dampness later get into the floor. This space is covered by the base molding.

All tongued-and-grooved flooring should be blind-nailed, using eight-penny steel-cut flooring nails for 13/16-in. stock; for ⅜-in., use three-penny cement-coated wire finishing nails. The maximum distance between nails for ⅜-in. flooring should be 8 in.; for 13/16-in. stock, 16 in.; and care should be used in nailing.

An Emergency Left-Hand Nut

Trying to obtain a left-hand nut from the usual sources of supply is usually of no avail, for the average hardware store does not carry such an article, and it requires a left-hand tap, or a lathe, and considerable mechanical skill, to turn a left-hand internal thread.



The drawing shows how an emergency nut was made for the left-hand axle of a baby carriage, from which both the nut and protector cap had been lost. A piece of putty was formed over the nut on the right side, and this improvised mold was set up over the threaded end of the left axle from which the nut was missing. A small amount of melted lead was then run into the cavity around the end of the axle, and formed a very serviceable nut. A tin cap was fashioned to conceal it, as on the other wheels, and the makeshift repair answered all requirements until the youngster no longer cared to ride in his carriage.—Frank W. Bentley, Jr., Missouri Valley, Ia.

CONCRETE GARDEN FURNITURE

By Donald MacKay

Part V — Ornamental Pools

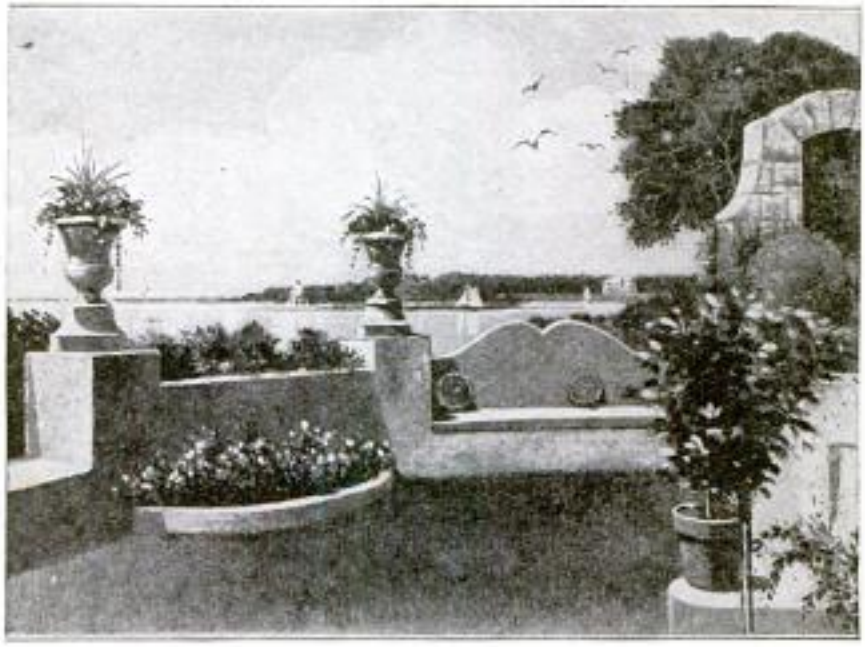
THE appearance of even the simplest garden may be considerably enhanced by the addition of an ornamental pool, of a size suitable to the surroundings. The construction of the garden pool is simple, and, with or without the presence of aquatic plants, a note of dignity and attractiveness is added to the garden by the cool, quiet water.

The selection of the site, while governed, of course, by the space available, and by consideration of the other details of the garden, is important, and should be given careful thought. The ground must be firm and well drained, to afford a good foundation for the walls and floor. The weight of the water and concrete in a pool of fair size is considerable, and if the ground does not afford a solid support, there is some danger of settlement, with resulting cracking of the concrete. The quality and method of placing the concrete, the reinforcing, the forms used, and the method of surface finish are all important considerations, if the resulting walls are to be smooth, dense, and water-tight.

The foundations, as shown in the detailed illustration, should be carried down below the frost line, the drain pipe being led out underneath the footing. The forms should be made, for the rectangular pool, of 1-in. lumber, and, to insure a smooth, dense face on the wall, should be planed on both edges and face, carefully matched, and water-tight, as a small leak in the surface of the forms will allow the cement to run through, thus leaving an air pocket in the surface of the wall.

Particular attention should be paid to the bracing of the forms; the best method is shown in the illustration. In addition to woven-wire reinforcing, shown by the dotted line in the cross-sectional view, ⅜-in. rods are used in the side walls; three on each side and end will be enough, spaced about 6 in. apart.

The concrete used is what is known as a 1.2:4 mix, that is, a mixture of 1 part Portland cement, 2 parts clean sharp sand, and 4 parts of clean broken stone. An estimate of the amount of material needed for a rectangular pool of the dimensions shown is: cement, 9⅓ bbl.; sand, 2.8 cu. yd.; broken stone, 5.61 cu. yd.; woven wire, 65 sq. yd., and ⅜-in. rod, 140 ft. When the outside forms are in place, and the foundation laid, adjust the woven-wire reinforcing as shown by the dotted



Various Pieces of Concrete Garden Furniture Combined to Make a Most Attractive Ensemble: Note the Simple Semicircular Flower Bed

line, place the inside forms in position, then fill in the concrete, which must be of a "mushy" consistency, spading it well next to the forms, and laying in the ⅜-in. rods in the proper positions. By spading is meant the thrusting of a thin paddle

A Pleasing Concrete Lily Pool of Suitable Size for the Small Garden

between the newly placed concrete and the form, to obtain a wall surface free from pits and voids. A hoe, straightened out in line with the handle, makes a good tool for this purpose, or a thin wooden paddle may be used. The inner forms may be removed in about 24 hours, and the face of the walls painted with a cement and water mixture, to make the surface more dense.

It should be noted that the inner form must be set to slope, as shown. This is necessary because, when winter sets in, and ice forms in the pool, the ice will slip up the sides, instead of exerting its thrust straight against the face of the walls, as it would if the faces were vertical.

The following materials will be necessary for the construction of a circular pool of the dimensions given: cement, 9½ bbl.; sand, 3 cu. yd.; broken stone, 5.62 cu. yd.; woven wire, 75 sq. yd., and ⅜-in. rod, 110 ft. This pool may be constructed by using silo forms, if these are available; if they are not, sheet-metal forms will be found just as good. The method of reinforcing, placing the concrete, etc., is similar to that used in making the rectangular pool, but the inner face, to save trouble in making the form, should be left vertical, removing the inner form as soon as possible and forming the interior slope with cement.

The walls and bottoms of the pools should be wetted at least twice a day for about two weeks, to assist in curing the concrete, and the pools should not be put into service until the end of this period.

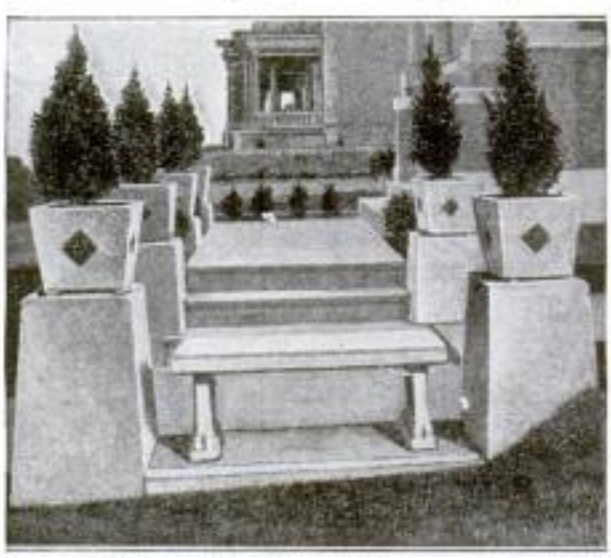
The best method of keeping the concrete wet is to cover all the exposed surfaces with canvas, wetted frequently. Another method of preventing the floor from drying too rapidly is to cover it with a layer of earth, 7 in. deep, sprinkling this thoroughly, together with the walls, several times a day.

At the end of the curing period, the floor should be covered with about 1 in. of water, this depth being gradually increased, until, at the end of about 20 days, the pool is filled with water.

It may not be amiss to give here a list of aquatic plants best suited for small pools. Among the *nymphæas,* or water lilies, the following varieties give best results: *N. Graziella, N. Aurora, N. fulva, N. pygnæa, N. pygnæa,* var. *helvola.* Parrot's feather, water snowflake, water poppy, and pickerel weed are also suitable, while papyrus forms a very attractive centerpiece around which to group smaller plants.

Many of the foregoing instructions apply with equal force to the construction of swimming pools, although somewhat greater care must be used in the selection of a suitable site, and in the reinforcing of the walls and floor.

As it is not possible to lay the floor of a large pool in a single day, joints must be provided at the end of a day's work. A ½-in. strip of wood, afterward removed, will form this joint. The open joint is



Simple Pedestals, Benches, and Flower Boxes Add Considerably to the Appearance of the Formal Garden

afterward filled with a bituminous sealing compound. A similar joint must be pro-

vided at the junction of wall and floor, and V-joints to provide a proper bond between previously laid material and the new concrete must be left in the walls.

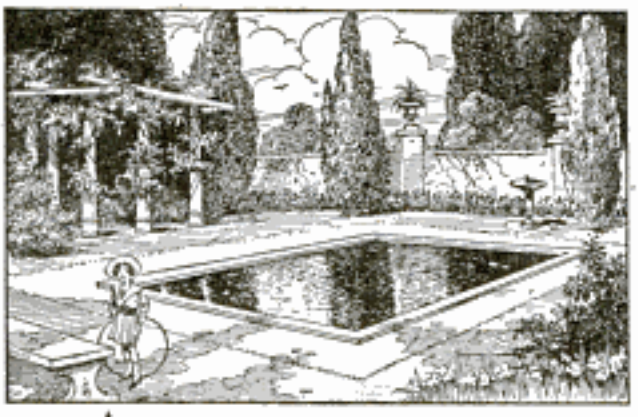
The fittings for a swimming pool will, of course, depend upon personal preference. A springboard is almost a necessity, and steps or climb-out ladders, the latter preferably of U-shaped iron rods, with the ends imbedded in the walls, should be provided for convenience of the bathers.

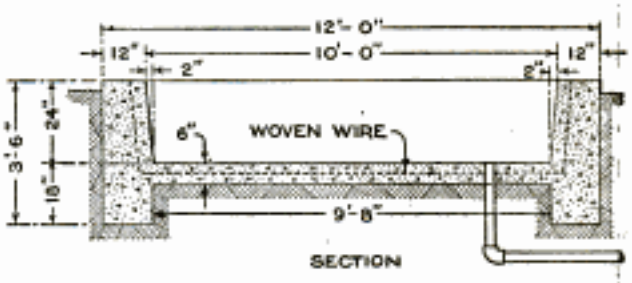
A concrete walk, rough-finished to prevent slipping, should run around the pool; this should not be laid until the backfill around the walls has settled for a period of several months; this will prevent the concrete walk from cracking.

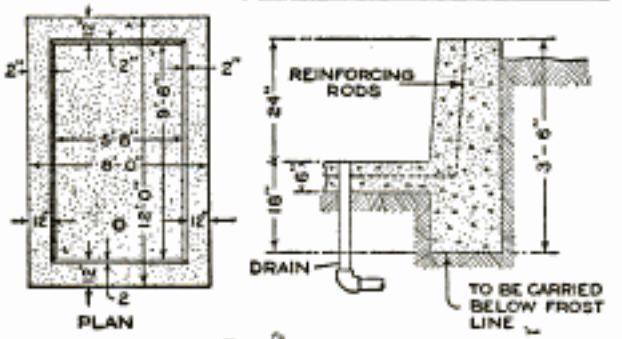
Wading pools are a godsend to the youngsters in hot weather, and will more than repay the effort of construction. They may be built with gradually sloping sides, dispensing with the wall and footing, and rough-finished with a wood float, to eliminate the danger of slipping. In these, as in all other pools, the underlying earth must be compact and firm, to support the concrete and prevent cracking.

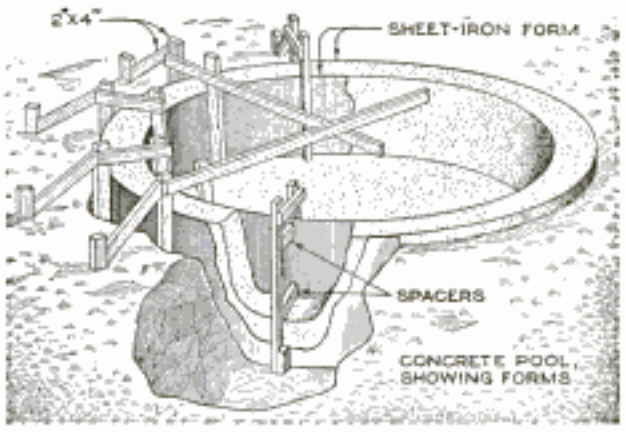
The various types of garden furniture described in this series by no means exhaust the subject. The illustrations show what may be accomplished by grouping several pieces such as vases, pedestals, benches, etc. Small semicircular flower beds, set against, or made a part of, the wall, relieve the monotony of a long wall, and are very easily made; to the ingenious reader, many other combinations will suggest themselves.

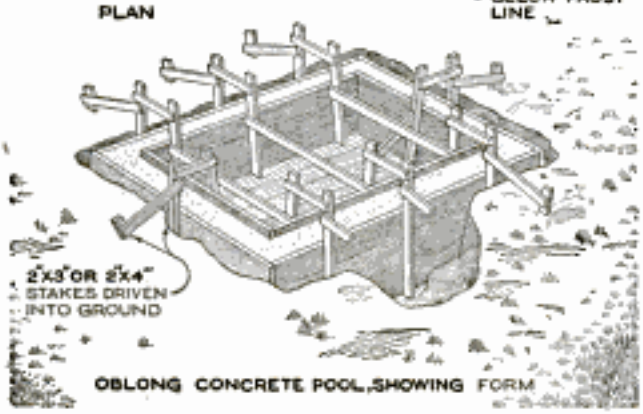
In conclusion, I may say that the worker will find the making of garden furniture in concrete a very interesting pursuit, and the articles produced are a permanent addition to the attractiveness of the home site.

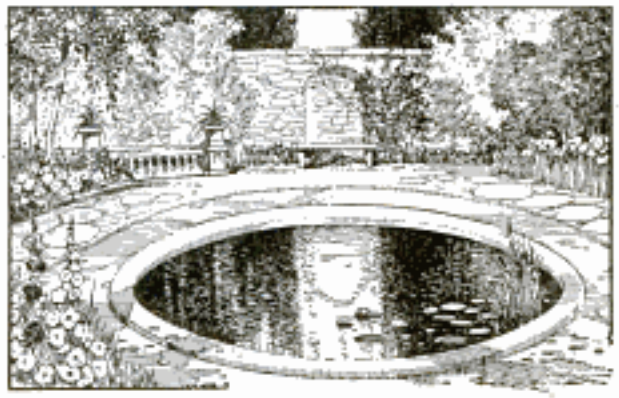








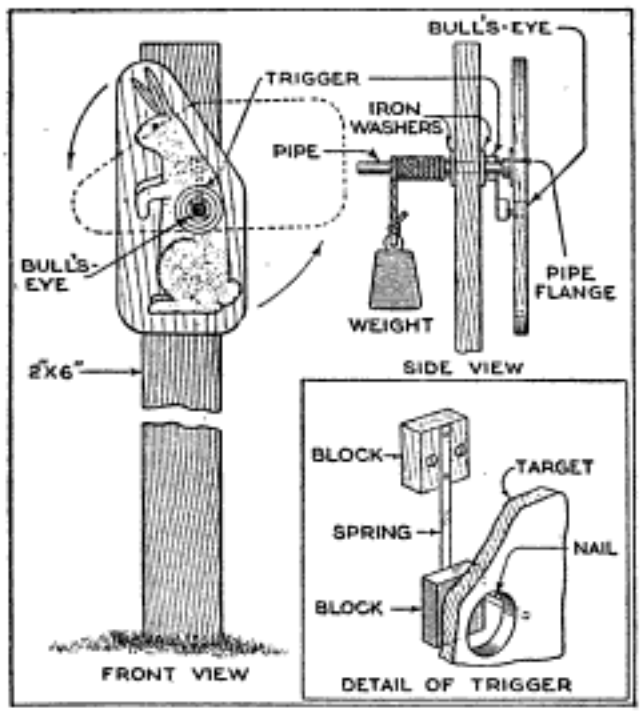




Dimensions and Full Details of Two Easily Made Garden Pools: This Work Is of the Simplest Nature, and the Results will Be Very Pleasing If Proper Care is Used in the Selection of a Site. Aquatic Plants, Such as Water Lilies, Parrot's Feather, etc., may be Used in the Pools if Desired

The Somersaulting "Bunny" Target

The somersaulting "bunny" target shown in the drawing is intended for target practice with the bow and arrow,



Whenever the Marksman Makes a Bull's-Eye on This Target the "Bunny" Makes a Complete Somersault, and Turns Again to an Upright Position Ready for Another Shot

but, by substituting sheet-iron parts for the wooden ones described, it may be used as well for small-caliber rifle practice.

The rabbit is outlined on a 10 by 24-in. board with the rings and bull's-eye of the target a trifle off center to the right; the bull's-eye is formed by drilling a 1½-in. hole through the board.

A 2 by 6-in. post is used for supporting the target, which is mounted on a shaft so as to revolve freely. A piece of gas pipe, about 12 in. long, will answer for the shaft; this is inserted through a hole drilled in the post, and is attached to the back of the target with a floor flange. A washer on each side of the post, together with cotter pins driven through holes in the shaft, serve to maintain the proper space between the post and target for the operation of the trigger.

The trigger is made by fastening two blocks of wood to the opposite ends and sides of a piece of spring steel. One of the blocks is nailed to the post, in such a position as to bring the other block directly behind the bull's-eye block, and, by bearing against a nail in the back of the target, to hold the rabbit vertically until the trigger is released by a properly placed shot.

The somersaulting effect is produced by the weight arrangement shown in the drawing. A piece of stout twine is wound around the projecting end of the shaft, behind the post, and a weight is attached to the free end. The target remains stationary until a lucky shot springs the trigger; the weight then unwinds the rope, and the rabbit makes a complete revolution, the nail striking the block again and stopping the target when it is in an upright position.

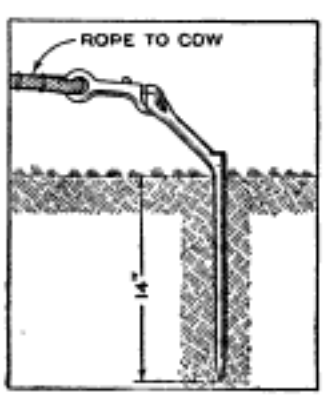
From 10 to 20 bull's-eyes may be recorded by the somersaulting bunny, according to the number of turns of rope around the shaft, before it is necessary to rewind it.—G. E. Hendrickson, Argyle, Wisconsin.

Filling a Blown-Out Tire with Water

A motorist, having experienced a blowout on the road far from any garage or repair shop, found that he was without the necessary repair materials which every car owner should carry. In this emergency the idea of filling the tire with water occurred to him, and, as the water did not leak out as rapidly as the air, the trip to the nearest garage was made without running on the rim or damaging the tire. The water was injected into the tire with the pump.—L. E. Brundage, Norwood, Colo.

A Revolving Tether Stake

Owners of live stock know the disadvantages of tethering their animals to a simple stake driven into the ground. One of two things generally happens: the animal winds the rope around the stake or else, pulling the stake, strays.



The revolving tether stake shown in the drawing is forged from a 22-in. piece of 1-in. round iron rod. The vertical portion of the stake is 14 in. long, and the bend, which is made at an angle of about 45°, takes up the additional length. An eye is formed in the upper end of the stake, and a shoulder is forged on the outside of the angle, as indicated, to aid in driving the stake into the earth. As the animal grazes, the stake will turn but will not pull out.—G. A. Tibbans, Galena, Kan.

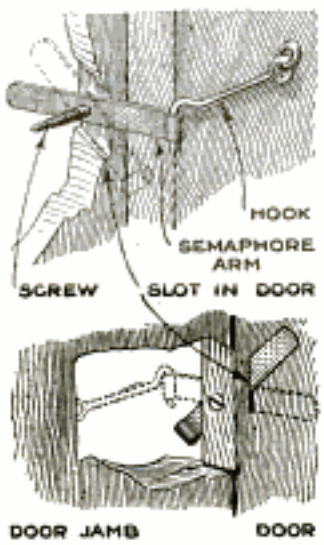
Avoiding Dry Rot under Linoleum

When linoleum is fitted closely to the baseboard of a room, it often contributes to dry rot in the floor, as it prevents proper circulation.

It is better to leave a margin of a few inches around the linoleum, but, if this cannot be done, and the covering is fitted closely, it should be taken up occasionally to allow the floor surface to be aired.

Semaphore Lock for Locker Doors

The bathhouse of an Ohio summer resort has its locker doors equipped with a simple device that indicates at a glance just what lockers are in use. Instead of the usual knobs and locks, an arm of stiff sheet iron, about 2 by 7 in., is thrust through a slot cut in the door about 1 in. from the edge. The arm is pivoted near its center by a long screw that passes through it from the edge of the door. An eye is formed on the inside end of the arm in which a common screen-door hook catches. When the door is thus hooked, the outer end of the arm extends horizontally, indicating that the locker is occupied; when the door is unlatched from within, the inner end of the arm, being heavier, falls and pulls the outer end upward, showing that the locker is unoccupied.—Curtis Ralston, Springfield, Ohio.



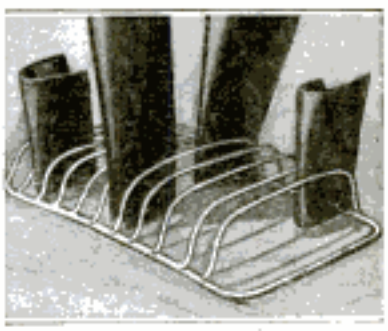
Picric-Acid Solution for Burns

A solution of picric acid, made by dissolving 30 gr., or ½ dr., of picric acid in 1 pt. of water, is a very effective remedy for burns. This solution relieves the pain very quickly, and by its antiseptic action promotes rapid healing. The picric-acid solution also leaves a persistent yellow stain, but the patient is usually less concerned with this than with the alleviation of his suffering.

However, while this solution is perfectly safe when used on burns of limited area, it is likely to cause poisoning by absorption, when applied to a large surface that has been denuded of skin.

Rack for Developing Cut Film.

Amateur photographers using cut films can save some of the time and bother involved in developing each film individually by an adaptation of the tank system for treating all the films at one time.

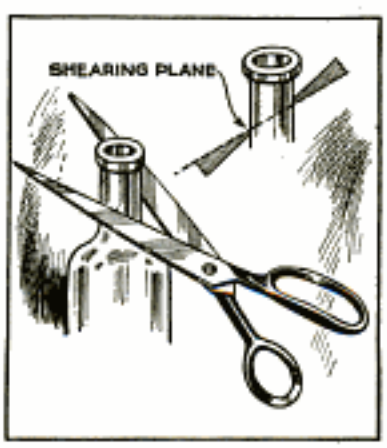


The drawing shows how a simple soap dish can be used as a rack to hold the films in the solution. Roll films can also be held in the same manner by folding them in a "wave" formation, with loops, about 2 in. long, inserted on each side of the wires.

The tank can be made from any earthenware vessel large enough to hold the rack and films. Care should be taken, of course, to prevent parts of the films from coming into contact with each other, as this would cause spots. The films can be removed from the developer, rinsed off in clear water, and placed in the fixing and washing baths without removal from the holder.—R. U. Clark III, Newton, Mass.

Sharpening Scissors on a Bottle

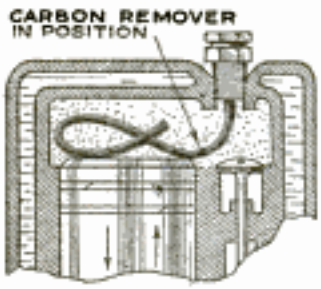
One reason why scissors fail to cut is that the edges, which should come together and cut the material in passing each other, are somewhat rounded and merely pinch the material between them instead of cuting it.

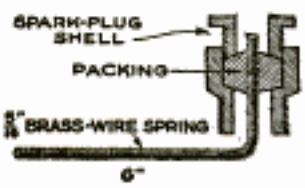


To turn up the edges somewhat and restore the sharpness to a pair of scissors, place the neck of a small bottle between the blades, as though about to cut it. Hold the scissors at an angle, so that the edges of the cutting blades are turned inward; open and close the scissors several times, and allow the cutting edges to slide back and forth on the glass surface. This operation turns over a new sharp edge on both blades, and causes them to meet more closely.

Spiral Spring Removes Carbon

Brass wire of small size, closely wound into a spring the diameter of a pencil and attached to the shell of an old spark plug, as indicated in the drawing, makes a serviceable and inexpensive tool for beating carbon accumulations loose from the cylinders and pistons of an automobile engine.

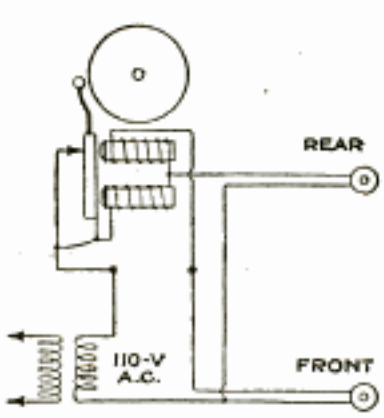




The spring extends about 6 in. inside the cylinder, and is rapidly driven about by the moving piston while the engine is being run on the other cylinders. Brass wire only should be used for the spring, as it will not score the cylinder walls, and the spring should be sufficiently flexible to drop with and follow the piston in its movements. Particles of carbon being discharged through the exhaust may be accepted as evidence that the spring is doing its work properly. In the case of very oily carbon, a little kerosene poured into the top of the cleaner plug, so that it will flow down through the spring, will assist materially.

Bell Gives Two Distinct Signals

In the installation of doorbells it is customary to use both a bell and a buzzer, in order to distinguish between signals from the front and rear doors. By the arrangement described, the buzzer is eliminated, and the bell circuit so modified that one bell will give two distinct signals, a ring when the button at the front door is pushed, and a buzz when the button at the back door is operated.



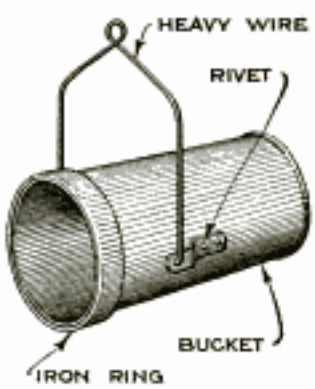
A tap is taken from the bell winding at the point where the ends from the two coils are connected together. This tap, of insulated wire, is brought out through a hole in the base, or a slit under the cover of the bell, and the circuit is wired as in the drawing. The clapper is adjusted so that the hammer is 3/32 in. from the bell when the armature is at rest.

Current flows through only one coil of the bell when the button at the back door is pressed. While the magnetic energy of this single core will be sufficient to operate the armature, the clapper is not brought up forcibly enough to have the 3/32-in. overthrow necessary to strike the bell. Consequently, instead of ringing, the bell simply buzzes. If, however, the button at the front door is pushed, both of the bell coils receive current in the usual manner and the magnetic effect of the cores is, in this case, sufficient to cause the armature to operate with such force that the clapper strikes the bell.

If batteries are used in place of a transformer, the circuit is the same as shown, with the exception that the interrupter contacts are not short-circuited.—H. H. Schneckloth, Omaha, Neb.

A Weighted Well Bucket

Everyone who has had occasion to draw water from a well after "the old oaken bucket" fashion knows how provoking it is to drop the bucket into the well and have to shake it around in order to make it overturn and fill with water.



This difficulty can be overcome by riveting an iron ring to the top of the bucket, thus making it top-heavy when empty, and placing strap-iron ears so arranged that the bucket, when empty, will swing to the position shown in the drawing. When filled, the additional weight of the water below the ears will keep the bucket upright.—W. W. Parker, Lead City, S. D.

Softening Hard Putty

Putty that has become hardened by exposure, as around window glass, may be softened and removed by the use of the following mixture: Shake 3 lb. quicklime in water and add 1 lb. pearlash, making the whole about the consistency of paint. Apply to the putty on both sides of the glass and let it remain for about 12 hours. The glass can then be lifted out without trouble.

Tested Radio Grounds

By F. L. BRITTIN

A GOOD ground system makes great things possible for the radio enthusiast. The grounds of the government and commercial stations are very complex and cover large areas. The average amateur does not give enough attention to his ground system; this is a mistake, as no matter how good the apparatus may be, its efficiency is no greater than that of its weakest point.

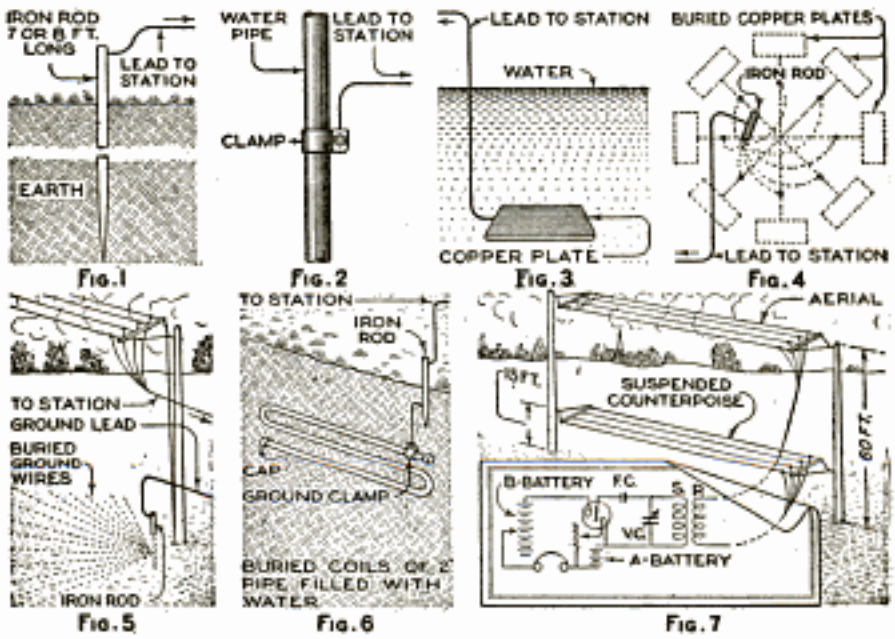
Soldered joints and a fairly heavy ground lead, preferably of the seven-strand, rubber-insulated type, should be used, and in choosing the best method for grounding the station, the fact that the wave length is governed by the length of the ground lead as well as by the length of the aerial must be taken into consideration. The total length of the aerial is always measured from the far end of the aerial to the ground; after reaching the ground, the main thing is to get a good "hold" on it.

Many methods are in use, but those shown in the drawing give the best results. Figure 1 shows the most common method, consisting of a 7 or 8-ft. iron rod driven into the earth with the lead to the aerial switch securely soldered to it. A hole should be drilled through the upper end at the point of connection so that the wire may be threaded through it before soldering, thus insuring a tight joint. The method shown in Fig. 2 is another much used system, and consists in grounding to a water pipe by means of a clamp. The pipe should be scraped free of all paint before the clamp is applied. The water ground illustrated by Fig. 3 is very efficient, although not a common one, as the water is not usually at hand; a near-by well or cistern can be used by soldering a metal plate, preferably copper, to the end of the lead, and dropping the plate into the water.

The buried-plate ground is shown in Fig. 4, and consists of a number of copper plates buried in the ground, the leads being connected at a common point. One of the best systems in use is the buried-counterpoise type, shown in Fig. 5. A number of trenches, about 10 or 15 in. deep, are dug, radiating in all directions under the aerial, and No. 12 bare copper wire is buried in them and brought together to a common point, whence the lead is taken to the aerial or so-called lightning switch. Twice as much wire is buried as there is in the aerial; this makes the best ground known, especially when used in connection with the water ground in Fig. 3. A type of ground that has been used with excellent results is shown in Fig. 6 and consists of a coil of 2-in. pipe, filled with water, and buried 5 ft. under ground. A suspended counterpoise is illustrated in Fig. 7; this consists of a second aerial suspended directly underneath the aerial proper and connected to the instruments in the manner indicated. The results from this method are good when the counterpoise is suspended about 15 ft. above the ground.

Whenever the ground or aerial is changed or altered, the operator should use his wave meter to be sure that he is keeping within the 200-meter limit, and should retune his transmitter.

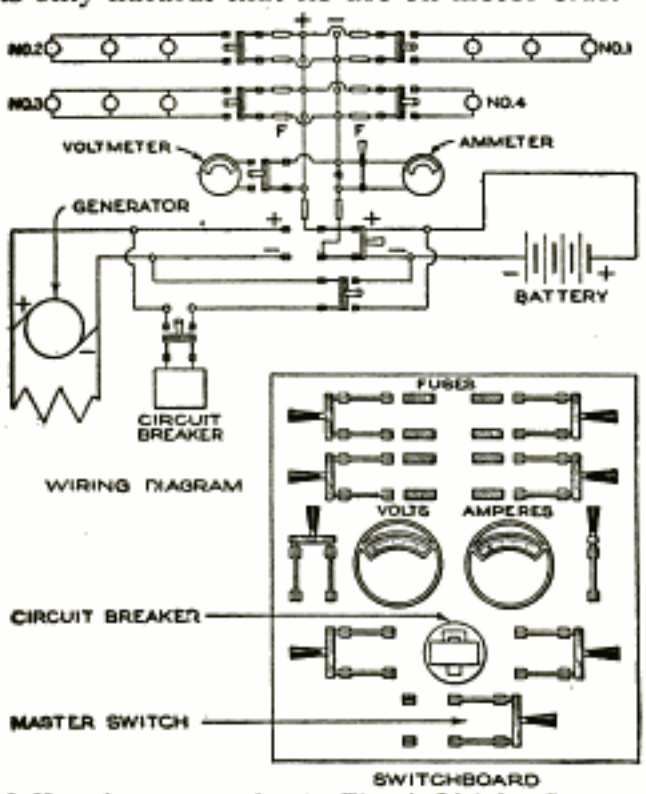
Apropos of the 200-meter wave limit, all amateur stations should make an effort to get down to this wave length. Nothing will hurt the amateur radio enthusiasts all over the country so much as disobeying government regulations. The amateur generally seems to be under the impression that his infraction of this rule passes unnoticed; this is not so, and, if present regulations are not adhered to, the result will be that stricter laws will be passed and enforced.



A Number of Different Methods of Grounding Amateur Wireless Stations, by Means of Which the Efficiency of the Average Apparatus may be Materially Increased

Motorboat Illumination

Because electricity lacks the dangerous and disagreeable characteristics of oil, it is only natural that its use on motor craft



A Neat Arrangement for the Electric-Lighting System of a Motorboat or Cruiser: An Automobile Generator may be Used to Furnish All the Current Required, While a Storage Battery Takes Care of Emergency Demands

of various styles is becoming more and more common.

The electrical system shown can be easily installed, and advantage is taken of the efficiency of tungsten lamps operated from a six-volt current. Also, on account of the low voltage, No. 14 gauge rubber-insulated wire can be used without the trouble and expense of putting it in metallic conduit.

A generator having an output of from 6 to 8 volts, and an amperage of from 6 to 10, is needed to furnish the charging current. This is about the capacity of the average automobile generator, and as these can be picked up cheaply from wreckers and secondhand dealers, the cost will not be great. Such generators are usually designed to be driven by a silent chain, and this arrangement should preferably be adhered to, as the drive is more positive than a belt drive. The storage battery for emergency purposes can be concealed in some accessible locker from which the corrosive acid fumes can be carried away by ventilation.

The drawing shows the appearance of the small switchboard and its wiring arrangement for use with such a system; it is divided into four circuits, with a volt and ammeter, a main switch, and a small circuit breaker. It might be mentioned that the knife switches shown can be replaced by the smaller and neater snap switches. Circuit No. 1 takes care of the three running lights, port, starboard, and mast; circuit No. 2 is connected to the toilet, galley, binnacle, or an engine-trouble lamp as desirable, while circuit No. 3 controls the cabin lights, and circuit No. 4 takes care of the searchlight. Naturally, the circuits and their arrangement are merely suggestive, but represent typical practice.

All the running lights should be controlled directly from the switchboard, but the others may be placed in key sockets.

During charging, it will be seen that both volt and ammeters can be used, provided all the lighting circuits are open. The circuit breaker should be set for the correct charging current, and will take care of this automatically. However, the circuit breaker can be dispensed with by frequently observing the fluctuations of the voltmeter. Fuses in each circuit are inserted to prevent the battery from injury through a short circuit.

Silencing a Wheelbarrow

The park commissioner of a western town believes that there are more agreeable sounds than the distressing and nerve-shattering screech and squeak of a rusty wheelbarrow. Accordingly, all the wheelbarrows used by his department were fitted with grease cups as shown. A hole was drilled and tapped through the hub of the wheel to take the grease cup. Not only was all the undesirable noise eliminated, but as the friction of the wheel on its unlubricated shaft was materially reduced, it was much easier to push the loaded barrows.

Making Contrasty Prints from Flat Negatives

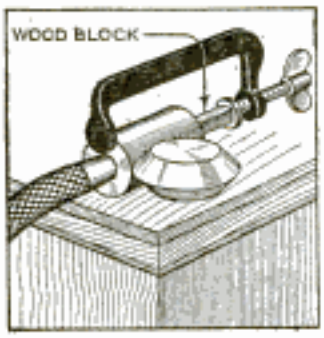
Very frequently negatives are underexposed, and yield, with printing paper of "medium" contrast, a very dull and lifeless print. If the "hard" or contrast grades of paper are not at hand, bright prints can still be obtained from almost

any negative of this character by varying the duration of development.

Expose the print for about one-fifth the ordinary time, and then place it in developer that is about one-fifth the normal strength. The image will develop very slowly, but if left in the developer for the proper time, which is somewhat longer than normally required, a bright print will be the result.

Removing Corroded Cable Terminals

Pounding with a hammer, or forcibly jerking the cable to loosen a corroded storage-battery connection is quite likely to result in broken battery plates or cell jars, while using a spike or bolt to drive out the terminal usually damages the terminal threads so that trouble will be experienced in getting the terminal nut to screw in properly. All injury to the battery and terminal will be prevented by the use of an ordinary screw clamp and a short wooden plug applied to the connection. The plug bears against the end of the terminal, and as pressure is applied by turning the screw, the cable is forced out.



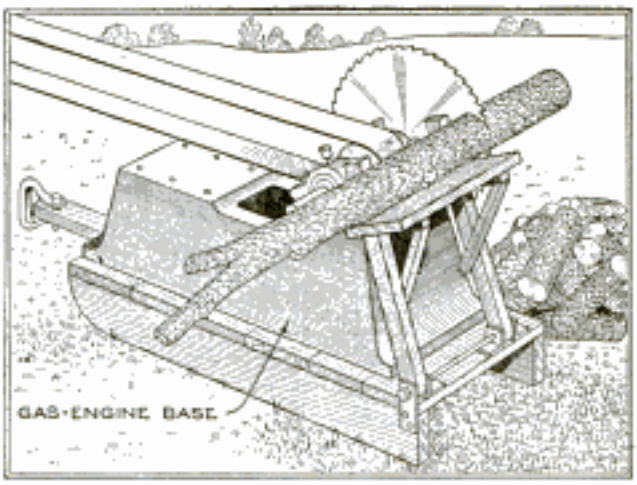
A Bedtime Savings Bank

The drawing shows an interesting and original method of "banking" small change, that is proof against the attacks to which earthenware pigs and similar "banks" are subject.

Immediately below one of the ornamental caps of a tubular bedstead a slot is cut out with a hacksaw just large enough to receive the largest coin likely to be inserted. An examination of the bed should first be made to determine whether the casters can be removed to permit "withdrawals."—Norman Hazen, Montreal, Que.

Saw Frame from an Old Engine Base

The cast-iron base of an old gasoline engine can be converted into a most substantial frame for a pole or cordwood saw,



The Base of a Discarded Gasoline Engine Mounted on a Wooden Sled may be Used to Make a Most Substantial Frame for a Circular Saw for Cutting Up Poles and Cordwood

and but very little work is required to convert it to its new purpose. Such old engines can usually be picked up at implement stores and scrap yards at junk prices. The base is stripped clean of everything—cylinder, crankshaft, and the like—and mounted on a pair of 3-in. plank runners, with a short tongue attached to the rear end for moving it from place to place.

A piece of steel shafting is obtained, and one end of it is threaded to take a nut holding the saw. Two collars, several inches in diameter, are also provided for this, the inner one threaded to fit the shaft, the outer one a loose fit on it; also, a suitable pulley is attached. If the saw mandrel thus made is smaller than the engine bearings, the old babbitt is removed and the bearings are rebabbitted to fit the mandrel.

The logs are held to the saw on a swinging table attached to the sled, as shown in the drawing.

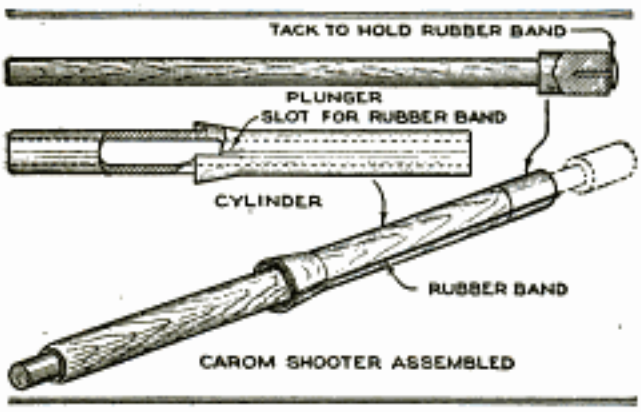
The cast-iron frame will not twist and bind the saw mandrel, and has sufficient weight to hold it to the ground with little or no staking to hold it against the tension of the belt.—G. G. McVicker, North Bend, Neb.

A Simple Carom Cue

Shooting the pieces with the fingers, as in such games as carom and crokinole, is sometimes quite painful, and at no time can the player direct his shot to the best advantage.

To overcome these objections, the cue

shown in the drawing was developed. It can be easily made from two pieces of round wood, the larger being bored to fit



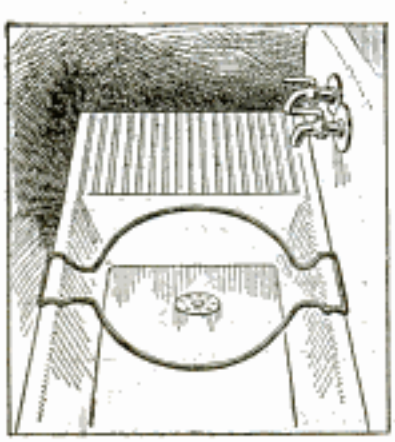
An Easily Made Cue for Playing Carom and Crokinole That Makes More Accurate Shots Possible and Relieves the Fingers: The Plunger is Operated by Rubber Bands

the smaller piece, which acts as a plunger. A shoulder is cut on one end of the plunger to limit its travel, and a tapered, undercut shoulder, having slots cut on opposite sides to hold the rubber bands, is formed on the cylinder. Two rubber bands are used, which extend from the shoulder on the cylinder to the end of the plunger, where they are secured underneath a tack, as shown.

In use, the cylinder is held in the left hand and the plunger is pulled back with the right. When the cue has been properly lined up with the piece to be shot, the plunger is released. "Hard" or "soft" shots can be made with this cue, depending altogether upon the distance that the plunger is pulled back.—Lester A. Hitchcock, Kewanee, Ill.

Overcoming Disadvantages of a Narrow Sink

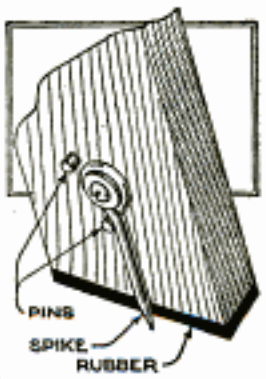
Many people experience the annoyance of having to use standard-size kitchen utensils in the miniature sinks that some builders insist upon installing in present-day apartments and houses. In many cases the sink is so small that the housewife has difficulty in getting a regulation - size dishpan or washbasin to fit into it. This condition can be overcome by taking a piece of heavy wire, or light iron rod, and bending to the shape indicated in the drawing, making the diameter suited to that of the basin. This frame can be placed to rest on the edges of the sink when wanted, and hung underneath when out of service. It is also of advantage when the sink, although perhaps wide enough, has been set too low, as the pans or basins will be raised to such a height that dishwashing will no longer be a back-breaking task.—Lloyd R. Dickens, Stratford, Ont.



Safety Attachment for a Ladder

Bad falls are sometimes the result of a slipping stepladder, and as it is always better to be safe than sorry, the ladder should be safeguarded against slipping.

The drawing shows how the ladder may be made safe by gluing a piece of old automobile inner tube to the bottom of each leg; this will effectively prevent any tendency to slip when the ladder is used on smooth, polished floors that must not be marred.



The spike is used on rough floors, concrete, etc., where the slight mark made by it will not be objectionable. When in use, the spike, which is pivoted on a screw, bears against the lower pin and prevents the ladder from slipping. When the use of the spike is undesirable or unnecessary, it is swung back on its pivot and rests on the upper pin.—Lowell R. Butcher, Colfax, Ia.

Airplane Motors from Auto Tubes

The enthusiasm of the model-airplane builder is usually brought up with a jolt when he comes to the rubber-band motor required to propel his plane and finds that the rubber bands cannot be bought in his locality.

In such cases, old automobile inner tubes fill the bill and at very little, if any, cost. Using a pair of sharp scissors, cut strips from the length of each tube and tie them together. If a single strip is required, cut around the tube in a spiral, with the cuts about ⅛ in. apart. By this method, depending upon the size of the tube, rubber bands upward of 75 ft. long are easily obtained; they will be found very powerful and lasting.—A. D. Keogh, Springfield, Ohio.

PRIZE OFFERS

MANY KINDS OF INSTRUMENT MAKERS WANTED IN U. S. CIVIL SERVICE

The Civil Service Commission announces an open competitive examination for instrument makers to fill vacancies under the departments and bureaus, and at salaries, as follows: Coast and Geodetic Survey, $1,400 a year; Naval Observatory, $6.88 a day; Office of the Secretary of Agriculture, $1,200 a year; Bureau of Standards, Department of Commerce, $900 to $1,800 a year; Weather Bureau, $1,300 and $1,440 a year; supervising instrument maker, $1,620. Appointees may be allowed the increase granted by congress of $20 a month. The examinations are open to all U. S. citizens, men or women, who have reached their 20th but not their 65th birthday on the date of their application.

Competitors will not be required to report for examination at any place, but will be rated on the basis of sworn statements of their education and experience, 40 per cent and 60 per cent respectively. Applicants must submit, with their applications, their unmounted photographs taken within two years, with their names written thereon. All desirous of competing should at once apply for form 1312, stating title of the examination desired, to the Civil Service Commission, Washington, D. C., or to the Secretary of the U. S. Civil Service Board, in the applicant's locality.

CITY OF SHAWNEE, OKLAHOMA, INCITES CIVIC RIVALRY OF THE RIGHT KIND

Emulation of the right kind will be stimulated among the middle-sized cities of the state of Oklahoma by the Rotary Club of Shawnee, which offers a prize of $2,500 to any city of 20,000 or under of the state, which can outscore their city in an examination to prove which has the best home life, school methods, church training, and community-welfare conditions. There will be a separate committee to judge the scores of each of these four institutions, and a central committee to give the final verdict. The award will be made at Thanksgiving, 1921. The subjects for examination are embodied in a score sheet under ten points, as follows: play, industry, schools, health, scouteraft, moral safeguards, sociability, religion, service, housing.

As the originator and promoter of the idea, Dr. Wm. A. McKeever, of the Extension Division, Kansas University, will have general charge of the state-wide movement. It is expected that about 50 competitors will undertake to make a showing in the campaign.

INTERESTING WORD-BUILDING CONTEST OPEN TO WOMEN AND GIRLS ONLY

In a contest open to women and girls only, prizes will be awarded for the greatest number of words made from any or all of the letters in the phrase "Venida Hair Net." No letter must be repeated oftener than it occurs in the phrase, and foreign, technical, or proper names will not be counted. At the top of the list the competitor's name should be clearly printed, and a line should be drawn under each 10 words to facilitate counting. The first prize is $1,000; second, $500; and third, $200; besides, 40 prizes of $5 each, and 200 prizes of one dozen nets will be given. The contest closes Aug. 31, 1921, and entries must be addressed to Venida Contest Dept., Station "O," New York City.

HORSESHOE-PITCHING TOURNAMENT TO BE HELD AT MINNESOTA STATE FAIR

At the Minnesota State Fair, to be held at Minneapolis, September 3-10, there will take place the greatest horseshoe-pitching tournament ever attempted. It will be under the auspices of the National Horseshoe Pitchers' Association, the Minnesota State Association, and the Minnesota State Fair Board. The men's tournament will be September 7-10; the women's state tournament on September 5, and national tournament, September 8. A cash prize of $1,000, with championship medal, and other cash prizes down to $20 for sixteenth place, with trophy cups valued at $700, are offered for the men's events. The women's prize list includes $100 in cash, from $25 for first place, down to $5 for eighth place, with a championship medal, and other prizes to a value of $300. In each event there will be three medals for the first three places. For the national tournament the entry fee will be $2 for all men who live more than 100 miles from the "Twin Cities," and $5 for all who live within this distance. For the Minnesota State Tournament, there will be an entry fee of $1 for women, and $3 for men from St. Paul and Minneapolis, and $1 for men from elsewhere. The list closes August 27. All entries should be sent to B. G. Leighton, 327 City Hall, Minneapolis, Minn.

"PHILADELPHIA AWARD" GIVEN YEARLY FOR GREATEST SERVICE TO CITY

What on the face of it would appear to be the best way of boosting a city is the method adopted in Philadelphia by Edward Bok, former editor of The Ladies Home Journal. As a reward for the greatest service to that city he offers a prize of $10,000 to be given each year, and which is to be known as the "Philadelphia Award." The first of these awards will be made in either the spring or summer of 1922. The donor has deposited with a local trust company securities to the amount of $200,000, yielding an annual income of over $10,000. If, during the year, there has been no signal service to Philadelphia that would warrant the award, the income will be devoted to the creation of free scholarships in ten universities and colleges for boys and girls in the district of Philadelphia.

The scope of the achievement for which the award will be made embraces any act or work far-reaching in effect, which will be of service to the general public. The main object of the award is to stimulate public service. The persons eligible for the award must live in the Philadelphia district, and must be identified with some business or institution in the city.

UTILIZATION OF WOOD WASTE PROMOTED BY FOREST-SERVICE EXCHANGE

The purpose of the wood-waste exchange of the U. S. Forest Service, as its name implies, is to contribute toward a more complete utilization of wood by making use of the side lumber and short lengths, and therefore this service will be greatly facilitated by the transfer of the exchange from Washington, where it has been hitherto located, to the Forest Products Laboratory, Madison, Wis., in the heart of a great lumbering district. The exchange will issue quarterly reports on "Opportunities to Sell Waste," which will be sent to all concerns that desire them. These reports will contain the names and addresses of manufacturers of wood products who could utilize this waste.

A similar report on "Opportunities to Buy Wood Waste" will be sent to wood-using factories who ask to be listed for this service. Thus the service will work both ways. In this connection all communications should be addressed to the Director, Forest Products Laboratory, Madison, Wis.

ORCHESTRAL-COMPOSITION CONTEST OPEN TO AMERICAN COMPOSERS

American composers are offered an opportunity to compete for a prize of $1,000 in a contest announced by the Chicago North Shore Festival Association. The prize will be awarded to the composer who submits the best work for orchestra, the winning composition to be played at the final concert of the 1922 North Shore Musical Festival. From the compositions submitted the judges will select five, which will be performed at a public rehearsal, when the winner will be adjudged. Under the rules of the contest all competitors must be American by birth or naturaliza-

tion. The work must not exceed 15 minutes in performance, and the score must be legibly written in ink. All manuscripts must be submitted on or before Jan. 1, 1922, to Carl D. Kinsey, 624 S. Michigan Ave., Chicago, Ill.

NATION'S SCHOOL CHILDREN OFFERED PRIZES FOR SAFETY-FIRST ESSAYS

Five hundred prizes for the best essays on safety are offered to the grammar-school children of the United States by the National Automobile Chamber of Commerce. The contest is for the purpose of educating children in self-protection against the dangers of highway traffic, particularly in connection with the automobile. It is desired to attract the interest of young people everywhere, and full details regarding the contest have been sent to teachers of all public schools, who can explain them to their pupils. Pupils are asked to think the matter over during the summer vacation, and study the subject of the essay, which is "How Can I Make Road Travel More Safe?" The essays are not to be handed in till late in the fall, and the exact date, and any other information desired, will be furnished by the teacher. There will be three national prizes: First, a trip to Washington and a gold watch; second, a gold loving cup; third, a silver loving cup; and in addition to these, each state will offer a number of other prizes.

NOVEL KIND OF PRIZE CONTEST IS OF MUTUAL ADVANTAGE

Quite a novel form of prize contest that is of benefit to everybody concerned is offered by the News-Times, of Indianapolis, Ind. In the so-called market-basket department of this journal the advertisements of goods offered for sale by two stores, out of the many advertising in this department, are selected, and the first person who goes into one of these two stores, and mentions the fact that he read the advertisement in the News-Times, receives a cash prize of $5. Thus the newspaper, the storekeeper, and the prize winner all gain some advantage from the transaction.

COMPETITIVE EXHIBITION OF INVENTIONS TO BE HELD AT LYONS, FRANCE

A competitive exhibition of inventions is to be opened Oct. 1, 1921, at Lyons, France. Each exhibitor will be given one square meter of space free. Inventors desiring to compete must have their models in Lyons before September 30. These cannot be withdrawn before the end of the exhibition. Transportation charges must be borne by the exhibitor. The prizes will be in the nature of diplomas and medals. Any invention that might be the subject of a French patent will be protected by a free certificate equivalent to a patent for one year. Applications for space must be made before September 15, and should be addressed to the Societé des Inventions, 17 Place Belle, Lyons, France.

CONTESTS PREVIOUSLY ANNOUNCED

Students of Railroad Engineering: Scholarships; announced March issue, 1920; closes Dec. 31; offered by the Southern Pacific.

Essays on the Life of Roosevelt: Scholarship prizes valued at $1,000, $750, and $500; announced August issue, 1920; closes Dec. 31; address, Woman's Roosevelt Memorial Association.

New Methods of Testing Hardness of Metals: Prize $1,000; announced October issue, 1920; closes Jan. 1, 1922; address, Institution of Mechanical Engineers, London, England.

Piano and Strings Quintet by an American Composer: Prize $500; announced July issue, 1921; closes Nov. 1; address, M. Gobert, 4 W. 130th St., New York City.

Painless Animal Trap: Prize $500; announced May issue, 1921; closes Oct. 1; address, American Society for the Prevention of Cruelty to Animals, New York City.

Essays on Economics: Prizes, $1,000 and $500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

Essays on Contributions of Jews to Hygiene: Prize $1,000; announced August issue, 1921; closes Nov. 1, 1922; address Jewish Publication Society of America, 1201 North Broad St., Philadelphia, Pa.

Best Mural Design: Prize, $5,000; announced August issue, 1921; closes Sept. 15, 1921; address, Mural Scholarship Competition, Chicago Art Institute.

¶For the assistance of Japanese inventors who have not the means of developing and testing their ideas, an invention laboratory is being built in Tokyo, and will be opened by the end of the year. The institution will be equipped with a workshop, with all the tools and material necessary for experimental work.

THE CIVIL ENGINEER

BY LYDIA M. D. O'NEIL

Safe and sound and sheltered close, in luxury and ease,
You count in hours the journey twixt the east and western seas;
But when you win the crater's rim, or gaze across the pier,
I wonder if you ever think of the civil engineer?

Before the streams were spanned with steel, before the hills were riven,
Before that day of triumph when the golden spike was driven—
Ay, long before the Indian watched the laying of a rail,
The civil engineers went forth to blaze the western trail.

They floundered through the desert sands, they sought the cañon's gloom,
That you might know the peaceful strands where winter roses bloom,
They climbed the crags where eagles nest, and gave their brain and brawn
That you might see the ocean flush beneath a western dawn.

And day by day they strode ahead, with transit, chain, and rod,
By high ambition onward led where never man had trod.
No danger could their footsteps stay, nor death their spirits quail—
Those valiant civil engineers who blazed the western trail.

They fought their fights with loneliness and cold and thirst and heat,
And streams and storms, and left their foes behind them in defeat;
They dreamed of whistles ringing down the highway of the years—
The crowning of the labors of the civil engineers.

The panther snarled a challenge, and the Indian twanged his bow;
And wolves' wild eyes surrounded them when campfires dwindled low;
But still they fought and dreamed and planned, while days waxed bright or pale,
And onward still, with level and rod, they blazed the westward trail.

And now above the panther's snarl, above the lone wolf's wail,
We hear the sound of rails that ring beneath the whirling mail;
And where their campfires dwindled low, we see the headlight's gleam,
And where the Indian twanged his bow, all day the whistles scream.

We hear the tumult of the towns where once the bison grazed;
And shining highways mark the path that dreary labors blazed;
The work they wrought endures for aye, and onward through the years
Goes echoing the fame of them—the civil engineers!

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Pre-War Price $100 Now $36 Less

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