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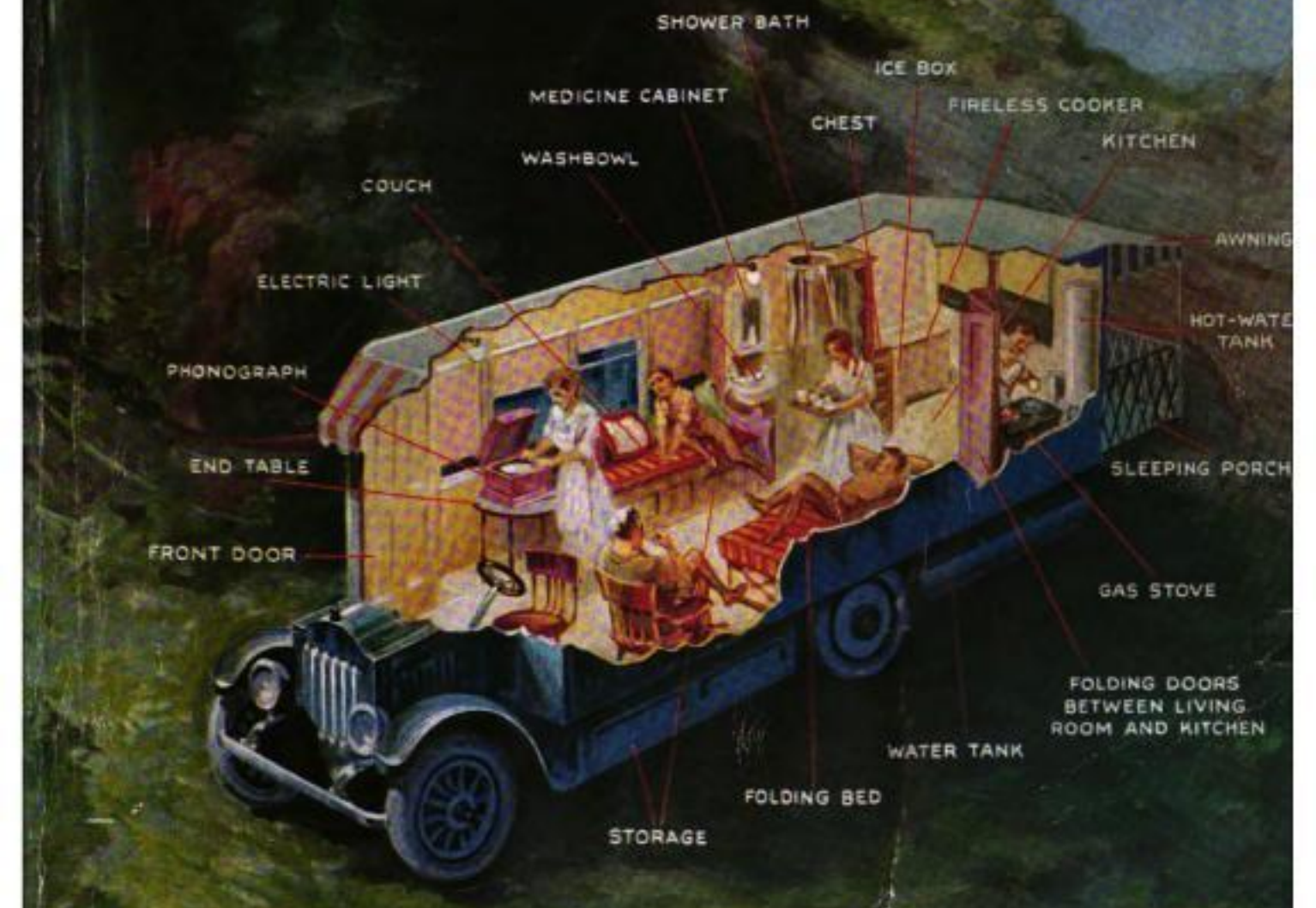

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Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

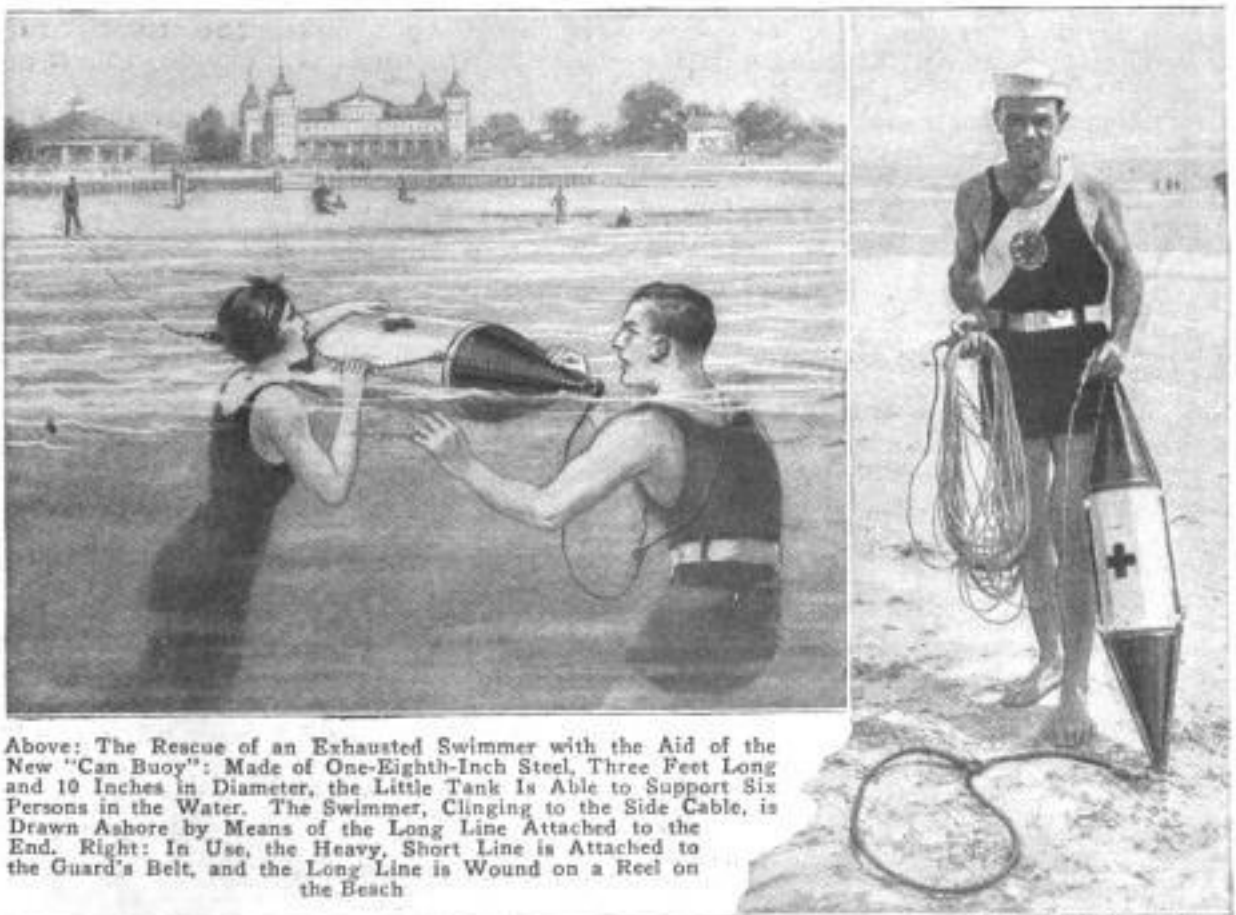
Vol. 35 MARCH, 1921 No. 3

Torpedolike Buoy Is Efficient Life-Saver

SIMPLICITY is the essence of ingenuity, despite the intricacy of much of the equipment with which modern life is surrounded. That the tools used by seabeach life-savers should be designed without complexity is especially fitting, for when man becomes an aquatic animal, he takes simplicity as his keynote; his equipment is usually nil, and his garb is reduced to the conventional minimum. Therefore the "can buoy" invented by a guard at Pablo Beach, Fla., is especially interesting, for its high efficiency in saving lives depends upon its sturdy, one-piece, foolproof construction.

This serviceable float consists of a torpedo-shaped shell of ⅛-in. steel, 36 in. long and 10 in. in diameter, with conical ends. Though it is rigid enough to stand a large amount of buffeting without sustaining so much as a dent, it weighs but 6 lb., and will support six average persons in the water. Steel eyelets at the points enable ropes to be attached by means of ordinary snap clips. One rope, 5 ft. long, is tied to the guard's belt, while the other, thin but strong and of great length, is wound on a reel on shore. As the guard swims out through the surf to the assistance of a hapless bather, the buoy bobs freely along behind him, its shape offering little resistance, and the reel pays out line as he goes. Lengths of cable on the sides of the can afford a handgrip for the rescued swimmer, and when that connection has been established, buoy, swimmer, and all are easily hauled inshore by the man at the reel.

It is interesting to note that life-saving crews at other beaches, notably in California, are recognizing the desirability of the "streamline" form for life rafts.



Above: The Rescue of an Exhausted Swimmer with the Aid of the New "Can Buoy": Made of One-Eighth-Inch Steel, Three Feet Long and 10 Inches in Diameter, the Little Tank Is Able to Support Six Persons in the Water. The Swimmer, Clinging to the Side Cable, is Drawn Ashore by Means of the Long Line Attached to the End. Right: In Use, the Heavy, Short Line is Attached to the Guard's Belt, and the Long Line is Wound on a Reel on the Beach

INVALID'S WHEEL CHAIR IS ELECTRICALLY PROPELLED

What Americans will insist on calling an invalid's wheel chair and which our overseas cousins just as stubbornly contend is a bath chair, has been motorized by an English concern. The only exertion necessary in driving the vehicle is that of manipulating the easy-moving controller and steering lever. The drive is by a small electric motor built integrally with the front axle, which transmits the power to the two pneumatic-tired front wheels. Storage batteries, which may be quickly exchanged for fresh ones when they become discharged, supply the power. These are incased in a box, suggestive of an automobile hood, which is mounted directly over the front axle. A victoria top lends distinction to the otherwise conventional wheel-chair body.

WIDE WORLD PHOTOS

A Recently Developed Motorized Wheel Chair is a Full-Fledged Electric Automobile

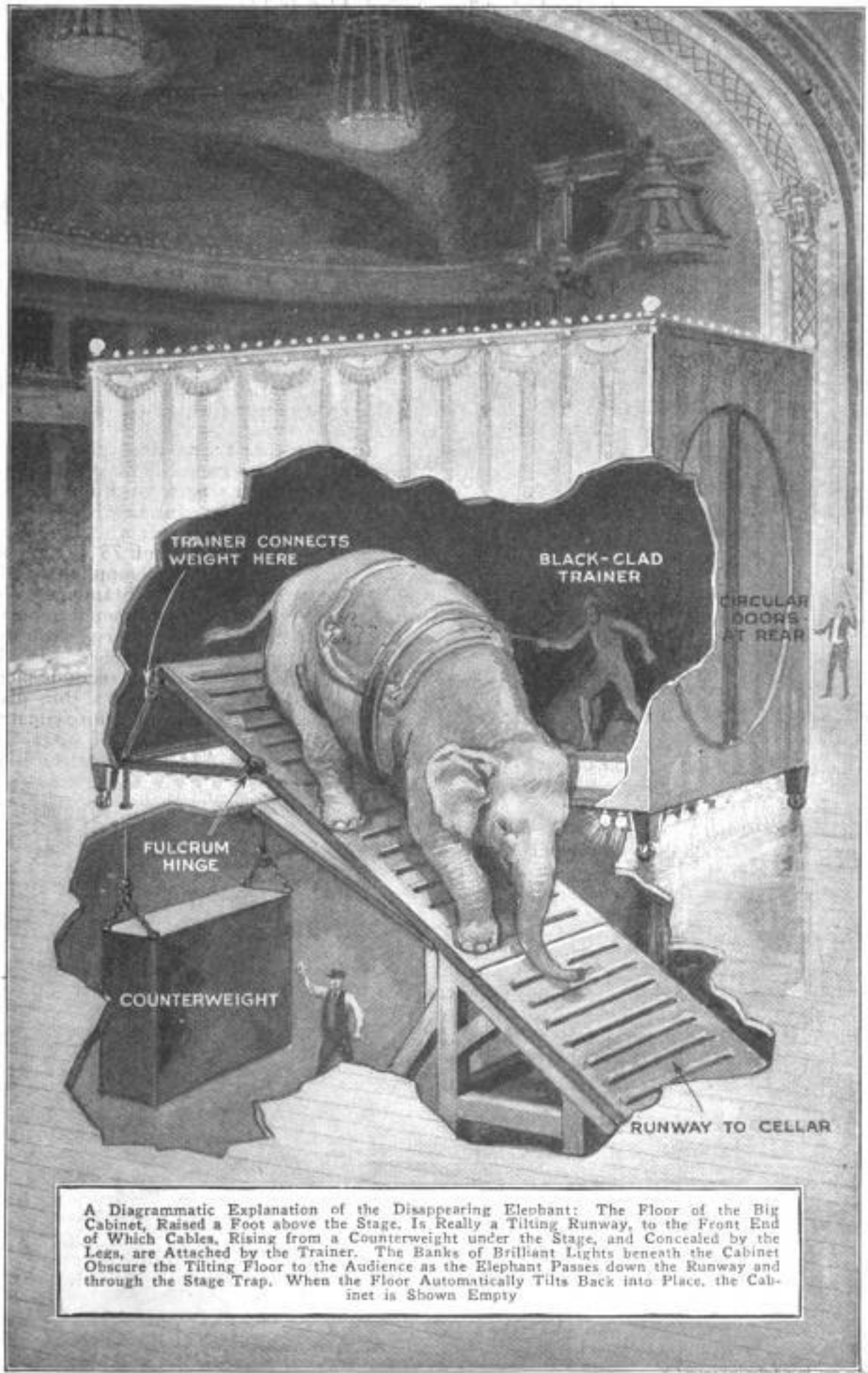
ELECTROPLATING PROCESS RENEWS WORN AUTO PARTS

Electroplaters will be interested in a process for the electrodeposition of iron on iron, developed and used very extensively in England during the war in renewing the worn bearing surfaces of automobile crankshafts, and like parts. The method, so states the claim made for it, is so efficient that a smooth, tightly adherent coat of iron from .005 to .078 in. thick can be plated on iron, other than cast, and steel, either mild or cast. The solution formula given is ferrous ammonium sulphate at a strength of 75 grams per liter of water. Another, supplied by the United States Bureau of Standards, recommends the addition of a small quantity of sulphuric acid to a nearly saturated solution of the above chemical. In the American process it is also recommended that the parts be first given a thin plate of copper. A current of approximately 20 amperes per square foot of surface to be plated is used. The anode is built up of many strands of soft-iron wire of great purity. Heretofore some difficulty has been experienced in attempts at iron deposition due to the instability of the ferrous solution.

MAKES LIVE ELEPHANT VANISH FROM CABINET

Stage magicians who cause assistants to disappear from the view of blasé audiences still receive applause, but a New York performer has added a brand-new thrill by "vanishing" a 1,000-lb. elephant. A huge cabinet, on legs a foot high, with banks of electric lights underneath to aid the scrutiny of the skeptics, is rolled onto the stage by a number of helpers, the front door opened, and a pair of rear doors thrown back, revealing a circular entrance. Into this black, tunnellike interior the elephant, coming from upstage, is urged to enter, amid the "patter" of the magician. The doors are closed, appropriate ceremonies performed, and the doors opened again. The half-ton beast is gone.

Like most effective tricks, the explanation is simple. The floor of the cabinet is really a tilting runway, pivoted at about a third of its length from the front. Cables rising through the stage from a heavy counterweight below are hooked onto this overhanging front end of the floor, behind the cabinet legs, by the trainer. When the mechanism is released, the animal's weight swings the floor down through the stage trap to a runway under the stage, and down this the huge animal walks or slides, and the floor swings back to its place, with the cabinet empty. The brilliant light ostensibly intended to aid the view under the cabinet, actually obscures it, so that the small amount of drooping floor within range is not detected, and the disappearance remains an effective mystery.



A Diagrammatic Explanation of the Disappearing Elephant: The Floor of the Big Cabinet, Raised a Foot above the Stage, Is Really a Tilting Runway, to the Front End of Which Cables, Rising from a Counterweight under the Stage, and Concealed by the Legs, are Attached by the Trainer. The Banks of Brilliant Lights beneath the Cabinet Obscure the Tilting Floor to the Audience as the Elephant Passes down the Runway and through the Stage Trap. When the Floor Automatically Tilts Back into Place, the Cabinet is Shown Empty

FOLDING SEAT AND TELEPHONE RECESS ECONOMIZE SPACE

As companion pieces to the "in-a-wall" bed and combination kitchen cabinet and electric range, comes the niche in the wall

Left: The Folding Telephone Seat in Use. Right: Seat Folded into Its Recess. The Instrument may be Concealed by Drapery

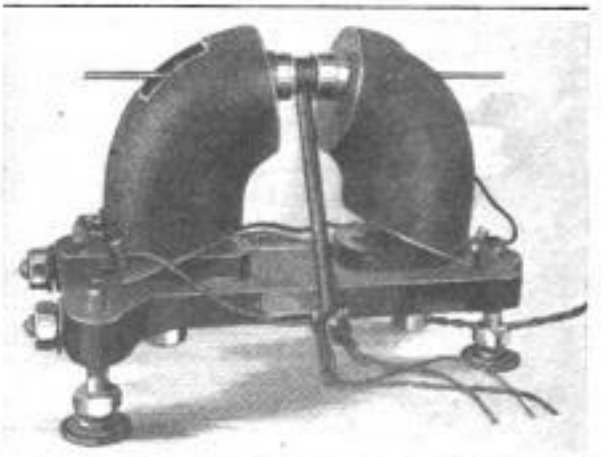
for the telephone and the self-effacing folding seat upon which to rest while using it. These last are features of some new bungalows designed by a western architect. The recess for the telephone instrument is quite shallow, and is finished at the bottom with a shelf which projects only 2 in. into the room. Below and slightly to the left of the telephone recess is a larger one containing two panels, hinged together in such a way that, as the outer one swings down and out to a horizontal position, the inner one moves up to form the back of a comfortable seat. When not in use, the panels fold away into the recess.

RANGE OF TWO HUNDRED MILES CLAIMED FOR FRENCH GUN

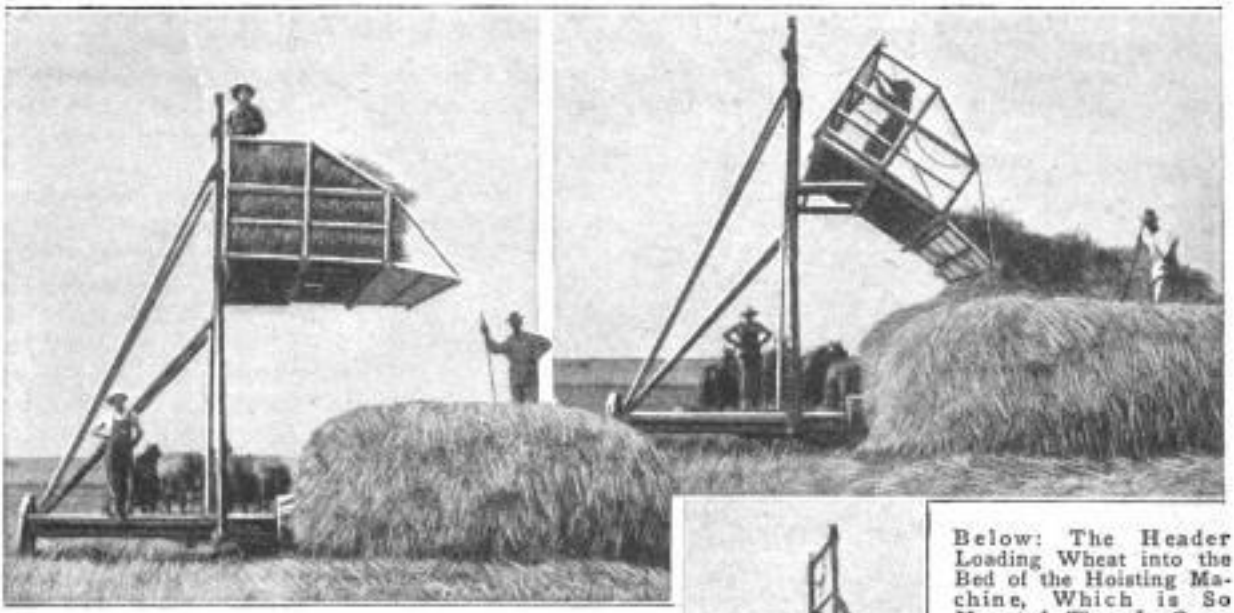
Apparently the 125-mile range of Germany's gun of nine-days' wonder, "Big Bertha," is to receive credit in history only for the first step in a new era of long-distance shooting. Announcement comes from Paris of a new gun, invented by a French officer, that is declared able to throw a shell the incredible distance of 200 miles. An elaborate series of tests has been conducted by French and Belgian officers with a small model, built to the scale of a 3-in. field gun. A new slow-burning explosive is used, which maintains full pressure on the projectile clear to the muzzle, making it necessary to construct the barrel without taper, and capable of resisting 42,500 lb. per square inch. The projectile is unusually sharp-pointed, and is stated to increase its velocity after leaving the muzzle, for which reason the weapon is named the "Turbo" by its inventor. No explanation of this seemingly paradoxical action, however, has been divulged.

POWERFUL ELECTROMAGNET ANALYZES STEEL BARS

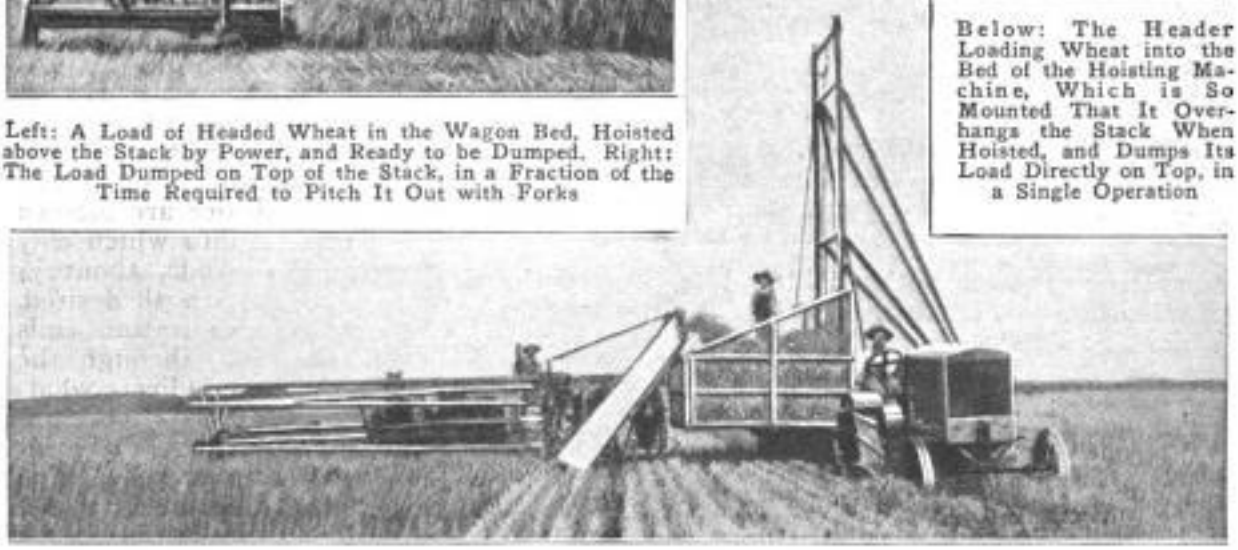
To aid in the comparative study of the magnetic and mechanical properties of iron and steel, an electromagnet, capable of producing a powerful field, has been constructed by the Bureau of Standards. The pole pieces of the device are pierced by perfectly alined holes, into which may be inserted test-specimen rods, about ¼ in. in diameter and of any length desired. During the test, three exploration coils encircle the specimen and, through the medium of sensitive meters, indicate whatever magnetic changes the metal may undergo as a result of variations in the intensity of the electromagnet field. The magnetic properties of permeability and reluctance of metals, especially iron, steel, and steel alloys, may some day be accepted as the indexes of their mechanical properties, such as hardness, toughness, and immunity to crystallization. These are now determined by somewhat complicated chemical analyses, which require much time and intense attention.



For Its Size, This Electromagnetic Steel Tester Generates a Powerfully Intense Field. The Rod That Passes through the Pole Pieces is Undergoing a Test for Its Magnetic Properties



Left: A Load of Headed Wheat in the Wagon Bed, Hoisted above the Stack by Power, and Ready to be Dumped. Right: The Load Dumped on Top of the Stack, in a Fraction of the Time Required to Pitch It Out with Forks



Below: The Header Loading Wheat into the Bed of the Hoisting Machine, Which is So Mounted That It Overhangs the Stack When Hoisted, and Dumps Its Load Directly on Top, in a Single Operation

FIELD HOIST PITCHES WHEAT FROM HEADER TO STACK

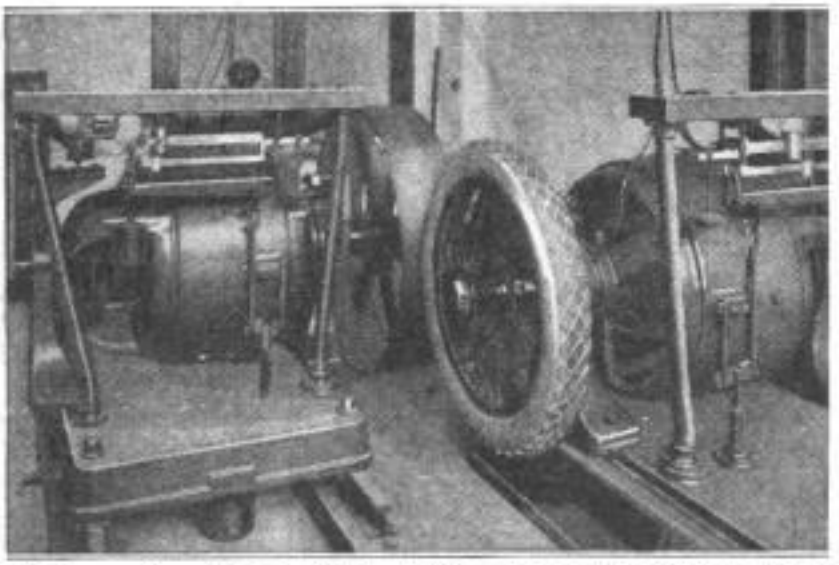
Out of the dearth of farm labor the past season, and the peculiar weather conditions that harass the Kansas farmer, a new and curious machine has arisen in the great wheat fields of that state. This man-saving implement is virtually a wagon, horse or tractor-drawn, with a body that may be hoisted straight up above the top of a stack, and then dumped. The tall hoist guides rise from the right side of the wagon bed, and the body is hung on the outside, so that when lifted it may actually overhang the stack, and dump directly on top of it. The machine thus, in one brief operation, does what formerly required the hand labor of two men for a considerable period of time. A new combination machine that cuts, threshes, and sacks the wheat, ready to be picked up by a following wagon, also helped to harvest the 150,000,000-bu. Kansas crop. Some cut swaths 16 ft. or more in width, and save much field labor, but they are most useful where all the wheat ripens at one time.

VEST-POCKET SLIDERULE IS WATCHLIKE IN SHAPE

College students, engineers, and others having occasion to make frequent use of a sliderule, will welcome the advent of a new, compact, watchlike instrument, less than 2 in. in diameter, which, despite its small size, has easily read graduations as large as, or larger than, those of many straight rules. The scales being circular and the slide following a circular path, the latter can never be at the wrong end of the scale. An accuracy of three significant figures of the logarithmic tables is claimed for the device. It is made in both simple and complex scales.

DYNAMOMETER SHOWS POWER LOST IN AUTO TIRES

A pneumatic tire must not only be tough and elastic, it must also transmit the driving power with as little loss, in friction between its various layers, as possible. To determine this loss in tires of various makes and types, the rubber-testing section of the Bureau of Standards has installed an apparatus consisting of a powerful high-speed electric motor and a dynamo. The tire undergoing test is mounted on a standard auto wheel, which, in turn, is attached to the shaft of the motor. The tire tread is pressed forcibly against a large pulley attached to the dynamo shaft. Thus the latter is driven through the medium of the test tire. The normal power loss between the motor and the dynamo being a known constant value, any additional losses, shown by the test, must be charged to the internal and tread friction of the tire. Conditions of rates of road speeds up to a maximum of 50 miles per hour can be duplicated with the apparatus.



Testing an Auto Tire for Frictional Power Losses: The Electric Motor, on the Right, Drives the Dynamo at the Left, through the Test Tire

PIPING COAL FROM MINES TO NEW YORK CITY

By WILLIAM RESSMAN ANDREWS

WITH the realization of a project to bring coal through a pipe from the anthracite regions of Pennsylvania to New York, the metropolis will have to fear no repetition of the fuel crisis in 1918, when thousands of tons were "immobilized" on the New Jersey shore, in sight of shivering Manhattan, by a heavy freeze that closed navigation, nor, possibly, unreasonable coal prices.

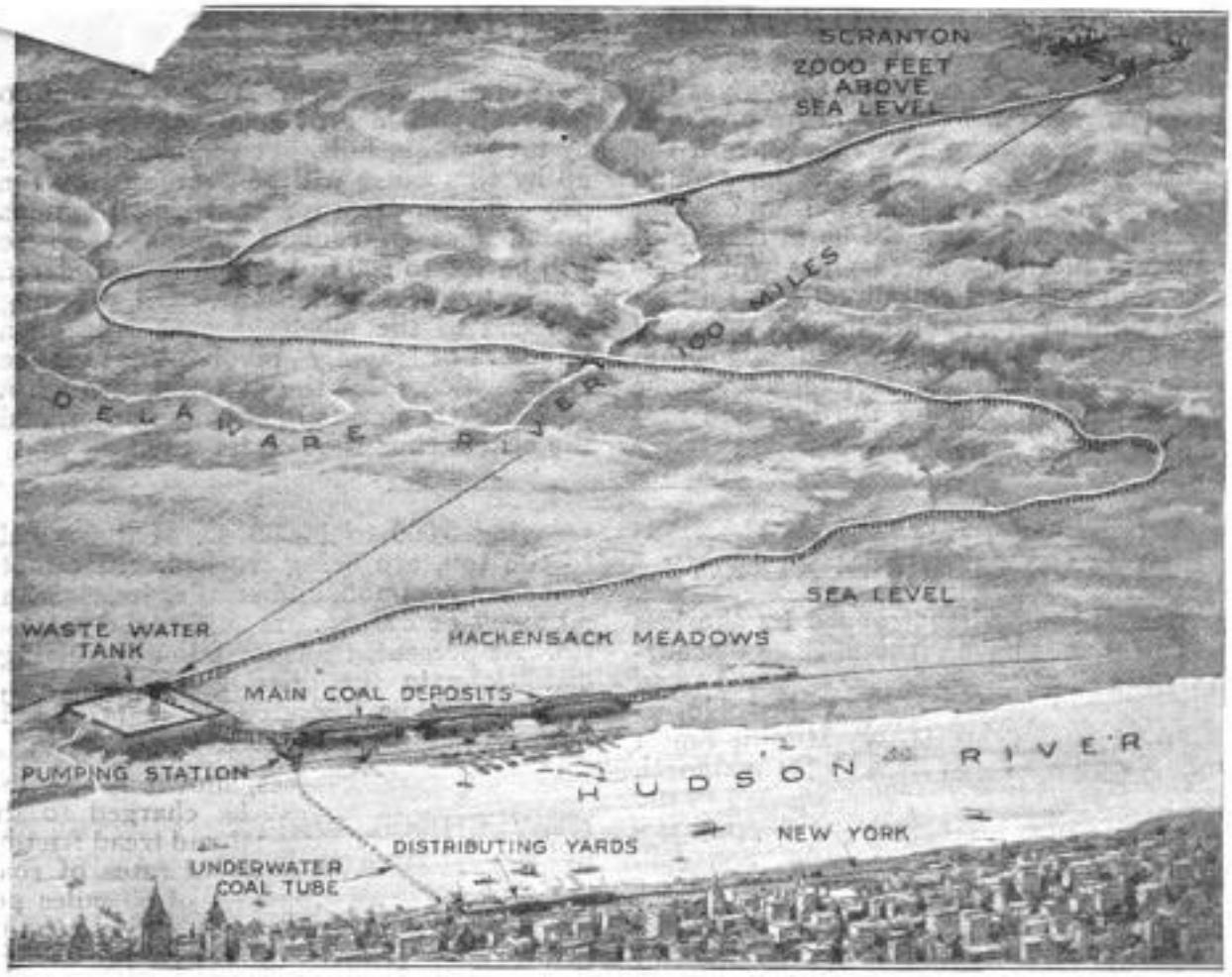
By means of this transportation system, worked out by Reginald P. Bolton, a well-known consulting engineer, 10,000,000 tons of coal a year will be forced through two 18-in. pipes by water pressure over a 130-mile route. An altitude difference of about 2,000 ft. between Scranton and New York City will send the coal, mixed half-and-half with water, through the tubes at the rate of 7 ft. a second.

The Hackensack meadows of New Jersey are mentioned as being suitable for the huge storage basin necessary to maintain the reserve supply, and an auxiliary system of pipes, under the Hudson River, will carry the coal to smaller supply stations in the boroughs of New York City.

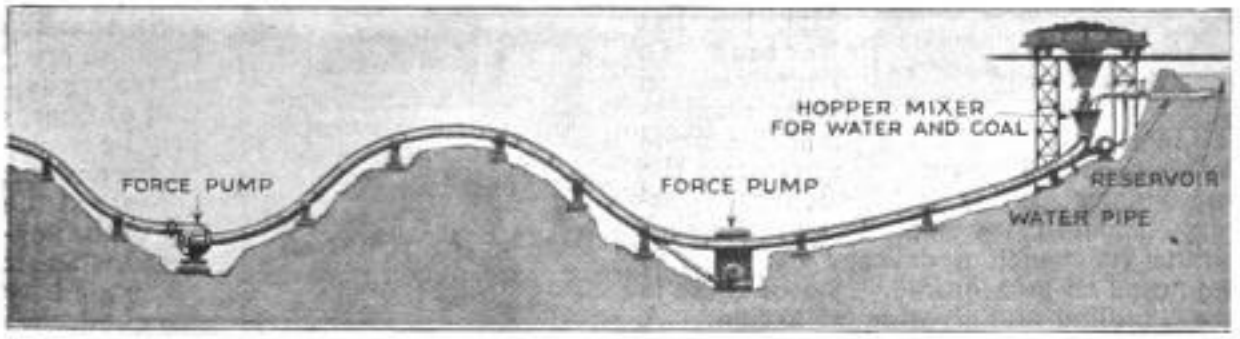
As to economy, it is calculated that the pipe can move coal at the rate of 75 cents, possibly even 50 cents, a ton, while rail transportation costs $2.88. The costliness of carriage by train is due partly to a 12 to 16-per-cent coal consumption by the locomotive hauling the cars to and from the mining district and partly to reloading and transshipment expenses, averaging 25 cents a ton.

No construction difficulties face the engineers who are working out the details. Already the principle has proved sound in its application to similar material, such as earth and stone, in hydraulic dredging, and removal of ashes, not to mention oil. Fuel in a dry and powdered state has been sent through pipes by means of an air blast, the diameter of the tubes being in some cases as small as 3 in., a small installation of the kind having been in operation in London, Eng., for some years.

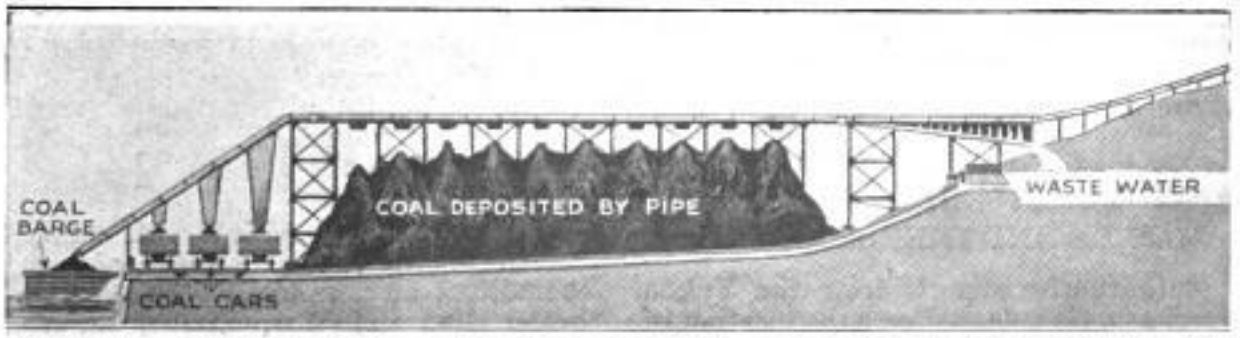
The application of the method on a larger scale is only a logical step in meeting the exigencies of fuel cost and fuel shortage in New York. The means of obtaining this result are simple enough, and within reach. The 2,000-ft. slope in



An Aerial View Giving a General Idea of the Land Contour between Scranton, 2,000 Feet above Sea Level, and the Terminal opposite New York, an Air-Line Distance of 100 Miles: The Probable Route of the Proposed Coal-Pipe Line, as Shown, would Make It Much Longer than This, but would Avoid Difficult Passes. Centrifugal Pumps at Intervals in the Line would Keep a Constant Stream of Mixed Coal and Water Moving toward the Terminal Coal Bunkers at the Rate of Millions of Tons a Year



A Typical Side Elevation of the Proposed Coal-Pipe Line at the Transmitting End: The Coal Car on the Trestle at the Right is Dumping Its Load into the Pipe Hopper, Accompanied by a Stream of Water, Enabling the Pumps at the Center and Left to Handle It as a Fluid



The Receiving End of the Pipe Line, on the Hackensack Meadows opposite New York City: The Water Runs Out at the Rear, as Indicated on the Right, While the Coal is Discharged at the Pipe End into a Barge, or through Hoppers into Gondola Cars, or onto a Storage Pile beneath the Trestle

the direction of New York City gives the head necessary for the requisite pressure. The pipes need not be sunk beneath the surface, but can be laid on the ground without danger of the coal and water freezing, as the mass will be in a state of constant motion. These pipes will probably follow the general direction of a railroad right of way, and although they will pass through two states, no opposition from the legislatures is expected, since the communities along the line will also benefit from the system.

The general descent from Scranton to the seaboard is broken at various points by intervening hills, but the resistance set up by this cause will be overcome by the use of high-pressure centrifugal pumps installed at convenient intervals. These will be 100 to 500 hp., which is considered ample to meet conditions. On reaching the end of the pipe, the coal falls on a number of rapidly revolving scooplike arms, which force the material through a pipe slightly elevated above the other, and the coal is thus shot on its way.

OWNER OF ARTIFICIAL HANDS IS PROUD OF HIS DEXTERITY

Many persons handicapped by the loss of both hands have succumbed to discouragement and defeat. Not so Hughie Smith of Cincinnati, a guard in the Covington, Ky., jail, who is not only quite well satisfied with the mechanical substitutes with which science has supplied him, but has become so dexterous in their manipulation that he exhibits a justifiable pride in his accomplishments. He performs the usual daily routine tasks, such as dressing, etc., and many small finger-movement stunts for which a delicacy of touch is supposed to be required. One of these is the handling and lighting of a cigar. A clamp which performs the duties of the left hand is actuated by a cord which passes over his shoulders and loops under his right arm. An imperceptible movement of the right shoulder tightens the cord and closes the clamp with any degree of pressure desired.

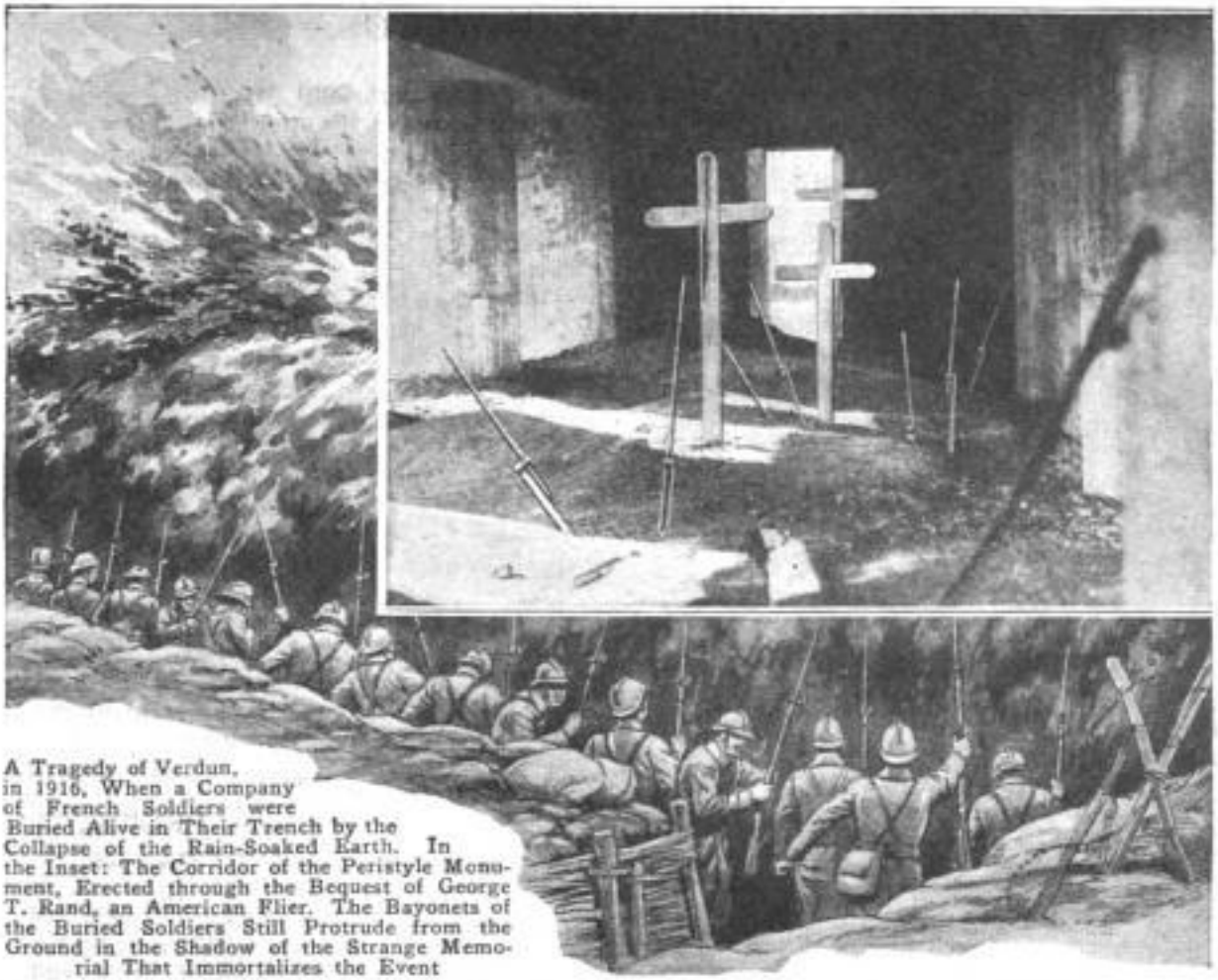
RICH YUKON SILVER DEPOSITS MAY BE ANOTHER KLONDIKE

Authoritative reports from the Yukon Territory, Canada, indicate the location of marvelously rich silver deposits in the Mayo district, about 150 miles east of Dawson. A few veins, 8 ft. in thickness, assaying 5,000 to 14,000 oz. of the metal to the ton, are being worked. Five-foot veins are common, and smaller lodes, with an assay of 200 oz., are said to be plentiful. At present, transportation and living conditions in the district are very bad. These will be bettered if a proposed motor road into the territory is built.

NEW CHECK WRITER PROTECTS BOTH DRAWER AND PAYEE

The drawer's signature, the payee's name, and the amount for which a check is drawn, are all protected by an improved check-writing machine recently placed on the market. Also, that the common error of transposition of figures may be avoided, the amount appears at the top of the keyboard, where it is easily checked, before the printing lever is depressed. The spaces occupied by the payee's name and the amount are perforated, making changes in either next to impossible. Drawers' signatures are supplemented by their firm names, trademarks, or other special designs, printed in the space before the amount.

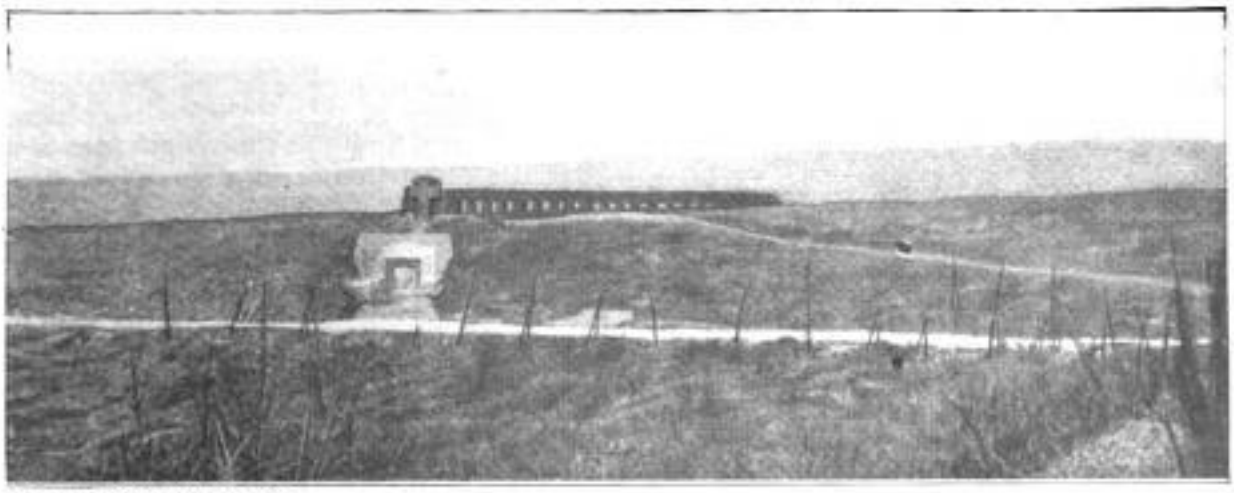
¶Motor trucks, provided with flanged steel wheels, are to take the place of steam locomotives on a railroad between Winchester, Va., and Wardensville, W. Va., according to plans recently completed. Short passenger and freight trains will be hauled in increased number by the trucks.



A Tragedy of Verdun, in 1916, When a Company of French Soldiers were Buried Alive in Their Trench by the Collapse of the Rain-Soaked Earth. In the Inset: The Corridor of the Peristyle Monument, Erected through the Bequest of George T. Rand, an American Flier. The Bayonets of the Buried Soldiers Still Protrude from the Ground in the Shadow of the Strange Memorial That Immortalizes the Event

MONUMENT MARKS VERDUN'S "TRENCH OF BAYONETS"

On Dec. 8, 1920, there was dedicated at Verdun, France, a monument to one of the strangest tragedies of the World War. In June, 1916, a company of French soldiers, in a trench cut through the shell-shaken, rain-soaked earth, awaited with poised bayonets the command to charge. Before the word could be given, the quivering soil gave way, the trench closed in, and the entire company was buried alive. The only witness, an American flier of the Lafayette escadrille, shocked by the awful spectacle, contributed $100,000 for a monument, and was himself killed in action shortly after. Now a peristyle of marble, granite, and concrete protects the long row of upraised bayonets that have remained protruding from the soil, gripped in buried fingers, for more than four years, and a giant cross carries the names of all who could be identified of the missing company.

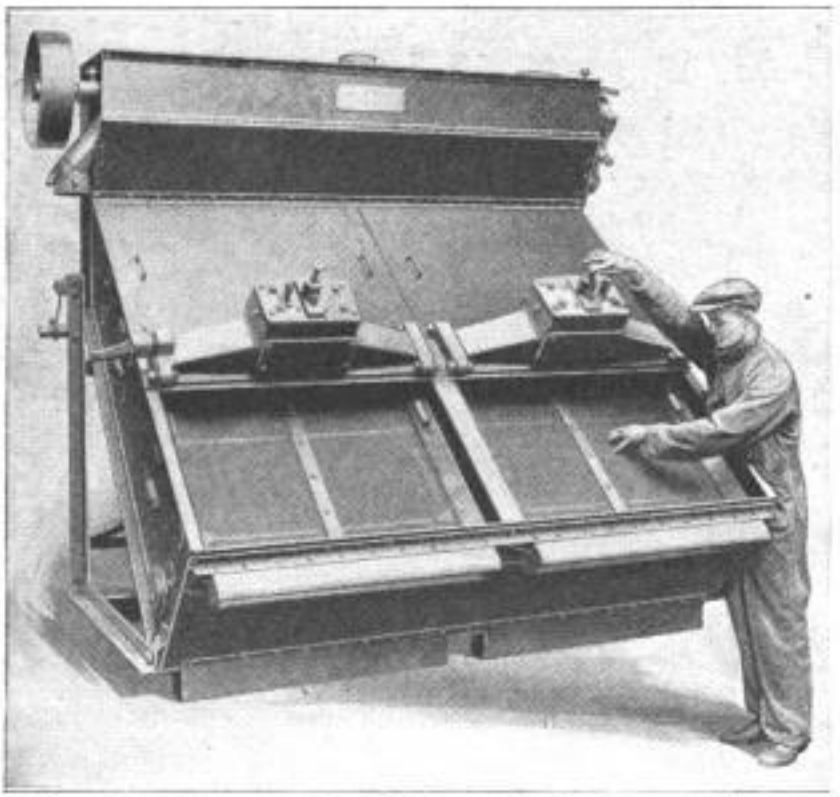


BY COURTESY OF L' ILLUSTRATION, PARIS

The Imposing Peristyle of Marble, Granite, and Concrete That Now Marks the "Trench of Bayonets" at Verdun, with Its Giant Cross, on Which are Inscribed the Names of Those Lost Who could be Identified

MAGNET PULSATIONS VIBRATE SIFTING-MACHINE SCREENS

In a new machine, designed to sift sand, sugar, cement, etc., all moving parts, such as pulleys, shafts, cranks, and connecting rods are supplanted by large stationary electromagnets. The only parts of the machine which have any movement are the screens, and as their motion is a short rapid vibration, they can hardly be classed as moving parts. Alternating current, passing through the windings of the magnets, placed directly above the screens, sets up pulsations of magnetism which attract and release the metal screen, causing it to vibrate in unison with the alternations of the current. As the screens are stretched taut, this results in a vertical shaking action of very high speed.



A Magnetically Vibrated Sifting Machine: Pulsating Magnetic Waves Act Directly on the Screens, Causing Them to Vibrate Rapidly

HOT WATER FOR FLUSHING SNOW FROM CITY STREETS

Warm water from a natural hot spring is being successfully utilized by the street commissioner of Salt Lake City for flushing and melting the snow from the business-section streets. The water has a temperature of about 100° F. at the springs, near the city limits, and after being forced into the flushers under a pressure of from 85 to 100 lb. reaches the streets at a temperature of between 80° and 90°.

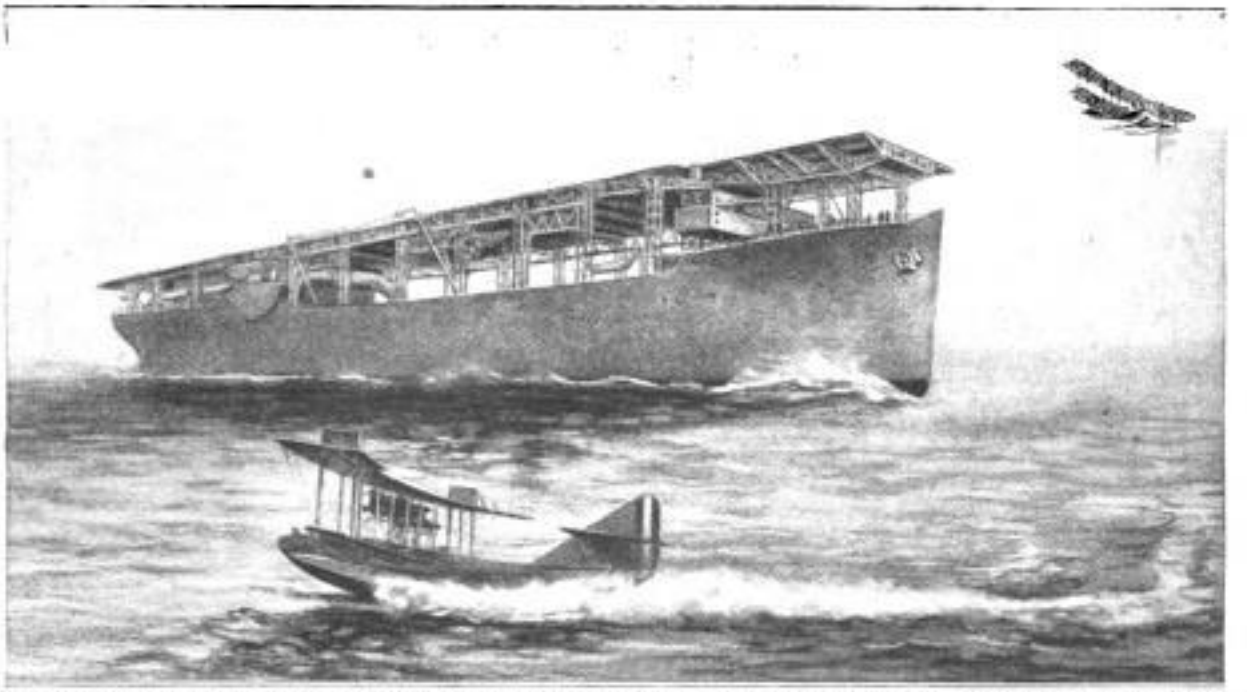
Two of the flushers are drawn in tandem by huge motor trucks at a good rate of speed, in localities where the snow depth permits, and a 1,000-gal. tank will clear a swath a block in length, or about 800 ft., while, if both flushers are flowing in heavier snow, from a block and a half to two blocks can be sprayed one swath wide. Where the snow is more than a few inches deep or has been compacted by travel, the "once over" is not enough to remove the snow, but the scrapers and shovelers find the hot-water treatment a great assistance.

The aim is to use the flushers only in the business section where the snow accumulation causes the greatest inconvenience. They are put to work at the first fall of snow, and continue in operation until the temperature falls to, or below, freezing.

Christmas Day five inches of snow fell in the city, but with the power flushers playing warm water on the down-town streets all night, the business section was practically clear the following morning. It has been estimated that the cost of removing that amount of snow was reduced to about one-tenth of the usual amount.

SIMPLON-TUNNEL POWER PLANT TO BE ENLARGED

Traffic demands have so far outstripped the capacity of the plants supplying power to the Simplon-tunnel railway line that the construction of a complete new station is under consideration. The project contemplates the installation of three hydroelectric generators, of a total capacity of 105,000 hp., in an extension of the Brig station, which was built to supply power for construction purposes at the time of building the line. A new reservoir with a capacity of 280,000 cu. ft., giving a head of 142 ft., will be needed to supply the new generators. Supplementary power may be leased from a commercial electric company at the Italian end.



The New Air-Craft Carrier "Langley," Reconstructed from the Collier "Jupiter": Its Feature Is the Flying Deck, 525 Feet Long, 56 Feet above the Waterline, with Elevators, Cranes, Catapults and Arresting Devices for the Planes

NAVY BUILDING BATTLESHIPS OF NEW DESIGN

BY JOHN W. KEAN

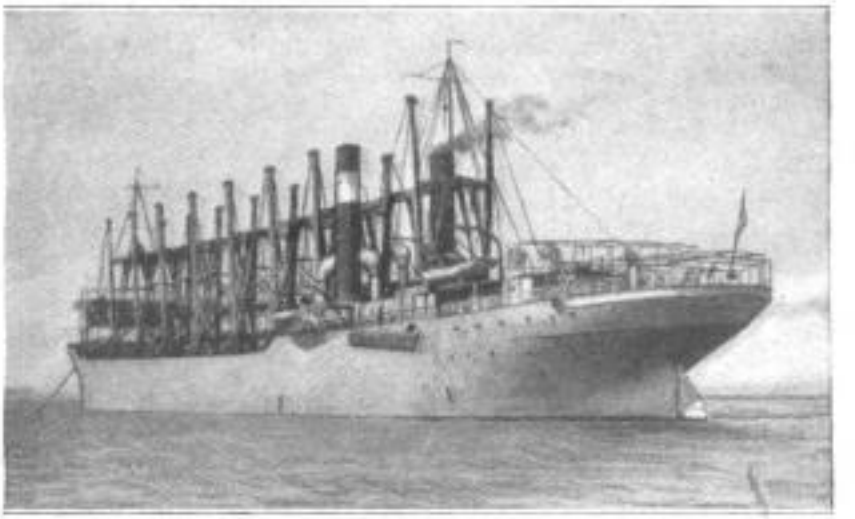
NEW styles in warfare are developing new styles in battleships. The dropping of bombs from the air is compelling the sailors to get more under cover.

Six battleships, three fleet submarines, and an air-craft carrier of the new designs are to be constructed for the United States Navy. New features, particularly in the case of the battleship, indicate the attempt to protect the sea fighters from attacks by air, as well as from attacks by land and water. The new designs also embody other late features in battleship construction which developed as a result of the war.

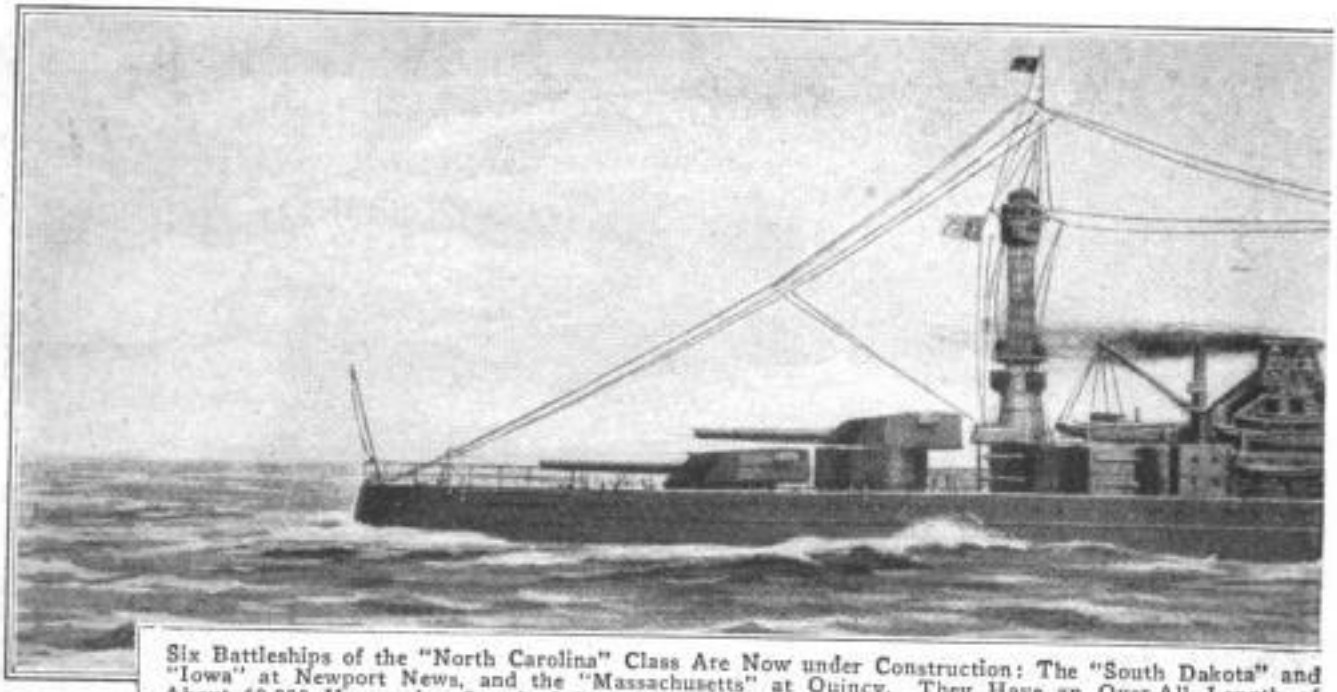
Congress has authorized an expenditure of $21,000,000 each for the battleships. They will be oil burners, with electric drive and a displacement of 43,200 tons. They will have 60,000 shaft horsepower and a speed of 26½ miles an hour. Their over-all length will be 684 ft., breadth 106 ft., and mean draft about 33 ft. The complements of these big fellows will be about 70 officers and 1,500 men.

The fleet submarines are to be 300 ft. in length, and will have a displacement of about 2,000 tons. On the surface they will be propelled by two main oil engines aft, driving directly on the main shafts. There will also be two auxiliary engines forward, driving electric generators which will supply current to two main motors, one connected to each shaft. Submerged, the vessels will be propelled by the motors, taking current from a powerful storage battery.

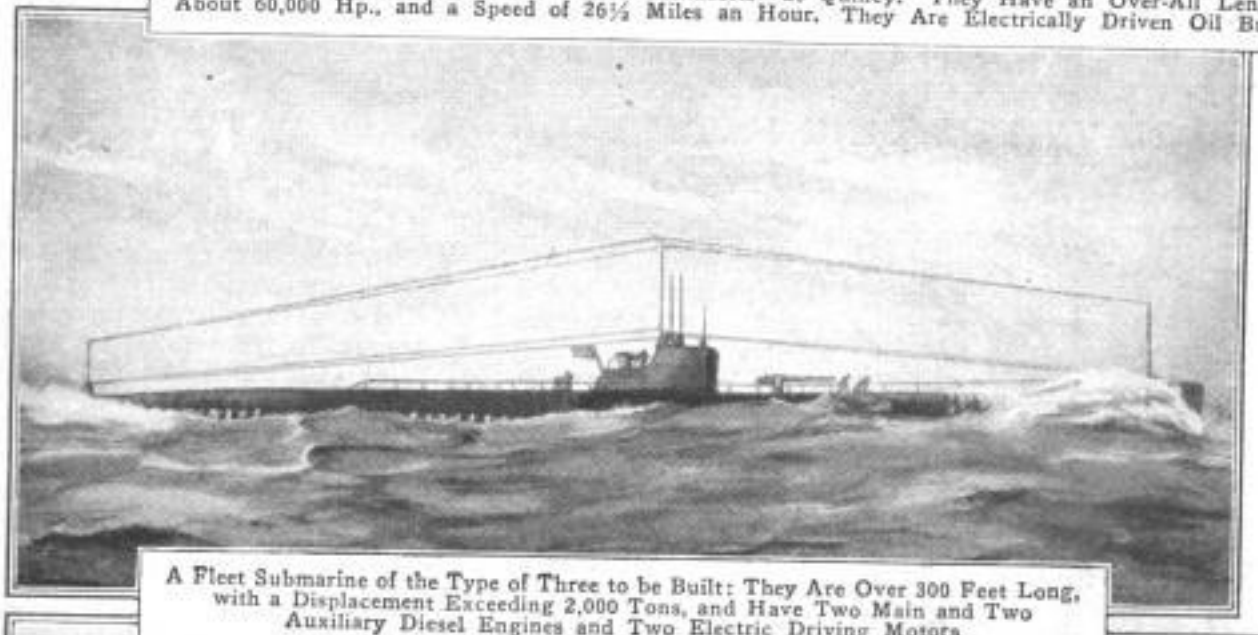
Their surface and submerged speeds will be about 23 and 11½ miles per hour, respectively. They will have sufficient fuel capacity to accompany the fleet under all conditions. Tubes for handling 21-in. torpedoes will be located in the bow and stern, and a 5-in. gun will be mounted on



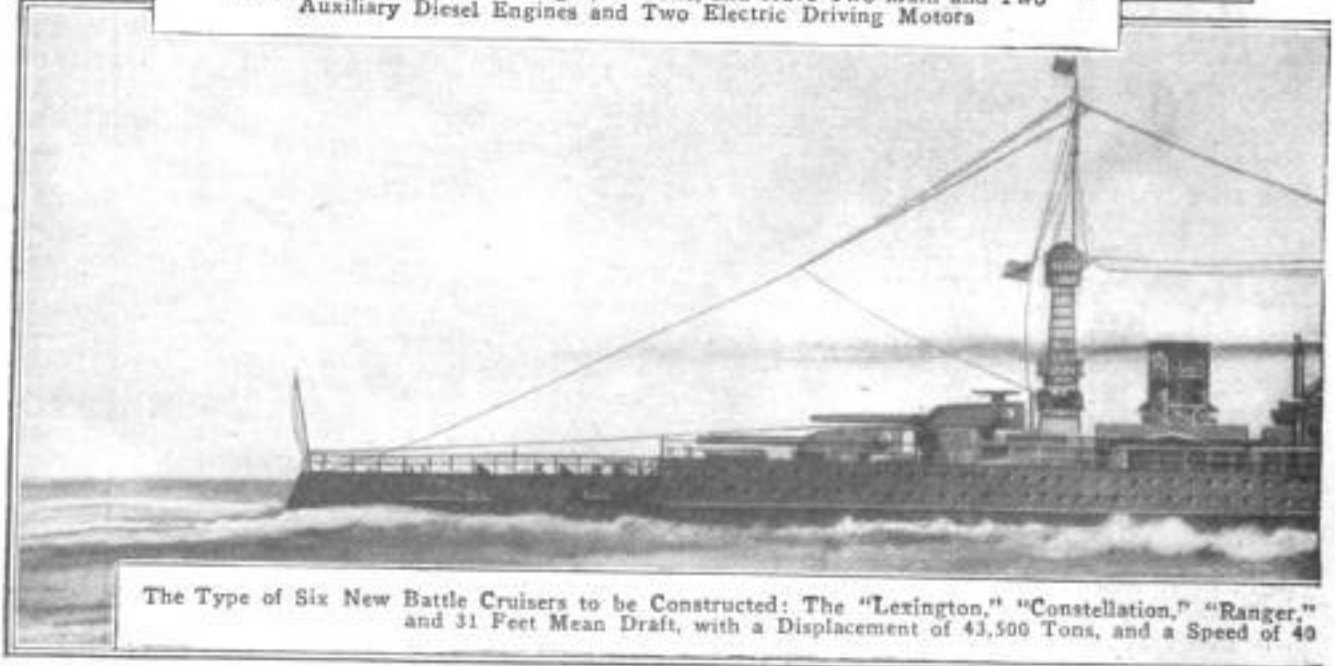
The Collier "Jupiter," before Its Transformation into the Air-Craft Carrier "Langley": The Coal-Handling Gear All has been Removed or Altered



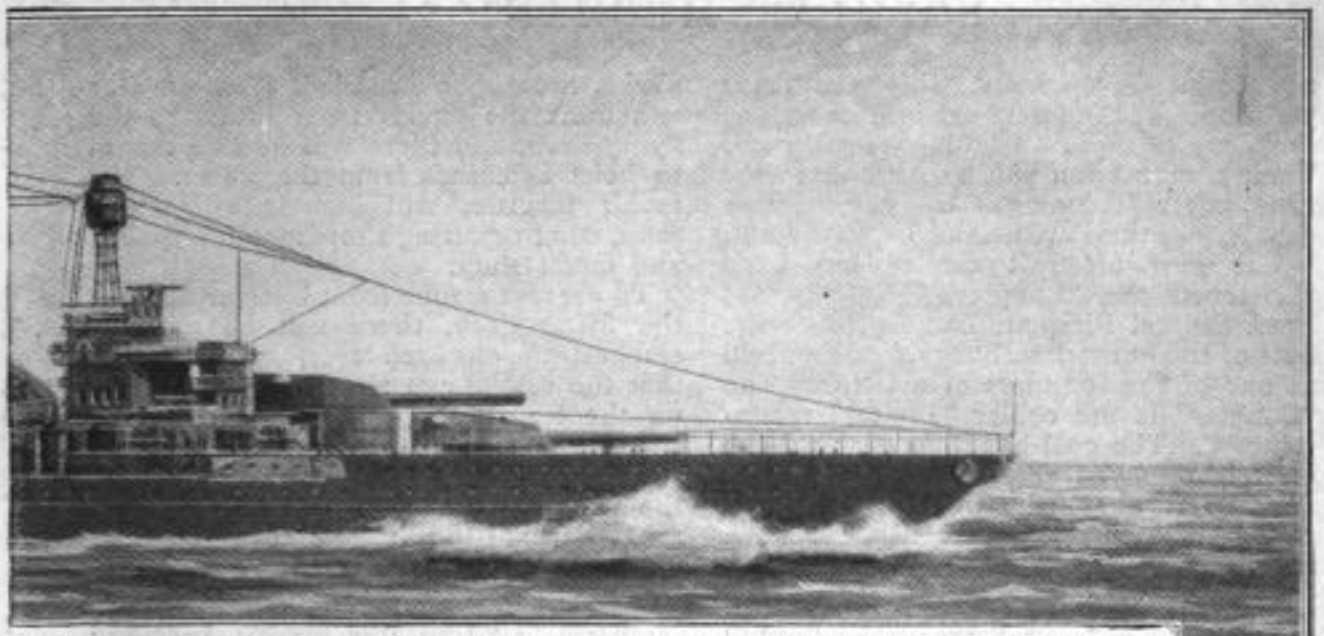
Six Battleships of the "North Carolina" Class Are Now under Construction: The "South Dakota" and "Iowa" at Newport News, and the "Massachusetts" at Quincy. They Have an Over-All Length of About 60,000 Hp., and a Speed of 26½ Miles an Hour. They Are Electrically Driven Oil Burners.



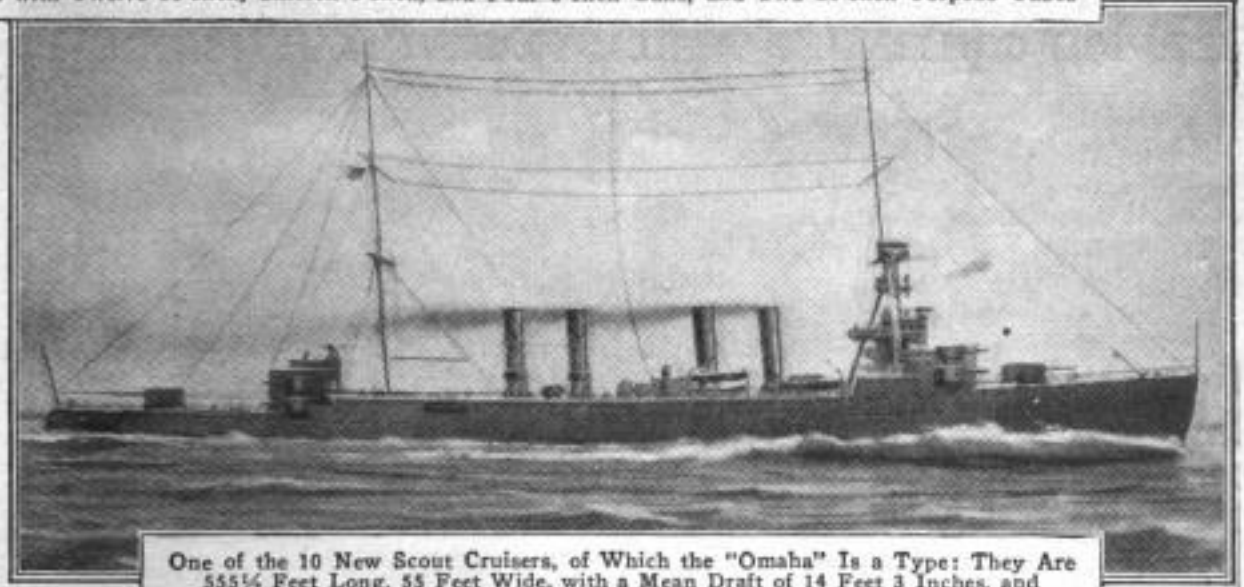
A Fleet Submarine of the Type of Three to be Built: They Are Over 300 Feet Long, with a Displacement Exceeding 2,000 Tons, and Have Two Main and Two Auxiliary Diesel Engines and Two Electric Driving Motors



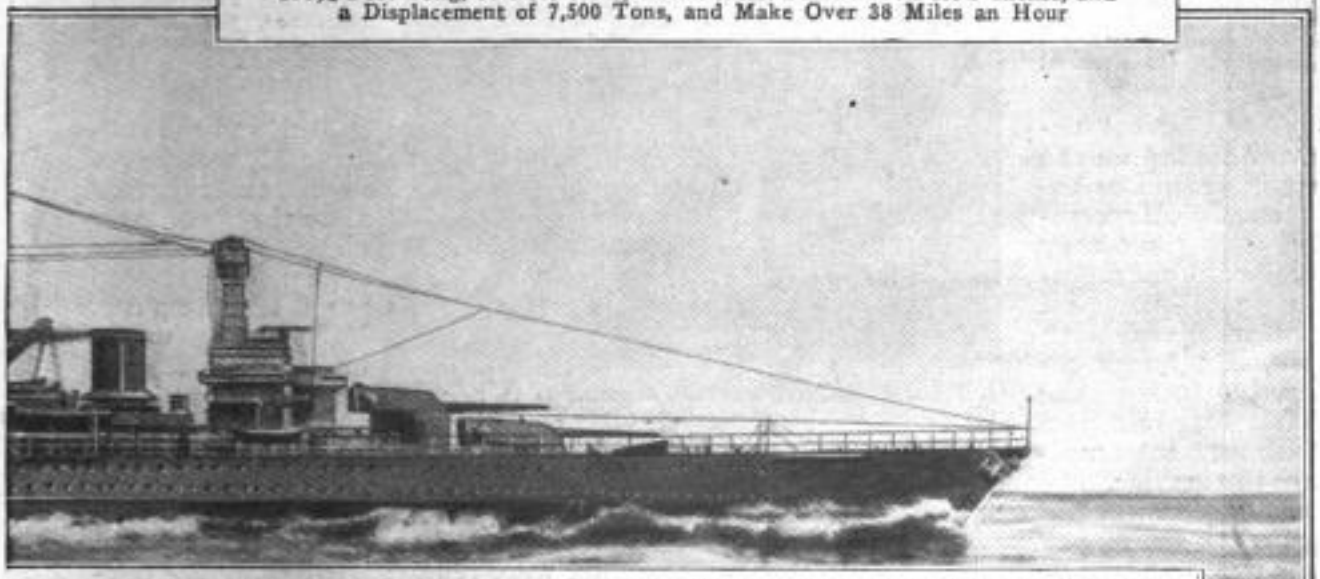
The Type of Six New Battle Cruisers to be Constructed: The "Lexington," "Constellation," "Ranger," and 31 Feet Mean Draft, with a Displacement of 43,500 Tons, and a Speed of 40



the "Indiana" at New York, the "Montana" at Mare Island, the "North Carolina" at Norfolk, the 684 Feet, an Extreme Width of 106 Feet, a Mean Draft of About 33 Feet, a Displacement of 43,200 Tons, Armed with Twelve 16-Inch, Sixteen 6-Inch, and Four 3-Inch Guns, and Two 21-Inch Torpedo Tubes



One of the 10 New Scout Cruisers, of Which the "Omaha" Is a Type: They Are 555½ Feet Long, 55 Feet Wide, with a Mean Draft of 14 Feet 3 Inches, and a Displacement of 7,500 Tons, and Make Over 38 Miles an Hour



"Saratoga," "Constitution," and "United States." They are to Be 874 Feet Long, Over 105 Feet Wide, Miles an Hour. They will Be Oil Burners, with Electric Drive and Auxiliaries

the deck. Each vessel will have three periscopes of the latest pattern, as well as the latest radio listening equipment. Their construction will be such that they can safely submerge to considerable depths, and also withstand depth bombs.

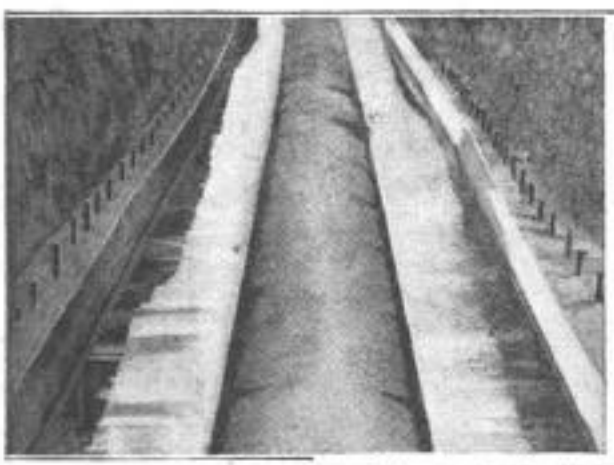
The new air-craft carrier has been christened the "Langley," in honor of Prof. Samuel Pierpont Langley, once the butt of the humorists, but now recognized as one of the founders of aviation. The "Langley" is the collier "Jupiter" reconstructed. The coal-handling gear will be entirely removed or altered, and a flying deck, 56 ft. above the water line, will be constructed. This deck will be 525 ft. long.

Catapults to assist the planes to attain the necessary speed before hopping off, and arresting devices to assist them to alight, are to be installed. An elevator will hoist the planes from below to the flying deck, and there will be two cranes to hoist machines from the water. The repair facilities will include a machine shop, wing-repairing shop, molding spaces, and metal shop.

To prevent smoke from interfering with the flying deck, there will be a short smokestack on each side, so connected that the smoke can always be discharged on the lee side if desired. One of the stacks will also be hinged, to permit the smoke to be discharged downward near the water, and the other will be so arranged that the smoke can be discharged through a water spray.

Radio equipment will be installed on the "Langley" so that this mother ship can talk to her flying children at all times.

SERVICE CONTINUED WHILE WATER MAIN IS RELAID



Here is Shown How the Concrete Conduit was Cast around the Old Steel One, Leaving Only Space Enough for the Removal of the Latter

Ready to Pour the Cover: After the Concrete Had Hardened, the Planking and Steel Pipe were Removed and the Cover Dropped into Place

A Finished Section: All That Remains Is to Remove the Planks and Lower the Cover into Position, Sealing the Top Opening

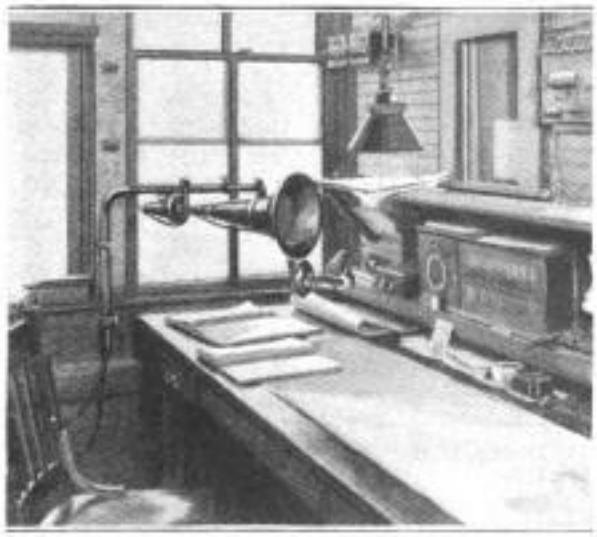
The unusual demand made upon the engineers of Los Angeles, Calif., recently was that they replace a four miles-long 44-in. steel water main with one of a larger capacity, using the same trench and without interrupting the service. It looked like, and was, a large order, but the resourceful engineers called to their aid the well-nigh infallible concrete and started in. Working on short sections at a time, the soil was dug from around the pipe, molds were installed, and the concrete poured to form an approximate three-quarter circle around the old conduit. The top was left open. When the main body of the casting had dried, planks were placed lengthwise of the top, and a bed of concrete was poured upon them, forming the cover. Upon the completion of the second drying, the pipe section and planking were removed, dropping the concrete cover into place. The new conduit is 6 ft. wide and 3½ ft. deep.

VOLATILE ESSENCE POISONS WEARER OF DYED SHOES

Severe symptoms of poisoning, developed recently by the wearer of a pair of freshly dyed shoes, caused a Chicago chemical laboratory to make a careful analysis of the dye used. It was found to contain nitrobenzene, commonly known as oil of mirbane, a fluid of poisonous vapor made by treating benzene with nitric acid. While it is a by-product of aniline production, it does not normally exist in the dye, and was probably added as a cheap penetrating and perfuming agent, as it has an almond odor. Inasmuch as its poisonous emanations may readily be absorbed through the feet, shoes treated with dyes containing it should not be worn for three or four days after the application, and its use in public shoe-shining shops should be guarded against.

LOUD TELEPHONE CONVENIENT FOR TRAIN DISPATCHING

Railroad train dispatchers whose only objection to the modern telephone-order method is the use of the headband, or the alternative of holding an ordinary receiver in the hand, are freed from even those requirements by a new form of loud-speaking telephone, devised for that purpose by a western inventor. An interesting feature of the new receiver is that the transmitter is mounted on an adjustable arm hanging from the amplifying horn, so that the operator is entirely independent of the instrument, and can use both hands for



The New Loud-Speaking Telephone Receiver Arranged for Train Dispatching, with the Transmitter Hung from the Horn

the records. With a special transmitter, the loud receiver may also be used to distribute music from a phonograph.

IMPERISHABLE BURIAL ROBES SHOWN ON LIVING MODELS

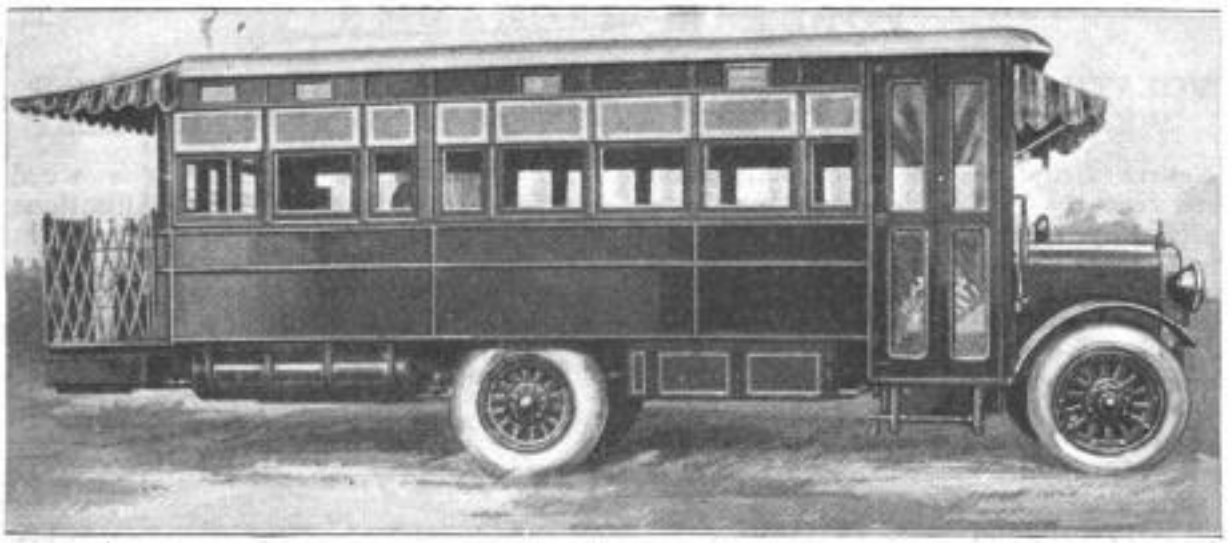
To the cheery mortician, the word "grewsome" exists only to make situations in fiction, and is without significance in

Living Models Employed to Display New Types of Burial Gowns, Made of Indestructible Materials

real human affairs. The idea recently conceived by an eastern casket concern, of displaying samples of a new type of burial robe on feminine models, very much alive, might have shocked sensitive souls by its intimate suggestion of mortality. As only undertakers and a few blasé newspaper men were present, however, presumably no gloom was provoked. The feature of the gowns so exhibited is that, unlike their intended wearers, they are made of practically indestructible material.

AMERICAN-LANGUAGE LESSONS FEATURE OF JEWISH PAPER

In accordance with the awakening spirit of Americanism among aliens, a prominent Jewish daily newspaper, with offices in New York and Chicago, is featuring a continued series of lessons in the English language. Each lesson is prepared with a view to its interest as well as pedagogic value, simple stories of a practical or even humorous character being used to assure the attention of the student. Parallel columns or alternate lines of Yiddish and English, explanations of phrases, and glossaries of words, compose the system of printed instruction. The editor of the paper also has prepared a history of the United States in the Yiddish language.



Exterior of the Palatial Auto-Bungalow: The Long Overhang Balances the Load over the Rear Axle, Thus Relieving the Front Wheels and Making Steering Easier; the Underslung Tank Contains Compressed Gas for Cooking and Heating

AUTO-BUNGALOW TOURING WITHIN REACH OF ALL

BY WM. H. HUNT

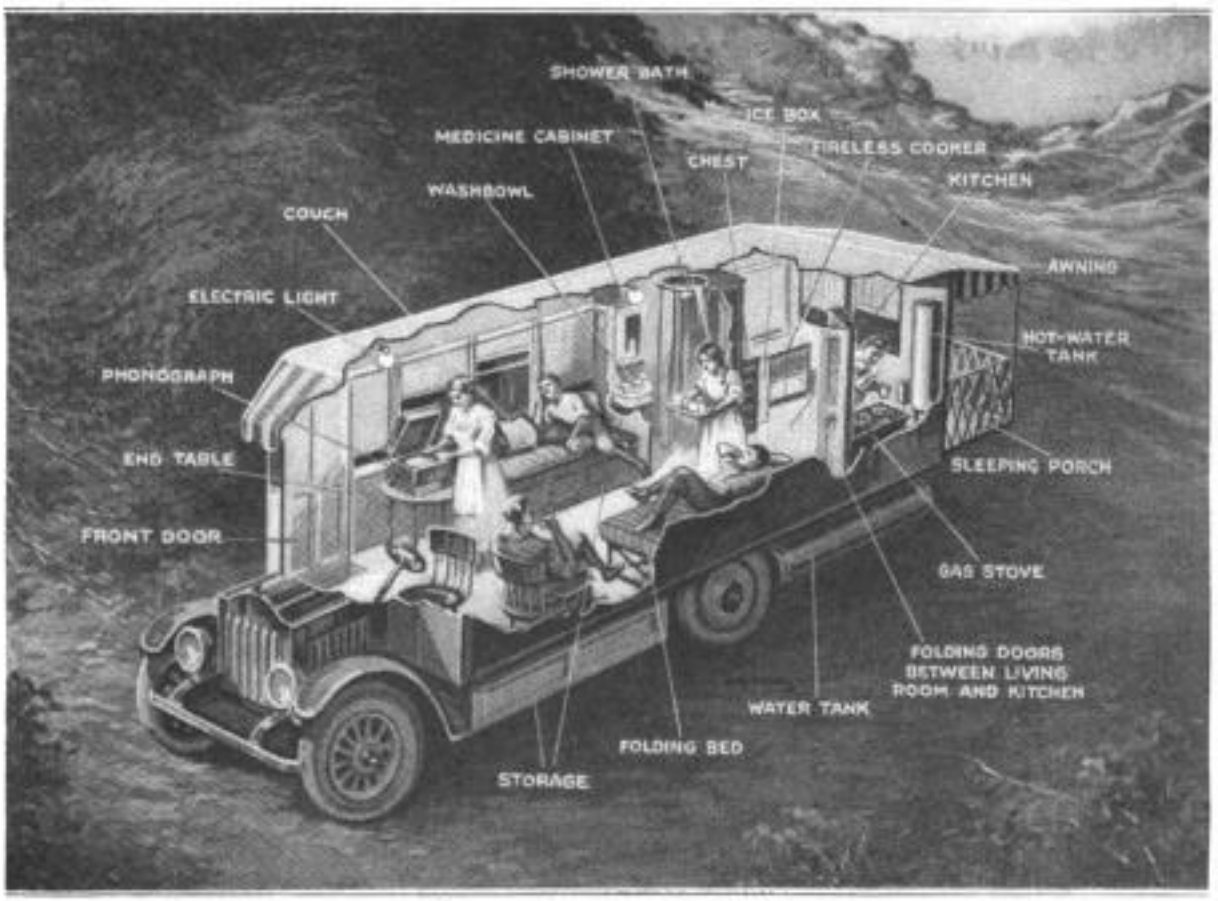
THE auto-bungalow is the culmination of a movement which has been growing ever since the motor car became a reliable means of transportation. Its ancestor was the two-wheeled homemade camp trailer, designed to carry the tents, bedding, and other simple requisites of a two-weeks period of "roughing it" in the woods or at the shore. Little did the builders of these makeshift contrivances realize that they were obeying a desire which has finally found expression in traveling homes equipped with conveniences not found in many rural homes. That this assertion is not overdrawn, an inspection of one of these automotive apartments, built for a retired eastern farmer, discloses. The complete cost of the vehicle was $16,000, of which the major part was expended on the body and appointments.

This Twentieth-Century Prairie Schooner Was the Bedroom, Dining Hall, Reception Room, Library, and Kitchen for a Family of Six during a Tour to California

A standard motor-truck chassis, fitted with pneumatic tires, forms the foundation—if such it may be called. The body, built to the owner's specifications, is a splendid example of the coach builder's art, spacious, substantial, and weatherproof. An over-all length of 30 ft. necessitates an abnormally long overhang in the rear which, though presenting an odd appearance, is a positive advantage, as it balances most of the weight over the rear axle, thus relieving the front wheels and making steering easier. The living quarters occupy the whole of the interior, including the space usually taken up by the front seat. This gives a clear space of approximately 8 by 20 ft., which is ample to accommodate a kitchenette, combination couches and folding beds, easy chairs, a folding dining-room table, and other necessary furnishings. The floor level is well above the top of the rear tires, which affords a surprising amount of space under the body edges for the stowage of steamer trunks, suitcases, and miscellaneous luggage. Sleeping accommodations are provided by three folding cots, which are made up on the rear observa-

tion platform, and by combination couches that extend lengthwise on each side of the compartment. The kitchenette is equipped with a gas stove, fireless cooker, refrigerator, and hot-water tank. Toilet facilities have not been overlooked, being amply supplied by a stationary washbowl, with hot and cold running water, and a shower bath. A special storage-battery and generator installation supplies power to operate 22 incandescent lights of small size but great brilliance.

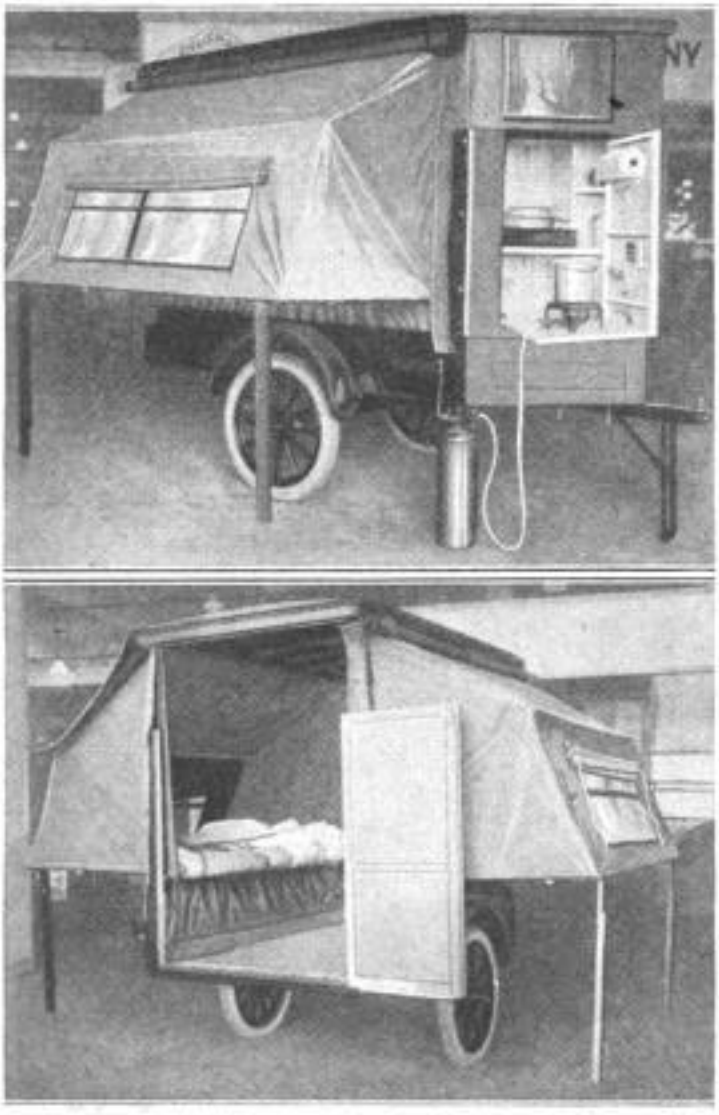
The owner, his family, and two guests have embarked in this auto-bungalow for



Encamped for the Night after a Leisurely 100-Mile Run: The Ideal Arrangements of This Traveling Bungalow should Satisfy the Most Exacting. Few Rural Dwellings Have the Conveniences—Gas Stove, Shower Bath, Hot and Cold Flowing Water, and Electric Lights and Fans—Which Are Part of the Furnishings of the Very Latest Example of the Automotive Home

a tour of the United States which, according to the plans, will consume two years. The idea opens a vista of pleasant possibilities to the imagination, which, if dwelt upon, will likely arouse the latent wanderlust slumbering in one and stir up longings to go and do likewise.

That few are able to finance the construction of such wheeled palaces need be no bar to their partaking of the joys of the open road on a more economical scale, as witnessed by the growing swarms of self-sufficient tourists which frequent the highways throughout the length and breadth of the land. Thousands of the fraternity are quite independent of hotels, eating, sleeping, and genuinely living aboard their traveling homes. One of the most interesting of these outfits was built by a resident of Kansas City at a reasonable cost, last year. It consisted of a body modeled on the lines of an old-time "prairie schooner." The chassis of a popular make of light car, upon which it was mounted, was lengthened several inches to increase the wheelbase and improve the riding qualities. Six persons enjoyed a trip to the Pacific coast in the inexpensive vehicle at a considerably less cost than would have been the case had they traveled by rail. An even simpler equipment was that assembled by a Maine citizen. This was simply an open, canopy-top, light-delivery car, fitted with comfortably cushioned broad benches, which were used as beds by the younger members of the party of six. The others slept upon folding cots under a quickly erected half tent, one side of which was attached to the side of the canopy top and the other to tent pegs. Meals were prepared over camp fires or on an oilstove, depend-



Two Views of a Well-Designed Touring Trailer: The Canvas Extensions Fold Inward, and the Telescoping Sides Permit the Top to be Lowered

ing upon the weather, and eaten from paper dishes. The party's total expense for a five-weeks' trip from Belfast, Me., to Santa Ana, Calif., including leisurely stops at all points of interest and two new tires, was $312, an average of $52 per person.

For those who have neither the leisure nor the ingenuity to originate and build outfits, there are numerous two and four-wheeled trailers offered on the market. Many of these are of quite elaborate design and make-up, including two comfortable berths, extension canvas sides fitted with mosquito-barred windows, kitchen cabinets, gas stoves, and luggage space. One or more is made on the double-deck plan, with the top deck collapsible. This arrangement furnishes sleeping quarters for four.

So far, in this country, those who have taken to the various modest or ornate wheeled homes have done so from choice, on account of the novelty and enjoyable features, and with the idea that the sojourn should be only temporary. But there is another angle of the matter that is not quite so enjoyable to contemplate. At the rate at which our increase in population is outstripping our home-building activities, the time may come, and shortly, when hundreds or thousands may be compelled to take up their residences in wheeled bungalows, cottages, or shacks, as the case may be. This possibility is not so remote as it may seem. In France it is an actuality, so

This Outfit Established the Trans-Continental-Tour Cost Record of $312, Which Included Two New Tires. Most of the Cooking was Done over Camp Fires

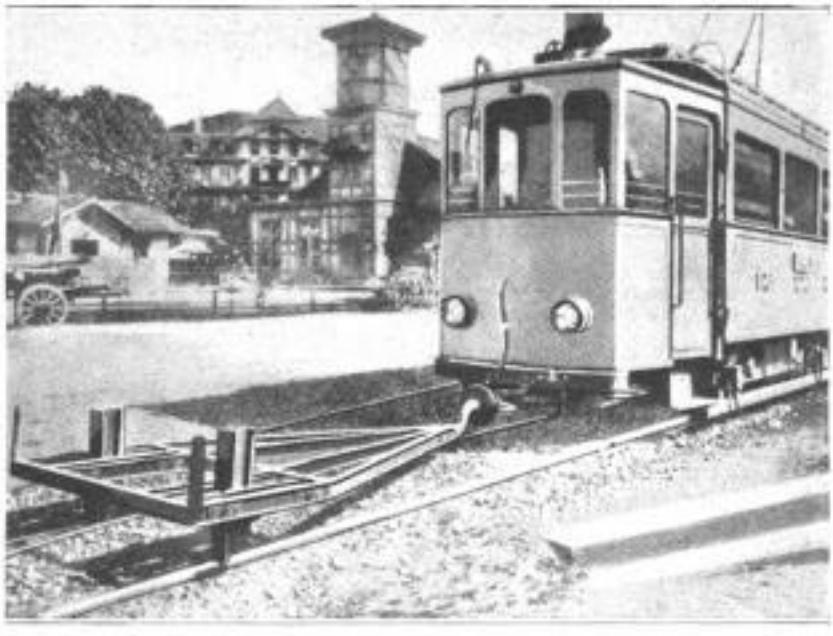
acute that the French government has contracted for a quantity of two-story bungalows, mounted on two-wheeled trailers, for quick transportation to those parts of the war front where whole communities were left homeless. To be sure, we have not been swept by fiercely struggling millions, but peace has its ravages, secondary in severity to those of war, yet severe enough. Not the least disquieting of these is the housing shortage and high-rent era through which we are passing, and which seems to be becoming more critical as time passes. Another matter of grave concern to those living in the northern states is the yearly threat of fuel shortage and the attendant high price of that commodity. Were it not for the excessive travel cost thousands of families would gladly migrate south or west in an effort to better their condition or at least escape the rigors of the northern winters. When these factors are given consideration, and an easy solution of the problems presented by them is found in the inexpensive method of climbing aboard a light, simply equipped car and, in a few days' travel—really a vacation—reaching a climate where the mean yearly temperature is 55°, and life's principal necessities spring spontaneously from the soil, it is not to be wondered that every season finds more families "hitting the trails" south or west in home or custom-made dwellings on wheels. If a census were taken, it would probably be found that these wayfarers constitute an army which outnumbers that of the '49ers many times over. The auto-bungalow or cottage dwellers are not all tourists by any means. Hundreds of them are people migrating from one section of the country to another, who have discovered that their outfits supply not only a satisfactory mode of transportation but also a comfortable home when they reach their journey's end.

NOVELTY WINDOW SIGN SPELLS WORDS WITH SNOWFLAKES

An advertising novelty for the shop window is a case, about 18 in. square by 4 in. thick, covered at the front by a pane of glass and at the back by a fine-mesh screen painted black. Thousands of tissue paper snowflakes are kept swirling and eddying inside the case by the blast of an electric fan. Pressed against the back side of the background, out of sight of the spectators, are the openings of a number of tubes so arranged that they form designs or groups of words. Four distinct designs and word groups are used. When a vacuum is created in any one set of tubes, the artificial snowflakes are caught and held against the inner face of the screen in an outline that spells the words or displays the design represented by that particular group of tubes. When the latter are relieved of the vacuum, the flakes are released and the blast from the fan quickly sweeps the background clean. As the miniature blizzard is continuous, the effect is pleasing though somewhat bewildering.

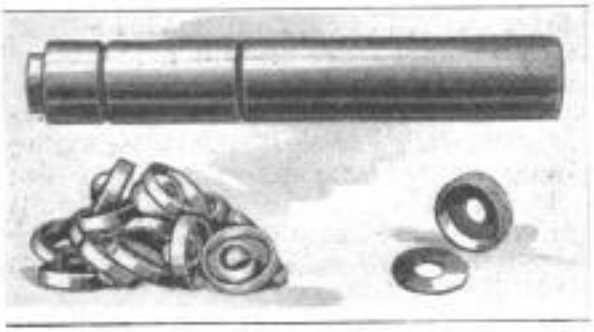
AUSTRIAN STREET-CAR TRACKS CLEANED BY NOVEL FRAME

A metal frame which is pushed along street-car or railway tracks to remove insulating dirt and ice, is an Austrian invention that is proving popular in Europe. The frame is made of bars arranged fan shape. The apex of the fan is coupled to the drawbar of the street car; the front of the frame carries two steel uprights, which are adjustable for gauge and carry the steel cleaning knives.



Pushed by the Street Car, This Steel Frame Removes Dirt and Ice from the Tracks. The Steel Uprights, Seen at the Left, can be Adjusted to Fit a Track of Any Gauge

IMPROVED GUN SILENCER EASILY DISMANTLED



The New Silencer Dismantled for Cleaning: Top, the Tubular Body; Bottom, the 19 Silencing Chambers, the Knurled End Cap, and the Washer That Rests against the Rifle Muzzle

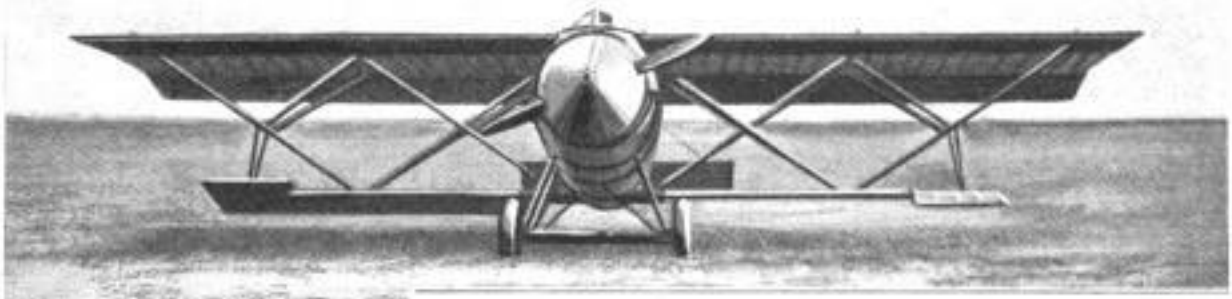
An improved form of the now familiar gun silencer, just placed on the market, is so constructed that it is readily taken apart for cleaning or repair. The new rifle attachment weighs 4 oz., and is ⅞ in. in diameter, as compared with a 5-oz. weight and a 1-in. diameter for the old model. With the aid of a simple tool, the 19 silencing chambers in the improved type are easily removed from the tubular body, and as easily reassembled on the same tool and inserted into the tube, where a knurled cap holds them firmly in place.

HUGE SNOW LOADER CLEARS STREETS QUICKLY

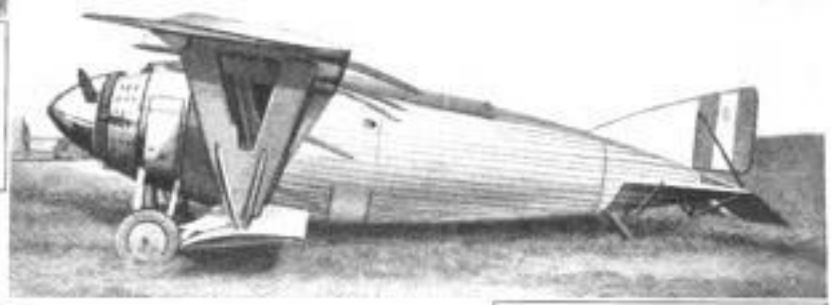
The Snow Loader Demonstrating Its Capability by Cleaning Up a Big Drift

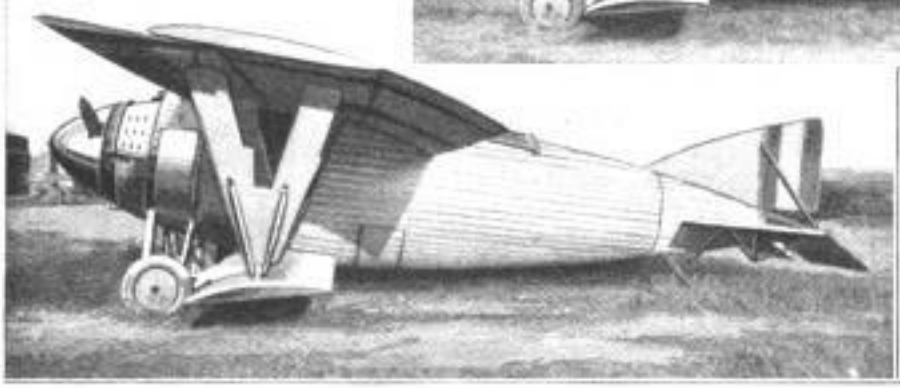
During a recent demonstration upon the business streets of the city of Chicago, a self-propelled snow shovel and loading machine scooped up and loaded snow into large motor trucks at an average rate of a truck load every five minutes. So rapidly did it do the work that it was necessary to fit the truck bodies with sideboards to hold the load. The huge machine did the work of 50 or 60 shovelers and, operating tirelessly without a stop for 30 hours, established a record for the amount of snow moved in that length of time. In construction, the apparatus is practically identical with similar machines used to load ashes, sand, gravel, etc., which services it performs when required. It consists of a long, inclined, cleated conveyor belt, which picks up the snow from a scoop at the front end, and carries it to the rear end, where it is dumped into the attendant trucks. A four-cylinder gasoline engine supplies the power to drive the belt and also the endless-tread tractor upon which the apparatus is mounted. In service, the snow is first piled into large windrows at the side of the streets by motor snowplows. Then follows the loader, eating steadily into the drifts, which fade away as if by magic. A crew of four operates the apparatus.

Five-Ton Trucks, Fitted with Sideboards to Increase Their Capacity, were Filled in an Average of Five Minutes Each by the Snow Loader



A Head-On View of the Test Plane Equipped with Extension Wings: They are Here Extended to Their Limit, Presenting a Sustaining Surface of About 560 Square Feet





Side View of the Extension Wing. Above: Folded; the Protruding Cross-Frame Ends Form Guides for the Subsidiary Planes. Left: Extended; Not Only is the Supporting Area Almost Doubled, but the Curvature is Also Increased, Giving a Weight-Carrying Wing Form

EXTENSION AIRPLANE WING MAKES LANDING SAFER

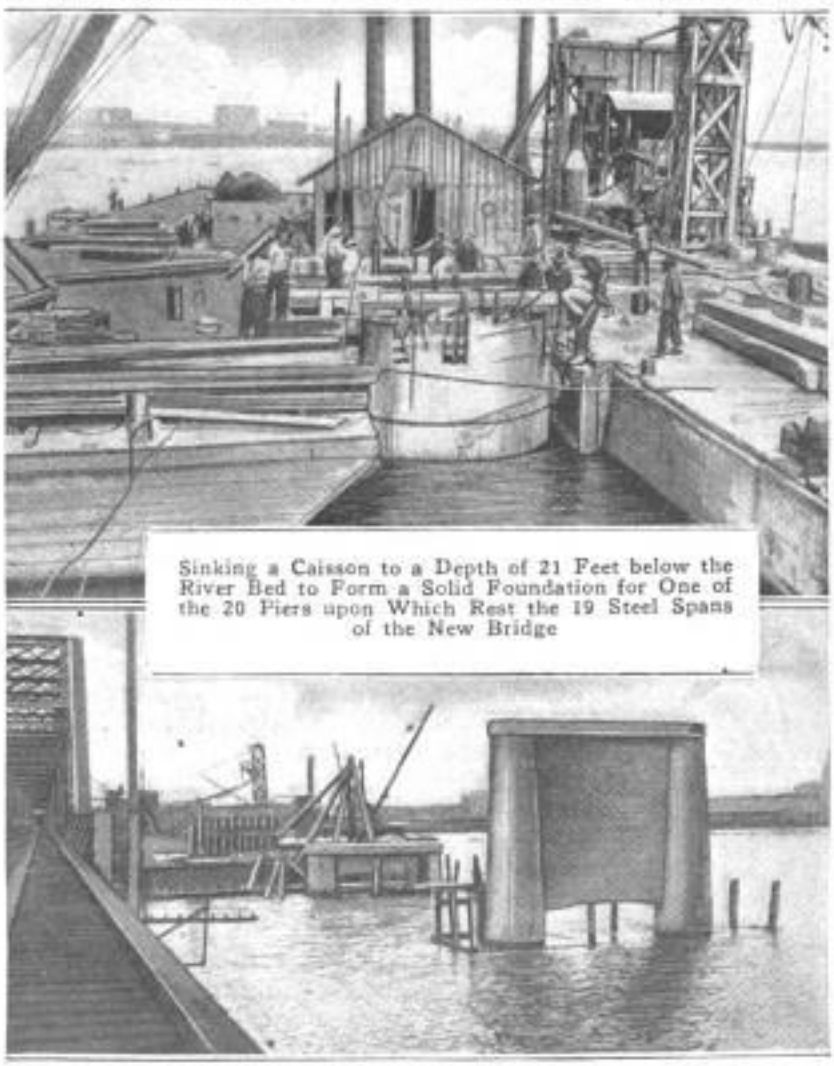
As the most striking finding of his classical experiment in mechanical flight, Darius Green voiced an axiom that has been, and is, the basis of one of the principal problems in aerial navigation. To paraphrase his observation, "flying is a wonderful experience, but alighting leaves much to be desired." Everyone who has ever flown, from the days of the Wright brothers' earliest experiments down to the present, has speedily come to appreciate the truth of the foregoing. Possibly our latter-day pilots feel it more keenly than did the pioneers, for it is a fact that as the air speeds have increased, with increased power and decreased wing area, the landing speeds have also increased until it has come to be more of a feat to make a successful landing than it is to get up and away. The reason for this lies in the last above-named factor—decreased supporting area—as compared with an increase in both the weight and power of the machines. Airplane designers have long recognized this fault and, since before the war, have set themselves the task of evolving the remedy. Various devices have been worked out and given trial until it is now becoming evident that some method of altering the size or shape of the wings at will, while in flight, will be the ultimate solution of the problem.

Both of these principles have been tried singly with more or less satisfactory results, but it has remained for Messrs. Levavasseur, Gastambide, and Latham, noted French designers, to score another triumph in aerial engineering by combining the two in a wing which can be increased or decreased in total supporting surface between the extreme limits of 32 square meters—about 344 sq. ft.—for the minimum, and a maximum of 52 square meters, or about 560 sq. ft. In structural detail the new wing consists of three surfaces, one main plane and two subsidiaries. These latter are so arranged that the pilot may cause one to slide forward from its normal position, underneath the main plane, while the other moves backward from the top of the main member. Not only does this have the effect of almost doubling the supporting area by increas-

ing the wing depth from 5 ft. 4 in. to 10 ft. 8 in., but it also effects a change in the camber from that of a flat speed type to a deeply curved weight-sustaining surface. During recent trials a biplane, of a conventional design, aside from the new-type wing with which it was equipped, gave a wonderful exhibition of certainty of control, showing a speed variation of from 37 to 125 miles an hour by means of wing manipulation, the pilot spreading or folding them at will. However, the most noteworthy feature of the performance was the attainment of that which had been the dream of the designers, the successful landing at a low speed in a very restricted space. How well this was accomplished the official records show. These are: landing speed, 38 miles an hour; distance required to come to a stop, 120 ft. A few more signal successes on the order of this one, and human inventive genius will have passed beyond the point where it longer has need of the tutelage of the feathered brethren of the aerial ways.

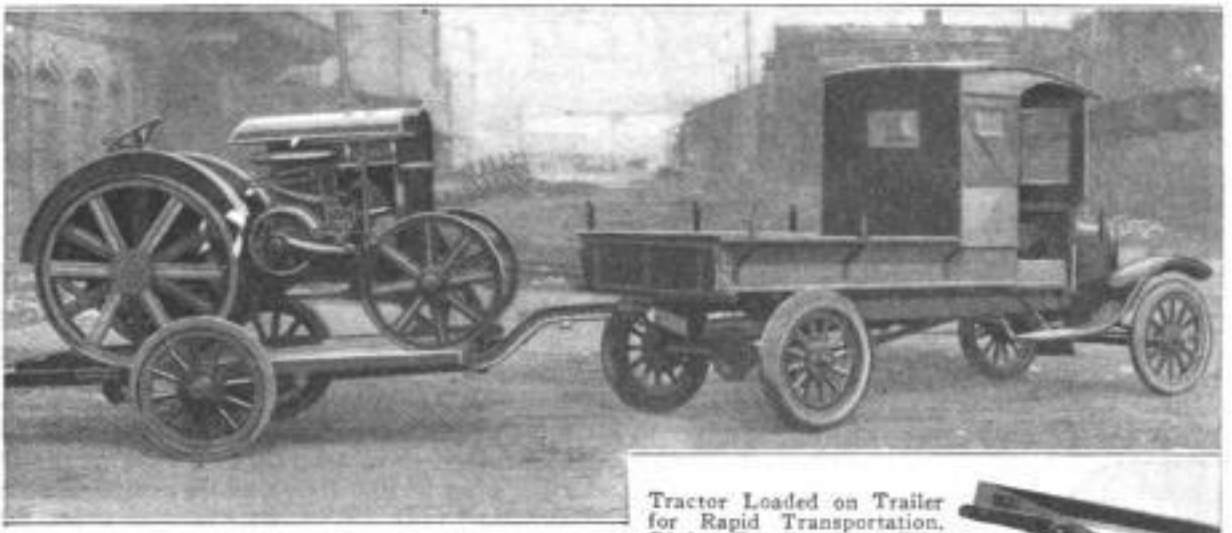
IMPOSING NEW BRIDGE AT JACKSONVILLE, FLORIDA

Barring accidents, a splendid steel-and-concrete bridge, spanning the St. Johns River at Jacksonville, Fla., will be opened to traffic in a few weeks, as it is rapidly nearing completion. Built by Duval County at a cost of well over $1,000,000, the majestic viaduct will relieve the ferry lines plying between Jacksonville proper and South Jacksonville of much of the heavy traffic. The new bridge is 3,800 ft. in length, of which the north and south approaches make up 500 and 900 ft., respectively. The 44-ft. width will accommodate vehicle and street-car traffic and include 7-ft. walks on each side. The site parallels that occupied by a railway bridge, from which it is only 75 ft. distant. This presented a nice problem in clearance for the swing span of the older bridge, which was solved by placing the 140-ft. vertical lift-span section of the new structure in direct alinement with the moving span of the other. As the extreme bottom of the lift span, when in the down position, is several feet higher than the topmost point of the railway bridge, the swing span of the latter has ample space in which to turn, passing under the lift span in its travel. A 120-hp. electric motor supplies the power to lift the 1,400,000-lb. weight of the lift section to a height of 165 ft. above the water level. With the span down, the clearance is about 57 ft. The great weight is balanced by two counterweights suspended by thirty-two 2¼-in. plow-steel cables. A 6-hp. gas engine will be installed for emergency use.



Sinking a Caisson to a Depth of 21 Feet below the River Bed to Form a Solid Foundation for One of the 20 Piers upon Which Rest the 19 Steel Spans of the New Bridge

The Approach and First Pier at the Jacksonville End of the New Bridge: Proximity to the Railway Bridge Necessitated Some Adroit Engineering at One Point, to Avoid Interference with Its Swinging Span



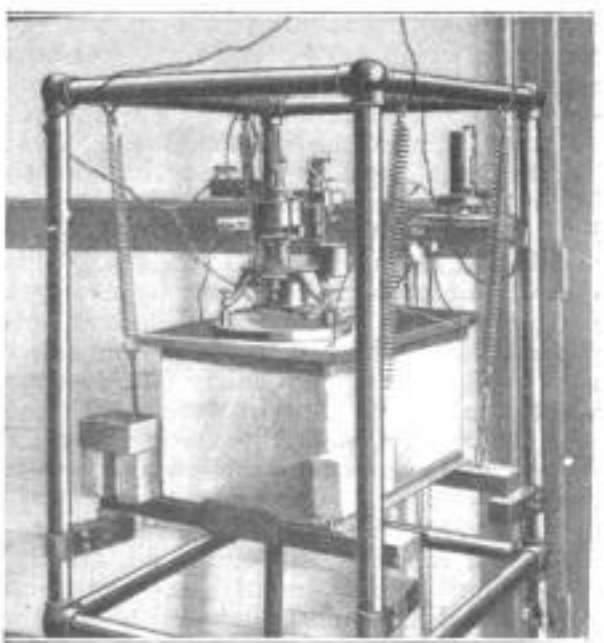
Tractor Loaded on Trailer for Rapid Transportation. Right: Details of the Tilting Frame, Showing the Automatic Latch Which Locks It in Position

TRACTOR-CARRYING TRAILER SPARES GOOD ROADS

After having voted generous funds and built a system of highways which is the topic of favorable discussion wherever the subject of good roads is brought up, the citizens of California, as a preservative measure, caused the enactment of a statute which makes it a misdemeanor to drive a tractor on the highways without having removed the strakes from the bull wheels. One result of this order is that specially designed two-wheeled heavy-duty trailers, of low clearance, upon which a tractor may be easily loaded under its own power, have made their appearance. The platform of the device is pivoted to the axle in such a way that the rear end can be dropped down to the ground, forming an easy incline up which the tractor is driven. After the tractor front wheels have passed a trifle beyond the center of the platform, it rights itself on its frame and automatically locks in position by means of latches. To unload, the process is reversed. Hitched to a passenger car or truck, the tractor can be transported wherever desired in much less time than would be required to move it under its own power.

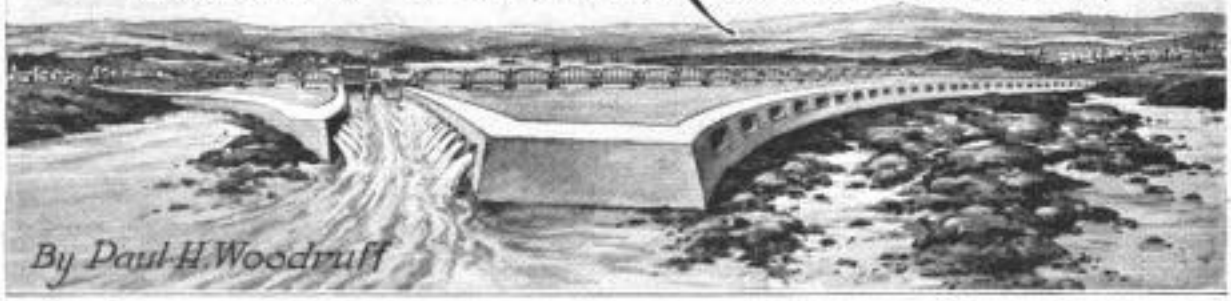
VIBRATION GALVANOMETER ADJUSTED FROM DISTANCE

As the ordinary form of galvanometer cannot be used with alternating electric current, the vibration galvanometer, with an oscillating mirror, is employed in laboratories. The effective length of the suspension filament in such an instrument is adjusted, heretofore by hand, until its frequency agrees with that of the current, but in a model recently developed by the Bureau of Standards, the adjustment is accurately made from a distance by magnetic means. As a consequence, the observer need not touch the galvanometer at all, and to avoid all outside vibration, it is mounted on a heavy concrete block, suspended by springs from an iron frame. The new instruments, used for checking the primary and secondary ratios of instrument transformers, are extremely sensitive, and measurements to one part in 10,000 are made.



Two New Remote-Control Vibration Galvanometers, Mounted on a Concrete Block Suspended on Springs

BRITAIN'S HUGE TIDAL-POWER PROJECT



By Paul H. Woodruff

SINCE the mechanical potency of a head of water first was known engineers have gazed with covetous eyes upon the almost infinite energy of the tides, and schemes of all degrees of practicability have been proposed for the salvage of a modicum of that wasted power for the work of civilization. Most of these rather fanciful suggestions have been unable to survive the test of practical mechanics, and the whole idea has remained in the comfortable but unprogressive stage of a "development of the future." From this category, however, it now appears to have been suddenly removed, by the announcement, from no less authoritative a body than the British ministry of transport, of remarkably comprehensive plans for an enormous tidal-power plant on the estuary of the Severn River, between England and Wales.

Noninterference with established shipping is a necessary element in the selection of such a site, but entirely aside from this condition, the Severn's mouth is remarkable in its natural fitness for the project. The maximum range of the spring tides at that point is 38 ft., and the minimum neap range is 20 ft., giving a mean range of 29 ft. The width of the estuary, on the line where the Severn tunnel now carries the tracks of the Great Western Railroad from west England to Wales, is about 2½ miles. In the center is a natural sandstone channel, of ample width and from 60 to 100 ft. deep. This convenient canal is bordered by nearly a square mile of broad, rocky shelves, exposed at low tide, and the banks on either side are low-lying and fairly flat. Above the tunnel line is a basin which, with the tide controlled, would extend over 27 square miles, and accommodate the largest ships.

Inasmuch as the quantity of water available in a tidal flow is unlimited, and its utilization is not embarrassed by such sentimental considerations as obtain in the case of cataracts, the magnitude of such an undertaking is a mere matter of means and engineering skill. The Severn project, with a cost unofficially estimated as not less than $40,000,000, and perhaps as high as $150,000,000, calls for a usable output of 500,000 hp. continuously for 10 hours a day. To gain this huge volume of power, in the face of the well-known irregularities, cessations, and reversals of tidal heads, requires the installation, in the new scheme, of two complete plants, with the stupendous total rating of more than 1,500,000 hp. It is the arrangement of these two separate power plants for cooperative action that constitutes the ingenious feature of the plan.

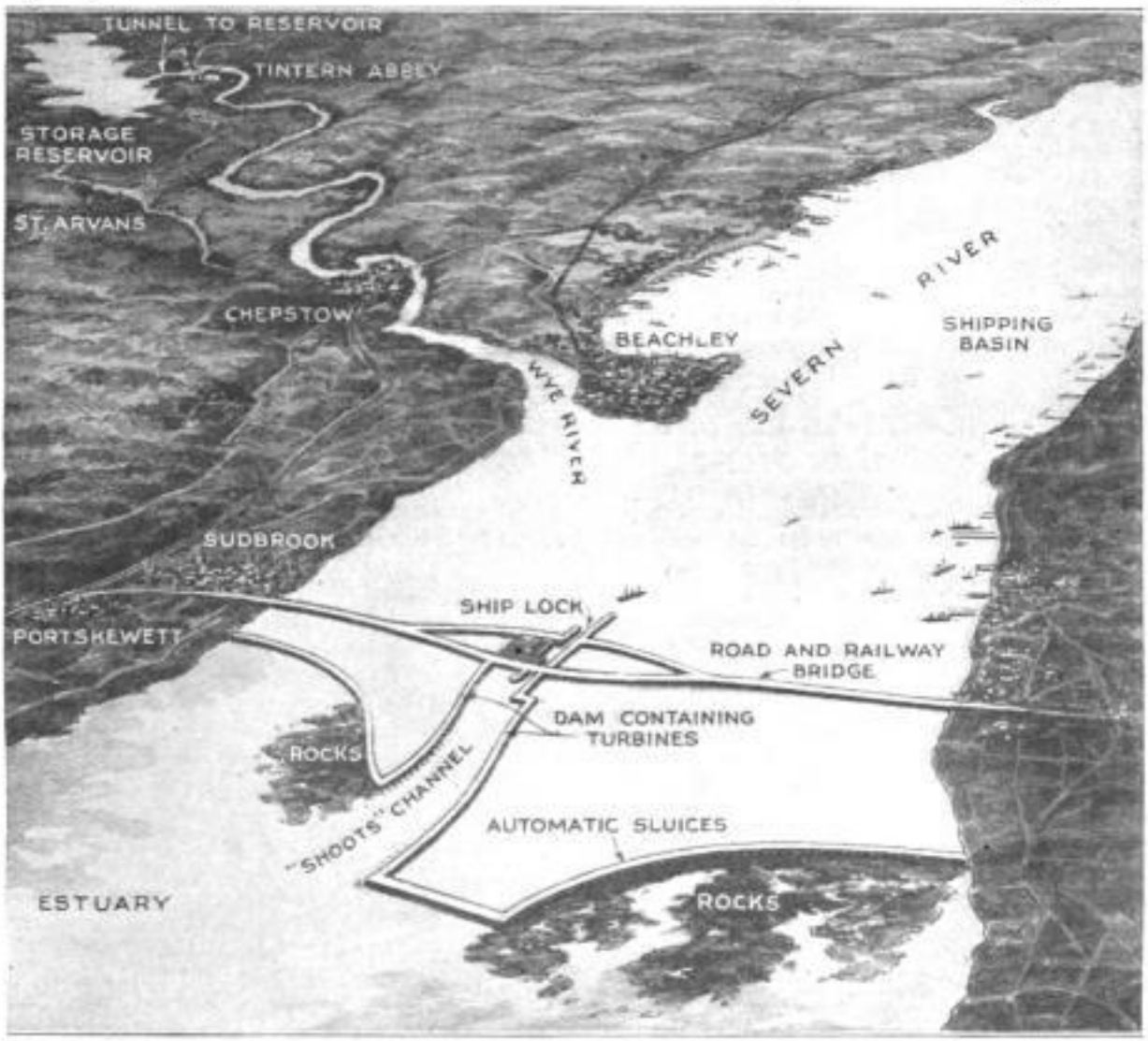
The first work to be undertaken would be the construction of a reinforced-concrete dam on the rocky shelves of the river mouth, its walls extending laterally from each shore as far as the central channel, and then turning upstream along its sides and terminating in a lock, large enough to accommodate any vessel. In the lateral parts of this wall it is the intention to hang automatic sluice gates, opening inward when the tide presses against them, and then closing to prevent the escape of the impounded water. Built into the parts of the dam paralleling the channel will be the power plant itself, equipped with a huge battery of vertical mixed-flow turbines, 10 ft. in diameter, the channel serving as their tailrace. These will have a working period of seven hours, beginning with a 5-ft. head soon after the tide begins to ebb, reaching a maximum 30-ft. head in three and a half or four hours, with a possible drop of 10 ft. in one hour, and then diminishing until there is a five-hour period of no operation at all.

With this changing head, the turbine speed would vary between 40 and 80 r.p.m. Direct-current generators of separately excited type will be driven through helical gearing at 300 to 500 r.p.m., and will develop a constant voltage of 525, with a varying current output controlled either automatically or by an attendant. The current will be used to drive large rotary converters, delivering alternating current

at 330 volts, and this will be stepped up by transformers to 60,000 volts for transmission. Not less than 1,000,000 hp. will be the maximum output of this plant.

Ten miles from this huge installation, its site also favored by geographical peculiarities, is the proposed location of the secondary plant, of over 500,000-hp. maximum capacity. It is on the bank of the river Wye, a Severn tributary, near Tintern Abbey, and its main feature is a concrete dam across a neighboring valley, forming a gigantic storage reservoir at a considerable elevation above the river mouth. Between this artificial lake and the Wye, a tunnel of 40-ft. diameter is to be driven through solid rock for more than a mile. The plant equipment, as planned, consists of a bank of 13,000-kw. alternating-current motors, of a type operable also as generators. Of these machines, 90 per cent will be of the induction type, and the remaining 10 per cent synchronous. They will operate at a speed of 375 r.p.m., at 2,200 volts' pressure.

This enormous group of electrical machines will absorb all the current the primary plant generates in excess of the first 500,000 hp., which will be distributed for industrial purposes. Thus at the peak of the tidal head, when the estuary plant is producing 1,000,000 hp. or more, the powerful motors of the secondary plant on the Wye will be running to full capacity. They will operate huge centrifugal pumps, forcing water from the river up through the 40-ft. tunnel into the high storage reservoir. Then, as the head at the tidal plant falls gradually to zero and reverses, the couplings of the secondary-plant motors will be shifted, separately or together, according to the demands of the occasion, from the pumps to a set of turbines; the storage sluices will open, and the secon-



A Diagrammatic Aerial View of the Severn River Tidal-Power Project: In the Foreground Is the 2½-Mile Dam with Its Automatic Sluice Gates; behind It the Shipping Basin of 27 Square Miles; in the Upper Left Corner, the Big Storage Reservoir of the Secondary Plant, 10 Miles Away on the River Wye

dary plant will take up the duty of maintaining the electrical pressure on the distributing lines. This whole operation of shifting the burden from one plant to the other will be automatically performed, so that current will flow into the line system without interruption. With both plants, a temporary peak-load capacity of about 1,000,000 hp. will be made available in emergency.

From the mouth of the Severn to London is 115 miles, and it is calculated that economical transmission to the metropolis would require 120,000 volts, allowing a 10-per-cent loss, and that the line, of 500,000-kw. capacity, would cost some $6,000,000. South Wales and the English midlands, within a radius of 50 to 100 miles, would doubtless absorb much of the output, and it is quite likely that an industrial community would establish itself right at the Severn basin, similar to the development at Niagara Falls, and with the additional advantage of extensive shipping facilities. Figures indicate that the cost of current production will not greatly exceed one-fourth cent per kilowatt-hour.

An incidental but interesting detail of the proposed improvement is a new bridge across the Severn estuary, on the line of the ship lock, directly over the existing railroad tunnel. This bridge, accommodating both tracks and highway, will be branched at the center, one line passing above and the other below the lock. With this arrangement, one or the other line of tracks will always be open for traffic, and trains will be automatically switched onto the open line, so that the passage of ships through the channel and lock will not delay the use of the bridge at any time, even for a moment. The additional trackage will contribute a needed increase to the railroad facilities of the region.

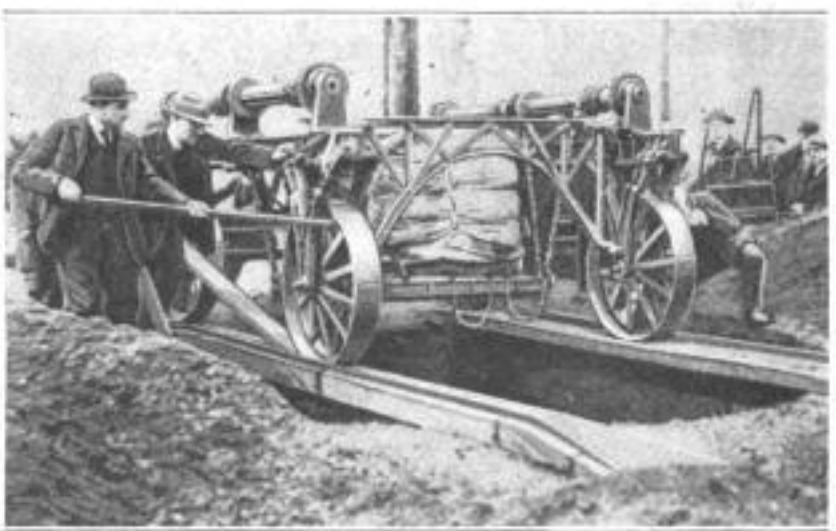
AIRPLANE-FLIGHT READINGS RECORDED IN FILMS

The dummy "watchman" in the cornfield to frighten crows and other crop-devouring pests is common in corn-growing areas, but for the first time a dummy observer is being employed by the aeronautic-instrument section of the Bureau of Standards in performance tests during airplane flights. The novel departure consists in the use of a moving-picture film for recording instrument readings. The method will be thoroughly tested by the air service of the army.

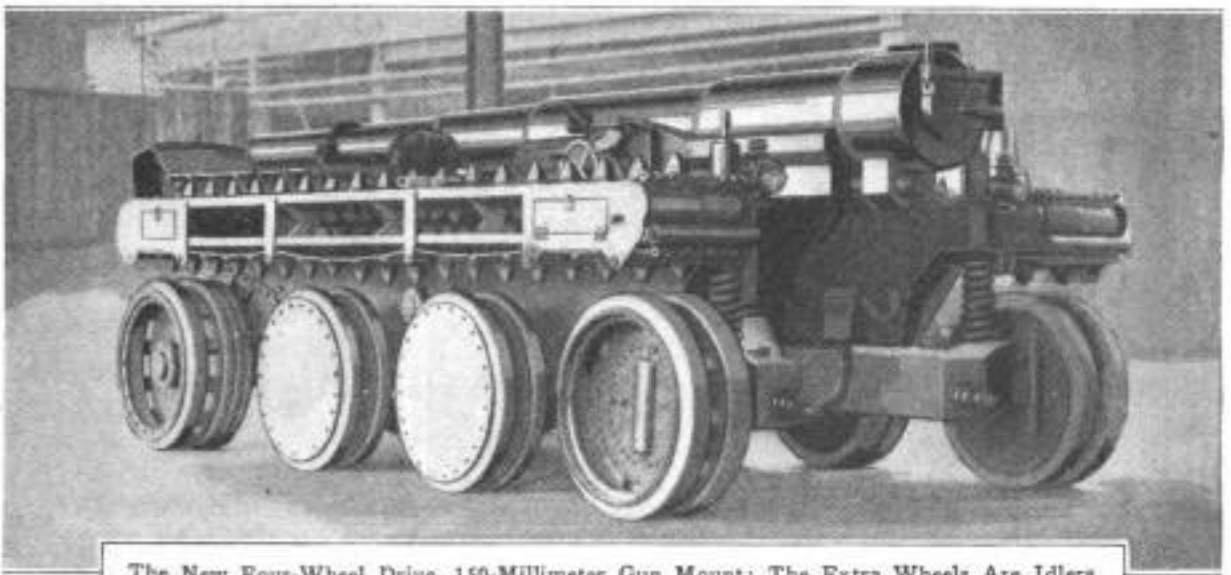
The dummy, which eliminates the services of a human observer on the airplane, consists of a group of specially designed performance-test instruments illuminated and arranged in a box with automatic timing control for the camera. According to the tests of the Bureau of Standards, this method affords records which are more accurate than those obtainable by the usual recording instruments, as the factor of human error is reduced. Details of construction and more elaborate specifications for using the dummy recorder are being withheld pending the publication of a scientific paper on the subject by the government.

TREE-TRANSPLANTING MACHINE TRANSPORTS AND REPLANTS

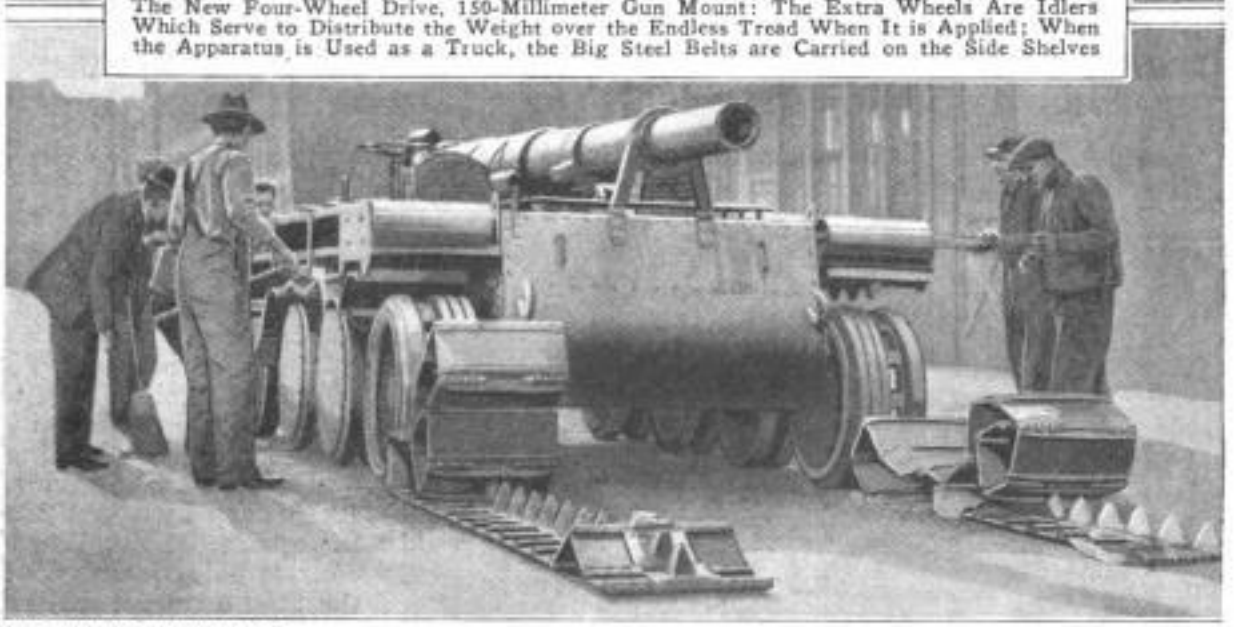
Transplanting large trees has become a simple matter in Green Park, London, since the recent acquisition of an ingenious machine. When the roots have been uncovered, a four-wheeled frame is run onto a short pair of rails laid near the tree, and a substantial platform lowered and worked under the roots. By means of two winches and chains, the whole tree is then raised clear of the ground, and the frame and its load hauled away. At the new location, the rails are laid again, the tree lowered and released, and the job is finished.



The Tree-Transplanting Machine on Its Pair of Short Rails, About to Lower the Tree It Carries into the Newly Dug Pit



The New Four-Wheel Drive, 150-Millimeter Gun Mount: The Extra Wheels Are Idlers Which Serve to Distribute the Weight over the Endless Tread When It is Applied; When the Apparatus is Used as a Truck, the Big Steel Belts are Carried on the Side Shelves

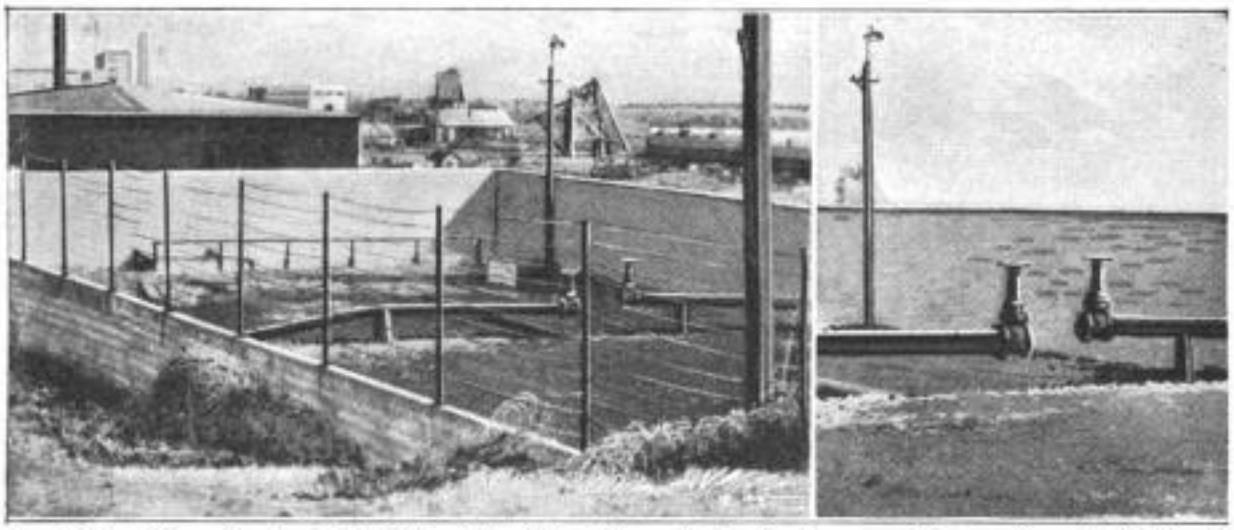


Applying the Treads: In This Way the Truck is Converted into a Tank-Type Tractor Capable of Dragging Its Ponderous 20 Tons of Dead Weight over Soft Ground and up 45-Per-Cent Grades

HEAVY GUN MOUNT IS EITHER TRACTOR OR TRUCK

A new type of artillery mount recently underwent preliminary tests before U. S. ordnance officers preparatory to final official acceptance trials. The design of the apparatus is almost revolutionary, combining conventional motor-truck and endless-tread-tractor components in one assembly, said satisfactorily to perform the duties of both. Loaded with a 150-mm. gun, the novel mount, running as a truck, developed speeds of 14 to 15 miles per hour. As a tractor, the speed is reduced to 10 miles per hour, but the traction efficiency is increased enormously; so much so that gradients of 35 to 45 per cent were negotiated during the test. The change from truck to tractor is quickly made by applying detachable, endless steel treads, similar to those used on the famous tanks, which pass around the outside of the driving wheels. Four extra wheels, placed two each between the main wheels, help to distribute the 20-ton weight of the mammoth apparatus to eight points of the tread, thus spreading the load over a great area and allowing the heavy vehicle to be driven over soft ground. When detached, the treads are carried on the sides of the machine.

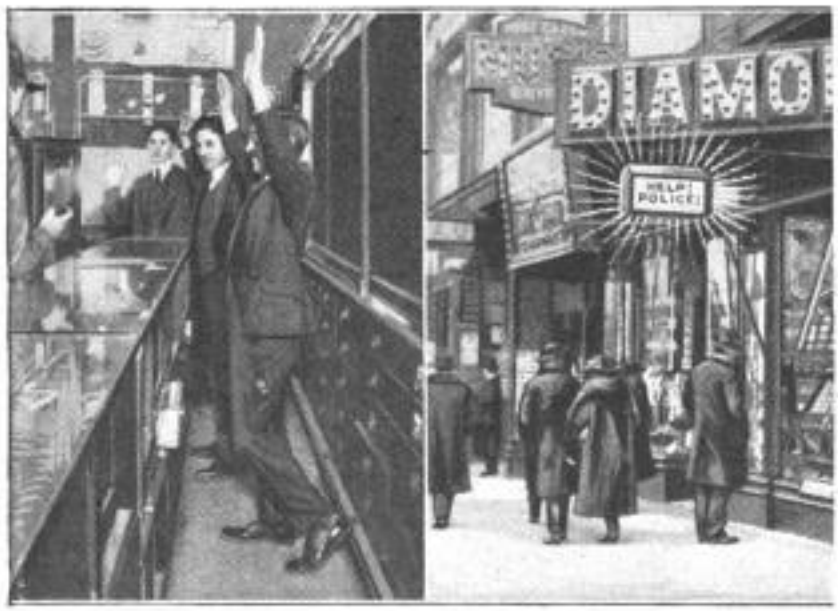
¶The Department of Agriculture and the Plant Protection Institute have combined their efforts to determine the best methods to use in dusting cotton plants with calcium arsenate and other boll-weevil poisons.



An Oil-Pipe Line with the Outlet Valves Placed in a Reservoir for the Purpose of Impounding the Oil Should the Valves become Stuck. Right: A Close View of the Gap in the Line into Which is Fitted a Short Pipe Section When Oil is Transferred between Storage Tanks

STREET SIGN CALLS FOR HELP IF ROBBERS INVADE STORE

Considerable excitement was caused on a New York City business street a short time ago, when a small electric sign, hanging outside a jewelry store, suddenly flashed the words "Help! Police!" in white letters on a red ground. The occasion was a test demonstration of a new burglar-alarm system. The sign, connected to a storage battery, is actuated by pressing a trip board running along the floor behind the counter, where it is easily reached even during a holdup. In actual operation, a powerful electric siren is arranged to work with the warning sign, but was not used in this demonstration.



Left: The Store Clerk, in a Demonstration Holdup, is Pressing the Contact Board with His Heel. Right: The Sign That Appeals for Help

WALLED INCLOSURE SURROUNDS OUTLETS OF OIL-PIPE LINE

Many times, after crude oil has been flowing through the shut-off valve of a pipe line, the valve becomes so badly gummed and stuck that it can hardly be turned off, which results in a considerable wastage. To safeguard against this, a western refining company has placed its pipe-line outlets inside a reservoir, 10 ft. deep by about 100 ft. square. Should any considerable quantity of the fluid escape it will be safely impounded. Another feature of the unusual installation is that there is a gap in the line for a distance of 3 ft. between two shut-off valves. When it is desired to transfer oil from one storage tank to another, a section of pipe of the proper length, threaded on the ends and fitted with a coupling, is screwed into the outlet ports of the valves. The whole line then becomes practically one solid piece for its entire length. Loading tank ships is the main purpose of the installation.

¶ Nineteen kinds of lumber, totaling 28,926,552 ft., were used in the manufacture of toys by domestic factories last year. Most of this was in the form of mill waste which would have been burned had it not been so utilized.

SIMPLIFYING WIRELESS COMMUNICATION

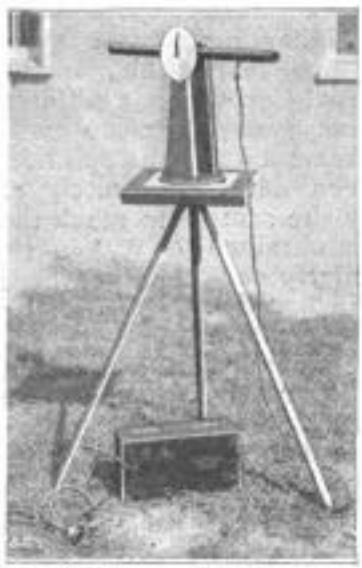
"Resonance Wave Coil" Uses No Ground and Tunes Its Own Waves

BY SAMUEL W. BEACH

IT is called the "resonance wave coil," and was discovered by Lieut. Col. Joseph O. Mauborgne and Capt. Guy Hill, U. S. A., while they were collaborating with Maj. Gen. George O. Squier in the development of the Signal Corps' new progeny, "wired wireless." General Squier presented the first facts about the Mauborgne-Hill find in a paper read before the National Academy of Sciences in April, last year.

Although comparatively of "vest-pocket" dimensions, it is not only a full-fledged radio antenna, but entirely eliminates the use of any receiving apparatus other than a detector and a pair of phones. There is absolutely no ground connection, either actual or counterpoise. It is proving to be an almost perfect single-unit direction finder; and it will even spot the position and altitude of an airship on the wing. When used for transmitting, it tunes its own waves.

These startling facts have been proved. The thing is yet in embryo; but radio masters who have seen it have confidently predicted that when it has been fully developed it will revolutionize the art of wireless telegraphy and telephony, besides putting a safety-first crimp in sailing the air.



The Mauborgne-Hill Resonance Wave Coil and Mounting, Used with a Detector and Head Set as a Complete Radio Receiver

One of the first resonance wave coils made by Mauborgne and Hill was a hollow cardboard tube (any highly insulating material may be used), about 38 in. long, by 2¾ in. in diameter, around which was wound a single layer of No. 32 gauge insulated wire, giving about 100 convolutions to the inch. Terminal binding posts were later placed at each end of the tube for experimenting with various hook-ups. Then there is a brass band, or ring, roughly ¼ in. wide, which is also supplied with a binding post. It is not a continuous ring, being split apart ¼ in. at a point opposite to the binding post. This split prevents the possibility of annoying eddy currents developing. The ring is just large enough to slip snugly over the wired tube. The coil is pivoted to swing to any angle in the vertical plane. A dial on the base of the framework marks the compass direction of the tube, while another dial, facing the operator, indicates the degrees of elevation.

A resonance wave coil of the dimensions given above will receive signals ranging upward of 1,200 meters' wave length. Unlike the old-fashioned types of tuning coils, the shortest wave point is at the center of the coil. If the tube is in a position exactly at right angles to incoming waves, the brass ring may be moved toward either end of the coil in order to tune in. In other words, there are two points along the coil, situated at equal distances from its center toward either end, where 600-meter waves will be heard; likewise, a little farther along, where 975-meter waves may be read, and so forth.

With this tube, located within the laboratory of the Signal Corps at Washington, signals from the Naval Radio Station at Guantanamo, Cuba, have been plainly heard. The Mauborgne-Hill coil is in itself a combination whereby incoming radio waves act uniformly on each element of the coil, supplying the requisite inductance, capacity, and resistance without the assistance of cumbrous, expensive tuning apparatus.

To hear incoming signals it is only necessary to fasten a single wire to the binding post of the brass ring, connecting the other end of that wire to the input grid terminal of an audion detector, or better, a five or six-stage amplifier, the filament connections to which may be entirely left off. Head phones are attached as usual.

This wave coil is extremely sensitive to every sort of local outside influence, thus necessitating its insulation as far as possible from metal objects. Even the human body excites the little wonder, so that the operator stands at a suitable distance, maneuvering the brass ring by tapping it with a wooden stick rather than with his hands. This is not an essential drawback, however. It will be easy to figure out a handy contrivance for the purpose.

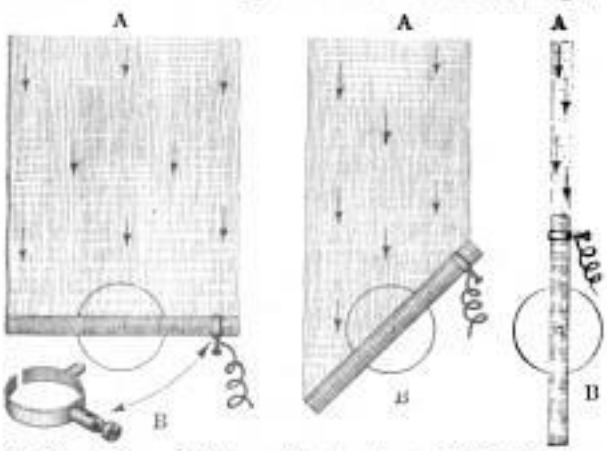
It will be noticed that the lead from the coil to the amplifier box is made of a twisted pair of wires, with the upper end of one strand free. It has been found that the addition of even one foot of wire to

the coil affects it, so a second wire is twisted around the main lead to counteract such influence, much as telephone wires are transposed at frequent intervals along a highway to neutralize their mutual inductances.

A Close-Up of the Mounted Coil, Showing Its Compass-Card Base, Inclinometer Dial, and Sliding Connection Ring

The most pernicious evil encountered in the radio game has always been atmospheric disturbance, or static, but this does not bother much when a resonance wave coil is used. It permits the use of more amplification than ordinarily, the incoming radio signals being magnified far more than static sounds. At present the Signal Corps' experts are using multi-amplifiers, generally of at least six stages, for extreme long-distance reception. It has been determined, however, that practically the same ratio of sound increase may be obtained by connecting two or more similarly constructed resonance wave coils in parallel. Each coil must be in the same position with relation to the angle of the incoming wave trains. Each coil is tuned separately, and then the several lead-in wires from the brass rings are joined at the detector grid terminal.

Perhaps the greatest difficulty now encountered in long-distance aerial navigation is a lack of quick-acting dependable direction finders. The German authorities have continually insisted that this was the cause of the collapse of their Zeppelin campaign during the war. Exhaustive experiments indicate that the resonance wave coil will prove revolutionary as a direction finder.



Manipulation of Coil, at Station B, to Find Direction of Station A. Left: Right-Angle Position of Maximum Loudness. Center: Fewer Waves Cut and Signals Weaker. Right: Position of Minimum Signal Reception. Left Bottom: The Split Contact Ring in Detail

Let A be the transmitting radio station whose direction is desired by station B. The wave coil at B is tuned by sliding its brass ring toward one end of the tube and the latter swung at the same time until the sounds are at their loudest. At this juncture the wave coil is exactly at right angles to the direction of the impulses, and the sounds are loudest because the coil is absorbing every wave that it can, just as a person standing facing a window blocks all the light that the size of his body will allow.

We will presume that the brass ring has been tuned to the right of the operator. The tube is slowly turned upon its axis in a counterclockwise direction. Less and less waves are being cut by the tube, and the sounds consequently diminish. There is a difference of phase between the electromotive force acting on each element of the coil because of the difference in time—infinitely short—required for the waves to reach the different elements of the coil.

When the coil has been rotated to a point where the sounds are the weakest it is parallel with a line drawn between A and B. The operator does not yet know, however, whether A is in front of him or behind. The tube is now reversed slowly past the maximum point until, when in exactly the same parallel as before, it will be found that there exists a zone of practically complete silence. This shows that the ring is at the end of the tube farthest from the distant station A, so that the free end must be pointing directly toward it. A glance at the compass dial completes the finding. To locate an aeroplane is even simpler. The wave coil is turned toward the heavens, and a search made for the position of least sound.

Resonance wave coils were first successfully tried with single layers of wire. Additional layers may be found advantageous. Tuning is astonishingly sharp and distinct, while the absence of ground connections is a distinct boon. The counterpoise ground has never proved fully efficient, and there are innumerable places where it is difficult to get any ground at all. To obtain one on the island of Corregidor, for instance, great areas of that rocky island had to be webbed with wires. The French, at Pen Mane, employ hundreds of feet of expensive copper ribbons spreading in all directions just under the surface of the thin, scraggly sod.

Lieutenant Farrell of the Navy Fliers, Entering Mattice, Ontario, at the Head of the Dog Team That Brought the Rescued Adventurers from Moose Factory, on James Bay, in the Wilds of Canada

BALLOON DROPS NAVY AIRMEN IN CANADIAN WILDERNESS

That the boasted ability of air craft to penetrate inaccessible regions may sometimes turn out to be an embarrassing virtue was proved by the recent experience of Lieutenants Kloor, Farrell, and Hinton, of the U. S. Navy. They left Rockaway, N. Y., at 1:00 p. m. on December 13, last, in a balloon of 35,000-cu.-ft. capacity, for a training trip as long as the gas charge would allow them to make. With this idea, after the regular ballast had disappeared, they threw overboard all the equipment they could spare, including the basket lining. A forced landing finally was made, at 2:00 p. m. on December 14, in the midst of a limitless wilderness of forest, lakes, and snow, and the lost fliers, without food except for two carrier pigeons, abandoned the useless gas bag and started southeast by the compass in search of help. It was December 17, three full days later, when the exhausted men were found by an Indian, and guided to Moose Factory, on James Bay, a Hudson's Bay Company trading post. From this point they were taken to Mattice, Ont., on the edge of civilization, by dog team, a 14-days' journey of little less hardship than they had experienced during their trackless wandering in the woods, accomplished in a temperature that reached as low as 30° below zero. They had flown 720 miles in 25 hours.

PHONOGRAPH USES TAUT WIRE INSTEAD OF TONE ARM

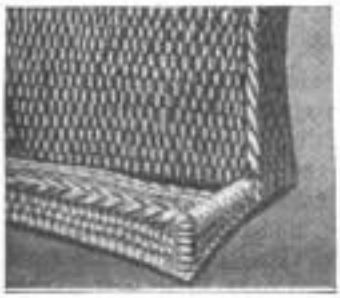
An interesting deviation from previous practice in the acoustic equipment of a phonograph is exhibited by a new cabinet model of a well-known make. No reproducer, tone arm, or tone chamber, as ordinarily understood, is used in this machine, which transmits vibrations from the record by means of a single taut wire, the inner end of which is attached to the stylus and the outer end to the center of a large shallow cone of parchment, supported on a metal frame. The metal tube which covers the wire serves only as a

A Taut Wire, inside the Protecting Tube, Carries the Tones from the Needle to the Parchment Cone

protection, and has no tone function. Improved clarity of reproduction is claimed for the new method.

REED CHAIRS MADE FLEXIBLE WITH SEA-GRASS BRAID

Reed furniture, because of its decorative value, has become highly popular despite a certain degree of stiffness in upholstered



Above: A Chair Made of Reed Woven on a Warp of Braided Sea-Grass Ropes, Instead of the Usual Stiff Reeds, Giving Cushionlike Flexibility. Left: A Closer View of the Yielding Surface, Which does Not Differ from the Usual Form

chairs and couches. Now that objection has been eliminated by a western manufacturer, by the simple method of substituting braided ropes of sea grass for the stiff reeds ordinarily used as the "warp" of the woven material. On these flexible foundations the cross members of reed are laid in the usual manner, so that the finished surface, though as yielding as a cushion, is not altered in any respect in appearance or durability. The braided sea grass is declared to be quite as strong as the stiff reed.

MECHANICAL INDICATOR AIDS STRAIGHT-LINE FLYING

The hazards incident to flying in fogs, when clouds are to be penetrated, and in the darkness of night, are lessened by a new form of guiding indicator designed by the Bureau of Standards. The device is based on the principle that, owing to inertia, a jet of air issuing from a short tube affixed to the frame of an airplane will not change its course relative to the earth at the same moment that the airplane does.

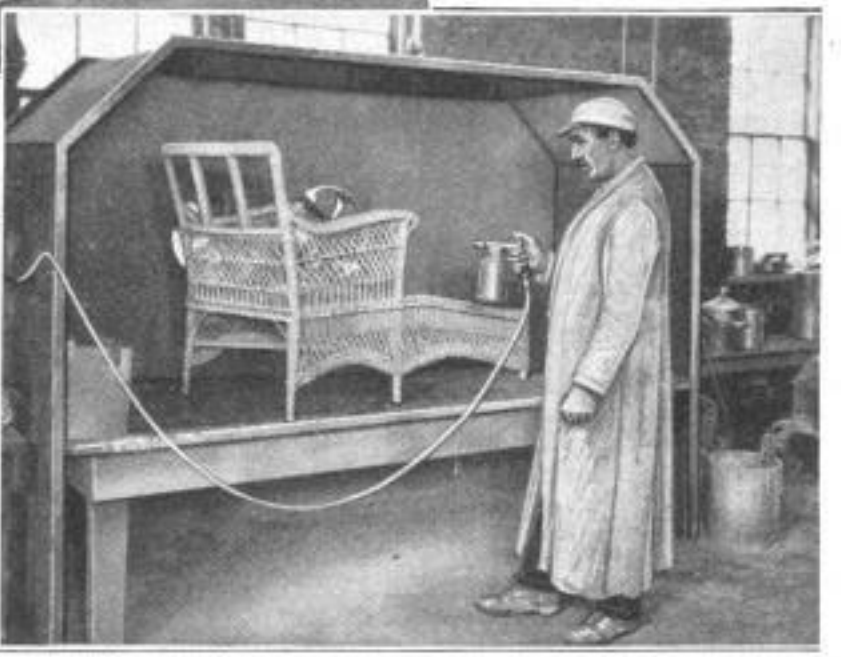
The new turn indicator is stationed in the path of the jet, which reflects immediately any deviation of the air craft from a straight line. The usefulness of the instrument lies in the aid it offers to airmen whose vision may be obscured by fogs, clouds, or darkness. The pilot, with its assistance, can guide his craft in so nearly a straight line that his compass will function properly, thereby preventing him from unknowingly flying in a circle of such small radius that the machine is likely to become uncontrollable. The instrument is simple in construction and the Bureau of Standards anticipates that it will be inexpensive to manufacture in quantities.

NEW DEVICE WARNS MOTORIST OF OVERHEATED ENGINE

Rising automobile-engine temperatures are detected and indicated by a new accessory recently introduced on the market. The active element of the device, a thermostatic switch, is attached directly to the engine block and presses tightly against the iron. Being in intimate contact with the heat source, this member will act quite independently of the temperature of the radiator or the cooling water. The signal proper is an upright fitting, which may be mounted on the radiator cap or on one of the front fenders. Two small light bulbs, one red and one green, contained in the signal member, are wired to the electric system of the car, by way of the thermostatic switch, in such a manner that, at normal engine temperatures, the green light burns continuously. If for any reason, such as low water, a broken fan belt, insufficient oil, etc., the engine begins to overheat, the thermostat will expand, and turn the green light off and the red danger signal on.

Using the Spraying Gun to Paint a Barrel, Which is Placed on a Revolving Base, Sprayed, and Removed in Less than One Minute

Paint-Spraying Gun of the Type Used for Volume Work, in Connection with a Pressure Tank



Left: The Type of Paint-Spraying Gun That Screws to the Top of a Mason Jar or Metal Paint Container. Right: Painting a Piece of Reed Furniture with This Type of Gun, in Less than Three Minutes

IMPROVED PAINT-SPRAY GUNS HAVE VALUABLE FEATURES

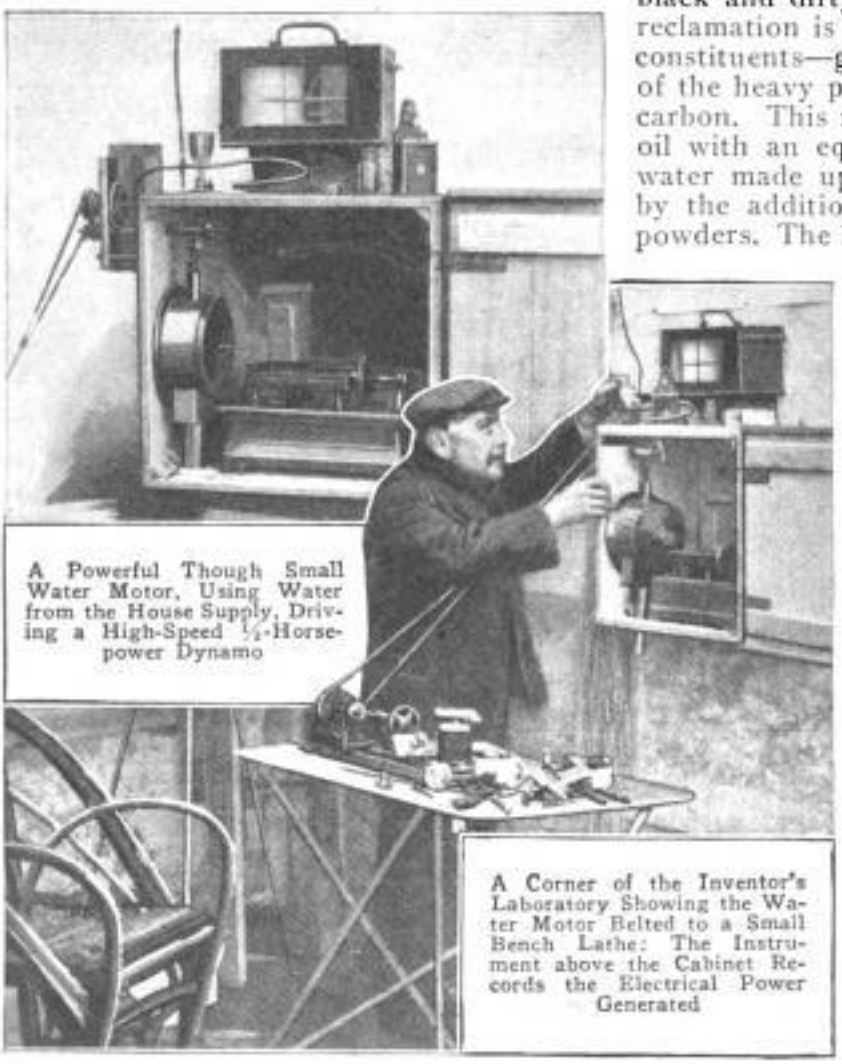
Painting or varnishing by the spray method has so clearly proved its advantages that improved tools for its use are of general interest. A spraying nozzle, of automatic-pistol form, now being made in Missouri, handles all kinds of liquid coatings, including heavy asphalt paint, with pressures of 80 lb. and less. One model is made to fit the top of an ordinary screw-top jar or metal container. Jars containing different colors may be interchanged in about 30 seconds, the nozzle being cleaned by blowing kerosene and air through it. This model covers up to 30 or 40 sq. ft. of surface a minute, while a larger type, arranged for connection to a special pressure tank, covers as much as 80. An important feature is its easy adjustment from fine shading to heavy-flow coating.

TINWARE DISHPANS MAKE GOOD FLOOD-LIGHT REFLECTORS

The on-time completion of a power project in a western state depended upon the work going on continuously day and night. Artificial illumination being required, very efficient though cheap flood lights were made by installing incandescent light bulbs on the inside of common tinware dishpans and mounting the assembly on posts. The pans proved excellent reflectors, flooding the work with soft, non-glaring light.

HOUSE-LIGHTING PLANT RUNS ON WATER FROM KITCHEN TAP

The power supplied by the water from a house faucet is sufficient to drive a small dynamo by means of a new water motor, of about ½ hp., recently developed by a noted French scientist and inventor. In his city home the motor installation is permanently attached to the tap, and power is generated every time water is drawn for any of the myriad household purposes.



A Powerful Though Small Water Motor, Using Water from the House Supply, Driving a High-Speed ½-Horsepower Dynamo

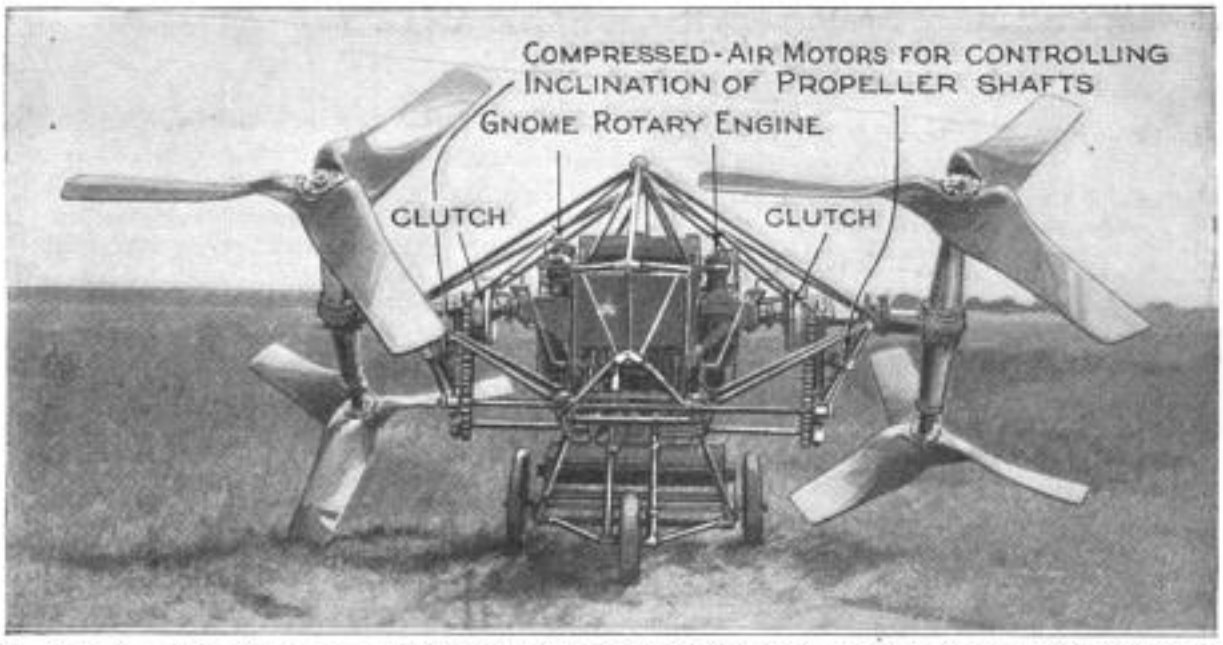
A Corner of the Inventor's Laboratory Showing the Water Motor Belted to a Small Bench Lathe: The Instrument above the Cabinet Records the Electrical Power Generated

Surplus energy, generated during the day, is stored in a battery, and later drawn upon to supply 20 incandescent bulbs of 15 to 20 candlepower.

AUTOMOBILE CRANKCASE OIL IS SALVAGED BY CLEANING

A highly connected lubrication engineer is authority for the statement that the automobile, tractor, stationary-engine, and airplane crankcase oils, usually drawn off and thrown away as having no further use, may be reclaimed by the simplest sort of cleaning process. Heretofore it has been thought that these oils were, literally, worn out, and that the molecular structure was broken down and changed to such a degree that they were rendered unfit for lubrication purposes. This theory has been exploded. The truth of the matter is that the oils are diluted by the fuel which passes the pistons during the compression stroke and contaminated by metal cuttings and minute particles of carbon. This latter is what makes the oil look black and dirty. All that is necessary in reclamation is the removal of the volatile constituents—gasoline, kerosene, etc.—and of the heavy particles, metal cuttings and carbon. This may be done by boiling the oil with an equal, or greater, volume of water made up into a saturated solution by the addition of the common laundry powders. The boiling vaporizes and drives off the gasoline and kerosene, while the agitation washes out the comparatively heavy metal cuttings and carbon. These settle to the bottom.

The reclaimed oil is better than new. Two instances are cited in proof of the statement. One is that in gas engines operating on commercial or natural gas, the crankcase oil, instead of thinning, actually thickens. This is because there is no dilution. The second, and most conclusive, demonstration took place at one of the large aviation training fields where, due to the fact that difficulty was experienced in procuring the specification aero oil, the planes were operated for a number of weeks on reclaimed oil, the engines being drained and the oil washed every night. It is a peculiar circumstance that the reclaimed oil is superior to the same grade of new oil, and that, after it has been cleaned several times, it closely approaches the specifications of the ideally perfect cylinder lubricant. This for the reason that the volatile parts and the carbons have been burnt out, leaving a practically incombustible lubricating body. A saving of approximately 78 per cent is credited to the process. As the gases liberated by the treatment are inflammable, the boiling had best be done out of doors.

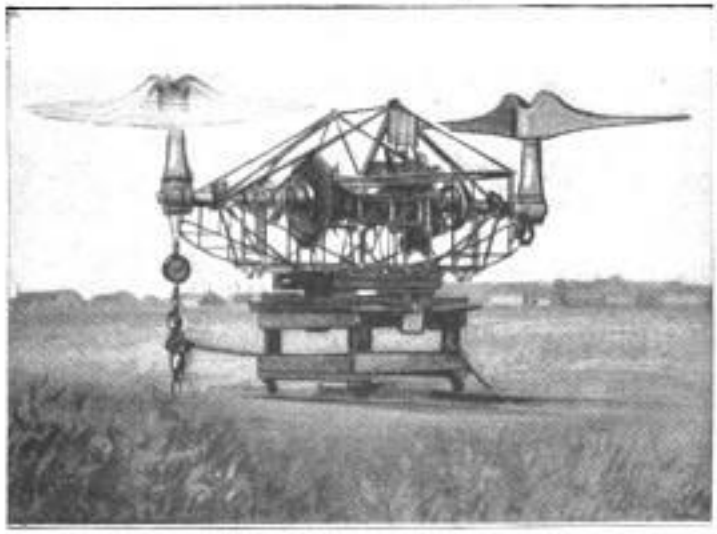


Head-On View of the Helicopter, Built for Test Purposes: The Outstanding Features Are the Unusually Broad Propellers of Distinctly Novel Shape, and Their Arrangement on Shafts That can be Tilted from the Vertical to the Horizontal to Give Both Lift and Tractive Effect. Small Compressed-Air Motors Control the Tilting and Automatically Maintain Stability

PROPELLERS OF HIGH EFFICIENCY FEATURE NEW HELICOPTER

BY PAUL A. JENKINS

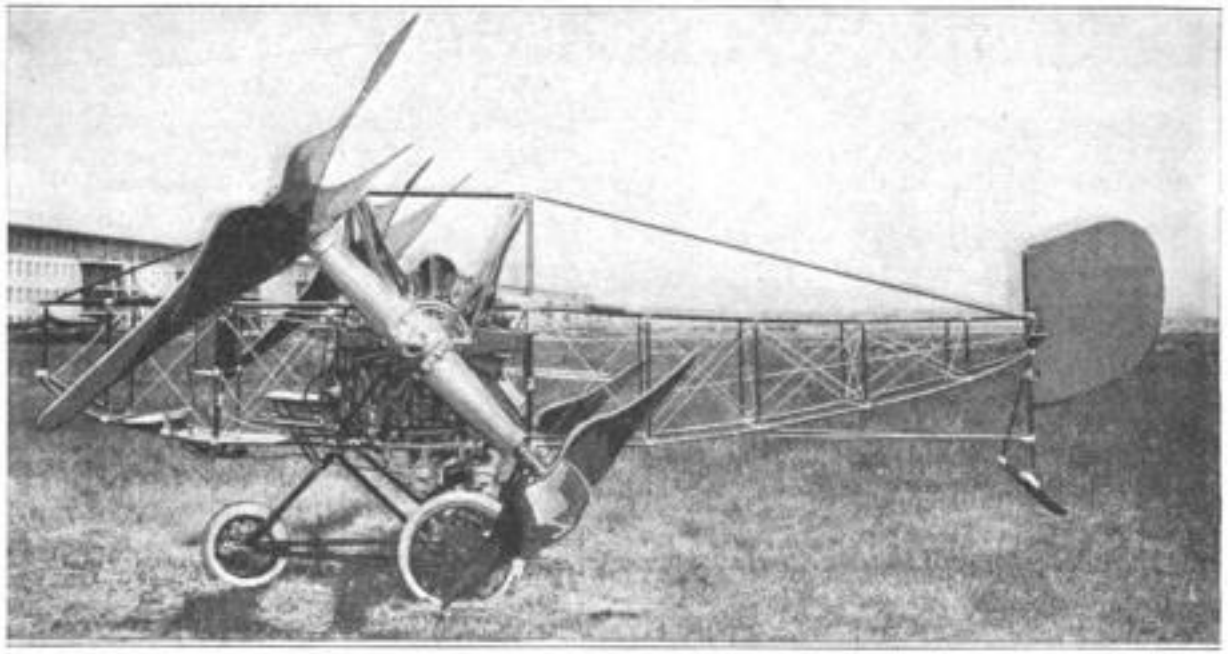
THERE are those who assert that the problems of practical mechanical flight will never be solved by development of the helicopter. Yet in an isolated hangar upon the western outskirts of Chicago, there can be seen today a flying machine of this sort, which embodies the toil and dreams of a father and three sons. Though completed and tested for vertical lift, it has not yet been tested for flight, but the interest of the builders continues unabated, and since recent tests, described below, this interest is known to be shared by representatives of foreign powers.



Testing a Two-Bladed Propeller for Static Lift: The Dynamometer was Anchored to the Ground and Connected to the Propeller Shaft. With the Motor Running at a Speed Developing Only 97 Horsepower, the Meter Registered a Pull of 980 Pounds

In simplest terms it may be said that the test machine consists of two normally vertical shafts, each bearing at either extremity a horizontal three-bladed propeller, measuring 22 ft. from tip to tip, and of peculiar design. The shafts are revolved by two Gnome rotary engines, and their inclination is controlled from a central cockpit by means of small compressed-air motors. Thus it is seen that the propellers alone are depended upon to produce vertical flight. Horizontal flight will be effected, the builders say, by inclining the shafts away from the vertical, and so giving the propellers a horizontal thrust component.

As the efficiency of a propeller diminishes rapidly as its shaft is inclined away from the line of flight, one is at liberty to question whether the effect last mentioned can be satisfactorily obtained. It is a fact, however, that during recent tests, conducted at the request of the foreign investigators referred to, the machine proved itself altogether capable of rising from the ground. Only one propeller was used during the test, and the machine was allowed to rise only far enough to



Side View of the Helicopter Showing the Skeleton Body with Which It has been Equipped for Test Purposes Only, and Which Gives No Idea of the Machine in Its Finished State: The Power Equipment Consists of Two 200-Horsepower Motors, and the Propellers Measure 22 Feet in Diameter

move a hand around the dial of an anchoring scale. But the interesting fact is that the hand did move—and far enough to indicate that the simultaneous action of all four propellers would easily have sufficed to lift the helicopter into the air.

Whatever these tests did or did not prove, they demonstrated beyond a question the efficiency of the unusual propeller type employed. This "prop" is the design of the helicopter builders; and academic and military experts have rated its efficiency, despite the comparative crudity of the present model, as far above the ordinary. This is so because effective and fairly uniform thrust is obtained from the tips to within a very few inches of the hub. In this way a slip stream of uniform cross-sectional velocity is obtained; and in addition, since the slip stream parallels exactly the line of the propeller shaft, efficiency is increased still further by the elimination of many problems of streamline and slip-stream interference. As to the surprising design of this ultra-efficient propeller, it is sufficient to direct attention to the accompanying photographs, and to suggest the resemblance of each blade to the wing of a bird.

Realizing the value of their propeller, the designers are now busy with refinements and improvements. One promised improvement is in the matter of dimensions. Propellers of the next "series" are to measure 30 ft., or more, from tip to tip, it is declared, and are to be revolved at slower speed. Thus will be obviated the old argument against the helicopter, that "propellers are not supposed to lift—planes must do the lifting." For it is evident that a propeller blade 15 or 20 ft. long, and proportionately wide, is in effect a planing surface.

The successor of the helicopter now guarded in the isolated hangar will no doubt resemble nothing more than a number of rotating airplane wings, which in case of motor stoppage in mid-air will simply reverse themselves and carry the machine gently back to earth.

TREE'S QUEER SPIRAL GROWTH REVEALED BY LIGHTNING

Trees that grow with a spiral twist, concealing a ropelike fiber under a straight bark, are not unknown, but are generally regarded as arboreal curiosities. A recent instance in which a pine tree of this curious formation was discovered through the agency of a lightning stroke, is reported by W. M. Kern, of New York City. The bolt, in its downward course, circled the trunk seven times, leaving a spiral channel in which a man's arm could be laid, and disclosing the fact that the grain of the wood followed the same helical lines, though the bark and limbs appeared normal.

¶Intensive fruit cultivation has been carried to such a point in England that in one 1,400-acre orchard each four square rods of cultivated soil supports four apple trees, five plum trees, and 112 currant and gooseberry bushes, a total of 121 plants.

COMMENT AND REVIEW

[These pages were printed January 25, 1921.]

CHICKENS, which are found the world over, are said to be pretty much the same everywhere, whether it be in South Africa, Siberia, India, or Labrador. And where chickens, there are eggs, which are even more alike in shape and appearance. Indeed, it would puzzle our most learned men to determine whether two eggs came one from St. Johns and one from Copenhagen, or both from Four Oaks.

Hens across the Sea

However, so commonplace an article as eggs serves to illustrate the working of the law of supply and demand. New York City consumes an amazing quantity of eggs, and the price had also been amazing for some time, when there landed at Vancouver a ship load of this universal necessity. The cargo was feverishly loaded into 28 cars, which traveled at passenger-train speed. On reaching New York, the shipment was only 31 days en route from Japan and 33 days from China. On arrival, the egg market dropped 10 cents a dozen the first day, four cents more the second day, and some more the third day.

When Admiral Perry knocked at the door of Japan in 1853, the fastest transportation of that day would have consumed the better part of a year between that country and New York. Modern transportation by sea and land requires barely four weeks. The American hen may well take notice of the new Japanese peril. However, there's some advantage in having the cackling which two and a half million eggs occasioned, no nearer than the Orient.

THE wave of sentiment in favor of compulsory military training which swept the country before we entered the war, has not only subsided, but most of its former supporters are now its objectors. We have had ample opportunity to note the effect of millions of our young men transferred from normal productive life to military camps. We don't like it. The boys themselves, most of all, are opposed to it in times of peace. The public also has a better realization of the cost in dollars to maintain a vast training system. Before, it had no conception whatever. Even a minimum of training for a comparative handful runs into millions; the War Department figures it will cost over $26,000,000 to give 100,000 men a four months' military training. Moreover, it would not sound well for the nation loudest in its voice for universal peace, to embark on a huge new scheme of soldier making. The proposal to reduce the size of our standing Army will be approved by an overwhelming majority of our people.

One-Year Enlistment

This does not mean they are ready to go foolishly to the other extreme, which at present is equally absurd. The proposal of President-Elect Harding to shorten the term of enlistment in our Army from three years to one year, is both sensible and practical. Naturally, the drillmasters will have to work much harder with a one-year instead of a three-year term. On the other hand, one year will yield all the recruits necessary, doubtless more. There should no longer be the necessity to carry on a constant campaign for men. It would be unfair to say that for years—barring the period of the Spanish War—the methods of securing men to fill expired terms almost bordered on shanghaiing, in some of our larger cities. Certainly many a boy awoke from a drunken spree to find himself pledged to shoulder a rifle for three years.

Three years is a long prospect, even to the careless, and to the more desirable class of applicants it's a very long time. Hence, largely, the cause for desertions—a most regrettable event in any man's life, no matter how justified he feels his case to be.

The one-year enlistment term will easily provide full ranks of a desirable character. Many a young man will take a year's army life, just for the experience, who would never in peace times consider three years. While three years' training turns out a more exact soldier perhaps, we demonstrated in the late war that one-year men are not to be regarded lightly. Moreover, with the one-year term the training will easily graduate twice as many men as the three-year, and there are many who, entering for one year, would find the life attractive and remain for years. The one-year enlistment has so much to recommend it, it should by all means be given at least a few years' trial.

RUSSIA has been traveling through the Red Sea. As she proceeds each day, more and more of the things with which the Soviets started, and which are essential to modern civilized life, have been thrown away. Exhausted, stripped, famished, and freezing, they will soon drop for want of strength, and as yet no Moses has appeared to lead the people out into the light of peace and plenty once more.

Through the Red Sea

Conditions are awful: Railroad transportation has practically ceased; mills and factories are closed, even coal mines filling with water, all for lack of coal; electric-light service growing less daily. Soon the country will be in darkness, with but few remaining public services attempting to function. The printing presses no longer turn out their endless flood of paper rubles, 3,000 of which were recently the price of a single meal. Work cards have supplanted the ruble as currency. The hand of the czar, even when heaviest and most remorseless, was as nothing to the present heartless regime, and in the former days the people at least had employment, and food and fuel. Things can hardly go on this way much longer; the end of the dreary, bloody road is nearly reached. The price of this venture has been costly beyond conception in human life taken, families broken up, property of all kinds destroyed, and the functions of civilization paralyzed. The rest of the world should be thankful that they are permitted to see and profit by the results of this awful demonstration, without directly paying the cost. Even the most ignorant are compelled to acknowledge and realize that government by and through ignorance can never succeed, and that its fundamental principles cannot be reversed.

NOW the store windows are rapidly filling up with brilliant placards announcing a reduction of 25, 30, and even 50 per cent from former prices. The pair of gloves I bought today, which cost me $2.95, are precisely the same quality which a month ago was selling for $7. Reductions must be made, and the consumer hails any sign of relief with joy. There is such a thing, however, as prices being so low as to work a hardship on everybody. It would be a very questionable advantage to be able to make all our purchases at bankrupt sales. There have been quite a lot of business failures in January, several times as many as during the crest of high prices, yet the number is very much smaller than might reasonably be expected. There will doubtless be many more failures in February. But what of that? The essential thing, the *astounding thing*, is that the number is so small. And the winter is nearly gone, and spring always brings a revival of hopes and activities. The path may be a bit rough in places, but we have only one obstacle to surmount at a time, and smoother going is not far ahead.

The Reconstruction Period

There is good reason to predict that next December, most of us will remember and talk about the difficulties of February, 1921, about as much as we will recall the earthquake yesterday in New Hampshire, even though the one is a serious matter and the other was not.

TO be perfectly honest, not so many of us as should be—outside the clergy—are overenthusiastic with the idea of being our brother's keeper. For the past four or five years, brother was in such demand at fabulous wages per day, he had no trouble in taking care of himself. It was during this period he gravitated to the large cities. Some will be able to remain, but many will have to gravitate back to the small towns and farms where they came from. This rearrangement is bound to be a more or less unpleasant process. And so, just now, every one who possibly can, must do his bit in the way of providing employment for the man who is temporarily out of work. There are always some odd jobs around a plant or store or house in the way of repairs or minor improvements. If it is only for a month, or week, or day, or even an hour, it all helps, and in the aggregate will amount to a great deal. Employers should strain a point to be

Be Considerate

as liberal as possible in fixing rates of pay. Employes, on the other hand, must not delude themselves with the hope they can maintain war wages merely by the strength of organization, however strong. The law of supply and demand finally asserts itself, always.

TIDE and wave motors were for many years in the Keeley motor and perpetual-motion class, or their inventors were, to a large extent, at least. There is all the difference possible, however, between the so-called perpetual-motion efforts and those dealing with the tides, because in the latter case the power is visibly there, untold millions of it, and the problem is simply to harness it, not create it.

When a Tide Motor?

Out of all the efforts, covering more than 200 years, very little has survived, and no tide motor has, so far as the records reveal, ever been duplicated in a second place. And yet fortunes have been spent, and faithful, earnest work continued year after year. To find the North Pole at one time seemed much less likely of accomplishment. The honored discoverer of the pole passed into history several years ago, and the tide motor still waits.

It would seem that the subject should receive a new and fresh impulse at this time. Our coal fuel, while by no means near exhaustion as yet, still has been subjected to restrictive conditions during the past two years, which tend to enlarge the view of what effective tide motors, which know no union rules, could do toward keeping the freezing people warm. The tides never go on strike, no matter what the justification; they work nights and Sundays, and know no holidays. True, they can deliver their heat and light and power only as far as electrical transmission permits, but this is constantly being extended. The tides are never snow-bound, with no wheels turning for days.

The vast tide-power plant planned for erection in the immediate future, on the river Severn, to cost $150,000,000 and produce from half a million to a million horsepower, ought to stimulate anew scientific and mechanical minds toward the perfection of a universal tide motor which will operate profitably under a smaller head of water and produce even as low as 1,000 horsepower.

It is difficult to conceive any other device so much needed, and to whose inventor will come so large a reward of both fame and wealth, as this.

H. H. WINDSOR

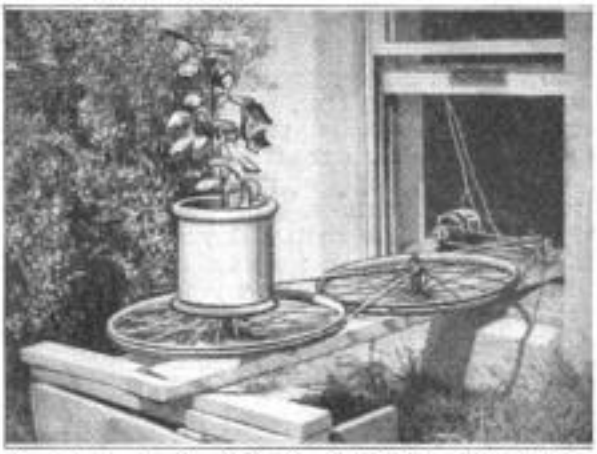
NEW-STYLE LOG CABIN BUILT LIKE STOCKADE

Lumberjacks' cabins are now made by setting the logs on end, thus making a stockadelike wall. It has been found that this construction is far more economical of timber than the older form in which the logs were placed horizontally. As the cabins are abandoned after only one or two years' occupancy, the saving effected is a considerable item. Another form of shack is made of rough unseasoned lumber, covered inside and out with heavy coats of tarred building paper. It is said that a whole camp can be built of these materials at a cost no greater than that of one old-fashioned log house.

New-Style Lumber-Camp Cabin: The Logs are Set on End, the Chinks Plastered with Clay, and the Interior Walls Covered with Tar Paper

STUDIES COTTON-FIBER TWIST BY REVOLVING PLANT

To facilitate the study and possible control of the formation of twisted fibers in cotton, a plant inspector of Houston, Tex.,



The Mechanism for Rotating the Cotton Plant: Two Large Horizontal Pulleys, Turned by an Electric Motor

has devised a means of continually revolving a growing cotton plant, under uniform heat and light conditions, until the bolls are open and the fiber ripe. The plant is placed on a large horizontal pulley, driven slowly through another large pulley by an electric motor. Over the plant is placed a light-tight box, 45 in. square, painted white inside and containing six 60-cp. lamps behind a ground diffusing glass, 35 in. square. Every fiber thus receives an equal share of light and heat.

VINES COMPLETELY COVER TINY OFFICE BUILDING

Vines are customarily trained to grow on building walls for esthetic reasons, and the fact that a tiny office building in an oil company's yard at El Centro, Calif., is almost concealed by its covering of morning-glories does not suggest any utilitarian value to the observer. There is, however, a foot or more of dead-air space between the vines and the walls of the little house. When the plants are kept moistened, the office interior remains delightfully cool even on the hottest days, adding considerably to the energies of its occupants.

Office Covered with Morning-Glory Vines, Whose Moist Leaves Keep the Interior Cool on the Hottest Days

HIGH-PRESSURE OUTLET GATE FOR DEEP RESERVOIR

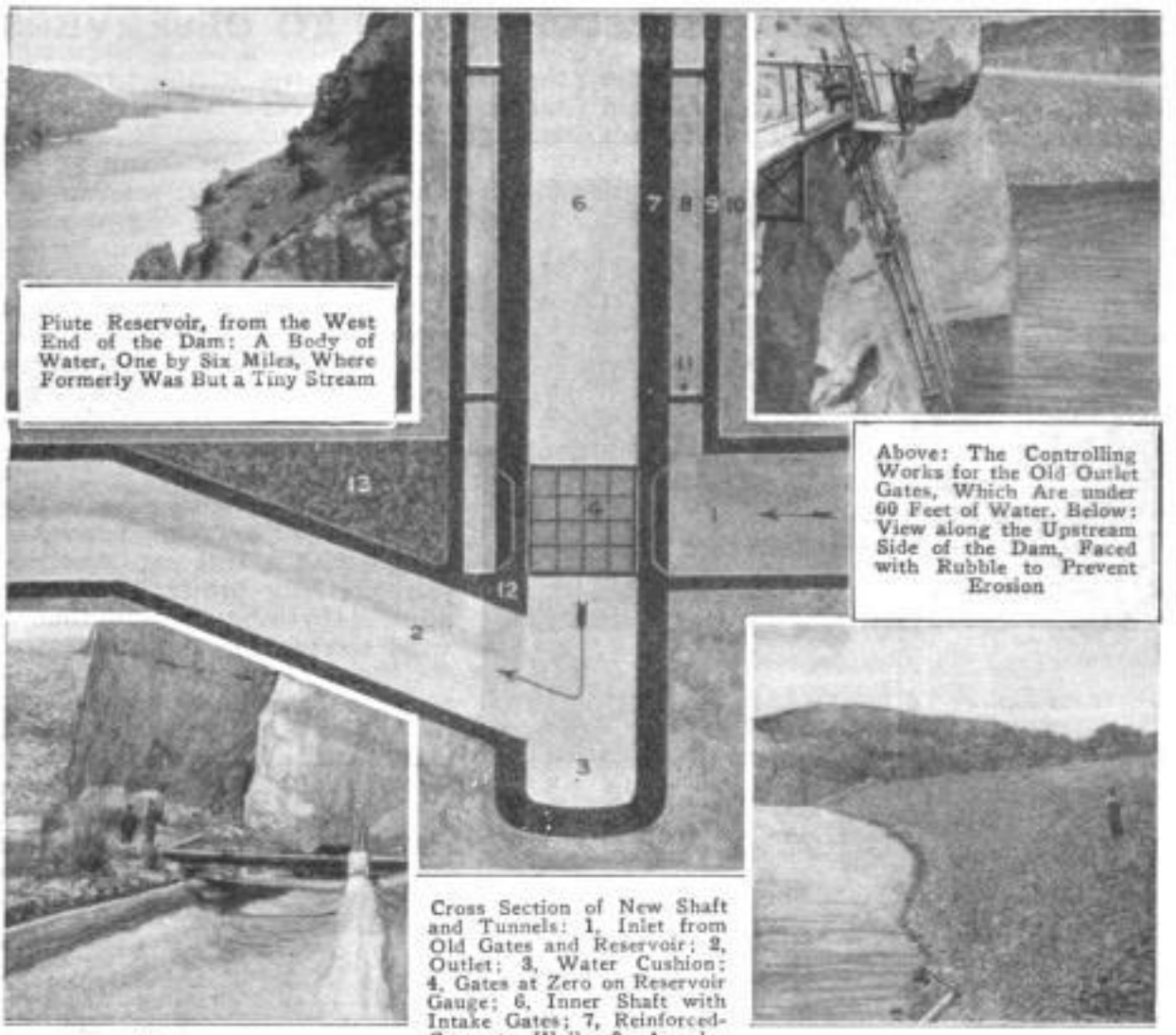
The hydraulic pressure on the outlet gates of the Piute reservoir, located on the Sevier River in central Utah, and being one of the largest irrigation reservoirs in the state, was sufficient to crack the three large cast-iron 4 by 6-ft. gates, when the water reached a stage of 50 or 60 ft., and to disrupt part of the controlling works at the top. The entire breakage endangered the irrigation system, and more than a million dollars' worth of crops.

For this reason, and because the dam and controlling works were otherwise designed to carry at least a 70-ft. reservoir head, it was decided by the state engineering department and the board of land commissioners, to construct dual control gates, the second set to be located on the outlet tunnel which runs through the rocky ledge around the west end of the dam. This new gate was to be practically indestructible and admit easy and ready control, but principally it should pass the water with a greatly reduced head, or pressure, and consequently with considerably less strain and wear on the works, including the discharging tunnel and upper ditches near the dam.

The outlet gate, as designed, was partly constructed in the 1919-20 winter, the work being suspended during the 1920 irrigation season, and is now being completed by private contract under the supervision of the engineering department of the state, while the reservoir is filling.

A working tunnel was driven from the west end of the dam into the rocky ledge to a point about 100 ft. above the outlet tunnel and the same distance, horizontally, from the old outlet gates at the edge of the reservoir. Here a circular shaft, 17 ft. in diameter, was blasted down to the outlet tunnel, a small shaft being sunk first, through which the rock from the larger shaft was dropped and removed through the outlet tunnel. The large cylindrical shaft was then lined with reinforced concrete, 1 ft. thick.

Within this large shaft, now 15 ft. in diameter in the clear, another chimney-



Piute Reservoir, from the West End of the Dam: A Body of Water, One by Six Miles, Where Formerly Was But a Tiny Stream

Above: The Controlling Works for the Old Outlet Gates, Which Are under 60 Feet of Water. Below: View along the Upstream Side of the Dam, Faced with Rubble to Prevent Erosion

Cross Section of New Shaft and Tunnels: 1, Inlet from Old Gates and Reservoir; 2, Outlet; 3, Water Cushion; 4, Gates at Zero on Reservoir Gauge; 6, Inner Shaft with Intake Gates; 7, Reinforced-Concrete Wall; 8, Annular Space with Water at Reservoir Height; 9, Concrete Face on Native Rock; 10, Body of the Cliff; 11, I-Beams Supporting Inner Shaft; 12, Concrete Block; and 13, Old Outlet, Filled with Concrete. Left: View of the Outlet-Tunnel Mouth, Discharging Water at High Velocity

like cylinder of reinforced concrete, 7 ft. in inside diameter, with walls 2 ft. thick, was constructed centrally, and anchored to the outer walls by steel I-beams spaced 20 ft. apart. Directly beneath this central cylinder an extension shaft, 15 ft. deep, was blasted into the rock below the level of the old outlet tunnel, to contain water and thus form a cushion for the falling water when the gates were opened. From this well the outlet sloped upward siphonlike to the original outlet tunnel, the well being sealed on the reservoir side.

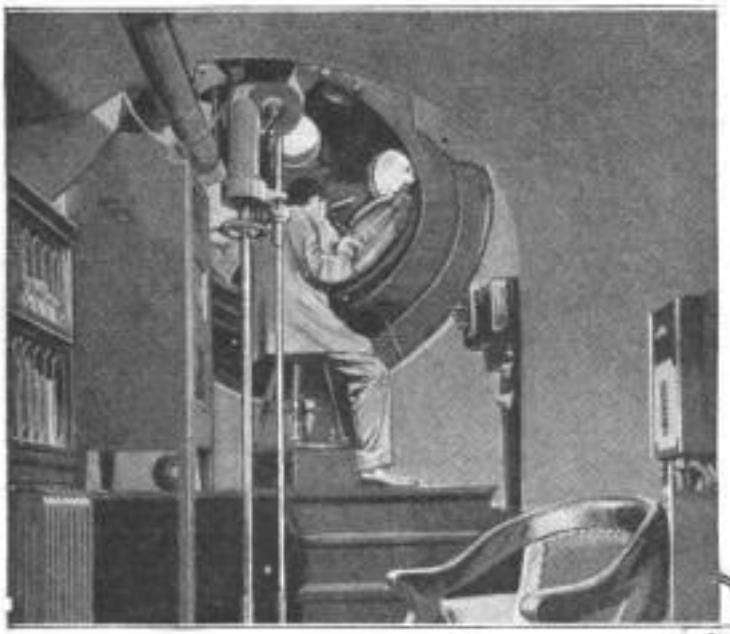
Intake gates were placed in this inner shaft at the zero of the reservoir stage, and another set at the 40-ft. stage. These gates are operated in pairs, on opposite sides, so that the inrushing streams of water will counterbalance each other. The water in the annular space between the inner shaft and the outer wall stands at the same level as the reservoir, the old gates being left open when this new system is working, except in case of emergency.

When the water is above the 40-ft. stage, the upper set of gates is used to let the water out, the water falling into the depression, or well, at the bottom, and thence through the outlet under practically no head. When the reservoir is shallower than 40 ft., the lower gates are opened, the rise in the inner cylinder being very largely prevented by the ample outlet, 6 by 8 ft. in size, through the old tunnel. Formerly the water dashed out of the lower end of this tunnel with very great pressure and a speed of 30 or 40 miles an hour, tending greatly to erode the stream bed before it became stilled.

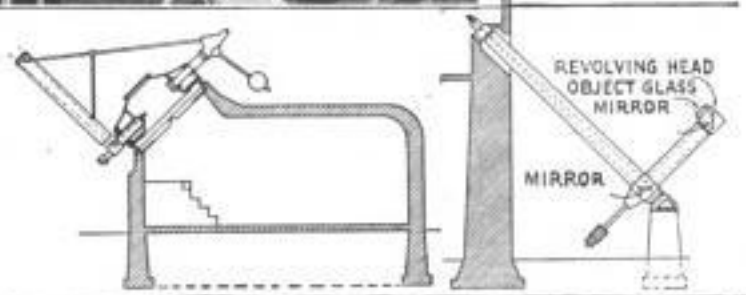
¶New 84-ft. all-steel dining cars, just put in service by the Canadian Pacific Railway, are said to be the longest on this continent. They have seating accommodations for 36 guests at a time.

TURRET-MOUNTED TELESCOPE BOON TO OBSERVERS

How a practical art, such as that of the machine designer, may give valuable aid to another in nowise related to it, is seen in the remarkable form of astronomical-telescope mounting devised by James Hartness, a machine manufacturer recently elected governor of Vermont. This ingenious invention, completed some years ago, is just beginning to receive the extended favorable notice to which it is entitled.



The Observatory Interior: The Observer, Working in a Comfortable Temperature, Changes His Position but Slightly, as the Eyepiece Moves When the Turret is Shifted

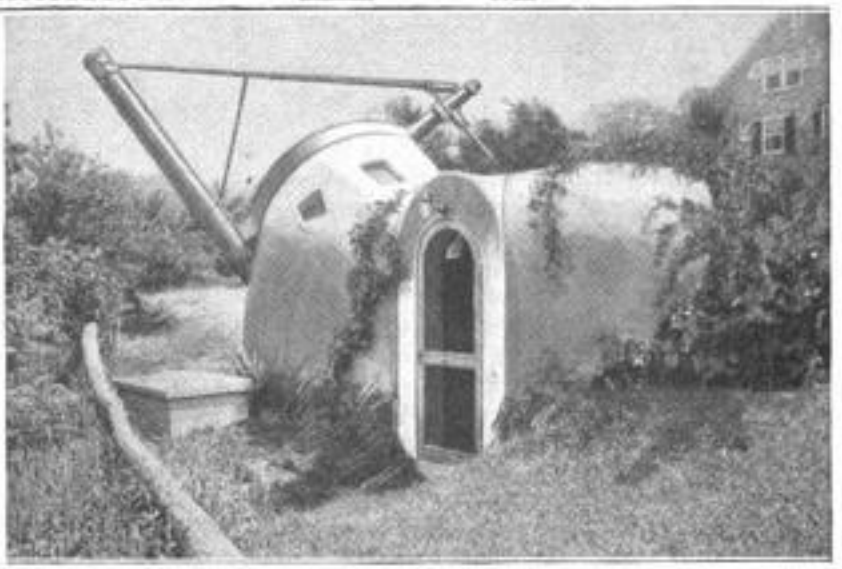


Left: A Section through the Turret. Right: The Old Objectionable Two-Mirror Mounting

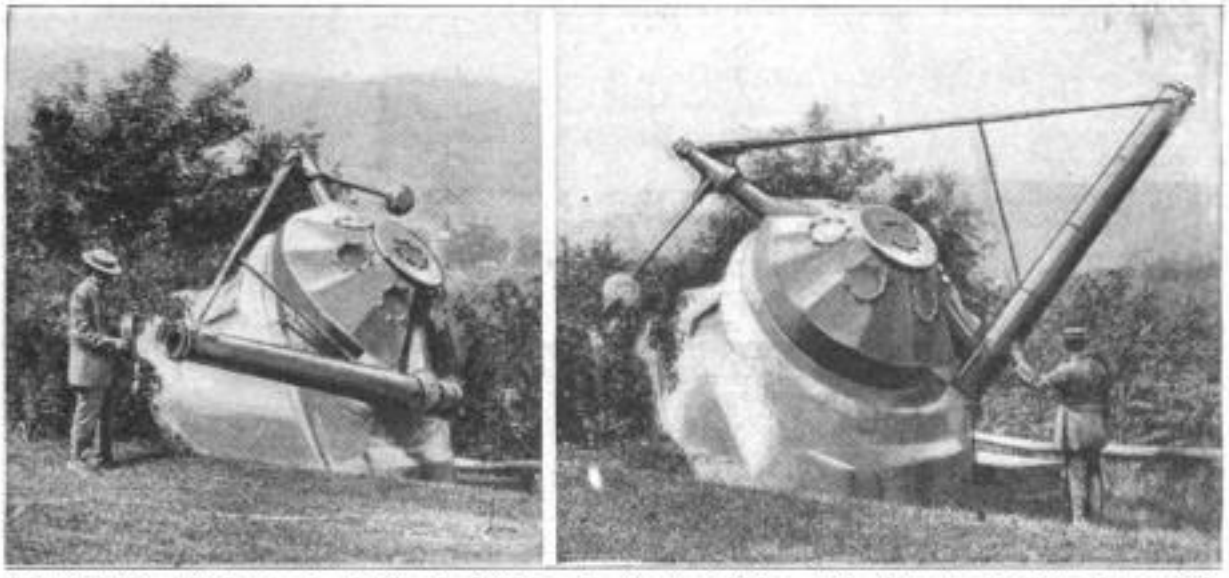
In the inventor's own instrument, a conical closed turret is mounted to rotate on rollers in the equatorial plane, driven at will by an electric motor. The telescope, carrying a 10-in. objective lens, is pivotally mounted on the periphery of the turret, and its light beam is reflected by a 90° prism to the eyepiece, before which the observer inside sits comfortably. A graduated declination circle about the eyepiece, and an hour circle on a 48-in. ring around the inside of the turret, permit all adjustments to be easily made. The great advantage of the arrangement is that the observer works in comfort in a warm room, and the familiar below-zero vigils of the devoted astronomer are made wholly unnecessary.

Further interest is given to the model installation by the fact that it is reached from the inventor's house by a tunnel, 240 ft. long and 9 ft. high. Besides the observatory proper, the little building, on the brow of a hill, contains a comfortable office. The telescope, when not in use, is closed with a lens cap, and despite its long projection, is not affected by vibration, so that a wind screen is seldom necessary.

Undoubtedly the credit for this marked sturdiness, of parts that must be moved and delicately adjusted, rests with the fact that they are built after the manner of precision machines, rather than as sensitive instruments. The face of the turret on which it moves is accurately machined, as is the corresponding face of the base, and



View of the Inventor's Observatory from the Entrance Door, opposite the Turret: The Structure Also is Entered through a Tunnel from the House, and Contains a Comfortable Office besides the Observation Room



Left: The Turret Telescope in Position for Viewing the Eastern Horizon. The Observer has Just Removed the Protecting Cap from the Object Lens. Right: The Counterbalanced Telescope Turned to Point at a Part of the Sky About Northwest of the Observer. The Round Ports Are Windows

not only are roller bearings used between them, but another peripheral set of rolls keeps it positively centered, and serves to transmit the driving power from the motor. The result is a mechanism practically proof against disturbance.

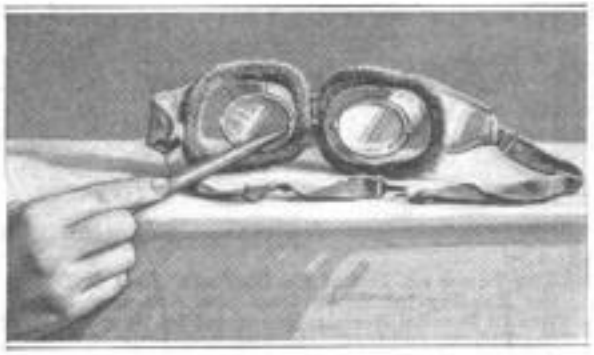
ROTARY-KNIFE CLOTH CUTTER TAKES PLACE OF SHEARS

The cutting of many thicknesses of fabric, such as clothing materials, tent and awning goods, and the like, is easily done by means of a new rotary electric cutting machine, with a high-speed blade, something like that of a meat slicer, recently introduced to the trade. It is designed to perform a service midway between that of hand shears and the somewhat heavy, cumbersome, straight-knife cutters used to cleave through 300 thicknesses at a time. Complete with electric motor, using either direct or alternating current, the device weighs only about 6 lb. and is said to be very easy to operate on that account. The blade can be sharpened without interrupting the cutting operation by bringing two emery stones, mounted one on each side, into contact with the edge by a slight pressure on two finger levers.

EYEGLASSES AND GOGGLES COMBINED

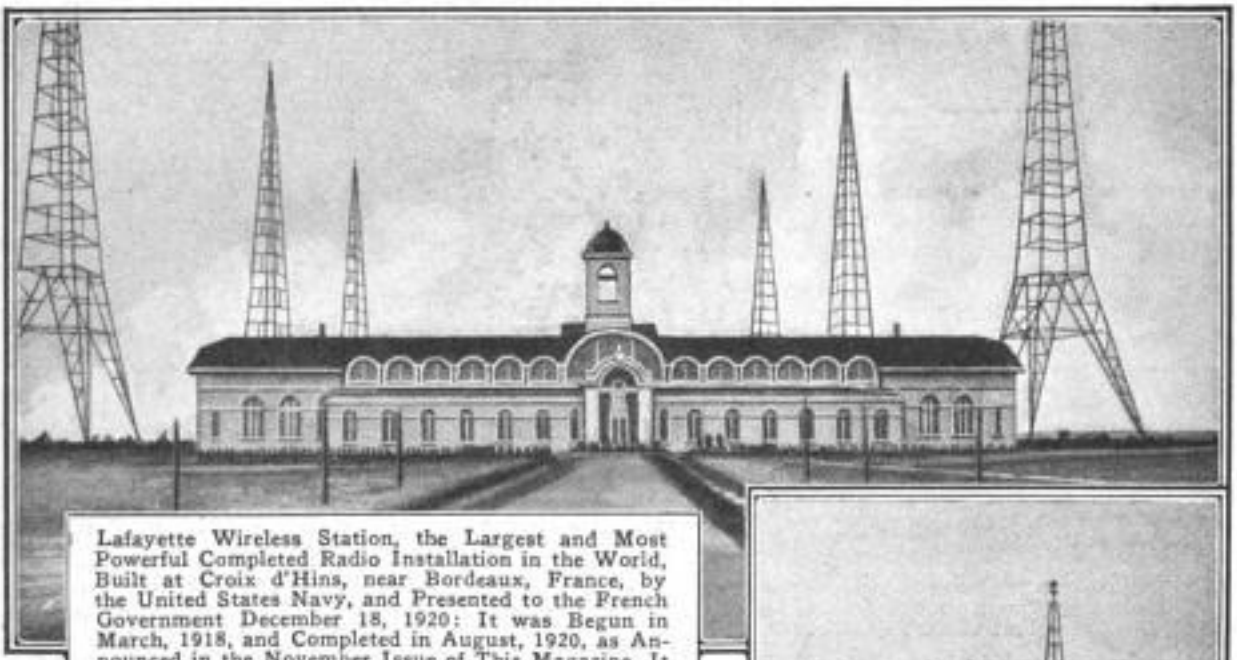
Everyone who wears glasses for the correction of optical defects, and who also has occasion to wear goggles for motoring, flying, or other eye protection, will welcome the device of a western inventor who has developed a solution of the problem of wearing eyeglasses and goggles at the same time. To the metal frame of motoring or aviation goggles a pair of spectacle frames are attached. These are hinged to the goggles so that the glasses may be swung out for cleaning the lenses of either the goggles or spectacles. When the goggles are placed over the user's eyes, his spectacles are also in place. The combination is sold without eyeglass lenses, and upon buying a set, the purchaser merely takes them to his oculist to have the frames fitted with lenses which duplicate those of his eyeglasses.

These spectacle-goggles are obviously much more comfortable to wear than two individual units.

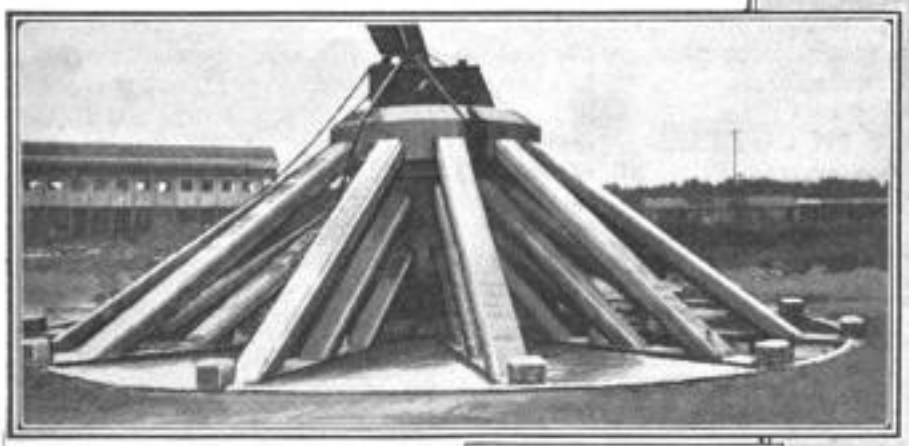


Combination Goggle and Spectacle Frame: The Eyepieces of the Latter are Hinged to the Goggle Mounting to Permit Either Set of Lenses to be Wiped

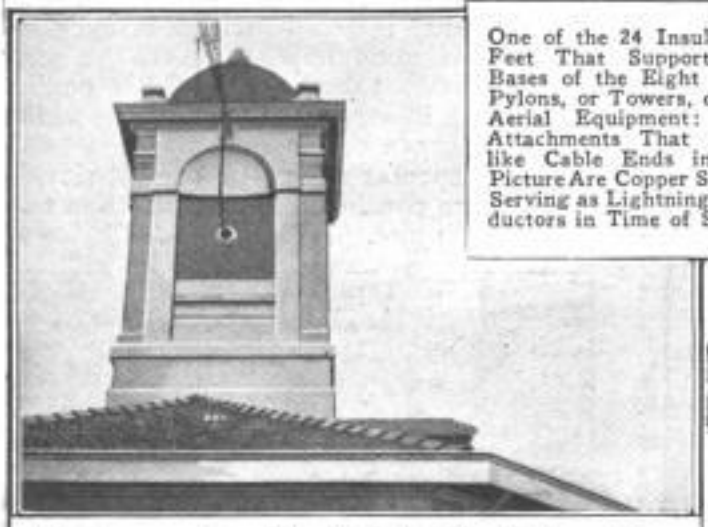
LAFAYETTE WIRELESS STATION, WORLD'S LARGEST,



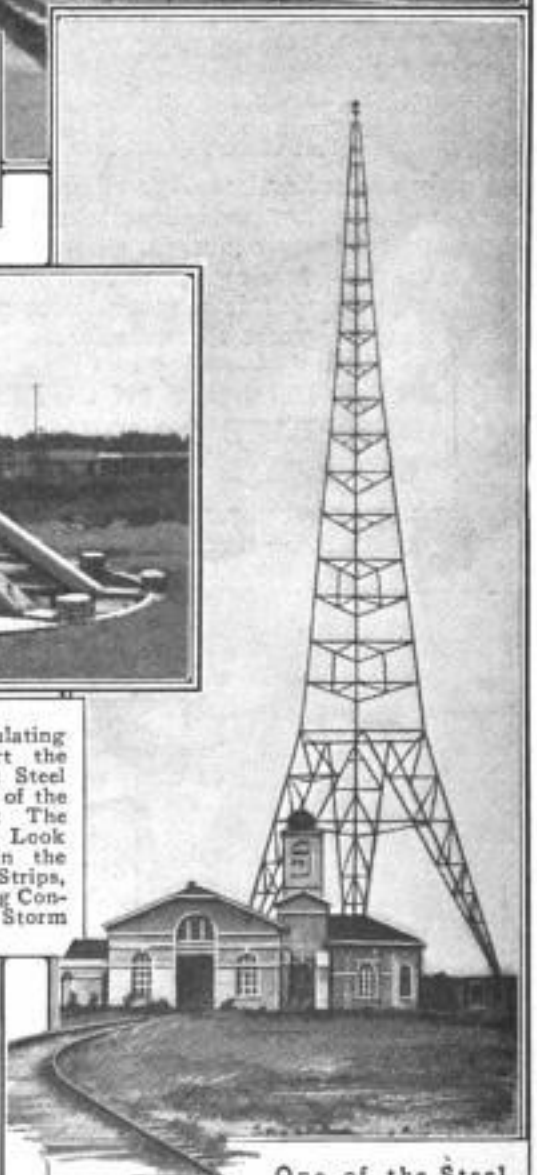
Lafayette Wireless Station, the Largest and Most Powerful Completed Radio Installation in the World, Built at Croix d'Hins, near Bordeaux, France, by the United States Navy, and Presented to the French Government December 18, 1920: It was Begun in March, 1918, and Completed in August, 1920, as Announced in the November Issue of This Magazine, It Covers a Ground Space of About 4,000 by 1,300 Feet



One of the 24 Insulating Feet That Support the Bases of the Eight Steel Pylons, or Towers, of the Aerial Equipment: The Attachments That Look like Cable Ends in the Picture Are Copper Strips, Serving as Lightning Conductors in Time of Storm

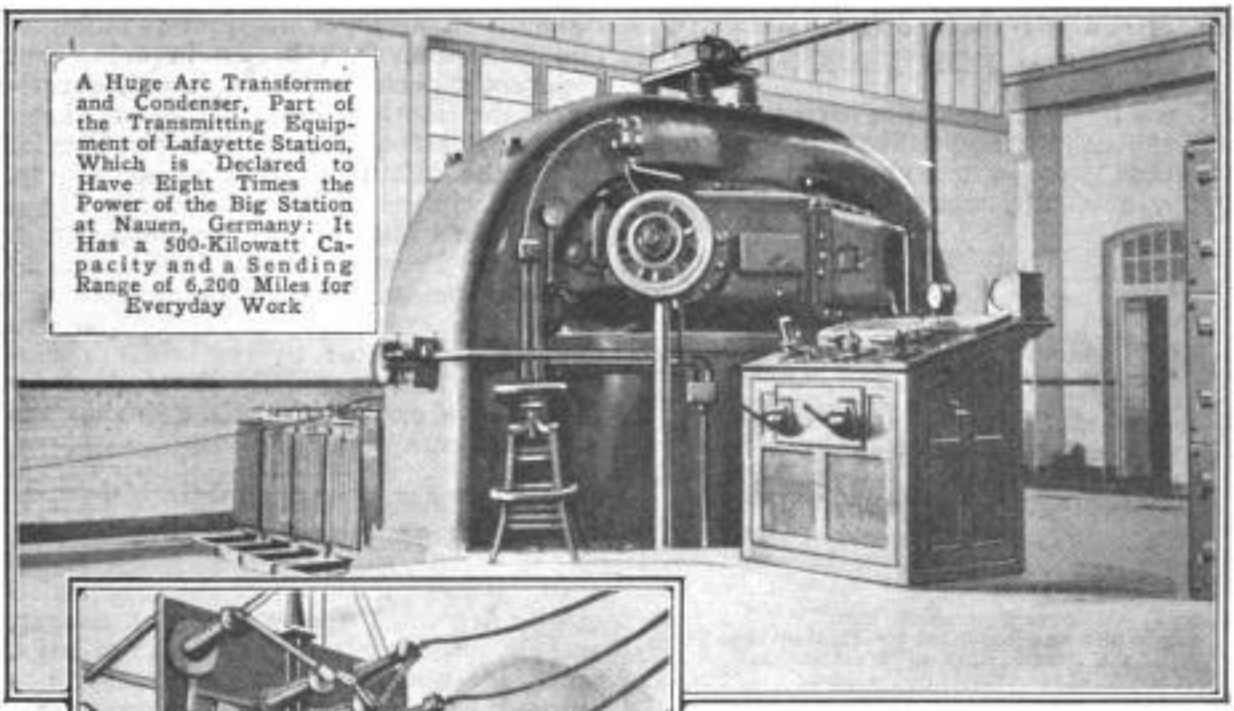


The Tower on Top of the Station's Main Building, Where the Leading-In Wires from the Antennæ Enter: There Are 16 Parallel Aerials, Supported by Four Cross Wires on the Pylons, and from Them 10 Connecting Wires Go Down to an Insulating Support on the Tower, are Formed into a Cable, and Pass through a Conduit into the Station

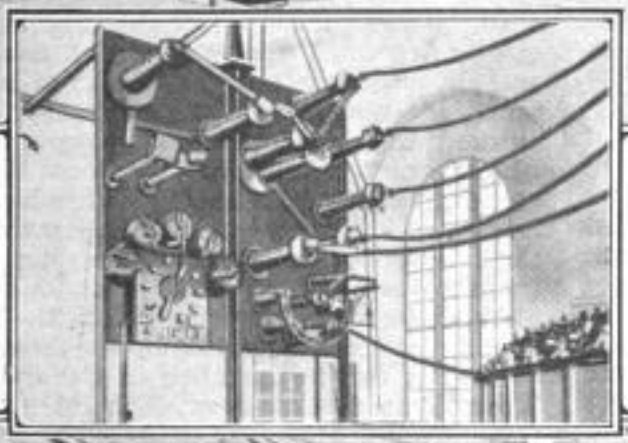


One of the Steel Aerial Masts, or Pylons, 820 Feet High, with a Three-Legged Base Supported by Insulating Feet, and Resembling the Eiffel Tower in General Outline: There Are Eight of These Huge Masts, in Two Rows, All Spaced About 1,300 Feet Apart, and Supporting the Four Cross Wires That Carry the Antennæ

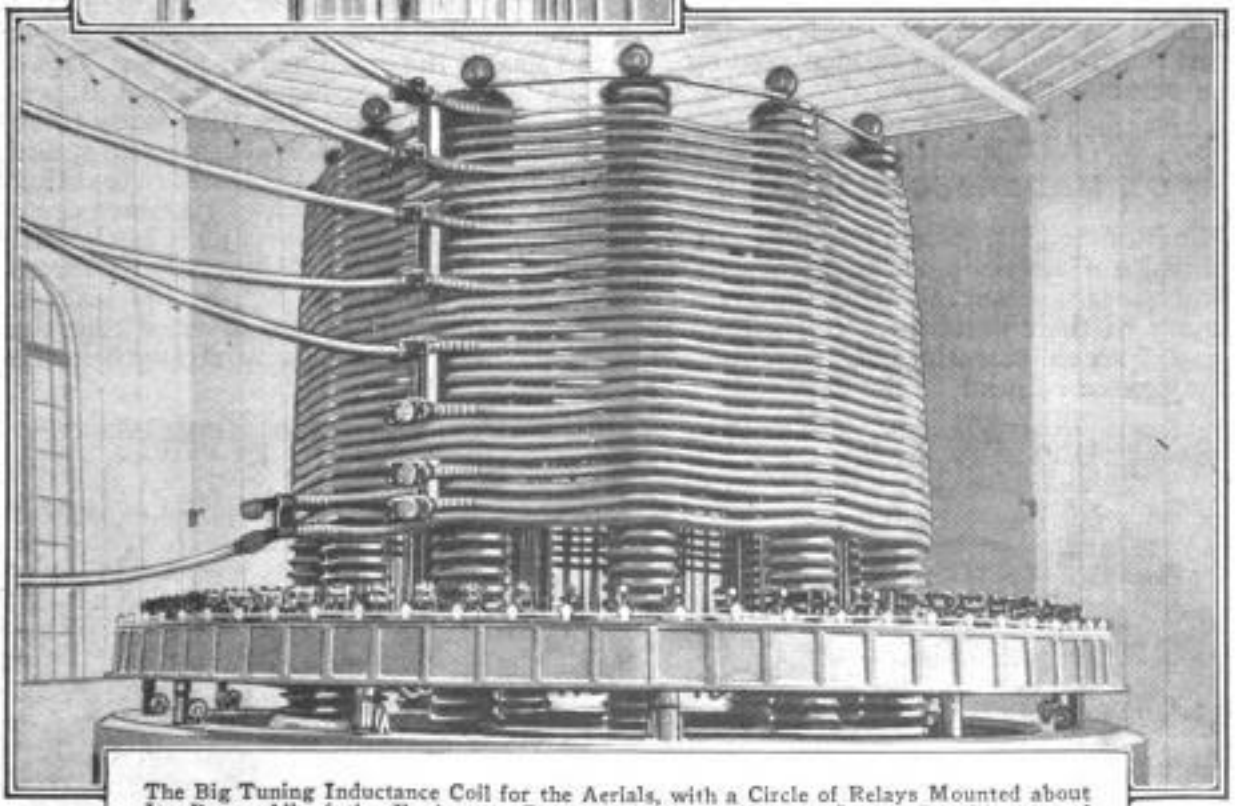
PRESENTED TO FRANCE BY AMERICAN BUILDERS



A Huge Arc Transformer and Condenser, Part of the Transmitting Equipment of Lafayette Station, Which is Declared to Have Eight Times the Power of the Big Station at Nauen, Germany: It Has a 500-Kilowatt Capacity and a Sending Range of 6,200 Miles for Everyday Work



The Switchboard Panels by Which the Sending Wave Lengths are Changed: A Wave Length of 23,450 Meters is Commonly Used, the Current Employed Having a Frequency of 15,000 Cycles a Second. The Sending Capacity of the Big Station Is 50 Words a Minute, as Compared with the Ability of the Brest-New York Cable to Take About 25 Words a Minute



The Big Tuning Inductance Coil for the Aerials, with a Circle of Relays Mounted about Its Base: All of the Equipment Represents, of Course, the Latest Development of Wireless Science, and Is in Charge of a Chief Engineer, Five Assistant Engineers, and 14 Mechanicians. The Station Is Already in Use for Sending Messages to Japan

BEAUTIFUL ICE STALAGMITES ARE PRANKS OF "JACK FROST"

On a farm in Wyoming, irrigation water, bubbling through the meshes of tumbleweeds, was so finely atomized that a spray, or froth, was thrown off. This,

These Freakish Ice Formations Resulted When Rushing Water was Vaporized by Flowing through the Fine Meshes of Tumbleweeds

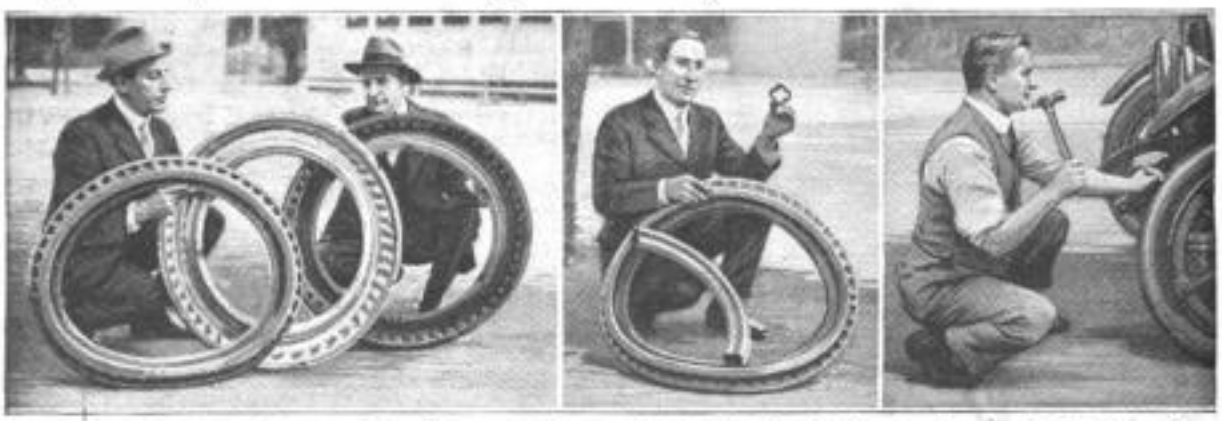
freezing as rapidly as formed, overnight built up delicate columns of ice, one of which was nearly 20 ft. in height. The chief peculiarity of the freak was that the centers of the columns were hollow, which provided ways for the passage of the vapor to their tops and prevented its freezing until it emerged. The building process was continuous while the cold snap lasted. "Jack Frost's" artistic labors were eventually arrested and his handiwork destroyed by the sudden coming of the chinook wind.

FIND VAST RADIUM DEPOSITS ON MADAGASCAR ISLAND

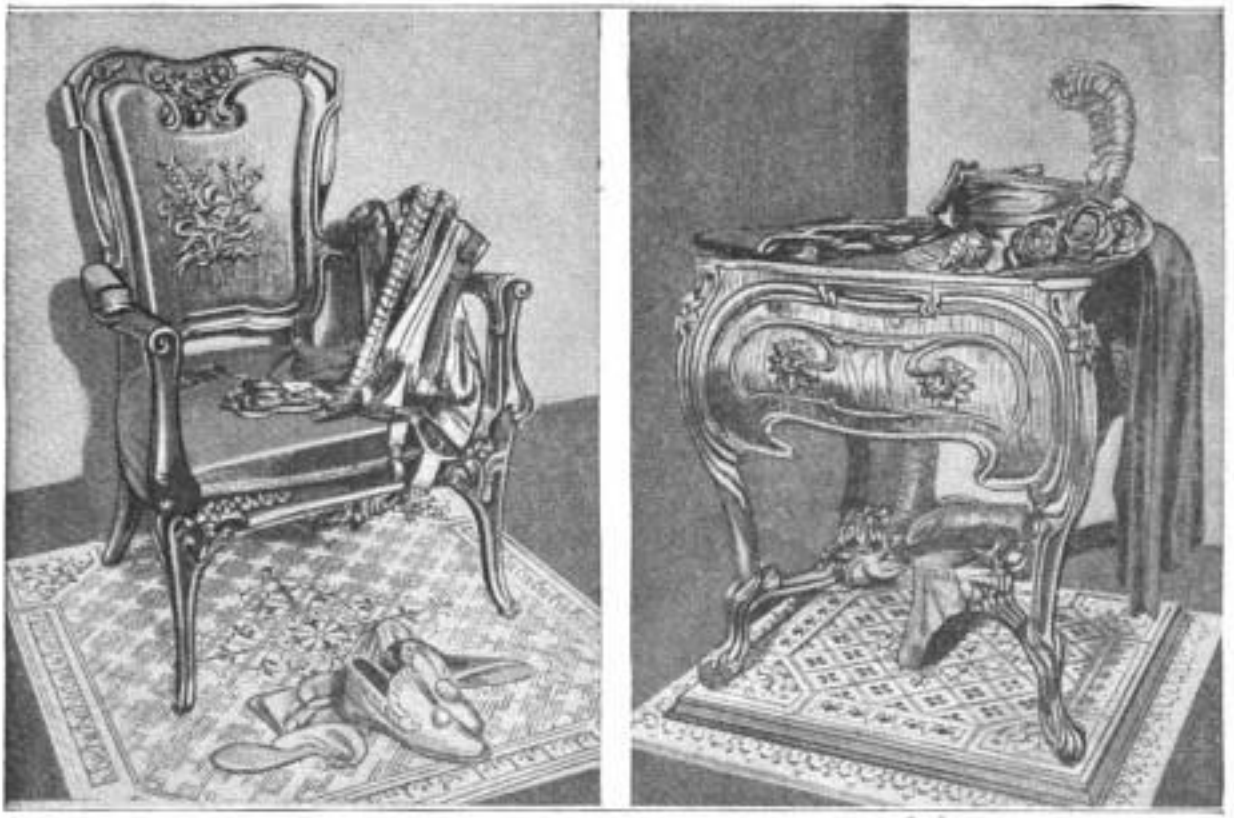
Radium-bearing mineral deposits of remarkable richness have been located on Madagascar Island, following the first discovery of their presence a few years ago by a French scientist, M. Lacroix. A complex compound of the relatively rare elements titanium, columbium or niobium, and tantalum, dark brown in color and apparently peculiar to the island, constitutes the mother ore, which has been named "Betafite," from the district Betafo. While the radium content varies largely, some specimens of the mineral are found to contain as much as one-fourth grain per ton. Prospecting is done with an electroscope and photographic plates, ore samples being wrapped in black paper and laid on the plates to test their radioactivity, which is readily determined by the relative extent of their effect on the sensitive emulsion.

NEW LEAK-PROOF INNER TUBE IS SELF-REPAIRING

In the quest for a pneumatic tube which can be depended upon to hold its temper, and air, under the pointed attacks of nails, tacks, glass, etc., a western inventor has worked out a method of making one which is of a greater cross-sectional diameter than that of the casing with which it is used. This is accomplished by molding the tube in such a way that the sides collapse inward in four places over its complete diameter when it is deflated. This has the effect of decreasing its diameter so that it can be installed in the casing. The collapsed portions on each side of the tread are indented with depressions about the size of the small end of an egg. Upon inflation, in the casing, the collapsed cavities expand, causing the tube walls to be subjected to a considerable pressure, and also to be somewhat thickened. Anything causing a puncture is simply extracted, no mending being necessary, as it is claimed that the tube walls will instantly compress and close the hole so tightly that leakage is impossible. It is also asserted that the ½-in. thick walls greatly strengthen the casing.



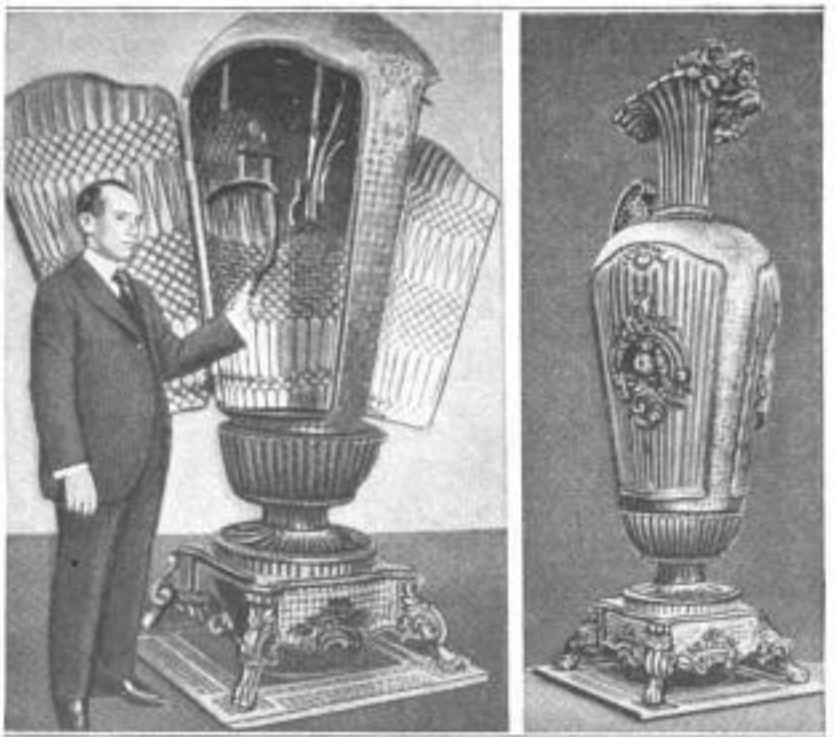
Views of the Leak-Proof Tube. Left: Finished Tube and Molds Used in Making It. Center: The Sections Show the Odd Shape; the Small Section Resembles a Maltese Cross. Right: Nails are Driven into the Tire as a Diversion; They Do No Harm, as the Holes Close Air-Tight When They are Withdrawn



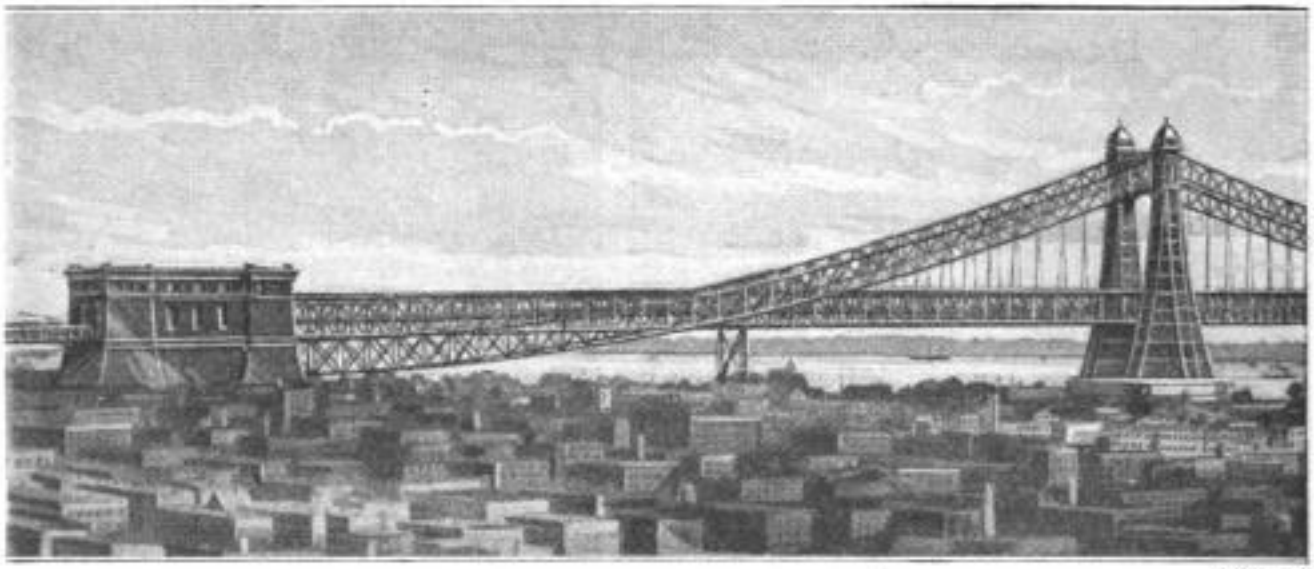
The Armchair, Rug, Garments, Slippers, and Hose are Hand-Carved in Wood. An Intricately Wrought Lady's Hat and Wrap, Also in Wood, As Are the Shoes and Hose, Adorn the Fancy Table, a Gem of the Cabinetmaker's Art

UNIQUE WOOD SCULPTURES ARE WORK OF A DECADE

Some truly remarkable examples of the wood carver's art have been brought to the United States by their owner and creator, a citizen of Colombia, South America. The skill displayed in the work is of such a high order that the term carvings scarcely does the subjects justice. Sculptures in wood is the more correctly descriptive expression. The artist, a cabinetmaker by trade, devoted his spare-time efforts to the work over a period of 10 years, with the result that an unhurried, intense attention to detail is apparent. An armchair, carved of solid walnut even to the seemingly yielding embossed-leather upholstery, stands upon what appears to be a handsome fabric rug, which, in reality, is a cunningly wrought design in wood-inlay work, in which thousands of small pieces are perfectly matched both in joinery and shade values. Another example of inlay work, also representing a rug, supports a very elaborate



Two Views of the Vase-Wardrobe: The Interior is Equipped with Hangers of the Builder's Design. From Base to Mouth the Big Urn Is Over Eight Feet Tall



DESIGNED BY
Design for the World's Greatest Bridge, across North River in New York City: Between the Towers, 600 Feet High, Its Height above the Water Is 150 Feet, and Its Two Decks will Accommodate Eight Railroad

fancy table. The masterpiece of the collection is a vase, over 8 ft. in height, with the interior fitted with hooks and hangers, the whole constituting a cleverly camouflaged wardrobe, access to which is had through skillfully concealed doors. A unique feature of the work, considered from the standpoint of technique, is the faithful reproduction of various items of feminine wearing apparel, all executed in wood.

SEATTLE BUILDS THE LARGEST AMERICAN COMMERCIAL PIER

What is believed to be the largest pier in the United States, designed exclusively for commercial purposes, is now nearing completion at Seattle, Wash. The 2,580-ft. length of the big dock will permit 11 of the largest ocean-going freighters to load or unload at the same time. Distributed over the width of 365 ft. of dock space will be the most modern machinery and apparatus for the rapid handling of cargo. Warehouse facilities are provided by two two-story structures, which occupy the landward end of the pier. This wharf is the first of a series of extensive waterfront improvements, piers, elevators, cold-storage warehouses, etc., to be undertaken by the city. It is expected also to become the American terminus of a future line of magnificent passenger steamers.

PLAN ENORMOUS NEW BRIDGE FOR NEW YORK CITY

As the vital part of a comprehensive plan for making the city of New York a railroad terminal in fact, and eliminating the present confusion and cost of bringing freight and passengers in from New Jersey, a suspension bridge of remarkable size and capacity has been designed. This huge span, crossing North River at 59th Street, will stretch 3,100 ft. clear between its 600-ft. towers, with a total length of 7,340 ft., and will be 150 ft. above the water—the world's greatest bridge. It is to have two decks, the lower accommodating eight railroad tracks, freight and passen-

This Mammoth Commercial Pier, Which is Rapidly Nearing Completion, will Add Enormously to the Harbor Facilities of Seattle. The Big Wharf, Believed to Be the Largest in America Devoted to Commercial Uses Exclusively, will Accommodate Eleven Large Ocean Liners at One Time

GUSTAV LIEBENTHAL
the Clear Span is to Be 3,100 Feet, and the Total Length of the Structure, Including Anchorages, is to Be 7,340 Feet. Lines and a Moving Platform, Below, and Electric Tracks, a Boulevard, and a Promenade Above

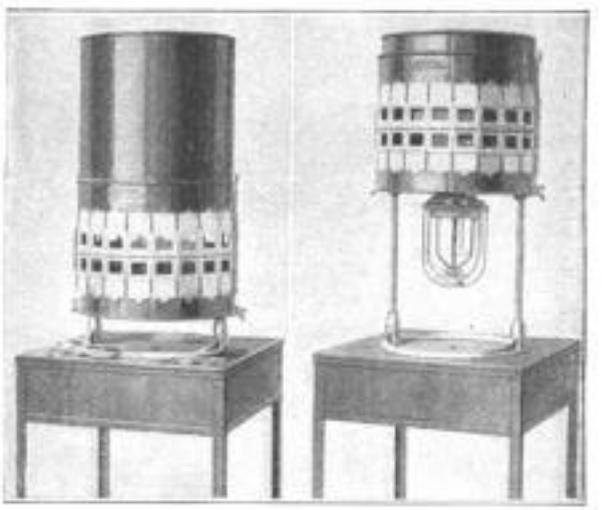
ger, and a moving conveyor platform, while the upper carries the tracks for electric and local lines, a boulevard wide enough for six lines of traffic, and a broad promenade. For the dispatch of traffic over the new bridge, a comprehensive belt-railroad system is planned for the New Jersey side, and a double-deck, eight-track elevated line connecting with the Manhattan end. The bridge, with an estimated cost of $75,000,000, will have a capacity equal to 18 tunnels, which would cost $220,000,000. The whole project dependent upon the new bridge will cost about $211,000,000, and will require seven years to complete.

BEEKEEPER DISCOVERS CURE FOR FOUL-BROOD DISEASE

Beekeepers of British Columbia have suffered great loss in recent years from foul-brood disease, which attacks the larvæ of the bees and is highly contagious and destructive. Driven to heroic measures by the inroads of the pest, a beeman of Edmonds conducted a long series of experiments, and finally discovered a form of emulsified oil that not only kills the germ, but, what is equally important, is tolerated by the bees. The compound is sprayed into the cells of each hive, preferably by compressed air, sealed cells being treated repeatedly until they are penetrated. After the first experimental treatment, new eggs laid by the queen in the disinfected cells hatched a healthy brood. The new process will meet its ultimate test this spring, but witnesses of the trials are already confident of its reliability. The cost is reported to be very moderate.

MACHINE TESTS DYED FABRICS FOR FASTNESS OF COLORS

With the constant production of new dyestuffs, whose color fastness is tested by nature only through the slow processes of years, a method for the rapid determination of permanency becomes desirable. A machine for this purpose is now offered by an Illinois manufacturer. An inclosed electric arc, with special electrodes giving light of solar quality, including ultraviolet rays, is surrounded by a metal drum with 40 windows, at which samples of fabric, up to 3 by 5 in., are exposed in individual holders. Arrangement is made for shield-

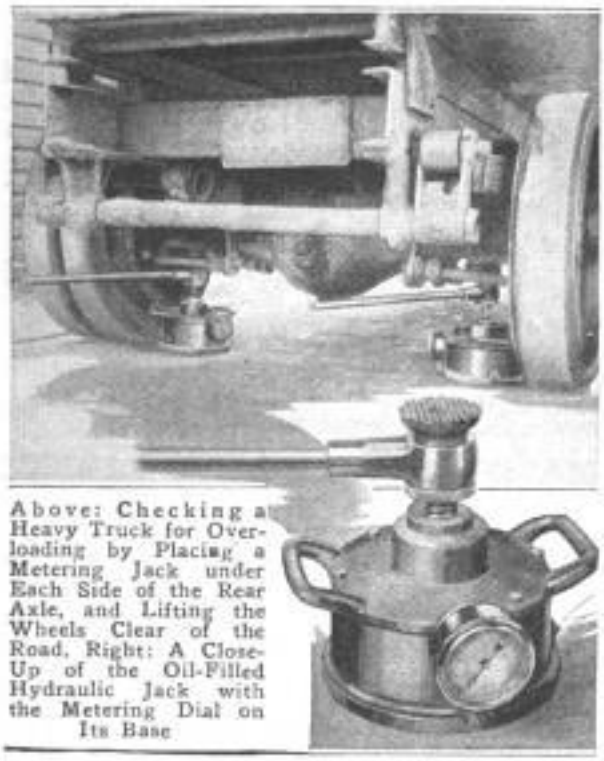


Left: Testing Samples of Dyed Fabric at the Small Windows in the Lower Drum. Right: The Lower Drum Raised to Give Access to the Electric Arc, Which Gives Rays of Daylight Quality

ing part of each sample for comparison. To give access to the arc, the lower part of the drum slides over the upper, without disturbing the holders.

JACKLIKE METER KEEPS TAB ON TRUCK OVERLOADING

Not the actual weight of motor trucks and their proper loads, but the practice of overloading them, is responsible for damage to highways, according to expert opinion. To give road commissioners a reliable means of detecting such overloading, an eastern manufacturer now offers a measuring instrument in the form of an oil-filled hydraulic jack, with a pressure gauge mounted on its broad base. The screw stems of two such jacks are placed under the rear axle of the suspected truck, and the whole back end of the vehicle lifted clear of the road. From the reading in pounds on the gauge dials, it is easy to figure the load per inch of tire width.



Above: Checking a Heavy Truck for Overloading by Placing a Metering Jack under Each Side of the Rear Axle, and Lifting the Wheels Clear of the Road. Right: A Close-Up of the Oil-Filled Hydraulic Jack with the Metering Dial on Its Base

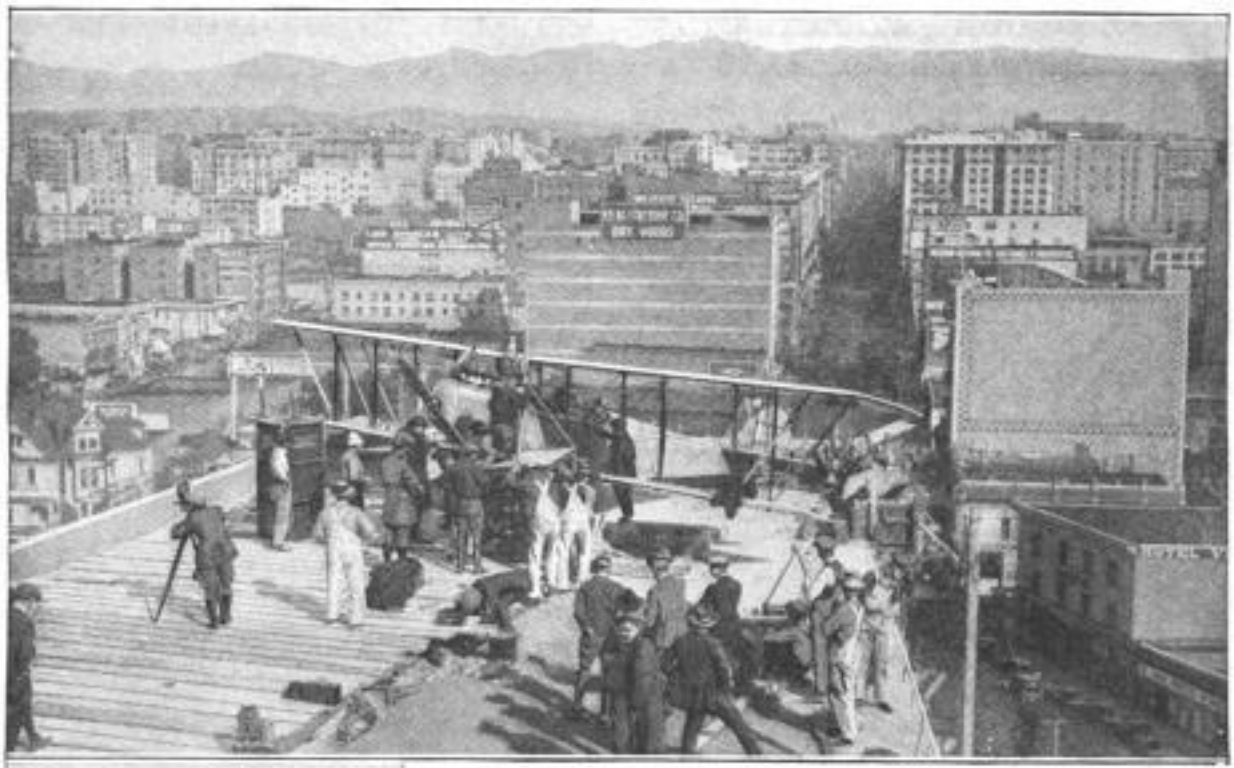
PLAN HUGE BOTANIC GARDEN AS NEW CAPITAL PARK

Because the existing botanic garden at the national capital is inadequate for complete representation of American flora, the proposal is now made that the Mount Hamilton tract, adjoining a new public park on the Anacostia River, be converted into a national botanical garden at least comparable to those of other countries. The suggested tract, accessible by all forms of transportation, is remarkable for its large variety of timber and the diversified nature of its terrain, offering hills and ravines with slopes of all grades from gentle to steep, and including meadowland, small streams, marshes, and practically every kind of plant-growing soil.

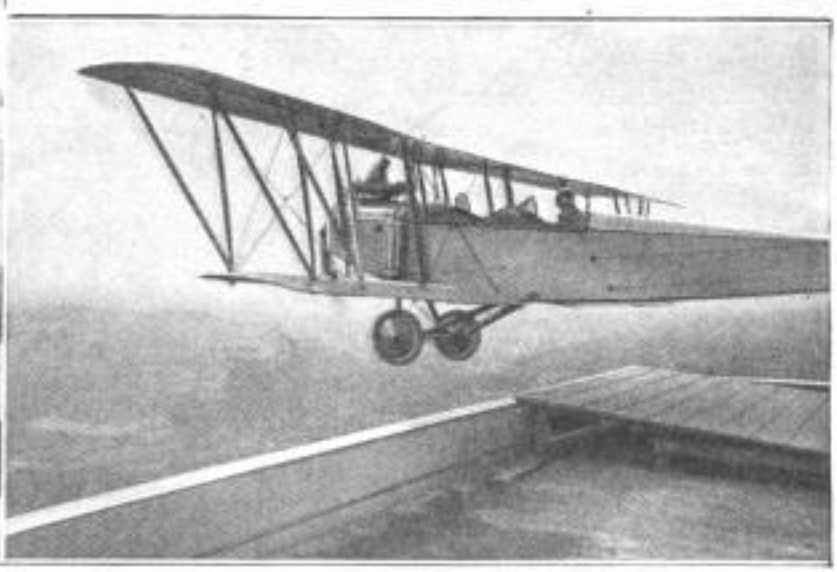
HUGE MOWER CUTS AND STACKS GRAIN IN ONE OPERATION

Stacking the grain at the same time it is cut, is the work performed by a harvesting outfit used in Kansas. It avoids the necessity of driving a heavy wagon about the field, loading from shocks and later making a long haul to the stack. The novel part of the outfit is a 12 by 24-ft. platform, with a high slat-sided rack, mounted on wheels and hitched to the rear of a tractor. Two headers, also drawn by the tractor through a side hitch, cut the heads and a short length of the stalks from the grain, after which it is carried to the rack by conveyors. Three men tramp the load continuously, packing it tightly, especially in the center. When the rack is filled, a rope is passed around the load and fastened to a stake driven into the ground. Upon the tractor resuming its journey, the well-packed grain is unloaded, and the erstwhile load of straw becomes a stack of wheat, oats, timothy, or rye, as the case may be.

Grain Harvester and Stacker: By Carrying the Grain Along in the Rack Until Enough is Accumulated to Make a Good Stack, This Outfit, with a Crew of Five, Cuts and Stacks 40 to 60 Acres of Grain a Day



The Plane Undergoing Final Inspection: Owing to the Triangular Shape of the Building, the Right Wing of the Plane Projected Several Feet beyond the Edge. The Skillful Flier Had the Machine Clear in a Run of Less than 90 Feet



Mr. Frank Clark, Whose Nerve Proved Equal to the Occasion and Who Says He Is Glad It Did. Right View: The "Hop-Off"; Split-Second Watches Caught the Plane's Speed at 90 Miles an Hour at the Roof's Edge

AIRMAN "HOPS OFF" FROM SKYSCRAPER ROOF

Making a "hop-off" from the space afforded by the roof of a building was a feat recently performed by Mr. Frank Clark, a 22-year-old airman, resident of California. He now enjoys the distinction of ranking with the late Jules Védrines, famous French flier, who was the first intentionally to land an airplane on a roof. Had it not been for the interference of the Paris police Védrines would have attempted the stunt performed by Clark. From the standpoint of hazard his feat perhaps overshadows that of Védrines, for the reason that in the latter instance safeguards, in the form of ramparts of sandbags, inclosing the roof, somewhat reduced the risk, while in the case of the take-off there was no chance to stop the rushing plane after it was once under way.

CENTRIFUGE EXTRACTS OIL FROM LATHE TURNINGS

Reclamation of cutting oil on a large scale has proved well worth while to a large eastern manufacturer. The reclaiming mechanism is nothing more than an 8-ft. centrifugal extractor, on the order of those used in laundries, which, spinning at the rate of 800 r.p.m., separates the oil from the lathe, or other machine, cuttings with which it is loaded. The method is credited with a saving of 3,000 gal. of oil per month. A secondary benefit is the reduction of the fire risk, as the finely divided film of oil, which often takes fire spontaneously from atmospheric oxidation, is removed.

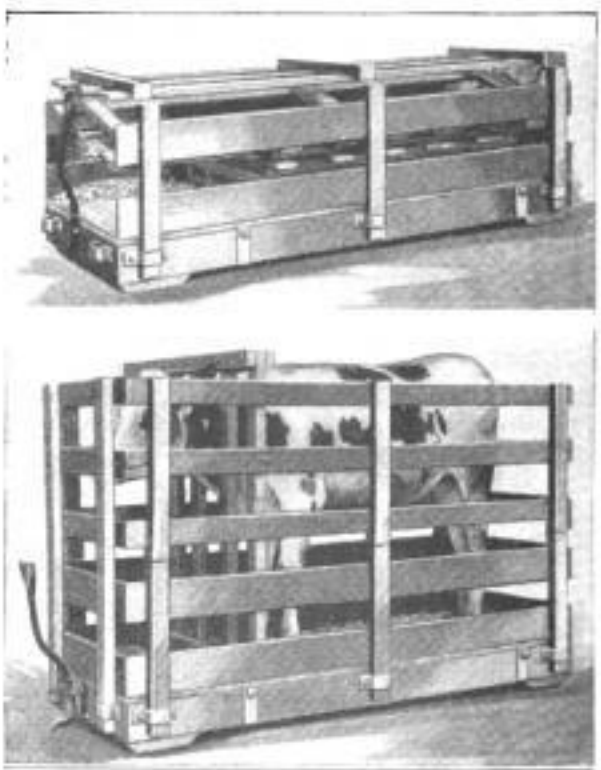
Loading a Centrifugal Extractor Basket with Oil-Soaked Metal Turnings: The Oil is Torn from the Mass by Centrifugal Force and Thrown through the Basket Perforations

LIGNITES OF WESTERN STATES BRIQUETTED INTO NEW FUEL

One-third of the country's fuel resources are included in the enormous deposits of lignite in North Dakota, Texas, and other western states. The material is so difficult to use, however, because of its moisture, easy disintegration, and proneness to spontaneous ignition, that inhabitants of those regions find it more satisfactory to import expensive coal. Now the Bureau of Mines has succeeded, by using enough heat to drive off the moisture and the free gases, in making the raw lignite into charred briquettes of a fuel value practically equal to that of hard coal. By virtue of a $100,000 congressional appropriation, a governmental plant is to be erected at New Salem, N. D., for the manufacture of the new briquette fuel, and its valuable by-products of gas, oil, and tar. The enterprise is expected to release large amounts of coal and coal cars for use elsewhere.

LIVE-STOCK SHIPPING CRATE FOLDS INTO SMALL SPACE

A cattle-shipping crate, designed to be used in the shipment of live stock via express, is so constructed that the side members can be folded to half their height, which economizes much space when the crate is returned to the shipper. The sides and ends may be completely removed, if desired, leaving a generous platform which, being equipped with rollers, makes a handy truck. Caster-type rollers and a tongue on one end of the platform make it possible to maneuver the apparatus in limited spaces, such as an express car or the bed of a wagon. The outfit is quite sturdy in construction, and is of sufficient size to comfortably accommodate half-grown cattle or horses. A stanchion prevents plunging and bucking.



The Collapsible Cattle-Shipping Crate. Top: Folded for Return Shipment. Below: Half-Grown Animals are Easily Accommodated

ACTION OF GRAVITY IS LESS THROUGH MASS OF MERCURY

That matter may absorb gravitational force is indicated by experiments recently performed by an Italian scientist. It was found that a sphere of lead suspended by a wire inside a cavity would weigh less when the cavity was surrounded with mercury than it would when the mercury was removed. The effect was found to be small. The change measured in the experiment corresponded to about eight parts in ten billion parts. If this is verified, small though the measured effect was, it will be of revolutionary importance to astronomy, physics, geology, and will be reflected in all branches of science. The larger the object, the greater the influence of this absorption.

According to the theory deduced in connection with this experiment, the earth actually contains more matter than has been heretofore supposed. Also, the sun and all of the stars are relatively more massive, or represent more material than has been deduced from the observations which have been made up to the present time.

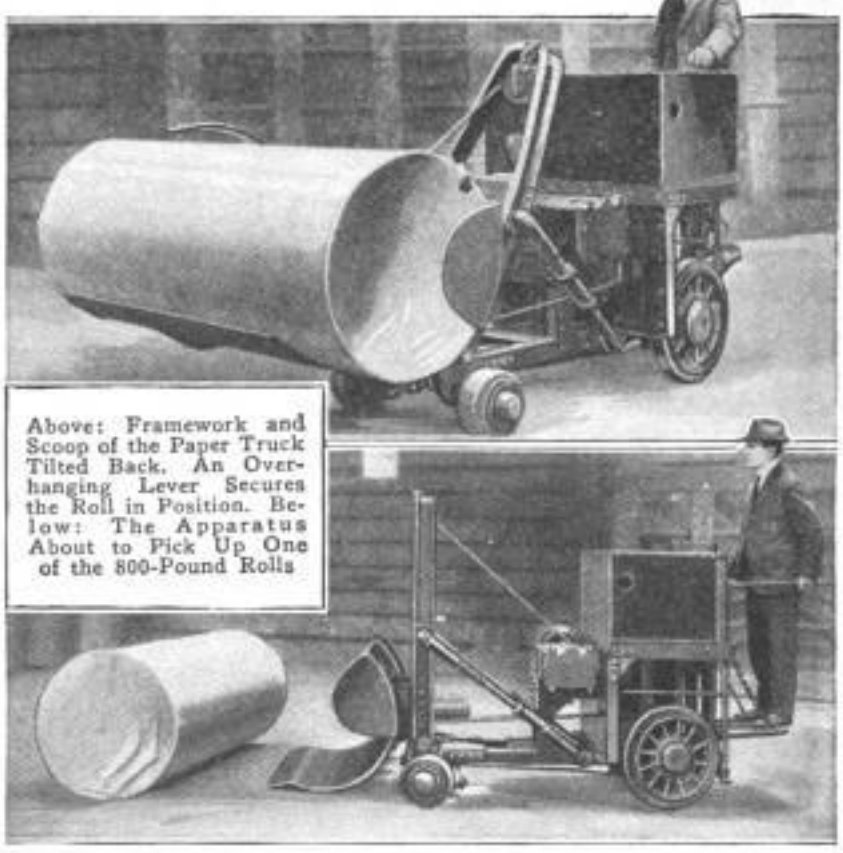
An approximate value for the mass of the sun, based on a simplifying assumption as to the distribution of matter in it, and on the recent experiments, comes out three times as large as the figure which has been accepted as correct previously.

"UNKNOWN WARRIOR" SERVICE ON PHONOGRAPH RECORD

Parts of the impressive services, held at Westminster Abbey, London, on Armistice Day for the "Unknown Warrior," have been perpetuated on phonograph records, through ingenious arrangements devised by two army officers. These records are now available to the public, and the proceeds of their sale are to go into a fund for the restoration of the Abbey. Kipling's "Recessional" and the hymn "Abide with Me" are included in the record.

ELECTRIC WAREHOUSE TRUCK PERFORMS HEAVY TASKS

Picking up an 800-lb. roll of paper lying flat on the floor, taking it to any part of the plant, and setting it up on end is the everyday work of an electric truck fitted with an ingeniously designed scoop, mounted on a channel-steel framework, which may be tilted toward the rear of the vehicle by a power winch. A heavy steel casting, mounted on ball bearings, forms the bracket for the scoop and may be revolved by power so that the scoop and its load come into a vertical position. It is, of course, necessary to roll the heavy bundle onto the scoop by hand. This is the only manual operation, as the channel section framework then tilts backward, lifting the scoop and its load 18 in. clear of the floor. One man handles the heavy rolls easily.

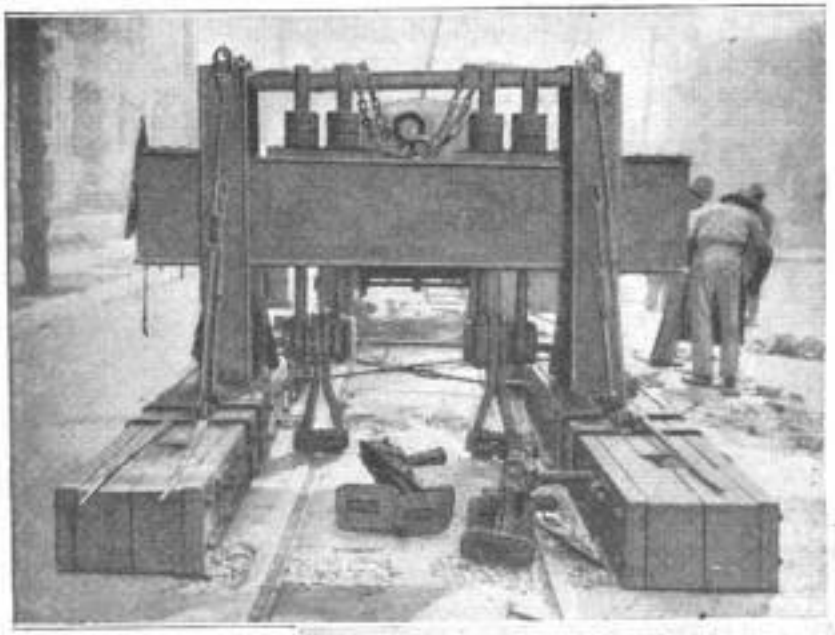


Above: Framework and Scoop of the Paper Truck Tilted Back. An Overhanging Lever Secures the Roll in Position. Below: The Apparatus About to Pick Up One of the 800-Pound Rolls

¶ Encountering a hurricane 45 miles west of Cheyenne, one of the crack U. S. mail fliers flew with it to that city, covering the distance in 7 min., flat, or at the rate of 385 miles an hour, or 6½ miles per minute. He then made a nearly vertical descent from a 3,000-ft. height by heading the plane into the gale, the force of which almost exactly balanced the driving thrust of the propeller.

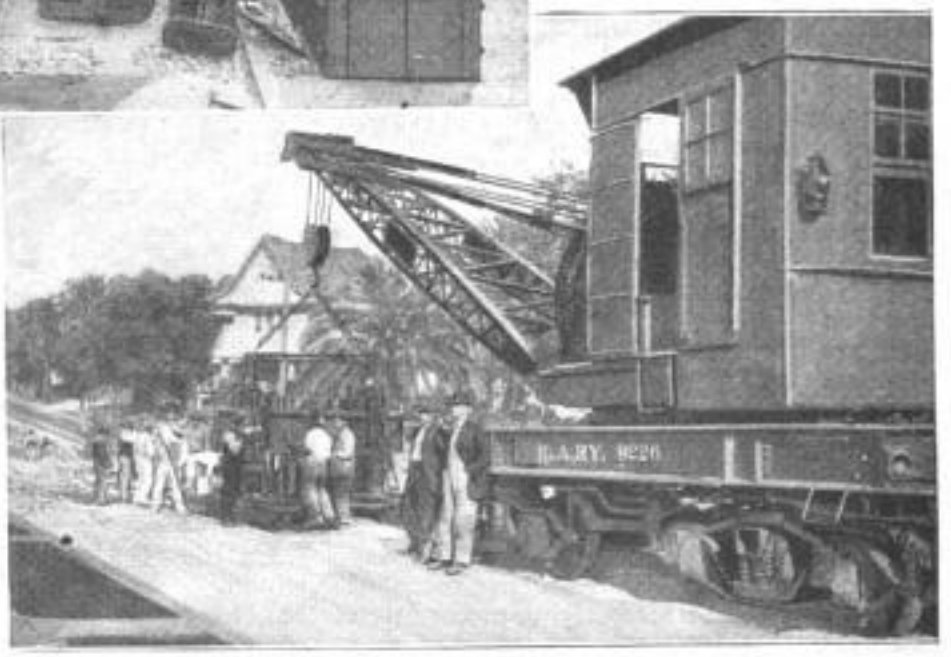
HYDRAULIC JACK TEARS UP STREET-CAR TRACKS

A hydraulically operated rail-pulling jack, having a lifting capacity of 500 tons, is quickly exerted by the jack cylinders. This force is usually sufficient to loosen the rails from the ties and shatter the concrete in which they are imbedded. The apparatus weighs 12 tons, and is moved from point to point along the track by means of a portable crane mounted on a construction car. Track is torn up at the rate of 100 ft. per hour, with a crew of 14 men operating the powerful machine. With the salvage valued at $2 per foot, the apparatus may be said to earn $1,600, gross, per day.



Pulling Up Street-Car Tracks with a 500-Ton Hydraulic Jack: The Concrete Bed is First Broken Up

is used in Los Angeles to literally tear street-car rails out "by the roots." The huge apparatus is placed directly over the section of track to be removed, and powerful clamp hooks grasp each rail. With four men operating two pumps, a lifting force of 150 tons



A Portable Crane, Mounted on a Construction Car, is Used to Move the Track-Pulling Jack Forward, Six Feet at a Time. For Transportation over Any Considerable Distance, the Huge Apparatus is Mounted on a Flat Car

SULPHUR IN ENGLISH SHALE OIL LIMITS ITS USE

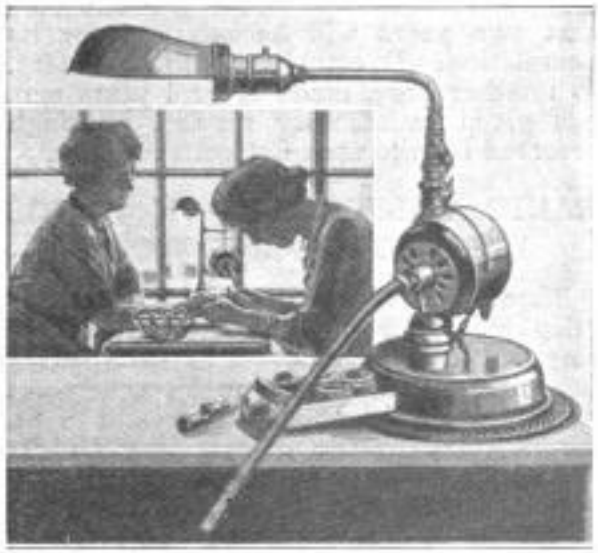
Unlike petroleum, the shale oils are manufactured products. They do not exist in the shales as free fluids, as does petroleum in the oil sands, but must be produced from them by a somewhat complicated, destructive-distillation process similar to that used in the distillation of the volatile constituents of coal. The cost of the process, plus the cost of subsequent refinings and the elimination of sulphur, has, up to the present, acted as a deterrent on the shale-oil industry. This latter factor is the one to which the slow exploitation of the earth's enormous shale deposits is principally charged.

Sulphur, either in its free state or in the form of compounds, is inherent in all oil shales, and, unless prevented from distilling into the crudes, results in the partial or complete spoilage of the refined products for other than fuel-oil purposes. Unfortunately the deleterious component is the most difficult to remove. For this reason the industry in England is laboring under a severe handicap, as the native shale deposits are exceptionally rich in the

troublesome element, the percentage running as high as 5.57 as compared with the 1.5-per-cent content of the Scotch shales. During distillation much sulphur is eliminated, but the remainder is sufficient to contaminate the resulting distillate with a content in some cases as high as 8.9 per cent. To what extent this unfits the oil for general use may be gathered from the fact that, during the time of its most desperate need, the British admiralty set an extreme high limit of three-per-cent sulphur content and paid but a very low price for oils containing more than two per cent. However, the low grades are suitable for fuel purposes, and it is quite apparent that until some low-cost quantity-production process of sulphur elimination is discovered, the English oils will be restricted to this field.

NEW ELECTRIC MANICURE SET GROOMS FINGERS QUICKLY

A California inventor has recently placed on the market a device in the form of a completely motorized manicure set, consisting of a small electric motor, flexible shaft, and the various cutters, files, probes, and buffers. These last are in the form of circular bits which fit into a chuck on the end of the shaft and do their work with a high-speed rotary motion. The pedestal upon which the motor is mounted also forms the base of a swivel-arm light



A View of the Manicure Motor, Showing the Flexible Shaft and Instrument Drawer. Insert: The Manicure Motor in Service

fitting, and contains a drawer, arranged in compartments for the handy disposal of the instruments, chemicals, and polishes. As no great degree of skill is needed to operate the device it may become an article of home use.

MAN-POWER ONION PLANTER SETS AN ACRE PER DAY

The "man with the hoe" is rapidly losing his job. The latest usurper of his place in the scheme of things agricultural

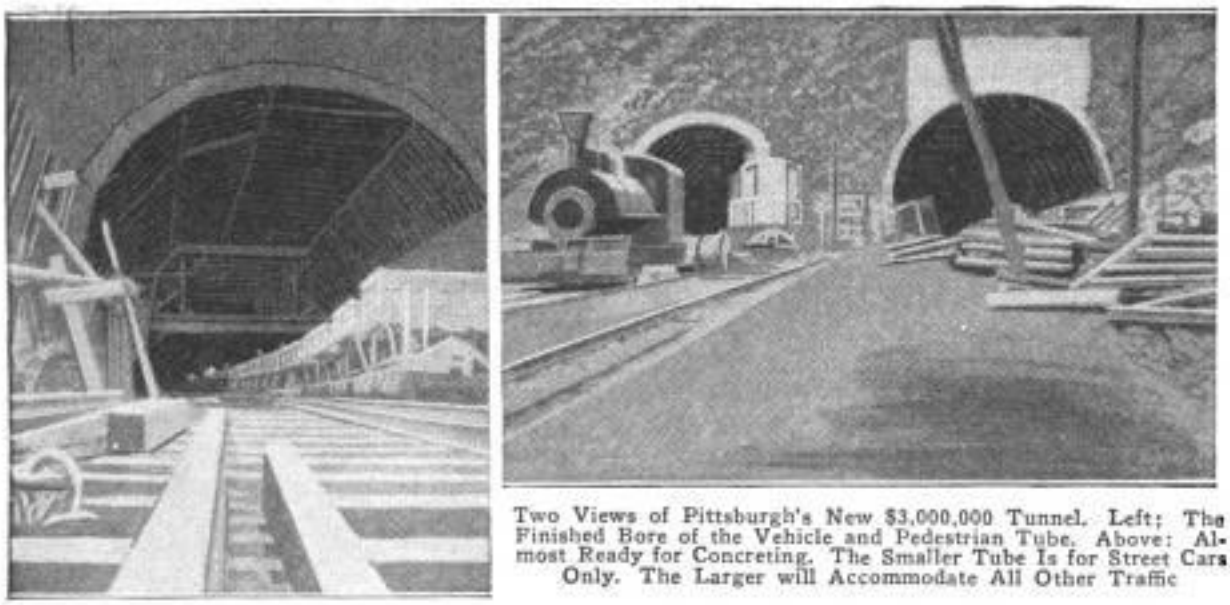
The Onion Planter Holds Enough Sets to Plant a Row 40 Rods Long. The Dropping Mechanism Is Adjustable to Handle Onions of Various Sizes; Another Workman Follows with a Hoe Covering the Sets

is the man behind the onion planter. This machine, the product of the inventive genius of an Iowan, is a simple four-wheeled contrivance which makes the furrow, measures the correct spaces, and drops the sets. The dropping mechanism is operated by chains and sprockets driven from the rear wheels. Power is supplied by the operator through the medium of plow handles projecting from the rear of the device, and another workman follows with a hoe and covers the sets.

PUMP ASHES UNDER CONCRETE FLOORS TO LEVEL THEM

Concrete floors laid on made ground are sometimes warped by subsequent sinking of the soil. In constructing several large warehouses at Royal Albert Dock, London, this difficulty was corrected by inserting short vertical poles about every 20 ft. in the concrete, and withdrawing them when it had set. If the ground sank at any point, ashes and water were pumped at 20-lb. pressure into the adjacent hole by an electric pump. This raised the floor to its level and furnished a new foundation, the water escaping from the other holes. Holes not needed were filled up.

¶As an experiment, French army horses have been maintained in serviceable condition on a ration of three parts of dried seaweed mixed with one part of oats.



Two Views of Pittsburgh's New $3,000,000 Tunnel. Left: The Finished Bore of the Vehicle and Pedestrian Tube. Above: Almost Ready for Concreting. The Smaller Tube Is for Street Cars Only. The Larger will Accommodate All Other Traffic

GROTESQUE IMAGES REWARD MOTORCYCLE-RACE RIDERS

Two exhibition motorcyclists recently gave a special performance, by imperial command, for their majesties the king and queen of Bali—a little island in the Malay archipelago, just east of Java. Delighted with the entertainment, his majesty presented the performers with two horribly grotesque but wonderfully carved wooden images, thereby conferring upon them no inconsiderable honor, as the figures have traditional significance and are semisacred. Their bestowal by the royal hand enhanced the value of the gift

Carved Wooden Images, Presented to an American Motorcycle Racing Team by the King of Bali, before Whom They had Given a Special Performance

in the eyes of the natives. It took over two months for the trophies to reach America, Bali being about 12,500 miles away. The owners are justly proud of the queer prizes.

PITTSBURGH DRIVES A TUNNEL THROUGH IMPRISONING HILLS

After having tried, for a number of years, to get over and around the hills surrounding their city, the residents of Pittsburgh, Pa., have decided to strike at the heart of the difficulty and go through them. Accordingly tunneling operations have been gotten under way which, when completed, will result in a double-tube bore that will accommodate pedestrian, street-car, and vehicular traffic. The estimated cost of the undertaking is between $2,000,000 and $3,000,000, and it is expected that two years will be required for its completion. It establishes no precedent, as another bore, made several years ago, has given satisfactory service, although reserved for the use of street cars only.

RADIO TELEPHONES IN AUTOS USED FOR POLICE WORK

Three autos equipped with wireless-telephone receiving sets, and a transmitting outfit of 40-mile range installed at headquarters, are innovations recently put under test by the police department of St. Louis. One of the officers in each car constantly wears a head receiver, by which means new orders, or additional information, can be given to the squad at any time, no matter where the car may be. False clews are thus corrected, and much valuable time saved.

¶A new ship-coaling record was established Dec. 19, last, when the Cristobal, C. Z., coaling plant restocked the bunkers of the steamer "Rio Grande" with 297 tons 480 lb. in 20 min., flat.

FORECASTING THE PATH OF HURRICANES ON THE GULF OF MEXICO

BY HARRY H. DUNN

A NEW method of discovering the approach of a hurricane to the Gulf of Mexico coast of North America long before even the most delicate of barometers has given any indication of the coming of the storm, has been worked out by Dr. Isaac M. Cline, district forecaster of the United States Weather Bureau, stationed at New Orleans. Not only does this new method warn that the hurricane is coming, but it tells its direction, its velocity, the place at which it will go inland on the coast, and the probable force with which it will hit whatever stands in its way.

The height of the tides along the Gulf coast, Doctor Cline has learned through 20 years of close observation, tabulation, comparison, and study from Corpus Christi to Key West, bears tales of the coming of the hurricane, and a comparatively full description of the storm, from 24 to 48 hours before it comes within reach of the barometers. In the 20 years, from the beginning of 1900 to the end of 1919, during which Doctor Cline was quietly and thoroughly working out this theory of the close connection between tide and tempest, hurricanes bred in the Yucatan Channel and coming in off the Atlantic through the Straits of Florida, took 7,225 lives on the Gulf coast of the United States. In the same period these same storms destroyed property valued at $105,642,000, as reported by cities, towns, shipping firms, fishermen, and coast guards, while probably half as much more was destroyed which was not officially recorded.

This is an average of nearly one human life a day for 20 years, sacrificed to incomplete knowledge of Gulf hurricanes. It means that more than $5,000,000 in property—the value of 10 ocean freight steamships—was literally "blown to smithereens" every 12 months, by winds which warned not of their coming or their going.

In the year 1920, under the warnings which Doctor Cline was able to issue, based on his new theory, and on the widespread circulation of that theory by the United States Weather Bureau, all along the Gulf coast, only two ships—one a small freight steamer and the other a power schooner—were destroyed by the September hurricanes, and, so far as had been reported at the end of November, only 18 lives lost. Shippers, owners of deep-sea vessels, operators of fishing fleets, and the governments of Gulf ports hail Doctor Cline's discovery as the greatest check ever put upon the uncertain and destructive elements of the Gulf. Last year's experience, compared with that of each of the past 20 years, would prove it so.

Twenty years ago, in 1900, Doctor Cline, studying the data gathered on the great hurricane which, that autumn, virtually wiped out Galveston with tremendous loss of life, first developed his theory that in the height of pre-storm tides is to be found an accurate messenger, giving abundant warning to the coasts of the approach of the hurricane. It remained for him to collect and arrange the data on these tides in such form that succeeding tides, compared with those which have preceded other storms, would tell what is to come. Since then, through two decades, at Galveston and Corpus Christi, the mouth of the Mississippi and New Orleans, and all around the curving shore of the Gulf, through Mobile and Pensacola and Tampa to Key West on the east, the indefatigable weather worker has studied and correlated and compared these tides,

ONE LIFE SAVED EVERY DAY IN YEAR BY WARNING TIDES GIVE OF HURRICANES

HURRICANES on the Gulf coast of the United States wiped out 7,225 human lives in the 20 years from 1900 to the end of 1919, an average of almost exactly one life a day.

The new method of forecasting time, place, velocity, and power at and with which these hurricanes travel and will hit the shore line, will save the lives of all who heed it.

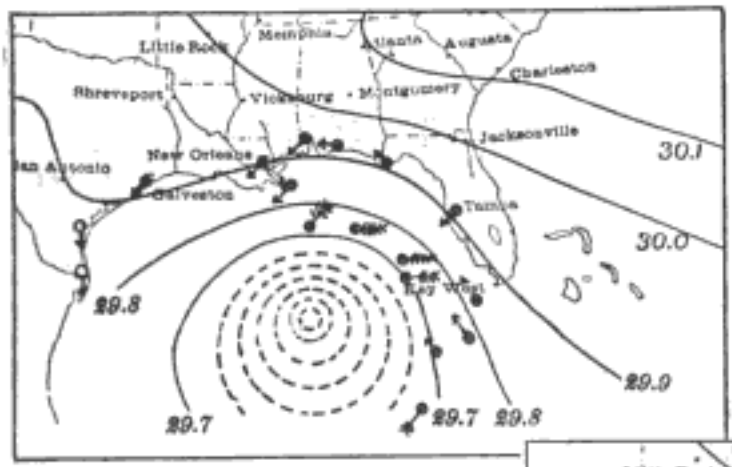
During the same 20 years, these hurricanes cost, in reported property destroyed, $105,642,000, with probably half as much more which was not reported. The greater part, probably 80 per cent, of this property was shipping, all of which can and will be saved by this new system of forecasting, which tells all about the storm from 24 to 48 hours before it reaches any given point on land or sea.

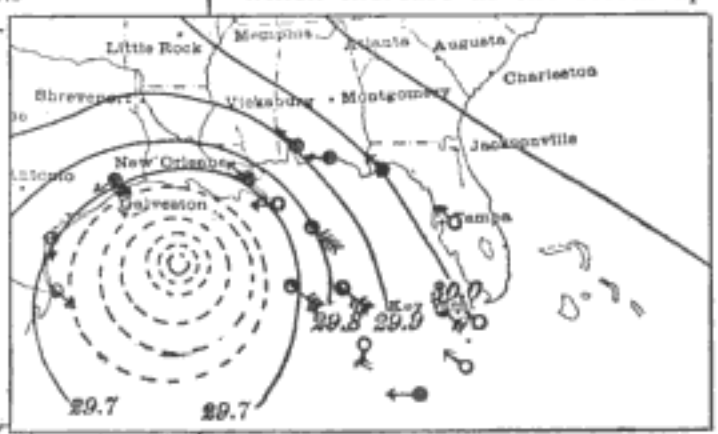
The story tells of the remarkable discovery of Dr. Isaac M. Cline, district weather forecaster at New Orleans, of the accuracy with which relative heights of tides tell all the details of a Gulf of Mexico hurricane, long before it hits the shore. Doctor Cline bases his new method on 20 years of personal study of hurricanes, face to face with them on the Gulf coast of the United States.

until today he formulates his findings in this statement:

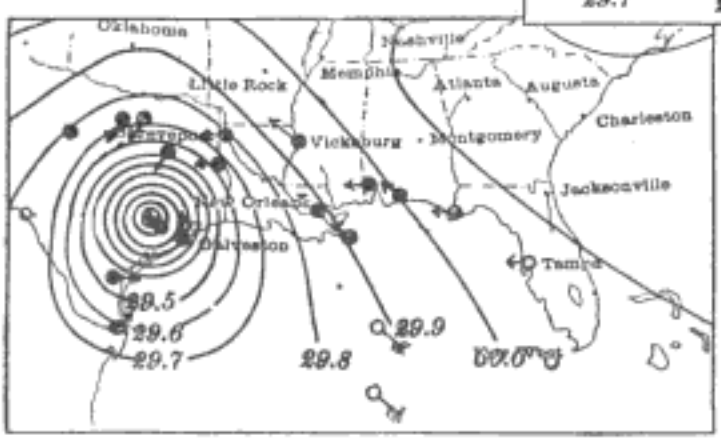
"With the approach of a hurricane to the Gulf coast, the tides rise from the center of the hurricane's path to the right of that path, and are lowest at the left of the course the storm is taking."

Thus, for example, if a hurricane approached the Texas coast between Corpus Christi and Galveston—both heavy sufferers from past storms—and if the tide were markedly higher along the Galveston coast, and markedly low along the Corpus Christi coast, then the hurricane would strike nearer to Galveston than to Corpus Christi. This announcement of the hurricane's approach would be read by the tide observers, from 24 to 48 hours before the barometer gave any indication of it.





Official Weather Maps of the Gulf Region, Plotted during the Hurricane of 1915: In the Map Above, Dated August 15, the Vortex of the Storm is Seen to be Entering the Gulf, While Its Advance Guard, in the Form of a Falling Barometer, has Reached the Coast. In the Map at the Right, Dated August 16, the Coast Cities Are on the Edge of the Disturbance, While in the One Below, of August 17, the Center of the Hurricane has Passed Inland. In This Storm, Buoys along the Coast were Carried for Miles Nearly Parallel to the Shore by the Tidal Cross Currents Set Up in Advance of the Actual Disturbance

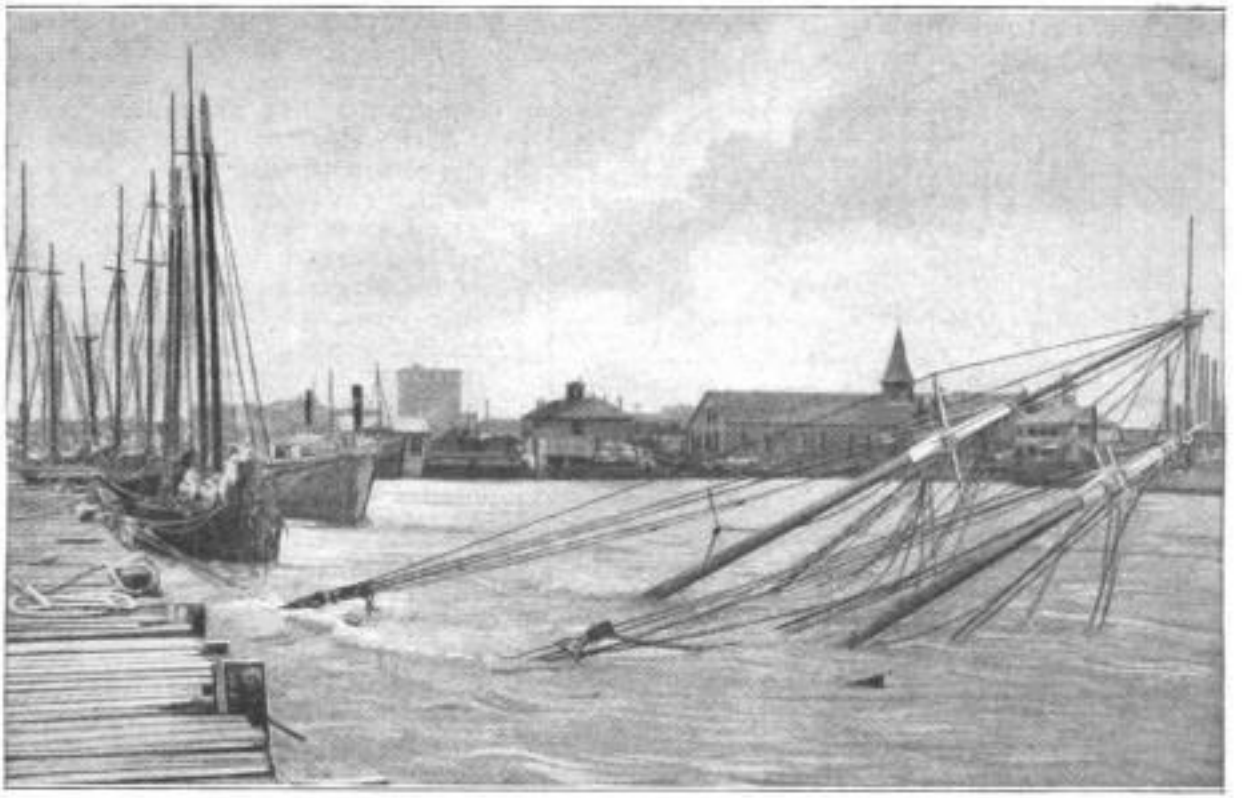


Doctor Cline's summary of conclusions, published in full in a Weather Bureau report, is as follows:

"The waves and swells of greatest size and length are developed in the near right-hand quadrant of the cyclonic area, and move through the smaller waves in the front of the storm, and are carried by inertia to the shore in the direction in which the cyclonic area was advancing at that time. The waves sent out in other directions, being smaller and shorter, do not persist long after leaving the cyclonic area, and soon flatten out and disappear. The transference of water with the long waves and swells causes rises in the water along the coast, which increase as the storm approaches. The rise of water along the coast, in front of the line of advance of the cyclonic area, beginning 12 to 24 hours after the hurricane enters the Gulf, indicates the rapid movement of the waves through the storm area and across the Gulf.

"From a study of the movement shown on the different charts and figures, collected by me during the past 20 years, this speed is shown to vary from 30 to 45 miles an hour. The rapidity with which the waves travel depends both on the extent of the cyclonic area and the intensity of the winds that develop the waves and swells. The water rises at the shore in the front and to the right of the point toward which the center of the hurricane was moving at the time the waves started on their journey.

"The rise at shore of the water from the hurricane shows long in advance of any change in the barometer. Take, for example, the hurricane of Sept. 11-14, 1919: When the barometers at Burrwood, New Orleans, Galveston, and Corpus



The Wreck in the Foreground Is That of a Trawler, Sunk by Storm in the Harbor of Pensacola, Florida. The Fishing Fleet, Worth $2,000,000 a Year to the City, is Endangered Every Season by the Hurricanes

Christi were either stationary or falling only a few hundredths of an inch, the water, first at Burrwood, later at Galveston, and then at Aransas Pass, was rising by feet, telling the story of the movement, and of the change in the course of the storm as plainly as it could be told without words.

"In using the information conveyed by the tides in forecasting the movements of hurricanes, the tides, as predicted by the Coast and Geodetic Survey, should be plotted for each hour, whenever a storm appears on the Gulf. The height of the tide above mean low tide should be telegraphed from coast stations with each observation, and these should then be plotted over the predicted tides. The place where the water exceeds the predicted tides, and continues rising, is in the line of advance of the hurricane at the time that particular water started on its journey.

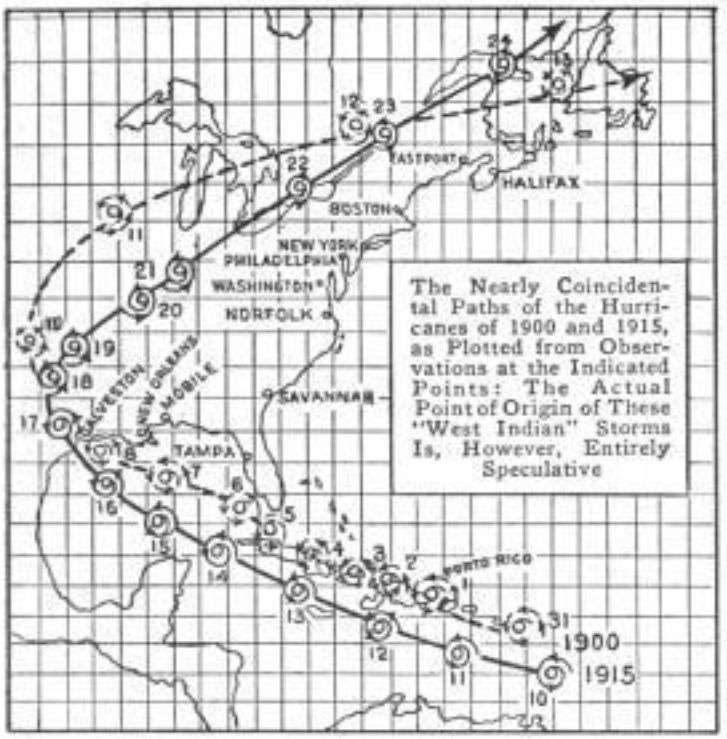
"The intensity and extent of the hurricane is indicated—when the hurricane itself is at a considerable distance of space and time—by the rapidity of the rise in the water and the extent of the coast over which that rise is taking place.

"The time between the commencement of the rise in the water at shore and the arrival of the hurricane will depend upon the rapidity with which the cyclonic area is advancing, and the intensity of the hurricane.

"If the point of greatest rise in the tides shifts to right or left, this shift indicates that the storm is changing its course in

The Mission Yacht "Primrose," Owned and Operated by Reverend Father Francis Prim of New Orleans for Saving Lives in the Gulf Storms

that direction toward which the increased rise is taking place. When the crest of the storm tide is coincident with the crest of the regular tide, the height of the water will be greater by more than one foot for hurricanes of equal intensity, than when the crest of the storm tide is coincident with low tide, and in forecasting storm tides this must be borne in mind."



The Nearly Coincidental Paths of the Hurricanes of 1900 and 1915, as Plotted from Observations at the Indicated Points: The Actual Point of Origin of These "West Indian" Storms Is, However, Entirely Speculative

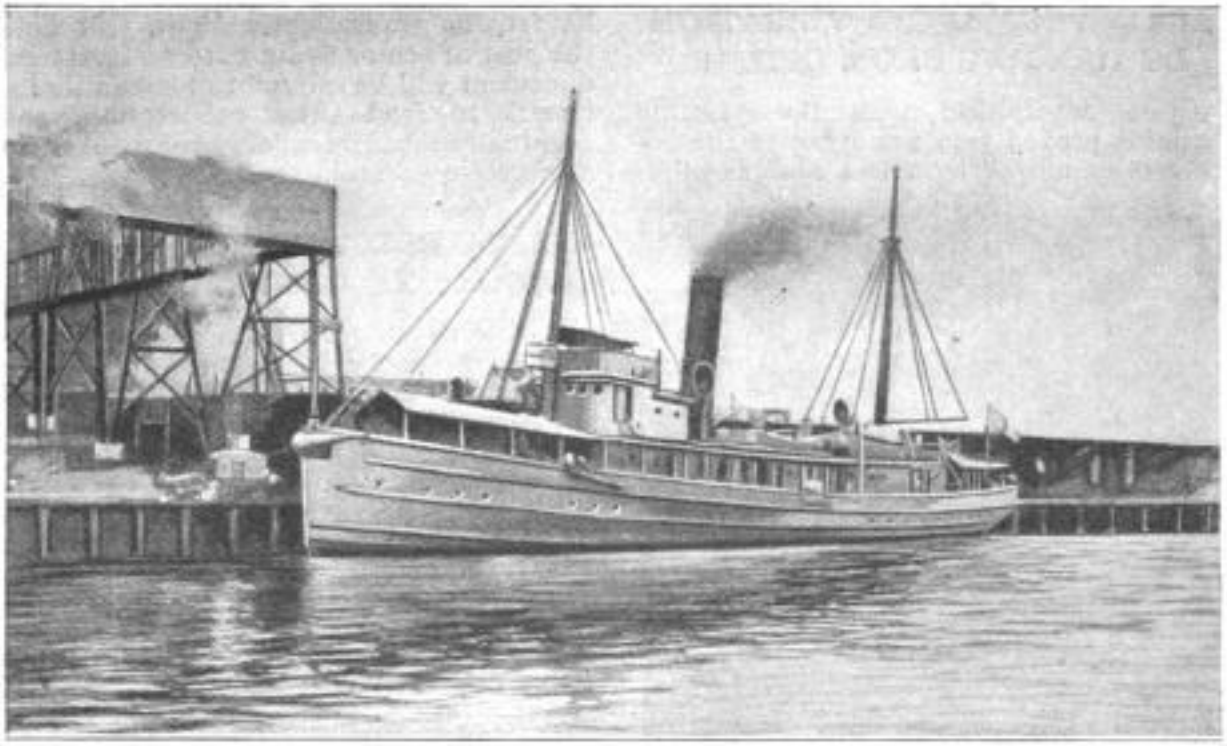
One of the interesting factors is that the regular tides are not obscured at any time by the storm tides, except at, or near, the point at which the storm moves, or will move, inland, and then for only about 12 hours before the passage of the center of the hurricane. The highest water occurs a few miles to the right, and about the time of the passage, of the center of the cyclonic area. At points on the coast some miles to the right of the line of advance of the center of the storm, the highest water occurs on a line drawn at right angles to the line of advance of the hurricane, about the time of the passage of the center of that storm across that line. The high water extends for only a short distance to the left of the point where the center of the storm moves inland. High water, however, is experienced to the right of the center for a distance varying from 100 to 200 miles.

The water commences rising at the shore toward which the cyclonic area is advancing less than 24 hours after the center of that cyclonic area has entered the Gulf of Mexico. The waves and swells that give this rise must have moved through and out of the rear right-hand quadrant of the storm area within 12 to 15 hours after the center of the storm entered the Gulf. This indicates that with a "fetch" of 150 to 200 miles in the rear right-hand quadrant of the cyclonic area, the winds furnish sufficient energy to develop waves and swells of a size and length that travel 30 to 45 miles an hour, reaching the middle Gulf coast, 400 miles distant, in 10 to 15 hours, and reaching the Texas coast, 800 miles distant, in 15 to 20 hours.

Strong currents are created in the right-hand segment of the cyclonic area, which move, in the main, coastwise, toward the line along which the cyclonic area is advancing. The fact that two gas and whistling buoys, in the storm of August, 1915, and three in that of September, 1919, were carried two to eight miles, nearly parallel to the coast, shows the force of these currents. If these buoys had been moved by waves, they would have been carried in toward the shore.

The Southern Yacht Club's Patrol Boat, Which Saves Lives and Property by Carrying Storm Warnings on the Lakes near New Orleans

The high water attending the hurricane is frequently referred to as a "tidal wave,"



The United States Navy Tug "Ontario," Stationed at the Port of Galveston, Texas, Where It has Done Much Good Work in Sending Information of Approaching Hurricanes from the Gulf of Mexico to Its Home Port and Other Coast Cities

or a "storm wave," but it is not a wave in any sense of that word. It is a culmination of the water from successive "storm waves" reaching shore, covering a period of two or more days, with a gradual rise which increases as the center of the storm approaches. The "storm tide" results from the physical forces of the hurricane, driving the large waves forward and transferring the water in the same direction as the line of advance of the hurricane.

The rise in the water at shore frequently is against opposing off-shore winds, as was the case in 1900 and 1915 at Galveston, and in 1919 at Corpus Christi. In such cases, the off-shore winds force the waters backward on the stream, retarding the rise. Then, when the winds shift and come in with the storm, the rise in water is much more rapid. The diminished pressure near the center of the hurricane will have some effect on the height of the water. The weight of 1 in. of mercury is equal to that of about 1 ft. of water. The increase in the height of the water due to diminished pressure at Galveston, in 1900, for example, with the barometer at 28.48 in., could not have exceeded, under most favorable conditions, 1.5 ft., whereas the storm tide was 15 feet.

This remarkable discovery of Doctor Cline, which already is in practical use all along the Gulf of Mexico coast, doubtless will eliminate the plan announced in New Orleans some months ago by Charles F. Marvin, chief of the Weather Bureau of the Department of Agriculture, for having fast boats, such as destroyers or subchasers, stationed at frequent intervals on the Gulf of Mexico, to "ride herd" on the hurricanes. Doctor Cline's forecast of location, direction, velocity, destructive power, and "landing place" of each hurricane is being carried by radio to all ships on the Gulf whenever a storm threatens, and to all coast-guard stations, ports, pilot posts, and towns along the Gulf coast, and for some miles inland, much more rapidly than the same information could be obtained by storm-proof ships hunting hurricanes.

Mr. Marvin's plan was to have four to eight, preferably eight, fast boats stationed, one each, at Key West, Tampa, Mobile, Pensacola, New Orleans, Galveston, the Yucatan Channel, and some central island of the West Indies, cruising from these ports, but keeping in close touch with them by powerful radio equipment, seeking the first signs of a hurricane. When one of these boats, which must be capable of at least 30 miles an hour on long-distance runs, sighted a hurricane, it was to call all the others to swoop down on the disturbing storm, and literally "herd" it across the Gulf, advising all ports and the weather observers all along the coast of the extent, velocity, location, and probable point at which the storm would hit the shore.

ENGRAVERS AVOID VIBRATION BY HANGING FROM CEILING

Close association with the printing business proved very annoying to the engravers employed by a Des Moines litho-

The Platform on Which the Engraver and His Table Rest is Hung Clear of the Floor by Wires from the Ceiling, Preventing Vibration

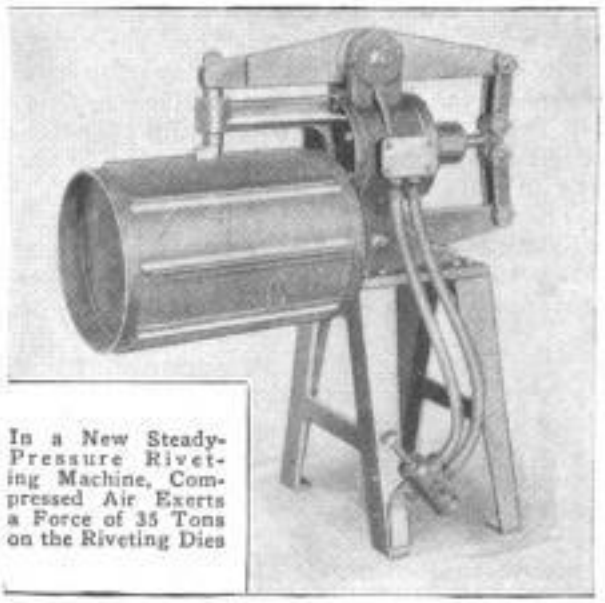
graphing concern, who were unable to work at all, because of vibration, when heavy presses were running on the floor below. The difficulty now has been entirely obviated, however, by the simple expedient of hanging each engraver, with his table and chair, about 1 in. above the floor by wires strung from the ceiling beams. Small floor blocks prevent undue oscillation, and the workers, thus insulated, perform the most delicate operations without further interference.

BRITISH GOVERNMENT BRANCH TO AID COMMERCIAL FLYING

Stimulated by German competition and success in civil aviation, Great Britain has created a new department in the air ministry, to be known as the Civil Aviation Department. Its aim will be to arouse the interest of British merchants in the possibilities of aerial transportation by means of an educational campaign which will emphasize the speed, economy, and safety of dirigibles in the carrying of commodities. Five of the huge craft, with the necessary personnel, an airdrome, and plant have been turned over to the new department to be used in the work. Maj. G. H. Scott, who piloted the "R-34" on its famous transatlantic flight, will hold the post of senior flying officer. Every inducement will be offered to mercantile interests to lend their coöperation, and eventually take the whole project over on a private-ownership basis.

HAMMERLESS RIVETING PRESS WORKS BY COMPRESSED AIR

A new riveting machine, designed especially for service in the making of ash cans and other barrel shapes, drives and heads the rivets with a steady pressure of 35 tons instead of by the older hammering method. The motive power of the apparatus is compressed air at a pressure of 100 lb. per square inch, which is controlled by a four-way foot valve. This leaves the operator's hands free to manipulate the work. A special die, recessed lengthwise, is used when applying the reinforcing strips on ash cans. The power elements of the device are a cylinder and piston, which acts on a pair of toggle joints through the medium of a short connecting rod. As the toggles straighten they exert a pressure on the ends of two powerful levers which are pivoted at their centers. The other ends of the levers carry the dies between which the rivets are pressed. It



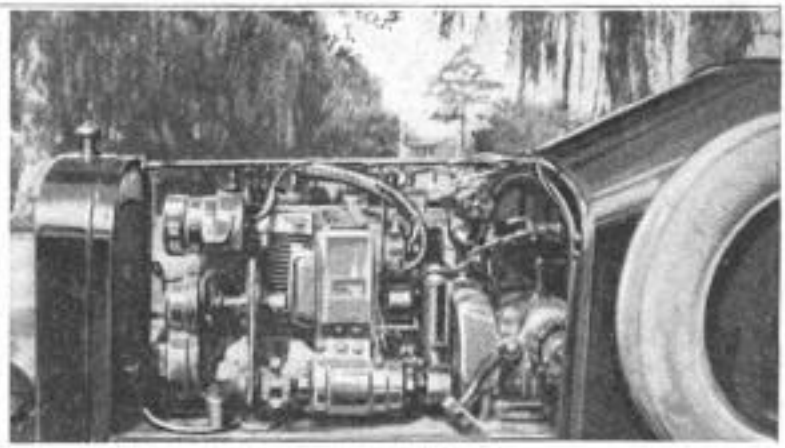
In a New Steady-Pressure Riveting Machine, Compressed Air Exerts a Force of 35 Tons on the Riveting Dies

is claimed for the apparatus that rivets set by it swell and fill the holes so completely as to make a steam-tight joint.

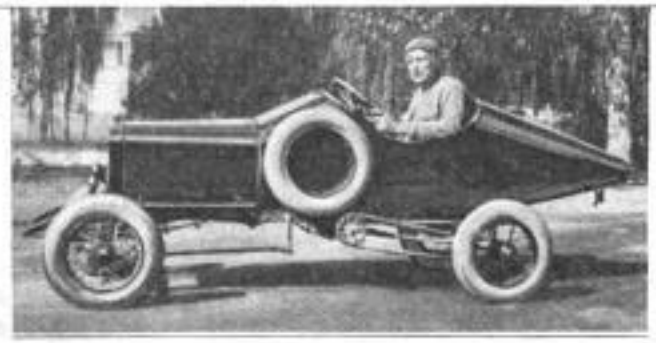
¶A garage of office-building shape, 16 stories high, is to be constructed in Cincinnati, at a cost of $800,000. It will accommodate 1,000 autos, which it will be able to handle, by a new system, at the rate of 600 cars an hour.

TINY HOMEMADE MOTOR CAR BUILT OF STOCK UNITS

This View Shows How a Standard Auto Front Axle was Cut and Welded to Make One of Narrow Tread



The Power Plant of the Midget Car Is a Four-Cylinder Air-Cooled Motorcycle Engine of a Popular Make



The Miniature Replica of an Auto Speed Creation Is Capable of a Rate Out of All Proportion to Its Size. It has Developed 55 Miles per Hour

An automotive genius, residing in Florida, has assembled a serviceable, though diminutive, automobile speedster from various odds and ends of parts from different makes of cars and motorcycles. The engine, a four-cylinder, air-cooled type, originally constituted the power plant of a popular make of motorcycle. The sliding-gear transmission is integral with the engine. As a bevel-gear rear axle was not available in the very narrow tread desired, 33 in., a straight dead axle and chain final drive was substituted. The jackshaft, carrying the front sprockets and brake, once served the same purpose on a light friction-drive car. The problem of a narrow-tread front axle was solved by cutting a section from the center of a standard-tread stock axle and welding the resulting short halves together. This also supplied steering knuckles and spring saddles. The radiator is not entirely camouflage, as it contains an oil reservoir. A fuel tank of 5-gal. capacity is located in the cowl. Other specifications are: length over all, 9 ft.; wheelbase, 72 in.; speed, 55 miles per hour. The tiny car is a good advertisement for the auto dealer who built it.

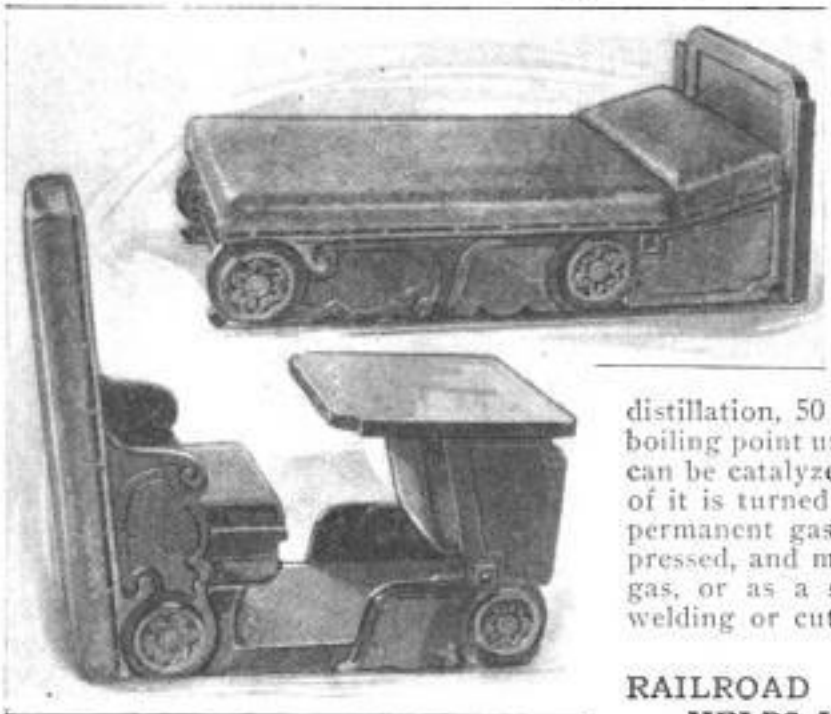
FIREARM SHOOTS SEVEN CARTRIDGES TOGETHER

One of the most curious products of the Belgian gunmakers' art, now in the possession of a Colorado sportsman, is remarkable for its arrangement of seven barrels in one, the composite tube with its cluster of parallel bores being about the size of a heavy-gauge shotgun barrel. Seven .22-caliber rifle cartridges are inserted in the breech openings, and fired simultaneously by a single firing pin and hammer. The shell ejector is a removable disk with seven holes, which swings back when the lock is opened.

At the Top: The Curious Firearm in Its Entirety. Bottom: A Close-Up of the Seven-Barrel Breech and Lock Mechanism, with the Ejector Tied to the Guard

ATTRACTIVE DAY BED, FOLDED, BECOMES DESK AND CHAIR

A graceful upholstered couch or day bed which, when folded, becomes an equally attractive combination of writing



Top: The Folding Day Bed, Graceful and Comfortable. Bottom: Its Appearance as a Desk and Chair

desk and chair, is the useful invention of an Illinois woodworker. The decorative lines of the couch are the invisible joints of the folding parts, and the wood pivots are concealed by ornamental rosettes. The couch top turns up to form the high chair back, and the headboard becomes the desk top, while the removable chair seat may be adjusted to the user. The unusual nature of the convertible feature might, it is suggested, adapt the new piece of furniture to the use of outdoor schools for ailing children.

NAVY INVITES DESIGNS FOR SCOUT PLANES

The Navy Department contemplates inviting all classes of airplane inventors to submit specifications covering a new type of scout plane, to be carried by battleships, which will float safely in the event of a forced descent upon water. The most meritorious designs will be tested in planes constructed at government expense. As the awards of merit will be allowed on a competitive basis, the poor inventor will have an equal chance with the wealthiest airplane builder.

PETROLEUM IS DECOMPOSED BY CATALYTIC ACTION

Production of the whole series of volatile oils and gases from petroleum by catalytic action, instead of by fractional distillation and cracking, has been accomplished by a French scientist. The vapor of kerosene, crude, or heavy oil is brought into contact with certain metals at the proper temperature, and a gas is produced with about three times the B.t.u. content of common illuminating gas. Condensed to a fluid and subjected to fractional distillation, 50 per cent of its yield has a boiling point under 160° F., and the residue can be catalyzed again until practically all of it is turned to light hydrocarbons and permanent gas. The gas is readily compressed, and may be used to enrich water gas, or as a substitute for acetylene in welding or cutting.

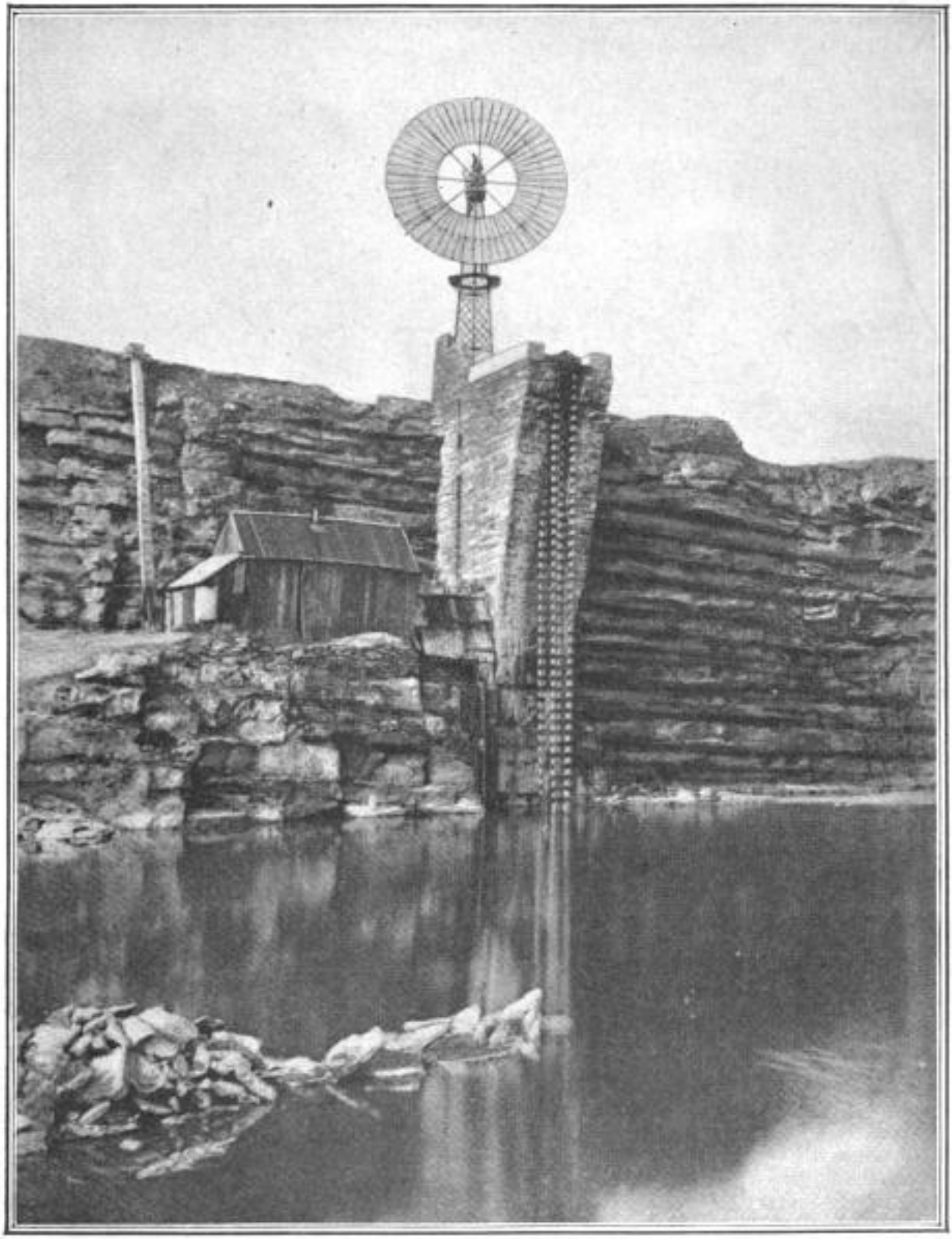
RAILROAD TRACK-LAYING TOOL HELPS IN MAKING JOINTS

Bringing the ends of track rails together to make a joint becomes a quick and simple operation with the use of a tool invented by a California railroad man. A long vertical lever is pivoted to a steel yoke which fits over the abutting ends of the rails. Pivoted to the lever, one above the other, are two rods extending in opposite directions to clamp bars that hook

The Rail Ends are Brought Together at the Joint by Moving the Long Lever to the Left

onto the head of each rail. Moving the long lever then exerts a toggle action on the clamps, drawing the rails together. The tool is quickly placed and removed.

OLD PUMP ON ISLE OF MAN GETS NEW WINDMILL



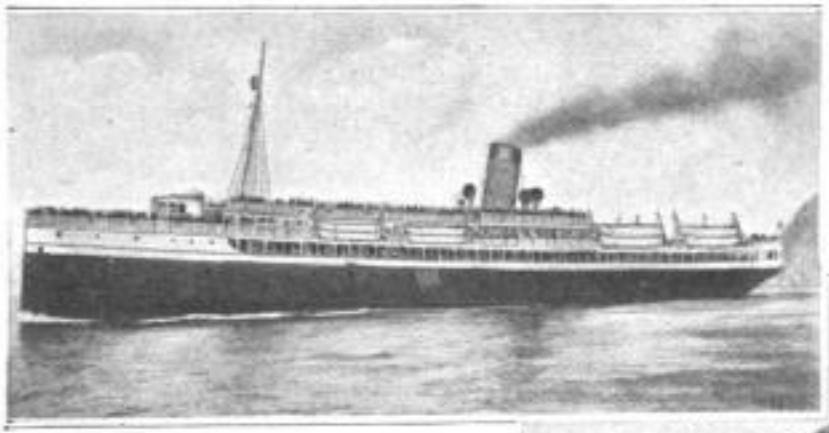
ON the quaint and picturesque Isle of Man, made famous by Hall Caine's fiction, an ancient pump of the chain-bucket variety, built into a masonry abutment on the face of a rock cliff, lifts its endless load of water some 80 ft. from the pool below. For many years a big steam engine of obsolete form, slow and extravagant of fuel, attended to the duty of turning the chain shaft. But now the old boiler and cylinder are gone, and in their place a modern wind motor has been installed, its slim, efficient steel form rising from the cliff top in striking, yet not inharmonious, contrast with the primitive ruggedness that marks the earlier work of man and nature. The whirling 26-ft. wheel of the new motive power now is drawing up 14,300 gal. of water an hour as an average figure, and it is significant of the value of modern method that the saving of fuel, no longer needed for a hungry boiler, soon paid the cost of the mill.

AN OPEN BOAT ON A FROZEN RIVER IS HOME FOR RUSSIANS

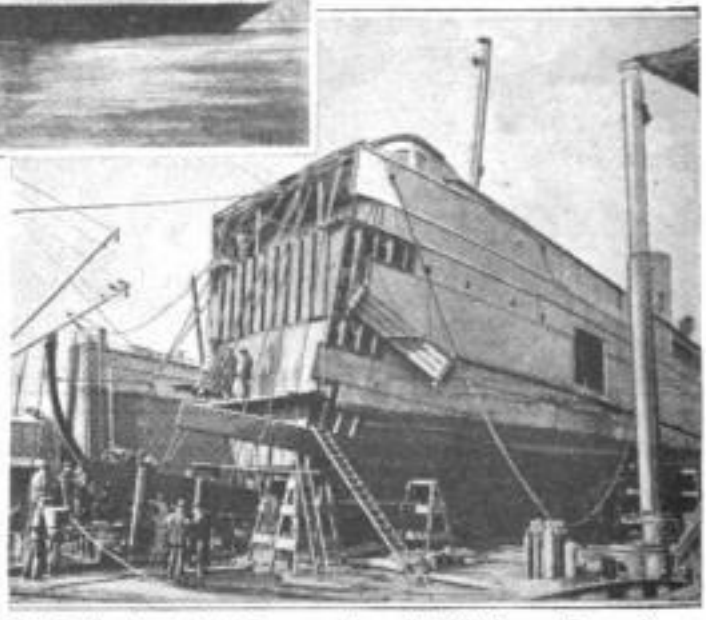
AMERICAN citizens who grow despondent over the scarcity of dwelling places, and the high prices of those that are available, might consider the plight of some inhabitants of Archangel, Russia, and take heart. With that frozen port under Bolshevist control, none may live in rooms in the city without special permits, and rents have reached remarkable figures. The group of Russians depicted here have made a home out of a rowboat, a tarpaulin, and a pair of boathooks, with the icy surface of the River Dvina serving as the kitchen floor. The best that can be said about this strange winter house is that it escapes conditions perhaps even less tolerable.

MUCH-SEVERED VESSEL REBUILT FOR EXCURSIONS

Between San Pedro, Calif., and the island of Santa Catalina, a new and luxuriously appointed excursion steamer now plies, with a placid competence that gives no hint of its interesting history. During the World War the vessel was in service on Lake Michigan. Requisition by the government sent it to the Atlantic coast by way of the St. Lawrence River, and to pass its 277-ft. length through the Lachine Canal, at Montreal, it was necessary to amputate both bow and stern, which were piled on the central part of the hull for the balance of the voyage to Boston. It was still in three parts when the war ended. Acquisition by the California interests resulted in its transfer to Brooklyn, where it was rebuilt, with two dance halls and other excursion adjuncts, and started on its long trip to the west coast and its new round of duties as a pleasure ship.



The Modern, Luxuriously Appointed Excursion Steamer, Showing No Sign in Appearance of Its Former Dismemberment



The Beginning of the Restoration, with Workmen Preparing to Fit the Three Severed Parts of the Vessel Together

PROGRESS INDICATED IN HUNT FOR TUBERCULOSIS SERUM

Recent reports from Paris appear to indicate that first steps, at least, toward success in the long search for an anti-tuberculosis serum may have been taken. The discovery of a vaccine for the prevention of tuberculosis in cattle was announced a few weeks ago by Doctors Calmette and Roux of the Pasteur Institute, and while the news was received in this country with the conservatism natural to its extreme importance, the reputation of the French scientists is regarded as contributing great weight to their claims. A short time later the institute received the report of another bacteriologist on experiments conducted with the larvæ of butterflies and moths, which are declared to have power to destroy the germs of tuberculosis and other virulent diseases within a few days after their inoculation. At a meeting of scientists in Chicago, however, it was stated that this fact alone was of little value, and had been known for some time.

BUZZER REMINDER HELPS SAVE CURRENT

Many times when hurried, or called unexpectedly, one will forget to turn out the basement, attic, pantry, or clothes-closet lights. A reminder, in the form of a small buzzer, combined with a wall switch, will be welcomed by the housewife. The buzzing, while not loud or obtrusive, is insistent and will quickly penetrate a person's consciousness with the message that something is amiss. It persists until the switch is turned off. The switch and buzzer are mounted on one base designed to replace the conventional flush-type wall switch.

MARINES WITH PHONOGRAPHS LEARN FOREIGN TONGUES

Phonographs have been employed for teaching foreign languages almost since they were invented, but to find a whole class pursuing their linguistic studies by this method is rather unusual. That is the system now in use, however, by the Marine Corps Institute, at Quantico, Va. Instead of arranging a single machine to throw its unfamiliar diction to the class through a horn, each student has his own small instrument, with a pair of ear tubes to confine the output of strange sounds to the individual user. Textbooks are used with the mechanical lectures.

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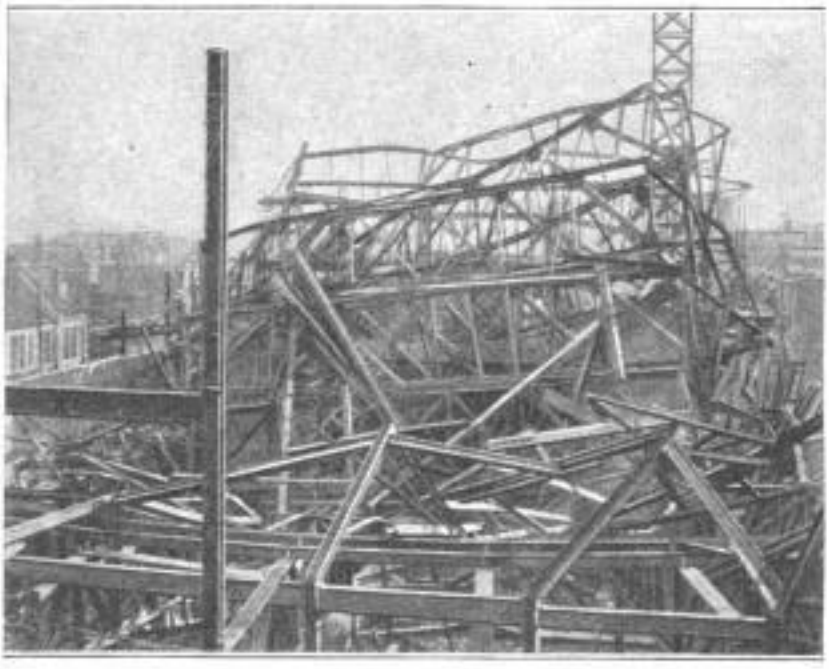
The Phonographic Class in Foreign Languages at the Marine Corps Institute: Each Student Has His Own Machine and Ear Tubes

ROCKS OFF SPANISH COAST WRECK PASSENGER SHIP

With all the safeguards of modern navigation, tragedies of the sea continue to take their levies of lives and property. A few weeks ago, while passengers on the Spanish steamer "Santa Isabel" were dining below, in fancied security from the rough weather outside, the vessel suddenly crashed with great violence upon a point of rock projecting from a little island only a few miles from the seaport town of Villagarcia, in northwestern Spain. So complete was the disaster that some 200 of the crew and passengers were swept away before aid could reach them, only 45 being rescued.

WEAK DERRICK STARTS WRECK OF STEEL BUILDING

What might properly be called a progressive wreck occurred in Indianapolis when an insecurely guyed derrick toppled against the steel framework of a school building in process of construction. The heavy apparatus threw one end of the block-long framework out of balance and imposed a strain on the rest of the structure which it could not withstand. As each section failed and added its quota of weight, the collapse progressed from one end of the building to the other, and in a few moments the 350 tons of steel girders and beams had become a chaotic mass of tangled wreckage. Besides the material damage, estimated at $100,000, the wreck caused the death of two workmen and injuries to a score.



What had, a Few Moments Before, Been the Symmetrical Framework of a School Building, Became a Tangled Ruin When an Improperly Secured Derrick Fell upon It and Caused It to Collapse

CARBIDE AND CRUDE OIL GIVE NEW FUEL GAS

A Swiss engineer has produced a rich new gas, suitable for use in internal-combustion engines, by first packing sheet-metal drums with alternate layers of common calcium carbide and sawdust, saturated by crude oil, then adding water. The carbide in combining with the water liberates acetylene gas and also generates a high degree of heat which cracks and volatilizes the crude oil, liberating its gases. The two gases then combine to form the new one.

AMMONIA FROM AIR AND WATER IN NEW ITALIAN PLANT

Air and water are the raw materials from which a new plant at Terni, Italy, is producing some 2,200 lb. of synthetic ammonia a day. Hydroelectric power is used to decompose the water for its hydrogen, which is then piped to a vertical, boiler-like cylinder that extracts nitrogen from the air by a method not disclosed. The mixed gases are chemically combined by contact, in another cylinder, with a catalytic agent which, unlike those previously used, is declared to operate efficiently in the presence of impure as well as pure gases. Refrigerating machinery condenses the resulting ammonia gas to a liquid, and it is sealed into steel drums for the market. American capital erected the plant, and is seeking concessions for another. The Italian inventor of the process also has devised a method of combining ammonia with carbon dioxide to form urea, a highly concentrated fertilizer.

THEFT OF AUTO THERMOMETER PREVENTED BY NEW LOCK

A method of locking automobile-radiator thermometers has been devised which promises to stop the theft of these instruments. A bar of nonrusting material, having spiral springs upon its ends to prevent damage and rattling, fits crosswise inside the radiator. Rising from the bar is a swivel, which permits the filler cap to be removed after the device and thermometer have been locked together. Immediately above the swivel is a fitting into which the bottom stem of the meter is screwed. After assembling in place on the radiator, the meter stem and special fitting are locked together by a one-way setscrew, which cannot be removed except by a long drilling operation.

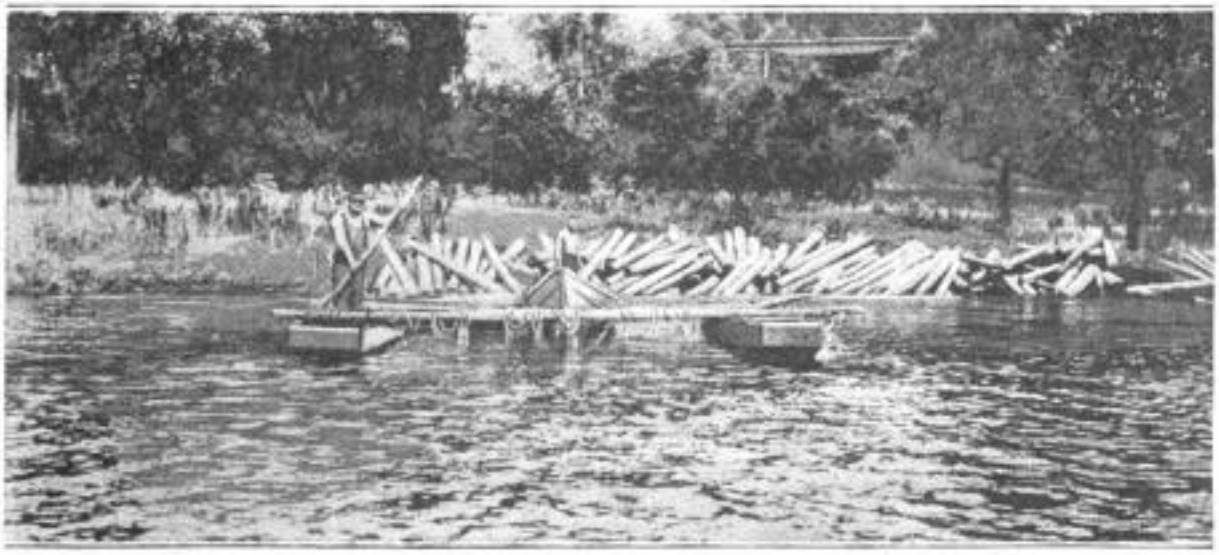
The Deadhead Hunter at Work: The Long Cross Poles That Connect the Two Square-End Boats Carry Chain Slings for the Recovered Logs, and the "Pick Pole" in the Hunter's Hand is Shod with a Steel Screw

THE LOGGING INDUSTRY OF THE RIVER BOTTOMS

BY ROBERT PAGE LINCOLN

ALONG those swift rivers of the northern states that have aided the busy lumbermen to drain the once vast pine forests almost of their last sticks of timber, a second and more curious crop of logs is floating now to the mills. These are the resurrected deadheads of the river bottoms, the big cut logs that sank uncounted in the old days of plenty, and have lain unmolested in the ooze of changing channels until the growing dearth of lumber has called them forth, and given their recovery the dignity of an industry.

Sunken logs preserve their qualities indefinitely, and the available supply is almost incalculable, for of all the millions of sticks that have floated down these streams in the past 60 years, a certain considerable proportion went to the bottom. Their salvage is accomplished with simple equipment. A pair of flat-bottom, square-end boats are joined at bow and stern by long cross poles, hung with chains for carrying the rescued logs. The treasure hunters work in pairs, with long "pick poles" shod with steel-pointed screws. When a log is found, these points are thrust into it and turned, and it is raised easily to its chain slings. As soon



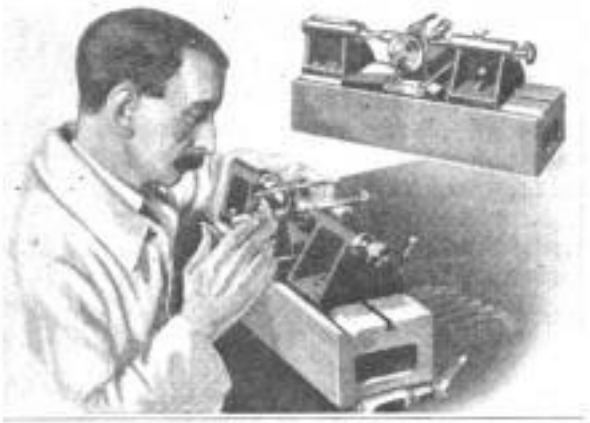
The Rescued Logs are Piled on the River Bank, and When Enough are Gathered to Make Five Rafts, They are Floated Down to the Mill, with the Aid of the Curious Boats That Raised Them from the Bottom

as five rafts of the deadheads are gathered, they are floated to the mill. On the St. Croix River alone, along the Wisconsin-Minnesota boundary, more than 130,000,000 ft. of lumber has already been reclaimed in this manner.

It is an interesting detail of this strange business that these ancient logs are carefully examined for the marks of their original owners, and to those old accounts, if any trace of them exists, a definite stumpage fee is credited. The hunters work on contract, and are paid by the thousand feet. But like most primitive pursuits, this one too has its pirates, who net a larger profit by dealing with less scrupulous receivers.

MICROMETER GAUGE MEASURES SCREW-THREAD ACCURACY

A new instrument, which checks the accuracy of the inside, outside, and effective diameter of screws, and also the distance from thread to thread, within a limit of .001 in., has been developed in England. Three steel wires of a known diameter, suspended from a light arm at the top of the device, bear on the screw being measured, the bearing points being between the crests of the threads. Two of the wires are placed on one side of the screw and one on the other. The distance, measured with a micrometer, from the extreme outside of the one wire to the outside of the opposite pair, gives an accurate indication of the dimensions it is desired to determine. Any irregularities in the thread contour will cause a decided discrepancy in the comparative values shown by the micrometer scale. The device is also used as a plain micrometer to determine to what extent a normally round piece may be out of round.



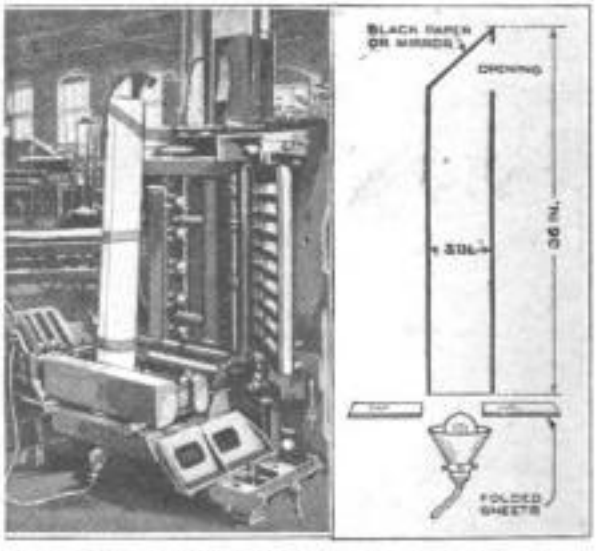
A New Screw-Thread Gauge is So Made That Screws and Other Small Pieces can be Held between Centers While the Micrometer is Applied

CONCRETE CISTERN MAKES A GAS-ENGINE MUFFLER

A large oil-refining concern has abandoned sheet-metal mufflers for its gas engines in favor of a new type made of concrete. A cisternlike concrete box, 4 ft. square by 8 ft. deep, is buried in the earth to a depth of 5 ft. The top, which slopes inward from the four sides, thus acting as a baffle plate, has an 8-in. square hole left in the center. Engine exhaust gases are led into the chamber near the bottom and, dissipating their heat and force against the cool, solid walls, leave the cistern at pressures and temperatures very little above those of the atmosphere. It is said that a large engine can be so completely muffled that its running will cause no annoyance in even a comparatively quiet neighborhood.

PAPER PERISCOPE KEEPS TAB ON FOLDING-MACHINE WORK

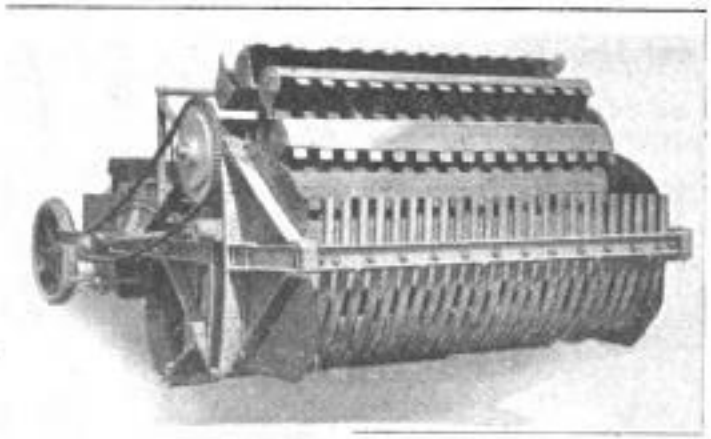
A curious use of the periscope principle is being made in a Michigan printing shop, where a folding machine with an attachment for 32-page forms is working. A 5-in. tube of paper, 3 ft. long, has a sheet of black paper at 45° on the upper end, with an observation window opposite. At the bottom of the tube an incandescent lamp and reflector are so arranged that the folded forms pass between them and the tube. The result is a constant series of flashes at the tube window, and when these are interrupted, the operator knows the machine is clogged. By its prompt report of this condition, the attachment saves much spoilage of paper.



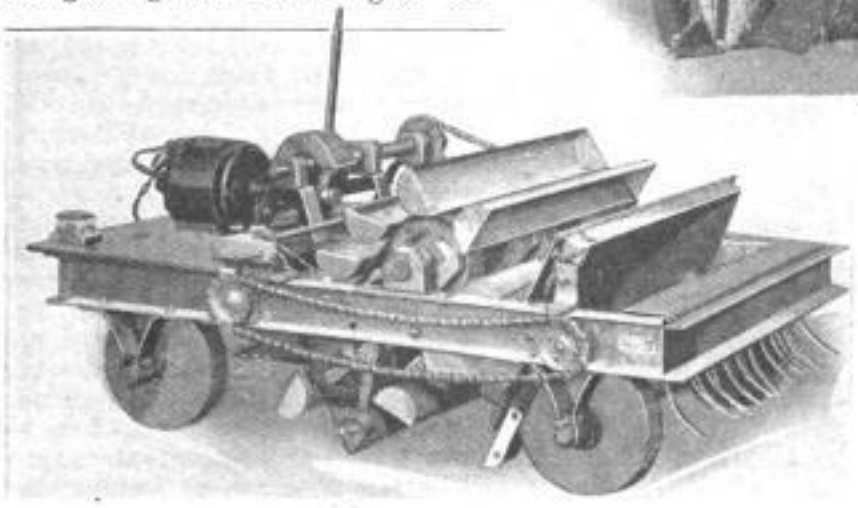
Left: The Paper Periscope Attached to a Folding Machine. Right: A Diagram of Its Arrangement

AGRICULTURAL EXCAVATOR PERFORMS MANY TASKS

A new type of plowing machine, which the inventor believes will revolutionize present methods of soil cultivation, is constructed on the principle of the continuous excavating machines used to dig ditches. A series of buckets, varying in length from 30 to 72 in. in different-size machines, is carried on an endless-chain conveyor in such a way that as each bucket reaches the lowest point of its travel it comes into contact with and scoops up the soil. The depth of the cut can be varied from 3 to 16 in. The earth is next discharged against steel fingers at the rear of the apparatus, which pulverize and sift it. As the heavier clods, weeds, etc., are sifted out, they fall to the ground first and are later covered by a layer of the finely divided soil. If desired, a seeder, or planter, and a roller may be attached to the rear of the machine. Thus all the separate operations of plowing, harrowing or disking, planting, and rolling can be performed at one time and at a rate, so it is claimed, of from 15 to 20 acres a day.



In the Large Excavator Plows the Buckets are Driven by the Engine or from the Bull Wheels



A Working Model of the Agricultural Excavator, Which Clearly Illustrates the Principles Involved: The Conveyor Buckets Scoop Up the Soil and Carry It toward the Rear of the Apparatus, Where the Large Clods are Broken Up and Pulverized by Steel Fingers

ANNUAL COUNT SHOWS SEAL HERDS TO BE GROWING

UP to a few years ago the indiscriminate slaughter of fur-bearing seals threatened the extinction of the species in northern waters. Recognizing the danger, agreements were entered into by the United States, Canada, and Great Britain establishing a closed season and setting aside certain localities within the boundaries of which seal hunting is prohibited. The illustration shows United States experts from the Bureau of Fisheries rounding up a herd of seals, on one of the islands of the Bering Sea, and taking the annual official census. The count last year showed a population of 550,000, and it is estimated that this figure will be increased to 600,000 this year, proving that protection is having the desired effect. With the exception of the old bulls, seals are timid, and can be herded like sheep.

QUADRUPLE CRANES USED IN COAST SHIPYARD

Two cranes of similar and unusual design are now in service in the yards of a shipbuilding company on the California coast. They are quadruple affairs, having not one but four cantilever arms, or jibs. Each of these is a girder of channel steel, pivoted and guyed to one corner of a square steel tower so as to swing horizontally through about 220°. Along each girder can be moved the crab, or jenny, which carries the hoisting tackle. The tower of one of these quadruple cranes is topped with an umbrellalike roof to protect the structure against the weather.

Above: The Crane Tower with Its Umbrella-like Roof. Bottom: The Four-Armed Crane in Action

SUBMARINE TELEPHONE CABLE ONE HUNDRED MILES LONG

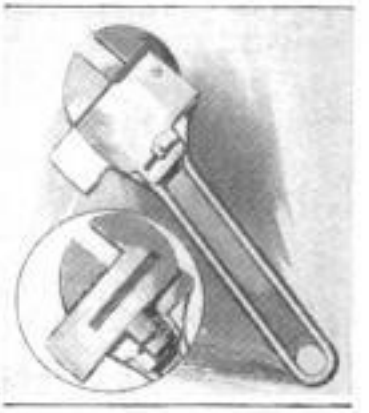
Communication has just been opened through a submarine telephone cable declared to be the longest yet laid, which follows a devious course of 100 miles across the Baltic Sea, from East Prussia to Germany. It is armored with galvanized-steel interlocking strands, has a diameter of 2 in., a weight of 18 tons to the mile, and contains six pairs of loaded telephone conductors and three single telegraph wires. The terminals connect to land lines through amplifier stations.

HUGE SCIENTIFIC EXPEDITION WILL SPEND YEARS IN ASIA

Believing that the heart of Asia conceals the key to the origin of the human race, American scientists have organized a mammoth expedition that will devote five years to that and other problems in Mongolia and the Asiatic hinterlands. The party, with a fund of $250,000, is expected to leave this month for Peking, where a year will be spent in studies of paleontology and zoölogy. The next four years will be devoted to field work in the depths of unknown central Asia, geology, archæology, and anthropology being added to the curriculum. Not only is diligent search to be made for evidences of human or semihuman life 500,000 years ago, but the strange aboriginal tribes now living along the inland borders, seemingly of Caucasian origin, and fast disappearing, are to be examined. Collections of such strange animals as the golden-fleeced takin, the long-haired tiger, the snow leopard, the golden monkey, and other little-known species, will be made in duplicate, and one set of specimens used as a nucleus for a new Chinese museum at Peking, the other set being sent to the American Museum of Natural History.

SELF-ADJUSTING END WRENCH IS A QUICK-ACTION TOOL

A self-adjusting end wrench, evolved by a northern Illinois inventor, has a light compression spring inside the movable jaw, which instantly adjusts this member to the size of the bolt head, or nut, that it is desired to turn. After setting, the jaw is positively locked against accidental movement by means of a small ratchet, which is brought into engagement with a corresponding ratchet cut in its inner edge. The locking ratchet is operated by means of a small knob which pro-



trudes from one side of the tool. As the adjusting jaw slides very easily in its guide, and the tension of the spring is light, the jaw can be opened to its full width merely by the pressure of the operator's thumb on the end of the shank.

A NEW WHARF-PAVING METHOD IS TRIED IN CINCINNATI

By a method of open spacing between the paving blocks the city engineer of Cincinnati is confident that he has solved the problem of rendering the hitherto difficult public-wharf approaches much easier for both horse-drawn drays and motor trucks. The foundation of the new pavement consists of a substantial concrete mat. Upon this was spread a coat of dry-mixed cement and sand. The granite blocks, split so as to present a new rough surface, were laid upon the dry secondary bed in a wide-spaced formation, and the resulting spaces were packed almost full with dry-mixed cement and gravel, a shallow, unfilled space being left at the top. After a wetting down and drying, the interspace filler and the secondary foundation, of course, hardened and secured the blocks firmly in one solid, stonelike mass. The interblock spaces present gripping points for the calks of the horses' shoes, and the rough surface makes good traction for motor trucks. The 16-per-cent gradient of the approach was decreased to 13 per cent.

RUSSIAN TOILET ACCESSORY ECONOMIZES WATER

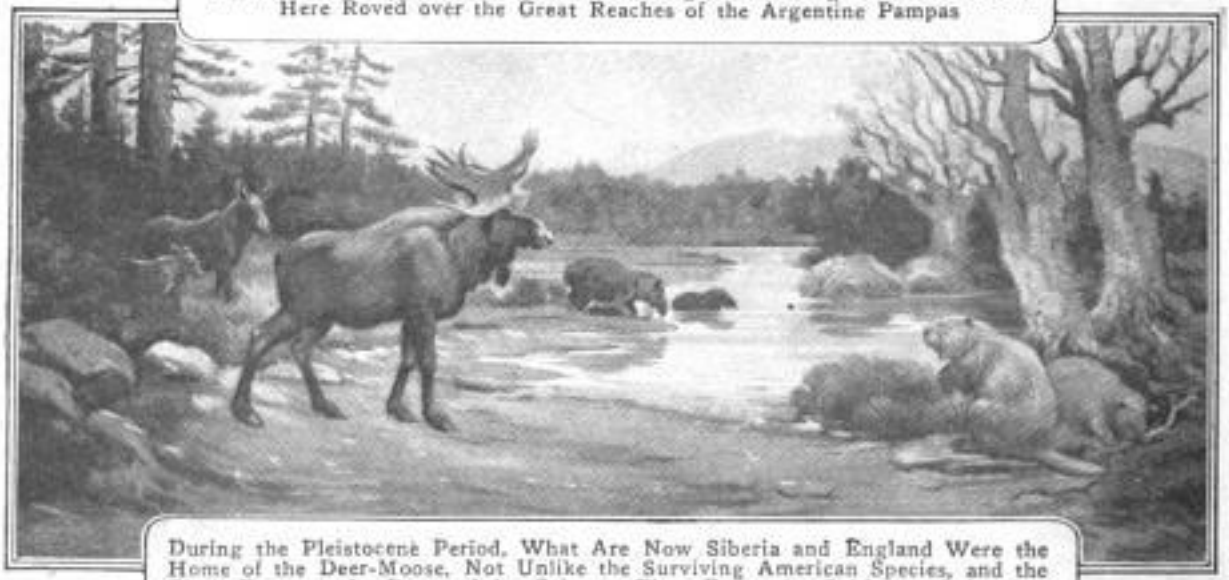
The "rookamoinick," which, translated, means hand washer, is a valued adjunct of Russian household equipment. Despite its long name it is a simple article, being merely a sort of kettle from which water flows upon the hands when a valve in the spout is pressed upward. The ablution is completed over a tub placed below. The apparatus doles out the precious fluid grudgingly, allowing only a small trickle to flow. The reason for this is that, in many localities, water is scarce, and it is necessary to haul it, by cart or sledge, a distance of several miles, a most unwelcome task during the rigorous Russian winter, when drifted roads and subzero weather are the rule.

Cincinnati's New Public-Wharf Approach is Calculated to Withstand the Ravages Incident to the High-Water Periods. Mud, Settling in the Wide Interblock Spaces, is Easily Flushed Out. The Wide Spacing Also Affords a Good Foothold for Horses

REMARKABLE MURAL PAINTINGS IN MUSEUM HALL

Among the Most Interesting of a Remarkable Series of Mural Paintings Recently Completed for the American Museum of Natural History, New York, Is One That Depicts the Rude Artists of the Prehistoric Cro-Magnon Race Drawing the Colored Pictures That Still Adorn the Cavern Walls at Dordogne, France

These Unusual Pictures Are a Striking Feature of the New "Hall of the Age of Man," and Portray the Teeming Life of the Glacial Epoch with Scientific Fidelity. Thousands of Years Ago the Strange Creatures Seen Here Roved over the Great Reaches of the Argentine Pampas



During the Pleistocene Period, What Are Now Siberia and England Were the Home of the Deer-Moose, Not Unlike the Surviving American Species, and the Giant Beaver. As Restored by Science, They Form the Subjects of Another Interesting Study

PORTRAY STRANGE LIFE OF PREHISTORIC AGES

As Striking as Its Companion Picture of the Cro-Magnon Artists, but Barbaric Rather Than Esthetic, Is Another Human Study Depicting the Blonde Race That Inhabited Northern France in the Early Neolithic Era, Perhaps the Progenitors of the Nordic Peoples. The Scene Represents a Successful Stag Hunt

Northward across the Basin of the River Somme, in Northern France, the Mammoth of the Glacial Period is Seen Moving on His Spring Migration, and Just Ahead of the Uncouth Herd Runs the Magdalenian Reindeer

A Scene of Glacial Winter on the Steppes of Northern France, After the Strange Creatures That Throve in Heat and Humidity had Vanished, to be Succeeded by Others Equally Strange, but Better Equipped: Long Hair and Matted Wool Protected the Formidable-Looking Woolly Rhinoceros of the Foreground; in the Distance Are the Mammoth and the Saiga Antelope

The North American Mastodon, of the Mississippi Valley, the Huge Royal Bison, and the Aboriginal American Wild Horse, Gathered about a Glacial Water Hole, Are the Exceptionally Interesting Subjects of the Last of These Great Paintings

AUTO-ENGINE REPAIR STAND IS ADJUSTABLE THREE WAYS

An improved article of motor-car repair-shop equipment is an engine-repair stand which is quickly adjustable to accommodate any size of passenger, motor-truck, tractor, or airplane engine. A special fitting on the telescoping crossbar, at one end of the engine rails, is designed to be securely bolted to the front end of engines of the three-point suspension type. Telescoping rods and a crank-operated screw in the base of the apparatus allow transverse adjustment up to a total width of 33 in. One of the engine support rails is connected, by means of a heavy shaft, to a gear, which may be turned by a hand-crank-operated worm. By means of this arrangement, an engine may be turned to any angle to permit easy access to all parts.

FLOATING PIPE LINE TAKES OIL FROM TANK SHIPS

At points where tank ships cannot readily make a landing, much ingenuity is used in loading and unloading oil cargoes. Last December this magazine described a mile-long submarine pipe line used for loading off the Mexican coast. An equally interesting system of unloading the oil is giving good service at points in Chile, employing a string of rafts, on each of which is a pair of 6-in. steel pipes. Between the floating rafts, the pipes are connected by lengths of rubber hose. The outer raft is connected to the ship's pumps, the inner one to a shore pumping station, and the oil is quickly transferred from the vessel to the inland storage tanks.

GIRL USING ELECTRIC IRON STRANGELY ELECTROCUTED

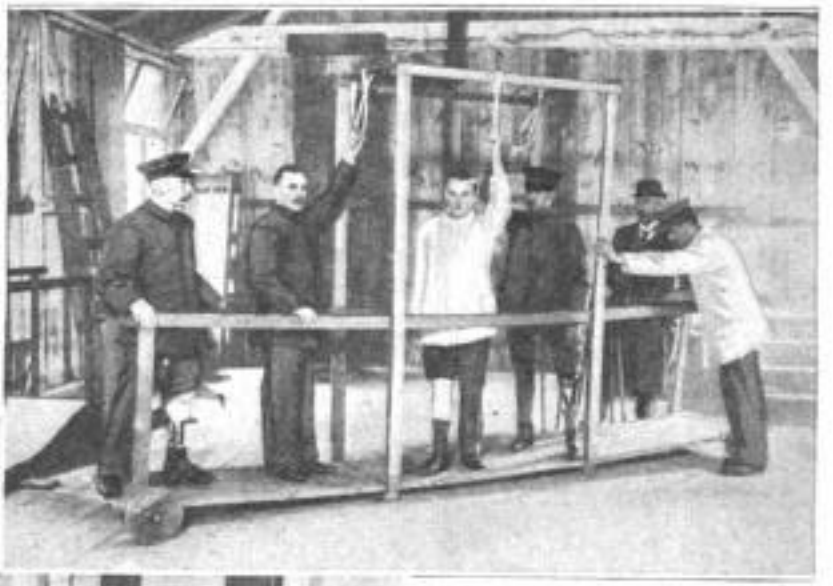
While using an ordinary electric iron in the usual manner at her home a short time ago, a young woman resident of an Illinois town suddenly received an apparently heavy discharge of current, and died almost immediately. The house-circuit voltage was the customary 110, commonly regarded as safe. The line voltage, however, was 1,000, and burns on the hand and hip of the victim, as well as the report by witnesses of a flash at the iron, suggested a cross between the house and line wires, or in the transformer. Against this theory, however, is the evidence that neither the iron nor the house lights were affected by the brief surge of current, and apparently no fuses were blown. It is possible that the unfortunate accident may be charged to an unusual manifestation of alternating-current resonance.

¶Charring the surface of posts and poles at the ground line does not protect them from decay, because, as Forest Products Laboratory tests show, the charcoal covering checks through, and cannot be made deep enough without weakening the post.

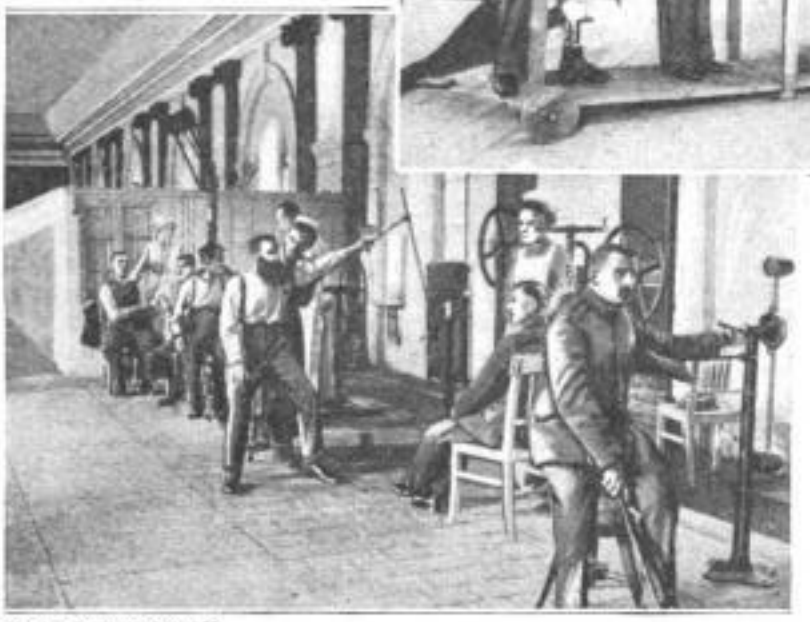
Left: A Tank Ship Discharging Oil into the Floating Pipe Line. Center: The Shore End, Where the Oil is Pumped into Tanks. Right: The Six-Inch Steel Pipes, Mounted in Pairs on Rafts, and Connected Together, and with the Ship and Shore Lines, by Rubber Hose

GERMAN PALACE NOW A RECONSTRUCTION CENTER

The once royal palace at Charlottenburg, just outside Berlin, has been transformed by the present administration into a great reconstruction center. Here, for Germany's crippled veterans, are being made thousands of artificial arms and legs. The building's most interesting activity, however, is to be found, not in the workshops, but in several long corridors where the cripples are taught the use of their mechanical members. One corridor, for example, is given over to ingenious machines which discipline the arm and shoulder muscles. Another corridor contains a wheeled platform with overhead straps. Standing on this apparatus, and grasping the straps, the wearers of artificial legs are pushed back and forth, to this side and that, in order that they may learn to keep their equilibrium in a jerking car.



Men with Artificial Limbs, Learning the Art of Trolley-Car Strap Hanging, with the Aid of a Movable Platform Which is Pushed about the Floor



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Machines for Exercising the Arm and Shoulder Muscles of the Cripples, to Enable Them Properly to Handle Their Newly Placed Artificial Limbs

DRUG FORMS GAS UNDERGROUND AND KILLS PEACH BORERS

Gassing the peach tree's worst enemy, the borer, in his own trenches, is a curious method of orchard protection developed by the Bureau of Entomology. These destructive larvæ make their attack around the base of the trees, and are customarily dislodged laboriously with a knife. The new treatment consists in sprinkling the soil around the tree with 1 to 2 oz. of paradichlorobenzene, one of the great group of aromatic compounds derived from benzene. The fine crystals are then covered with a thin layer of earth. When a temperature between 74 and 80° F. is attained, the chemical volatilizes, and the resulting gas, five times the

Left: A Peach Tree with the Insecticide Crystals Sprinkled around Its Base. Right: The Soil Replaced over the Crystals, Ready, with Warm Weather, to Form Gas and Kill the Borers

weight of air, penetrates the soil and kills all the peach-tree borers within range. The cost of the insecticide does not exceed 25 cents a pound, and the labor of applying it is only about one-third that of the old knife process.

CONCRETE LOGGING PIERS ARE USED IN LUMBER INDUSTRY

A large lumber company in the state of Maine has discontinued the construction of logging piers of logs and rock in favor of the solid-concrete type for the reason that the latter have proved to be more economical when their greater length of life is considered. The new-type piers are shaped somewhat like a triangular pyramid, with the downstream face open. The sides of the base are 8 ft. in length, which affords ample strength and a sufficient area to support the 25-ft. height.

A New-Type Logging Pier, Used in the Rivers of the Logging Country, is Built of Concrete Instead of Logs and Rock, as were the Older Type

NEW OIL-BURNING ENGINE OF LOW-COMPRESSION TYPE

A Louisiana inventor has succeeded in developing a new fuel-oil engine of semi-Diesel design, in which the excessively high compressions of this type are eliminated. Owing to the use of an improved fuel-injection jet and a method of preheating the oil, it is claimed that the power impulses are smooth expansions rather than abrupt, racking explosions, and that, for this reason, the engine can be built lighter than existing models of heavy-oil burners, making it suitable for installation in passenger automobiles and motor trucks.

FLOATING SHOP REPAIRS SHIPS AS THEY UNLOAD

Ships that enter a certain Pacific-coast port in need of repairs may now be overhauled and put in first-class shape without the loss of a single day, the work going on while the cargo is being unloaded. This highly efficient arrangement is made possible by a complete repair shop built on a big barge, kept permanently afloat in the harbor. The movable plant, equipped with all the machinery and tools to be found in any modern shop ashore, is easily run alongside of a vessel needing its services, and the saving to ship owners, by thus avoiding days of idleness, runs into thousands of dollars, not to mention escape from the difficulties of transporting heavy objects, in need of fixing, from ship to shore.

The Barge Repair Shop, in Mid-Harbor, on Its Way to a Mooring alongside a Vessel, Which It will Repair While Unloading Progresses Uninterruptedly

The Interior of the Well-Equipped Shop, Whose Factorylike Vista in No Way Suggests Its Floating Foundation

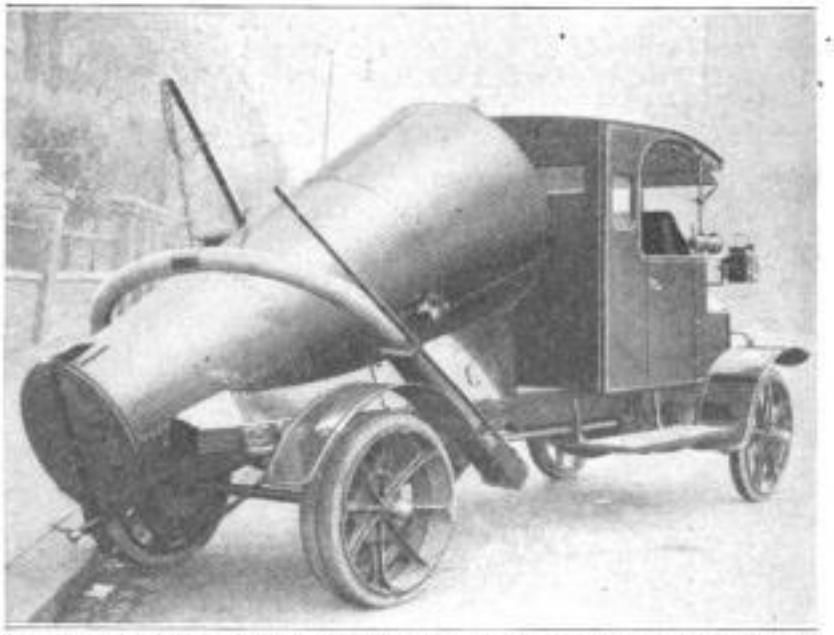
Auto Vacuum Cleaner for City Gutters: The Odd-Shaped Body Has a Capacity of 1,200 Gallons. Hand Winches are Used to Manipulate the Flexible-Steel Suction Tube and Open the Heavy Discharge Door

SUBMARINE SOUNDS SUGGEST THAT FISH COMMUNICATE

The remarkable facility with which sound is transmitted under water, as demonstrated by holding the head submerged while clicking two stones together, suggests to Prof. A. Graham Bell that aquatic creatures have some system of communication. The fact that fish have serviceable ears seems to bear out this theory. The famous observer relates one occasion when, cautiously immersing his head in the Grand River, Ontario, he distinctly heard a tiny repeated signal that was answered from the opposite side. Experiment shows that sounds wholly inaudible to human ears in their natural element might nevertheless be quite as distinct to the denizens of the water as are, for example, the communicatory chirpings of birds. Earth's greatest domain lies under water, and its phenomena are practically unknown.

AUTO VACUUM CLEANERS KEEP CITY GUTTERS CLEAR OF MUD

Immense vacuum cleaners, designed to remove the water, slush, and mud from street gutters, are being manufactured by a concern in England. The machine is made in 400 and 1,200 gal. capacities and is

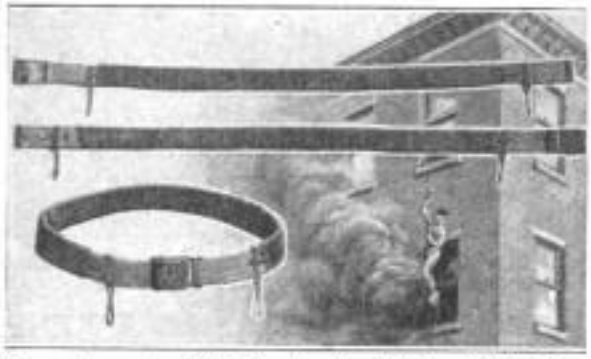


A Smaller Model of the Vacuum Gutter Cleaner: The End of the Suction Hose is Protected by a Coarse Strainer. As the Flexible-Steel Tube Is Quite Heavy, It is Balanced by a Strong Spring Attached to the Inboard End of the Long Lever

mounted on a motor-truck chassis. The tank of the smaller apparatus is shaped like an old-fashioned dash churn and is so placed on the truck that it inclines at an angle, with the small end projecting beyond the rear axle. A vacuum pump, driven by the engine, and a 4-in. flexible steel-armored suction pipe complete the assembly. Mud and water, picked up by the suction hose, are deposited in the tank, the heavier portions settling to the low rear end. To discharge the load, a lid covering the small end of the tank is opened, and the water flushes the heavy matter out cleanly. The larger machine is built on the same general principle, but exhibits some refinements, such as winches for operating the discharge door and manipulating the heavy suction hose. A vacuum of about 7 lb. per square inch can be created in the tanks in about ten minutes.

QUICKLY AVAILABLE LIFE LINE FORMED BY BELT AND ROPE

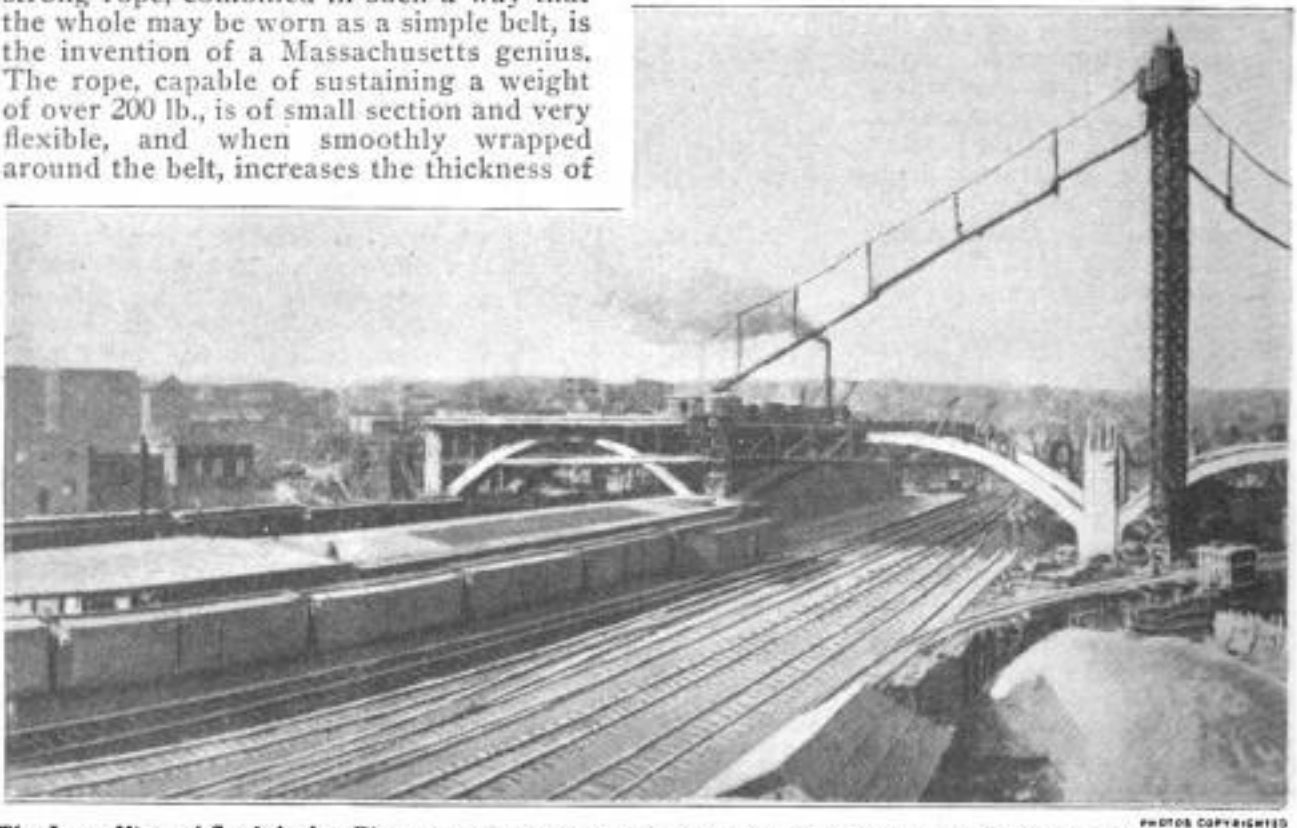
A fabric belt, such as that used by boy scouts, and several feet of small, very strong rope, combined in such a way that the whole may be worn as a simple belt, is the invention of a Massachusetts genius. The rope, capable of sustaining a weight of over 200 lb., is of small section and very flexible, and when smoothly wrapped around the belt, increases the thickness of the latter to such a slight extent that it is not unduly bulky or cumbersome. For use as a life line, the rope is quickly unwound and the belt clasped to make a loop which may be easily and accurately thrown. When used as a fire escape, the line is threaded through a number of eyelets in the belt. By keeping the latter stretched tightly a sliding friction is set up, thus preventing a too rapid descent.



Three Aspects of the Combination Belt and Life Line, and Its Application as a Fire Escape

IMMENSE MUNICIPAL VIADUCT BUILT BY AKRON

The founders of the city of Akron, Ohio, could not foresee that it was destined to produce 41 per cent of the world's manufactured rubber goods and a large part of the total number of the automobile tires consumed yearly. Neither did their vision



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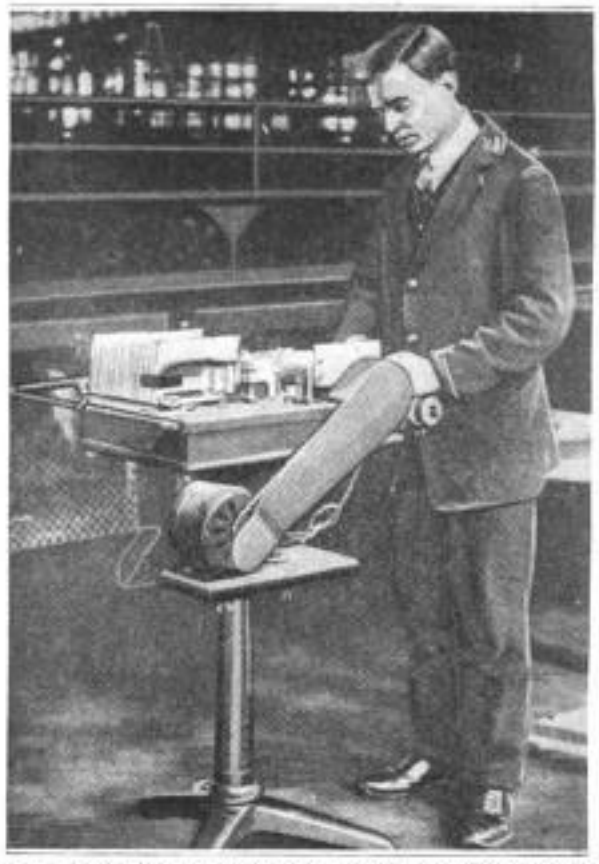
The Long Vista of Steel Arches That are to Support Akron's New Municipal Viaduct of Reinforced Concrete, Connect a Central Section of 2,800 Feet, and Approaches of 200 and 1,350 Feet, and Its 72-Foot Top will Carry Street Cars,

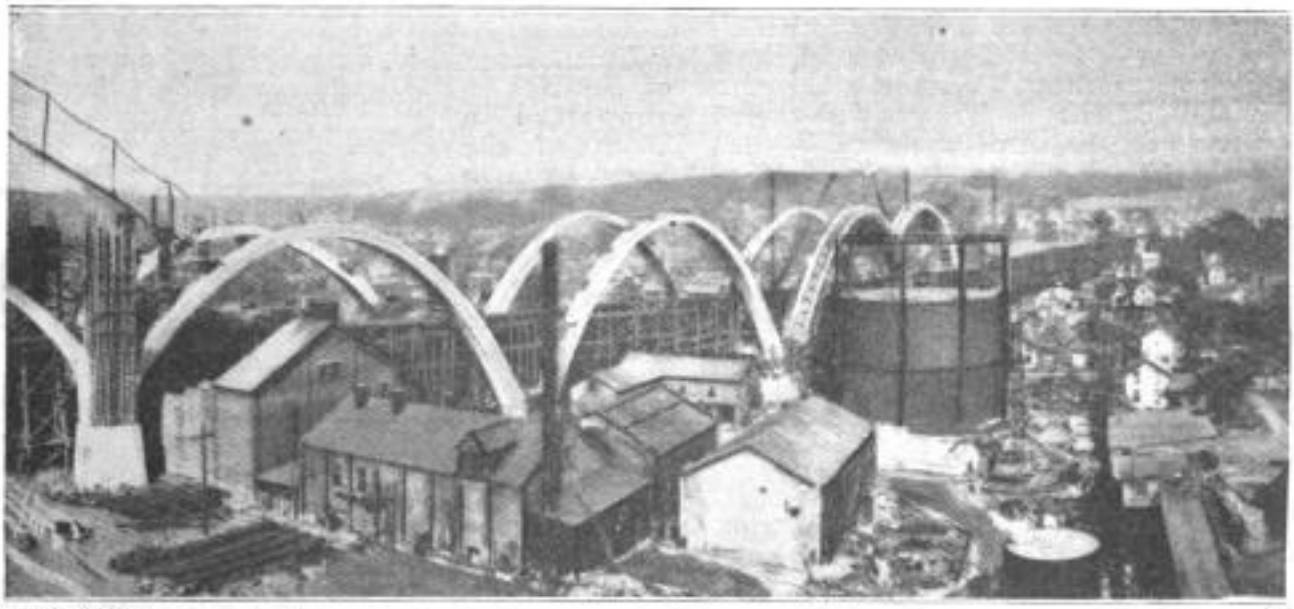
embrace a most phenomenal growth in population. They accordingly chose for a site a beautiful plateau, surrounded by deep valleys, on the other side of which are towering hills. When the expansion occurred, the newcomers took up their residences on the hillsides, with the result that an almost intolerable transportation situation was brought about, as the grades from the valleys are so steep that street cars and automobiles have much difficulty in negotiating them. As the initial step in overcoming these conditions, the city has started on the construction of a splendid reinforced-concrete viaduct, which will be one of the world's largest. The total length will be 4,350 ft., divided into three sections, of which the main one—the viaduct proper—will be 2,800 ft. long.. The northern approach will measure 1,350 ft., and that from the south 200 ft. in length. The great way will bridge the Cuyahoga River and connect the northern, residential portion of the city with the heart of the business section. The spans, 16 in number, are 130 ft. high and vary in length from 150 to 180 ft. Six distinct channels on the 72-ft.-wide top will accommodate double lines of interurban and street-car tracks, vehicle roadways, and sidewalks.

BRITAIN TRIES NEW MACHINE FOR CANCELING STAMPS

Illegible postmarks will cease to annoy the recipients of British mail, if present tests of a new form of stamp-canceling machine prove successful. The improved device, which is being tried out in English post offices, is driven rapidly by a small electric motor, and is declared to print the day, hour, and place of mailing very clearly on each envelope. Besides this advantage, the speed of operation results in a considerable saving of labor, as compared with the old manual methods of cancellation.



Stamp-Canceling Machine That Prints a Clear Postmark, Now being Tested in British Post Offices

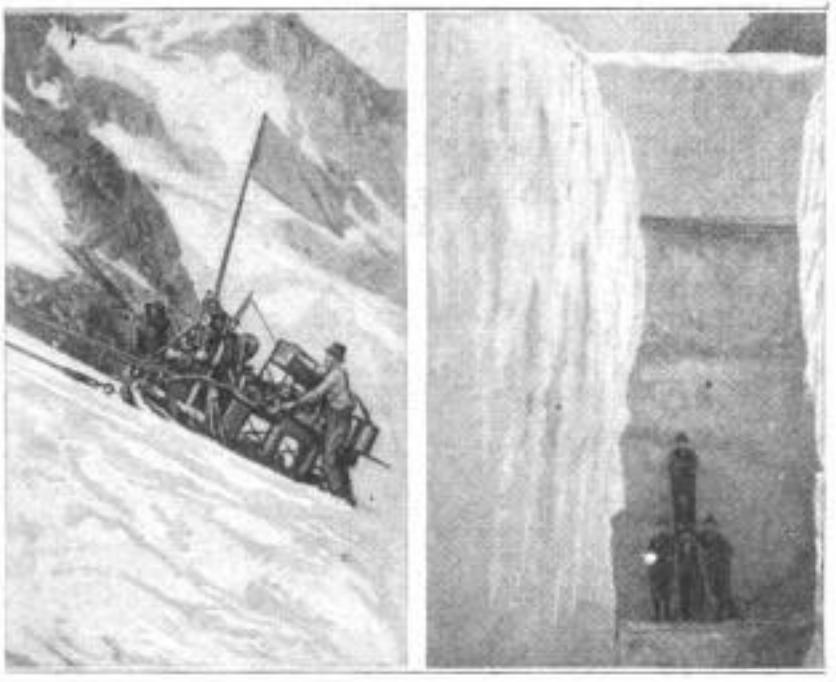


BY J. O. SEYMOUR

ing the Business District with the Residential Part across the Cuyahoga Valley: It will Be 4,350 Feet Long, with Roadways, and Sidewalks in Six Separate Channels. The 16 Spans Are 130 Feet High, and Up to 180 Feet Long

GOLD MINE UNDER A GLACIER TESTS ENGINEER'S SKILL

The working of the Alaskan and Canadian gold fields has, many times, called forth the utmost ingenuity and skill of the mining engineer. One of the most remarkable of these exploits was recently performed when location operations were undertaken which necessitated the sinking of a shaft through the icy heart of a glacier. The approximate location of the outcropping was known, but to determine definitely the exact site upon which to begin extensive operations, it was necessary to dig to bedrock through 50 ft. of solid ice and snow. With the aid of a diamond drill and its gasoline-engine power plant, the work was accomplished and the lode located. Not the least of the difficulties presented by the undertaking was the transportation of the heavy drill and power plant up the face of the glacier over comparatively soft snow several feet in depth.



Left: The Mine-Drill Power Plant Pulling Itself up the Face of the Glacier by Means of a Cable. Right: The Shaft, 30 Feet in Depth. Later a 50-Foot Shaft was Sunk through the Solid Ice and Snow

PAPER FINGER BOWL AS ADVERTISEMENT

A patent was recently granted on paper finger bowls for use in hotels and restaurants, which have printed on the interior, with invisible ink, the name of the hotel or other advertising matter. When water is poured into the bowl, the letters appear and attract the attention of the customer.

HYDRAULIC EXPANSION METHOD REINFORCES HEAVY GUNS

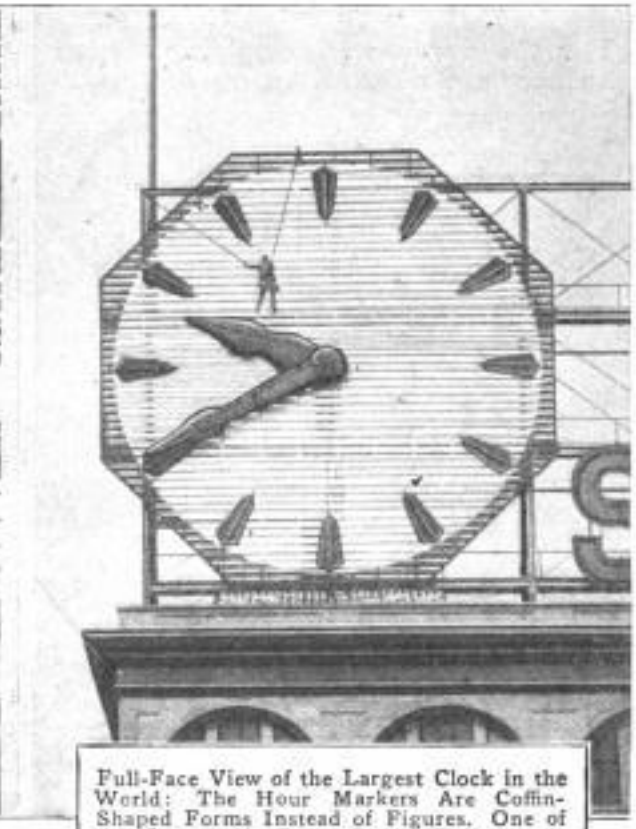
What is known as the "autofrettage" method of large-caliber gun construction is being investigated by the Ordnance Department with the object of determining whether weapons of lighter weights for given sizes can be produced, and also whether the adoption of the method will shorten the time of production. In the new method neither shrunk-on sleeves nor wire winding are resorted to for reinforcement, but the metal of the piece has stresses set up in its various strata, which have a reinforcing effect identical with that accomplished by the older methods. The gun is formed to full size in one piece, but before the final boring and rifling are completed, it is subjected to an internal hydraulic pressure of many tons. This has the effect of actually stretching the steel. Upon removing the pressure the metal remains under tension, the inner parts trying to expand and being held in restraint by the contracting force of the outer portions.

ARC WELDER'S FACE SHIELD HUNG FROM SHOULDERS

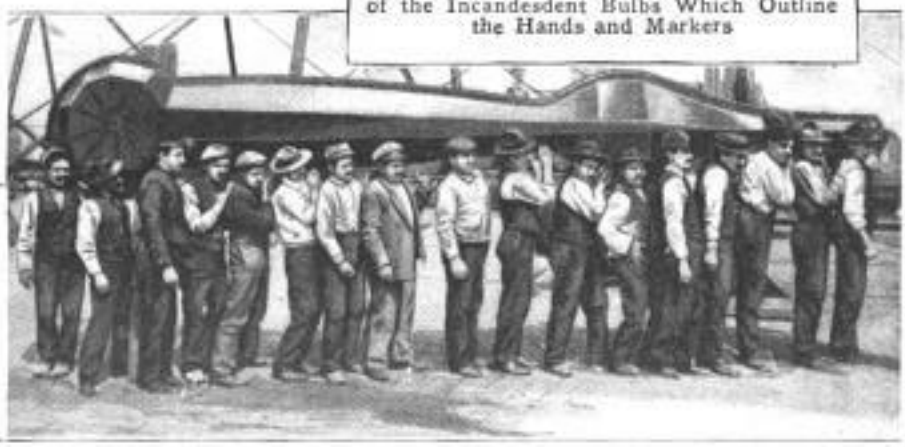
A new face shield, designed for the use of electric-arc and acetylene welders, is supported in front of the body by two light metal straps which hook over the shoulders. The shield proper is a fiber board through which is cut a large square aperture. In this is fitted a pane of glass of the proper color to stop the ultraviolet light rays given off by the welding flames. A sheet of plain white glass protects the pane from flying particles of hot metal.

WORLD'S LARGEST CLOCK KEEPS ACCURATE TIME

View of the Back of the Big Clock, Showing the Method of Diminishing Its Resistance to the Wind: An Electrically Controlled Driving Mechanism of Unusual Power is Housed in the Shed



Full-Face View of the Largest Clock in the World: The Hour Markers Are Coffin-Shaped Forms Instead of Figures. One of the Caretaker's Tasks Is the Replacement of the Incandesdent Bulbs Which Outline the Hands and Markers



By Comparison, the Crew of 17 Conveys an Idea of the Length of the Minute Hand. It is Built Up of a Brass Framework, Covered by Sheet Copper, and, with Its Counterpoise, Tips the Scales at 640 Pounds

A large part of the dwellers in Jersey City and surrounding territory enjoy the distinction of having their activities regulated by the largest clock in the world. The monster dial of the great clock, being 38 ft. in diameter and having an area of 1,134 sq. ft., is visible for miles, and as its mechanism is accurate within a limit of 30 seconds in a week, it sets the time for the neighborhood alarm clocks. To cut down the area offered to the wind as much as possible, the face of the big timepiece is built of 6-in. boards, spaced 3 in. apart. The minute hand is 20 ft. long and with its counterpoise weighs 640 lb. Its tip makes 11½-in. jumps every 30 seconds and travels over one-half mile in 24 hours. The hour hand is somewhat shorter and fatter, being only 15 ft. long, but measuring 3 ft. 10 in. at its greatest width. Both are made of sheet copper and mounted on a trussed brass frame. During the hours of darkness, hundreds of incandescent bulbs set in the hands and hour markers blaze forth the time to scores of square miles of countryside.

¶ Disastrous fires have been started by the emission of sparks of accumulated static electricity from large power belts. These charges will be harmlessly dissipated as rapidly as they are generated if a thin film of graphite, mixed with the belt dressing, is applied.

WEATHER MEN STUDY CLOUDS FOR BENEFIT OF AIRMEN

For the purpose of supplying airmen with accurate information on the move-

Left: A Weather Observer Using the New Form of Nephoscope to Gauge the Movements of Clouds, to Determine Upper-Air Currents for the Benefit of Fliers. Above: A Close-Up of the Instrument, Showing the Mirror, Straightedge, and Sighting Pedestal, with Tiny Peepholes in the Brackets at the Ends of the Horizontal Arm

ment of upper-air strata, the U. S. Weather Bureau now has installed nephoscopes, or cloud-gauging instruments, in a large number of stations. The instrument consists of a horizontal black mirror in a circular metal frame, marked in degrees, resting on a round iron table. A movable pedestal alongside the mirror carries a horizontal arm, with a bracket containing a peephole at each end, one 6.4 in. and the other 3.2 in. above the mirror. A trained observer, knowing the height of a cloud, and noting the direction and speed of its reflection passing across the mirror, can readily determine the essential characteristics of the wind.

SUBSISTENCE SCHOOL OPENED TO TRAIN QUARTERMASTERS

Buying food for the U. S. Army is the subject of a series of specialized courses of study in a new subsistence school just opened in Chicago under the direction of the quartermaster-general, the first of its kind. The various classes of foodstuffs are handled in separate courses, and their inspection and purchase taught with the coöperation of a number of local business concerns. The complete series will occupy 11 months, and is expected to train officers who can effect economies in the quartermaster's department.

SEPARABLE-BODY PNEUMATIC DRILL IS A NEW DESIGN

Dividing the main body of an air drill through the center line, parallel with the length of the crankshaft, in such a way that each half contains two complete cylinders and their valve mechanisms, is an English engineer's method of simplifying the design of these tools. This construction makes it possible to assemble the power elements, such as the pistons, connecting rods, crankshaft, etc., outside the casing and, later, install them therein in one unit. Another feature of the design is that the connecting rods are boltless, being attached to the pistons by ball-and-socket joints and to the crankpins by the solid ends which contain replaceable steel bushings.

GROTESQUE FACE ON AUTO ADVERTISES CARNIVAL

As a means of advertising a frontier celebration which was held not long ago in Prescott, Ariz., a business man of the locality had the rear of his car decorated with a huge face done in startling shades of red, brown, pink, and blue, relieved and contrasted by white in the teeth and eyeballs, and black in the eyeglass ribbon. The spare tire, painted red, formed the lips of the wide-open mouth, done in brown, from which issued the invitation, "Stay Cowboy," painted in blue letters on a white ground on a piece of sheet metal. A comical straw hat was made by placing a light piece of wood across the top and coloring it the natural straw shade, with a blue band. It is reported that the novel advertising stunt attracted much favorable attention and comment.

Workers on a Wisconsin Farm Packing Trinitrotoluene, the War Explosive, into Cartridges, like Dynamite, for Use in Blasting Stumps: Cartridges of the Usual Size, 1¼ by 8 Inches, Weigh 5½ Ounces, as Compared with Eight Ounces for Dynamite

T. N. T. USED IN PULLING EARTH'S MOLARS

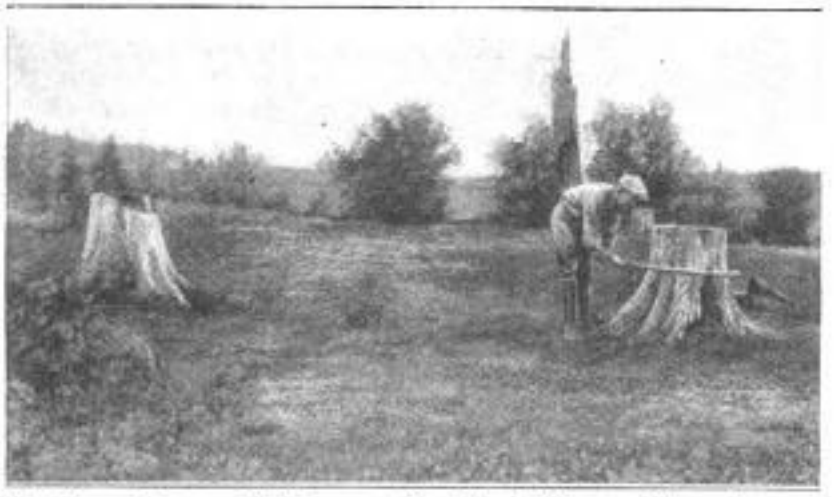
By GEORGE H. DACY

IN coöperation with the departments of War and the Interior, the Wisconsin College of Agriculture has recently been conducting some invaluable investigations of T. N. T. as an explosive for stump removal, drainage operations, and general road work. The results of these practical field tests have been so satisfactory that efficient utilization of high-powered explosives—the by-products of the war—for agricultural purposes is anticipated. The demands for T. N. T. as a direct consequence of these experiments have been very large. Wisconsin farmers alone have asked the government for more than 4,000,000 lb. of the material.

From the viewpoint of political economy, land clearing and the reclamation

Four Big White-Pine Stumps, Occupants for Years of a Wisconsin Farm Field, That were Effectually Removed by Properly Proportioned Charges of T. N. T.: The Explosive, Though a Third Stronger Than Dynamite, Is as Safe to Handle

of fertile fields which are not available for farming purposes because of such impediments as huge stumps and forest aftermaths, are now, perhaps more than ever before, desirable undertakings. In the upper Mississippi River states alone there are more than 35,000,000 acres of undeveloped, cut-over lands. Could these vast tracts of woodland wastes be made into farming land, the increase in value would aggregate over $1,000,000,000. And to settlers in these cut-over countries, T. N. T. spells the expeditious removal of the earth's molars—the deep-rooted stumps which prohibit cultivation of the lands.



The Blaster Measures Each Stump with a Tree Caliper, and Then Computes the Proper Charge of T. N. T. Required for Its Destruction

Trinitrotoluene has been thoroughly tested out as an explosive for agricultural purposes on more than 2,000 farms. As compared with dynamites, regardless of their grade and manufacture, T.N.T. has proved stronger and yet fully as safe and as easy to use. One disadvantage is its comparative inertness, but this can be easily overcome by the use of a larger detonator; it is no more susceptible to moisture and dampness than the best of the ordinary dynamites, and is not affected by freezing. Furthermore, it has a less poisonous effect on the user, when it is properly cartridged, than the general run of dynamites.

The tests have demonstrated that the war stocks of T. N. T. can be properly cartridged and made available for agricultural use at a cost of less than 10 cents a pound. Wisconsin has successfully cartridged, packed, and distributed 200,000 lb. at a total cost of $16,000, or only about eight cents a pound. However, the cost of distributing this explosive was here very low, as the local rural banks, county agents, and other interested parties, aided in this work. If the T. N. T. cartridges are made the same size as the dynamite caps, the same tools, such as crimpers and the like, may be used. The ordinary dynamite cartridge is 1¼ in. in diameter and 8 in. long, and weighs 8 oz., but as T. N. T. is more bulky, a cartridge of this size would weigh not more than about 5½ ounces.

T. N. T. is a yellow crystalline powder usually made in three grades, which differ technically but not in practical application. Grade No. 2 is the one most plentifully available from the war surplus. It is about one-third stronger than dynamite, when loads of less than 2 lb. are used. Where the quantity of explosive exceeds this amount, the T. N. T. appears to exert a still greater effect, and in such cases it is therefore necessary to use the utmost care, because the explosion is much more violent and the stump pieces are thrown farther. A No. 8 blasting cap is required for complete detonation, it being about similar to the cap ordinarily used with dynamite except that it is larger. Ordinary fuse is satisfactory. The electrical

The Violence of the Blast Assures the Complete Disintegration of the Stump, as is Indicated by This View Taken after the Detonation

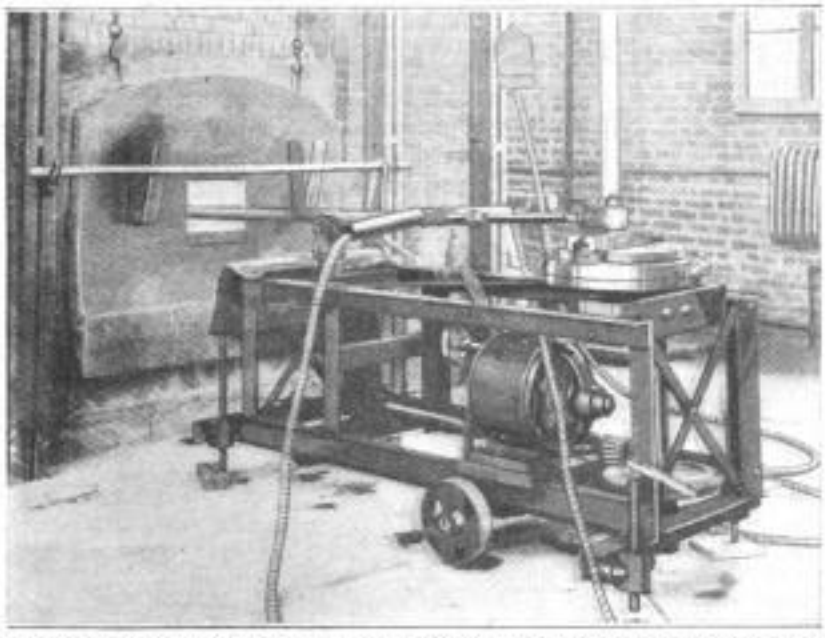
method of firing the explosives is preferable. The hole for the charge is made in the same way as with dynamite, except that the T. N. T. charge should not extend very far from the bottom of the hole, due to its inertness, the recommended practice being to enlarge the hole at the bottom so that the charge will be well bunched. In carrying out the experiments, a spoon with a long handle was ordinarily used for this purpose, the process of packing it down being further facilitated by slitting the sides of the cartridge with a knife. Saying that T. N. T. is safe to use does not signify that it is less dangerous than other explosives. It should always be handled with the greatest caution. It burns readily and is much more sensitive when aflame—once started, it is very difficult to extinguish. In preparing for a blast, the charge should be tamped firmly into the hole, and then the earth tamped above and around the charge and up to the top of the hole. Care must be exercised that dirt does not get mixed with the explosive, as this often prevents the charge from exploding.

Where electric-blasting outfits are available, T. N. T. may be used economically in ditching and drainage activities; it also is invaluable for bowlder-blasting operations, either by mud capping or by drilling a hole in the rock. In mud capping, T. N. T. is used in the same way as dynamite, except that the charge is one-third to one-half smaller. Here again, care must be taken to protect the charge against the introduction of moisture or soil. In road-construction work, T. N. T. is of practical value for the speedy and inexpensive removal of earth and rocks. Generally speaking, T. N. T. is readily adaptable to work that is performed in the open air, and where a relatively inert explosive can be used.

If T. N. T. is permitted to get wet, it will not give satisfactory results, for with over 10 per cent of moisture present, it cannot be detonated by ordinary means. On this account, explosive experts recommend that the material should never be poured out of the cartridges in the bore hole, as soil moisture will prevent some of the material from detonating. Similarly, it is inadvisable to allow a load to remain too long in a hole before firing. However, T. N. T. is less susceptible to moisture than ordinary dynamite.

OPTICAL GLASS STIRRED BY NEW MACHINE

For the successful production of optical glass, it is necessary that, while melted, it be stirred and mixed in the pot. Heretofore this has been done by hand, a tiresome process, which sometimes resulted in spoilage of the glass, because the worker touched the walls of the pot with his tool, which caused streaks to be formed in the glass. A stirring machine has now been developed by the Bureau of Standards to spare human arms the task. The stirring tool consists of a long thimblelike porcelain tube, floating, closed end downward, in the glass and engaged loosely by a suitable fixture on the end of the stirring arm of the machine which extends through an opening in the furnace door. To keep this arm and fixture cool, water is circulated in it with the aid of hose lines.



The Motor-Driven Stirring Machine with Its Long Arm Reaching through the Furnace Door into the Pot of Melted Optical Glass within

The machine gives a horizontal motion to the stirring rod which carries it through the volume of the glass; and the curve which it traces is very much like that made by the ruling machines used to engrave the plates employed for making paper money, bank notes, etc. The stirrer never touches the sides of the pot.

BAMBOO SUSPENSION BRIDGE CROSSES CHINESE RIVER

Without detracting in the least from the renown of those engineers who built the great steel suspension bridges of America, it is interesting to learn that a structure equally deserving of the name has swung since unrecorded antiquity above the river Min, in southern China. This slender and somewhat shaky span is built wholly of bamboo and wire, with a floor of light boards and towers of brick-work, supplemented by log piers, and is 800 ft. long. It is situated 35 miles above Chengtu, where the cold, milk-white torrent of the Min was divided and harnessed by the engineer Li Ping, 2,000 years ago.

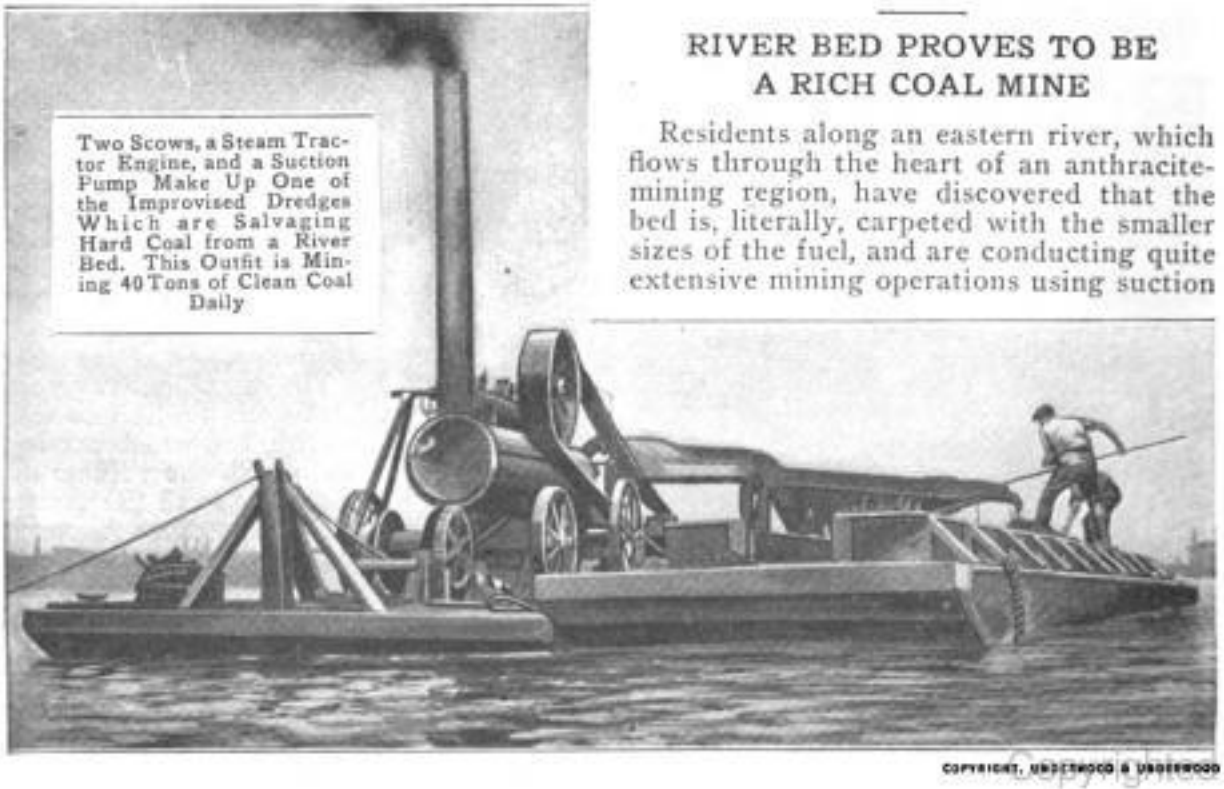
Bamboo and Wire Are the Structural Materials of This Ancient Suspension Bridge across the Min River in the Chinese Hinterland

WIRELESS IS GERMAN MEANS OF REGAINING STRENGTH

Realization that wireless, unlike cables, remains independent and unhampered through all vicissitudes, has impelled the new German government to turn to radio communication for the redevelopment of its commerce. Within a period of seven months, the number of stations in service in that country increased from 27 to 55, with many others under construction. Arrangements now have been made for a regular exchange of messages between the giant station at Nauen, Germany, and a high-power station at Marion, Mass. This will give Germany service to all Latin America, Japan, China, and the Orient, and connect the United States with all central European countries. The arrangement is unofficial until peace is declared.

RIVER BED PROVES TO BE A RICH COAL MINE

Residents along an eastern river, which flows through the heart of an anthracite-mining region, have discovered that the bed is, literally, carpeted with the smaller sizes of the fuel, and are conducting quite extensive mining operations using suction

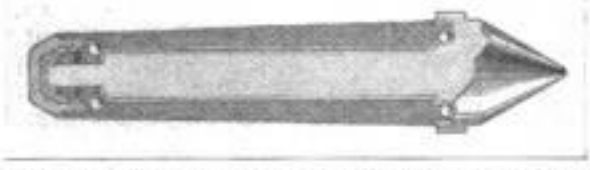


Two Scows, a Steam Tractor Engine, and a Suction Pump Make Up One of the Improvised Dredges Which are Salvaging Hard Coal from a River Bed. This Outfit is Mining 40 Tons of Clean Coal Daily

and clamshell dredges, and other improvised apparatus. The source of the coal is mines located 50 miles upstream, where the river is used as a means of disposal of the low-value screenings. By the time the fuel has been washed and tumbled over 50 miles of river bed, it may be supposed that it is thoroughly cleaned, as the slate and other stony foreign elements, being much heavier than the coal, very likely come to a stop early in the journey.

BALL-BEARING LATHE CENTER IS ALMOST WEAR-PROOF

Many highly skilled machinists have, in the past, made ball-bearing and other forms of frictionless lathe centers for their own use. However, these devices have but recently been offered in the open market by an eastern manufacturer. The frictionless parts of the new center are two rows of ball bearings, one in each end of the device, rolling between old-style cup-and-cone-type of races. The center proper is ground to the conventional taper point on the outer end, and extends inward into a hardened shell, which is ground on the outside to fit the inner taper of the tailstock. The ball



Sectional View of a New Frictionless Lathe Center: An Adjustable Cone in One End Compensates for Wear

bearings are placed between these two parts. It is claimed for the fitting that, on account of the angle at which the ball races are cut, the balls have a spinning as well as a rolling motion, which insures that they will remain truly spherical.

CONCRETE BED FOR "DRY RUN" PREVENTS ROAD DAMAGE

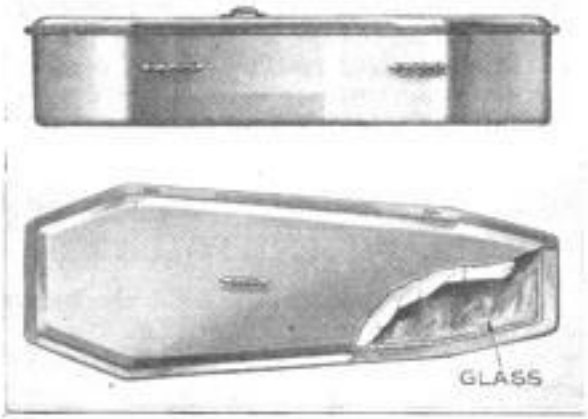
Many a good stretch of road is marred by the so-called "dry runs" which cross it. These are small water courses which are too insignificant to warrant the cost of culverts, as they are dry except during rainstorms, when they become small torrents and wash the road badly. The road commissioners of Wisconsin are credited with having worked out a method of combating the evil. This consists in paving the bed of the run with a slightly concave layer of road-building material, principally cement. The water follows its natural channel and, as the bed is smooth, there is nothing to obstruct the flow and start erosion. For the same reason mud and

The Bed of the "Dry Run" is Paved with Cement. This Stops the Damage and Also Makes a Smooth Road

débris do not lodge, but are carried away, leaving the roadway clean.

AIR-TIGHT ALUMINUM CASKET HAS GLASS INNER COVER

Aluminum is the material used for making a new form of burial casket, the structural improvements of which were invented by an Oregon nurse. Under the metal top, fitting the box with a close joint, is an inner cover of glass, which, being air-tight, excludes moisture and makes inspection safe when contagious disease has been present. Means are provided for fitting a lining to the light and corrosion-proof metal, and the sealed construction operates to preserve the inclosed



The New Aluminum Burial Casket in Side and Top Views, in the Latter Broken Away to Show the Glass

body, an especially valuable feature for long shipments, or where disinterment may become necessary.

WELDED RAILWAY CROSSINGS WITHSTAND VIBRATION

The use of thermite in the welding of the frog joints in railway crossings instead of depending upon the old method of bolting them together, is a process that is being adopted by one of the large railroad companies. The crossing parts are assembled, as in the older method, and the joints incased in molds of refractory material. The thermite, which is a mixture of fine aluminum filings and iron oxide, is ignited and allowed to burn to the point where the aluminum and other impurities are burned out and only pure molten iron at a temperature of 5,000° F. is left. Upon pouring this mass into the mold surrounding the joint, the steel of the rail is melted to a short depth and, combining with the metal of the casting, forms a solid one-piece joint, which endures vibration much better than does the older bolted type.

Thermite Welding of Railway-Crossing Frogs is being Used Extensively. The Joints will Not Loosen from Vibration as Do the Bolted Type

WATER-CHLORINATING PLANT QUITS: TYPHOID FOLLOWS

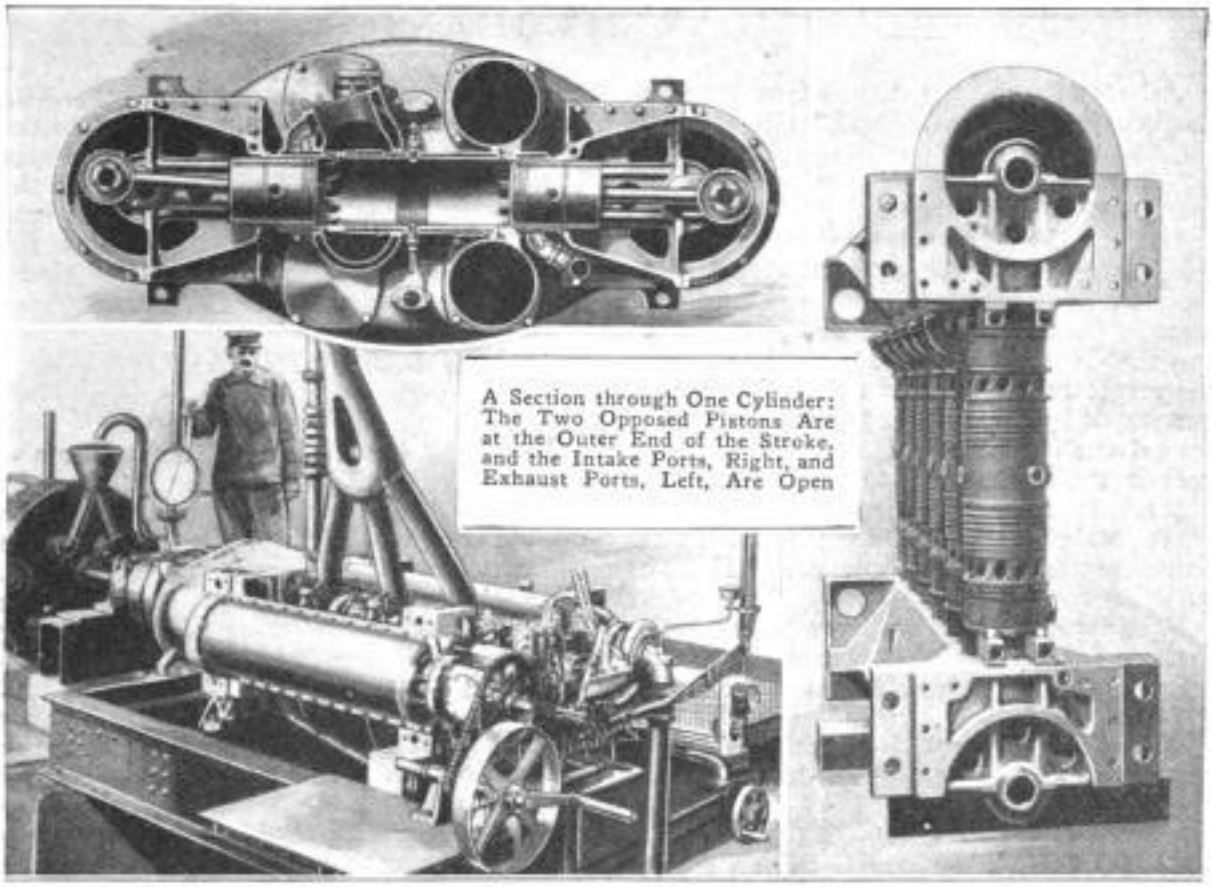
Just how important a work is being done by chlorinating plants, now commonly used for disinfecting city water supplies, was unpleasantly demonstrated a short time ago in a California city of 5,000, using river water. The municipal chlorine plant was out of service for repair for one day, and in that brief time 100 cases of typhoid fever, and some other diseases, developed.

AIRPLANE TRANSPORTS SURVEY EXPEDITION INTO WILDS

Approximately 94 hours of very valuable time and 88 miles of arduous overland travel were saved the surveyors of a large Canadian enterprise when an airplane was engaged to transport the personnel and impedimenta, provisions, instruments, tents, a folding canoe, etc., of an expedition into the untracked forests. The plane made the trip to the site of operations—44 miles into a wilderness—in something less than an hour. Had the usual program been followed, four full days, for the round trip, would have been consumed by the hard going, numerous portages, etc. Arrived in the vicinity of the point from which it was desired to start operations, the plane again demonstrated its adaptability to the work by covering 400 square miles of territory in one day, materially aiding in making the preliminary survey of the unmapped tract through which the true lines were to be run. On this flight photographs were taken from which, by the triangulation method, the location of the surface starting point was easily fixed. The necessity of "chaining" over a distance of 22 miles was thus avoided.

AIR BUBBLES CAUSE FAILURE OF HIGH-VOLTAGE CABLES

Small air bubbles, trapped in the insulation of high-tension cables at the time of their manufacture, sooner or later cause them to break down for the reason that the air converts to ozone under the influence of the high voltage. As the ozone has an oxidizing effect on the wax with which the insulation is impregnated, it causes a chemical change and disintegration. In an effort to overcome this difficulty cable makers have adopted a new process of air elimination by which, it is claimed, underground cables capable of carrying pressures up to 66,000 volts safely and without material loss, can be constructed. The process is now being used in quantity production of cable of a capacity of 33,000 to 55,000 volts.



Left: The New Diesel Airplane Engine in a Horizontal Position on a Test Stand. Right: A Partly Assembled Model in Vertical Position, with the Two Crankcases at Top and Bottom, and the Six Cylinders Between

DIESEL AIRPLANE ENGINE GERMAN PRODUCTION

BY HAROLD F. BLANCHARD

THAT the Germans have developed a Diesel engine for airplanes is a fact of extraordinary interest, because this engine is radically different from the usual airplane engine, which invariably operates on the so-called Otto, or four-cycle, principle. The new engine has many notable features new to or unusual in air practice. It is a six-cylinder, two-cycle motor; it has no valves; it has two pistons per cylinder and two crankshafts; it has no carburetor, the fuel being sprayed into the cylinder in liquid form; the compression is more than 200 lb., whereas in the ordinary engine it is less than 100. Big stationary engines have been built for 15 years or more along these general lines, but this is the first time these ideas have been successfully applied to air craft.

The advantages of the Diesel engine are: greater fuel economy; absence of valves; safety against fire; perfect balance; low weight per horsepower. The pistons in each cylinder move in and out together, their respective crankshafts being connected by gearing, located at one end of the crankcase. The right piston uncovers the intake ports, and the left the exhaust ports. The exhaust ports are uncovered first, since these ports are larger; that is, as the pistons move outward the exhaust ports are exposed first because they extend farther up along the cylinder walls. Pure air forced in by a centrifugal blower located at one end is all that comes in through the intake ports. At the proper moment the fuel is injected into the combustion space through a nozzle located directly beneath the spark plug. The cycle of events is as follows: Suppose that the pistons are at inner dead center, and that a spark has just occurred to ignite the charge. The pistons are forced outward by the resulting pressure until the left piston exposes the exhaust ports, when the burned gas starts to escape through them. Then the intake port is uncovered and a fresh charge of air is forced into the space, driving all remaining burned gas before it until all of it has been forced out through the exhaust ports and nothing but pure air remains in the cylinder. As the pistons move in, the ports are covered and the gas is compressed. When the pistons near the end of the inward stroke, a pump shoots

a measured quantity of gasoline into the combustion chamber. The high heat of the air, which has been compressed to 200 lb., or more, is sufficient to vaporize this fuel instantly, so that when the spark occurs a moment later, the mixture burns readily.

As previously stated, valves and their troubles are dispensed with, although balanced against this is the complication of the fuel-injection apparatus. The engine is perfectly balanced, since the forces generated by opposing reciprocating parts cancel each other; it is fire-safe because fuel is delivered only to the engine cylinders; there is no mixture of fuel and air outside of the engine; there is no danger from backfire, nor are fuel leaks as dangerous.

While this engine appears to be satisfactory for air craft, it is not likely that it will ever be employed, at least in its present form, for automobiles, for the reasons that it is costly to make and does not possess the flexibility demanded in an automobile engine.

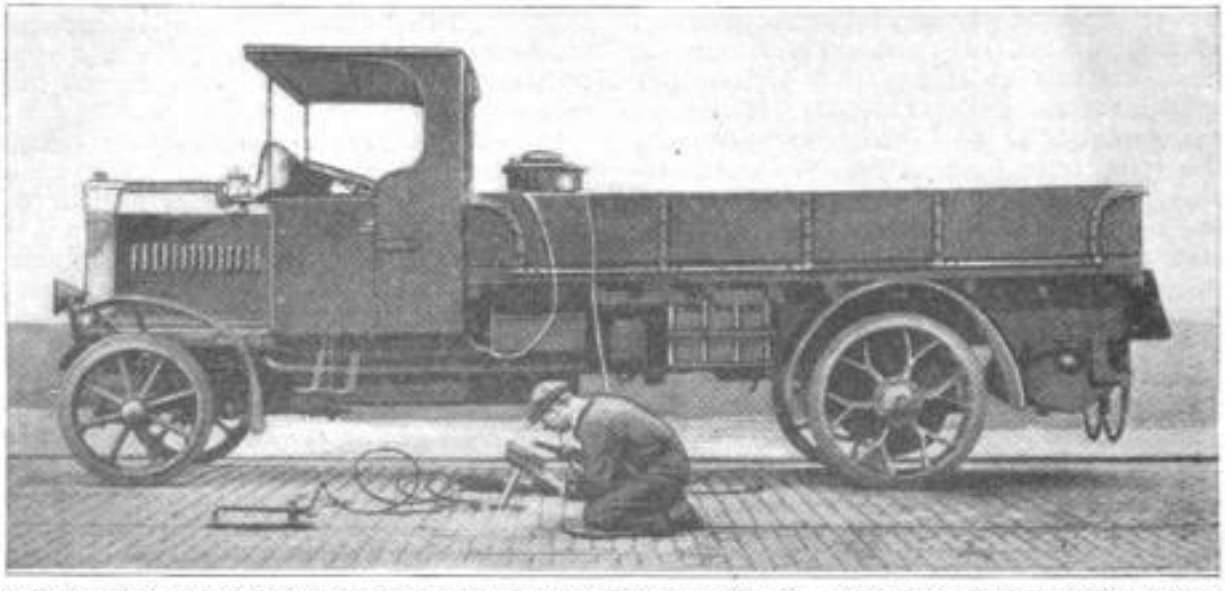
ELECTRIC-WELDING PLANT IS PART OF MOTOR TRUCK

Portability is achieved in a new English arc-welding outfit, not by merely mounting it on a motor truck, but by making it actually a part of the truck's power plant. The vehicle is of the "gas-electric" type, an electric motor driving the rear axle through a worm gear, and the motor in turn being driven by a dynamo direct-connected to a gasoline engine. No shifting gears or clutch are used, the speed being regulated by variable resistance in the field circuits of motor and generator, and by the usual foot throttle. With the car at rest, the engine-driven generator is used to operate the welding set, all the equipment of a repair shop being carried. The current is also available for many other purposes, such as the emergency operation of tools or lights.

RIPEN DATES IN PAPER BAGS AND GET BETTER CROPS

Inclosing bunches of dates in heavy-paper bags as they ripen on the tree is found by the Bureau of Plant Industry to double the yield of fancy fruit and reduce the number of pickings from 12 to two. The new method tends to equalize the humidity and temperature of the ripening period. Applied just before softening begins, it protects the fruit from dust and insects, and simplifies the final curing process. By its use, it is expected that the cultivation of dates, now confined to the Coachella Valley in California, can be extended to the Imperial, Yuma, and Palo Verde valleys, as well as to parts of the Salt and Gila river valleys in Arizona and the Rio Grande Valley in Texas. Some of the dates now produced equal the best of the old-world fruit.

¶Plans for an extraordinary nonstop flight that would take the huge American dirigible "ZR-2" from Bedford, England, where it is now building, clear to the Pacific coast, some 8,000 miles, are being seriously considered. The airship, formerly the British "R-38," is expected to start for home in late May or early June.



Doing a Street Job of Arc Welding with the New English Motor-Truck Outfit: The Gasoline-Engine-Driven Generator Used Is Part of the Truck's Power Plant, and an Electric Motor Drives the Rear Axle

Indians Gathered at a Canadian Trading Post of the Far North to Receive the Annual Payment of Money, Ammunition, and Fish-Net Twine Guaranteed Them by a Curious Treaty Granted in Perpetuity 50 Years Ago

PAYING TREATY IN FAR NORTH

BY FRANCIS DICKIE

"*AND this agreement shall go on forever and aye.*"

Thus in part runs the wording of a treaty between the Canadian government and certain nomadic tribes of far-northern Indians, who live today much as their forefathers did hundreds of years ago. The carrying out of this treaty presents one of the most interesting sights to be viewed in the northland. Though the Indians still have the same hunting and fishing rights and are practically as independent as before the white man came, the government, in return for the nominal taking over of the country from these red men, made a treaty a little over a half a century ago by which it undertakes an annual payment of certain moneys and other things. The treaty is in the name of the "Great White Queen," Victoria being upon the throne at the time of its making, and the promises read thus: "Her majesty agrees that each chief, after signing the treaty, shall receive a silver medal and a suitable flag, and every third year thereafter shall be given to each chief, and also to each headman, a suit of clothes. Every common member of the tribe yearly shall receive five dollars per person; each chief twenty-five dollars, and each headman fifteen. In addition, each member shall receive as much ammunition and twine for net making as will amount in value to a dollar per person. And this payment shall continue forever and aye."

Certain places, generally some trading post on the bank of one of the larger rivers which flow through the region, are appointed for the distribution. To these the government agent comes once a year, carrying in his grips tens of thousands of dollars in one and two-dollar bills. Larger denominations are never used.

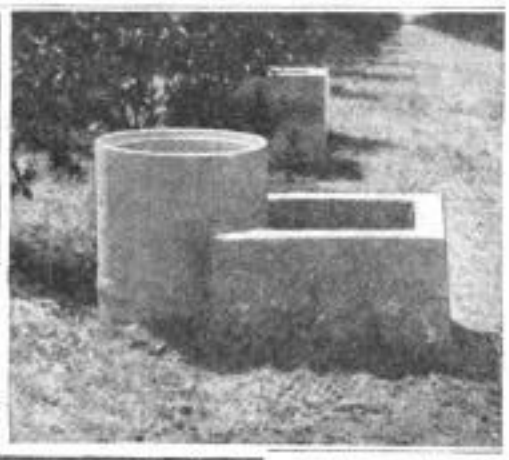
Out on the open plain, the agent stands, surrounded by the vast crowd of red men—chiefs, headmen, aged hunters, young bucks, squaws, and hundreds of children. One by one the Indians come forward and receive their yearly compensation, the white man checking off each name in his book as he pays. The agent is always a man carefully chosen for his work, one with intimate knowledge of the natives, gained by years of close personal touch. Generally he speaks one or more of their languages.

As there is little probability of this land ever being settled, that part of the treaty which stipulates that the government will yearly pay out so much money per person according to rank "forever and aye," in all likelihood will be faithfully carried out, an exact keeping to the original wording, which the white invaders have not always observed in their dealings with aboriginal peoples.

¶Ability to make all necessary repairs on typewriters is now a requirement of graduation from the stenographic courses in Chicago high schools, the final two months of study being devoted to making efficient mechanics of the stenographers.

OUTLETS OF ODD SHAPES MADE FOR IRRIGATION

In the course of much experimental work with irrigation from underground mains, one American fruit grower has developed for use in orchards and fields several interesting outlets. The purpose of these is not only to distribute the water in the desired directions, but, even more important, to check its outrush, which, if unhindered, might wash away the smaller plants. All of these outlets are made of cement, with inlets in the bottom; but they take different forms. Thus, one resembles a small cistern with six radial discharge pipes, and is used to distribute flood water over an extensive field. Another is a simple concrete box, with top removed. Having flowed over the edges of this outlet, the water reaches small fruit trees without disastrous erosion of the soil. In a third form, the water enters a square trough, passes into a round one, and then out.



Form of Irrigation Outlet, with Six Small Pipes to Distribute the Water over a Field. Right: The Water Passes from the Square to the Round Trough

The Water Enters the Round Pipe and Overflows into the Triangular Trough

¶A gigantic gong, audible for several blocks, has been mounted on an outside corner of a New York clubhouse, as an alarm in case the building is invaded by robbers. Wires protected against cutting connect to concealed floor push buttons in all parts of the house.

NEW DESIGN OF REVERSED OARS IS SIMPLIFIED

While oars designed to permit the rower to face in the direction of movement are not new, those developed by a Florida inventor are characterized by the element of simplicity. As in all oars of this type, each consists of two main parts, the handle shaft and the outboard shaft, terminating in the blade. The shafts are joined, near the center, by a hinge. Taking the place of the rowlock is a short guide rod placed lengthwise of the boat. Upon this slides a guide which is connected by hinges to two short, rigid bars. The other ends of these are hinged to the inboard and outboard oar shafts. The oars fold along the gunwales when not in use.

Left: The Position of the Oars at the Beginning of the Stroke. Right: The End of the Stroke

The Improved Bow-Facing Oars Folded to Lie along the Gunwales, Out of the Way of Fishing Lines

¶Of a total of 151,500,000 acres of oil land in Mexico, 87,000,000 being on the Gulf coast, 47,000,000 on the Pacific, and the balance in Lower California, only about 54,000 acres are developed.

Unusual Sightliness, as Well as Comfort for the Passengers, Marks the New Ambulance Trailer for Ailing Animals. It is Padded Inside and Equipped with Slings and Other Veterinarian Facilities, While the Low-Hung Floor Permits the Long End Gate to Form an Easy Loading Incline

NEW ANIMAL AMBULANCE IS A SEMITRAILER

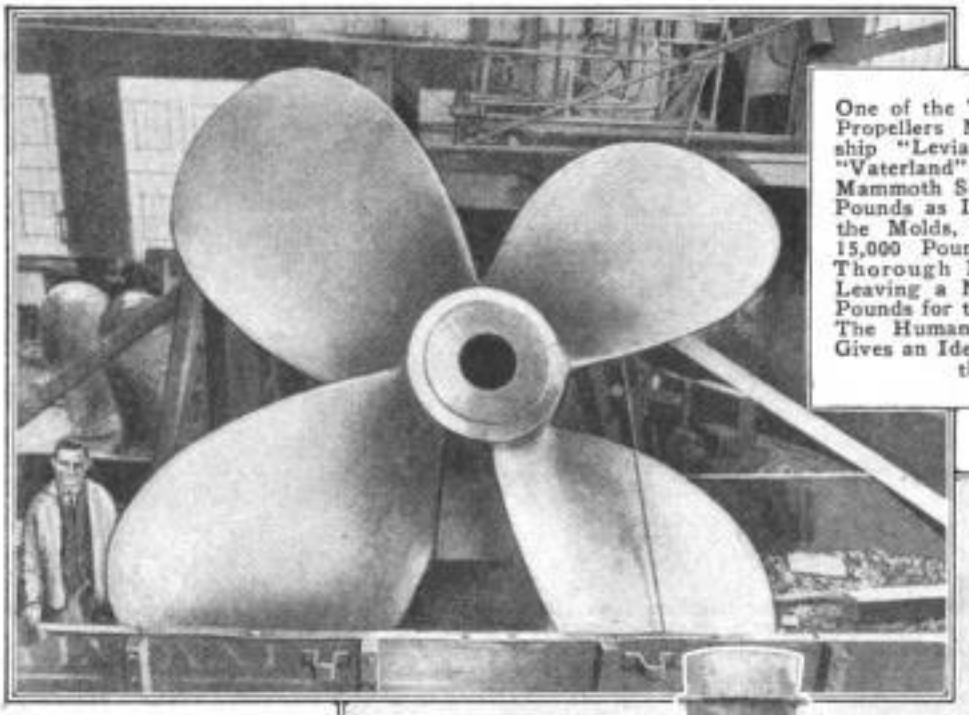
An animal ambulance, recently placed in service by the Massachusetts S. P. C. A., is a semitrailer which may be quickly attached to or detached from the tractor unit. It is equipped with up-to-date devices for the easy handling of large animals, horses, cows, etc., and comfort appliances such as padding and slings render the patients as comfortable as is possible. The vehicle is built with as low a road clearance as is permissible in order that, when the extra-long end gate is let down, it may form a gentle incline up which a lame horse may walk with ease. First-aid instruments and drugs also form part of the equipment.

CONCRETE DEHYDRATING PLANT WORKS ON ENORMOUS SCALE

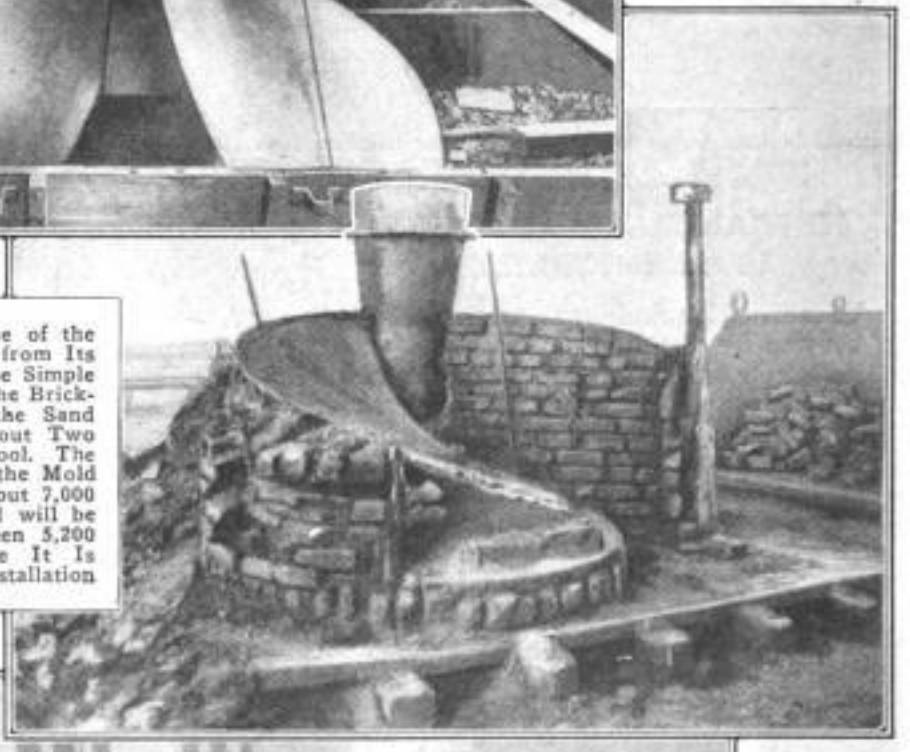
A new dehydrating plant with the enormous capacity of 80 tons of fruit every 24 hours has just been erected in southern California. The building is of reinforced concrete, and is the first of a series of similar plants to be built in the various fruit-growing regions of the United States by a Dutch syndicate. The installation of modern automatic peeling and slicing machinery, and complete systems of conveyors, makes it unnecessary for the workers to handle the fruit at any stage. One feat of the big plant is to dry prunes in four hours, a performance which may assist in saving crops caught by storm during the drying period.

The Growing Importance of Fruit and Vegetable Dehydration as an Industry is Indicated by California's New Concrete Plant, the First of a Series. Automatic Machinery for Peeling, Slicing, and Handling Makes It Unnecessary for the Workers to Touch the Product at Any Stage

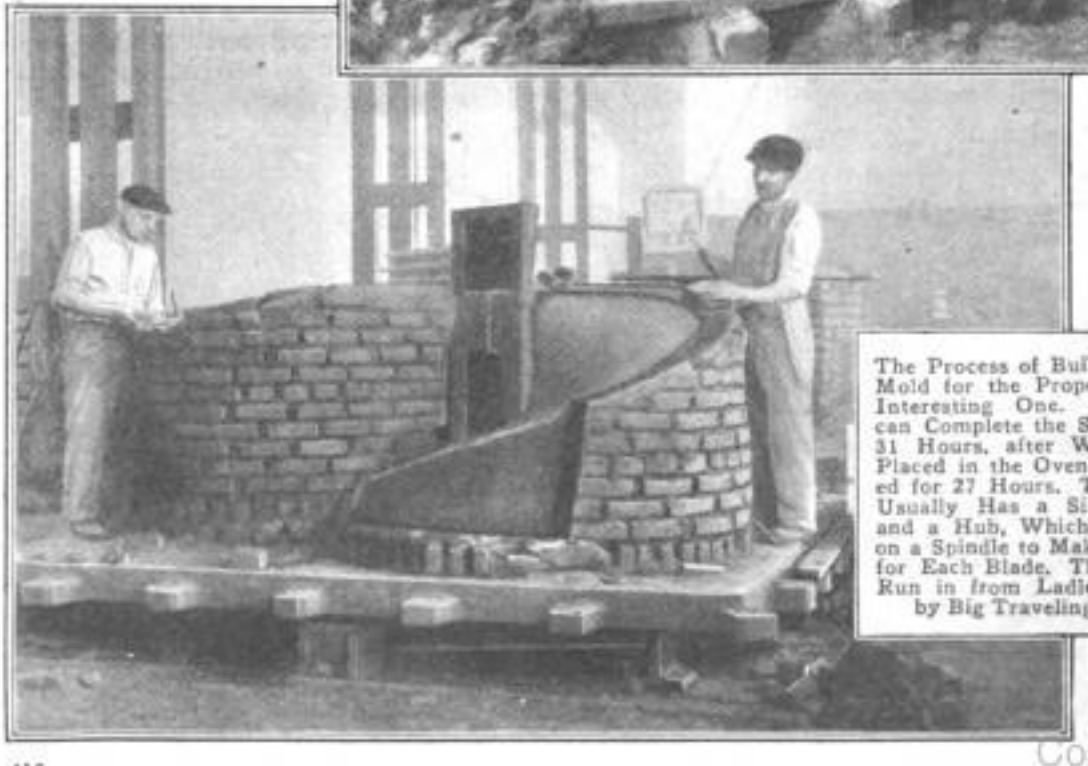
CONSTRUCTING GIANT TURBINES AND PROPELLERS



One of the Two Huge Cast-Brass Propellers Made for the Steamship "Leviathan," Formerly the "Vaterland": Each of These Mammoth Screws Weighed 56,000 Pounds as It Came, Rough, from the Molds, Only to Lose Some 15,000 Pounds of Metal in the Thorough Machining Process, Leaving a Net Weight of 41,000 Pounds for the Finished Propeller. The Human Figure on the Left Gives an Idea of the Great Size of the Casting

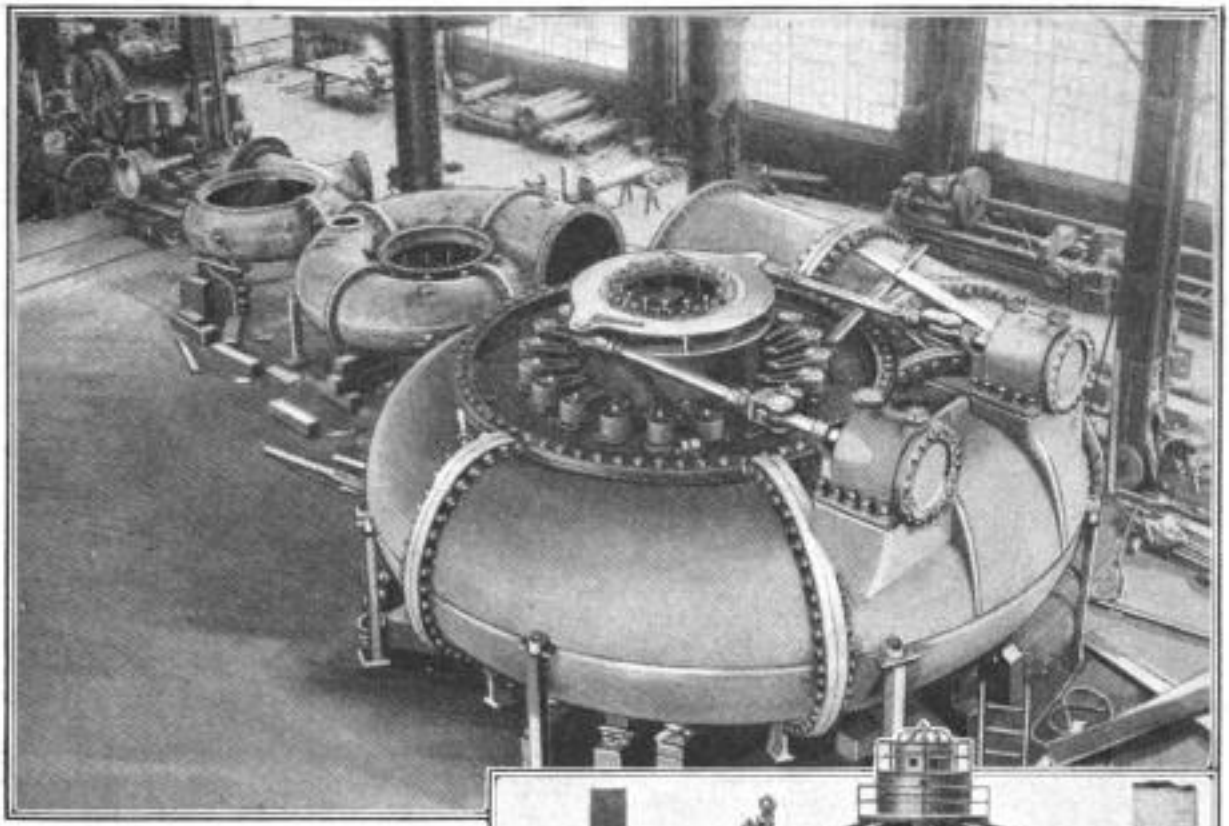


The Brass Casting for One of the Big Propellers is Rescued from Its Specially Built Mold by the Simple Process of Tearing Down the Brickwork and Digging Out the Sand Inside, after Allowing About Two Days for the Casting to Cool. The Screw being Dug Out of the Mold in the Picture Weighs About 7,000 Pounds in the Rough, and will be Machined Down to between 5,200 and 5,500 Pounds Before It Is Ready for Shipment and Installation

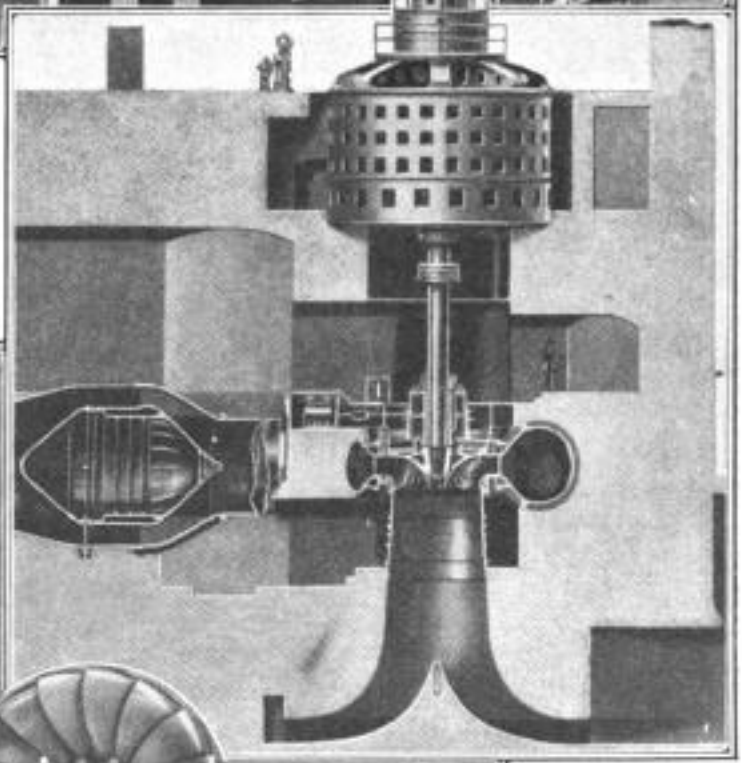


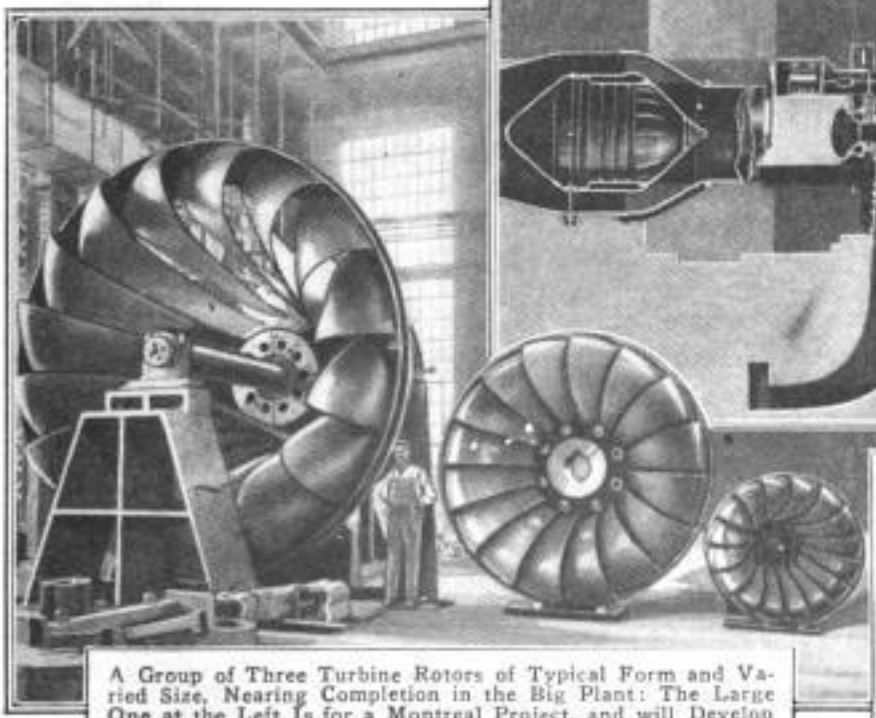
The Process of Building Up a Mold for the Propeller Is an Interesting One. Two Men can Complete the Structure in 31 Hours, after Which It is Placed in the Oven and Heated for 27 Hours. The Pattern Usually Has a Single Blade and a Hub, Which is Turned on a Spindle to Make the Mold for Each Blade. The Metal is Run in from Ladles Handled by Big Traveling Cranes

IN A MODERN SHIP AND ENGINE-BUILDING PLANT



Niagara Falls, of Growing Utilitarian Value, is to Yield Another Part of Its Flood for the Driving of the Big Turbine in the Foreground, Just Completed at an Eastern Ship and Engine Plant, and Rated at 37,500 Horsepower. In the Background Are Smaller Machines Produced in the Turbine Department





A Group of Three Turbine Rotors of Typical Form and Varied Size, Nearing Completion in the Big Plant: The Large One at the Left Is for a Montreal Project, and will Develop 10,800 Horsepower on a 30-Foot Head of Water

The Installation of One of Three 55,000-Horsepower Hydraulic Turbines at Queenstown, on the Niagara River, Several Miles below the Falls: They will Get Their Water from a Point Three Miles above the Falls, through the Welland River and a Canal, Giving a 305-Foot Head. These Record-Breaking Machines will Operate at 187.5 Revolutions a Minute

IDEALIZED STATUE OF AIRMAN COMMEMORATES HIS EXPLOITS

A symbolic statue was recently erected and unveiled to the memory of James Rogers McConnell, an American volunteer in the army of France, who was killed in battle while serving in the famous Lafayette Escadrille. The winged figure is of heroic proportions, and in the likeness of the flier. Poised, as if about to soar aloft, the figure expresses high aspiration and a confidence of greater achievements in the higher realms into which its spiritual prototype has been called.

WIDE WORLD PHOTO

Members of the McConnell Post of the American Legion, Named in Honor of the Flier, Placing Wreaths on the Idealized Statue of the Hero

WOULD REFOREST TEN MILLION DENUDED MICHIGAN ACRES

Among the states whose fame as timber producers has vanished, leaving behind only a vast problem in the disposal of stripped and scorched stump lands, Michigan occupies a position of peculiar interest. Out of a total land area of some 36,000,000 acres, fully 10,000,000 now lie idle, unfit for cultivation and swept periodically by fires that destroy not only the second growth struggling for a foothold, but the very humus of the soil itself. Almost a third of this huge area, covering much of the lower peninsula's northern half, is now in arrears for taxes; a fourth of it has reverted to the state for that reason, and the forfeiture continues at the rate of 3,000 acres a month. Meanwhile, the loss by fire, including soil damage, probably reaches $2,500,000 or more a year.

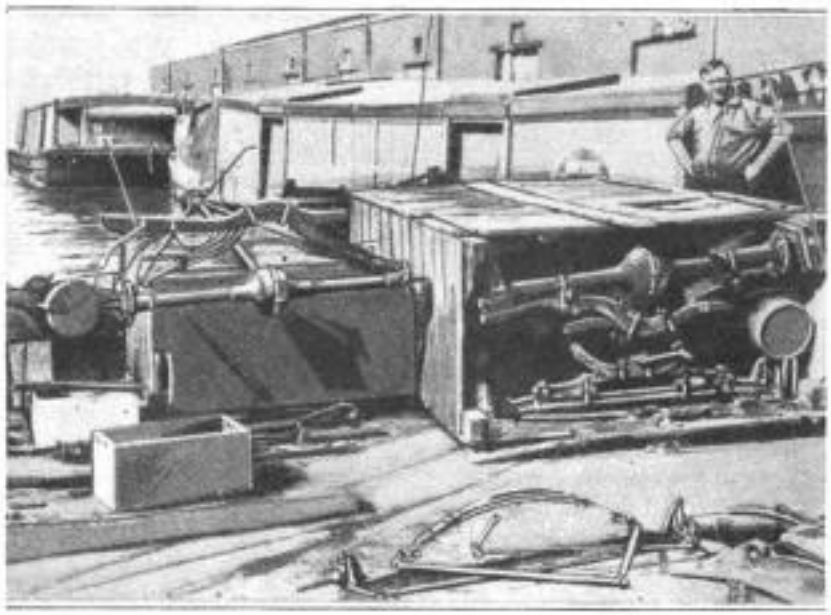
A reforestation plan proposed by university experts provides, first of all, for a comprehensive fire-protection system, at a cost of $550,000 a year, to be met by special taxes of two to five cents an acre. Trees planted immediately would not be marketable for about 60 years, but their value as a crop would exceed their cost before the end of 30 years, and thereafter the gain would be constant. The plan also contemplates the conversion of suitable tracts to farm lands, and lists as its invaluable by-products an increased influx of tourists and sportsmen, and the reëstablishment of vanished industries and communities.

SUEZ CANAL WAR BRIDGE TO BE WRECKED

In accordance with an agreement made at the time it was built, the Kantara bridge across the Suez Canal, connecting the railway lines of Egypt and Palestine, is to be wrecked. It was installed to facilitate communication during the World War, but is considered a menace to peace-time shipping. A tunnel to take its place is to be designed by the French engineer who built the bridge, after a study of similar tunnel problems in the United States.

SALVAGING AUTOMOBILES IN SALT WATER

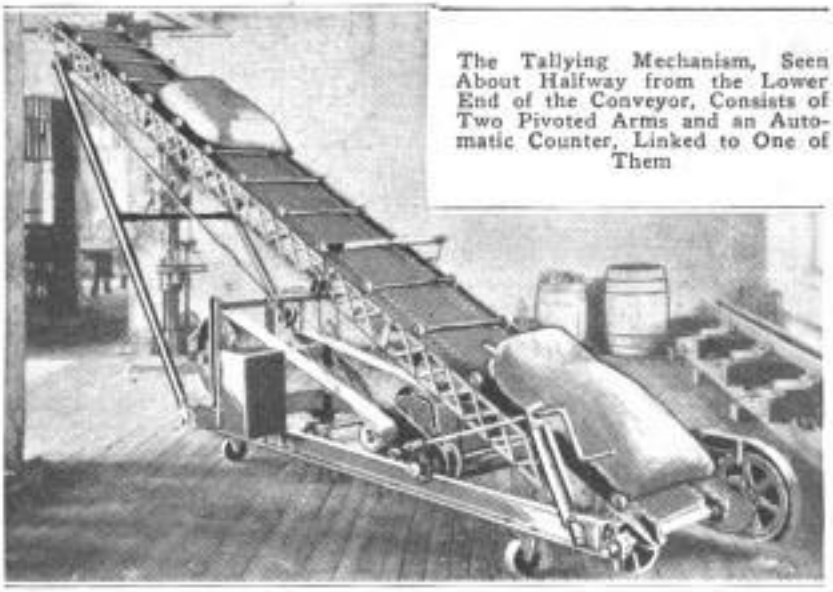
In congested harbors it often happens that barge collisions, or other accidents, result in the loss of valuable freight. If this occurs at an ocean port and the cargo consists of metal goods, the salvaging operation must be begun immediately, or the action of the salt water will damage the goods beyond repair. A recent instance of this kind was the accidental sinking of a consignment of automobiles, packed for export, near a pier in New York Harbor. While the actual raising was accomplished without difficulty, and with little loss of time, the contents of each case was reduced to a conglomerate mass of rusted metal, sand, and mud. The salt water had removed the paint from the various parts, but after being sandpapered and greased, the metal itself was found not too badly damaged for use. Parts containing grease were less injured, and required only a thorough washing in kerosene to make them as good as new. Most of the motor cars—of a small popular make—were rebuilt, fitted with new tires, and sold to buyers who came to the piers in response to the bargains offered. Of course, it was only the chassis that were sold, as the bodies, upholstery, and tops were beyond repair, but the working parts were able to resume their functions in spite of their briny immersion.



The Salvaged Parts of a Shipment of Automobiles That Went to the Bottom of New York Harbor in a Recent Barge Accident: After Sandpapering and Greasing, They Proved Still Serviceable

CONVEYOR MECHANISM COUNTS PACKAGES CARRIED

A tallying mechanism, recently contrived, records each article, no matter what the size and shape, which is carried along a conveyor system. This it does through the action of two transverse arms which extend horizontally, like a double gate, just above the surface of the conveyor, and so across the path of every box or bag conveyed. These arms are pivoted to substantially vertical rods, one of which is linked at its base to a counter, or register. As the arms are pushed aside by each article that encounters them, the counter clicks. When the article has passed, the bars are returned to their first position by springs. In addition to saving the time of a checker, the record of this new mechanism may be valuable in adjusting shortage.



The Tallying Mechanism, Seen About Halfway from the Lower End of the Conveyor, Consists of Two Pivoted Arms and an Automatic Counter, Linked to One of Them

MONEY-ORDER TYPEWRITER SPEEDS POST-OFFICE WORK

Post-office money orders that are wholly typewritten, except for the postmaster's signature, are the product of a new kind of labor-saving machine now on trial in Washington. A modified form of bookkeeping typewriter is used, greatly reducing the possibility of error always present with the longhand system. A sheet containing 10 money-order blanks is inserted in a special holder, together with a carbon and a second sheet. When the first order has been written, and drawn out for removal, the carbon-copy sheet and the second blank are automatically brought into position, the copy remaining in the machine until filled. A dial at the front shows the number of orders issued, and the total amount of cash.

A Bookkeeping Typewriter of the Kind Now in Use in Washington Post Offices for Writing Money Orders and Their File Duplicates: Sheets of 10 Blanks, with Carbon and Second Sheet, are Used with the Aid of a Special Holder

MUD SCRAPED OFF GOATS' FEET BY NETTING IN RUNWAY

In a far-western goat corral, containing 350 of the horned ruminants, the full-time labor of one man has been required to remove the dirt brought in on the feet of the animals, after their daily pasturing in the hills. Now the owner of the corral has remodeled the entrance runway by digging a pit under it, removing 10 ft. of the floor, and substituting a screen of heavy-gauge wire. Scuffling over the mesh, the goat's hoofs are automatically relieved of their clods of clay, and the animals enter the inclosure fairly clean.

WOODEN DERRICK-CRANE JIB IS 135 FEET LONG

What is said to be a remarkable piece of construction in its field is a 135-ft. derrick-crane jib built almost entirely of wood. The big boom is one of two ordered by the British government during the war. The specifications called for a lifting capacity of three tons through a vertical distance of 100 ft., the supporting post of the crane not to exceed 50 ft. in height. These specifications were met and exceeded by an apparatus which weighs less than three tons. Each main longitudinal member, 4½ in. square in the center and tapering to 3½ in. square at the ends, is built up of nine laminations of Oregon pine, glued together with a waterproof glue. The cross struts are of the same material and are barrel-shaped and grooved out on all four sides to reduce the weight. Piano wire, ¼ in. in diameter, having a breaking point of 140 tons per square inch, forms the bracing. The big jib is of a rough barrel-shape; that is, it is large in the center and tapers toward the ends. For ease in transportation and erection, it is so made that it may be separated into halves.

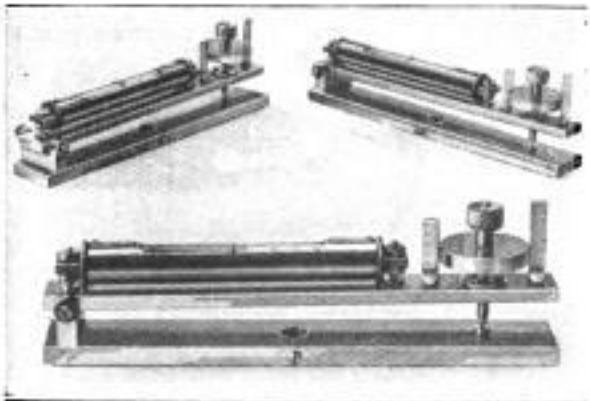
DEPARTMENT STORE PROVIDES PATRONS' APPOINTMENT BOOK

The main entrances of city department stores have been used as meeting places for years. In order that the congestion about its doors might be somewhat alleviated, and also as a measure of convenience for patrons, the management of a store in a northwestern state instituted a customer's "date book." Whichever of the parties to an appointment arrives

first, registers and leaves a notation informing in which of the departments she, or he, may be found. Or, if it is not possible to keep the appointment, a notation to that effect is entered, and the later comer is saved a tiresome wait and ultimate disappointment.

SENSITIVE LEVELS USED IN TESTING SCALES

The vibrations which take place in high buildings, caused by the traffic in the streets below, can be made apparent by means of sensitive levels, recently designed and made at the Bureau of Standards. Tremors cause quick movements of the bubble. The walking of a person on the concrete floor of a room containing one of the levels adjusted on a table, will produce very pronounced effects. The tip of the finger touched quickly to the vial at one end of the bubble will cause it to make a rapid run in that direction on account of the expansion of the glass. The



A Set of the New Levels, So Sensitive That They Respond to the Touch of a Finger

pair of levels composing the outfit were used recently on the levers in the test of a 120,000-lb.-capacity grain-hopper scale at Kansas City, and such was the sensitiveness that the weight of one man added to the scale was sufficient to cause a movement of the bubble through several divisions.

SCULPTOR'S PNEUMATIC CHISEL TAKES LABOR OUT OF ART

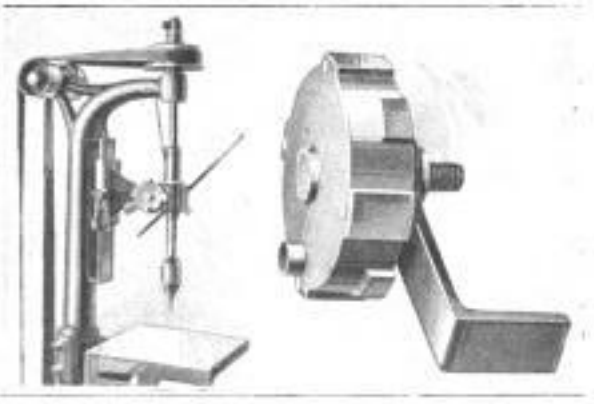
Except for the intrusion of the common air brush, art and applied mechanics are popularly supposed to be wholly antipathetic. It is quite surprising, therefore, to find no less a sculptor than Lorado Taft using a highly modern and mechanical pneumatic chisel for working out a large marble group. With this tool connected to a tank of compressed air, and regulated by a valve under the artist's left hand, the work progresses much more rapidly than with a hand chisel and ma-

An Assistant of Lorado Taft's, Using a Pneumatic Chisel with Interchangeable Points for Chipping Out a Large Marble Statue

let, and is just as accurate and individualistic. Coarse and fine chisel points may be interchanged as the detailing of the subject progresses.

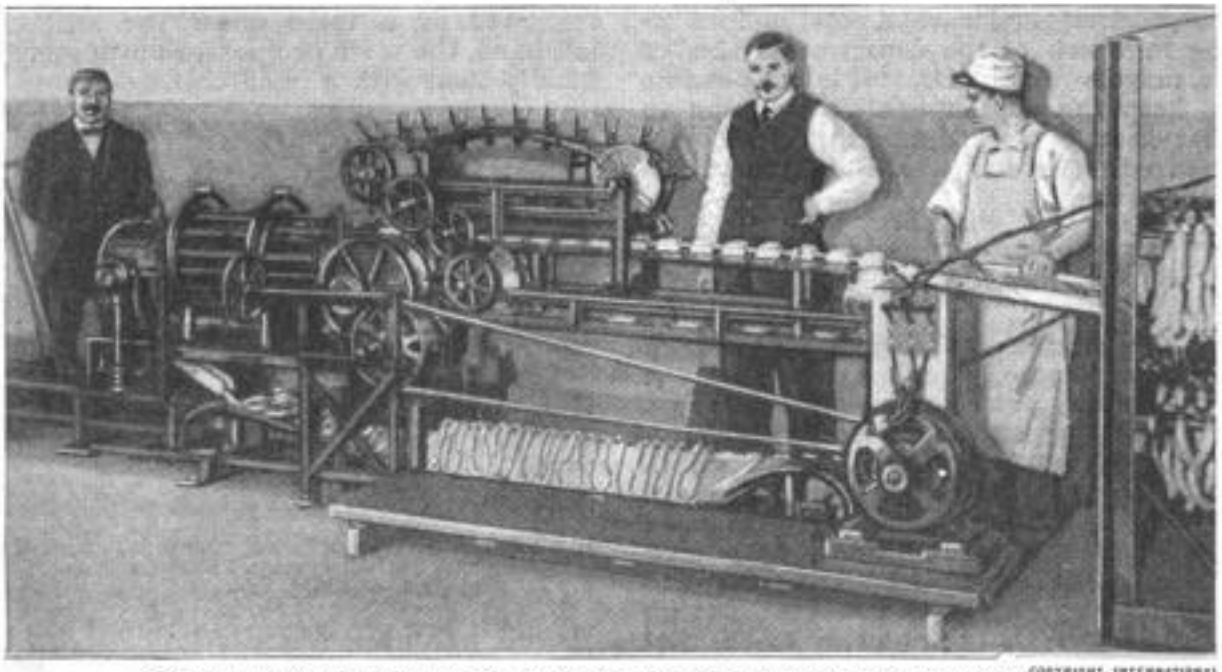
DRILL-PRESS FITTING STOPS SMALL-DRILL BREAKAGE

To prevent the breakage of ⅛-in., and smaller, drills a new accessory for drill presses has been introduced to the trade. The device is attached to the spindle guide in such a way that, at the end of the downward travel of the drill and just before it breaks through the stock, the hand-feed lever comes in contact with a short lever which projects from the device. This offers a resistance to the further travel of the feed lever, with the result that the rate of feed does not suddenly increase at the end of the job but remains the same throughout the operation. It is claimed



Left: The Drill Saver Applied to a Press. Right: An Enlarged View Showing the Lever Which Retards the Speed of the Drill-Press Feed

for the device that it will prevent the large percentage of drill breakage which occurs just as the drill point finishes the cut.

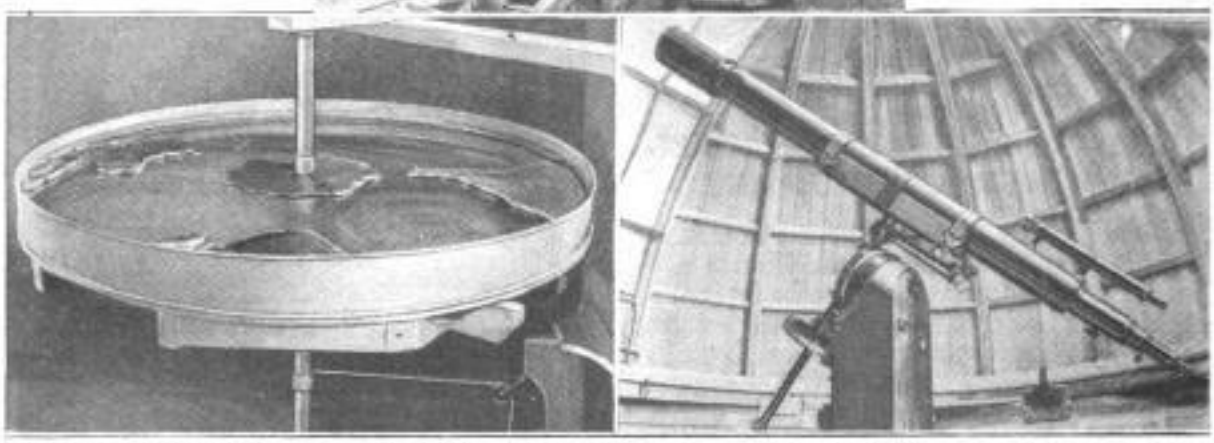


SAUSAGE-TWISTING MACHINE REPLACES FIFTEEN HAND WORKERS

SIMPLE as the mechanical process of twisting sausages into links may appear, the difficulty of designing a machine that would not break the thin casings has forced manufacturers to continue the use of hand labor for the task. Now, however, an Illinois inventor, after undergoing all the conventional trials and vicissitudes, has designed a machine that is declared to do the work with entire success. The stuffed casing, fed into one end of the mechanism, issues from the other in a series of properly twisted links of uniform size and firmness, and the output equals that of 15 hand workers. An electric motor drives the machine.

FORMING OF OCEAN CURRENTS SHOWN BY MODEL

To demonstrate his theory that ocean currents are formed by the rotation of the earth, an amateur astronomer of New Zealand has devised a working model of the southern hemisphere, developed in a plane, so that real water can be used for the oceans. A large round tray, centrally pivoted on a vertical shaft revolved by a cord and weight, contains properly shaped and located wood models of the continents and islands. Its outer rim represents the equator, which is declared by the scientist to act practically as a solid wall. When the tray is rotated, currents form in the water similar to those of the oceans. The inventor of this interesting demonstration has built, at his home, a small but strictly modern observatory, which he has equipped with a high-grade telescope.



Top: The Amateur's Observatory. Left: The Rotating Tray, Representing the Southern Hemisphere, and Demonstrating the Formation of Ocean Currents. Right: The Scientist's Modern Telescope

HUGE ALASKA CRABS TO BE CANNED

BY LAWRENCE WILLIAM PEDROSE

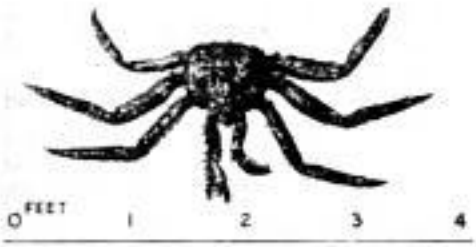
FORTY-EIGHT-inch crabs, weighing 15 lb. each and having enough delicious meat in a single leg to furnish a meal for a hearty eater—it sounds like fiction, but is merely an announcement that a new food resource and industry have been started in Alaska, at Kachemak Bay, near the mouth of Cook Inlet.

The big Alaska crabs have been known to fishermen for many years as a delicacy. They appear in the shallow water near Cook Inlet in vast swarms during April and May, disappear again, and return during September and October, again to depart, probably for the deeper regions of the North Pacific. Conjecture is that the crabs come in to the shallow water to mate and again to spawn, or they may spawn both times they appear. The enormity of their number inclines the fishermen to the belief that the crabs are prolific reproducers.

Last summer a woman living on Kachemak Bay canned 20 cases of the crabs and shipped them south with the salmon canneries' output, to test the possibilities of marketing them. The canned crab meat, it is reported, found ready sale. This year will mark the establishment of a new industry in Alaska—the canning of the giant Alaska crab.

Fishermen operating in Alaska waters, whose home port generally is Puget Sound, have often attempted to refrigerate the crabs, as salmon, halibut, and other fish are preserved, and bring them south to market; but so delicate is the meat of the crab, it cannot be preserved more than two or three days after it is removed from the water. When cooked immediately after capture, it has been known to keep 72 hours. In its natural state, it usually spoils in a day. Canning, too, because of the delicateness of the meat, offered difficulties. It was found that the contents of a can became black where it touched metal. A method has been found economically to preserve the color of the meat, however. A sheet of thin, tough paper between the meat and the metal prevents discoloring, yet does not interfere with the canning process. The crab meat, it is believed, could also be marketed like tamales, and the development of a wrapper or package which can be hermetically sealed is being worked upon.

Alaska crab resources have never been surveyed, but fishermen report that the crustaceans appear in numbers of millions at the bays and inlets along the coast. They are captured by means of spears and are hunted in rowboats in water ranging



The Gigantic Size of the Alaska Crab Is Indicated by the Scale at the Bottom of the Picture

This Brace of Average Specimens Aggregates 25 Pounds, and Each Leg, Nearly the Size of a Man's Wrist, Is Competent to Supply Meat for a Hearty Meal

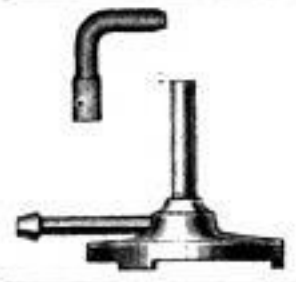
So Plentiful Are the Giant Shellfish in Alaska Waters That the Four Cannery Men Pictured Found No Difficulty in Spearing, from a Small Boat, All the Crabs Their Ship's Crew could Use for Dinner. They are Taken in Water from 6 to 15 Feet Deep

from six to 15 feet, or one or two fathoms, in depth. It is said that in quiet water two men can fill a dory with crabs in an hour. Heretofore the crabs were caught by cannery crews and fishermen merely to vary their diet of beans, bacon, beef, and fish, without giving a thought to their commercial value.

The Leg of a Crab, Which Looks like a Dried Fish in the Picture, may be Eaten Cooked or Raw

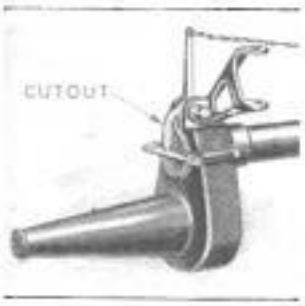
BUNSEN-BURNER ATTACHMENT TURNS FLAME AT AN ANGLE

An Oklahoma dentist has invented a right-angled tubular fitting which slips onto the top of an ordinary Bunsen-burner tube and diverts the flame at a right angle. Used when melting wax, it prevents any of the material from falling into and clogging the small gas passages of the burner mixing chamber. To avoid any chance of leakage between the burner tube and the fitting, the latter is made with a slight internal taper in the bushing which forms the connecting end.



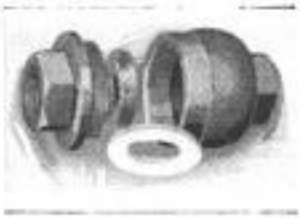
ONE-PIECE CAST-IRON AUTO MUFFLER AND CUTOUT

The conventional type of automobile muffler, built up of a number of sheet-metal stampings, is frequently wrecked by so-called "muffler shots"—accumulations of live gas which are fired by the following hot-gas stream. With the aim of abolishing this annoyance, and of supplying at the same time a solid one-piece device with no parts to work loose and rattle, an eastern manufacturer has produced a cast-iron muffler. The device may be had with or without a cutout. The latter is arranged in such a way that a muffler shot will cause it to open and relieve the pressure. As the device contains no baffle plates, back pressure is reduced to a great extent.



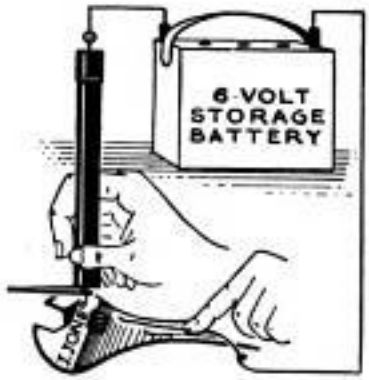
NEW COLD-WATER CHECK VALVE HAS RENEWABLE SEAT

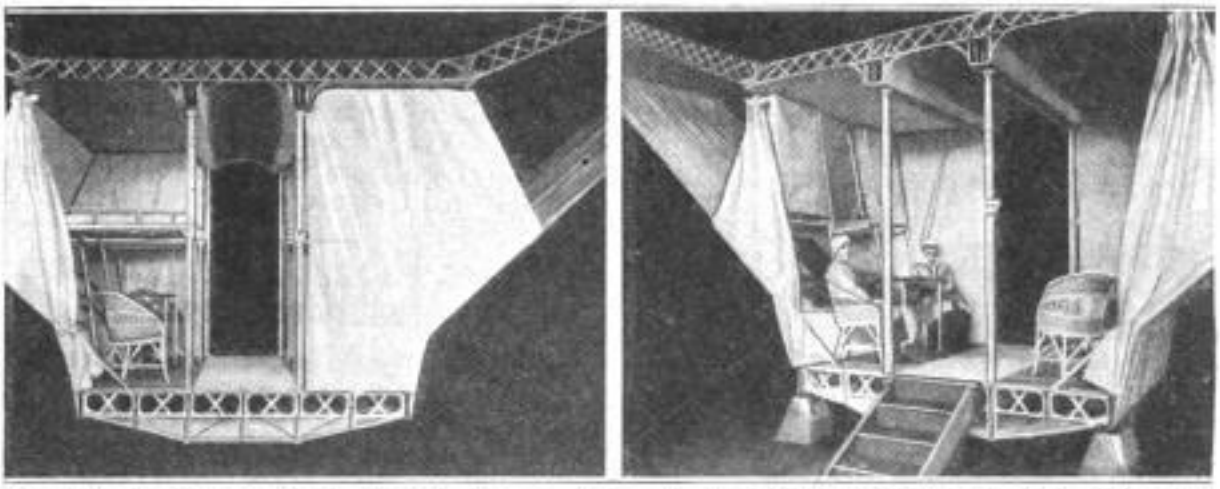
The soft-rubber seat in an improved cold-water check valve can be quickly replaced when it becomes worn. It also has the effect, according to the statement of the manufacturers, of rendering the valve absolutely noiseless in operation. Another claim is that, owing to the quick action of the conical-seated valve, leakage is impossible, as the valve closes instantly the water pressure falls and before the reverse movement can begin. The new valve works satisfactorily in any position or at any angle at which it may be placed.



ELECTRIC-ARC PENCIL BURNS DESIGNS INTO METALS

A simple arc-etching device, which may be used to burn an owner's name, or any other design, into tools or any piece of metal, consists of an electromagnet and a steel vibrator spring, to which is attached an arcking point made of copper wire. One end of the magnet winding is attached to the vibrator. In use, the device and part to be etched are connected, in series, with a six-volt battery. Immediately the copper point touches the work, the vibrator acts and breaks the circuit. This occurs at the rate of several thousand times a minute, and at each break a small but intensely hot arc is drawn from the copper point, so that in moving it over the work a burned-in pattern results.





Left: Sleeping Quarters in the Airship's Passenger Car, with One Side Curtained and the Other Opened to Show the Bunks. Right: The Room Arranged as a Day Cabin, with the Bunks Folded Away

AIRSHIP'S PASSENGER CAR HAS SLEEPING BERTHS

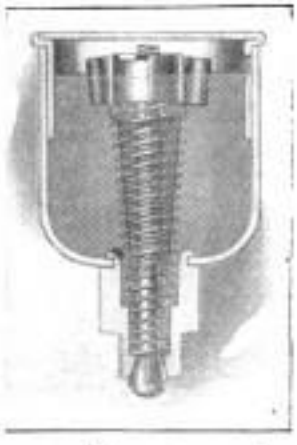
At an airship works near Glasgow, Scotland, is now being completed what will probably be the first passenger-carrying airship in Britain. It was here that "R-34," which visited the United States in July, 1919, was built in the same shed. The new ship, designated "R-36," is somewhat similar, in general dimensions, to "R-34," but has a slightly increased gas capacity. This extra capacity will give an addition to the useful lift, and this is being utilized to provide accommodation for a fair number of passengers.

The car is attached to the underside of the main structure of the ship, and is arranged at about the center of the length, in such a way that the passengers will feel the movements of the ship to a minimum extent, and every attention has been paid to their comfort and convenience. Each has, much in the manner of the sleeping car on the American railways, a berth and a chair. The window space is so arranged that each passenger can view in the greatest comfort all the country over which the ship may be passing. Through the night, when the beds, which fold up against the wall in the day, are let down, the chairs may be pushed back and the hinged table top lifted up to cover the windows, bringing into view and usefulness a small mirror fitted on its underside. All modern conveniences are being provided in the way of lighting, heating, and lavatory accommodation, and these, along with a first-class table, will enable passengers to be cared for as in any first-class steamship or railway train.

One advantage, it may be pointed out, of the airship as against the airplane, is that the passengers have a greater amount of liberty to move about and will not get cramped by having to remain in the same position throughout the flight. This really signifies that passengers could undertake a flight of 24 hours, or even more, in the airship without feeling any ill effects. This airship is also being fitted with the very latest arrangements for mooring in the open. Special devices are arranged on the bow of the ship to enable it to be coupled up to a mooring mast, and all its service installations, such as gas, water, and gasoline, have the mains arranged so that they can be recharged from the mooring mast while the passengers are being embarked or disembarked at either general terminals or intermediate stations.

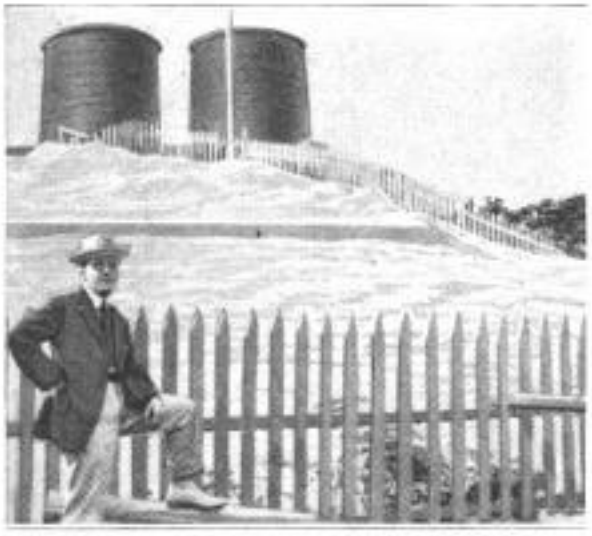
OIL CUP HAS VALVE OPENED BY MACHINE'S VIBRATION

Vibration is the principle depended upon to open the valve of a new form of oil cup for autos, tractors, and other kinds of machinery. A vertical rod, extending upward from the valve, carries an adjustable weight on its upper end, and is normally held stationary and central by a spiral spring inclosing it. With the machine in motion, the rod acts as an inverted pendulum, vibrating enough to allow the escape of oil past the valve in a quantity automatically proportioned to the need.



PRIMITIVE WATER-SUPPLY SYSTEM USED IN BERMUDA

The natives of Bermuda depend for their water supply upon the rain caught on the roofs and stored in cisterns. This



Trenches are Cut in the Coral Hillsides of Bermuda, and the Rainwater Collected by Them is Pumped into Large Storage Tanks

method being inadequate to the needs of large establishments such as hotels, restaurants, etc., these use a somewhat more elaborate, though still primitive system. Trenches are cut in the hillsides of coral, of which the whole island is composed, and given a coat of whitewash. The water from many trenches is collected in large reservoirs at the bottom of the hills and pumped into storage tanks. As the water is of exceptional purity and free from organic matter, it keeps fresh and sweet for years.

HANDY GARAGE SERVES STEAMER PASSENGERS

At a new steamer terminal just completed at Wilmington, Calif., and used by people going to Catalina Island to spend week ends, facilities have been arranged so that passengers can drive to the dock in their machines, and leave them in the building itself, from which they board the steamer. When they return to the mainland, they step from the boat to their automobiles and drive away in comfort.

A Steamer Terminal That Includes a Garage for the Autos of Catalina Island Excursionists

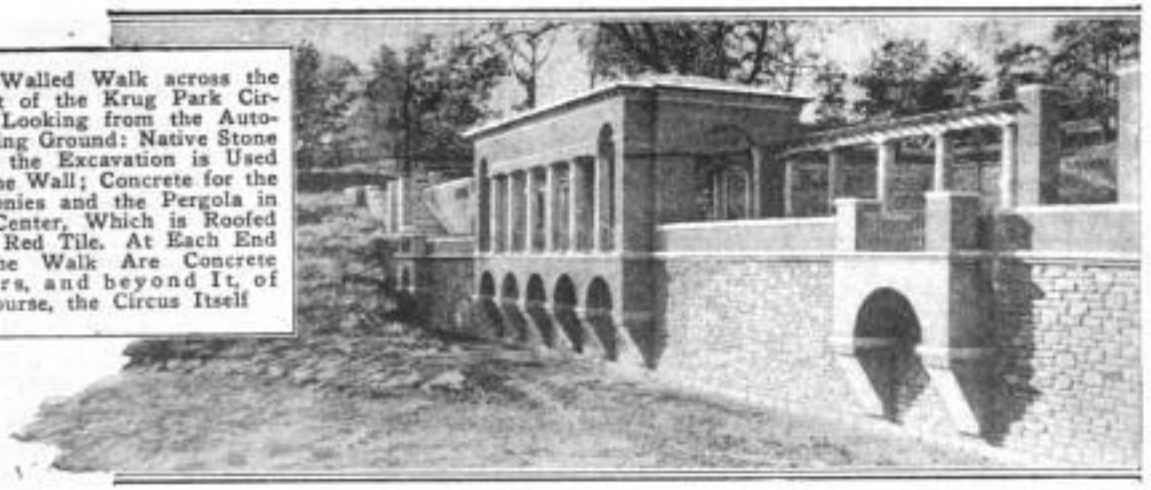
MACHINE TOOLS ARE HARDENED BY NEW ELECTRIC PROCESS

In a new electric process of hardening cutting tools, the piece to be hardened is immersed in an electrolytic bath and connected to the negative side of an electric power line, thus forming a cathode. Heavy current passing through the circuit quickly raises the tool to a red heat. Fine cutting edges are coated with a graphite paste which protects them by keeping them cool and also assists in the hardening, as the carbon present in the paste is absorbed by the steel.

UNUSUAL PARK PLAYGROUND BUILT IN CIRCUS FORM

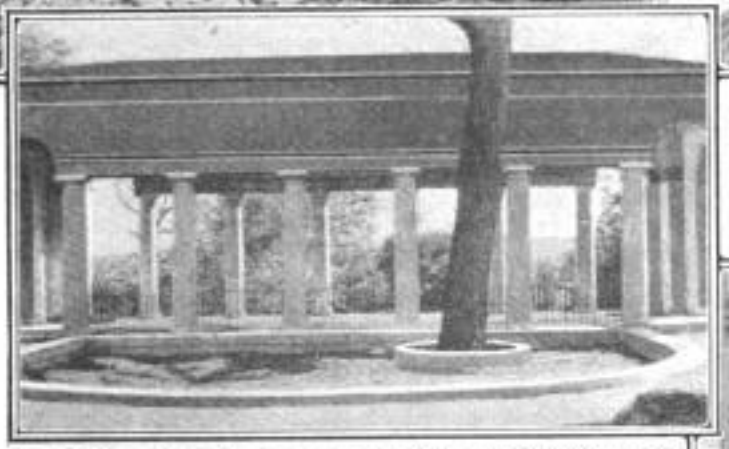
One of the most interesting and unusual of playgrounds has recently been completed in Krug Park, St. Joseph, Mo., after about two years of construction work. Natural advantages were utilized in the shape of a convenient hillside, an old and attractive oak tree, and a local supply of a yellowish-white stone. Out of the hillside a semicircular arena was excavated, and the stone removed was used to build a wall at the back. Across the diametrical front of the half-circle a broad walk was laid, reached by descending stairs at each end, and passing at its center through a concrete pergola, roofed with Spanish red tile, hung with vines, and illuminated at night by indirect lighting.

Just inside the walk and opposite the pergola, is a semicircular wading pool, 20 ft. long and 1 ft. deep, built around the oak tree, which is protected by a concrete curb. In the center of the back wall is a large fountain of native rockwork, while at the left a little stream cascades down a concrete stair. The circus thus artistically formed is entered by winding stairways and an interesting tunnel, and equipped with all the playground paraphernalia of swings, chutes, and tables. On the lower ground, outside the walk, is a parking space for autos. In view of the attractiveness and value of the finished work, the cost, about $30,000, is considered very moderate.



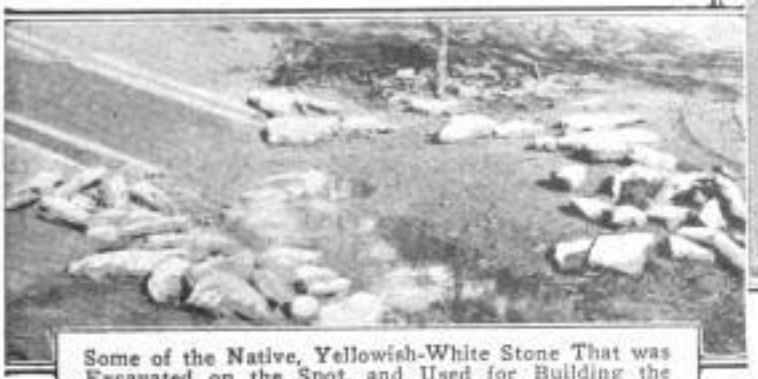
The Walled Walk across the Front of the Krug Park Circus, Looking from the Auto-Parking Ground: Native Stone from the Excavation is Used for the Wall; Concrete for the Balconies and the Pergola in the Center, Which is Roofed with Red Tile. At Each End of the Walk Are Concrete Stairs, and beyond It, of Course, the Circus Itself

A Panorama of the Circus during Its Construction: The Wall in the Background was Built of Stone Dug Out of the Center, and Contains a Rockwork Fountain. At the Left Is the Walk That Crosses the Diameter of the Circus



The Wading Pool, Semicircular and Concrete-Rimmed, Is 20 Feet Long but Only One Foot Deep, for the Safety of the Littlest Ones. It Abuts on the Pergola, and Is Curiously Built Right around the Old Oak Tree

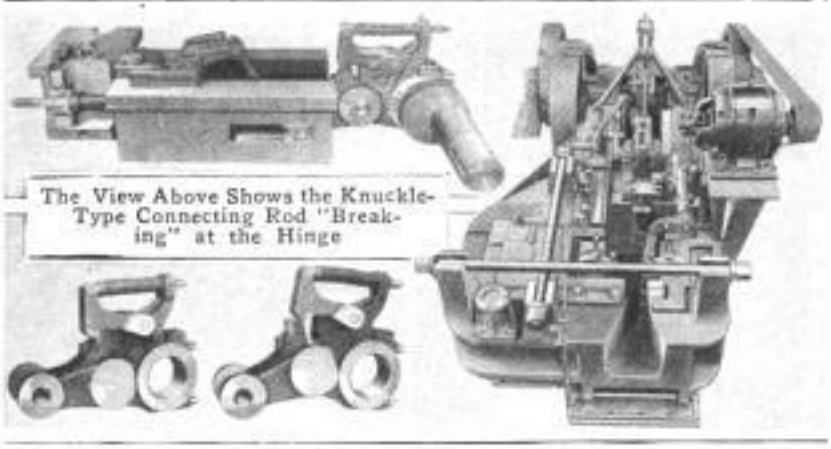
A View along the Broad Walk and into the Concrete Pergola, the Five White Arches of Which are Illuminated at Night by Indirect Lighting: It is Now Hung with Vines, and beneath It Is a Comfort Station of Modern Sanitary Appointment



Some of the Native, Yellowish-White Stone That was Excavated on the Spot, and Used for Building the Walls, is Seen Here. Considerable Commercial Value has been Found in This Material, So Fortunately Supplied by Nature, and Its Use Largely Accounted for the Moderate Cost of the Circus

HEAVY UPSETTING PRESS HAS DELICATE ADJUSTMENT

The most noteworthy point in the design of a new upsetting forging press is the method of suddenly relieving the die,



Left: The Knuckle-Type Connecting Rod in Detail. The Off-Center Arrangement of the Hinge is Plainly Shown. Right: The Complete Press

the work, and the machine of pressure the instant the upsetting operation has been completed. This is accomplished by means of a knuckle-type connecting rod, which is hinged at a point slightly off center toward the crank bearing. The hinge pin is also slightly off center above the horizontal line through the two end bearings of the connecting rod. The result is that this part tends to buckle, or fold up, as soon as an end pressure is brought to bear upon it by the crank. This tendency is counteracted by a spring-controlled latch, which holds the knuckle in rigid alinement until it sustains a pressure predetermined by the tension of the control spring. As this tension is adjustable, it may be set so that the connecting rod will trip the latch and double up as soon as that pressure is reached which it is calculated the die will safely withstand. As the rod is pulled back by the crank, it straightens out and is again locked by the latch. The manufacturers affirm that the spring adjustment is so delicate and the part so positive in action that, once correctly set to the pressure required on a job, the machine may be driven to its full capacity without danger of damage.

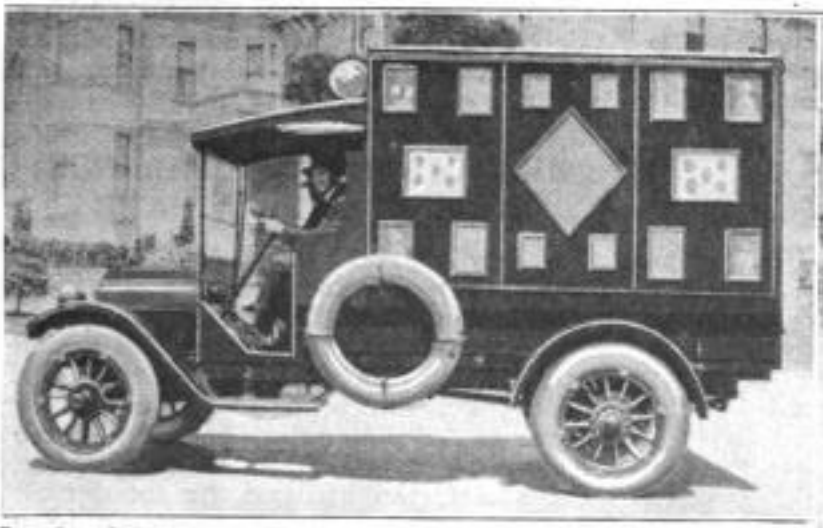
WINTER REFUGE OF MOOSE BECOMES TRAP

In the forest depths of northern and western Canada where dwells the lordly moose, the animals in winter tramp out small stretches of territory in the woods, keeping the snow underfoot in a hard-packed condition. They are thus enabled to move at ease over a limited space and browse from the trees around. The places so made are known as "yards," and from three to seven or eight animals generally are found in them. Beyond the walls of the yard, the snow lies from 3 to 8 ft. deep, a treacherous surface upon which the moose only ventures when hard pressed by wolves, or by men and dogs. Once out of the yard and forced to move through the snow, often belly-deep, the moose soon tires and is an easy prey.

An Unusual Photograph of a Cow Moose at Bay in One of the North-Woods "Yards" That the Great Animals Prepare in Winter by Treading the Snow to a Hard Surface

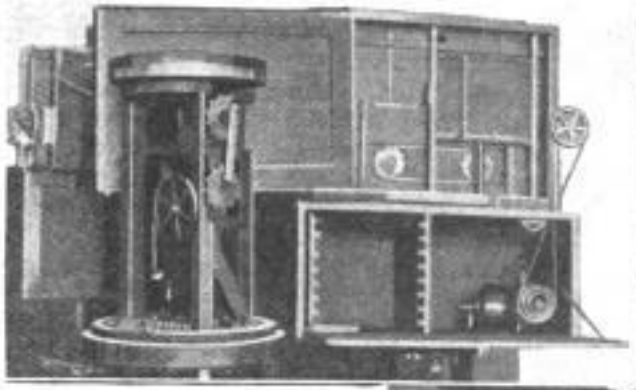
A cow moose standing at bay in safe footing is shown in the photograph. Though without horns, the cow can deliver a dangerous blow with the front feet, striking out boxerlike with an outward and downward-sweeping blow which would seriously injure any dog coming in contact with the hoof. The Huskies evidently were fully aware of this, as they kept well to the side, holding the cow till their owner came on the scene and took the picture.

MOTORIZED STUDIO DISPLAYS NEW PHOTO SYSTEM

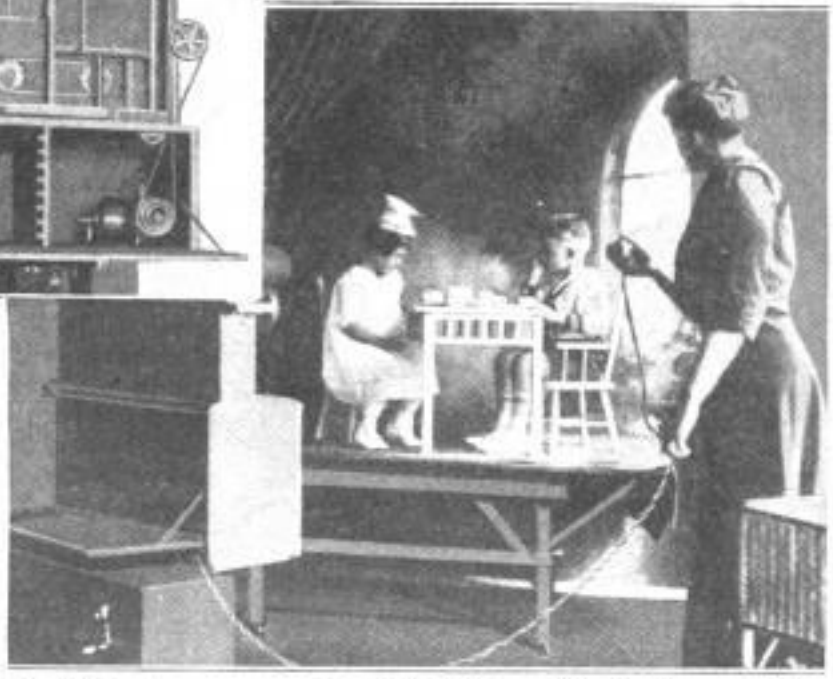


Samples of the Work Done by the New Photo Process are Displayed on the Sides of the Truck Body, Which Contains the Studio and Dark Room

The End Gate of the Truck, with Its Folding Ladder, Forms an Annex to the Studio, and Supports the Motor-Driven Revolving Chair



The Motor at the Right Drives the Camera Mechanism, While the Gear Arrangement at the Left Permits the Subject's Chair to be Either Revolved or Oscillated as Successive Exposures are Made

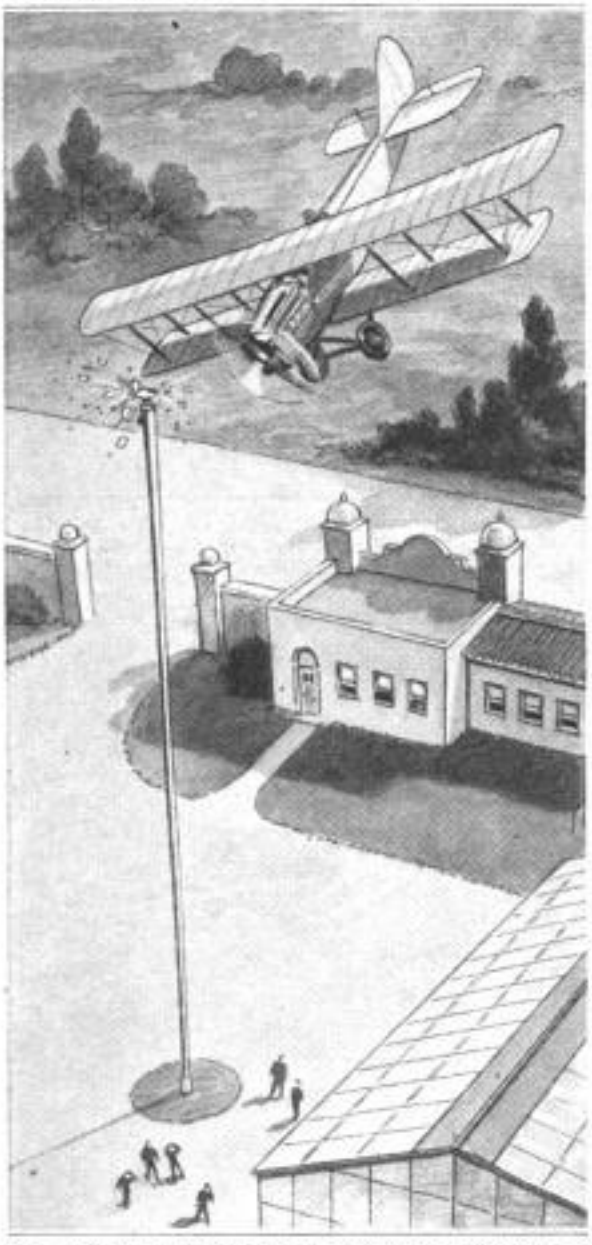


Even Single Exposures are Made Electrically, and the Equipment of Furniture, Backgrounds, and Screens Permits Artistic Grouping Even in the Limited Space Available

Not content with the novelty of a complete photographic studio on a motor truck, a California inventor has introduced innovations that make the picture apparatus itself remarkable in both operation and results. The big camera, worked automatically by an electric motor, takes a series of any number up to 400 pictures on a single large plate, and those the subject selects are printed in a panel strip. That they all may be different views, the subject is seated on a revolving stool, also worked by an electric motor, and making either complete rotations or oscillating half-turns. The operator controls both camera and stool with a push button on a cord. With the camera inside the truck body, the stool is mounted on a platform that slides out at the rear, and is supported by a small ladder. A background and a diffusing screen also fit into a rack on the platform. A dark room back of the driver's seat, and a 30-gal. water tank above it, enable the exposures made to be finished in a few minutes, and delivered to the waiting patrons.

STUNT FLIER BREAKS GLOBE OF LAMP WITH WING TIP

As illustrating the remarkable precision with which an airplane may be handled by an experienced pilot, one of the



One of Ormer Locklear's Last Stunts: Breaking a Light Globe with the Tip of His Airplane Wing, to Demonstrate His Control of the Machine to a Skeptical Movie Man

last exploits of the late Ormer Locklear is unusually interesting. The skepticism of a motion-picture man toward certain statements made by the flier finally led to a wager, the famous aerial performer agreeing to knock an electric-light globe from the top of a tall flagpole on the studio grounds with the tip of his plane wing. Ascending about 500 ft., and circling several times around the pole, the airman suddenly "zoomed" down at a sharp angle, and clipped the globe from its lofty support as neatly as a golf ball is driven from its tee. Then, soaring safely away as the shattered glass fell, he landed, collected his $100 winning, and paid the cost of a new globe.

NEW LABORATORY BALANCE MOST SENSITIVE MADE

A new balance has been developed which is sensitive to extraordinarily small weight differences. The beam consists of a simple frame constructed of small quartz rods. Instead of resting on a knife edge, the beam is suspended by means of very fine quartz fibers which are secured to a projection on either side. The objects weighed and the counterbalancing weights are also suspended from the arms by quartz threads of microscopic thickness. The whole is mounted in an air-tight case. The motion of the beam is determined by a small mirror mounted upon it, reflecting the image of an illuminated filament onto a distant graduated scale, a window being provided in the case for this purpose. The stop for lifting the beam, when it is not in use, is operated by rotating an armature on the inside of the case by means of a magnet-carrying fixture on the outside.

Differences in weight are obtained by various methods. Very small differences are calculated from the deflections of the beam observed by means of the mirror. Sometimes a small hollow glass ball is used which is suspended from one arm, and the weight is determined by adjusting the pressure of the air until its buoyant effect on the ball establishes a balance. With this method, the weight is determined from a reading of the manometer, connected to the case. In other instances, a "magnetic weight" is employed, consisting of a small steel needle inclosed in a silica jacket which is suspended from one arm of the balance and is acted upon by an adjustable magnetic field.

It is stated that the sensibility possible with this instrument is one ten-millionth of a milligram. This is a quantity smaller than would be obtained by dividing a pound into a million equal parts, and then subdividing one of these parts into another million equal parts.

The University of Wisconsin, through its extension division, has inaugurated a short intensive course for electric meter men, or those who wish to engage in this work.

BIG HYDROELECTRIC SYSTEM FOR NORTHERN INDIANA

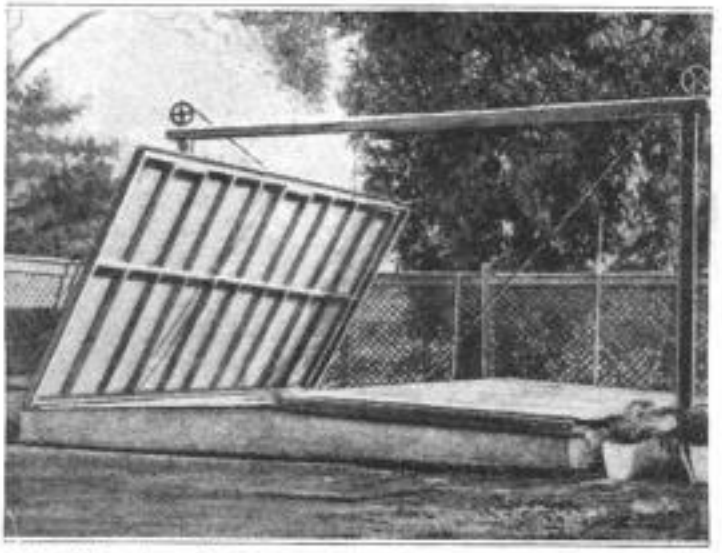
One of Indiana's most picturesque streams, the Tippecanoe River, scene of a famous battle in 1811 and favorite resort of the Hoosier bass fisherman, is about to sacrifice some of its pastoral beauty to the urgent demand for industrial power. No less than nine sites for dams have been optioned, five of them within less than 20 miles, between Monticello and the mouth, and others near Buffalo, Pulaski, and Winamac. A minimum total of 20,650 kw. will be generated by these plants, and distributed on a 200-mile line to Frankfort, Lafayette, Kokomo, Logansport, and other cities. High banks, reducing the overflow damage, make the Tippecanoe a particularly desirable power stream, and it is computed the cost per horsepower will be lower than that of coal at the mine. Later the Kankakee and Yellow rivers may be brought into the scheme, which involves the investment of some $3,000,000 for the Tippecanoe project, and about $4,000,000 more for the larger development.

METAL THIMBLE REINFORCES CORNERS OF AUTO CURTAINS

The present method of suspending automobile side curtains from upright rods often results in the supports punching holes through the curtain corners. To obviate this to as great an extent as is possible, simple, quickly attachable sheet-metal thimbles are offered. These are made in such a way that the rod slips through a short tunnel, which serves to keep the device firmly in place, and bears upon the underside of the horizontal portion of the thimble instead of upon the fabric of the curtain. It is also claimed that the stitching is relieved of all strains.

HOTEL HAS ITS OWN HOTBED OF CONCRETE AND IRON

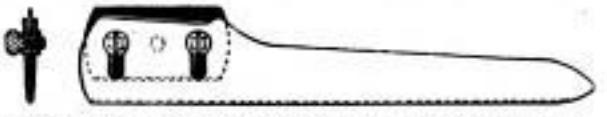
That he may have an independent supply of out-of-season fruits and vegetables, the manager of a western hotel has constructed his own forcing house, or hotbed. Built below ground level and with walls of concrete, the bed is easily kept at the required temperature by a few hot-water pipes. The roof, of two-by-fours and galvanized iron, is divided into two sections, each hinged and counterbalanced that it may be raised by one man.



This Underground, Concrete Forcing House Supplies Out-of-Season Fruits and Vegetables to a Western Hotel. The Roof Sections are Counterbalanced So That They may be Lifted by One Man

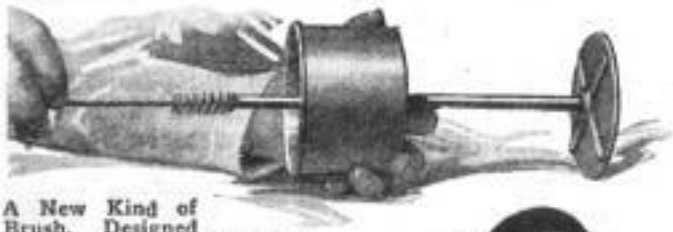
HANDLE FOR MAKING KNIFE FROM SAFETY-RAZOR BLADE

A newly invented paper cutter has the handle slotted in such a way that a standard safety-razor blade may be inserted into it and locked by screws, which are so spaced that they pass through the holes found in most blades. This makes a keen knife which is fine for ripping, pencil sharpening, and other small work of a like nature. When the tool is used as a paper cutter, or laid aside, the screws are loosened allowing the blade to drop into the recess to such a depth that its edge is protected.



Right: View of a Safety-Razor Blade Fitted into the Handle of a Paper Knife. Left: The Blade Sinks into the Recess When Not in Use

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



A New Kind of Brush, Designed to Clean the Usually Neglected Tube of a Coffee Percolator

New Tips are Put on Shoe Laces by a Folding Combination Tool That Acts Also as a Buttonhook and a Shoehorn

A Socket Attachment, for Use with an Electric Iron, Indicating Whether the Current Is Off or On

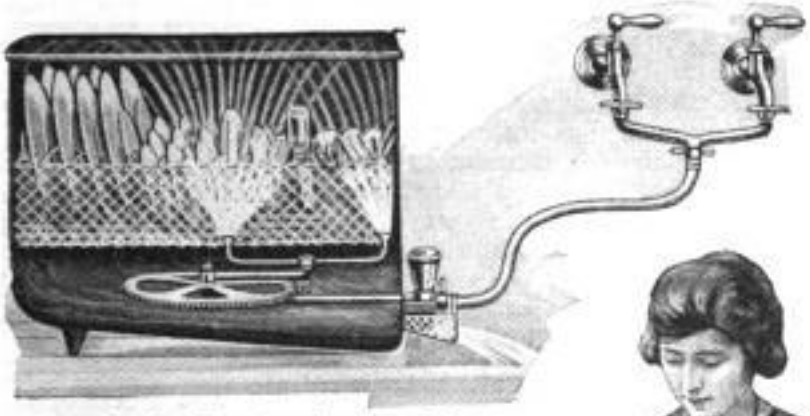
An Improved Electric Iron, Seen in Use on Delicate Work Above and in Detail at the Right, Contains a Thermostatic Control That Regulates the Temperature and Prevents Overheating

Made like a Hypodermic Syringe, a New Meat-Salting Instrument Injects a Solution of Salt Clear to the Bone of a Pork Shoulder or a Ham, Keeping It from Spoiling

An Aluminum Egg-Poaching Utensil, with Hinged Rings That Keep the Eggs from Spreading

The Spiral Wire Crank, Pivoted in the Center of the Flour Sifter, Works Easily and does Not Wear Out the Screen

A Drawer with a Cover and Folding Rack That Convert It into a Writing Desk, Is a Feature of an Improved Library Table



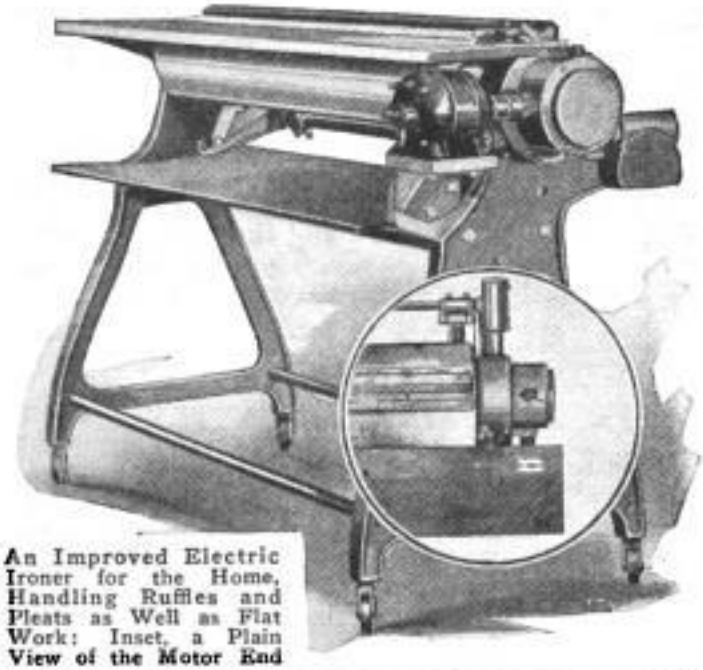
Simplicity Is the Keynote of a New Dish-washing Machine, Which is Attached Directly to the Faucet and Operated by the Water. It will Also Clean Vegetables

A New All-Metal Pot, That Has a Number of Interesting Features, is Now Offered for the Production of Drip Coffee in Home Quantities

Up-to-Date Homes Now can have Their Eggs and Cream Beaten Electrically by a Utensil That Contains Its Own Motor

A Teakettle Bail with a Broad Metal Shield Protects the User's Hand from Scalding Steam When the Kettle is Tipped, as Above; and is Easily Attached, as at the Right

Bears, Ostriches, and Other Interesting Creatures Grace the Enameled Sides of a Phonograph Now Made Particularly for Nursery Use

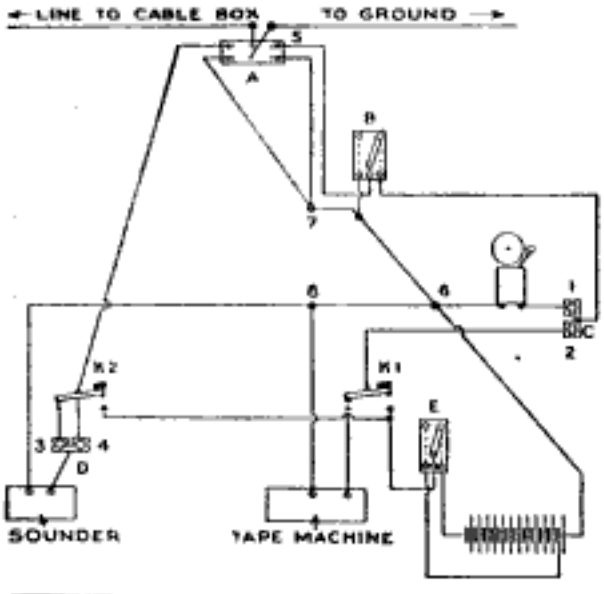


An Improved Electric Ironer for the Home, Handling Ruffles and Pleats as Well as Flat Work: Inset, a Plain View of the Motor End

TELEGRAPH-SWITCH ARRANGEMENT USED IN FRANCE

By SAMUEL W. BEACH

IN telegraph offices in France where, during the war, American and French operators worked together, a peculiar situation had to be met because the French received by tape machines while Americans received entirely by sound. At the Franco-American telegraph office on the Island of Pen Mane, the arrangement illustrated herewith was installed, whereby a two-pole, double-throw switch, when thrown to the left, cut in an American sounder, and when thrown to the right brought into play a French tape receiver. Plug switches are a favorite style of switch used in Europe. The hook-up was also designed to furnish means by which the French might practice receiving by sound when the main line was not in use.



Wiring Diagram of the Switching Arrangement That Enabled an American Telegraph Sounder or a French Tape Receiver to be Used at Will

When at rest, the main switch was to the right, or French side, and there was a plug at 1 of the switch C. The switch B was always to the right, excepting when it was desired to ground the line because of lightning.

Remembering that the line was an open-circuit affair, when a distant station closed his key to call, his current passed through the main switch at 5; through the switch B; the switch C through plug 1; through an ordinary electric bell, and out to the ground via connections 6 and 7. The bell called the operator.

If the calling station was French, the operator changed the plug in switch C from 1 to 2. This cut out the bell and cut in a tape receiving machine through the back contact of the key K1, and out via connections 8, 6, and 7 to the ground. To "break," the receiving operator closed the key K1, which cut out his tape machine, but cut in his main-line battery through switch E, which is to the right. The pathway through the battery then leads through connections 6 and 7. If the calling station was American, the operator threw the switch A to the left, completely cutting off the French apparatus, excepting the main-line battery. The plug in switch D was normally in 3, so that his sounder or relay was cut in through the back contact of the Key K2, and out to the ground through the connections 8, 6, and 7. Closing his key threw out the sounder but cut in main-line battery via the front contacts of the French key.

By keeping the main switch to the right and plugging the switch D at 4 instead of 3, and then throwing the switch E to the left, a complete one or two-cell battery and learner's set was provided through the lever of the key K2; the plug D; the sounder; connection 6; the first two cells of the main battery, and the switch E, to the front contact of key K2. This arrangement so pleased the French telegraphers that they soon got busy and learned how to receive by sound.

RAILROAD DITCHING MACHINE USED TO LOAD DEAD CATTLE

How to quickly dispose of 155 head of cattle, which had been killed by a fast train on a western railroad during a blinding blizzard, was a problem that was solved by the division officers in a novel manner. A big ditching machine and a train of gondola cars were rushed to the scene, and within three hours of the time it left headquarters, it was back with three gondola loads of carcasses. A chain was substituted for the bucket of the machine and fastened around one leg of each animal, and the derrick man, with a dexterous flip of the big boom, placed every carcass in the cars exactly where he chose. This was considered something of a feat as the boom was not long enough to reach to the end of the last car, and the load had to be swung into place.

RESILIENT STEEL GEARS ARE SELF-LUBRICATING

An English engineering concern has developed a laminated-steel gear on the order of the well-known rawhide pinion. It is claimed that, owing to the fact that the laminations are not secured rigidly together, but are allowed a slight movement, they will permit the gear teeth to adjust themselves to the mating teeth rapidly, thus cutting down wear and objectionable humming. It is also said that, instead of the teeth engaging with a lashing, destructive impact, they engage smoothly and quietly. Large gears are equipped with a reservoir which will hold enough lubricant for two or three months' service.

ELECTRIC LIGHT ON OILCAN SPOUT AIDS ENGINEER

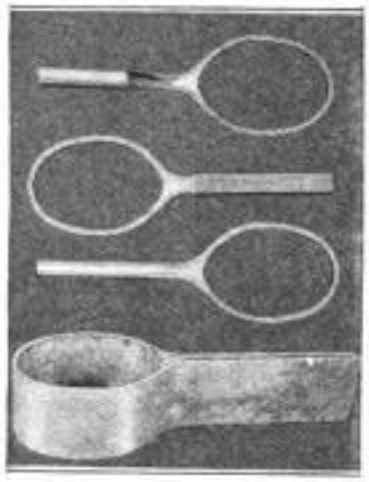
An inventor has produced an electrically illuminated oilcan for the particular use of locomotive engineers and others. The area to which the lubricant is applied is illuminated by an electric bulb attached to the spout. The bulb is connected to a dry cell contained in the handle of the can.

NEW PIPE LINE PUMPS OIL INTO CONGO INTERIOR

Oil shipments destined for the interior of Congo, Africa, are now pumped in from the coast, through a newly completed 4-in. pipe line, 224 miles long. Tank ships discharge at a pontoon dock into eight cylindrical tanks, each 49 ft. in diameter and 23 ft. high. Distributed along the pipe line are eight duplex steam pumps, each capable of delivering 45 to 60 gal. a minute under a pressure of 900 to 1,000 lb. The pipe is laid on the ground, near the railway line, and contains a series of frequent curves to allow for expansion. Detachable joints are installed every half mile, and cut-off valves every six miles, to facilitate repair, while all upgrades have automatic valves to prevent back pressure and consequent leakage in case of a breakdown.

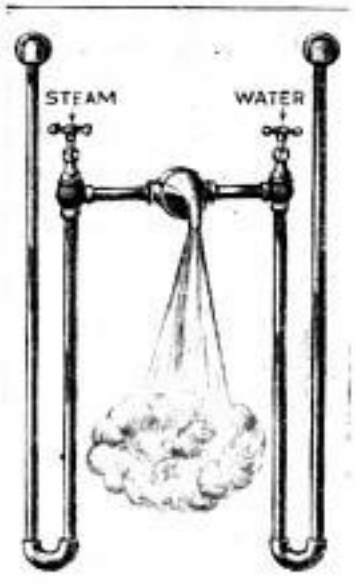
MAKE GOOD TENNIS RACKETS OF FIVE-PLY VENEER

Plywood made of five thicknesses of veneer was successfully used recently at the Forest Products Laboratory, Madison, Wis., for the experimental production of tennis-racket frames. Wide strips of alternate light and dark veneers were glued up, bent to the proper shape, and then cut into several rackets of standard thickness. Grips were glued on, and the frames finished in the usual manner. The process is interesting because of the growing dearth of good solid material for this purpose.



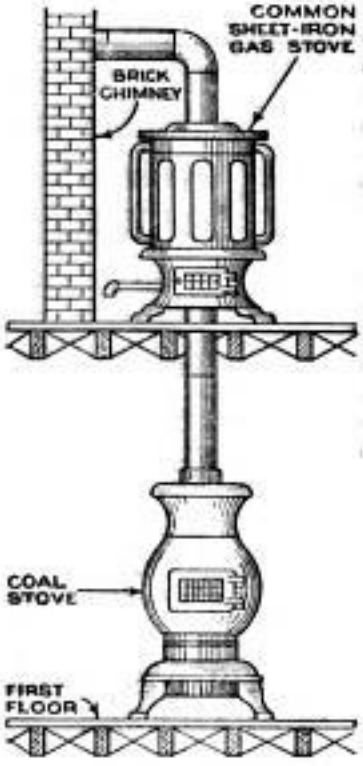
HOT WATER WITHOUT HEATER IF STEAM IS AVAILABLE

Hot water always on tap in factory, office, or home, without any water-heating plant or storage tank, is the achievement of a simple device now on the market, which may be installed wherever steam is used for heating or other purposes. Furthermore, the water may be drawn at any temperature desired, from cold to boiling. A mixing chamber, to which the steam is piped and combined with the cold water, is the secret of the appliance. All the heat of the steam is given up to the water, and with 10-lb. pressure, or more, no circulating pump is necessary. The attachment is made in a variety of forms, for all sorts of applications, large and small.



GAS STOVE MOUNTED AS DRUM ON PIPE OF COAL STOVE

Two of a set of six gas stoves used to heat a small Ohio factory were put to curious service during a recent inadequacy of the gas supply. A pair of discarded base-burner coal stoves were resurrected and put to work on the first floor, and their pipes were passed up to the second floor and connected to the gas heaters. The waste heat circulating through the flues of the sheet-iron gas stoves not only warmed the plant as thoroughly as the original six burners, but the installation proved decidedly more economical.



GIANT-VASE LAWN ORNAMENT IS MADE OF CONCRETE

A striking example of concrete ornamental work is a large vase which adorns the lawn of a residence in the state of Maine. The big urn is of a greater height than its builder, the owner of the property, and is made entirely of wood, cement, and small stones, native to the locality. The work required quite a degree of skill, and the selection and grading of the stones to size and color was a task demanding considerable patience.

CONNECT WORLD'S WIRELESS TO NATION'S TELEPHONES

Direct transmission and reception of radio messages between the telephone stations of inland American cities and all parts of the world is now a definite prospect of the early future. Atlantic-coast wireless stations already have been successfully connected with land telephone lines, and with the use of amplifiers at the receiving end, the length of the wire line becomes of little consequence. It is necessary, however, that the telephone line be absolutely quiet and free from disturbance, which for the present will probably prevent the direct wireless use of the regular subscribers' telephones, and confine the system to long-distance lines.

SIMPLE DEVICE POSITIVELY LOCKS CORK IN BOTTLE

A cork guard, recently placed on the market by a western manufacturer, can be applied to almost any type of bottle, and should do much to reduce the chance of error in the selection of bottles in the dark. The device is a very simple clip, made of one piece of sheet metal, so designed that two arms grasp the neck of the bottle tightly, while a third arm passes over the cork. Two hands are required to remove the guard, and there is little possibility that a child could do it unless shown how.

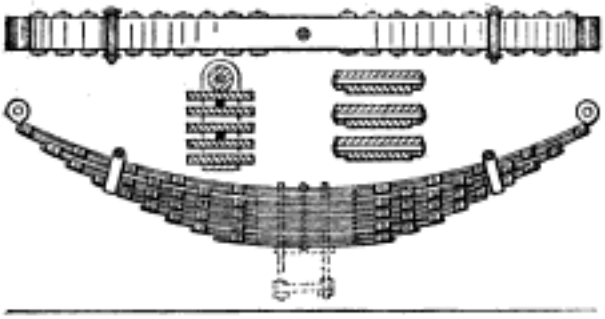
DRUM ATTACHMENT FOR BANJO BEATS AUTOMATIC TATTOO

Since the parchment head of a banjo is practically a drum, it remained only to devise a method of playing it to obtain a combination instrument. A simple attachment for this purpose is now being marketed by an eastern concern. A spring clip that snaps onto the metal frame of the banjo carries a group of eight spiral-spring snares resting against the taut skin of the head.

When this vibrates with the strings as the instrument is played the snares set up a drumlike tattoo in perfect rhythm with the music.

ROLLER-BEARING SPRINGS MAKE FOR EASY RIDING

In a new leaf-type vehicle spring sliding contact between the leaves is eliminated by the interposing of a series of hardened-steel rollers. These are so placed that no two consecutive rollers, in the vertical plane, are in alinement. This results in a staggered arrangement which has the effect of forcing road shocks and axle vibrations to follow a zigzag path, causing them to be broken up and dissipated to a great extent. The number of rollers per space is dependent upon the length of the leaves and is equal on each side of the spring center. The assertion is that, as the contact between leaves is

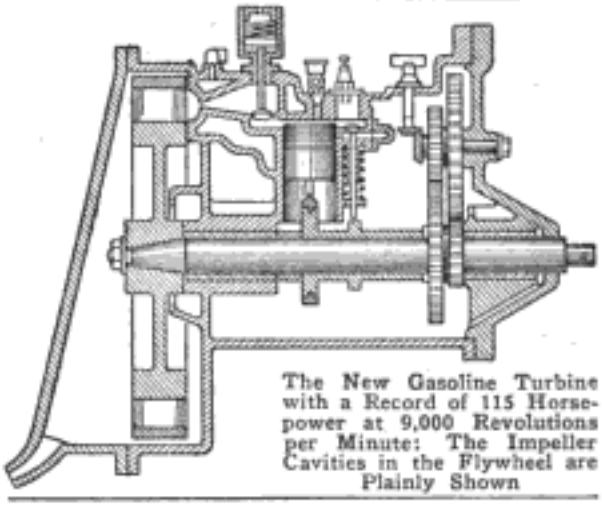


The Hard-Steel Rollers between the Leaves of a New-Type Spring Prevent Sliding Contact and Add to Elasticity

rolling, rust and dirt will not interfere with resiliency, as in the conventional type of spring.

POWERFUL GASOLINE TURBINE IS OF LIGHT WEIGHT

Patents have been granted to a Michigan inventor covering a gasoline turbine in which the flywheel is used as the impeller. A piston, driven through a double reduction gear, performs the usual functions of drawing the gas in and compressing it. Ignition is by the conventional high-tension current and spark plug. One of the striking features of the new apparatus is a valve that is held closed by a spring capable of withstanding compression pressures but, being overcome by the explosion pressures, allows the expanding gases to pass and act upon cavities in the face of the flywheel rim. Variations in speed and power are accomplished by varying the closing rate of this valve. A maximum rotating speed of 9,000 r.p.m. giving 115 hp. is among the claims made for the new engine. The inventor further claims that engines of



The New Gasoline Turbine with a Record of 115 Horsepower at 9,000 Revolutions per Minute: The Impeller Cavities in the Flywheel are Plainly Shown

this design will be only one-quarter the size of other types of engines of the same ratings.

HEIGHT-RECORDING METER IS WORN LIKE A WRIST WATCH

In aviation circles the wristlet altimeter is to the large airplane-panel altitude meter what the everyday wrist watch is to the library clock. Supplied with a strap of ample length, the handy little instrument may be buckled around the wrist or knee outside the clothing, where it is always in plain view. Absolute accuracy within its limit—15,000 ft.—is claimed for the device. Travelers who have occasion to make frequent cross-channel flights from England to the continent, or vice versa, evince a lively interest in keeping

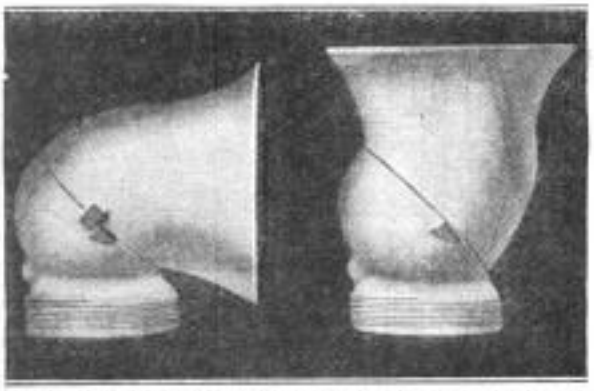
The Wristlet Altimeter, Worn Like a Wrist Watch, Accurately Shows the Height at Which the Wearer is Flying

records of the heights at which they have flown. Most of them use either the pocket or wristlet-type altimeter.

¶Ready-made summer tops for autos, complete in all details of trimming and fasteners, may now be purchased and applied by the car owner, at a considerable saving over repair-shop jobs. The tops are made to fit all models, assuring a satisfactory result.

AUTO-RADIATOR ORNAMENT IS A VENTILATOR AND FUNNEL

A new auto-radiator fitting, designed to take the place of the conventional filler cap, is made of an aluminum-copper alloy



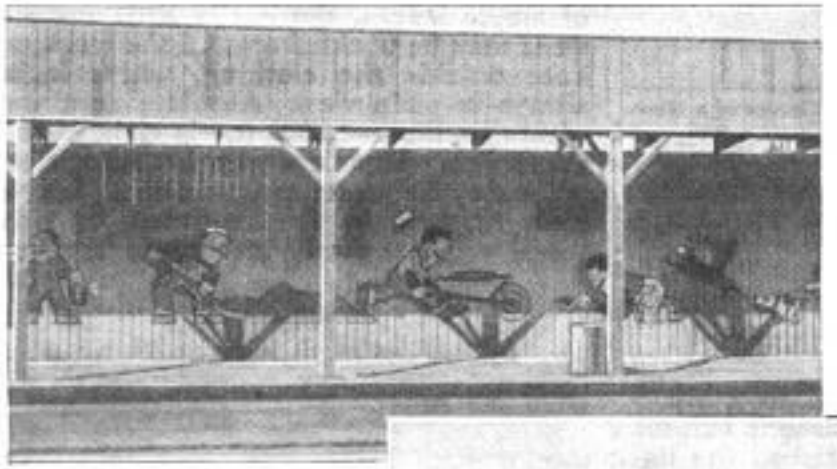
Left: The New Auto-Radiator Fitting Acting as a Ventilator. Right: Turned Straight Up It Becomes a Good Funnel

in the shape of a yacht's ventilator. The two main parts of the fitment are attached at right angles and so connected that the bell-shaped part will turn upon the other so as to form either a 90° angle or a straight line with it. When in the latter position, the bell points straight up and the device becomes a funnel. By turning the bell to the left from its upright position, it becomes horizontal, and air is admitted to the radiator with a claimed increase of 35 per cent in cooling efficiency.

NEW KIND OF WHEAT BREAD INVENTED BY UTAH BAKER

With all the experiments in bread making that have been tried through the ages, it is remarkable that a formula should now be discovered with enough novelty to be made the subject of a patent application. Such a bread is being made, however, by a Utah baker, and those who have sampled it declare it to be worthy of unusual attention. Every particle of the wheat is used in grinding the flour, which is mixed with pasteurized milk, honey, butter, salt, and yeast. A light golden hue characterizes the sliced loaf, and its delicate and pleasing flavor wholly lacks the pungent taste sometimes found in ordinary "whole-wheat" breads. The uncut loaf retains its freshness longer than usual, and the process lends itself also to making cakes and cookies.

ODDLY DECORATED FENCE MASKS UGLY EXCAVATION



This Scene of Feverish Activity Is Indicative of the Speed with Which the Buildings to Occupy the Site of the Excavation, Masked by the Fence, is being Erected

Being required by a city ordinance to mask the excavation on the site of a future building, the owner complied with both the letter and spirit of the law by having the homely board fence decorated. One side of the wall shows the cozy interior of a residence or the lounging room of a club, artistically done in rich, subdued shades. On another side of the fence is a study, in brilliant, glaring colors, which depicts the earnest efforts of those members of the building trades engaged in the erection of the building, to get it finished in record time.

Another Side of the Fence is Decorated with an Interior of a Residence or Club. The Object of the Whole Decorative Scheme Is to Substitute Pleasant Suggestions for the Unpleasant Ones Put Forth by the Ugly Excavation and Fence

VAST AMOUNT OF WOOD USED IN MAKING FREIGHT CARS

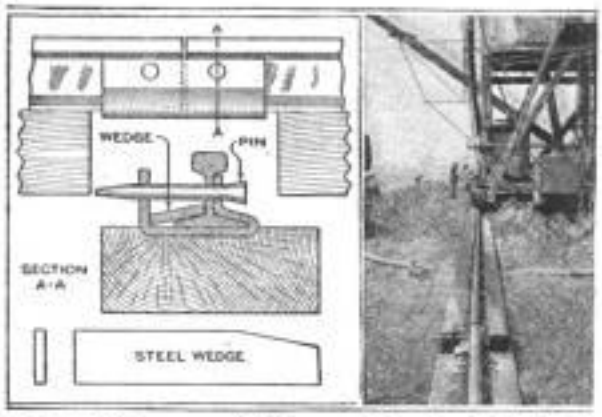
Figures recently made public by a railroad purchasing agent appear to indicate little likelihood of a reduction in the vast amount of lumber used every year for building and repairing freight cars. More than 2,000,000,000 board feet are so used, valued at over $50,000,000. It is found that all-steel gondola cars cost about 36 per cent more to maintain than composite wood-and-steel cars. The latter are more easily repaired, giving them a higher salvage value, their first cost is less, and they are not chemically affected by coal cargoes, as are steel cars. For all types of box cars, a steel understructure and a wood superstructure are recommended.

PHONOGRAPH SPEED INDICATOR IS A TUNING DEVICE

Disk talking-machine records are made at speeds of 78 to 80 r.p.m., and if the correct tone values are to be reproduced, these speeds must be maintained by the reproducing machine. A simple instrument, which determines whether the machine is running at the proper speed, consists of a base and an upright member carrying two horizontal arms, one of which is free at the outer end. The device is placed on the record turntable, and the phonograph is started. At 78 to 80 r.p.m. the free arm, acted upon by centrifugal force, will tend to fly outward, but as it is restrained by its connection with the vertical member, it will rise until it is exactly parallel with the stationary crossarm.

BOLTLESS RAIL JOINT SPEEDS TEMPORARY TRACK LAYING

To facilitate the laying of temporary tracks for cranes or ditching machines, a western contractor has adopted an ingenious form of boltless rail joint, which is quickly assembled or dismantled. The abutting rail ends are laid in a yoke of ⅝-in. steel, 12 in. long, one side of which rises 5 in. vertically, while the other side conforms to the rail foot and web. Two tapered steel pins, about 11 in. long, are driven through 1⅛-in. holes in the yoke and rail ends, and a steel wedge, 18 in. long, 2¾ to 4 in. wide, and ¾ in. thick, is

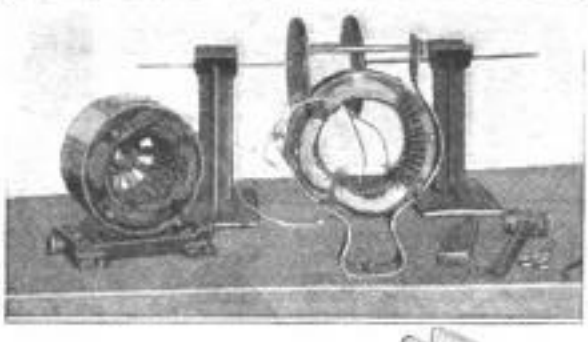


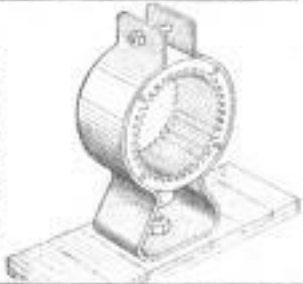
Left: A Diagrammatic View and Section of the Boltless Rail Joint. Right: A Section of Temporary Rail as Laid with the Clamp Joint

then forced between the rail web and the vertical side of the yoke. The rails are laid on individual stringers.

STATOR CLAMP FACILITATES WINDING OPERATIONS

A very simple clamp for holding alternating-current generator or motor stator rings while winding them, has been made by bending a 28-in. length of 2 by ⅛-in. flat steel stock in such a way that two uprights are formed with semicircular bends in them of the right size to accommodate rings varying in size from 6 in. to 9 in. The ends of the uprights point straight up and are drilled, near the extremities, with ½-in. holes. A ⅜-in. bolt passed through the holes and pulled up with a nut completes the device.





Top View: The Stator-Ring Clamp in Service. Bottom View: The Device Viewed from a Three-Quarter Angle. By Using Different Lengths of Clamp Bolts, Rings of Diameters from Six to Nine Inches can be Held Securely, Which Facilitates the Winding Operation

CHILDREN'S PICTURE-STORY DEPARTMENT

WIDE WORLD PHOTOS

An Indian Sand Artist Makes a Business of Drawing Pictures in the Sands at an English Seaside City. All His Drawing is Done with a Stick Held between His Toes. Coins Given Him by Onlookers Are His Payment

A Young Mechanic Living in Dallas, Texas, has Built a Quite Strong Carrier for His Baby Sister, Using the Parts of His Toy Steel Building Set. It is Safely Fastened to the Package Carrier of His Bicycle and the Baby Strapped In. No Parts Except Those Which Came with the Set were Used in the Carrier

Santa Claus and the Clock Reminded the Shoppers of Los Angeles, California, That the Last Hours before Christmas were Slipping Away. He Was Not Alive, as might be Supposed from His Lifelike Position, but He Made Fun for the Crowds Just the Same, and His Smiling Face Made Shopping a Happier Time for Many

In an Open-Air School in Milwaukee, Wisconsin, the Children Not Only Study and Recite; They Also Eat and Sleep Out of Doors. During One Afternoon Recess Everybody Wraps Up in a Warm Blanket and Takes a Short Nap

This Pretty Scene Was Part of the Decorations of a Dinner Table. The Tug, Tree, and Buildings Are of Cardboard. The Rock Is a Box Draped with Dark Cloth. Painted Sheets Form the Sky and Sea

An Intelligent Dog has been Trained by His Master, a Dock Tender, to Ring the Bell, Which Warns of the Leaving of Passenger Steamers, Just Before the Gangplank is Pulled in. Like Many Smart Animals, He Is Proud of His Task

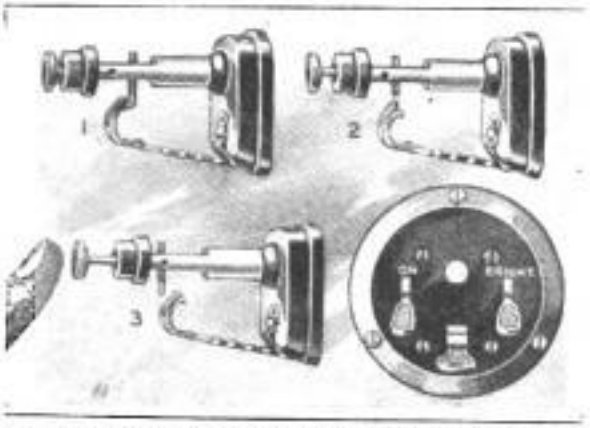
The Spouting Whale Is a Water Toy Which Makes the Bath a Good Game. On Squeezing the Bulb the Whale Sends Up a Fountain of Water and Spray. His Body Being of Wood, He Floats as Though Alive

ICE-CREAM CONES SERVED FROM SANITARY HOLDER

That humble but popular member of the refreshment group, the ice-cream cone, now may be served without any suspicion of harboring germs. A western manufacturer provides a small glass case in which the empty cones are stacked, with a shelf across the front containing five holes for individual cones. A light metal gripping ring is used to place the pastry shells in these openings, and when the cream has been added, the shelf may be removed for a serving tray. No hand but the customer's touches the cone.

NEW THERMOSTATIC SWITCH SAVES BATTERY CURRENT

No relays or vibrating mechanisms are used in a new thermostatically controlled automobile-ignition switch, designed to break the low-tension circuit, and thus prevent the discharge of the storage battery and burning of the coil, should it be left turned on while the engine is at rest. This is an improvement over an older-type switch which depended upon the energizing of a vibrating relay. In the new instrument a thermostatic element carries a short winding of resistance metal through which the low-tension current flows. So long as the engine is running, the value of this current will never rise high enough to heat the winding. But if the switch is turned on while the engine is at rest, a rush of current will quickly cause the resistance winding to become red hot. The thermostat arm expands and straightens, and, in from one half to one minute, releases an emergency button which, being forced out by a spring, breaks the circuit. Connection is reëstablished by pushing the button back into contact, in which position it is normally held by the thermostat arm. The emergency button is not to be used in the regular turning on and off of the switch, a removable key being supplied for this purpose.



New Thermostatic Ignition Switch in Various Positions: From Left to Right: 1, Full On; 2, About to Break Contact; 3, Off. Lower Right: Exterior of Switch Showing Toggle-Type Levers

TELEPHONE SHELF HAS MEANS FOR HANGING DIRECTORY

A tiny ornamental shelf for a telephone of the desk type, so designed that it resembles a candle sconce, is the invention of an Illinois man. The feature of the arrangement is a hook at the bottom of the tapered bracket, on which the telephone directory is hung, a special book cover with a metal ring at the top being provided for the purpose. By this means the volume is kept where it belongs.

STUDY SAMPLES OF AIR TAKEN FROM BURNING BUILDINGS

With the coöperation of fire departments in several cities, the Bureau of Mines has completed an analysis of 11 samples of air taken, by means of vacuum bottles, from burning buildings. Eight of the samples were taken above ground level, and but one of these contained carbon monoxide, in the relatively safe proportion of .03 per cent. One below-ground sample had no carbon monoxide, and the other two had .35 and .1 per cent, a quantity accounted for by the customary lack of ventilation in basements. It is found that the presence of smoke in dense and unbreathable quantities does not necessarily indicate a deficiency in oxygen, or even an alteration of the normal composition of the air, which a proper mask would make usable.

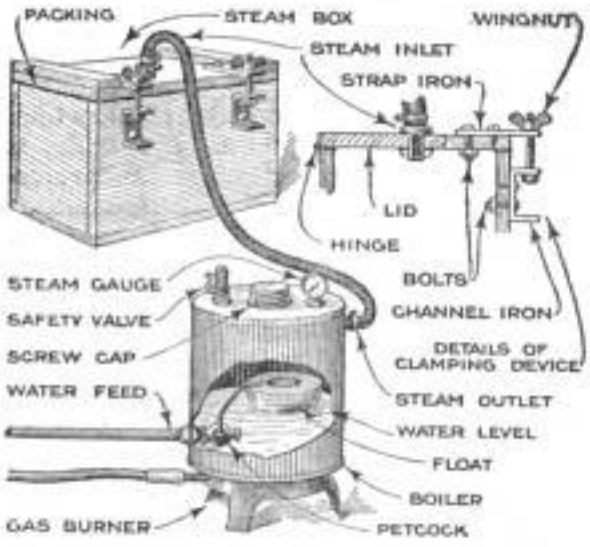
Homemade Storage-Battery Steamer

By THOMAS W. BENSON

WHEN storage batteries are to be overhauled, the sealing compound must be removed, and some method of softening it is necessary. One method consists in standing the battery in boiling water, until the compound is sufficiently soft to be removed with a putty knife or similar tool. A much better way is to make use of a steamer.

A simple steamer can be made from generally available materials, and consists of a box, in which the battery is placed during the steaming, and a steam generator. The box should be made of 1-in. material, and be about 12 by 12 by 18 in. It is assembled with 2-in. brass wood screws, and given two or three coats of asphaltum paint, to render it impervious to any acid that might be spilled on it.

The lid is hinged and provided with means for clamping it shut and preventing the escape of steam. One method of accomplishing this is shown in the drawing. A short piece of ¾-in. pipe is set into the lid and fastened by means of locknuts; this pipe is connected to the steam line. Rubber packing is tacked around the edge of the box to insure a perfectly tight joint. A steam supply may be obtained either from a steam-heating system, or from a simple steam generator made for the purpose, as follows: A sheet-metal tank, about 8 by 10 in., is provided with a tight-fitting screw cap. One inch from the top, a ¾-in. nipple is brazed into place, and at the same distance from the bottom, the ¼-in. water-feed pipe is secured with locknuts, using rubber washers for packing. A small petcock is attached to the inner end of the water-feed pipe, and the metal float from an old carburetor is attached to the handle by a short length of stiff wire, in such a manner that the cock will be closed when the float is raised about 4 in. from the bottom of the boiler.



The Boiler of the Steamer is Fitted with a Self-Regulating Feed, No Attention Being Necessary After the Flame has been Properly Adjusted and the Battery Placed in the Box

For Garages and Battery Service Stations a Storage-Battery Steamer will Greatly Facilitate the Removal of the Bituminous Sealing Compound When the Battery Elements or Jars are to be Removed

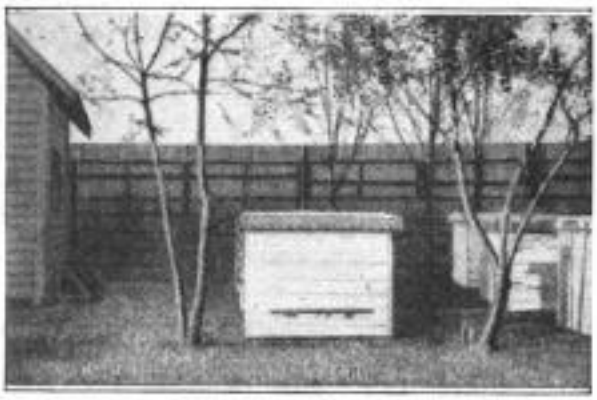
The boiler is heated by means of a small gas or oil burner, and is installed in some location where it will be accessible, and where there will be no possibility of danger from the open flame. The water-feed pipe is then connected to the supply main.

A steam pressure of 1 lb., or less, is about all that is necessary for work of this character, and the boiler should be fitted with a small pressure gauge, and a valve that will blow off at that pressure.

When a battery is to be completely dismantled, the connectors are first removed; the battery is placed in the steam box, and the cover fastened in place. The burner is then lighted, and the battery is steamed for about 20 or 30 minutes, no attention being required while this is in progress. The battery is then removed, the compound scraped off, the elements removed, and, if necessary, the rubber cell jars. The steaming loosens all dirt and corroded material on the battery box, and when wiped dry, it is perfectly clean. When only a single cell is to be removed, the steam hose may be connected to the filler opening of that particular cell, and the softening accomplished in a much shorter time. The fire hazard, always present when an open flame or torch is used for opening batteries, is greatly reduced by the use of a steamer of this character.

Lath Windbreak for Apiaries

A windbreak composed chiefly of lath has given good results at the Iowa State



An Eight-Foot Windbreak That has Given Good Results in Protecting an Apiary is Made of Ordinary Building Lath. It is Readily Taken Apart and Stored When the Winter Is Over

College apiary. The windbreak is about 8 ft. high, with the lath spaced about ¾ in. apart, and is built in sections so that it may be readily set up and taken down as occasion may require. During the summer, when the windbreak is unnecessary, the sections are stored away.—Byron W. Hamilton, Ames, Iowa.

Cutter Attachment for Compass

The usual method of cutting disks of cardboard, thin celluloid, or similar materials, is to scribe the circle and then resort to the scissors. By using a cutter attachment, inserted into an ordinary compass instead of the lead, a much more accurate and clean-cut product will result. A piece of drill rod, or a piece from a broken drill, about the size of the lead used in the compass, is ground down to a knife-edge. The cutter is inserted in the compass, and drawn over the circle.

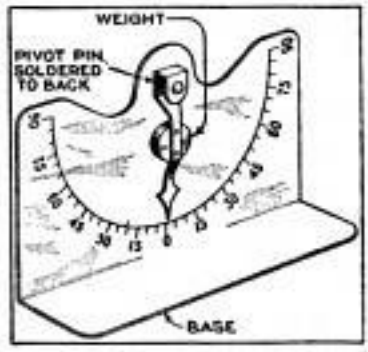
Trap for Codling Moths

In regions where the codling moth is a serious orchard pest, a simple and effective trap can be used. A few old rags are placed loosely in the lower crotches of each apple or pear tree and tied in place. The rags afford an ideal place for the worms to form cocoons and to pupate; they find the "soft snap," and make themselves at home. Every few weeks the orchardist collects the rags; which are then boiled, and if the supply is short, used again. By burning the rags the destruction of the pests is made certain.

A Simple Inclinometer

A level, reading in degrees, will be found a useful addition to any mechanic's tool equipment.

The main part of the instrument, which comprises the frame, base, and scale, is made of thin, bright sheet metal, preferably brass, bent to shape, as indicated. The graduations are laid out with dividers, on an arc, and numbered with ⅛-in. figure stamps. The pointer is also made of sheet metal and has a round brass weight riveted to it. The pivot holes at the center of the arc, and through the pointer, are made with a No. 45 drill; the pivot pin should be provided with a head on one end, the other being soldered at the rear of the frame.

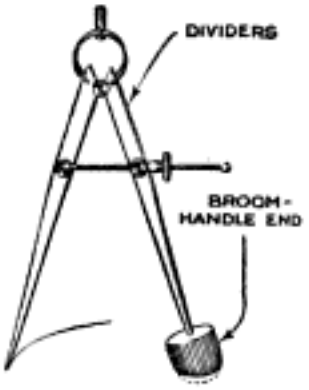


Concrete-Form Oil

Concrete will not stick to forms that have been oiled each time before use with a mixture of boiled linseed oil and kerosene, in equal parts. If not so oiled, the forms should at least be carefully wetted down before the concrete is poured. If the forms are to be used again, they should be taken apart, and all adhering particles of cement carefully cleaned off.

A Ball Center for Dividers

When called upon to drill a series of holes equidistant from the center of variously sized pieces of thick sheet steel, each with a ⅝-in. hole in the center, the ball-end dividers shown in the drawing were improvised for accurately laying out the new holes a certain distance from the center hole. The rounded end of a broom handle was cut off, and one leg of the dividers was tightly inserted into the wood, thus forming a ball center. —W. S. Standiford, Youngstown, Ohio.

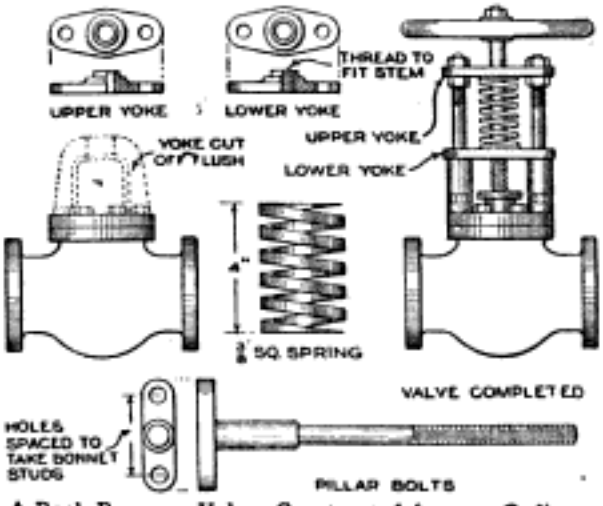


Making a Back-Pressure Valve

A very effective back-pressure valve, of a form intended specially for marine work, where the usual type of weighted valve is unsuitable, may be constructed from an ordinary stop valve.

A globe valve of the same size as the exhaust pipe, in this case 5 in., is selected, with bonnet and yoke in one casting, and the yoke is cut off and faced flush with the top of the bonnet. Two yokes are then cast from one pattern, one of them being bored and threaded to fit the valve stem, the other bored 1/16 in. larger than the diameter of the valve stem above the thread. Two pillar bolts are then made, as shown; the base is drilled to suit the bonnet studs, and is bolted in place on the bonnet, the studs being lengthened to go through the base.

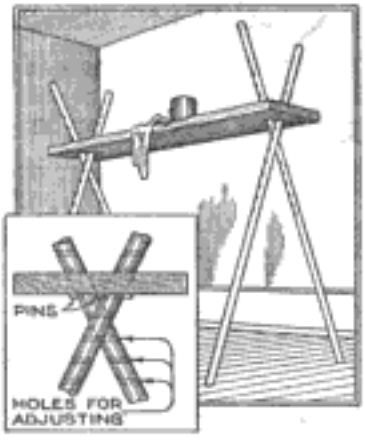
A spring is made of square steel, of a size suited to the working pressure; this spring fits between the upper and lower yokes, being adjusted by means of the nuts on the pillar bolts. With the spring shown, on a 5-in. valve, the valve being closed and the upper yoke just bearing on the spring without compressing it, a back-pressure of 5 lb. was produced. Care should be taken, when adjusting the spring, that enough space is left between the coils to allow the valve to lift to its full opening.—J. Arthur Stevens, East Boothbay Me.



A Back-Pressure Valve, Constructed from an Ordinary Globe Valve, and Specially Adapted to Marine Work, Where the Motion of the Ship does Not Allow Weighted Valves to be Used

An Adjustable Scaffold

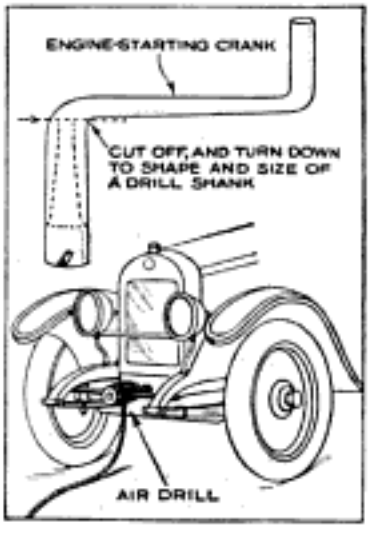
The drawing shows an ingenious paperhanger's scaffold. The horizontal plank is about 1 ft. wide and 6 ft. long, with two holes in each end for the insertion of the four legs; these holes are drilled at an angle opposite each other to give the proper slant to the legs for supporting the plank safely. The legs are each about 6 ft. long and are drilled with small holes for the accommodation of pins which are inserted underneath the plank, thus making the trestle readily adjustable for height.—R. F. Hamill, Elkins, West Virginia.



Small left-hand, or other special, taps may be easily made by cutting the thread on a piece of drill rod in the lathe. The flutes are made by filing the threaded portion three-cornered or square, tapering the entering end.

Air Drill Starts Automobile Engine

In the motor-repair shop, where an air drill or motor is used, it can be applied to starting motors that have had their bearings readjusted, and are consequently stiff and hard to start by ordinary methods. For this purpose, the ratchet end of a starting crank is cut off, as shown, and the shank tapered to fit the drill collet used with the motor. With this arrangement in place on the crankshaft of the motor, the air is turned on. If the engine refuses to turn over, leave the air turned on and push down on the electric starter button. The combined efforts of the two will usually start the engine, and the air motor alone will be able to keep the engine turning until the ignition is switched on.



Windmill with Narrow-Blade Wings

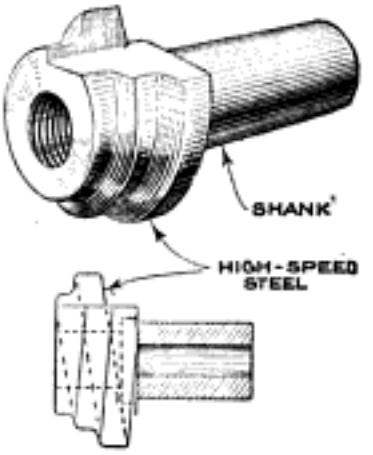
An unusual homemade windmill pumping plant, which has been used with considerable success for irrigation work on a small ranch, is illustrated herewith.

This windmill differs from most others in not having broad blades. Instead, the blades are made of 6-in. boards set at an angle of 45° to the wind, a double set of them being provided. The axle rests on well-lubricated wooden bearings, and small eccentrics attached to the ends of the axle operate the pump rods.

Being set to take power from the prevailing winds, the mill, which is situated on the shore of a lake in British Columbia, is not movable to suit winds from other directions. The wheel moves freely in light breezes and does sufficient work to keep an eight-acre tract well watered. —G. P. Melrose, Kamloops, B. C.

An Improved Radius-Turning Tool

A tool which will be found especially useful where a radius is to be turned on any number of pieces is made in the form of a helix, as shown in the drawing. The cutter is composed of two parts, as indicated, the cutter being made to appropriate dimensions from high-speed steel, the helical form producing the necessary cutting clearance. The shank can be made from cheaper steel and is threaded to screw into the cutter. When grinding, best results are obtained if the cutting edge is kept on a line radial to the center.



Stimulating Plant Growth

Clever truck farmers have a little trick in the culture of early vegetables for the market that the amateur can well copy. In early cultivation, until the plants are several inches high, they plow the soil away from the plants, getting as close to the row as possible without injuring them. Then, on subsequent cultivations, they plow the soil toward the row, throwing it up around the plants.

The principle involved in this trick is readily explained, so that the advantage is apparent. Early in the season, when the plants are beginning to grow, the element most necessary to plant development is not moisture, of which there is usually an abundance, but heat. What holds back plant growth at this period is lack of heat, and any method which introduces greater heat is naturally reflected in the rapidity of growth. When the soil is pulled away from the row the effect is to warm the soil which is left, by admitting air, and incidentally drying

out the soil; this is not usually objectionable at this period.

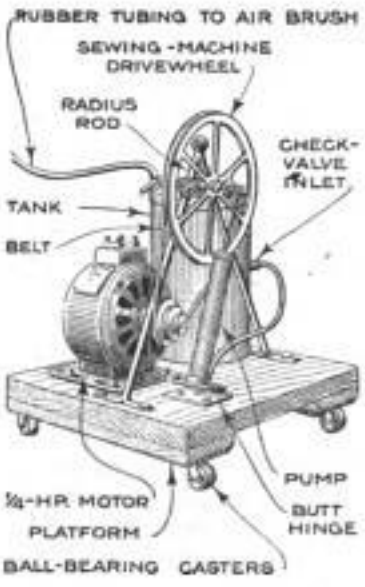
After a few weeks, however, it is moisture that is needed, instead of heat, and the earth is thrown back toward the row again to conserve the moisture.

An Electrical Scarecrow

A farmer, who had electric power available, found that the old-fashioned scarecrow was useless for preventing voracious birds from destroying his garden. He set up several posts at strategic locations in his garden plot; each of these was surmounted by two crossed slats, 6 ft. long, turning on a pivot, colored flags being attached to the outer ends of the slats. A belt of ordinary strong twine connects up the system by passing once around the spindles on which the rods are mounted and finally around the pulley of a small motor. The loud flapping of the flags as they spin around frightens the birds from the seeded plots with such effect that his neighbors are rapidly adopting the idea.—A. T. Lawson, Canso, N. S.

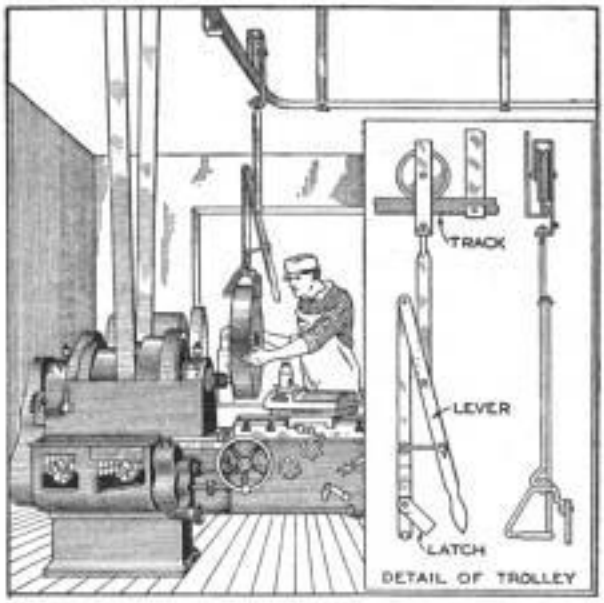
Compressor for Use with Air Brush

In doing sign work for a theater, I made use of an air compressor constructed from some old parts, as shown in the illustration. On a small platform fitted with ball-bearing casters, I fastened a ¼-hp. electric motor, and an old sewing-machine drivewheel with an automobile radius rod, bent so as to form a standard for the wheel. An ordinary hand air pump was connected to the wheel crank and pivoted on the platform, by means of a butt hinge. The drum is one which was formerly used in a gasoline-lighting system, fitted with a check-valve inlet, and an outlet for use with the air brush. The pump was given a 4-in. stroke. The motor is connected to an extension which can be attached to any lamp socket.—Blair Votaw, Mineral Wells, Tex.



Trolley for Mounting Heavy Chucks

The arrangement shown in the drawing is in use in a small machine shop, where the operator of a large lathe is often unable to obtain help in changing chucks and faceplates. A simple track was suspended from the ceiling, and a trolley, with the handling device shown, was attached. In use, the hook is inserted under the flange on the back of the chuck, which is then backed off the spindle, raised by means of the lever, the lever fastened, and the chuck pushed to an out-of-the way place behind the machine. Chucks of almost any size and weight may be easily placed or removed by one man, without assistance.—A. A. Stafford, Sparks, Nev.



A Track-and-Trolley Device for Handling Heavy Lathe Chucks and Faceplates: One Man with This Arrangement can Handle the Heaviest Chucks without Assistance

Screwdrivers from Cycle Spokes

Small screwdrivers for use on cameras, clocks, toys, and similar mechanisms, can be quickly made from bicycle spokes. In making them, the nipples are screwed up to the ends of the threads and forced down as tightly as possible. The threaded end of the spoke, which should project beyond the nipple about 1/16 in., is riveted over smoothly to prevent it from working loose and turning off. The spokes are cut to the desired length; the ends are dressed down with a file, and the blade hardened and tempered. If a wider bit is desired, the end may be hammered flat and dressed. Heavier screwdrivers may be made in the same manner from the spokes of old motorcycle or automobile wheels.

Shaping Table Legs on a Jointer

When special machinery for the purpose is unavailable, rectangular furniture

FIG. 1 TABLE LEGS

An Easy Method of Turning Out Square Legs for Furniture on a Jointer, When Other and More Specialized Machinery for the Purpose is Lacking

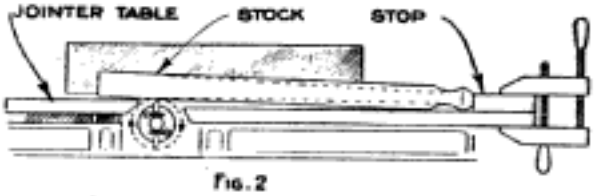


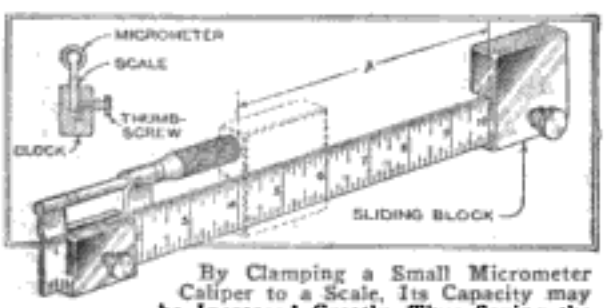
FIG. 2

legs of various forms can be easily turned out on an ordinary jointer by one familiar with its operation. Taking first the upper style, in Fig. 1, which shows several designs, set the stop, as indicated in Fig. 2, so that when one end of the stock is pressed against it, the center of the cutter will be about 3 in. from the opposite end. Then, by pressing down each face of the stock in its turn against the cutter the wood will be removed along the dotted lines. For cutting the taper, the forward end of the jointer table is lowered as shown, the stock being fed forward with the cutter rotating toward the operator. The bottoms of the legs may be finished off by hand or on a bandsaw.

Increasing the Range of the Micrometer Caliper

Few mechanics own a micrometer of larger capacity than one or two inches; the larger tools are expensive, and the small range of the smaller ones considerably reduces their usefulness.

The drawing shows how the range of a 1-in. micrometer may be considerably



By Clamping a Small Micrometer Caliper to a Scale, Its Capacity may be Increased Greatly, Thus Saving the Cost of Several Tools of Varying Ranges

increased. Make two blocks of cold-rolled steel; one clamps the micrometer to the scale, the other being free to slide, while capable of being fastened at any point. Bring the sliding block to the 4-in. mark, as shown by the dotted lines, and fasten it. Set the caliper at zero, then slide it, held in its own block, against the sliding block, and clamp firmly. The tool is now set. Supposing it is desired to measure dimensions between 5 and 6 in.; the sliding block is moved back until its inner edge is exactly on the 10-in. mark, so that the distance A is 6 in. Any distance between the end of the micrometer barrel and block may now be measured by opening the caliper in the usual way, subtracting the micrometer reading from 6 in. to obtain the desired dimension.

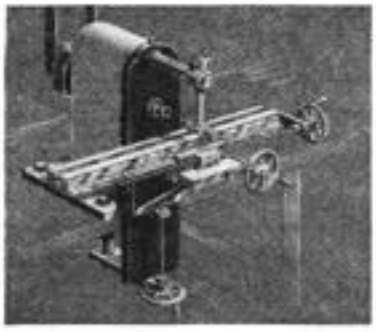
Emergency Expansion Bolts

The illustration shows an expansion bolt which was improvised by an engineer when no regular ones were at hand. It consists of short sections of garden hose, alternating with washers, strung on an ordinary bolt. The hole for its reception is drilled a push fit for the hose; when the nut is tightened, the hose sections are expanded, and grip the wall of the hole tightly. While not intended to be used for any more than emergency purposes, a number of these bolts were found to hold as tightly at the end of a year's service, as when originally installed.

Copper Tubing for Gaskets

Copper tubing of small diameter can be used for making very satisfactory gaskets for various purposes where pressure is to be maintained. Tubing having an outside diameter of about ⅛ in. is used. It is bent to the desired outline, and a piece of cotton wicking, or a tubular shoelace, is drawn through, to act as a cushion. The ends of the gasket are made tight by inserting a wire dowel into one end and soldering in place, the other end of the tube being slipped over the dowel and soldered, to make a leak-proof joint.

Such gaskets can be used for valve caps, carburetor and exhaust-manifold flanges, and in other ways about automobiles.—Wm. MacSorley, New York, N. Y.



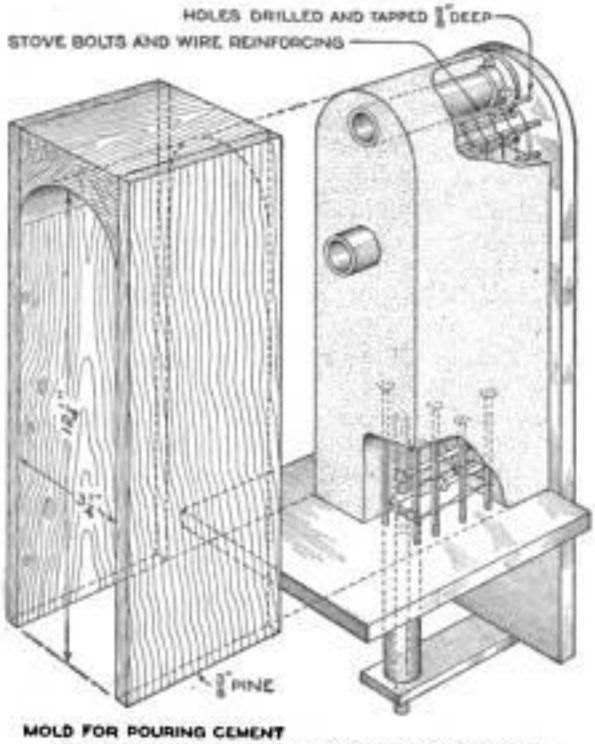
A SMALL BENCH MILLER

By J. V. Romig

DURING the late war, machines which required massive castings in their design were built with beds of cement or concrete, simplifying the work of construction, and providing a means of making very heavy machines with a minimum of large castings. This method can be adapted to the use of the mechanic in the small shop, and by using a combination of cement and cold-rolled steel, small machines can be constructed sufficiently strong to stand a considerable amount of heavy work, while eliminating entirely a body casting.

The bench miller described in this article is an example of this method; only one casting is employed, and the rest of the machine is of such construction that but few simple tools, and little machine work, are required in the building of it.

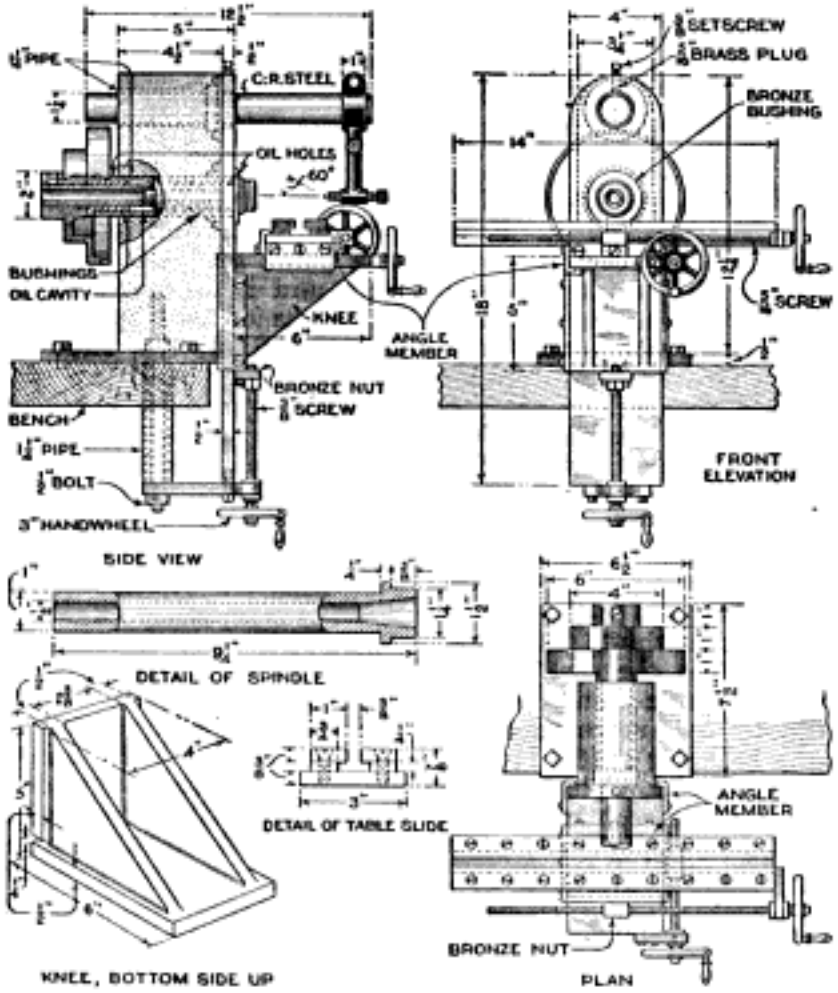
The steel, flat and round, which can be obtained from any steel merchant, is first carefully checked for straightness and parallelism, using a good straightedge and a micrometer caliper; if any bent spots are discernible, straighten carefully, and if thick spots occur in the slides, scrape them off until a level surface is obtained. The holes in the front slide and base should then be laid off and drilled, including the holes for the spindle and overarm, and the ¼-in. holes for the anchor bolts. These anchor bolts are ¼-in. stove bolts of varying lengths, as shown in the smaller drawing, and are placed so that the heads will be staggered, to distribute the hold and strains more evenly in the cement. The holes for the bolts are ⅜ in. deep, and tapped with a ¼-in. bottoming tap. The base is a piece of ½-in. cold-rolled steel, or iron, and is fastened to the front slide by means of two ¼-in. flat-head screws, countersinking the slide for the heads, so that they will be flush with the surface. The spindle and overarm pipes are fastened to the front slide by means of flanges, the pipes being bored—the overarm pipe to a sliding fit for a piece of 1¼-in. cold-rolled steel, the spindle pipe to fit the two bronze bushings which form the spindle bearings. These pipes must be fitted absolutely square with the front slide. A bolt and pipe, with a flat piece of steel, will be seen at the bottom of the base; these form a brace for that part of the slide projecting below the bench top, the flat piece also forming a bearing for the elevating screw. When this brace, the base, front slide, and pipes have been assembled, the next operation is the pouring of the cement. The anchor bolts are interwound with soft-iron wire, as shown, and the form is placed in position, and clamped rigidly. A mixture of 1 part cement to 3 parts clean, sharp sand has proved ideal for this purpose; during the pouring, the spaces between the screws, and all edges and corners, must be thoroughly poked with a knife, or other sharp-pointed tool, to insure that the cement reaches every part. After pouring, level off the surface, and then lay the assembly aside to season; this is a very important part of the construction, the cement being wetted at least twice a day



MOLD FOR POURING CEMENT
DETAIL OF MOLD AND METHOD OF REINFORCING

The Main-Body Casting is Poured in a Mold Made of Soft Pine, the Top of the Front Slide being Shaped to Conform to the Contour of the Casting

for a period of about a week. While the cement is thus seasoning, the screws, slides, spindle, knee, and various other component parts may be made up. The spindle should be turned and bored, using a No. 2 Morse taper in the nose, and cutting the thread for the chuck, which is ⅛-in. pitch; bronze bushings are used for the bearings, being turned to make a press fit in the spindle pipe. A three-step cone pulley is turned to the dimensions shown, and is fastened to the spindle by a safety setscrew. A simple pattern is built for the knee casting, which is made of soft gray iron, and machined as indicated. On the top of the knee is the main carriage slide; it is machined very carefully on the edges and faces, and must be perfectly square in all directions. On the vertical sides of this slide are screwed the angle members, two for the table slide and two for the carriage slide. These angle members are made of 3/16-in. angle iron, filed and fitted with great care, a cut being taken through the inside fillet, on the shaper, before fitting; ¼-in. round-head screws hold them to the carriage slide. The table is built up of cold-rolled steel, as shown in the detail drawing, the various pieces being held together with ¼-in. flat-head screws. This job can best be done by using a few rivets to hold the assembly, while performing the drilling and tapping operations. The T-slot in the table permits the use of ⅜-in. bolts, to hold a vise, or the various fixtures used on the machine.



By Adapting a Method of Construction Used in Building Very Heavy Machinery, to the Needs of the Man with a Small Shop, Machines Such as the One Shown may be Built at a Considerable Saving in Cost

All screws used on the vertical, longitudinal, and crossfeeds, are turned out of cold-rolled steel, and run in brass or bronze nuts, fastened to the slides with round-head screws. The equipment necessary, such as arbors, centers, and a small vise with a homemade swivel base, can be made up as required. A good chuck should form part of the equipment, and should be fitted with a flange threaded to fit the spindle nose.

While foot power may be used with the machine, a small ¼-hp. motor, driving through a countershaft and cone pulley mounted directly over the machine, is advised. The cone pulley should be of the same size as the one on the miller.

The builder of this miller will have a splendid little tool, at small cost.

Locating Cotter-Pin Holes

When replacing castellated nuts, which are held in place by cotter pins, it is often difficult to locate exactly the cotter-pin hole. This trouble can be avoided by marking the end of the bolt or stud in which the hole is drilled. The marks are made with a file, or cold chisel, on the end of the piece, parallel with the hole, so that when the nut is screwed up, the castellated openings can be lined up with the marks.

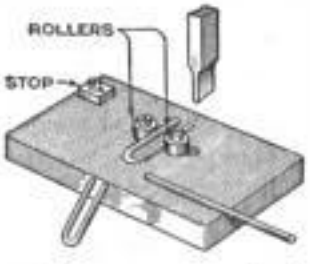
Refrigerator Wells

Refrigerating wells, piled full of hardened snow, are becoming more common among the farmers of the Northwest, and especially of the Dakotas. A shallow well is filled with snow. Water is then poured over the snow, and a practically solid pillar of ice is formed, that will remain throughout the summer and will serve as an everyday refrigerator.

These "refrigerator wells" are dug, or drilled, about 25 ft. deep; then rough stones are placed at the bottom, to allow the water to drain out and at the same time afford a substantial foundation for the pillar of ice. The eatables and provisions are placed on top of the congealed mass. A ladder is fastened against the side of the well, so that, as the ice melts later in the summer, the farmer can climb down to the cooler regions. A rope running over a pulley above the well is, of course, an alternative to the ladder.

Bending Wire in the Shaper

In making some special machines, it was necessary to bend a large number of pieces of soft-iron wire to a U-shape. This was done in the shaper by means of the attachment illustrated. Two rollers are mounted on a cast-iron block the proper distance apart, and a stop plate is screwed to the block. The block is fastened to the shaper table, and a tool of the correct thickness placed in the tool holder. After the block has been adjusted so that the tool runs centrally between the rollers, the stop plate is adjusted to bring the center of the wire opposite the tool. The machine is then started, and the wires, cut to length, are fed to the fixture.

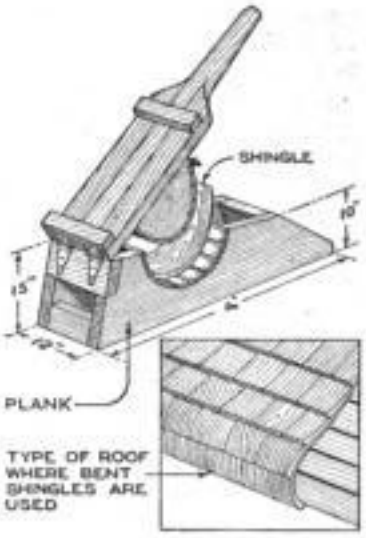


Painting New Plaster

New plaster, being alkaline, does not afford a good foundation for paint, and neutralizing the alkali with acids is of doubtful value. It is better to treat the walls with a solution composed of 3 to 4 lb. of zinc sulphate dissolved in 1 gal. of water, and allow it to dry before painting. If old walls have been whitewashed, the old whitewash must be removed, and the surface treated as above, before painting.

Fixture for Bending Shingles

A bending machine for curving shingles, that will greatly reduce the usual time spent in this work and make a much more satisfactory job possible, is shown in the drawing.

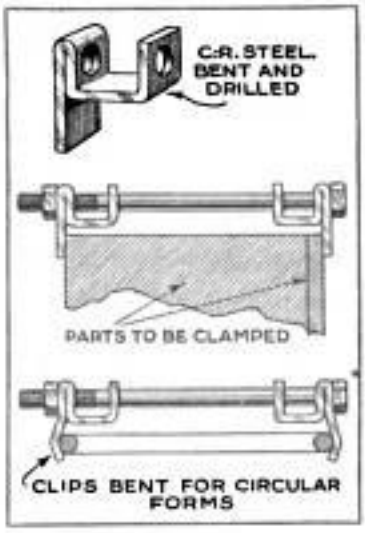


The machine is made of planking, to the dimensions given, both parts of the semicircular bending die being faced with wooden cleats.

The shingles to be bent are thoroughly soaked in boiling creosote, in the ordinary manner, and then laid in the bending machine. At first, a little pressure is brought to bear against the shingle and this is gradually increased. A slight amount of practice in the use of the device will enable an operator to turn out properly curved shingles with speed.

Simple and Inexpensive Clamps

When a clamp is required in a hurry, and the available ones are too short, or too bulky for the space in which they must be applied, the form of clamp illustrated may be used to advantage.

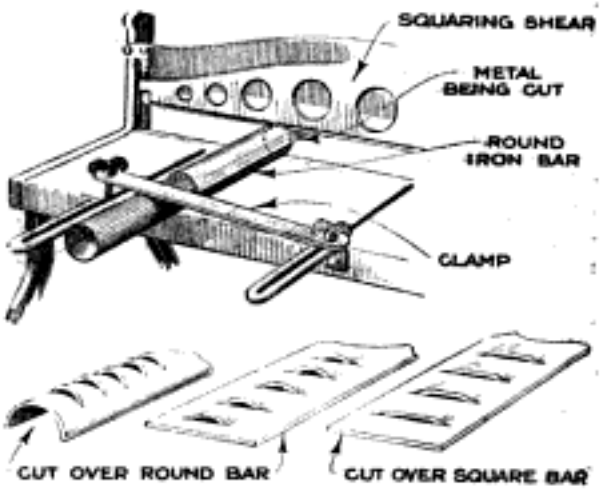


Two pieces of flat cold-rolled steel are bent to the shape shown, and drilled to accommodate a bolt or threaded rod. If the piece to be clamped is of circular section, the clips may be bent as indicated in the lower drawing.

¶Kerosene oil should be used as a lubricant when reaming aluminum.

Cutting Angular and Curved Shapes on Squaring Shear

An attachment for the sheet-metal worker's squaring shear, that will enable



An Attachment for the Sheet-Metal Worker's Squaring Shear, That Permits the Cutting of Curved and Angular Shapes without Flattening the Work

him to cut angular and curved shapes without flattening, is shown in the drawing. As indicated, this arrangement consists of a clamp which holds a square, or round, iron bar so that the end of the latter will be in the proper relation to the shear. The shape to be cut is placed over the bar and the cut made in the usual manner. For making a round cut of any desired width in the center of a flat piece, without cutting the edge, the device can be gauged for any width of cut by placing a piece of metal under the shear blade to stop cutting through. A flat cut can be made in the same manner, as shown.—Morris Tessler, New York, N. Y.

How Root Pruning Pays

There are two or three main reasons why it pays to prune the roots of young fruit trees when planting. The first, and most obvious, is that it gives the tree a better chance, as with the pruned top, the tree quickly sends out several new shoots around the point where the cut is made, and the transplanted tree is off to a flying start.

The second advantage is, that time is saved in planting, as the hole need not be dug so large. The roots of the young tree should under no circumstances be curled into the hole, and if the unpruned tree is properly planted a large hole must be dug. One pruning method, successfully used by some orchardists, is to cut off side roots, leaving stubs only about 2 in. long, and to plant with a crowbar. The bar makes the hole into which the tree is inserted, after which the earth is tamped down firmly.

A well-known nursery expert advises that one-year-old trees be pruned to leave roots 4 or 5 in. long; two-year-old trees, to have somewhat longer roots.

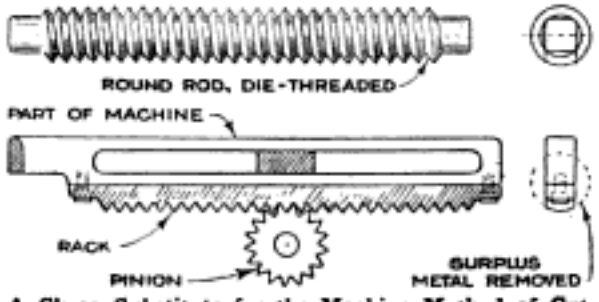
The actual pruning of roots is not at all a delicate operation. While various theories are held by the uninformed concerning the proper slant at which the cut should be made, nurserymen say it does not matter. A pruning knife, pocketknife, hatchet, or other edged tool, can be used. Pruning, in some nurseries and large fruit farms, is customarily done with a hatchet and chopping block, the cut being made square.

Auto-Tube Soles for Shoes

A piece of an old automobile inner tube, properly applied to the soles of a pair of shoes, will make them last a great deal longer and afford more comfort to the wearer. The leather sole is rasped, to roughen it, and about three coats of rubber cement are applied to this surface and permitted to dry. To this prepared surface a layer of cushion stock, obtainable from any tire-repair shop, is applied. A piece of inner tube, to cover the sole, is next put on over the rubber in exactly the same manner as a patch is applied. It is well to weight the shoes until the patch has thoroughly set.

Thread Die for Cutting Rack

Lacking means for making a rack in the usual way, an experimenter used the method illustrated. A round rod was threaded with a die to the same pitch as that of the pinion which was to engage the rack. The rod was then flattened off on all sides but one, the latter forming



A Cheap Substitute for the Machine Method of Cutting a Rack is Found in the Use of a Simple Threading Die

the rack. There is, of course, no great accuracy or durability in such a construction, but in many cases this is not a requirement.

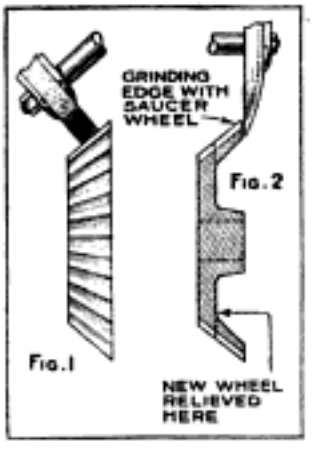
Safety Pockets for Overalls

Mechanics, farmers, and other workers who bend and stoop at their work, often suffer the loss of small tools, and other articles, from the capacious pockets of their overalls or jumpers.

To prevent such losses, a piece of steel from an old corset stay or clock spring is cut to the width of the pocket. The ends of the steel are annealed, and holes are drilled to take small rivets. A slit is cut in the end of the pocket hem, and the spring inserted. The rivets are placed through both cloth and metal, and, after placing washers over the ends, hammered smooth. The spring will keep the gap of the pocket closed, prevent the loss of articles, and keep dust, chaff, etc., from entering.

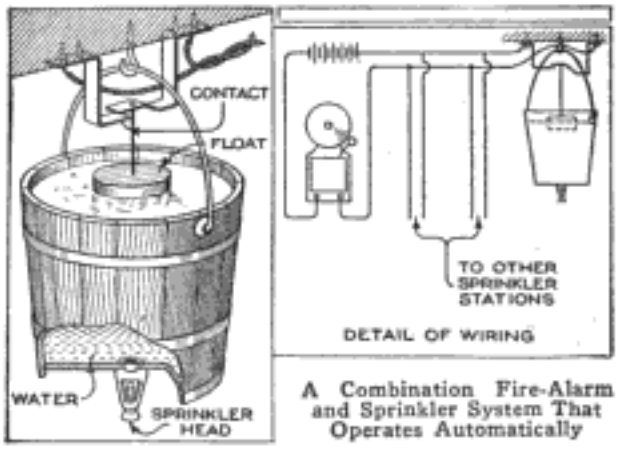
An Easily Sharpened Milling Cutter

In gashing cutters for key-filing machines to a depth of 1/64 in., too much of the standard 60° cutter was ground away in sharpening, as the cutter dulled at the point only, while the whole edge must be ground to sharpen it, as in Fig. 1. A new cutter was made, as shown in Fig. 2, which was easily and quickly sharpened with a saucer wheel, without the necessity of setting up the grinder. The new cutter can be used down to the point shown by the dotted line in Fig. 2. Milling cutters are expensive tools, and this method of making them considerably reduced the expense incident to the work.—E. J. Bachman, Fullerton, Pa.



Automatic Fire Alarm and Sprinkler

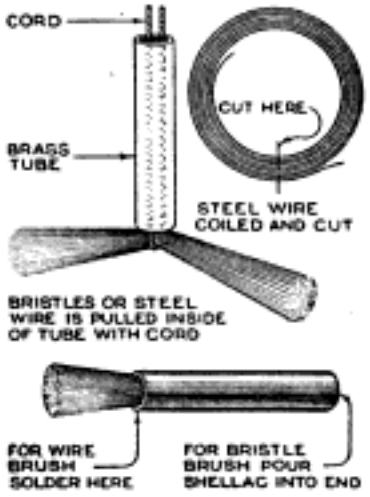
So many small shops and garages are without fire protection of any kind that the automatic fire-alarm and sprinkler system shown in the drawing will give a measure of safety and practically eliminate the possibility of a fire getting beyond control without an alarm being sounded. One or more wooden or metal buckets, fitted with a sprinkler head in the bottom, are suspended from ceiling hooks, as shown. In case of fire, the fusible link in the sprinkler head melts and permits the escape of water in the bucket on the fire below. The fire-alarm signal system operates in conjunction with the sprinklers. A float is arranged over each bucket, as shown. When the buckets are filled, the float keeps the contacts separated, but if the water level drops, the circuit is closed and the bell gives the alarm. A switch may be inserted in the circuit to stop the ringing of the bell.—Truman R. Hart, Ashtabula, Ohio.



A Combination Fire-Alarm and Sprinkler System That Operates Automatically

Making Brushes for the Shop

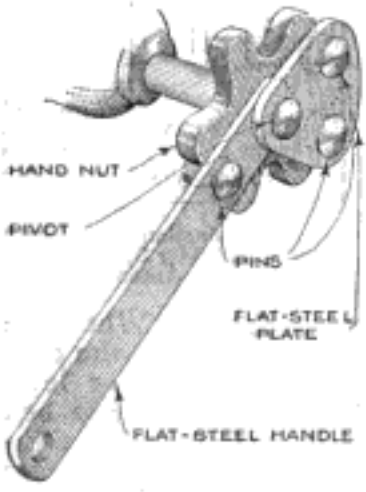
Small wire scratch brushes find a variety of uses about the shop and home for cleaning rusted metal surfaces, spark plugs, and other articles, and, similarly, bristle brushes are widely useful for applying soldering acid, cleaning commutators, etc. Such brushes, of either wire or bristles, are easily made by inserting a bundle of wires or bristles into a short length of metal tube, in the manner indicated by the drawing, and securing the brush with solder or shellac.



¶When the oxyacetylene cutting torch is stopped for a short time, the needle valve on the regulator should be closed to take the pressure off the hose. The torches should also be opened momentarily, to let the pressure out of the hose lines.

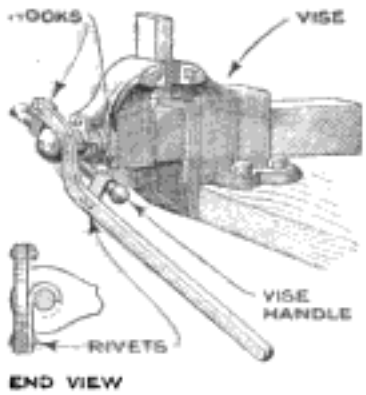
Wrench for Gas-Tank Valve

Users of compressed-gas tanks, who are well aware of the difficulty of operating a tight-fitting valve, will appreciate a quick-acting wrench. The tool is made in two parts, the handle and a triangular piece of flat metal, the two being loosely riveted together, as shown. Metal pins are riveted to the remaining corners of the triangle and to the handle a short distance back of the pivot; these pins are slightly longer than the thickness of the valve wheel, and should be spaced so that there will be a small amount of play in the wrench when it is dropped into position. The wrench is adjustable to fit valve wheels of varying diameters, and grips the wheel tightly as soon as pressure is applied.—Lowell R. Butcher, Newton, Ia.



Extra Leverage on a Vise

A casual examination of the average vise handle shows that it has been roundly abused by the hammer of the user whenever it was necessary to tighten up the jaws beyond his strength. Some mechanics use a piece of pipe over the handle, but this slips, and is not so universally satisfactory as the device illustrated.



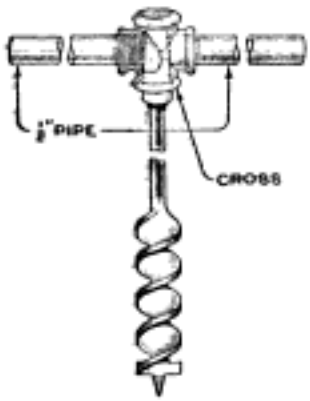
A ⅜ by 1-in. machine-steel bar is forged to the shape shown, and provided with two hooks, riveted to it so that their curved ends are on opposite sides. The bar should not be more than 2 ft. long. In use, the hooks are slipped over the vise handle and pressure applied. When the vise is to be opened, the lever is applied to the underside of the handle.—W. B. Bennett, Honesdale, Pa.

Eyebolts for Hoisting Auto Engines

Many automobile and truck manufacturers make no provision for the easy removal of the engine from the chassis. The difficulty of this work was eliminated in one repair shop by screwing eyebolts into the spark-plug openings. An eye was turned on a piece of round steel, the eye being welded to the shank with an oxy-acetylene torch. Afterward, the shank end of the eye was inserted through the metal shell of an old spark plug, and brazed in. Two of these eyebolts are used when "pulling" an engine, in order to get a better balanced load, the eyebolts being screwed into the first and last cylinders after the spark plugs have been removed. Two sets of such bolts should be provided in the general repair shop, to fit the standard ½ and ⅞-in. spark-plug openings.—Edwin Kilburn, Spring Valley, Minnesota.

A Strong Auger Handle

A strong and efficient auger handle can be made from ½-in. cross and two pieces of ½-in. pipe, which will be found superior to any wooden handle obtainable. As shown in the drawing, the square shank of the auger is held firmly in place by the pressure of the pipe handles against it. In order that the pipes may bear against the auger shank, it will be necessary to cut about double the usual number of threads on the pipe ends.



A Handy Sketching Board

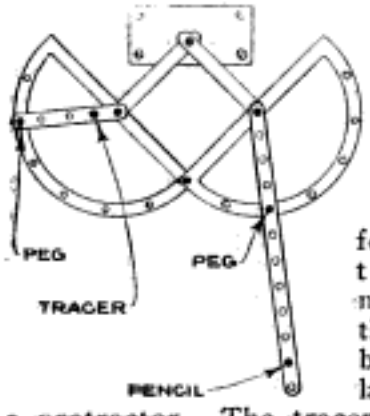
It is often necessary for a draftsman to make sketches in places where a strong wind is blowing or where much dust is present, such as in the coal pockets and bilges of a ship. When he has more than one sheet of sketches to make, a very convenient arrangement consists of two pieces of board, ¼ in. thick, and about 1 in. longer than the sketch pad. Rubber bands are placed over the ends to hold the boards and pad together, and the completed sketches are stripped from the pad and placed between the boards, where they cannot be blown away or soiled.

Welding Cracks in Auto Fenders

When welding cracks in automobile fenders by the oxyacetylene method, there is danger of buckling the fender through overheating, if precautions are not taken to prevent it. A great deal of the heat absorbed by the sheet metal comes from the play of the flame envelope on the parts surrounding the break, and suitable protection should be provided. This is best done by kneading finely ground asbestos with water to form a dough, which is built up in a dam around the crack and about ½ in. away from it. Before attempting a complete weld, the torch should be used to "tack" the edges of the crack at intervals of 1 in. If this is not done, the edges will buckle, and a good job will be almost impossible. The flame of the torch should be directed at a slant rather than at right angles to the surface, otherwise there is danger of cutting through and burning. Enough metal should be permitted to flow through the crack to form a slight reinforcing ridge underneath the fender. If, after welding and smoothing, depressions are found, fill them with solder, and file the solder off flush with the surrounding surface.—Edward B. Winter, Alhambra, Calif.

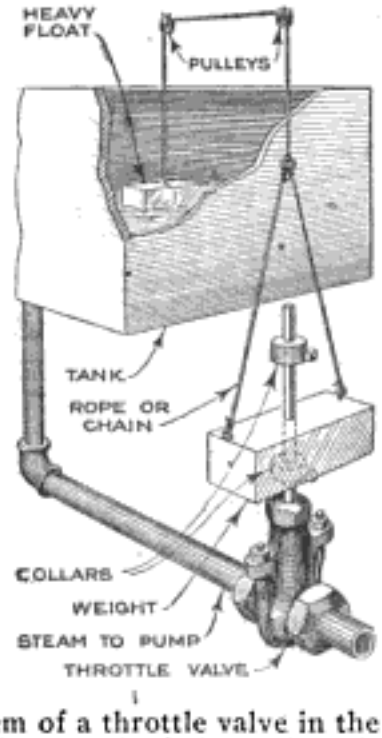
An Improved Pantograph

The improved pantograph shown in the drawing has some distinct advantages over the conventional device, inasmuch as with it drawings can be reproduced turned through any required angle. The instrument is formed by the two pivoted metal frames, the outer sides being semicircular in form like a protractor. The tracer and reproducing pencil are carried by bars pivoted at the center of the semicircles. Holes are drilled in both semicircles and bars, so that the tracer and pencil can be fixed at any desired location, the bars being held in their proper relation to the semicircles by means of pegs, as indicated. The instrument is permanently attached to the drawing board or table by means of a metal plate on which the pantograph pivots.—W. A. Reid, London, Eng.



Float Automatically Controls Pump

It was found necessary to rig up an automatic control for a steam pump that was located in an isolated part of a power plant. This was done as shown in the accompanying drawing. When the tank is full, the pump stops, and when the water falls below a certain mark it starts pumping water again, the action being controlled by a float in the tank. By reference to the drawing it will be seen that the float is connected to a weight which slides vertically on the stem of a throttle valve in the steam line. The travel of the weight is regulated by two collars which may be set to close the steam line when the water level in the tank reaches the desired height, or to open it when the level is lowered.—James E. Noble, Portsmouth, Ontario.

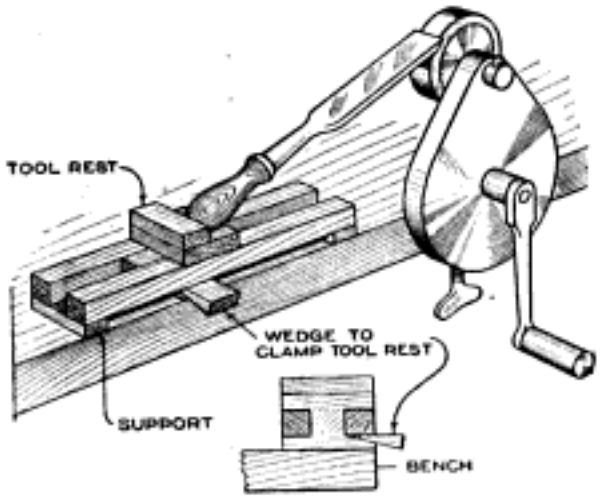


Lumber Used for Concrete Forms

Contrary to the common practice, in building construction, of using only seasoned and well-dried lumber, green lumber, or that which has been only partly seasoned by air drying, can be used in making forms for concrete work. In fact, unseasoned lumber is preferable for this purpose, as it is not so likely to warp from the moisture absorbed from the concrete. If kiln-dried lumber is used at all for concrete forms, or molds, it should be thoroughly wetted before the concrete is poured. If the forms are made tight, as they should be, the possibility of the kiln-dried forms warping and shrinking will be minimized. Oiling or greasing the inside faces of the forms is recommended, particularly where the forms are to be used repeatedly, as it prevents absorption of water and aids in keeping them in shape when not in use.—George L. Emerson, Chicago, Ill.

Jig for Grinding Carpenters' Tools

The accompanying drawing illustrates clearly the construction of a jig for grinding woodworking chisels and plane



A Jig for Grinding Carpenters' Tools, Which can be Used on Grinders of Any Type, and Which Produces the Correct Cutting Bevel with Ease and Accuracy

bits, to produce the proper cutting bevel with ease and accuracy. Although primarily designed for a hand-power grinder, as shown, the jig can be used with equally satisfactory results on grinders of any other type. While no dimensions can be given, the width of the tool rest should be about twice the width of the broadest plane bit, in order to keep it steady when one person must hold the tool and operate the grinder. The tool rest is clamped in any desired position by the insertion of a wooden wedge.

Remedy for Sticky Auto Valves

Certain automobile engines give trouble that can be traced to sticking exhaust valves, which upon examination are found to be coated with a deposit of carbon. As the carbon works down the stem, it lodges in the guide and prevents the valve from seating properly. After having considerable trouble of this character, a mechanic placed lock washers on the exhaust-valve stems, as shown in the drawing, the washers being slightly larger than the stems, so that they could move freely and thus keep off carbon deposit.

Harrow for Listed Corn

Listed corn is planted in the bottom of a furrow, where it is out of reach of the commonly used drag harrow. When the ground becomes crusted before the plants are up, the crust must be broken by some means, otherwise the plants will be unable to penetrate it, and the crop will be lost. Under these conditions it is customary to take the loss, plow up the land and replant it, making the crop late.

In order to prevent the loss, and the necessity of plowing and reseeding, one farmer built a simple breaker, as follows: He took two logs, 5 or 6 in. in diameter and 5 ft. long. Twelve 60-penny spikes were driven into each log so that the heads protruded about 4 in., the spikes being driven in a spiral around the logs so that one would never follow in the path of another. A 1-in. hole was drilled through one end of each log, and a stout wire, with a snap hook at its outer end, was run through the hole. The nail-studded logs are dragged along the bottoms of the furrows by one horse, the "harrows" being attached to the harness tugs on each side, and the horse driven between the furrows.—Mrs. Ruth Darling Shultis, Greeley, Colo.

Bearing and Commutator Oiling

When a bearing of the oil-ring type becomes hot, it is likely to be caused by a stationary ring, or by dirty or improper oil. Sometimes the rings will become worn smooth from long use and slip on the shaft instead of turning as they should. The remedy consists in roughening the inner face of the ring with a coarse file.

It is a common practice among some operators to put a small amount of dynamo oil on a rag and apply it to the commutator of the machine; this is altogether wrong. In a short time the carbon brushes will be gummed up, the dirty brushes will cause sparking, and the oil will be burned into a hard deposit which may possibly score the commutator so that it will require to be trued up. If none of the commercial commutator dressings are obtainable, a satisfactory substitute may be made from common paraffin and finely powdered graphite. The paraffin is melted, and while in this condition, as much graphite as possible is mixed with it. While still warm, the mixture is formed into bars about an inch in diameter. After sandpapering the commutator, apply a little of this dressing.

Testing Tension of Coil Springs

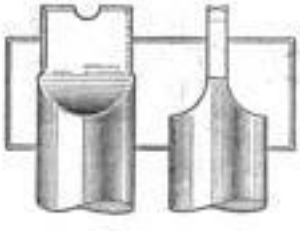
An order for spiral springs received by a manufacturer, specified that their tension, or strength, should correspond with that of a sample. By experiment it was found that a 25-lb. weight attached to one end of the sample caused an expansion of one inch.

The winding of the springs was done in the usual way, with the turns tight against each other. After the springs had been cut to correspond in number of turns to the sample, and the eyes had been turned up, they were opened up a little shorter than the specimen and tested.

The testing was done by suspending the springs from a nail, driven into the edge of a bench, and attaching a 25-lb. weight to the bottom eye. The outside distance between the eyes was then measured with a pair of calipers, set 1 in. wider than the normal length of the sample. If the spring did not open up to the proper length as registered by the calipers, it was put under greater strain by pulling it downward by hand until it stretched the required amount.

A Simple End Mill

When an end cutter, of a size which is not at hand, is required for use in a milling machine, or drill press, a very effective tool can be made as shown in the drawing. It is quite important that all the edges shown with a bevel should be ground in just this way, in order that the cutter may be durable. A small cutter of this type, say ⅜ in. or less, has been found not less satisfactory than the standard end mill. The tool is especially useful in milling keyways, or in milling a slot entirely through a piece.



Homemade Lights for the Motorboat

Motorboats on inland waters are compelled by law to carry a white light visible from all points of the horizon, in addition to the regular running lights.

It is a common practice to carry this light on the end of the stern flagpole, and the illustration shows how the light may be fashioned out of very simple materials, and yet present a neat appearance. White-glass telephone insulators, mounted on a section of the insulator peg, make very attractive lights when mounted as shown

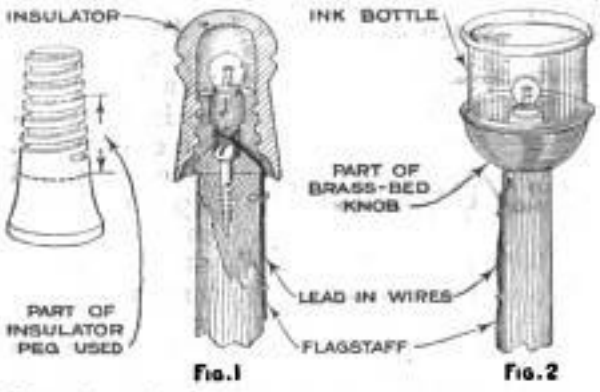


Fig. 1 Fig. 2

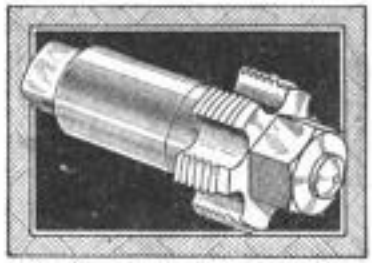
Very Attractive Masthead and Running Lights can be Contrived by Using Such Simple Materials as Telephone Insulators, or Clear-Glass Ink Bottles

in Fig. 1; if side lights are wanted, the same idea may be used, slipping pieces of red or green celluloid inside the insulator before assembling.

Figure 2 shows a masthead light made from half of a discarded brass-bed knob and an ink bottle. The bulb and socket are mounted in a hole drilled in the end of the pole, which is tapered to a neat fit in the neck of the bottle. The brass-knob half effectually disguises the bottle neck, and makes a neat finish to the lamp.

An Economical Tap

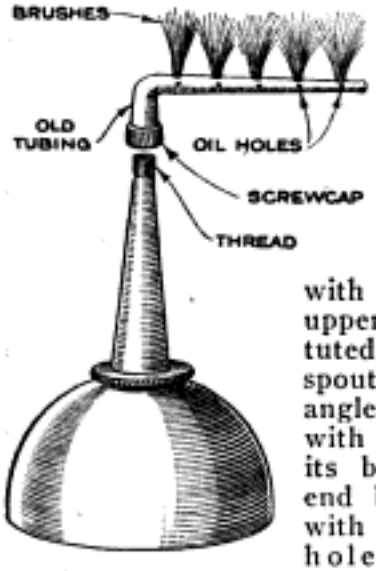
Where large and medium-sized taps are constantly used, the tool shown in the drawing will be found remarkably efficient and economical, because the shank can be made from cold-rolled steel while the working portion may be made of high-speed steel, the latter being removed when worn out, and another substituted without discarding the entire tap. An internal keyway in the shell engages with the key on the shank and prevents turning; a locknut underneath holds the shell to the shank. Another good feature of this tap is the semicircular shape of the flutes, which makes the tap relieve itself of chips when being backed out, and prevents tearing of the finished thread.



¶If an arbor sticks in the work, allow turpentine to penetrate thoroughly before attempting to drive it out.

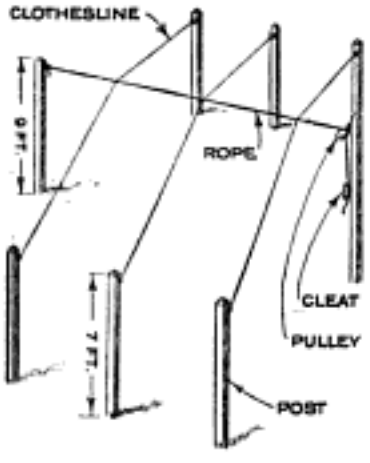
Oilcan for Large Surfaces

A can, for applying fluid lubricant over a large surface, is made from an ordinary oilcan which is adapted for the purpose by a specially made spout, as indicated in the drawing. The original spout is removed, and another, made from light metal tubing, with threads at its upper end, is substituted. The original spout is bent at right angles and provided with a screwcap at its base, the small end being closed with solder. Oil holes, and small brushes for distributing the lubricant, are provided on the right-angled spout, as indicated. Such a container is convenient for oiling small blanks that are to be drawn, without the waste of lubricant that characterizes the use of a brush.



To Avoid Clothesline Props

A method for eliminating the bothersome props used for supporting clotheslines is shown in the drawing. A 9-ft. post is set into the ground, midway on each side of the clothesline posts. A rope is attached to the top of one of the central posts and brought over a pulley on the opposite post, as indicated, and a cleat is provided for securing the loose end; this line runs underneath the clotheslines. After the clothes have been hung on the lines, the rope is pulled taut and fastened over the cleat.



¶See that the milling-machine arbor is perfectly clean before putting on the cutter—a small chip of metal may throw the tool out of true.

Photographic Business Cards

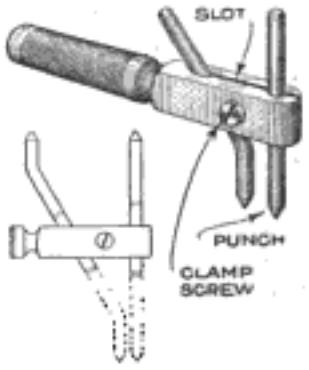
The idea of using photographic business cards, containing the desired information, and, in some instances, photographs of individuals, factories, etc., has recently come into vogue.

There are several ways to make such cards, the simplest, perhaps, being the preparation, on a 7 by 11-in. card, of the matter to be reproduced, and photographing this on a contrast plate to the desired size, making the prints in the usual manner from the negative. It is advisable to make the prints on double-weight, glossy paper, and dry them on ferrotype plates.

Another method consists in placing several of the regular printed business cards in a printing frame against a piece of clear glass and photographing them, actual size, on one plate. In this manner several cards can be printed up at the same time, the print trimmer being used to cut them apart.—Geo. R. Watson, Los Angeles, Calif.

An Adjustable Spacing Punch

The drawing shows a holder made of a length of square or rectangular cold-rolled steel, in which two punches are inserted. It is used for laying out work where a series of equally spaced points are to be prick-punched at any desired distance apart. The holder has a knurled handle turned at one end, while the square part is drilled for the punches, the inner hole making about a 30° angle with the outer. The end is slotted, and a clamp screw is fitted to hold the punches in place, when set so that their points are the proper distance apart.

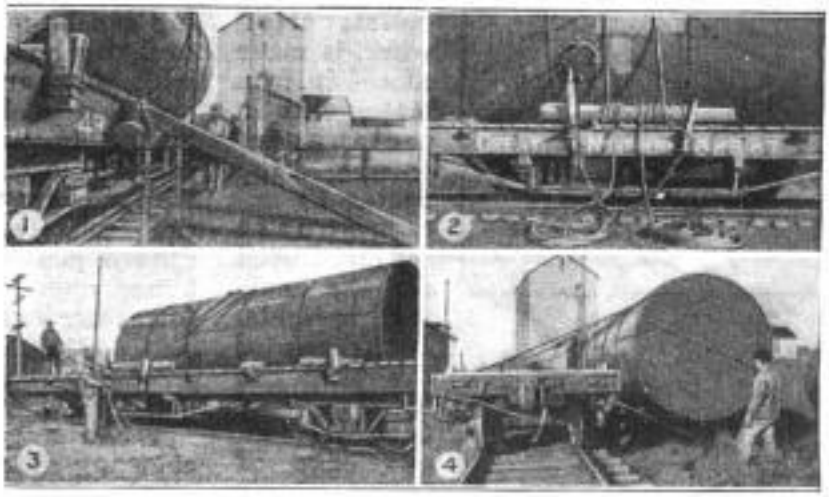


One punch, which serves as a guide, has its pointed end bent as shown; the other is straight, and a hammer is applied to the top in the same manner as an ordinary prick or center punch. A mark is made, the holder is moved along until the bent point registers in the mark; then another mark is made, and so on, until the work is completed. By pushing both punches down, their points will come nearer together, or by reversing them, as shown in the lower drawing, they can be set at a greater distance apart.

Unloading Tanks from Flat Cars

All manner of makeshifts are employed in unloading heavy objects from freight cars, and one of the simplest, for moving cylindrical tanks, is shown in the accompanying group of photographs.

Two railroad ties, or similar timbers, are chained to the stake sockets on the side of the car from which the tank is to be unloaded; these ties are placed low enough so that the planks, or beams, used for the skids, will rest on them and come flush with the floor, as in Fig. 1. A doubled rope is then passed through the center-stake socket on the same side, the ends being thrown over the tank.



By the Use of a Few Simple Materials, Properly Applied, Two Men can Easily Unload Large Cylindrical Tanks and Similar Bulky Objects from Freight Cars

On the opposite side of the car, a round log is fastened, by means of a chain passed under the rail, and through the stake sockets, as in Fig. 2, so that it is firmly anchored to the car. Two stakes are inserted into the sockets to hold the log in place. The ends of the rope are then looped and passed around the log so that one end is wound from above and the other from below, as shown.

The blocks and wedges holding the tank are removed. One man grasps the ropes and eases the slack, as the tank is rolled with a pinchbar. Once started, as in Fig. 3, the movement of the tank down the skids is easily controlled by the ropes. —J. E. Chrisman, Albion, Ia.

Mixing Lampblack with Water

Lampblack is the most frequently used coloring material for obtaining black or gray effects in concrete and stucco. Mixing lampblack with water, however, is very difficult if one does not know the "trick."

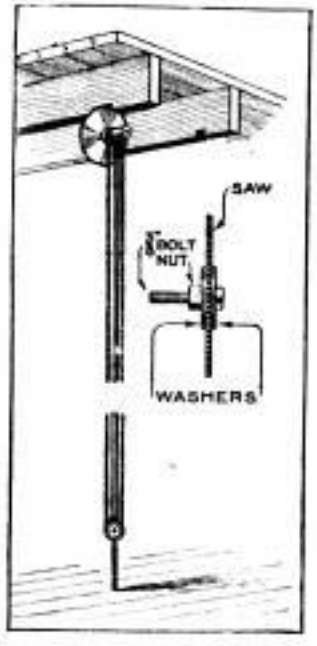
One method requires a little gelatin, which is dissolved in a small quantity of hot water. This solution is permitted to cool and the coloring matter is stirred in. After all the lampblack has been absorbed, the solution is thinned with water as desired.

Another way to get the greasy material to combine with the water is to grind a little gum arabic and the lampblack together in a mortar, adding a few drops of water from time to time to form a paste. This can be thinned with water to any consistency.

The easiest and simplest method, however, is to add a small amount of vinegar to the water in which the lampblack is to be mixed. The black will then mix with the water almost as readily as the most soluble specially prepared cement colors. —Hjalmer Lindquist, Minneapolis, Minn.

Boring Machine Used as Saw

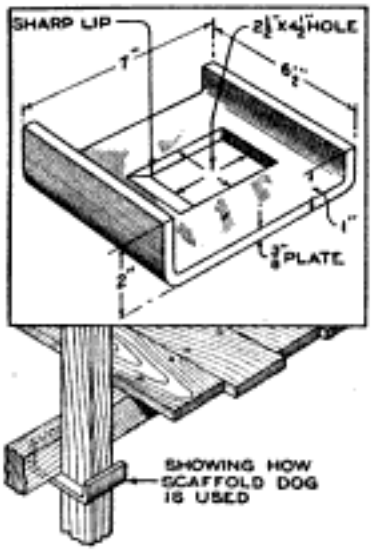
When conduit is used in wiring new buildings, it is necessary to notch all joists where the conduit crosses them; doing this with a hand saw is tiresome, owing to the strained position it is necessary to assume. By using a boring machine, as shown, replacing the drill by a circular saw, this work is very easily done.



The saw should be about 6-in. diameter and should be mounted as shown, the end of the bolt being held in the chuck in the same manner as the drill is ordinarily held.—Earle H. Barton, Lake Placid, N. Y.

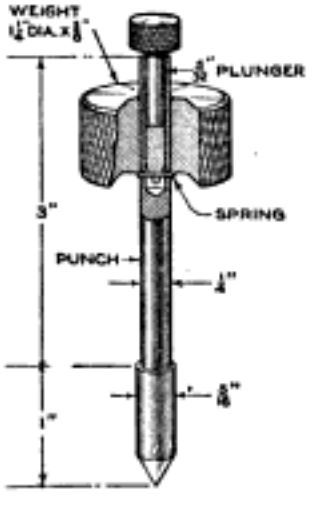
Scaffold Dogs of Iron Plate

An adjustable scaffold hanger, or dog, for the use of the builder in sheathing, brickwork, and similar construction work, is made of a ⅜-in. iron plate, with a rectangular opening at the center to accommodate the stock used for the scaffold uprights. Both ends of the plate are bent, or flanged, and one edge of the opening is provided with a sharp lip. This makes a perfectly secure hanger, inasmuch as the sharpened lip will bite deeper with an increase in the load. The hanger shown in the drawing is designed to be used with 2 by 4-in. uprights and crosspieces.



A Semiautomatic Center Punch

A simple and easily made center punch for layout work is shown in the drawing. The punch proper is made of tool steel, hardened and tempered, while the weight and the plunger are made of cold-rolled steel.



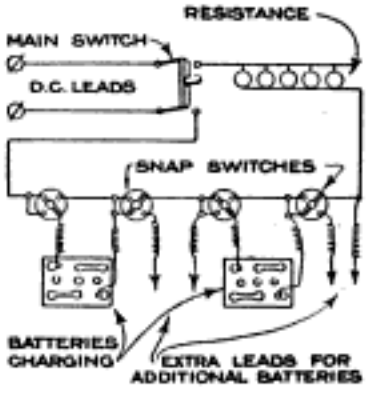
The plunger is pointed as shown, and, through a small hole near the point, a short piece of spring wire is driven. The spring fits through two holes in the punch, projecting slightly outside it, so that the weight is supported when at the top of the punch. When the plunger is depressed, the projecting ends of the spring wire are withdrawn, and the weight falls. The point of the plunger, when depressed, should strike the bottom of the hole, so that the ends of the wire spring will not be drawn completely through the small holes and fail to return the plunger.

Spading Concrete

To obtain the maximum density, and a good surface, on concrete work, the wet mixture should be spaded into place rather than tamped. A convenient tool for spading can be made by straightening out an ordinary hoe, so that the blade is in line with the handle. Special spading tools are also made with perforations in the blades, to assist in bringing the sand-cement mortar against the faces of forms, while holding back the coarser particles in the concrete. Concrete that has been spaded is less likely to be leaky, and a better appearance is obtained when the forms are removed.

Battery-Charging Switches

When a garage makes a practice of charging storage batteries, use is generally made of a motor-generator set, or a rectifier, with a number of cells charging in series. The arrangement of switches shown in the drawing will be found very useful for cutting batteries in or out without interrupting the circuit for more than a second. Snap switches, such as used for the two-position control of electric lamps, are used, and are connected to the circuit in the manner indicated. To insert a new battery into the circuit it is connected to the pair of hanging leads, and a single turn of the switch instantly cuts it in.



Filling Cracks in Boiler Settings

Sometimes the brickwork around steam boilers becomes so seriously cracked, that the only safe thing to do is to have that part rebuilt. Upon other occasions, however, the cracks may be of such a nature that by cleaning them out and refilling with cement mortar a safe repair is made.

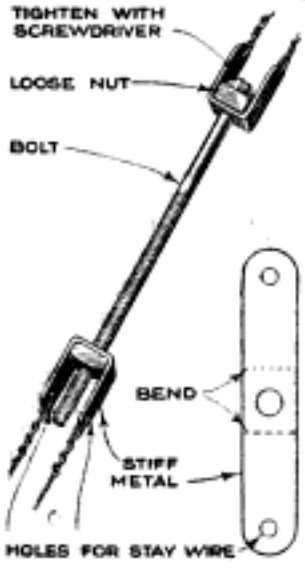
When the cracks are fairly wide, and the filling is done while the brickwork is hot, other cracks are likely to start when the cement cools. Cement mortar is inflexible, and contraction along the former open seam is not possible, therefore something must go. To help in overcoming

this difficulty, obtain some ground asbestos, new, if possible, although ground-up asbestos pipe covering will answer in the absence of the commercial product. Mix a very thin cement mortar, and thicken it to the consistency desired with the asbestos, the proper proportion being about 75 per cent asbestos to 25 per cent cement. This will make a flexible cement, which will harden and hold without cracking under a moderate amount of compression and expansion. The same filling can be used in furnace-wall cracks without taking down the brick, but in this case it is necessary to use fire clay instead of cement.

Another excellent filler for cracks on the outside of brickwork is made with asphalt paint and fine asbestos. As in the first case, the paint should be very thin and thickened to a mortarlike consistency with asbestos. This filler is very flexible, and after all the cracks have been filled, the brickwork can be given a coat of black japan or asphalt paint.

Turnbuckle Made from Odds and Ends

A light turnbuckle can be made from an ordinary bolt of requisite length. The thread is cut farther down the bolt, to about double the original length, and a nut is reamed out so as to slip over the shank against the head, as indicated. Two strips of stiff metal are drilled and bent to a U-shape, and both are slipped over the bolt, and the nut is then screwed on.—L. B. Robbins, Harwich, Mass.

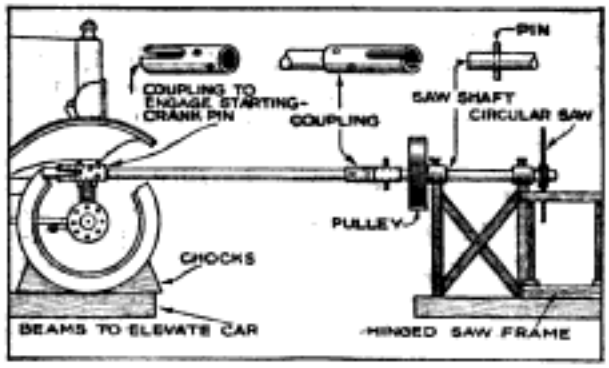


Speeding Up Blueprinting

Making blueprints in a printing frame by natural light can be facilitated by means of an ordinary mirror. The mirror is laid on the floor in such a position that the reflected light will be directed against the tracing. The mirror should be as wide as the printing frame, to prevent streaks. If desired, the mirror can be hinged to the printing frame.—Norman Taylor, Pomona, Calif.

Automobile Engine Coupled to Circular Saw

An arrangement whereby an automobile may be coupled to a circular saw for occasional use, is shown in the drawing. The saw frame for this equipment should be quite low, in order to obtain alinement with the engine shaft, or the car may be elevated on a runway.



For Temporary Use, the Automobile may, with Very Few Fittings, be Applied to Drive a Circular Saw

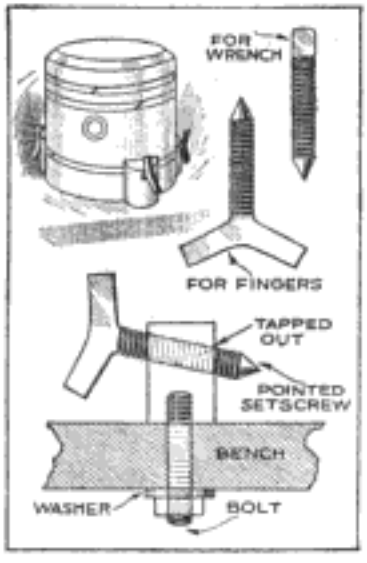
The couplings are made either of pipe with the necessary slots cut in the ends, or a solid bar may be used, with sleeves pinned to the ends; the latter arrangement is the better, as the sleeves can be made somewhat larger than the bar and shafts, and thus, to some extent, compensate for lack of accurate alinement. For continued use, the pin in the engine shaft should be replaced with a larger one, and a slight enlargement of the hole in the frame may be necessary with some cars.

Preventing Leaks in Concrete Tanks

Leaks in concrete tanks, silos, cisterns, and other structures designed to contain liquids, frequently result from neglect of properly joining the pourings of successive days. When work is stopped for the day, the surface of the concrete in the forms should be left rough so that the concrete poured on the following day will properly bond with the old mixture. The surface should be well washed and painted with a cement-grout paint, mixed to the consistency of cream and applied immediately before placing new concrete in the forms. Some builders, when discontinuing work on tanks, silos, and troughs, imbed a 6 or 8-in. strip of tin, or thin stovepipe iron, into the soft concrete, leaving half of it projecting so as to bond in the concrete to be deposited the next day, also painting the surface with a cement-grout paint. This method has been found very effective in preventing construction joints from opening up.

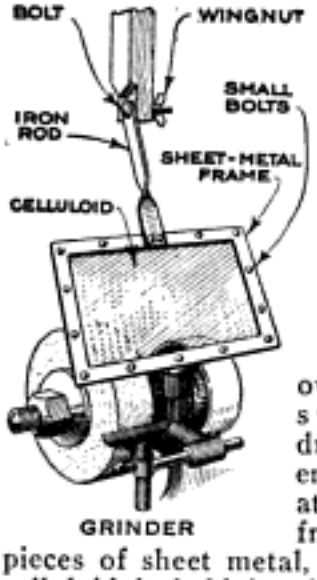
A Piston-Holding Fixture

In a garage, or automotive repair shop, frequent use will be found for the piston-holding fixture shown in the drawing, for replacing piston rings and bushings, for porting, and other operations, with the possibility of damaging the piston reduced to a minimum. The device consists of three projecting studs bolted to the workbench. Each stud is drilled and tapped at an angle, as shown, for the accommodation of a pointed setscrew, which bears against the skirt of the piston. Any small marks that may be produced on the piston by the sharp points of the setscrews are easily removed with a fine file.



A Simple Grinder Guard

A simple guard for a grinding wheel, that will prevent numerous eye accidents, is provided by interposing a piece of transparent celluloid between the wheel and the eyes of the operator, so that the latter is not only able to see what he is doing, but is protected at the same time.



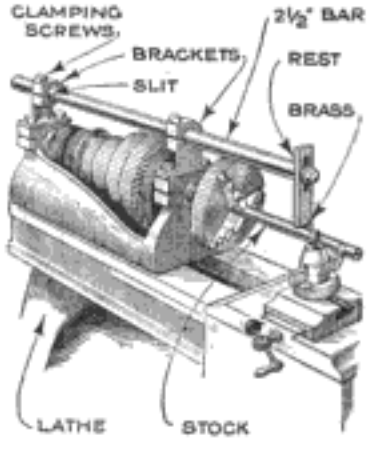
A flat iron arm is attached to some convenient part of the machine, or from an overhead beam, as suggested in the drawing, the lower end of the arm being attached to a light frame, made of two pieces of sheet metal, between which the celluloid is held in place by small bolts. This device is arranged so that when the guard is in position it will be about 12 in. above the wheel, and if desired, can be easily pushed up out of the way.

Safety in Handling Welding Apparatus

Oxygen and acetylene tanks should never be allowed to remain near stoves, salamanders, furnaces, steam heaters, or other sources of heat, and should not be exposed unnecessarily to the direct rays of the sun, as an increase in the temperature of the gas will cause an increase of pressure in the tank. Any excess of heat may also soften the fusible safety disk with which the tank is provided, causing it to blow, and allowing the gas to escape.

An Overarm Steady Rest

The overarm steady rest described was designed and used on a run of duplicate work on small shafts, which had many machining operations, necessitating the frequent use of a steady rest; this was always in the way, and had to be removed when cutting off the finished piece.



Two bearing brackets are cast from simple patterns, and bolted to the flat tops of the main-bearing caps of the lathe, using long capscrews to hold the brackets and caps together. The bracket bearings were bored to a nice sliding fit for the 2½-in. overarm, after which the bearings were slitted and fitted with clamping screws.

The rest, or shoe, is made of flat steel, provided with a central longitudinal slot for bolting to the end of the bar. A brass angle piece, fitted to the rest, will prevent scoring. After the work has been chucked true in the lathe, the rest is slid down to bear against it firmly, and clamped in place.

One of the most conspicuous advantages of a steady rest of this type is that it is never in the way of the tool or the carriage, and allows one to work on either side of the rest, without the necessity of removing and resetting it.

¶White lead, grease, and similar substances, should never be used in making joints for oxyacetylene torches. All joints, or leaks in equipment, should be brazed or hard-soldered.

A Desk Cabinet for Radio Apparatus

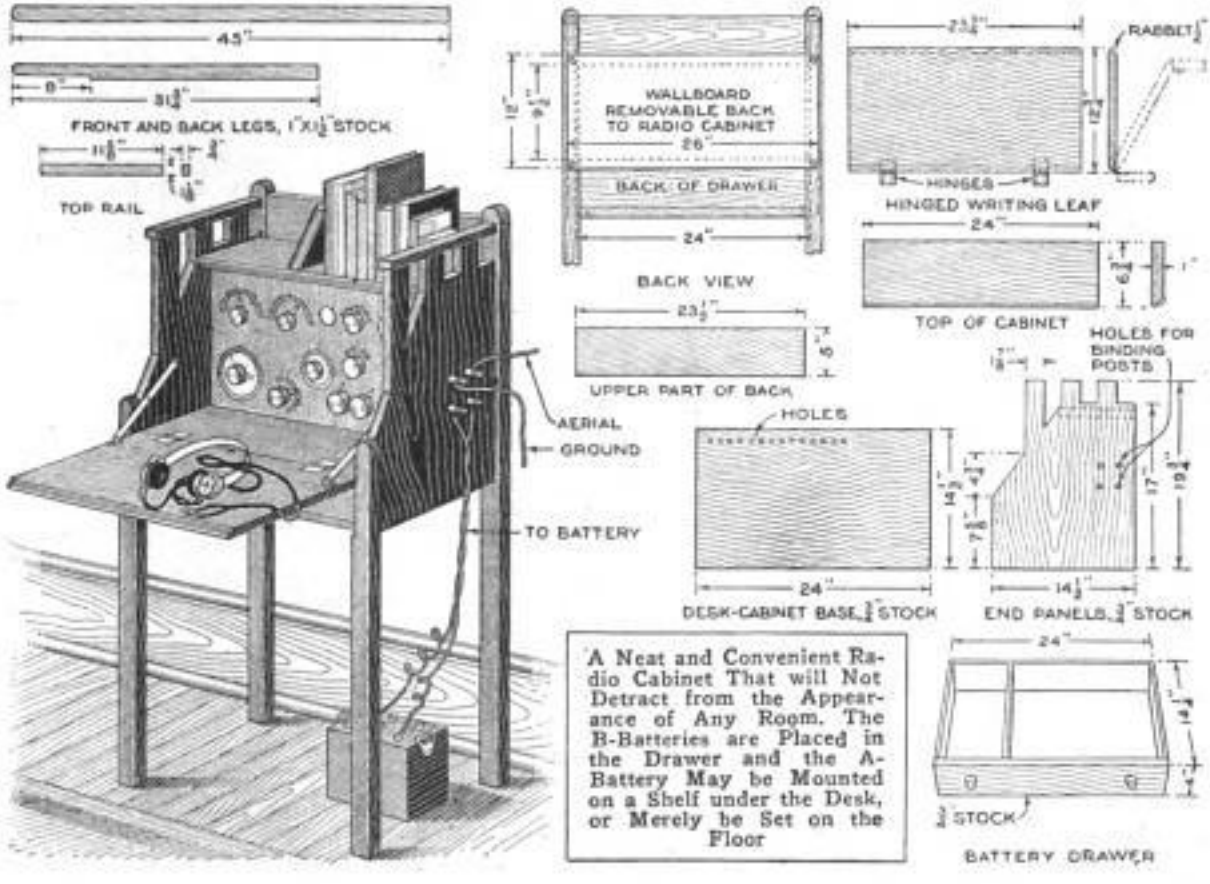
BY F. L. BRITTIN

NO longer does the radio enthusiast, from the beginner to the most advanced operator, consider it necessary to make of his laboratory a bewildering maze of wires, casually arranged switches, and ponderous and conspicuously disposed apparatus. The modern tendency is to inclose the entire set and make it as compact as possible, so that little or nothing is visible but the necessary adjusting knobs and binding posts.

The drawing shows a radio-instrument cabinet that is very neat and convenient, as all the instruments are completely protected from injury and dust; there is a commodious drawer and writing leaf, and all binding posts, with the exception of those for the phones, are on the outside, so that the apparatus need not be disconnected when the cabinet is closed. The construction cost is slight, and the materials are readily obtainable and easily worked, to the dimensions given, in the amateur's workshop. The dimensions are taken from a cabinet that has actually been constructed, although it may be necessary to alter them more or less, to suit the builder's radio set.

The kind of wood is, of course, entirely optional; almost any hardwood can be used, and finished as desired, although for this particular style, which is designed somewhat along mission lines, the use of oak, stained green or fumed, is suggested. However, if the other furniture in the room is mahogany, birch may be used, finished to correspond.

Care should be taken to fit all parts



A Neat and Convenient Radio Cabinet That will Not Detract from the Appearance of Any Room. The B-Batteries are Placed in the Drawer and the A-Battery May be Mounted on a Shelf under the Desk, or Merely be Set on the Floor

accurately; the end panels should be grooved to take the horizontal pieces, and the joints should be coated with good glue, to supplement screws, wherever necessary.

The following materials will be necessary:

2 legs, 1 by 1½ by 31⅜ in.
2 legs, 1 by 1½ by 45 in.
2 top rails, ¾ by 1⅜ by 11⅝ in.
2 end panels, ¾ by 14½ by 19¾ in.
1 writing leaf, 1 by 12¾ by 23¾ in.
1 cabinet top, 1 by 6¾ by 24 in.
1 cabinet base, ¾ by 14½ by 24 in.
1 upper part of back, ¾ by 5 by 23½ in.
1 piece wallboard, 12 by 26 in.
2 pieces for back and front of drawer, ¾ by 4 by 24 in.
2 drawer ends, ½ by 4 by 13 in.
1 drawer bottom, ½ by 14¼ by 24 in.
1 hard-rubber panel, ¼ by 9½ by 24 in.
2 brass hinges.
2 leaf brackets.

The instrument panel is made of hard rubber, with the various instruments grouped to meet the individual taste of the builder. This particular set is mounted for the short-wave regenerative hook-up, with audion bulb and controls. If desired, the upper shelf may be divided into pigeonholes, but using it as a bookshelf adds considerably to the cabinet's appearance. The back panel is made of wallboard, and is removable for easy access to the instruments and circuits, to make changes and adjustments. The drawer should slide easily without binding, and may be partitioned off as desired, although, as shown, it is used for holding a bank of B-batteries, with flexible leads of sufficient length to permit the drawer to be pulled out.

The hinged writing leaf is covered on the writing surface with green felt, extending back to the panel; this is applied in two pieces and is glued to the wood, providing a measure of protection if the phones should be dropped on the hard surface. The hinges are countersunk, and they, as well as the brass brackets which hold the writing leaf, are obtainable from any hardware store.

A Tree Pergola

The idea of growing an ornamental flowering vine over the dead trunk of a tree suggested a pergola top. After the tree had been sawed off to the height desired, the bark and sapwood were peeled off with a drawknife, and a smooth, even surface thus secured. A straight board and a level made it easy to bring the two branches of the crotch to the same height; trial determining the height that would appear best—in this case about 11 ft. The top is made of two 2 by 4-in. pieces resting in recesses on the sides of the trunk and having their tops flush. These pieces are each 12 ft. long and the ends were curved, as shown. The 4-in. sides were nailed to the trunk, while the 2½-ft. crosspieces, of the same stock, were nailed, broad side down; these were spaced about 8 in. apart and had their ends beveled on the underside. Two coats of oil, into which burnt umber had been stirred, gave the pergola a neutral brown color and, of course, helped to preserve the wood.—C. L. Meller, Fargo, N. D.

The Trunk of a Dead Tree is Converted into an Attractive Pergola, over Which an Ornamental Vine is Trained

Old Negatives Make Table Mats

An attractive mat for preventing hot dishes from injuring the finish of the dining table can be made from discarded photographic negatives and magazine illustrations.

The emulsion is first cleaned off the glass by soaking the negatives in hot water, two negatives being required for each mat. The picture is mounted on an appropriate background of light-weight cardboard, or, if desired, a picture can be used on each side. The cardboard, with the picture attached, is placed in position between the two pieces of glass, and the edges are bound with passe-partout tape.

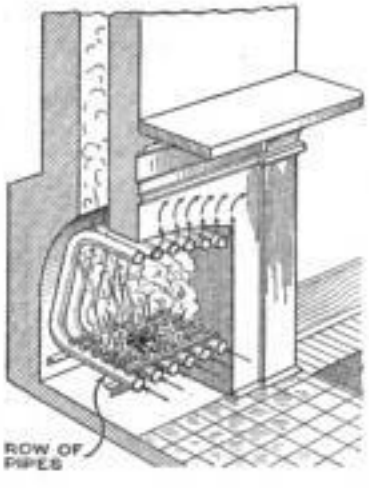
Hints on Using Postcard Projectors

The greatest disadvantage of postcard projectors is the fact that the original is shown on the screen in a reversed position as regards right and left; this is particularly apparent if there is any printed matter on the card, as it is shown backward. This can hardly be remedied with printed postcards, but when using one's own photographic prints it can be overcome in the printing. Instead of making the print in the usual manner, by placing the sensitized face of the paper against the dull side of the film negative, reverse the film and make the print with the back, or "shiny," side of the film next to the paper. In this manner the original print is reversed, and, as the picture is again reversed in the projected image, the objects in the view will appear in their natural position.

Printed inscriptions, or explanatory matter in connection with the pictures, can be reversed by placing the card and a piece of carbon paper into a typewriter so the carbon side is against the back of the card, and writing the copy in the usual manner; this will show the characters reversed on the back of the card, but when projected, the words will appear in their proper sequence on the screen.—Philip A. Wall, Bedford, Mass.

More Heat from the Grate

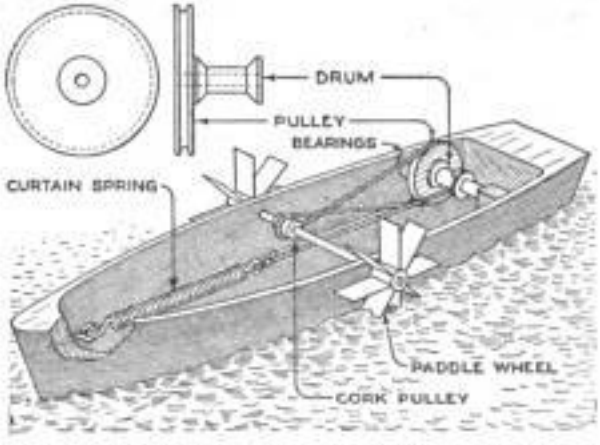
Complaint is often made that open fireplaces throw off insufficient heat. The drawing shows a novel idea for utilizing part of the heat that goes to waste up the chimney. A row of U-shaped pipes of fairly large diameter is arranged so that the cool air which enters the bottom of the pipes is heated and passes out of the opposite end into the room. Many modifications of the arrangement shown are possible, the only rule to bear in mind being that the pipes should be spaced far enough apart at the top to avoid the possibility of interference with the draft.



Spring-Propelled Toy Boat

A length of shade-roller spring forms the motive power for a model side-wheel boat, the hull of which is built along the usual lines for such craft.

The paddle wheels are mounted on a stiff wire shaft, on which a cork pulley, about ½ in. in diameter, is forced, the wheel assembly being mounted amidships. The pulley-and-shaft assembly, mounted at the stern, consists of a grooved pulley tacked to the end of a spool, the whole revolving smoothly on a shaft made from a wire nail.



A Spring-Propelled Toy Boat That can be Easily Made for the Entertainment of the Children. There Are Few Parts to Break or Get Out of Order

The spring is cut to such a length that, when one end is secured at the stem, the other will reach halfway to the pulley axle at the stern. One end of a stout string is tied to the free end of the spring, the other end being fastened to the spool with a small brad. Power is transmitted to the paddle wheels by means of a string belt.

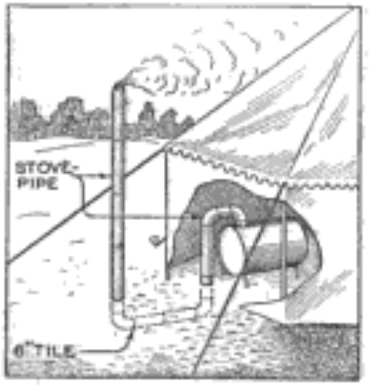
The craft is "wound up" by turning the paddles backward, until the spring has been stretched to double its length. By using two or more pulleys, to increase the ratio of revolutions of the paddles to the drive pulley, such a boat can be made to develop considerable speed and make quite extended voyages.—Edwin M. Love, Alhambra, Calif.

Automobile Chain Lock

Automobile tire chains are often lost on the road because the chain locks with which they are fitted open. Such losses can be easily prevented by wrapping one or two layers of tire tape around the locks. A tightly twisted wire loop might also do, but this is likely to slip off, permitting the lock to open.—Oscar W. Hallin, Braham, Minn.

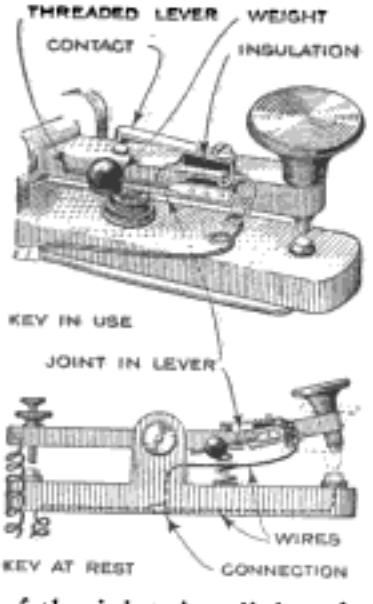
Running Stovepipe outside Tent without Cutting Canvas

When a stove is used in a tent, it is usually necessary to cut a hole somewhere in the wall for the stovepipe, but by the method shown, cutting the tent is unnecessary. The stove shown is made from a steel oil barrel, having a door cut into one of the heads and mounted on supports. A hole is cut on the top of the barrel, near the rear head, for the pipe. The underground stovepipe connections are made of 6-in. tile. This arrangement has been in use for three successive winters and has proved eminently satisfactory.—R. A. Griffith, Monticello, Ill.



A Self-Closing Telegraph Key

Every telegraph key in an American circuit must be kept closed when not in actual use. The switch commonly provided in series with the key must be opened or closed by hand, and it is decidedly human to forget to do this.

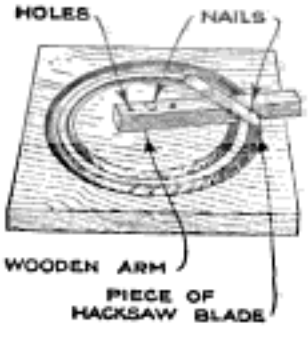


The drawing shows a telegraph key that automatically closes the circuit as soon as the operator's hand is removed from the knob. The key lever is jointed, or hinged, about the center of the front half. Firmly attached to the part in front of the joint, is a light wire lever, which is threaded so that a weight may be screwed up or down upon it, to adjust the pressure on the contacts. A light spring may be used instead of the weight and lever, if desired. Attached to, but insulated from, this forward portion of the key lever, is a short metal finger, the free end of which is fitted with a contact point; this finger is connected to the circuit by a wire, which is also connected to the lower main contact of the key.

When at rest, there is no hand pressure upon the key knob, and the weight causes the front portion of the key lever to rise a short distance, until the metal finger makes contact with the main part of the key lever. Thus, there is an unbroken pathway for the current from one side of the line to the other, through the contact points on the metal piece and key lever; yet, at the slightest touch of the finger, the key comes to the normal sending position, automatically opening the line.—Samuel W. Beach, Washington, D. C.

Forming Circular Moldings

Broken hacksaw blades can be used for making circular moldings, or picture frames, of almost any pattern. A suitable block of wood is provided with a revolving arm at its center, the latter consisting of a strip of wood, about ¾ in. square, and 8 or 12 in. long. A nail is driven through one end to form a pivot, and a piece of the broken saw blade is attached to the opposite end, at the desired radius and angle. The pivoted arm is worked around the board, the bits of saw blade used for the cutters forming the molding.—Geo. H. Holden, Chesterfield, Eng.



Growing Watercress Indoors

A constant supply of watercress can be obtained during the winter months by growing it indoors. A bottomless wooden box is needed, with a piece of flannel stretched across the top and tacked in place; this is the "garden." Sprinkle water on the flannel until it is thoroughly wet, and sow the cress seed rather thickly over the surface. The flannel must be kept constantly moist. It requires about two weeks to raise a crop, though germination may be hastened by covering the seeds with a piece of paper for the first two or three days, then removing the paper and permitting plenty of light to reach them.—James E. Noble, Portsmouth, Ont.

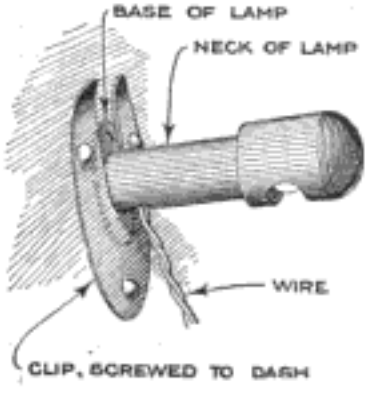
The Magic Handkerchief

Obtain some cobalt chloride, and dissolve thoroughly as much of it as will cover a ten-cent piece in three teaspoonfuls of water. Soak a handkerchief in the solution. Then remove and place it in a warm place to dry. After drying, owing to the absence of moisture and the presence of heat, the handkerchief will be blue. The least bit of moisture will cause the color to disappear.

Show the handkerchief to some friends while it is blue. Roll it in a ball between the hands and blow on it several times, until the color disappears. The trick can be performed indefinitely with a single treatment of the fabric. If too much of the chemical is used, it will not work so readily.—Mallory Dufur, Baltimore, Md.

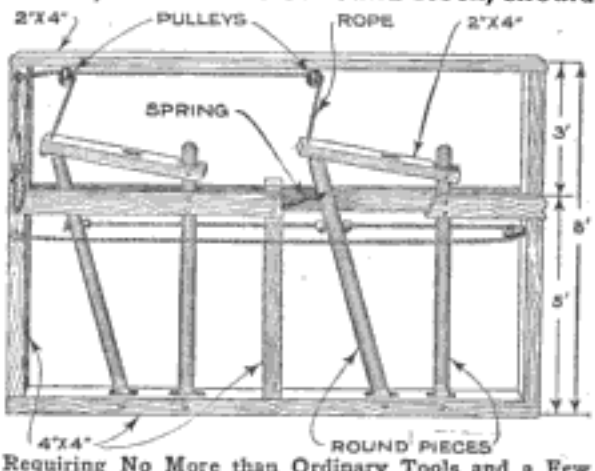
Holder for Dash Lamp

An ordinary dash lamp can be so mounted on the car that it may be removed easily, and used as a trouble lamp, without in any way interfering with its regular use. A circular piece of sheet metal, of the proper diameter, is provided with a slot of sufficient width to accommodate the shank of the lamp, as indicated in the drawing. Holes are provided in the resulting clip for attachment to the dash. The flange of the dash lamp fits behind the clip, which is formed so as to hold it securely in place, although it can be readily removed whenever desired.—Roy E. Kingsley, Melrose, Mass.



Making a Cattle Stanchion

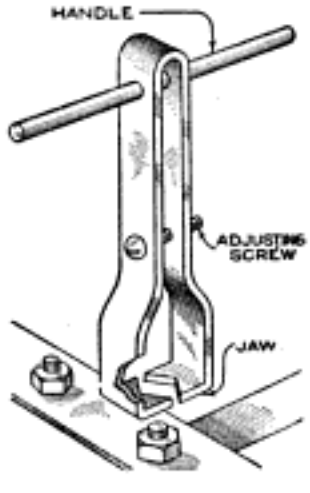
With no more than ordinary tools and a few pieces of lumber, the farmer can build a satisfactory cattle stanchion. A timber framework is first erected; this is braced by two planks, nailed or bolted to opposite sides of the vertical ends of the frame. The stanchion proper consists of two pieces, a vertical member, permanently bolted to the frame and braces, and another pivoted in a mortise in the bottom timber. The horizontal stanchion lock is pivoted at one end to the rigidly bolted upright, a mortise being provided, at the proper distance from the opposite end, for the accommodation of the movable upright. The vertical parts of the stanchions, if not made of round stock, should be rounded off to prevent injury to the cattle. By fitting the stanchions with the system of cords and pulleys illustrated, they can be opened or closed simultaneously.—Stuart Randall, Brooklyn, N. Y.



Requiring No More than Ordinary Tools and a Few Lengths of Lumber, a Very Satisfactory Cattle Stanchion can be Built at a Minimum Cost

An Adjustable Socket Wrench

The automobilist or home worker can save money and room in his tool kit by making the socket wrench shown in the drawing. The tool is made from flat steel stock, bent to shape. The jaws are filed to an angle of 120° for use with hexagon-headed bolts and nuts, or to an angle of 90° for squares. Turning the adjusting screw causes the jaws to close or spring out, so that the same wrench can be made to fit several different sizes of nuts.—R. H. Kasper, Philadelphia, Pa.

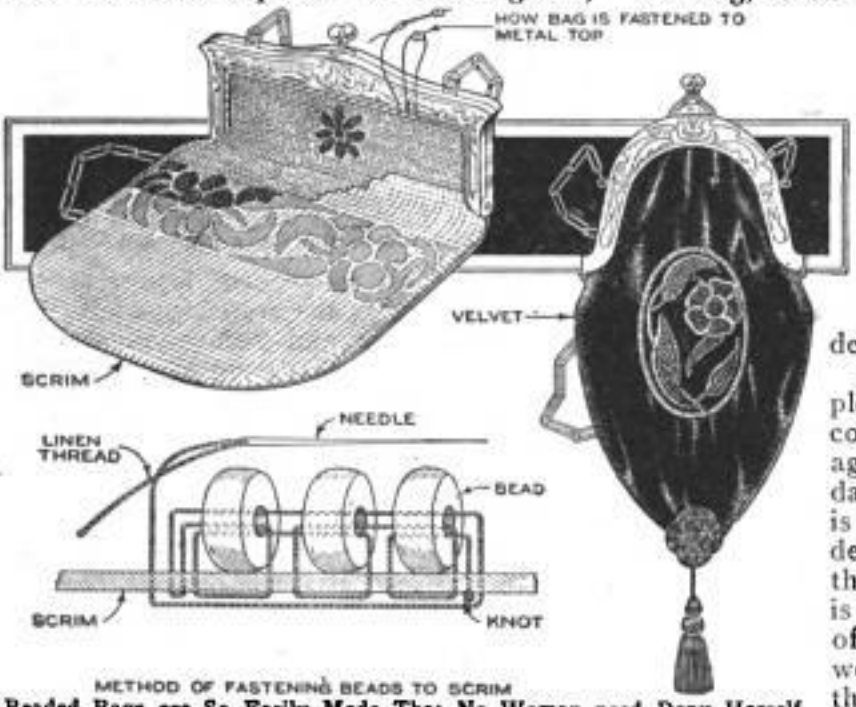


Preventing Bicycle Stand from Rattling

The rattling heard on bicycles equipped with stands can generally be traced to the stand itself. The vibration causes the stand to rattle in the latch that holds it in position. This annoyance can be stopped by slipping a piece of rubber tubing over the latch.

Making Beaded and Velvet Handbags

Beads have been used by woman for thousands of years, and she has not yet wearied of stringing beads on threads and applying them to a background to form various articles of use and ornament, such as the attractive beaded handbags that are at present so popular and —so expensive. However, there is no obstacle to prevent anyone making her own bag at a cost of only the trifling sum required for materials and time. The materials required for the bag are, a metal top, which may be obtained from most stores, ¼ yd. of scrim, lining material, and the necessary beads. In making the bag care should be taken to have the lines of the scrim run up and down, as these lines serve as guides for sewing on the beads.



METHOD OF FASTENING BEADS TO SCRIM

Beaded Bags are So Easily Made That No Woman need Deny Herself the Pleasure of Owning One. The Decorations may be Worked Out to Suit the Individual Taste

Make an accurate design of the pattern to be reproduced, on tissue paper, and trace it onto the scrim with a "4H" pencil, a hard pencil being used to prevent blurring. After the design has been traced, it is filled in with water-color paints as nearly as possible the color of the beads used.

The beads are sewed on one at a time, guided by the lines of the scrim. Linen thread should be used; this is knotted, and the needle is drawn through from underneath, taking a bead of the proper color on the needle. As shown in the drawing, each bead is securely sewed to the fabric. About every third bead the thread is taken back through them in the manner shown; this makes the bag stronger and the row straighter. It is necessary to make each row straight across, working in beads of each color as it occurs in the design traced on the fabric.

Another effective and pleasing bag consists of colored-bead designs applied against a background of dark velvet, or satin. As it is not possible to trace the design on the surface of these materials, the pattern is applied to the underside of the cloth, and is then worked out with colored threads, which gives the worker the necessary guidance, the beads being applied as described. Instead of using beads, the same idea can be pleasingly worked out in cotton yarns of different colors. The design in this case is traced on tissue paper sewed to the material at the exact location, and the yarn is applied through the paper, which is torn off when the work is finished.

Dustless Display Tray

A Canadian stationer exhibits small articles, such as paper clips, pencils, erasers, and the like, in a tray which has a wire-mesh bottom. Thus, instead of the compartments, into which the tray is divided, acting as dust catchers, the dust falls through to the surface of the table underneath. At intervals the tray is removed and the dust sucked up in a vacuum cleaner.—C. J. Henderson, Calgary, Alta.

Strengthening the Ice-Cream Freezer

After an ice-cream freezer has been in use for any length of time, the steel hoops begin to rust away, permitting the staves to loosen. This nuisance may be overcome by driving corrugated steel fasteners across the joints of the staves at both top and bottom. The fasteners will not take the place of hoops, but even if these should drop off, the staves are prevented from falling apart.—Robert Lee Bird, Roanoke, Va.

MAKING ONE'S OWN STEAMER AND WARDROBE TRUNKS

By Henri Marcelle

Part II — The Wardrobe Trunk

FOR the benefit of those who prefer a wardrobe trunk instead of the steamer trunk, this article describes and illustrates its construction and dimensions.

Covering a trunk with fiber increases the cost of construction but little, while adding immeasurably to its life. However, a little extra work is required to apply it. Either with or without fiber, the box is built in a similar manner to that described in Part I, the cut in this case being made in the exact center of the box, which is 24 in. deep. The other operations, such as bracing the corners, etc., are the same, with the exception that when using fiber, galvanized-iron angle pieces are not used on the edges. In their stead, fiber or rawhide, already pressed into shape, is used; 1½-in. angle fiber or rawhide can be obtained from manufacturers of fiber or rawhide, and in many instances from electrical-supply houses. Holes must be drilled in the fiber or rawhide, whichever is used, to take the nails, as both are very tough. With such a trunk no wooden slats are necessary, but when the sheet fiber is used, it is riveted down with round-head nails to the wooden base, after lines dividing the surface into 4-in. squares have been drawn on each side of the trunk. The nails are placed along these lines, as shown in Fig. 9. In addition to using the angle fiber on the corners, all the outside edges are similarly protected. The angle fiber is applied after the sheet fiber has been riveted in place, to cover up the exposed edges. Metal corners are used on this style of trunk as in the steamer trunk, as an additional protection, the standard practice among baggage handlers being to roll a trunk on its corners. The fiber covering, however, should not be applied until the interior accessories of the trunk have beeen installed, as it is necessary to fasten some of them through the wood.

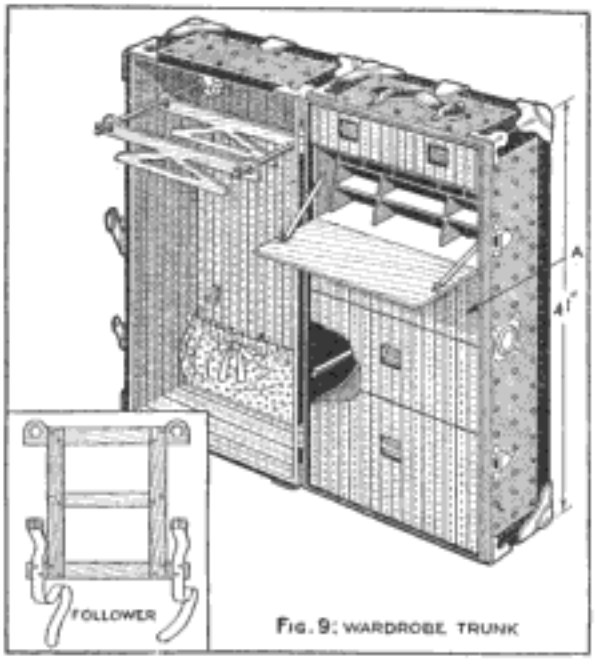


FIG. 9: WARDROBE TRUNK

This Illustration Shows a Fiber-Covered Trunk, the Interior Arrangement of Which may be Altered to Suit Individual Requirements

Of the interior arrangement of the wardrobe trunk, little need be said, as the taste and needs of individuals will differ. The clothes rack that supports the hangers is made by fastening two tripods, or crowfoots, such as are used in the installation of electric-lighting fixtures, to the inside of the trunk. These fittings can be obtained in various sizes, and should preferably be threaded to take a ⅜-in. pipe or rod. Stove bolts are used to attach them to the trunk before the fiber or canvas covering is applied, the bolt heads being countersunk to prevent a bulge on the outside. The projecting arms, which carry the clothes hangers, are made of ⅜-in. iron rod. Two 8-in. lengths of rod are required for each arm. One end of the arm is threaded to screw into the fitting, and the two sections of rod are joined by a knuckle, as illustrated in Fig. 10. The outer end of each arm has a hole drilled through it, and a small ball-head pin, taken from a pair of hinges, is inserted to prevent the hangers from slipping off.

The clothes hangers are best made of three-ply veneer, cut to the form and

dimensions shown in Fig. 11. The veneer will not crack or warp as readily as straight-grained wood. About nine hangers will be needed, and these can all be sawed out at one time, if a bandsaw is available.

To hold the clothes securely in place, the follower, shown in Fig. 9, is placed on the arms, after all the hangers have been put in position. Two straps are riveted to the bottom of this follower, and pass through buckles which are attached to the back of the trunk. The tongues are removed from the buckles, Fig. 12, so that the straps can slide through them and be pulled up tight before the trunk is closed.

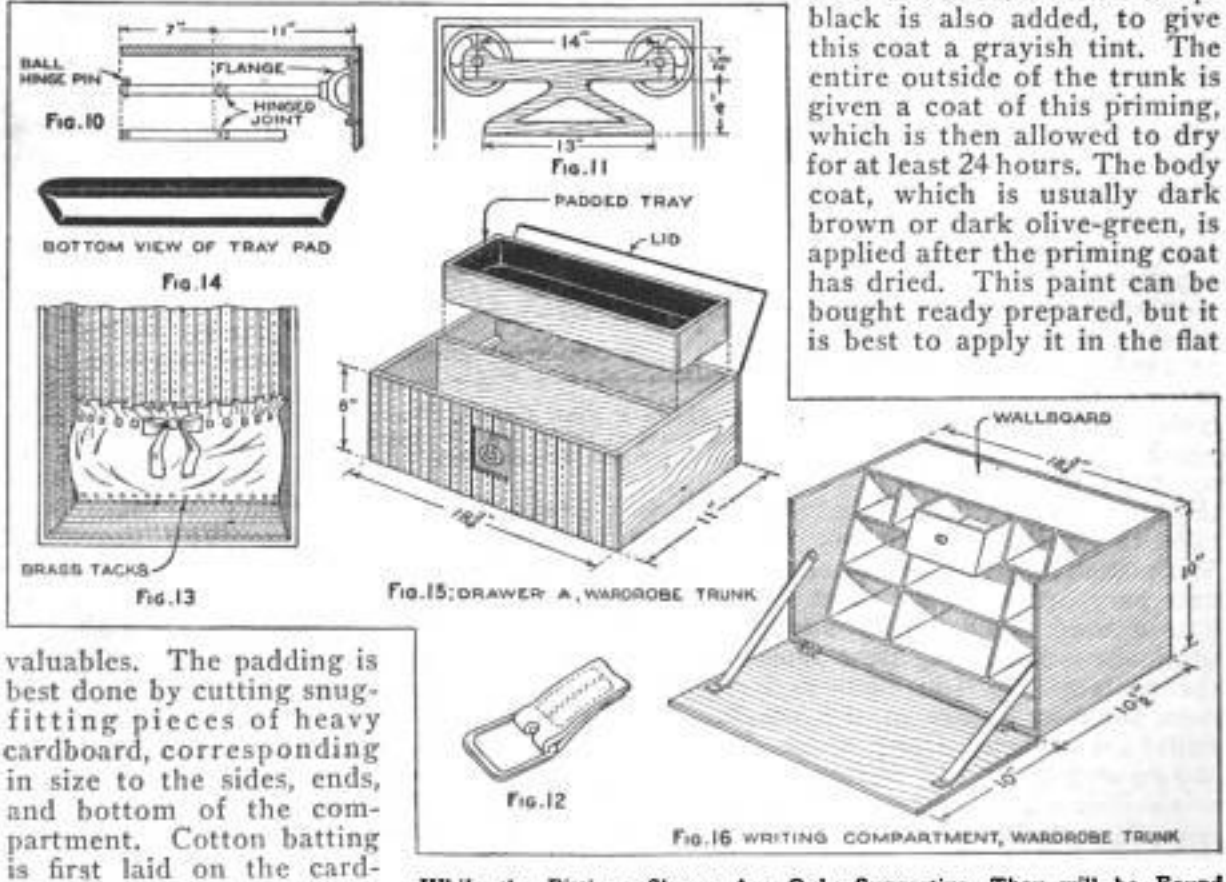
The drawers are supported by strips of ½-in. angle iron, riveted to the trunk before the covering is applied. The bottom of one section is equipped with a shoe, or laundry bag, made of the same material as the lining of the trunk. The bag is hemmed all around, and, being considerably fuller than the width of the box, it is gathered at the top and provided with a drawstring, or an elastic band, as shown in Fig. 13, which keeps the shoes or linen in place.

The top drawer may be fitted with a padded compartment for jewelry or other valuables. The padding is best done by cutting snug-fitting pieces of heavy cardboard, corresponding in size to the sides, ends, and bottom of the compartment. Cotton batting is first laid on the cardboard to the required depth, after which it is covered with muslin, which is glued to the underside of the cardboard, as in Fig. 14. A piece of dark-colored velvet, or similar material, is next applied over the muslin and glued in the same manner. The padded compartment is placed at the rear of the drawer, as shown in Fig. 15, so as not to attract attention when the drawer is opened, or the trunk left unlocked. Each drawer is fitted with a suitable handle or drawer pull, for convenience in opening.

Figure 16 illustrates the desk compartment, which may be added if desired, although the space it occupies may be devoted to the storage of clothing or other belongings.

When the trunk is packed, the pins in the ends of the horizontal arms supporting the clothes hangers are removed, and the follower is put in place; this is pulled up tightly, the straps buckled, the pins replaced, and the arms turned inward, thus holding all the clothing firmly in place.

The canvas-covered trunk described in Part I, is painted before the application of the slats and metal fittings, with a priming coat consisting of 2 lb. of white lead ground in oil; this is thinned with turpentine, and a small amount of japan drier is added. A little lampblack is also added, to give this coat a grayish tint. The entire outside of the trunk is given a coat of this priming, which is then allowed to dry for at least 24 hours. The body coat, which is usually dark brown or dark olive-green, is applied after the priming coat has dried. This paint can be bought ready prepared, but it is best to apply it in the flat



While the Fittings Shown Are Only Suggestive, They will be Found Very Suitable for General Use and will Meet the Needs of the Ordinary Journey Excellently

and afterward give it a coat of varnish. The flat color, if it is used, is known as color ground in japan, or gold size; it is thinned down with turpentine, to which a few drops of raw linseed oil have been added as a binder. A very neat job can be made by painting the canvas brown or green, and then painting the galvanized iron or fiber fittings black, leaving the brass corners, locks, and clips bright. No paint is placed on the wood slats, which are given two coats of orange shellac. The entire trunk is then given a coat of the best varnish.

If a fiber-covered trunk is to be painted, the priming coat is unnecessary, the color coat being applied directly to the fiber and finished as described above.

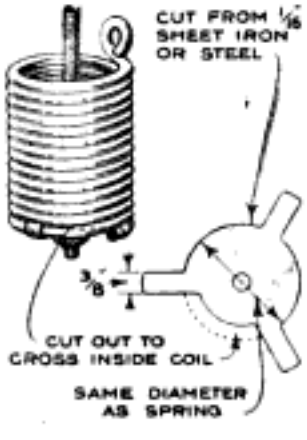
Improving the Drawing Board

Except for its firm and level bearing surface, the sole value of a drawing board lies in the trueness of its edges, yet this is the feature that is least protected. Hence the edge of the unmounted drawing board loses some of its accuracy after a time. When the board is of pine or other soft wood and made of several pieces this is particularly likely to happen.

To render the edges of a drawing board absolutely accurate and to protect them from damage, an angle strip of brass, aluminum, or other metal, sufficiently heavy to be almost inflexible, is applied to the edges of the board. One edge of the angle is flush with the board surface on one side, and that on the opposite side rests on the surface of the board. When sufficiently true, the latter edge can be used as a working base for triangles, and when the T-square is used, one end will be slightly elevated so that the possibility of blots is reduced. The metal strips are fastened to the board with small wood screws, which are countersunk.

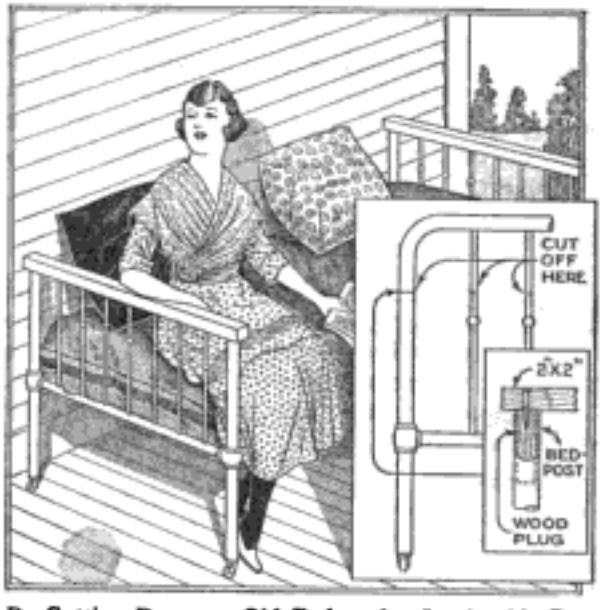
Repairing Cycle-Seat Springs

Motorcycle and bicycle-seat springs usually break at the lower end, near the eye; when this occurs, a very satisfactory repair may be made as shown in the drawing. A piece of sheet iron or steel, about 1/16 in. thick, is cut and filed to the shape shown; this is forced between the last two coils, and the lugs are bent over the bottom coil. When the bolt is fastened, the spring will be as satisfactory as before, and if the piece is enameled to match the spring, the repair is barely noticeable.



Couch Made of Iron Bedstead

An old iron bedstead can be converted into a day bed, or porch seat, by merely reducing the height of the head and foot. Measuring from the bottom up, the center rods are cut off with a hacksaw so that



By Cutting Down an Old Bedstead a Serviceable Day Bed or Porch Couch is Obtained

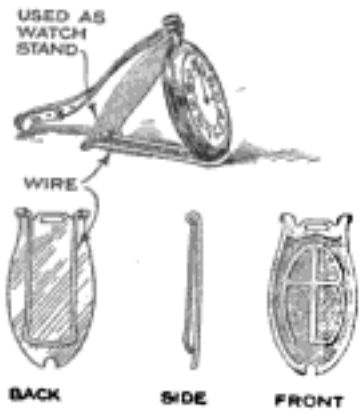
they are about the same length as the posts. The head and foot posts should previously be cut to such a length that when completed they will form comfortable arm rests. Tight-fitting wooden plugs are driven into the posts, to which the wooden crosspiece is fastened with long screws; this piece should be of hard wood, about 2 in. square, with holes drilled about halfway through from one side.

Making Parchment Paper

Paper that has the appearance of parchment may be made by soaking it in a bath of dilute sulphuric acid. Add one part of the acid to two, three, or four parts of water; immerse the paper for a few seconds in this solution, and then wash it in weak ammonia. When making the first bath, care should be taken to add the acid to the water; never pour water into acid.

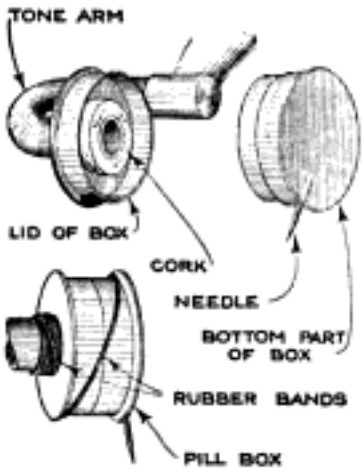
Combined Watch Fob and Stand

A watch fob that serves as a stand for the watch is easily made from sheet metal, as shown in the drawing. The fob is laid out with a semicircular opening at the bottom sufficiently large to accommodate the watch stem. Two ears are provided at the top, and these are bent over to form bearings for the wire support, the end of which has a slight curve to prevent the watch from slipping. A horizontal slot is provided in the top of the fob for the strap.—E. E. Lakso, Toledo, Ohio.



Pill Box as a Sound Reproducer

Having trouble with the reproducer of his phonograph, the user returned it to the factory for readjustment. In the meantime, desiring to use the machine, he rigged up a reasonably satisfactory substitute from an old pill box and a few rubber bands. A hole was cut in the lid of the box large enough to slip over the end of the tone arm. Two or three rubber bands were wrapped around the metal arm to prevent the box from moving, and to hold it solidly; then a hole was bored through a piece of cork, which was placed over the tone arm and inside the box lid to lessen vibration. A hole was made in the lower part of the box rim to take a needle, and the two parts of the box were put together and held with a rubber band. Using a loud-tone needle, such a reproducer will deliver about the same volume of sound as is obtained with a fiber needle in the original reproducer.—Chester Cooper, Glennville, W. Va.

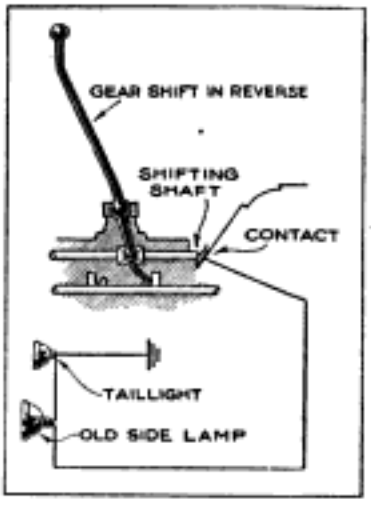


Saving Children's Clothes

Coasting down the slides in playgrounds is exceedingly hard on the children's clothing, making repairs frequent, and increasing the household budget. By providing the children with a piece of old carpet, tough cloth, canvas, or leather, about a foot square, the wear from this source is practically eliminated. A strap for carrying and to prevent the piece from slipping when in use, may be fastened to one side.—J. H. Rodgers, Montreal, Que.

A Rear Spotlight for the Automobile

For backing into unfamiliar places, or out of a park after nightfall, an automobile driver arranged an old side light at the rear of the machine in such a manner that, when the gear shift was thrown into reverse, the rear lamp would be lighted and illuminate the ground back of the car. A strip of copper was insulated from the ground circuit by attaching it to a piece of fiber; this arrangement was attached to the clutch handhole cover in such a way that when the gears were shifted to the reverse position, the gear-shifting shaft would come into contact with the copper and complete the circuit to the rear lamp.—G. E. Wilson, Norfolk, Nebraska.



Planting and Caring for Young Trees

Many a fruit tree is planted each year, to waste its vitality in trying to sustain life in sod, and poor run-out land; this is the commonest error. The tree grows by inches, if it grows at all, where it should grow by feet; it is dwarfed and unthrifty. Planted in a cultivated garden, trees usually do well, planted in uncultivated land they do not.

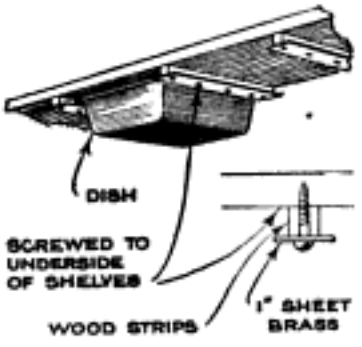
It is all a question of nourishment. This is provided by cultivation, which makes plant food available, and, when needed, by applying chemical, or other, fertilizer. The spot where the tree is planted should be well spaded and the soil

pulverized. A circle, the radius of which is roughly determined by the age of the tree at the rate of 1½ ft. for each year of growth, should be cleared of grass and other vegetation, and kept cultivated by using a pick. After the area is well cultivated spread a straw mulch over it; straw manure is the best. If the mulch is applied when the soil is loose, it will probably remain so.

Building a mound around the base of the tree is another common error, as mounding carries moisture away from the tree; the area around the tree should be slightly dished toward the center. Sometimes, even when other conditions are favorable, a tree does not respond to cultivation; this is remedied by applications of sodium nitrate at the rate of 2 oz. for each year of its age. The fertilizer is scattered on the ground a little farther out than the branches reach, and the earth is saturated with water to wash the chemical down to the roots.—John T. Bartlett, Boulder, Colo.

Increasing the Capacity of Shelves

The storage space of pantry shelves can be increased by almost half by keeping cooking utensils, dishes, and crockery underneath the shelves, as shown in the drawing. Wooden strips, ½ in. square, are screwed to the underside of the shelves and strips of stiff sheet brass, or galvanized iron, 1 in. wide, are attached to the underside of the wooden battens to form supports for holding dishes and other utensils by the rim, as indicated.



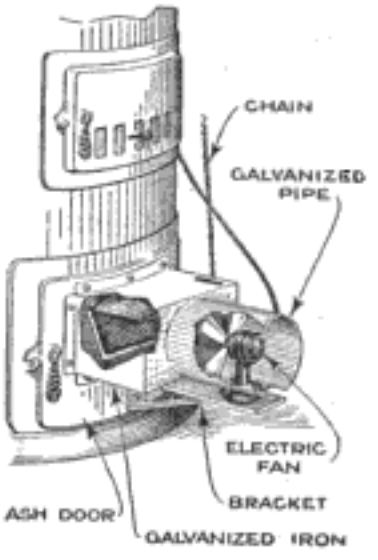
Handkerchiefs of Tracing Cloth

By freeing tracing cloth of the coating with which it is covered, the fabric can be used for making handkerchiefs, and other articles to which linen of this texture is usually applied.

The only treatment required to make the old tracings usable is to soak them in cold water overnight and then boil them, the water being changed several times. Any ink, stains, and other spots that may be on the tracing will come off with the coating.

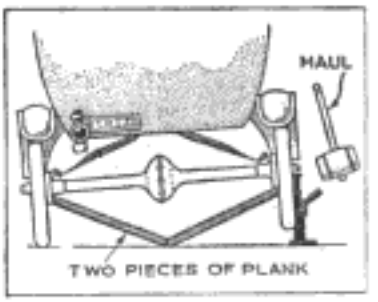
A Forced Draft for the Furnace

When heat is desired in a hurry, but the furnace fails to draw well, the forced-draft arrangement shown in the drawing will generally accomplish the desired results. An electric fan is mounted on a bracket fastened to the door of the ash pit. A sheet-metal hood, that fits over the ash-pit door, has a circular pipe fitted into it, large enough to accommodate the fan. The whole assembly should be mounted in such a manner that it will not interfere with the door movement when the ashes are to be removed. The fan should not be operated at full speed; the lowest speed being sufficient to bring the dullest fire into renewed life in a short time.—W. B. Bennett, Honesdale, Pa.



Improvised Toggle Aids Removal of Wheels

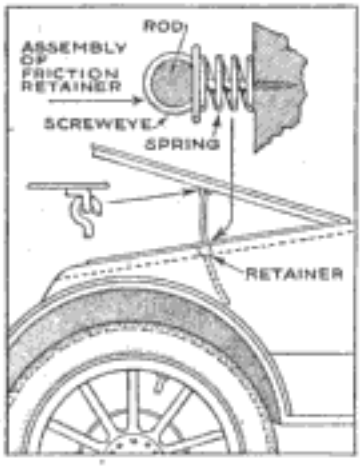
Two 3-ft. sections of plank can be combined into a toggle for the easy removal of automobile wheels that are stuck to the axle, for removing a bent or rusted rim, and in an emergency, for straightening a bent axle or axle spindle. The toggle is made by butting the ends of the pieces together when the car is jacked up, as shown in the drawing. Lowering the car causes it to exert a powerful pressure against the wheel. If a wheel is to be removed, the axle end should be hammered with a wooden maul or heavy piece of wood.



¶Undiluted cresol applied to an enameled surface and allowed to stand for a half hour will remove the enamel.

Friction Lock for Roadster Deck Cover

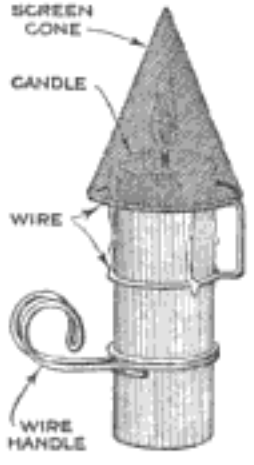
The rear deck, or compartment cover, on most roadster-type automobiles requires one hand to keep it elevated when removing or storing tools inside. A simple friction lock, that keeps the cover in any position and permits free use of both hands, is shown in the drawing.



A section of round steel rod is curved and attached to the underside of the cover by means of the eye joint indicated. Between the rod and the frame, into which the lid fits, a short stiff spring is placed, held by the screweye through which the rod passes. The spring bears against a washer, which in turn presses on the rod, and provides sufficient friction to maintain the cover in the desired position. The tension can be regulated by screwing the eye deeper into the lid framing.—G. A. Luers, Washington, D. C.

Gauze Guard Makes Safety Candle

By applying the principle of a miner's safety lamp, an ordinary candle can be used with little or no danger where an open flame is permissible, but ordinarily dangerous on account of the combustibility of surrounding materials or buildings. As shown in the drawing, a cone is made from a piece of very fine wire mesh, and a piece of stiff wire, bent to the shape shown, is provided for supporting the cone and holding it to the candle. A wire handle for carrying the candle may also be made. The screen should be placed over the flame and lowered as the candle is consumed.—Howard W. Roper, Milwaukee, Wis.



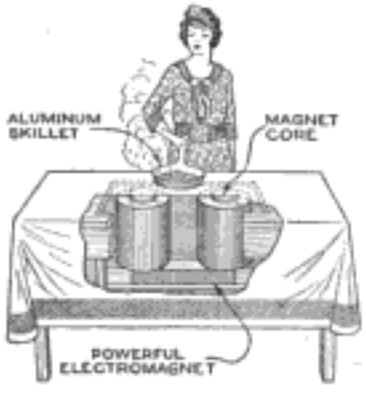
¶Always put a piece of heavy paper between a clamp and finished work, to avoid bruising.

Forcing Plants with Steam

Plants of all kinds expand their blossoms much more rapidly when given an occasional steam bath. A framework, large enough to cover the plant to be treated, is made and covered with cloth. Steam is generated in an ordinary teakettle on a portable stove, and admitted under the covering through a tube attached to the spout of the kettle. The length of time a certain plant should be steamed, depends upon the development of the buds, and different plants require longer or shorter treatment.—S. Leonard Bastin, Bournemouth, Eng.

Frying Eggs over an Unheated Table

The entertainer who can get hold of a powerful electromagnet, as, for example, the field of an old-fashioned two-pole generator, will be able to arrange an exhibition that will puzzle many who consider themselves well-informed on electricity. He has before him what appears to be an ordinary wooden table. He announces that he will fry eggs over it in an aluminum skillet. Some matches may be scattered over the table to prove that it is not heated, and spectators invited to satisfy themselves of the absence of heat by touching the table. After cracking and dropping an egg or two into the skillet, the latter is held a few inches above the table, and the eggs are speedily fried. An iron frying pan could be used, but the aluminum article is more effective, as no one can claim it is "magnetic."



The explanation is, that under the table top are the two powerful magnetic poles which are energized with ordinary alternating current. The lines of magnetic force between the poles will, of course, penetrate any nonconducting material, such as wood, without the production of heat. But, when any sheet metal, such as the skillet, is held in the magnetic field, the rapid alternation in its direction, produces electric currents in the metal, which are known to motor designers under the name of "eddy currents." These currents, tra-

versing the metal frying pan, have no other effect than to heat it by the ordinary process of heat production whenever a current encounters resistance. The fact that aluminum is nonmagnetic reduces the heating effect somewhat, as the lines of force are "crowded out" of the aluminum instead of being "drawn in," as they would be with an iron skillet. However, if the magnet is sufficiently strong, there is still enough heat to fry the eggs. If there is too much, the skillet can be held a little farther above the "stove," that is, a little farther out of the direct line between the magnet poles. The matches on the table will remain unlighted, but caution must be taken to prevent bringing the skillet against them or they will ignite from its heat.—Curtis Ralston, Chicago, Ill.

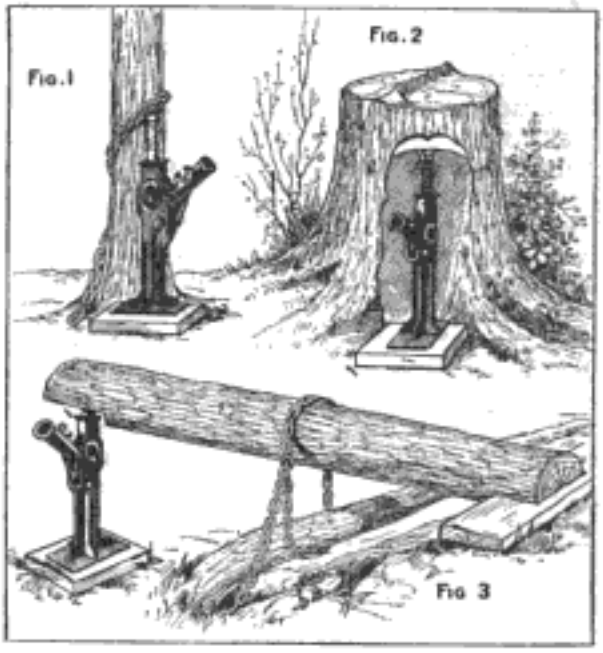
Writing Music with Carpenter's Pencil

When writing music in manuscript form, I use an ordinary soft-lead carpenter's pencil, sharpened to a flat edge. With this tool, neat and easily readable manuscript can be turned out at a considerable saving of time over the old method with its eye-straining hieroglyphics. With a little practice, good speed can be attained and duplicate copies can be turned out at once by the use of carbon paper.—Howard P. Albright, Albany, N. Y.

Jack Aids in Clearing Land

An ordinary ratchet jack makes an effective tool for pulling roots and stumps from cleared-off land, and for uprooting small trees, as shown in Fig. 1. Figure 2 shows a method of pulling stumps; a recess is cut in the stump for the jack to bear against. In the case of large stumps, it would possibly be better to crack it into several pieces with stumping powder and extract the pieces in the same manner. For removing the main roots of a tree, they are cut off as close as possible to the stump and pulled out of the ground by the method shown in Fig. 3, an excavation around the root being necessary to place the chain in position.

Pulling stumps, instead of burning them, has the decided advantage of leaving the ground in good shape for plowing, the humus is not burned out, and if the soil is clayey, it will not be burned hard as brick.—D. C. Chapman, Portland, Ore.



Pulling Up Stumps, Small Trees, and Roots with the Aid of a Track Jack Leaves the Ground Ready for Immediate Plowing

Typewriting on Labels

Owing to the difficulty of holding labels on the platen of the typewriter, and being aware that hand-written prescription labels depended upon the penmanship of the writer for their legibility, a druggist evolved the idea shown in the drawing for typing his labels. Four diagonal slits were cut in the center of a letter-sized sheet of paper, into which the corners of the labels were inserted. The sheet was then fed into the writing machine in the usual manner and brought into position for writing the directions on the label.—F. Rickey, Geneva, N. Y.

¶Hair cracks in hardened pieces quickly show up if the work is oiled, the oil wiped off, and the surface of the work chalked. The oil soaks through the chalk, thus betraying the presence of the cracks.

A Side-Wheel Motorboat with Automobile-Type Drive

By L. B. ROBBINS

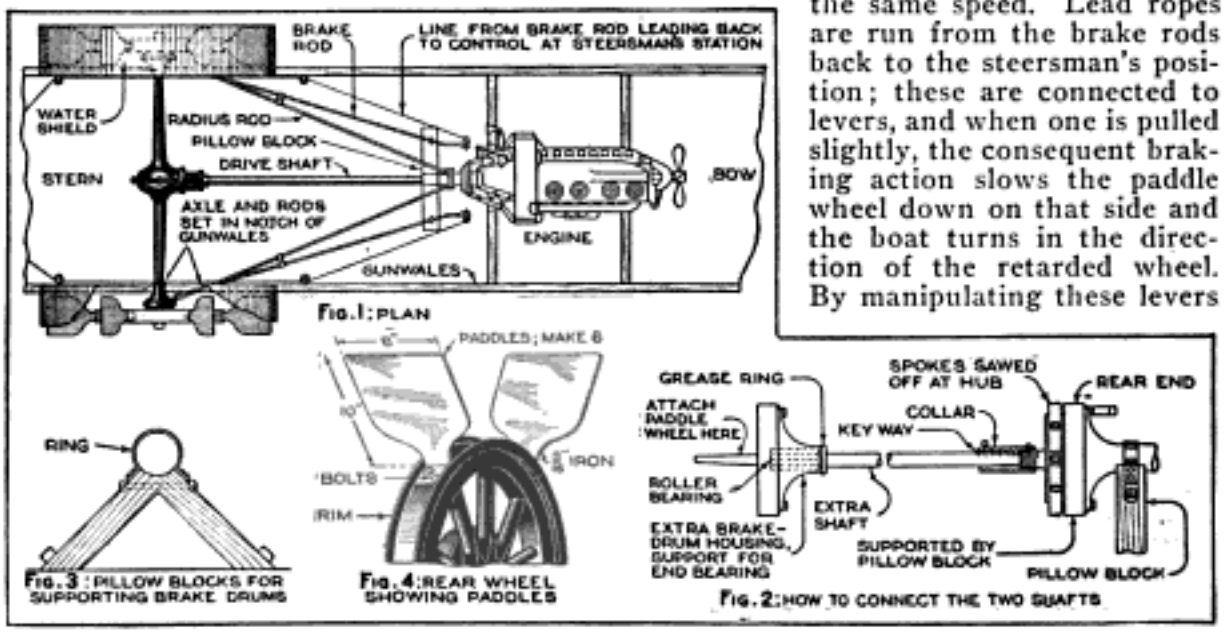
ONE of the simplest methods of propelling a boat in shallow water is by side or stern wheels and, while the latter is a little awkward to construct and operate, the former can be arranged with but little difficulty by utilizing the rear end of an automobile as the driving element and attaching paddles to the wheels themselves. Any motor of suitable power can be used as long as it can be properly connected to the driving shaft. The engine is mounted in the bow so that the paddles will be just aft of the center of the boat.

Where convenient, the axles are set in notches cut in the gunwales, and the forward end of the drive shaft is supported on a pillow block in the manner shown in Fig. 1; this should line the whole up with the engine shaft, although some deviation is permissible if a universal joint is used. Be sure, however, that the axles are at right angles to the sides of the boat and at such a height that the rims of the wheels will just clear the water. With a 24-in. wheel, that would mean that the center of the axle should be at least 13 in. above water level; 14 in. would be better, and allow for settling when the boat is loaded. Radius and brake rods should also be set in notches cut in the gunwales, to hold them in position; these openings may be closed with metal or oiled canvas, to prevent water from splashing aboard.

In the event that the boat is wider than the width of the axles, they must be extended to make up the difference; a simple way of doing this is shown in Fig. 2. The brake drums are supported on pillow blocks of the type shown in Fig. 3. An extra pair of axle shafts, brake drums, and roller bearings will be required. The extra shaft is connected to the original one by a collar which screws on the hub in place of the hub cap, and receives the tapered end of the extra shaft in the manner shown. Setscrews and keys are provided to make the connection secure. The outboard ends of the shafts are equipped with a roller bearing and brake drum, the latter being fitted into the gunwales as already explained. A grease ring should also be set against the inside opening of the extra brake drums, to retain the lubricant of the roller bearings.

Six sheet-metal paddles are made for each wheel, according to the drawing in Fig. 4; these are designed for a 24-in. wheel. The base of the paddles is bolted to the rim of the wheel, the rim being first drilled so that the paddles, when placed, will be equidistant around the circumference of the wheel. See that the paddles are strong enough to stand the strain imposed upon them, and that sufficient clearance is allowed between them and the sides of the boat. The wheels are keyed to the shafts in the same manner as on the car. A water shield, of metal or canvas, is provided over each wheel to prevent splashing, as in Fig. 1.

When the water is calm and the paddles are in the water on both sides at the same time, the action of the differential will remain even, and both wheels will turn at the same speed. Lead ropes are run from the brake rods back to the steersman's position; these are connected to levers, and when one is pulled slightly, the consequent braking action slows the paddle wheel down on that side and the boat turns in the direction of the retarded wheel. By manipulating these levers properly, no rudder is needed in either forward or reverse speeds. If the action

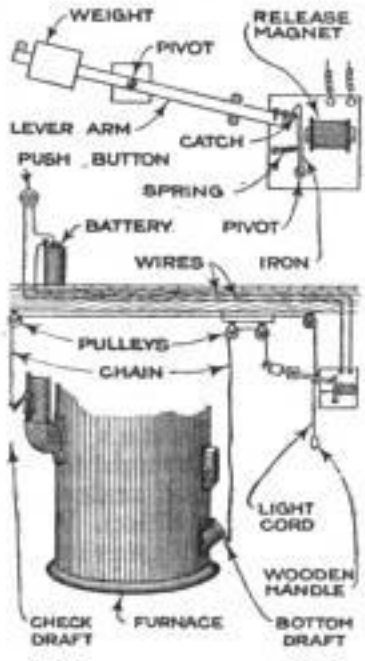


The Only Satisfactory Means of Propelling a Boat in Shallow Water Is by Side or Stern Wheels; the Former can be Arranged by Utilizing the Rear End of an Automobile and Attaching Paddles to the Wheels

of the differential is likely to be impaired because of rough water, or uneven loads, simply pin one of the small rotating differential gears so it will not turn, and both axles will revolve as one shaft, but in this case the brakes will have no effect except to stop both paddles.

Push Button Opens Furnace Draft

By merely pushing a button, the drafts of a furnace can be operated, without descending to the basement.



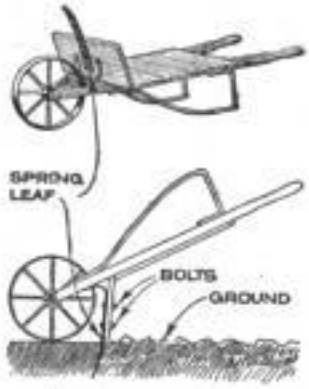
A lever, 14 in. long, is pivoted at its center, in a position near the furnace, where it will not interfere with the headroom. A light chain is run from the check-draft door to one end of the lever, while another chain connects the opposite end of the lever to the bottom draft. A weight is placed on the lever arm, at the end that is connected to the bottom-draft door, to act as a counterweight.

The device is operated by a simple spring-actuated catch, which engages with the end of the lever when it is pulled down to check the draft. A light cord, with a handle attached, can be provided to set the device, if it is located above reach. When it is desired to open the draft and start the fire, pressure on the push button causes the electromagnet to pull back the latch, thereby releasing the lever, which closes the check draft and opens the bottom draft. The same apparatus may easily be adapted to be operated automatically by means of an alarm clock.

¶Special care should be taken to avoid the interchange of oxygen and acetylene hose or piping, as this might result in a mixture of these gases which would be highly explosive. The practice of using threads of a different hand for each pipe is recommended.

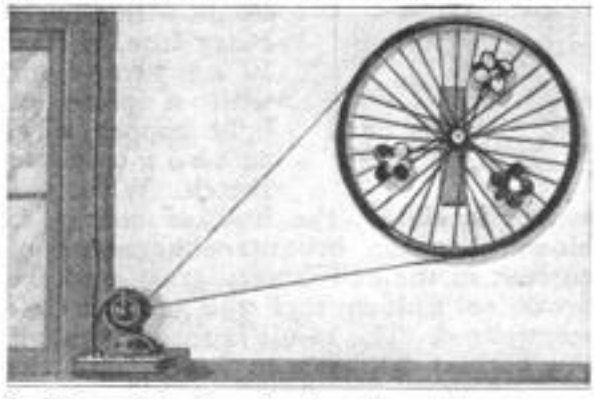
Garden Plowed with Wheelbarrow

The sketch shows how an ingenious gardener quickly converted an ordinary garden barrow into a serviceable cultivator. A leaf from a broken automobile spring, 2 ft. long, was secured to the dash of the barrow by means of two short bolts, put through holes drilled for the purpose. The other end of the spring was cut to the shape of a narrow cultivator shovel, and sharpened. To use the plow, the barrow was simply turned upside down and pushed along the row after the manner of a wheel hoe. Later, two smaller shovels, made from leaves of a seat spring, were bolted one on each side of the large one, to form a weeder. The cultivator does not interfere with the regular use of the barrow.—H. F. Grinstead, Columbia, Mo.



Device Amuses Children While Their Hair is being Cut

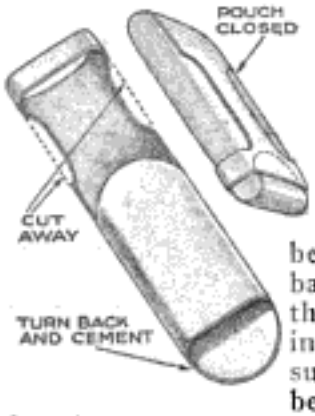
A Kentucky barber has installed the arrangement shown in the photograph in his tonsorial establishment, for entertaining the youngsters who are compelled to submit to his ministrations. An old bicycle wheel is mounted on the wall where the children cannot avoid seeing it; the wheel has attached to it several brightly colored pinwheels. The device is driven by a small electric motor, as shown. Thus, the barber is able to attract little Johnny's attention to something more entertaining than the usually disliked hair cut.—J. E. Reid, Bellevue, Ky.



A Barber, Knowing the Aversion of the Average Child to a Hair Cut has Rigged Up the Device Shown for Entertaining Them as He Wields the Shears

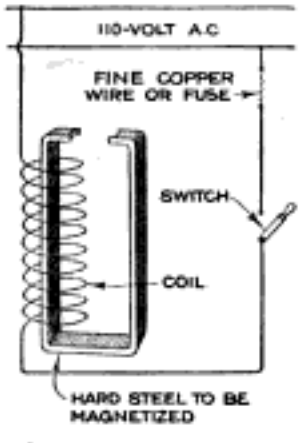
Tobacco Pouch Made from Inner Tube

A serviceable and convenient tobacco pouch, for the man who "rolls his own" or smokes a pipe, can be easily made from an 8 or 9-in. length of old inner tube. The tube is cut away at one end to make a flap, which is coated with rubber cement, turned back, and cemented to the tube, as indicated in the drawing. After sufficient space has been allowed for forming the pouch proper, the remainder of the tube is cut away on the dotted lines, in the manner shown. When the pouch is filled with tobacco, the upper flap is brought over, and the ring at its end is snapped over the opposite end, as shown. —Andrew Crowe, S. Manchester, Conn.



Making Permanent Magnets by Use of Alternating Current

In the amateur's laboratory it often happens that he desires permanently to magnetize steel parts, but is not able to do so without means of rectifying the commonly used alternating current. This difficulty can be easily overcome if the coil used to magnetize the parts is placed in circuit with a fairly heavy fuse, of 5 or 10 amperes, or with a piece of light copper wire, as shown in the sketch. When the switch is closed, the fuse, of course, is blown, but the instantaneous surge of current in the coil is very great, and the break so sudden that the steel is left magnetized. The result is secured only if the current happens to break near the peak of a wave, or alternation; if not successful the first time, the process must be repeated.—A. Swenson, Okmulgee, Okla.



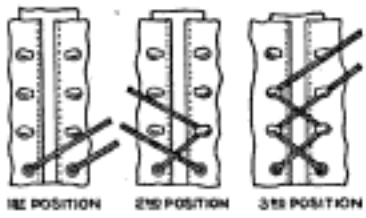
¶A flush-driven staple can be pulled if a nail is bent at the tip and driven under the staple. Draw the nail with a claw-hammer.

Tape Measure Used as Skirt Marker

The home dressmaker always has her tape measure handy, and she will rejoice to know that she possesses, at no cost, an excellent device for marking a skirt evenly around the bottom. The conversion, which is accomplished by inserting a steel corset stay into one end, does not interfere with the usefulness of the measure. With this ever-at-hand skirt marker it is a simple matter to insert pins at regular intervals in the material at the required height.—Mrs. Deane Newcomb, New York, N. Y.

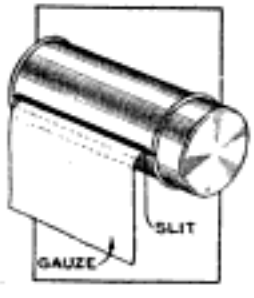
Lacing Boots with One Hand

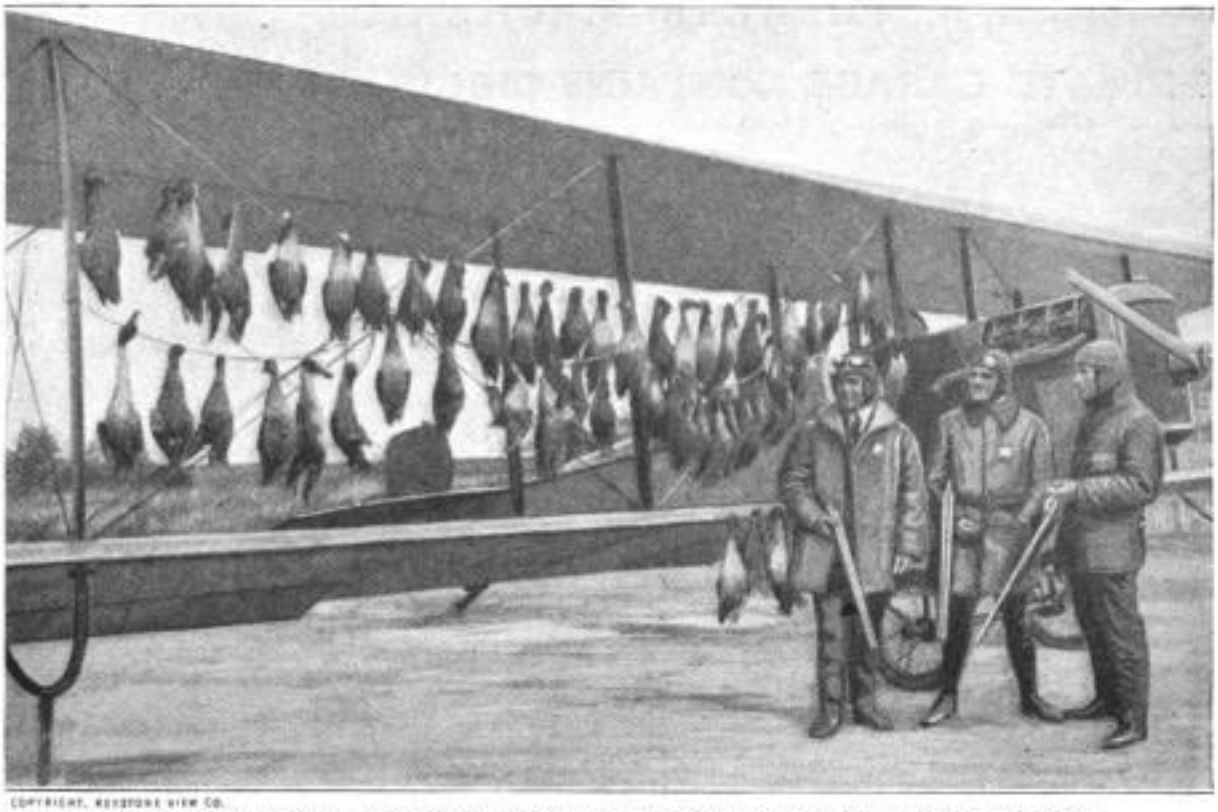
When lacing boots or leggings which have a long line of hooks, take one lace between the thumb and index finger, and the other between the index and second fingers, allowing the laces to slip as required. The laces are brought to the first position and then hooked under the first hook, as in the second position. With a twist of the wrist, catch both laces under their respective hooks, as illustrated in the third position, continuing until the top is reached, and the lace tied.—J. McCormack, Haliburton, Ont.



A Sanitary Gauze Holder

Antiseptic gauze is not likely to remain sterile very long after the package has been opened, unless precautions are taken to keep the hands from touching the roll. A sanitary holder can be easily made to any suitable dimensions, from a tin can having a lid. A slit is cut the entire length of the can, and the rough edges are bent out slightly to prevent the gauze from catching as it is drawn through. A few inches of the gauze are unrolled and the roll is placed inside the can, slipping the end into the slit. The cover of the can serves to keep the roll in and dirt out. If desired, a pad kept moistened with an antiseptic solution may be placed inside the lid as an additional safeguard.





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HUNTING PLACES ACCESSIBLE ONLY BY PLANE YIELD UNUSUAL BAG

THAT familiar plaint of sportsmen to the effect that shooting and fishing are not what they used to be, evidently applies only to the places accessible by rail or road. Now that the airplane has made it possible to "go in" to hidden fields and waters, over instead of through trailless wildernesses, animal life is not infrequently found in almost primeval abundance. Such an experience recently delighted a group of San Francisco hunters, who, navigating the air above a watercourse, discovered an unknown pond literally swarming with wild ducks. That the opportunity thus set before the winged Nimrods was not neglected is evidenced by the picture, and astonishment increases when it is asserted that all these fat fowls were slain with three shots.

OPPORTUNE ANNOUNCEMENTS

Whenever prize competitions mentioned on this page are conducted by a public institution, the name and address will appear with the announcement. Industrial addresses will not be published, but may be obtained from our Bureau of Information by request, mentioning the title of the article and date of publication.—Editor.

CONVENTION TO ORGANIZE TRADE WITH FOREIGN COUNTRIES

Although the export business of American manufacturers more than trebled from 1913 to 1920, totaling over $8,000,000,000 last year, little progress has been made in establishing permanent foreign-trade relations. The great expansion of manufacturing facilities has shifted the foreign market from its position of a convenient by-product to one of commercial necessity, yet the control of cables, fuel stations, harbor and terminal privileges, banking, railroad, and shipping facilities, remains largely in the hands of other nations. Attempt will be made definitely to solve these problems, with the active coöperation of governmental agencies, at a convention to be held in Cleveland next May by the National Foreign Trade Council. As an example of Latin-American trade development, the case of Colombia is cited. Of 11 imported commodities, American manufacturers supplied all the market imports, and from 40 to 90 per cent of many other lines of goods.

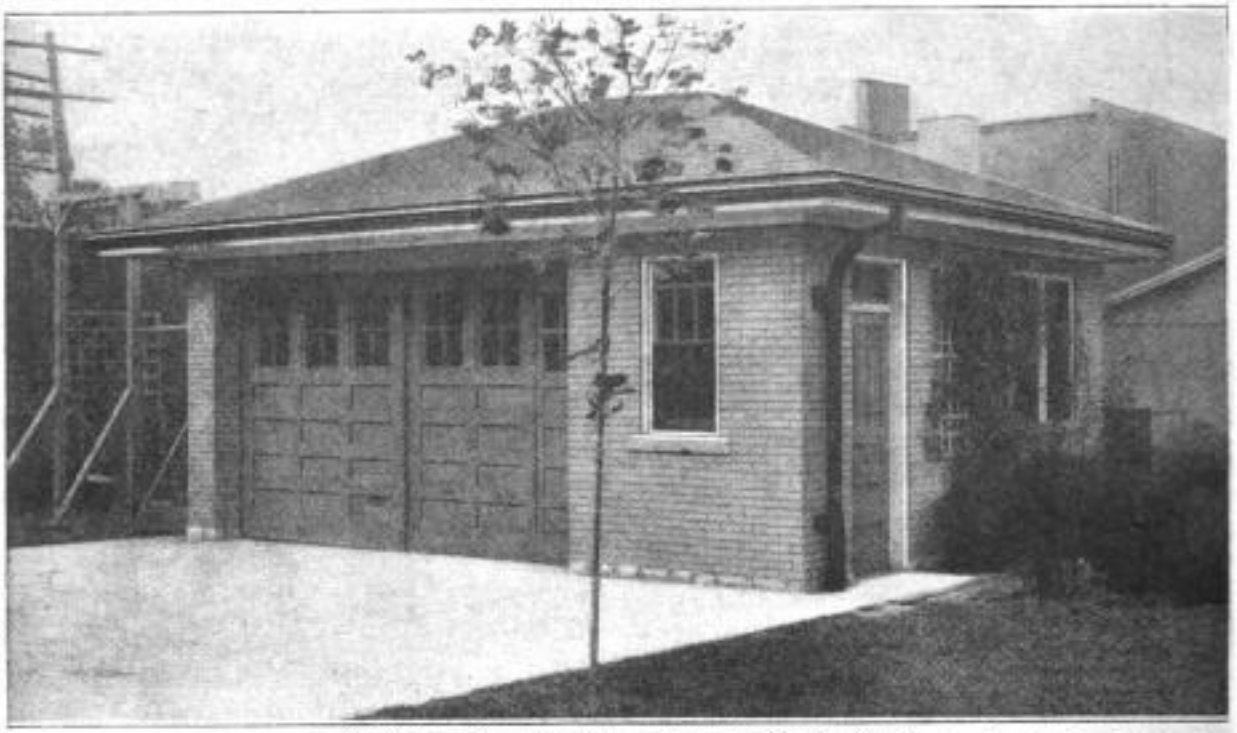
MANY INTERESTING POSITIONS OPEN IN GOVERNMENT SERVICE

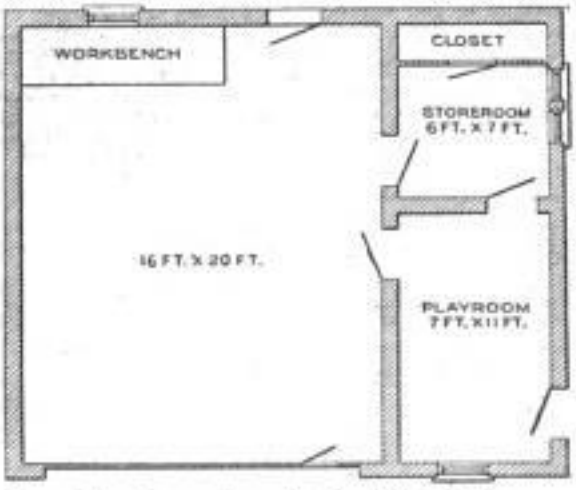
Examinations announced by the U. S. Civil Service Commission disclose a number of interesting opportunities now open in the government service. Among the vacancies listed are engineering positions in the civil, electrical, mechanical, signal, structural, telegraph, telephone, and architectural branches. Some of them are with the Interstate Commerce Commission, at salaries ranging from $2,340 to $2,700 a year, while other departments have similar vacancies at higher or lower remuneration. Requirements include at least four years of apprenticeship or school training, and four years of recent responsible experience, preferably in valuation and unit-cost work. Until March 1, examinations will be held for electric draftsmen for the office of chief engineers, War Department. Appointments will be made, according to grade, at salaries of $1,200 to $2,400 a year, plus a $20 monthly bonus. Entrance requirements are based on both education and experience. An examination for shop apprentices for the Bureau of Standards, similar to the one announced in this magazine last October, is also open until March 1. Applications for all these examinations are to be made on Form 1312, in asking for which the name of the desired examination should be specified.

COLLECTORS' DUPLICATE STAMPS TO HELP STARVING CHILDREN

Philatelists of Europe have devised an ingenious way to obtain help for the thousands of children in the eastern hemisphere who are suffering from the devastations of the war. Stamp collectors, amateur and professional, and all others who have duplicate, or unwanted, specimens of postage stamps, rare or common, are invited to send them under registered cover to the "Save the Children Fund," Central Union, 4 Rue Massot, Geneva, Switzerland. This organization, which has appointed a stamps committee with the coöperation of the Philatelic Union of Geneva, and claims the patronage of the International Red Cross Committee of Geneva, will attend to the classification and sale of all stamps received, and the proceeds will be devoted to the rescue and benefit of starving children in Europe and Asia.

PRIVATE GARAGE CONTAINS CHILDREN'S PLAYROOM





Top: The Garage Completed, with the Playroom Section at the Right-Hand End. Bottom: Floor Plan Showing the Playroom, Storeroom, and Garage Proper

CHILDREN of normal imagination need no outside suggestion to see the word "playroom" written attractively on almost any private garage; and unless an edict issue against it, or the key be hidden, the "little house" is quite likely to be so used. Many a temporarily vacant garage, indeed, has been turned over to the juvenile forces for just that purpose, with a considerable return in happiness on the investment. Considering this interesting angle of an everyday situation, a resident of an Illinois town has carried his plans so far as to include a real playroom in the attractive garage he has recently built in his back yard.

With this end in view, the building, though intended for only one car, measures 20 by 24 ft., and is made of buff brick to match the house, and hip-roofed with a wide cornice. The actual garage space, to the left of the inside partition, is 16 by 20 ft., giving room for a workbench in a back corner. At the right end are a playroom, 7 by 11 ft., and a storeroom, 6 by 7 ft., for toys and auto supplies, with a commodious closet across the end. The playroom has a large window, an outside door with a transom, and inside doors to the garage and the storeroom, while the latter also has a door to the garage, and is lighted by a double window.

Establishing this center of juvenile activity suggested one more step, and the outer end of the building has been made the wall of a miniature amusement park, equipped with swings, a seesaw, a sand pile, and various other outdoor entertainments. The whole installation is reported to have cost about $2,000, but could, of course, be reproduced much more economically on a less elaborate scale.