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HENRY J. RAHE (Dept. 2896) **Kansas City, Mo. Cincinnati, Ohio**

Popular Mechanics Magazine

6 N. Michigan Avenue, Chicago, U. S. A.
H. H. WINDSOR, Editor

London: Hachette & Cie, 6, King William Street, Charing Cross, W. C. 2
Paris: Hachette & Cie, 111 Rue Reaumur
Melbourne, Australia, The Australasian News Co.

ISSUED MONTHLY
SUBSCRIPTION:
SINGLE COPY, 25 CENTS

In United States, and its possessions, Cuba, Mexico, and Canada, per year, postpaid - $3.00
To all other countries in the Postal Union - - - - - - - - - - - - 3.50

All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879.
Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

Vol. 35

Contents for May, 1921

No. 5

Cover Design—Oxyacetylene Welding under Water, by C. E. Ruttan

[Continued on Page 4]

[Contents—Continued]

SHOP NOTES

[Contents Continued on Page 6]

[Contents—Continued from Page 4]

AMATEUR MECHANICS

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

VOL. 35 MAY, 1921 No. 5

SPRAY PAINTING FACILITATED BY MOTOR TRAILER CARS

PAINTING the railway bridge and other work along the right of way can be done just as speedily and economically as giving the car body or locomotive its new coat of paint at some divisional headquarters. One railroad has adopted the simple and practical method of mounting a complete spray-painting outfit on a motor trailer car, thus providing easy and quick transportation of equipment, and getting maximum results from this time and cost-saving process of painting. The air compressor, air tank, and gas engine are the only units permanently mounted. With a two-man outfit the paint tank can be so located that the operators can work to every advantage at points far removed from each other. There is plenty of room on the trailer for ladders, safety brackets, and such other extra equipment as it may be necessary to carry.

The paint-spray car not only saves time and labor, but actually prolongs the life of the bridge structure itself. It is difficult to force a protective coating of paint into the sharp angles and corners of the ironwork by any other method than spraying, and if left uncoated, they become collecting places for moisture and nucleus spots for the rust of ultimate disintegration.

Using the Spray System of Painting on a Railroad Bridge, with the Aid of a Motor-Driven Car on Which the Air Compressor and the Tank for Paint and Air are Mounted: Two Paint Guns and Lines of Hose Assure a Rapid and Thorough Job of Coating the Intricate Ironwork

BUILD GREAT MINT IN CHINA TO STANDARDIZE CURRENCY

One of the largest mints in the world, with a possible daily output of 500,000 silver dollars, is to be erected at Shanghai, China, at a cost of about $2,000,000, under the direction of an American expert. When completed, in about two years, it will absorb some 14 tons of silver a day in its task of establishing a standardized currency in China, where the present unit of value, the Mexican dollar, competes with as many varieties of coin as there are provinces. The Chinese tael, now used for reckoning, is not a coin at all, but a measured slug of silver, the value of which varies in different parts of the country.

VANITY CASE AND PARASOL MAKE NEW WIRELESS SET

Portability in wireless-receiving sets has become so commonplace that attention is directed toward the minor refinements of convenience and appearance, with the result that a newly designed set takes the queer shape of a lady's vanity case and parasol. The parasol is remarkable for the fact that its silk cover carries no less than 110 ft. of flexible antenna wire, arranged in an ornamental spiral. The hand case containing the instruments is only 5 in. long, 4½ in. deep, and 3½ in. thick. Any convenient water hydrant may be used for the ground connection, which is completed with a flexible cord that is carried in the case.

COPYRIGHT, JACK SUSSMAN

At the Left: The Parasol-Vanity Case Wireless-Receiving Set in Use, Grounded to a Convenient Water Plug by a Flexible Cord. At the Right: The Parasol "Aerial," with Its 110 Feet of Antenna Wire Decoratively Arranged

EXPLODING WIRES MAY YIELD THE SECRETS OF THE SUN

In studying the sun and stars, scientists attempt to imitate in the laboratories the conditions existing in the sun and heavenly bodies. For instance, the temperature of the gases on the sun is very high; the pressure may be greater than that at the surface of the earth, and even the crater of the carbon arc is less brilliant than the dark spots on the sun. Recently Doctor Anderson, in the wonderful laboratories of the Mt. Wilson observatory, made distinct progress toward a solution of some of the problems of the sun by exploding wires by electrical discharges. Small wires, about two inches long, some of which were so fine that it would take 28 miles of them to weigh a pound, were placed in a circuit through which a condenser, previously charged with a potential of 25,000 volts, was discharged. The result was that in .00001 second or even less, a relatively large amount of energy was freed in a microscopic amount of material, which raised its temperature to a high value, and caused it to explode with a loud crack. The force of the explosion could be felt like a blow on the hands or face at a distance of 20 in. from the flash, and care had to be taken to protect the ears from the impact of the noise. A glass tube filled with water and placed about the wire was reduced to a fine powder by the violence of the discharge.

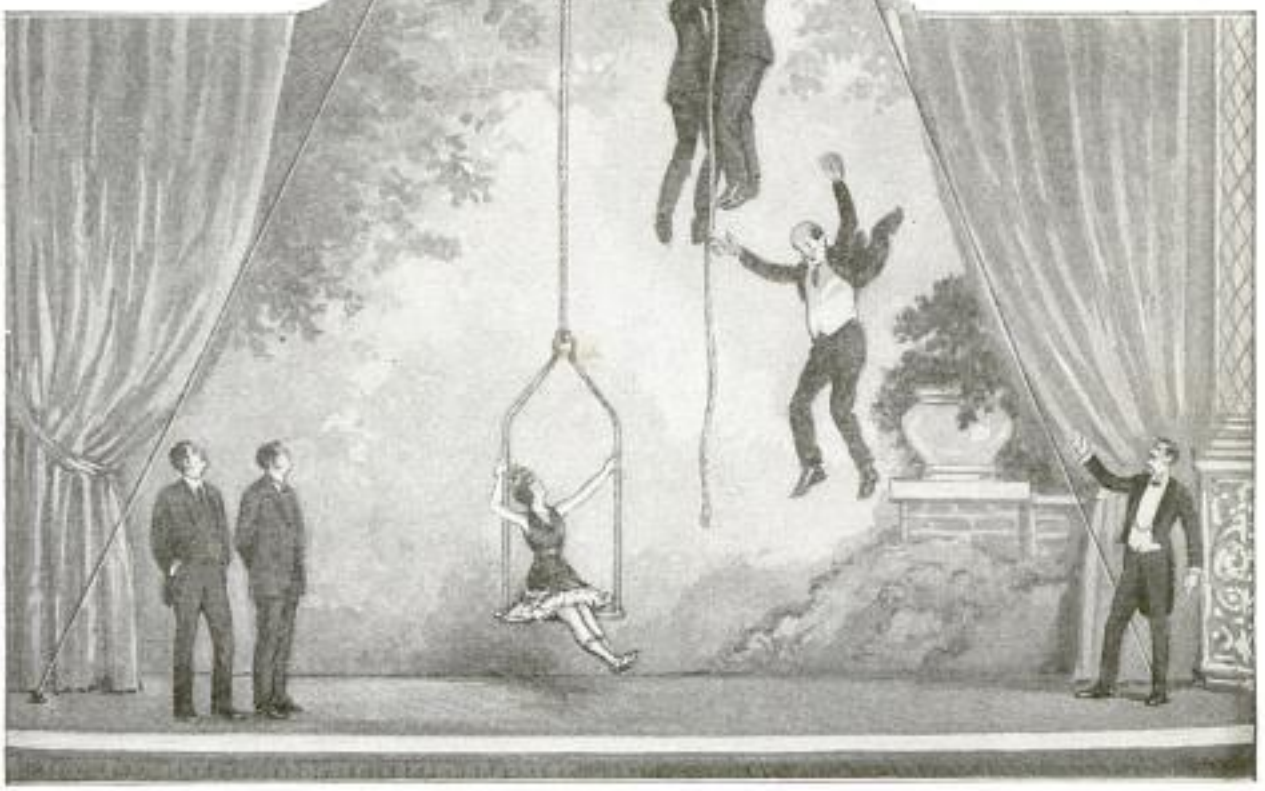
This wire explosion gives a high temperature produced at a pressure estimated to rise to about 20 atmospheres. It is calculated that if all the energy discharged were confined to and concentrated in the wire itself, the temperature would be raised to 300,000° C. As actually observed, however, the brilliant flash has an intrinsic intensity corresponding to a temperature of about 20,000° C. This is equivalent to about one hundred times the intrinsic brilliancy of the sun, and the corresponding temperature is probably the highest that has been produced by man, and the nearest artificial approach to actual solar phenomena.

GIRL IN ODD STAGE TRICK GAINS ENORMOUS WEIGHT

TAKING advantage of popular interest in a new jujutsu trick, whereby a person of slight build successfully resists being lifted from the floor, a stage illusion of ingenious form has recently been presented with an even more elaborate effect of mystery. A girl of less than 100-lb. weight takes her place in a light iron swing, which is hung by a 1-in. manila rope from a large nickelplated pulley attached to the stage ceiling. A committee from the audience, invited to pull the other end of the rope, easily lifts the girl to a considerable height. With the announcement, then, that the performer's weight will be miraculously increased, the swing slowly descends, dragging the several committee members off their feet.

The explanation is purely mechanical and quite simple. The 12-in. ceiling pulley, its upper half concealed by the ceiling drops, hangs below a pair of small guide pulleys, through which the loop of rope passes up to a powerful winch on the "gridiron" above the stage. Here the performer's hidden assistant is stationed, and it is an easy matter for him, when the signal is given, to reverse the revolution of the winch with a geared crank, and pull the committee's end of the rope into the air, while the girl descends by gravity. The pulley block is guyed to the stage floor to prevent the strain on the winch from moving it.

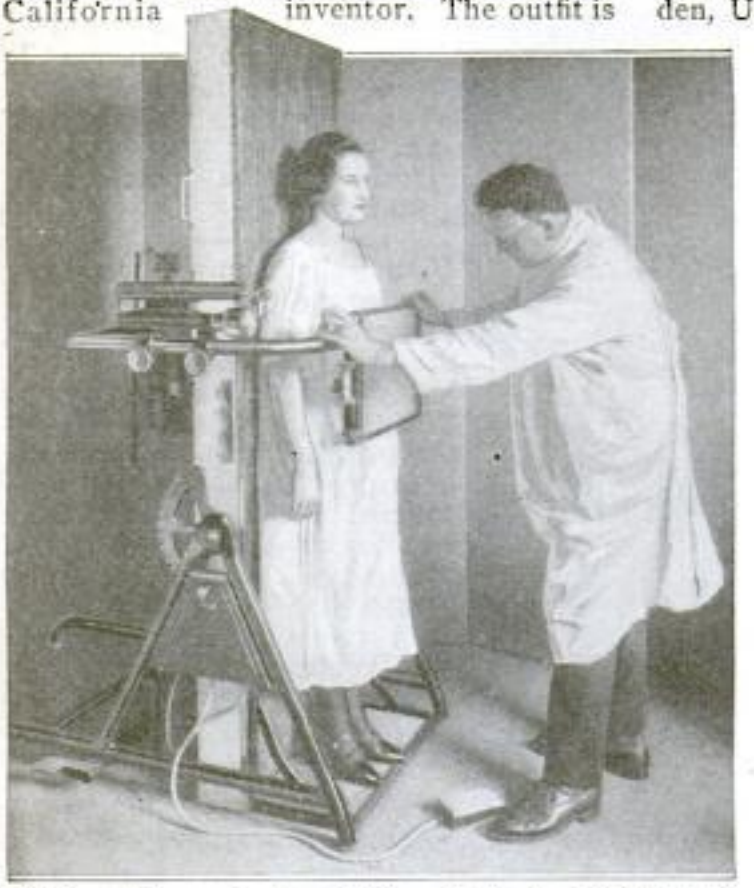
¶Australia, whose inhospitable interior still is little known, was crossed by motorcycle for the first time recently, by two hardy and determined riders. The trip, from Melbourne, on the east, to Perth, on the west, measured 3,000 miles, and consumed 36 days. Trackless wastes of sand and limestone, shortages of food and water, and hardships of various sorts were everyday adventures. The information gathered will be used in plotting an air route.



A Novel Stage Trick, in Which the Girl Performer Suddenly Acquires Sufficient Weight to Pull Several Men off Their Feet: The Concealed Winch Above Explains the Mystery

COMPLETE X-RAY LABORATORY IN ONE COMPACT UNIT

A very complete X-ray apparatus, which takes up less than 20 sq. ft. of floor space, and which is claimed to operate satisfactorily on the standard 110-volt alternating current available at any lamp socket, is offered to the medical profession by a California inventor. The outfit is



Making a Fluoroscopic Examination with the New Self-Contained X-Ray Apparatus: When a Photograph is Wanted, the Fluorescent Screen, in Front of the Patient, Is Replaced by a Photographic Plate

entirely self-contained, with the exception of the wires leading to a foot-operated control switch. These carry a low voltage only, and are heavily insulated and inclosed in a flexible steel conduit. There are no overhead wires, as all the active parts, transformer, X-ray tube, etc., are mounted on the back of the examination table which, being pivoted at the sides and counterweighted, can be easily tilted to any angle with the patient in position upon it. A combination fluoroscopic-screen and photographic-plate holder, exactly centered with the tube, is held in place in front of the table by a strong arm, adjustable along a line parallel with the direction of the rays. Rays of different qualities and quantities, from the soft, abundant variety used in the fluoroscopic examinations, to the hard, penetrating kind necessary for instantaneous photography, are instantly available, from the same tube, by the manipulation of handily placed control devices. The outfit can be easily moved from one room to another.

EVERY OGDEN CITIZEN HELPS FIRE DEPARTMENT

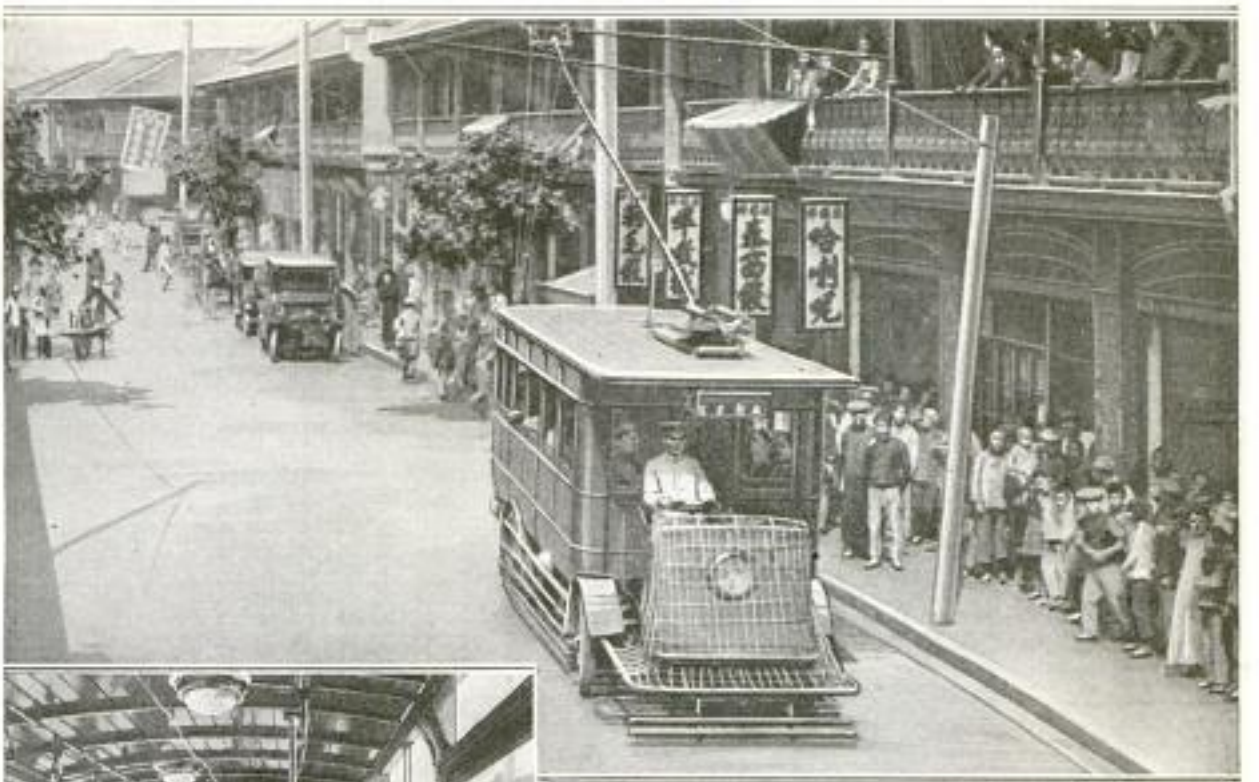
Once a year the fire department of Ogden, Utah, puts before its people an educational exhibit. Last fall, on one of the busy corners of the city, a sending box was opened, and on a table beside the pole was placed the punch register, connected to register each call just as if it were in a station. A representative of the fire department was on hand to demonstrate the use of the apparatus thus connected, and to answer the many questions regarding it. There was a throng about the fireman all day, and he answered hundreds of questions. A parade, three blocks long, exhibited the equipment, and this was used for the demonstration.

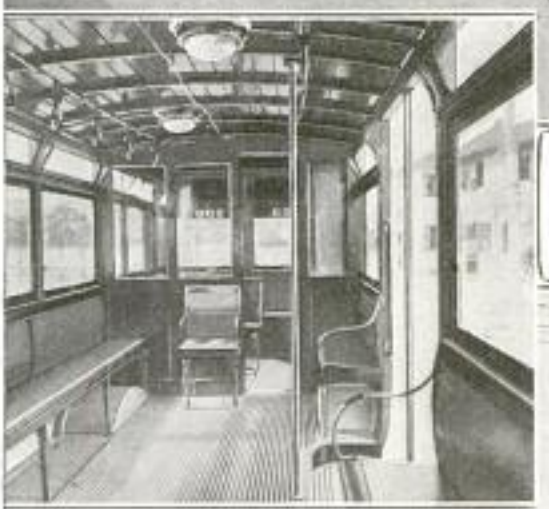
On the day preceding, the fire-department chief visited all the local schools and talked to the children on the necessity of fire prevention; and the pupils were invited to attend the exhibition on the day following. Twenty-five boy scouts of the city wear fire badges, report to the chief of the department each week, and are invited to go out on equipment to learn its workings. This interests them to the extent that they report rubbish and other combustibles that they see, in order that an inspector may attend to its removal. Chief G. A. Graves is thus securing coöperation that is teaching the entire city fire-prevention precautions.

TAKES GAS FROM AUTO TUNNEL TO KILL TREE PESTS

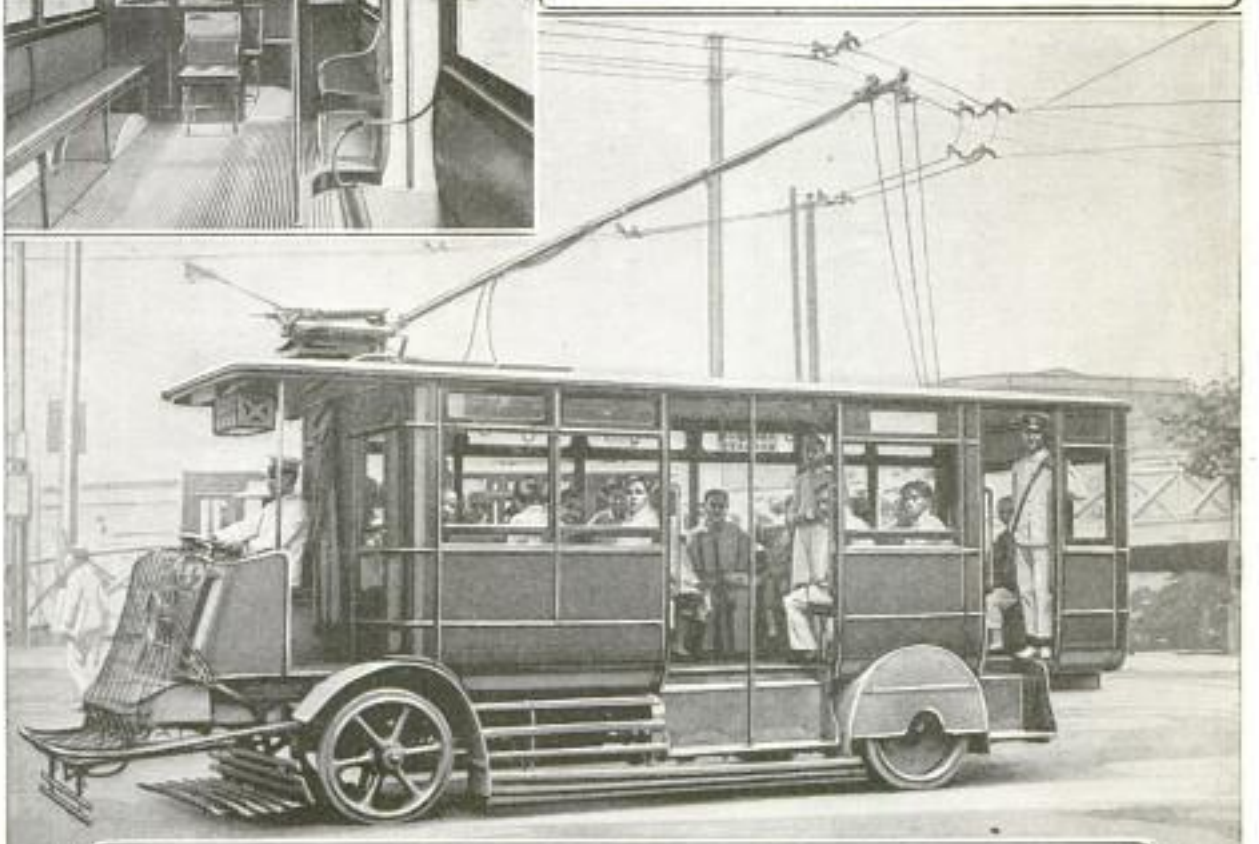
Exhaust gas from autos, collecting in a tunnel three blocks long used by Los Angeles motorists, has until recently been considered an unmitigated nuisance. Now, however, a local chemist announces the discovery that the gases so gathered have sufficient virulence to kill a form of scale with which walnut trees of the vicinity have been infested for some time. He offers to establish a ventilating system for the tunnel, and to pay the city $5,000 a year for the use of the poisoned air he extracts in the process.

CHINESE CITY USES MODERN TRACKLESS TROLLEY

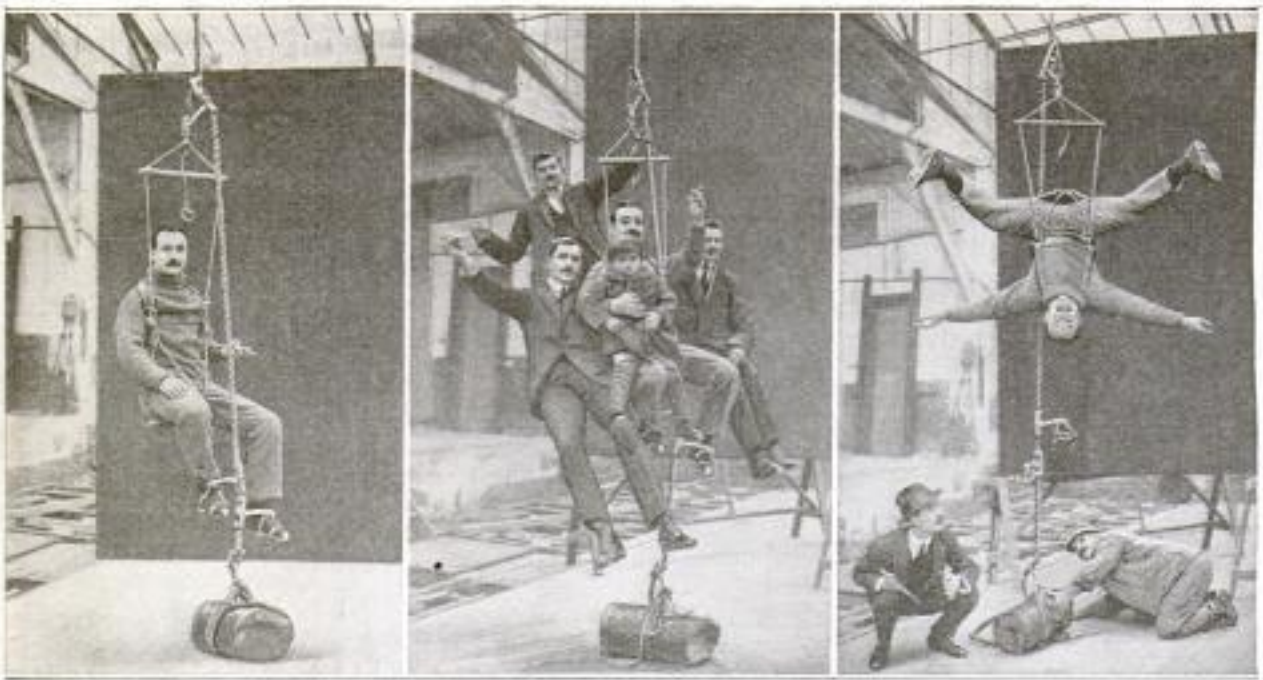




Persons Who Persist in Thinking of China as a Country Utterly Primitive may be Surprised by This View of a Street in Shanghai, in Which a Trackless Electric Trolley Car of Ultra-Modern Form Is Conspicuous. The Vehicle's Distinctly New-Fashioned Interior is Seen at the Left



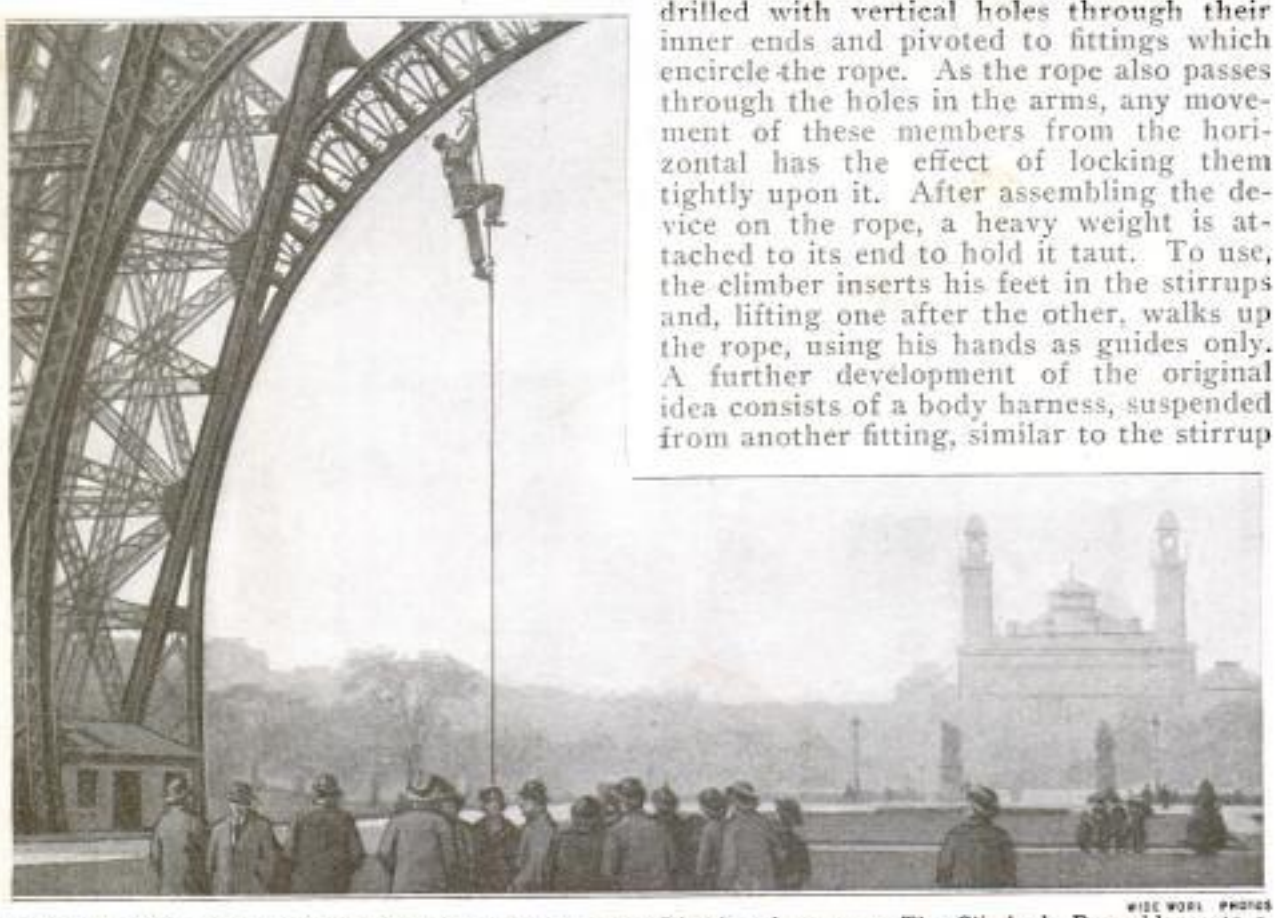
A Double Side Door of Ample Width Is a Feature of the Shanghai Trackless Trolley. The Large Front Section Is for First-Class Passengers, the Rear Section for Second-Class. The Double Trolley is Swiveled, Permitting Some Driving Latitude



The Inventor of an Ingenious Rope-Climbing Apparatus Demonstrating Its Safety. Left: A Clear View of the Stirrups and Climbing Parts. As Weight is Borne on Them They Bind on the Rope, as Shown by the Top Fitting in All the Above Views. Center: Demonstrating the Strength of the Apparatus. Right: Even Though a Workman should Lose Consciousness, the Device would Support Him in Safety

FRENCH "SPIDER MAN" INVENTS ROPE-CLIMBING APPARATUS

By the aid of a rope-climbing apparatus, invented by himself, a Parisian house painter scales the sides of tall buildings with the ease and certainty of a spider climbing its web. The device consists, principally, of two stirrups which are pinned to the outer ends of two arms, drilled with vertical holes through their inner ends and pivoted to fittings which encircle the rope. As the rope also passes through the holes in the arms, any movement of these members from the horizontal has the effect of locking them tightly upon it. After assembling the device on the rope, a heavy weight is attached to its end to hold it taut. To use, the climber inserts his feet in the stirrups and, lifting one after the other, walks up the rope, using his hands as guides only. A further development of the original idea consists of a body harness, suspended from another fitting, similar to the stirrup



WIDE WORLD PHOTOS

t caling the First Arch of the Eiffel Tower with the Rope-Climbing Apparatus: The Climber's Resemblance to a Huge Spider was So Marked That the Title of "Spider Man" was Conferred upon Him

arms, which is pushed upward ahead of the climber as he mounts, and, locking at any desired point, forms a comfortable and safe sling. On account of the odd appearance he presented at the time of a demonstration, climbing the Eiffel Tower, the title "spider man" has been given to the ingenious inventor.

CASTING DRESSER IS SMALL AND EASILY HANDLED

Because of the many almost inaccessible corners of castings that require dressing before they leave the foundry, a motor-driven emery wheel of very light and compact construction has been introduced. The rotating member of the motor is built up with copper bars taking the place of the manifold wires usual in such armatures, which construction makes for greater strength. The abrasive stone is set in a groove cut in the circumference of the rotor, and the latter receives power from collector bars located in shaped end plates. The whirling assembly gets its bearing on the handles protruding from both sides

The Emery Wheel, for Dressing Castings, is Mounted on the External Rotor of the Small Motor. The Dresser is Used for Working in Tight Places

of it, and is capable of powerful action. One of the handles is wired for transmission of current to the collector bars.

NEW AMERICAN MIDGET AUTO IS REPLICA OF BIG CARS

In an attempt to meet the demand for a car of a very low cost and economical upkeep, which, while very small and light, will come near equaling large cars in appearance, comfort, and satisfactory road performance, a California manufacturer is producing a machine having standard lines and cyclecar construction. Two can ride in comfort in the tiny car, space inside the hood affording ample leg room. A four-cylinder, air-cooled engine, rated at 16 hp., together with a three-speed and reverse gear set, is built integrally with the rear axle and develops a speed of 45 miles an hour. The stock model includes a full electric equipment of starter, battery, and lights. A wheelbase of 100 in. assures easy riding and 26 by 4-in. double-

The Tiny Car Has Standard Lines but Is So Small and Light That One Man can Lift Either End. The Fenders and Headlights Swing with the Front Wheels

tread airplane tires help to keep down operating expenses.

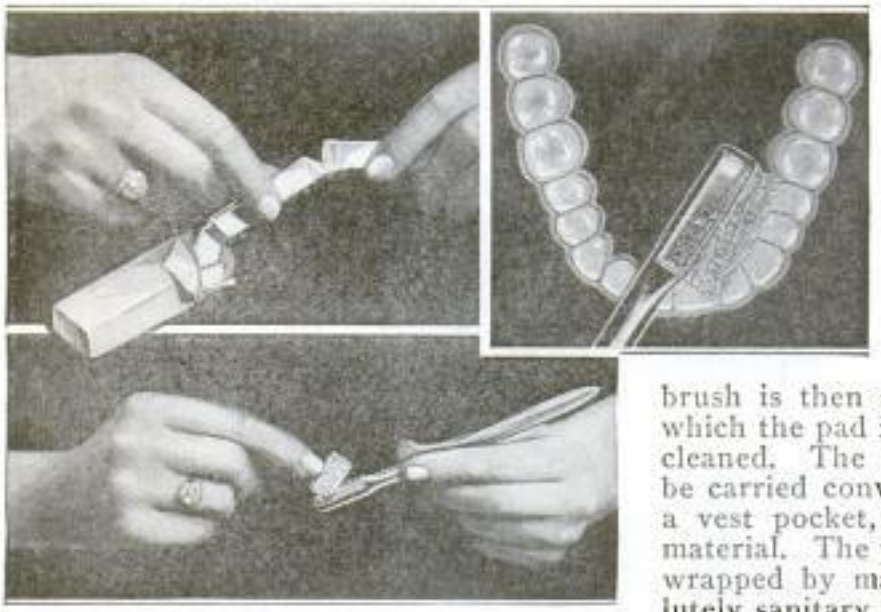
ADJUSTABLE GOLF PUTTER HAS LINING-UP MARK ON HEAD

Golf players who have difficulty in putting will be interested in a newly invented club, which has an aluminum head with a bright triangle, bisected by a center line, outlined on a black ground, at the top. The center mark is lined up with the hole in making the putt, and it is said that any deviation from the right line is readily detected. An additional feature is a shaft of steel tubing, with the grip telescoped over it, and locked on in such a way that it can be adjusted to any length between 31 and 37 in. Moving the grip also automatically adjusts the club's balance.

¶ Epsom salts, Glauber salts, magnesium carbonate, sodium chloride, and potassium salts are found in the waters of Maskakee Lake, Saskatchewan, Can., and an evaporating plant with a capacity of 25 to 30 tons a day is to be installed.

ULTRA-SANITARY TOOTHBRUSH HAS REMOVABLE BRISTLES

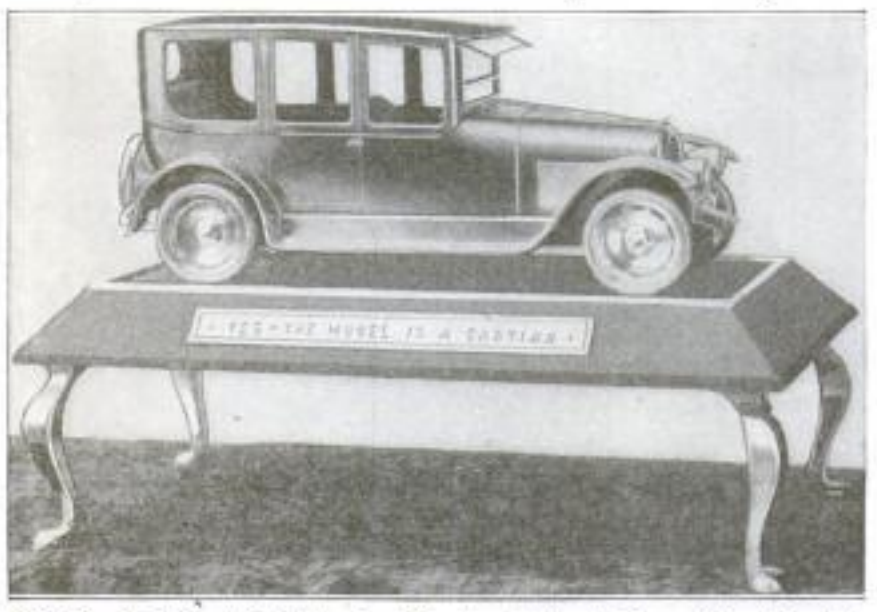
A toothbrush pad made of vegetable matter with a texture firm enough to allow for a maximum of friction without scratching, and soft enough to absorb water readily without giving off lint, is a new idea in this accessory. The pad may be removed from its holder and thrown away after the teeth are cleaned, and a new one may be inserted. It contains antiseptic paste, and is torn from a strip of pads sanitarily wrapped. After placing in the holder, the pad is dipped in water, which serves the double purpose of swelling it in the cavity of the holder and wetting the paste. The improvised brush is then applied to the teeth, after which the pad is discarded and the holder cleaned. The holder is small enough to be carried conveniently in a hand bag or a vest pocket, and is made of cellulose material. The pads are manufactured and wrapped by machinery, and are in absolutely sanitary condition when they reach the user. Little cups left in them because of their peculiar construction create a vacuum and assist in cleaning the teeth.



The New Sanitary Toothbrush Has Removable Brushing Pads. Above: Tearing Pads from Strip. Below: Inserting in Holder. Insert: The Brush Working in a Difficult Place

LIMOUSINE-CAR MODEL MASTERPIECE IN ALUMINUM

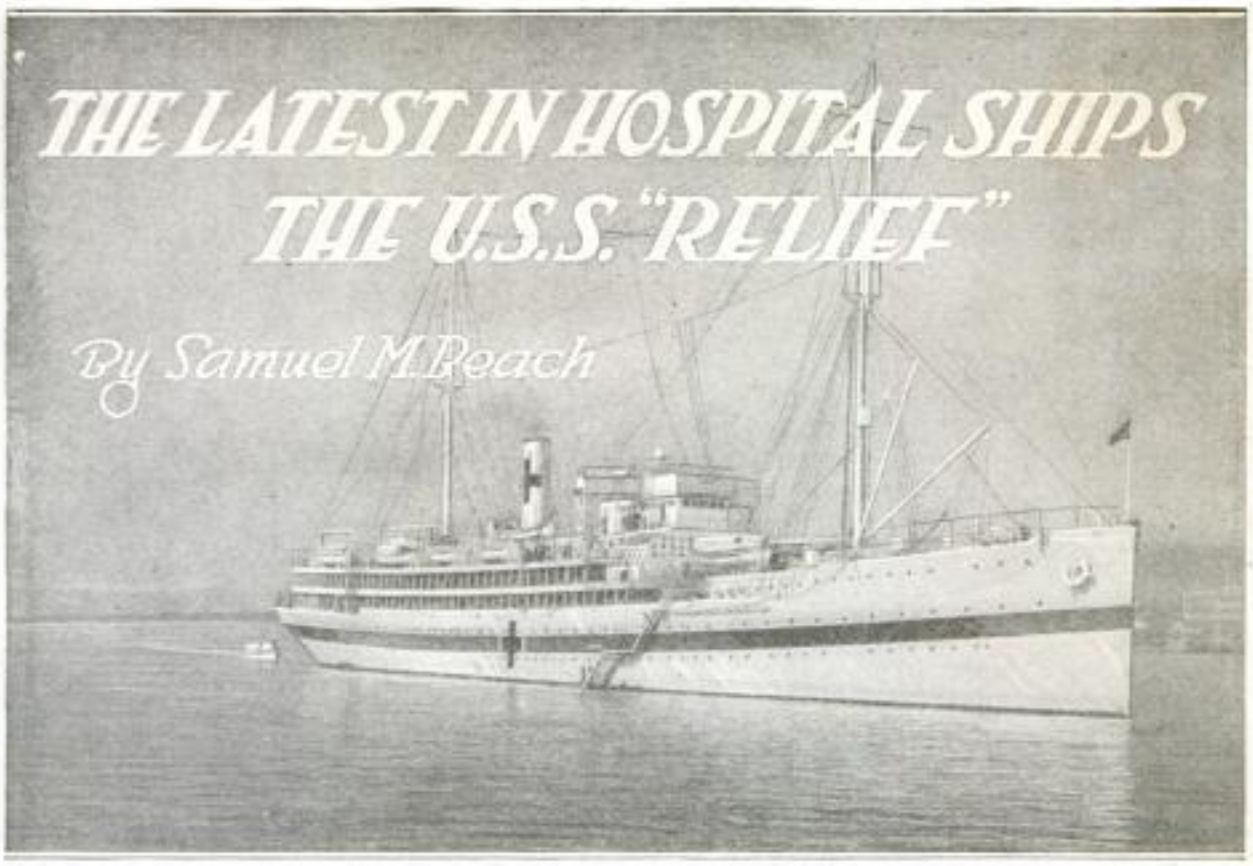
What is acknowledged to be a beautiful example of intricate aluminum casting is a miniature model of a limousine-type automobile which is making the rounds of the automobile shows. It is so absolutely true in detail and proportion to the full-size car, of which it is a one-sixth-scale reproduction, that persons familiar with the original have no difficulty in recognizing the characteristic lines in the miniature. The casting was done in two main divisions, the frame, running boards, splash aprons, and fenders in one solid piece, and the radiator, hood, and body in the other. The wheels, which turn upon their spindles, lamps, and a few other small pieces of the exhibit, were cast separately. Tiny bulbs light the head and rear lamps as well as the body interior, showing off the dainty, coppery-brown, panne-velvet upholstery to the best advantage. Polished celluloid panes are fitted in the windows and windshield. An exceptionally fine job of polishing makes the exquisite little car gleam with a silvery-white luster, with the exception of the tires, which are steel brushed to a dull-satin finish.



This One-Sixth-Scale Model of a Popular Make of Motor Car, Also the Stand and Sign, are Made Up of Intricate Aluminum Castings. It Is One of the Leading Attractions of the Automobile Shows

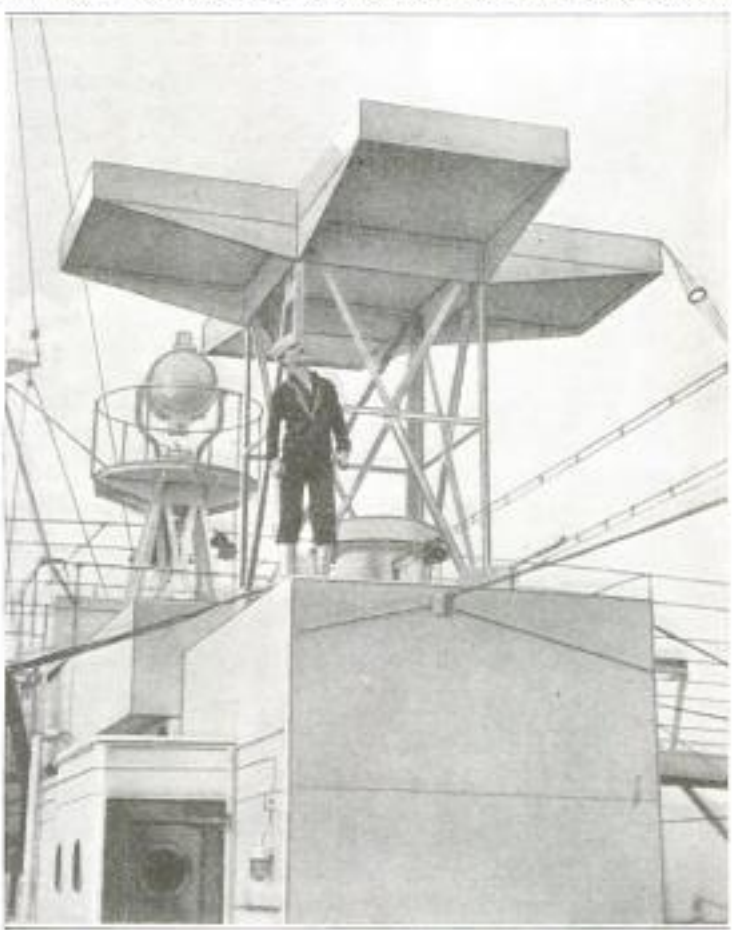
THE LATEST IN HOSPITAL SHIPS
THE U.S.S. "RELIEF"

By Samuel M. Reach



The New United States Hospital Ship "Relief," the First American Naval Craft to be Designed, from the Keel Up, Exclusively for Military-Hospital Use: It Is 483 Feet Long, with a Displacement of 10,000 Tons

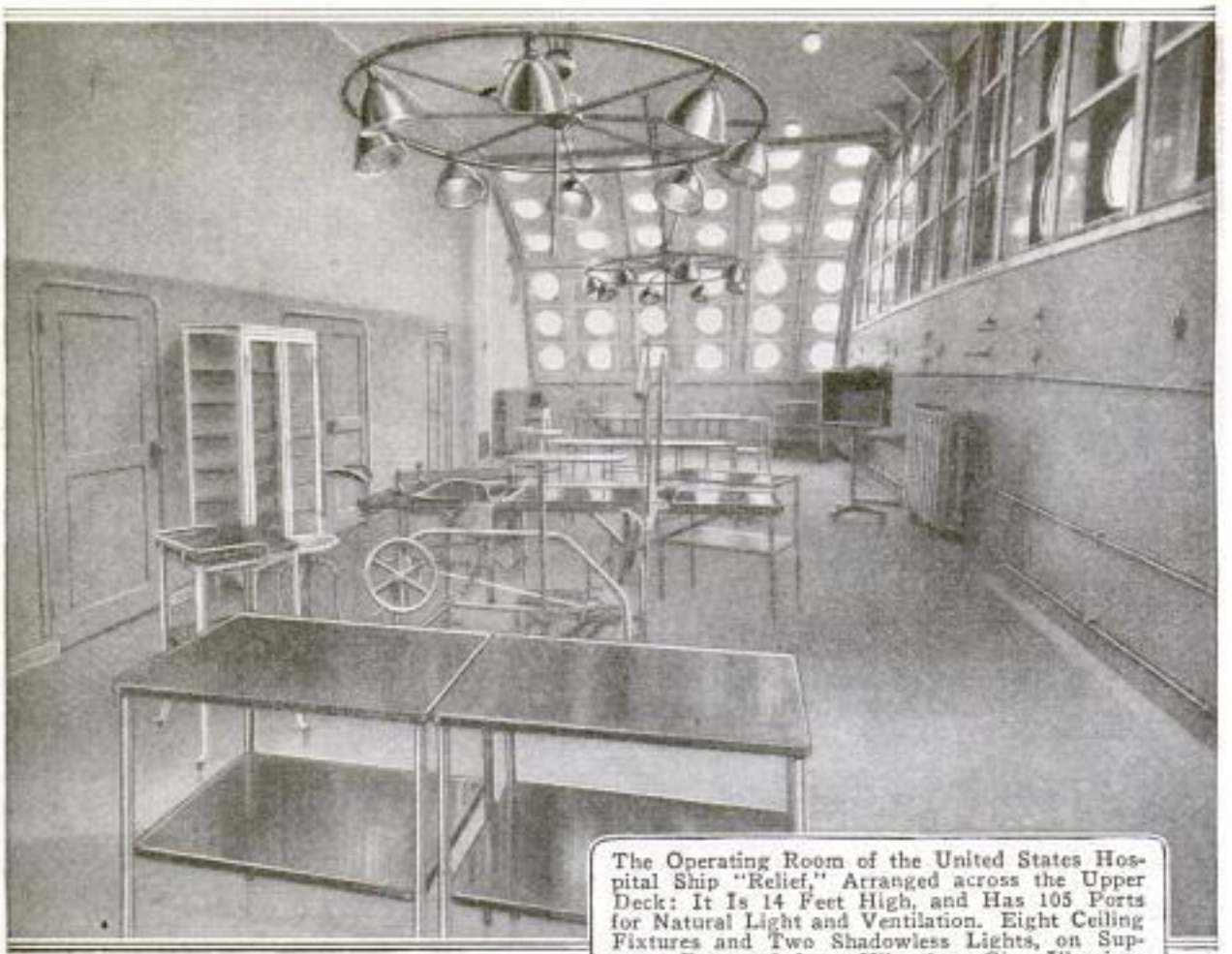
THE United States Navy has put in commission its new hospital ship, the "Relief," believed to be the most perfectly equipped vessel of its kind. It is the first naval craft that America has built, designed from the very keel up for strictly military-hospital purposes. Congress appropriated $2,500,000 for its construction in 1916, and the keel was laid during the following year. Every possible human injury or disease can be properly handled aboard.



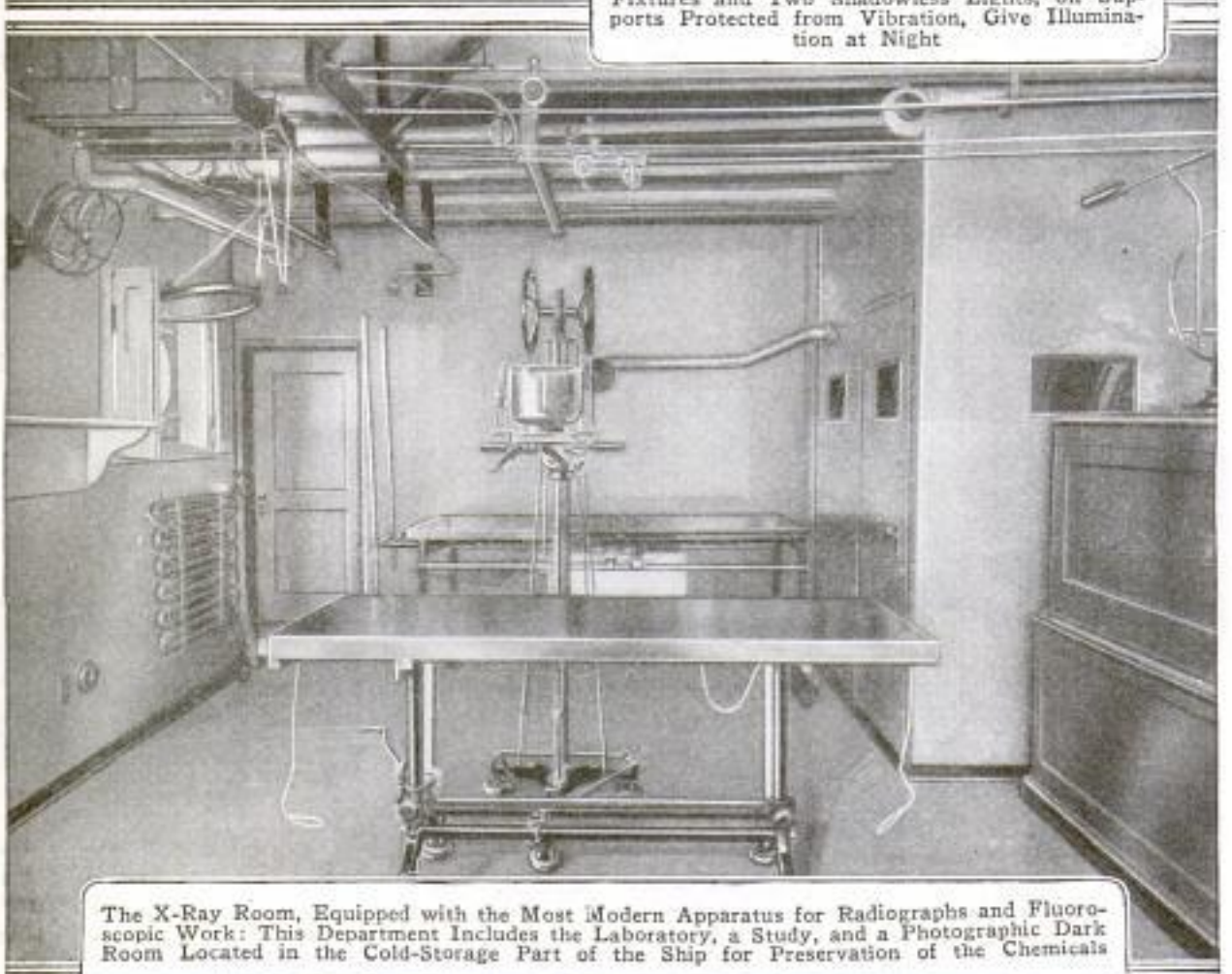
The Huge Horizontal Red Cross That can be Brilliantly Illuminated at Night for the Information of Airmen

The "Relief" is 483 ft. in length, has a displacement of 10,000 tons, is propelled by turbine engines, and burns oil to eliminate the accumulation of coal dust and gases. It is painted white, with a broad green band from stem to stern, to denote its humanitarian pursuits, and in addition shows mammoth red crosses on its sides, together with a cross so placed as to be readily seen by airships above. All of these markings may be lighted at night.

Large quantities of field medical equipment, tents, drugs, cots, ambulances, and surgical supplies are carried aboard for immediate use in emergencies, such as the Vera Cruz affair, the Galveston flood, the

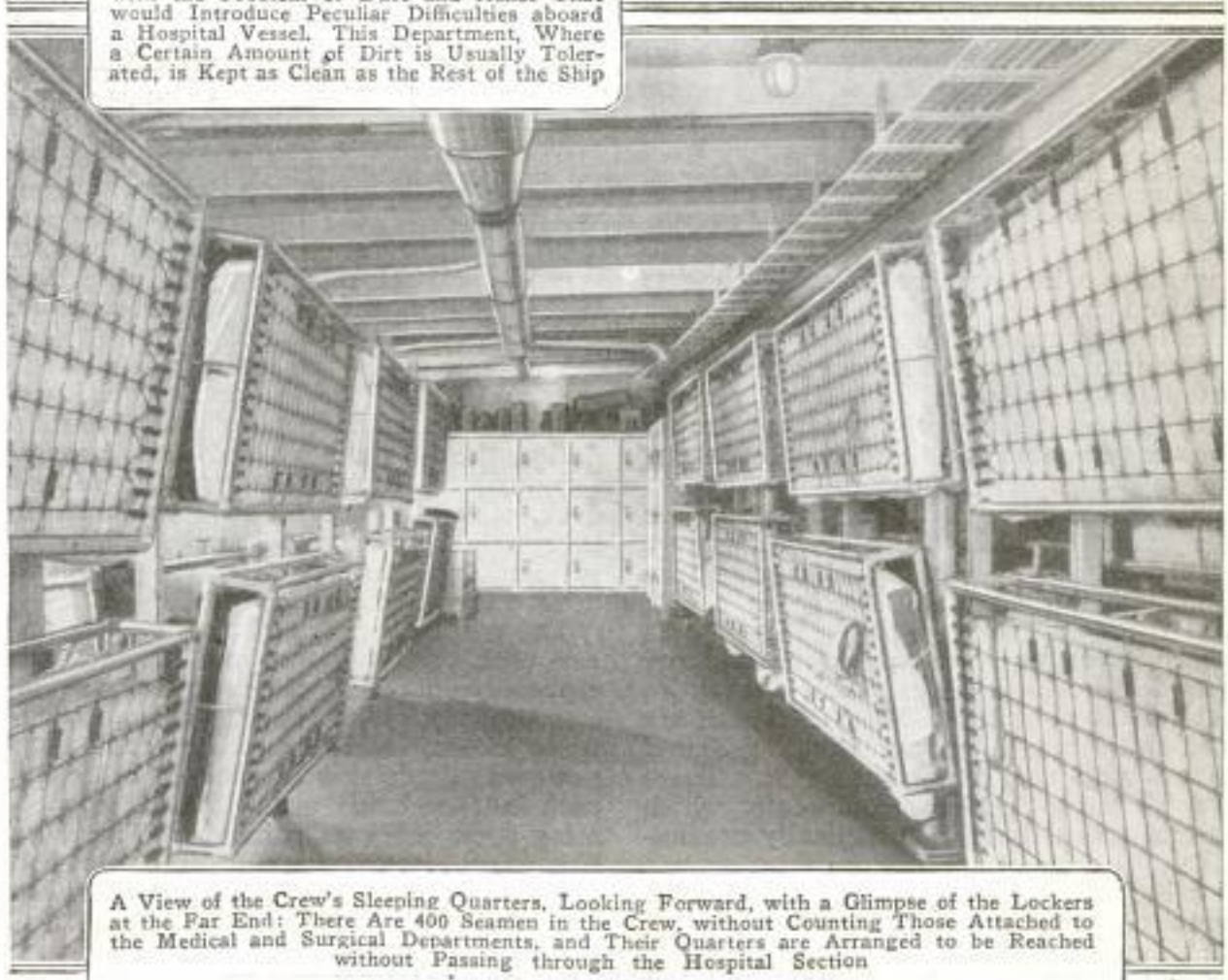


The Operating Room of the United States Hospital Ship "Relief," Arranged across the Upper Deck: It Is 14 Feet High, and Has 105 Ports for Natural Light and Ventilation. Eight Ceiling Fixtures and Two Shadowless Lights, on Supports Protected from Vibration, Give Illumination at Night



The X-Ray Room, Equipped with the Most Modern Apparatus for Radiographs and Fluoroscopic Work: This Department Includes the Laboratory, a Study, and a Photographic Dark Room Located in the Cold-Storage Part of the Ship for Preservation of the Chemicals

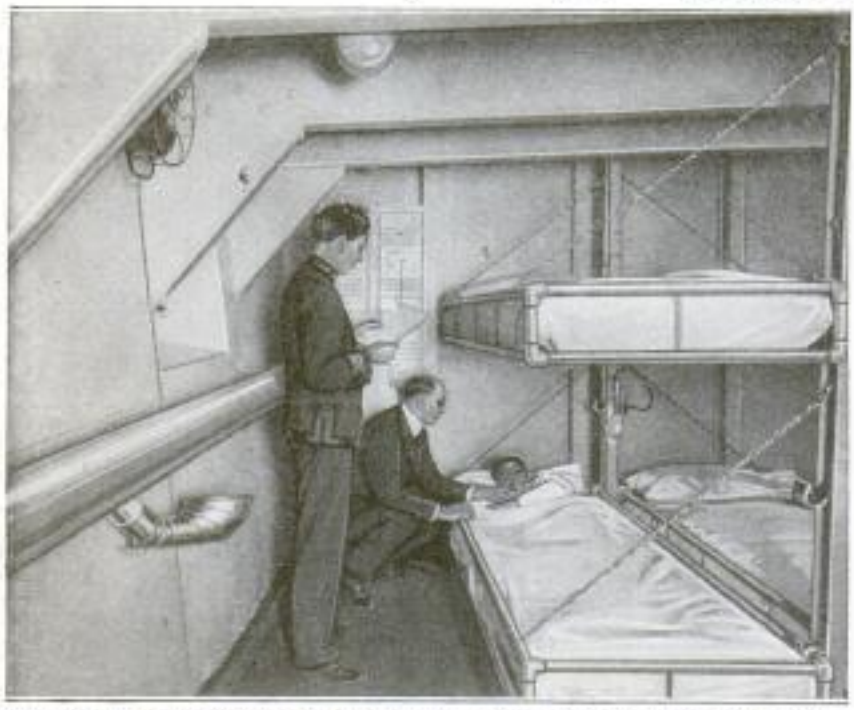
The Boiler Room of the "Relief," Looking across the Ship: Oil Fuel is Used, Dispensing with the Problem of Dust and Ashes That would Introduce Peculiar Difficulties aboard a Hospital Vessel. This Department, Where a Certain Amount of Dirt is Usually Tolerated, is Kept as Clean as the Rest of the Ship



A View of the Crew's Sleeping Quarters, Looking Forward, with a Glimpse of the Lockers at the Far End: There Are 400 Seamen in the Crew, without Counting Those Attached to the Medical and Surgical Departments, and Their Quarters are Arranged to be Reached without Passing through the Hospital Section

San Francisco fire, and the Messina disaster.

Extra-wide gangways afford ingress directly into the hospital division, but acute stretcher cases may be hoisted aboard gently by means of a peculiar boat davit situated well aft. At each side of the gangway entrance is an emergency operating, or wound-dressing, room, the great need of which was felt during the Gallipoli campaign, when numbers of patients were received aboard British hospital ships after lying exposed upon the battlefield for hours. Their wounds were often found infested by fly larvæ, and other vermin, which must be entirely removed before the unfortunates can be placed in general wards with other patients.



One of the Metal-Sheathed Wards of the Big Hospital Ship: The Entire Equipment Includes 500 Beds, Each Bunk being Arranged for Approach from Either Side, Mounted for Easy Adjustment or Removal, and Fitted with a Portable Electric Light for Medical Purposes. There Are Also Four Isolated Wards for Contagious Cases

Six of the nine decks are wholly above the water line. If the nine decks were placed end to end they would constitute a hospital building half a mile in length and nearly 60 ft. in width. Wide decks afford room for 146 comfortable swinging cots for fresh-air cases, while the entire equipment contains 500 beds. There are said to be but 31 hospitals in the United States with more beds than this. There are 64 water-tight compartments, which should make the ship practically unsinkable.

All of the wards are metal-sheathed, with rounded corners to facilitate thorough cleaning. Each bunk may be approached from either side, has a portable electric light for medical uses, and is always set with the patient's head toward the bow of the ship. These bunks are extra-wide, may be nested one above the other in pairs, used singly with the mattress at the convenient examination height of 32 in. from the floor, or may be readily removed, with their patients, directly onto wheeled operating-room conveyances.

The shafts of three elevators and four lifts afford natural ventilation to the wards in addition to a mechanical exhaust system which removes the old air through vents near the ceiling. Fresh air is taken in through ventilators by large electric multivane fans, passed to the blower rooms, where it is heated or cooled and humidified, and then discharged into the wards through insulated ducts opening close to the floors, so as to avoid possibility of dangerous drafts.

Four wards are set aside for contagious cases. These are located upon a superstructure toward the ship's stern, in order that their contaminated atmosphere may be wafted away from the vessel as it plows ahead. There is but one way to approach this segregated area, and that is by means of a single elevator, which doubly insures isolation.

The crew of the "Relief" consists of 400 men exclusive of medical and surgical specialists. In attending to their routine duties, the sailors need not pass through any hospital wards, but use the second deck, which is the main communicating thoroughfare. Stretcher patients may be wheeled anywhere, or lifted from deck to deck without passing outside.

The main operating group, on the upper deck convenient to the elevators, is especially noteworthy. A sterilizing room, a scrub-up room, etherizing room, instrument room, and operating room are grouped equidistantly about a lobby, each independently accessible. The operating room is 14 ft. in height. There are 105 ports, insuring natural illumination from practically every angle, controlled by casement shades. Artificial light is provided by eight ceiling lights and two no-shadow fixtures, all held by supports

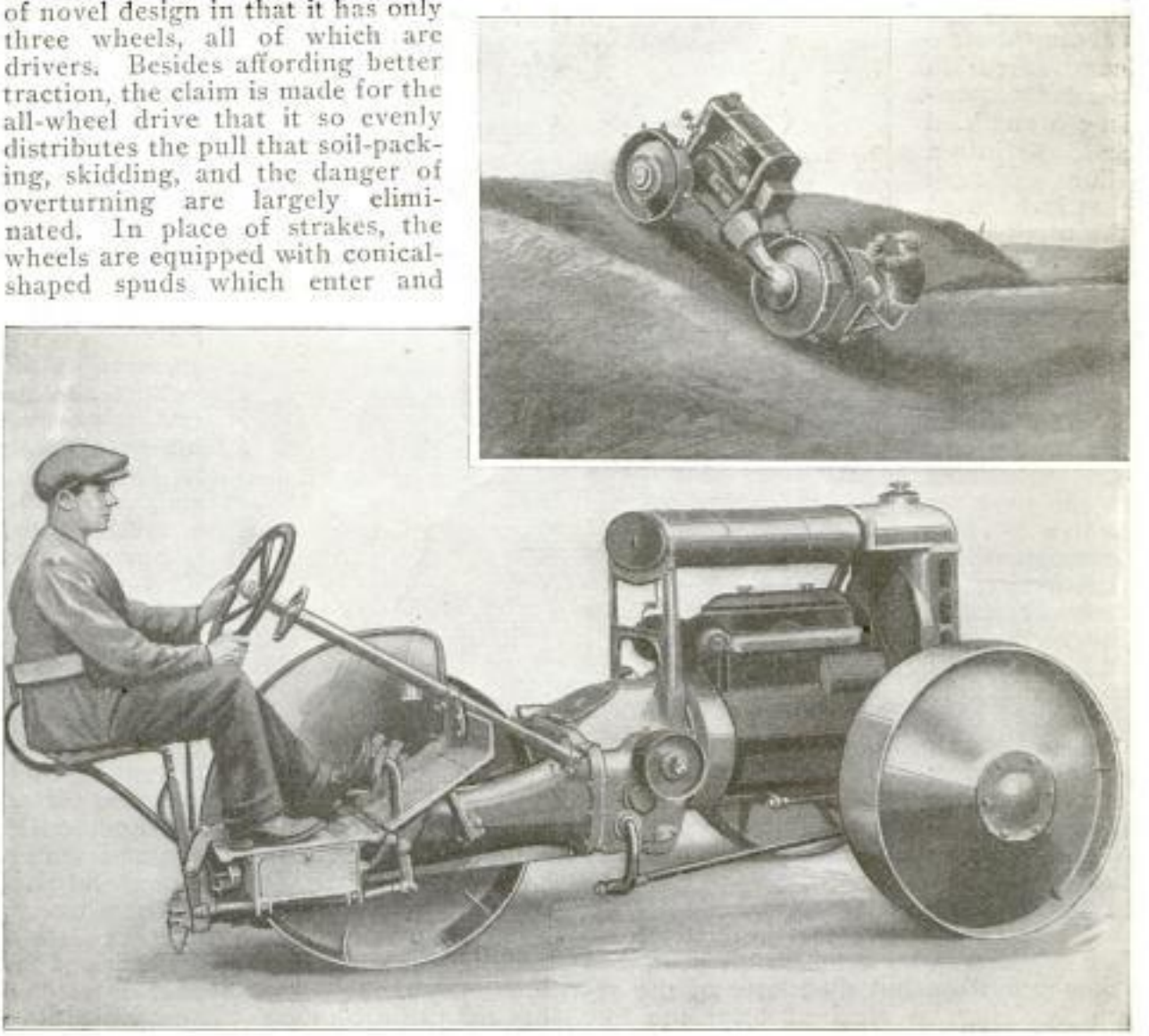
designed to counteract the ship's vibration. A feature of this light assembly is that should the ship's power fail, they automatically switch themselves into a storage-battery circuit, and then blink a red lamp of warning. This group of rooms is separately ventilated, and air from other parts of the ship is excluded.

Other features are a complete dental office; an eye, ear, and nose section, and an X-ray department. There is a soundproof room for ear and eye tests, and a laboratory for Wassermann and other blood, excretion, and tissue tests. There is also an animal house, an autopsy, or embalming, room, and a large mortuary. The mortuary is artificially cooled. The X-ray department consists of the laboratory, a study, and a photographic dark room. The last-named is located in the cold-storage section of the ship, in order best to preserve developing chemicals and plates. The walls of the X-ray room are of steel. In addition to this they are lead-lined on three sides, to guard against the influence of X-rays on chemicals stored in the dispensary near by.

The regular ship's rations are served in cafeteria style. Bed patients are served by wheeling the cafeteria to them. There is a separate diet kitchen for preparing special foods.

ENGLISH FARM TRACTOR HAS THREE-WHEEL DRIVE

A new agricultural tractor, recently brought out by a British manufacturer, is of novel design in that it has only three wheels, all of which are drivers. Besides affording better traction, the claim is made for the all-wheel drive that it so evenly distributes the pull that soil-packing, skidding, and the danger of overturning are largely eliminated. In place of strakes, the wheels are equipped with conical-shaped spuds which enter and leave the soil cleanly, without packing or tearing. The rear-wheel rim is concave and much wider than the front-wheel rims, which has a stabilizing effect. As the frame is pivoted to the front axle, either



Above: The Three-Wheel-Drive Agricultural Tractor Demonstrating Its Ability to Climb a Steep Grade, over Soft Ground. Below: The Machine Equipped with Plain Rims for Road Travel

of the front wheels may run in the furrow without causing the machine to tilt at a dangerous angle. The power plant is the conventional four-cylinder-type gasoline engine of 4⅛-in. bore by 5¼-in. stroke and has a 25-hp. rating.

DERAILED LOCOMOTIVE LODGES ON SIDE OF PRECIPICE

A locomotive, upside down, strangely held against the side of a 1,000-ft. precipice, and seemingly supporting a derailed express car on its precariously balanced frame, was the extraordinary ending of a recent wreck near Lytton, B. C. The train, running at ordinary speed, in the early morning crashed suddenly into a slide of rock that had buried the track in its course along the mountainside, and the locomotive and car plunged over the cliff, whose sheer wall drops straight down to the river far below. That some providential jutting of rock or earth caught the falling mass of steel, and held it until the bruised fireman and expressman could make their escape, is apparent, though no support was visible that seemed adequate for the heavy load. The engineer, who stuck to his post, was taken out alive, but died later of the severe scalding he received from the live steam that escaped from the twisted boiler and pipes as the engine turned over.

The Locomotive and Express Car, Derailed by a Rock Slide, were Strangely Caught against the Precipice, and Saved from a 1,000-Foot Drop into the River Below

STACK WITHIN A STACK IS REMOVED BY GAS CUTTING

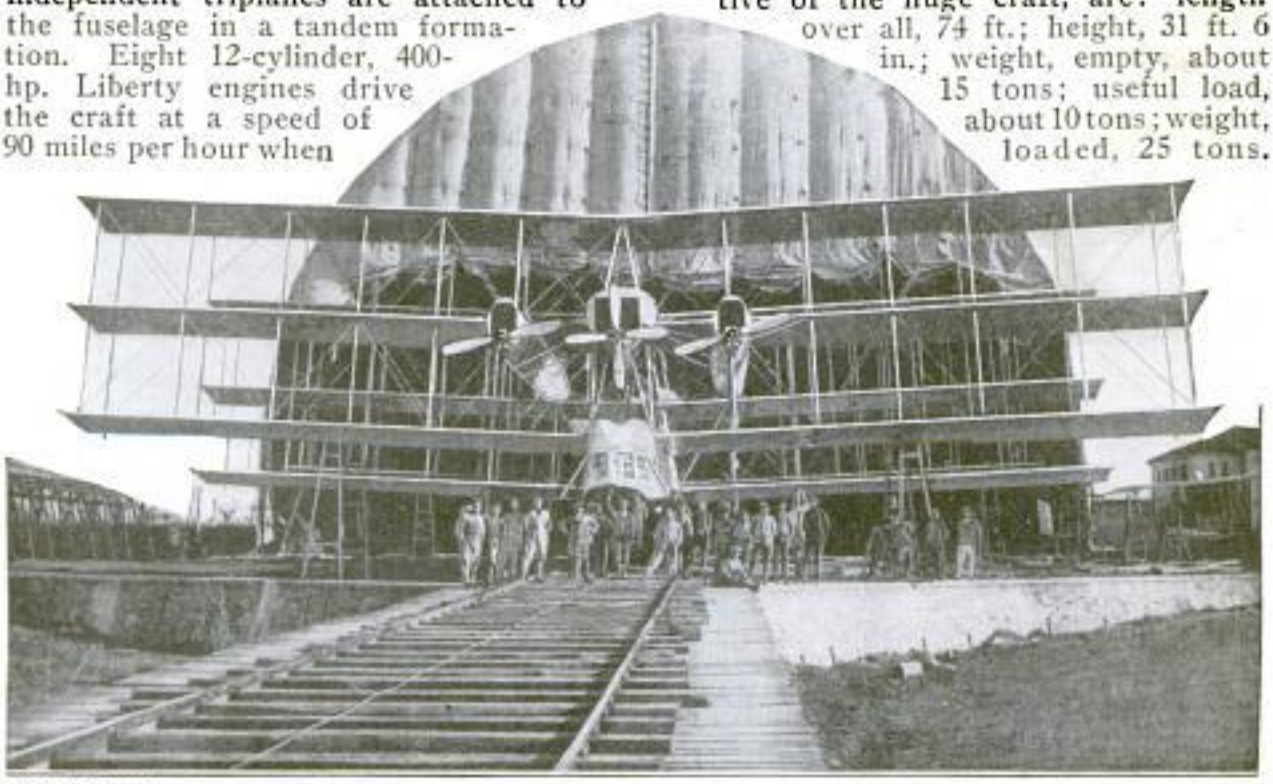
An error in calculating areas made it necessary to remove a steel smokestack, 90 ft. high, from inside a new brick one, after the latter had been built around it with only a few inches to spare between the two. This odd predicament arose when the heating plant of a church was enlarged, necessitating the erection of the larger stack. The contractor in charge of the work reasoned that the heat and gases would cause the old stack to decay gradually and fall away in time. However, when the new stack was tested, it was found that the old one seriously interfered with the draft. The problem was finally solved by an oxyacetylene-welding and cutting expert. After using the flame and oxygen blast to cut the stack off at the bottom, the operator wormed his way through it to the top and, attaching a tackle, lifted it several feet. This gave him a lengthy section upon which to work unhampered. The next step was to drill two holes through the steel plates, diametrically opposite each other, and pass a bar through so that, when the big tube was eased back, it was supported on the edges of the brick stack. The flame was then used to cut off the projecting section which was lowered to the ground. Thus the work progressed section by section, until done.

A 25-TON TRIPLE-TANDEM TRIPLANE

Gigantic Caproni Flying Boat Accommodates 100 Passengers — Transoceanic 24-Hour Flights Planned by Famous Italian Builder

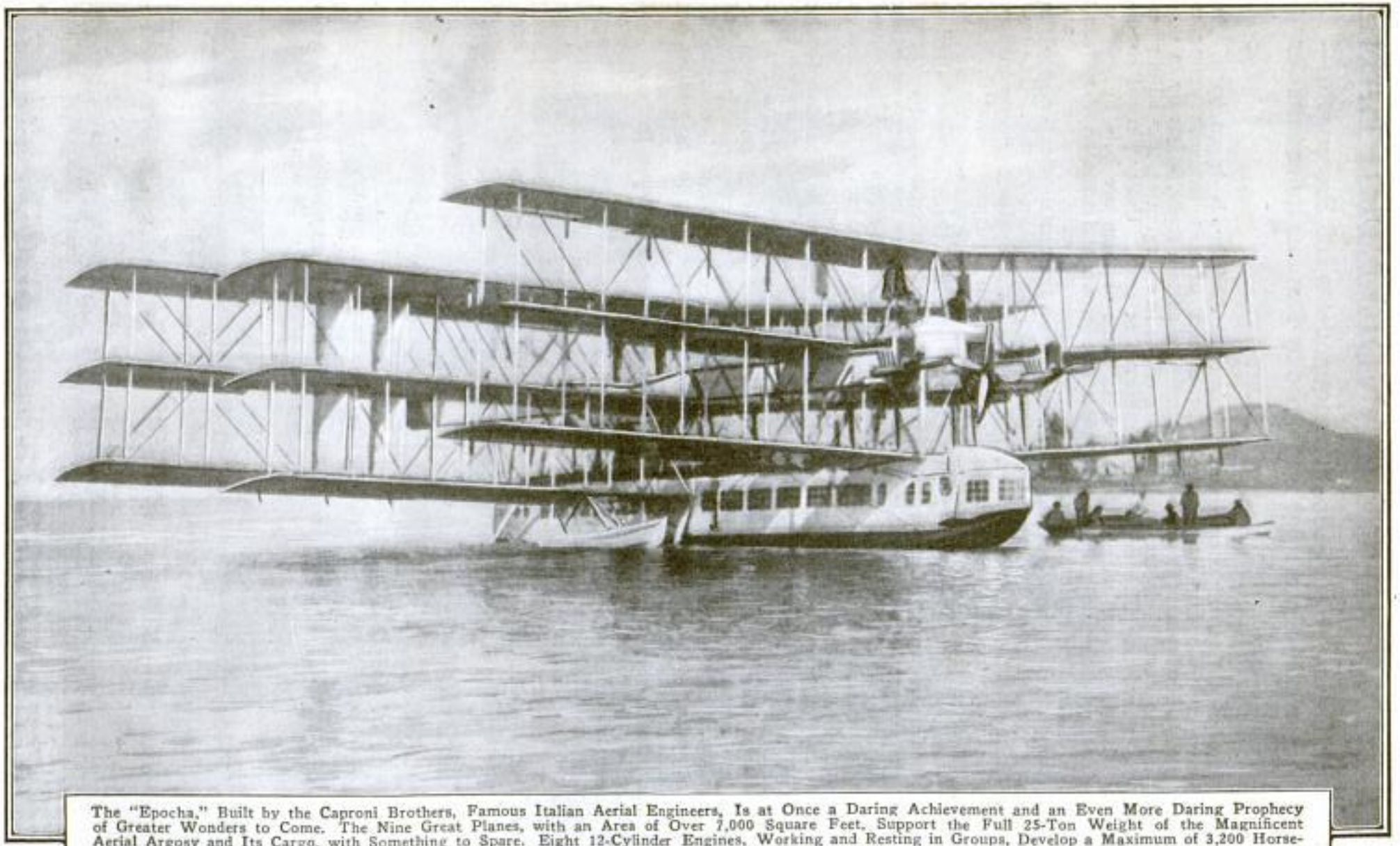
BY WM. H. HUNT

THAT the evolution of commercial aeronautics is following closely the lines of maritime development is quite apparent to all who have given the subject even passing attention. The early airplanes of limited power, which by a supreme effort and under skillful handling succeeded in struggling aloft with three or five passengers, may well be likened to the oar-propelled open boats of the Vikings. Likewise the later machines, capable of transporting 25 to 30 persons on 50 to 100-mile flights, may be compared to the last of the sailing liners which crossed the ocean in the phenomenal time of three weeks to a month. Following this line of thought the latest product of Gianni Caproni, one of the most daring of the aerial engineers, finds a parallel in the "Great Eastern," the original "ocean greyhound" and the largest ship of its day. In the "Epocha," the most gigantic heavier-than-air creation that man has ever attempted to fling free of Mother Earth, nine great planes of 100-ft. span present a total sustaining surface of over 7,000 sq. ft. On account of the wing arrangement the huge machine may be called a triple-tandem triplane as three independent triplanes are attached to the fuselage in a tandem formation. Eight 12-cylinder, 400-hp. Liberty engines drive the craft at a speed of 90 miles per hour when their total 3,200 hp. is drawn upon. As but a part of this immense power is needed to sustain flight, it is only in taking off, or in emergencies, that all engines are used at once. Under normal conditions, some of them are held in reserve, first one group and then another being used, to equalize wear. Four engines are mounted on the center wing of both the front and rear triplane groups. Of those at the front, three drive tractor propellers and the fourth a pusher-type, at the rear. The arrangement at the rear planes is the reverse of this, three engines driving pushers and one a tractor. All engines can be reached for necessary inspection and adjustment by way of a tunnel through the fuselage and passages to each engine compartment. The passenger coach seats 100 persons besides having space for a reasonable amount of baggage. Sleeping berths fold up into the upper sides of the body and are so arranged that they lie crosswise, instead of endwise, when let down. Perhaps hull would be a better term to apply to the big body, as it is really a seaworthy, boatlike structure, measuring 66 ft. in length and weighing 6,400 lb. Other figures, descriptive of the huge craft, are: length over all, 74 ft.; height, 31 ft. 6 in.; weight, empty, about 15 tons; useful load, about 10 tons; weight, loaded, 25 tons.

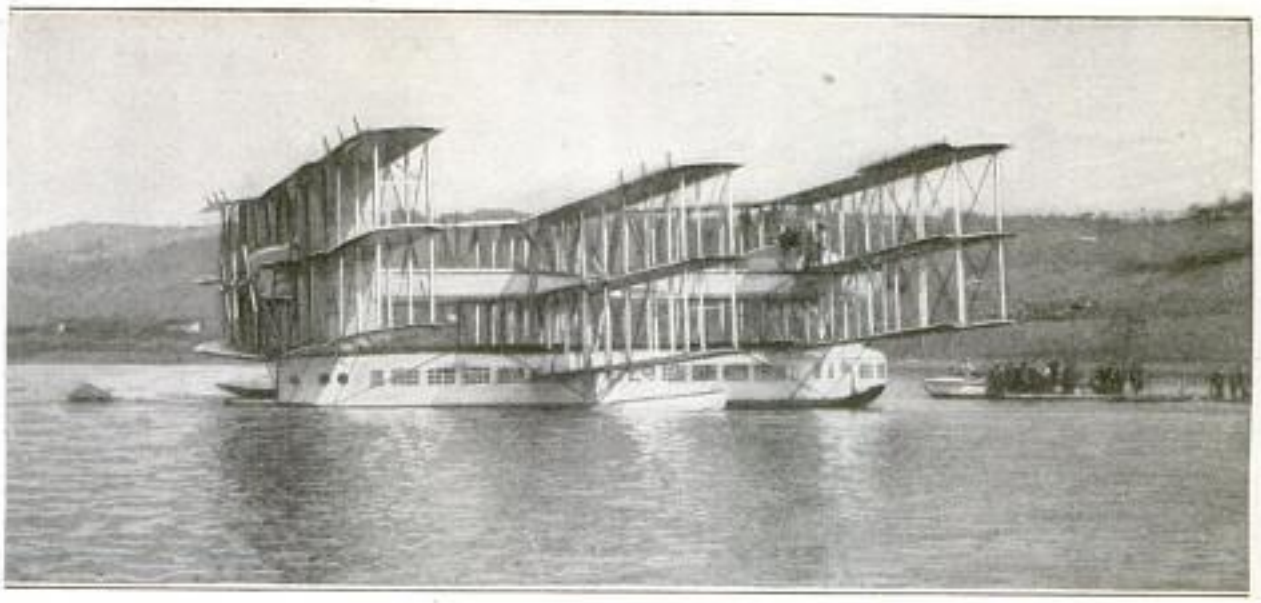


WIDE WORLD PHOTOS

A Remarkable View of the Caproni-Built Seaplane "Epocha," before Its Special Hangar, Preparatory to Launching: The Two Four-Bladed Propellers, at the Front and Rear of the Forward Triplane Group, are Driven by Independent 400-Horsepower Engines



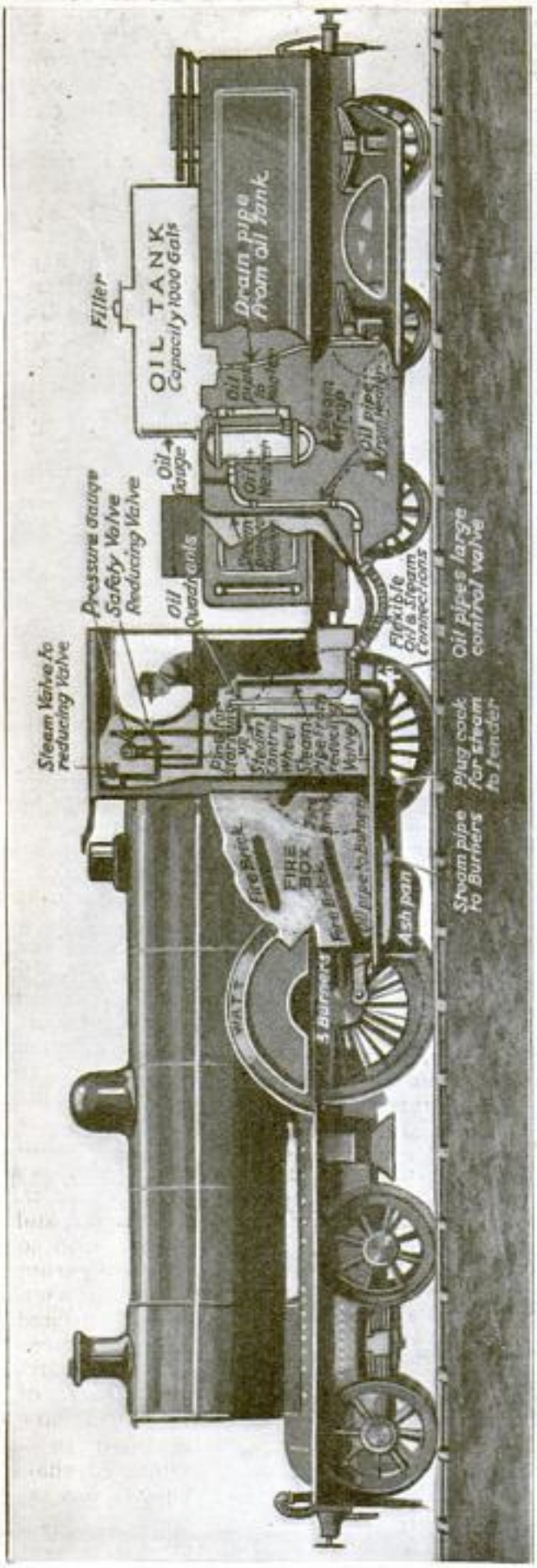
The "Epocha," Built by the Caproni Brothers, Famous Italian Aerial Engineers, Is at Once a Daring Achievement and an Even More Daring Prophecy of Greater Wonders to Come. The Nine Great Planes, with an Area of Over 7,000 Square Feet, Support the Full 25-Ton Weight of the Magnificent Aerial Argosy and Its Cargo, with Something to Spare. Eight 12-Cylinder Engines, Working and Resting in Groups, Develop a Maximum of 3,200 Horse-power Which may be Instantly Called Upon to Drive the Great Craft at a Speed of 90 Miles an Hour. The 66-Foot Hull Accommodates 100 Passengers



A Perspective View of the "Epocha," Showing the Rear Triplane Group, to the Left, and One of the Immense Rudders: Three of the Rear Propellers are Also Clearly Shown. The Boatlike Object Just Forward of the Center Plane Group, Is a Pontoon Which Prevents the Big Machine from Capsizing When at Rest

Not alone in point of size and power is the design a daring one. Another departure from the conventional is that it is tailless, the slight loss of stability on this account being more than compensated for by the immense wing area. The elimination of tail elevating wings has necessitated equipping all the planes with ailerons—movable tips. As may be supposed, such an immense craft requires huge rudders. Four of these occupy the full vertical distance between the planes of the rear group. However, after all is said, enormous proportions and clever tricks of design do not necessarily imply excellence or practicability. The question that invariably arises in the mind of the world is, "Will it work?" In this case the answer is an unqualified "yes." The big machine has made two successful trial flights over Lake Maggiore, on the shore of which it was built, one on March 2 and the last March 4. On these trials only 1½ tons of ballast and the pilots were carried. As before stated, this gigantic apparatus is the heaviest weight that has ever been launched from the earth. It is therefore not surprising that some difficulty was experienced in handling it. This is true, unfortunately, and a faulty landing, after the second trial, resulted in some slight damage. Also, rumor has it, a storm unexpectedly swept the lake and played further havoc with the crippled boat. However that may be, these mishaps have not daunted Signor Caproni. The "Epocha" is being reconstructed and will, doubtless, yet carry her full complement of passengers and crew on many a 1,000-mile nonstop flight. Far-visioned and indomitable as every true originator, Signor Caproni is not resting content with having realized the "Epocha." He has begun the construction of another machine of the same design, but of still greater size and power, for the United States Navy. To carry out the thought in the opening paragraph, this one may well be compared to the "Mauretania," or one of its sister ships. But, his vision soaring beyond even these limits, Signor Caproni prophesies "Titanics" of the air, carrying 300 passengers and making nonstop transatlantic voyages in 24 hours, or less.

This Illustration Conveys a Good Idea of the Gigantic Size of the Craft in Comparison with a Seaplane of the Conventional Type. Within a Few Moments After This Photograph was Taken the 15-Ton Machine had Demonstrated Its Ability to Overcome Gravity by Making a 400-Yard "Hop"



A Locomotive on the London and Northwestern Railway, in England, That has been Converted from a Coal Burner to an Oil Burner: In the Coal Tender will be Seen the Oil Tank with Pipes (white) Leading from It to the Burners in the Fire Box. Adjacent to the Tank is Shown the Heater That Warms the Oil, in Order to Make It Flow Readily. Steam Pipes (black) will be Seen at the Burners from Which Flow the Steam Jets That Atomize the Oil

OIL-BURNING LOCOMOTIVES AS USED IN ENGLAND

In England, the London and Northwestern Railway Co. has converted some of its coal-burning locomotives into oil burners. The fire box has been lined with fire brick, and "scarab" oil burners, of the type in which the oil is atomized by a jet of steam, have been installed so that there are three burners in a row across the fire box. It was found that when running, the best results were obtained with only the center burner operating, and this burner was equipped with a nozzle having a capacity of 160 gal. of oil per hour. The outside burners were fitted with nozzles having only 20-gal. capacity, and are used only for keeping steam up when the locomotive is not moving. The burners are supplied with oil by means of a pipe line running from an oil tank, with a capacity of 1,000 gal., which is installed in the tender, in the space that used to be occupied by the coal. Adjacent to this tank is a heater, through which the oil passes on its way to the burner, and in which it is warmed sufficiently to make it flow readily through the reducing valves, and to atomize freely.

TWO-MILE-LONG SMOKE-STACK IS COOLED BY SMALL STREAM

The heavy vegetation-killing acid fumes from a copper smelter in Wales are carried up the steep side of a mountain and discharged high above its summit by a smokestack which is a novelty in chimney construction. Over two miles in length, it leans against the mountain for most of the distance, ending in a 100-ft. vertical section. A near-by brook was diverted to flow alongside the long tube, partially submerging it, thereby cooling and condensing most of the rich vapors upon its walls. That this is well worth while is demonstrated yearly at the time of cleaning, when a ton or more of high-grade metal is recovered.

Motion-Picture Men Entering the Devastated Area by Motorcycle, with Their Cameras: The Light Machines and Sidecars Offered the Only Means of Travel. The Wreckage at the Left Is the Remains of a Mail Carrier's Auto, Which was Hit Squarely by a Huge Storm-Felled Timber, and Completely Demolished

TORNADO DESTROYS GREAT FOREST

Storm of Unprecedented Violence Lays Low Two Thousand Square Miles of Timber in Olympic Peninsula, Causing Loss of 150,000,000 Dollars

BY FRANK RICHARDSON PIERCE

IN the short space of two and one-half hours, a tornado which struck the Olympic Peninsula, Wash., destroyed a portion of one of the finest stands of timber in the world. The storm, which came without warning, is said to have reached a velocity of 180 miles an hour off the Columbia River. At North Head, the gusts reached an estimated velocity of 150 miles an hour, while the instrument indicated 126 miles an hour over a five-minute period and was then carried away. The instrument at the Lone Tree station, off Gray's Harbor, registered 140 miles an hour for a three-minute period.

An Auto Caught by a Falling Tree: One Wheel was Forced into the Ground Clear to the Hub, but without Damaging Wheel or Tire

The affected area is on the most northwesterly portion of the United States and embraces approximately 2,200 square miles of virgin timber, both in the Olympic forest reserve and in private lands. The storm center seems to have been between the Hoh River and the Clearwater River. In this district many square miles of timber have been laid low. Much of it can be used, if salvaged immediately, but as the area is so great and logging conditions most unfavorable, much of it will be a total loss. Neither words nor pictures can adequately describe the condition of this area after the storm, and even the human eye grasps but a small portion. Trees that have withstood the elements for hundreds of years, which measured as much as 12 ft. in diameter, and which stood so closely together that the sun rarely reached the soft moss and fern-covered floor of the forest, now lie piled in a splintered, shattered mass as high as 50 ft. Timber "cruisers" state that with all landmarks gone, it will be impossible to cruise it without following

the methods used on uncruised areas. Communication with the stricken area is by telephone and road running to the town of Port Angeles, on the Straits of Juan de Fuca. The distance to Forks, the largest community in the area, is less than 60 miles, yet it required 10 days to open up the road because of fallen timber.

One of the first parties to enter the area was equipped with motorcycles and sidecars, which, being light, could be lifted over obstructions. There were four of the machines, and two motion-picture photographers in addition to the writer were carried. Although the sections we visited were the least affected, yet the loss was appalling. We drove in places through a lane banked high on both sides by the ends of logs. The obstructing sections had been sawed out and rolled aside. Mechanical saws were used by the road gangs. The single strand of telephone wire was pinned to earth in thousands of places.

A Splintered Tree Sawed in Two to Open the Highway: A Typical Example of the Many Pine Trees Shattered and Ruined for Any Purpose but Pulp or Fuel

The Olympic highway, over which we drove, considered one of the most beautiful in America for natural grandeur, is not ruined, yet the storm left its mark in many ways. Some stretches were untouched, others showed trees stripped of bark, while still others were swept so clean that but a few snags remained standing. In such places the ground was not visible, because of the mass of timber. Much of this, though on the road and within easy reach of auto trucks, is so badly shattered as to be useless for anything save fuel or pulp. In some areas the tornado broke off the tops and dropped them below, while in others, where the ground was different, the stunning spectacle of a great forest uprooted presented it-

A Single Vista in the Vast Area of Down Timber: The Road, Discernible Only Because of the Motorcycle on It, has been Partly Opened by Sawing through the Logs That had Fallen across It, Which Explains the Clean-Cut Ends of Many of the Sticks in Sight

A Region of Smaller Timber, Where the Road has been Opened by Sawing through Actual Thousands of Sticks of the Average Size of Telephone Poles, a Herculean Task That was Performed with Remarkable Speed

self. Not one nor a dozen trees, but thousands of trees, lay with upturned roots high above us.

In one place, a spruce six or eight feet in diameter had been snapped off a few feet above the ground. Where the remainder is, is a mystery. It was not within a radius of 200 yards.

While at the present writing the worst of it, in the Hoh River district, has not been touched, or even photographed, a few facts regarding road clearing are of interest. In a stretch of three miles on the Clallam road 1,500 trees were sawed through to open up the road. They varied in size from saplings to giants of the forest.

Aside from the cost of removal of timber from the roads, the highways suffered damage in an interesting manner. Though gravel, they were soft from heavy rains. When the trees crashed fairly onto the road the great impact hollowed out a cross section several inches in depth, forming a rut that made it necessary to lift our motorcycles out.

Though the storm occurred on January 29, it was not until late in February that a party of three men made their way into and out of the Hoh River country. Members of that party state they made most of the distance from log to log, often 40 and 50 ft. above ground; that for miles in every direction the conditions seemed to be the same. Working 12 hours a day, it required four

Another Typical Scene: The Upturned Roots of a Giant Tree, with Smaller Timber Standing Unharmed in the Background

days to cover 20 miles. They also found evidence of a fearful destruction of game. It is believed hundreds of elk and smaller game have perished, as no living thing,

The Shattered Stump of a Spruce Tree Over Six Feet in Diameter: The Upper Part could Not be Found

except a cat, could have made its way through the débris. One magnificent buck was found cut in two. A six-foot spruce had caught him in the act of leaping a log.

Perhaps one hundred people, who have homes in this district, are now making desperate efforts to get out. They say their cattle are destroyed and provisions getting low. The men of the district have banded together and are literally sawing their way out. After having worked two weeks, they had cut a lane a mile and one-half in length, with 20 yet to go. Nothing could keep those people there this summer, for they, like everybody else, realize the tremendous fire hazard, and believe that the whole section, and possibly a large section of the remainder of the Olympic forest, is due to go up in smoke. Two thousand square miles of timber, mowed down like grain, covered with leaves and branches above and below, and saturated with sap and pitch until the air is heavy with it at times, makes a fire menace hard to combat.

The governor of Washington quit in the midst of a session of the legislature to visit the scene, as did others. They were accompanied by U. S. forestry supervisors. All expected to find the damage overestimated. The contrary was the case.

In round numbers the loss is as follows: 8,000,000,000 board-feet of hemlock, spruce, cedar, and fir down, a portion of which can be salvaged, if done immediately. Estimated in money the loss is $150,000,000. And though every known effort will be made to combat it, yet this loss may reach the billion mark if fire once gets a fair start this summer.

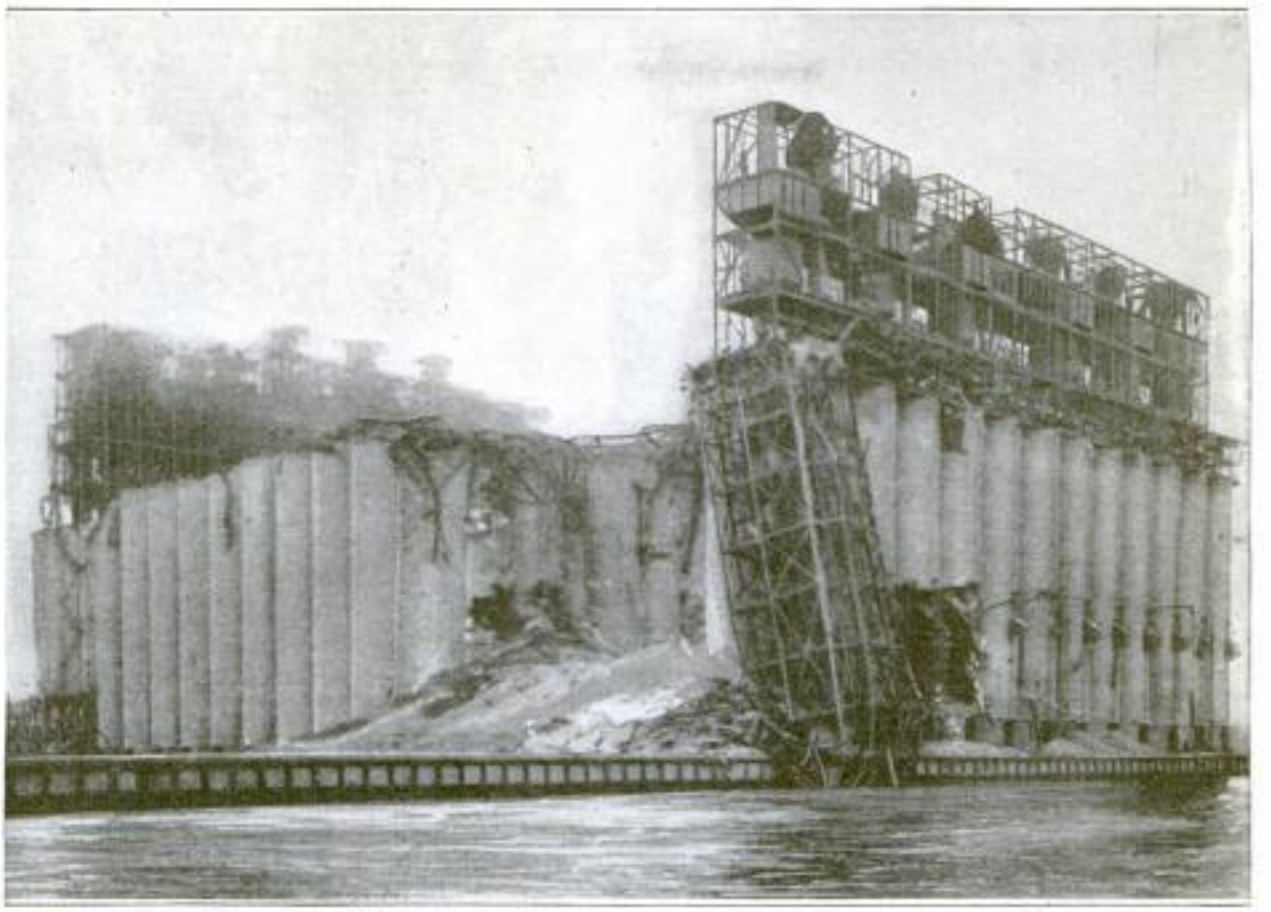
PNEUMATIC BASEBALL CAP PROTECTS BATTER'S HEAD

A skullcap built up in a series of inflated tubes which are attached together by leather straps, is a new means for protecting a baseball batter's head if hit by a pitched ball. The weight of the protector is only 7 oz. and it may be worn under the regular baseball cap. Many fatalities have resulted because of blows received on the head from pitched balls, and with the use of the protector, which is capable of withstanding 150 lb. of pressure, the danger is expected to be minimized.

The Pneumatic Baseball Cap is Built of Inflated Tubes Held Together by Straps and is Designed to Prevent Injury from Pitched Balls

TERRIFIC EXPLOSION WRECKS WORLD'S LARGEST ELEVATOR

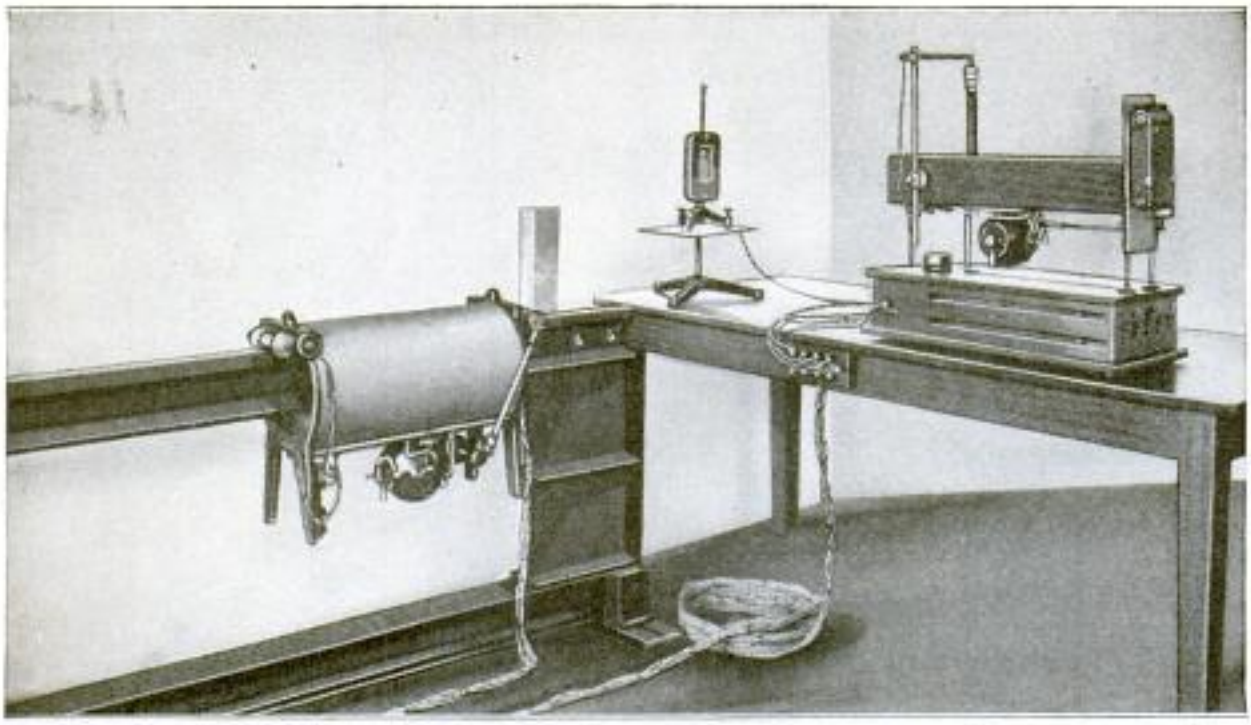
The largest grain elevator in the world lies in a distorted mass of wrecked concrete and twisted steel girders at its location on the banks of the Calumet River in South Chicago. A terrific explosion, caused either by spontaneous combustion or ignited grain dust, shattered the immense structure, and ruined what was acclaimed at the time of its construction to be an impossible achievement in the matter of elevator building. It was com-



The Remains of the World's Largest Grain Elevator after an Explosion Caused by Ignited Grain Dust: The Weighing Buildings Which Gave Out First were Superimposed upon a Series of 32 Cylindrical Storage Bins That were Ripped by the Impact and Their Grain Content Piled on the Ground

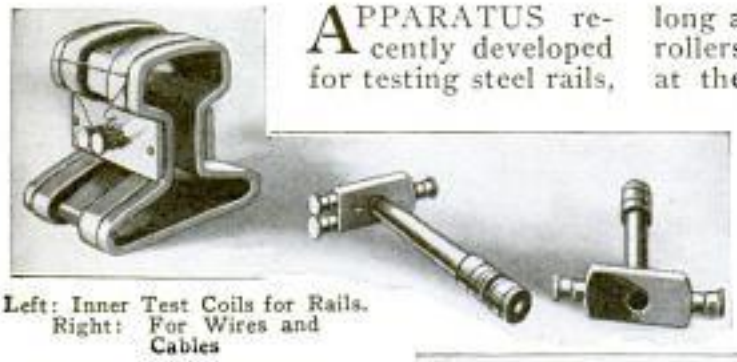
posed of 32 concrete grain-storage pits of cylindrical design, and superimposed upon them two weighing houses. The walls of the latter were built of a special steel reinforcement covered with concrete, the latter being designed to give way first in the event of just such a catastrophe, while the steel work remained intact, and at the explosion they acted according to expectation. It is estimated that at least 500,000 bu. of grain were lost, and that the building was irreparably damaged. Four persons are known to have lost their lives. Buildings on all sides of the elevator were damaged by the shock, the adjacent river blocked by the falling débris, and window panes as far as four miles away shattered.

This Picture, Taken between the River and the Elevator, Shows How Some of the Storage Bins were Blown in Half, as the One on the Right



The Complete Equipment for Magnetically Testing Steel Rails: At the Left, the Motor-Driven Coil, Traveling on the Test Rail, Connected by Cable to the Galvanometer and Motor-Operated Camera at the Right

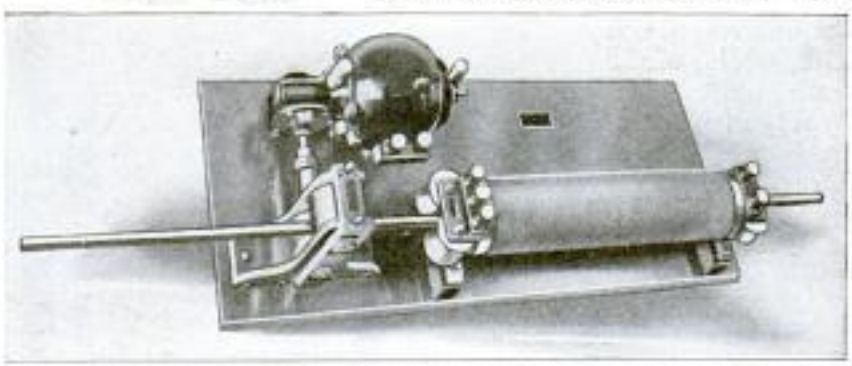
NEW MAGNETIC TESTER FINDS DEFECTS IN STEEL



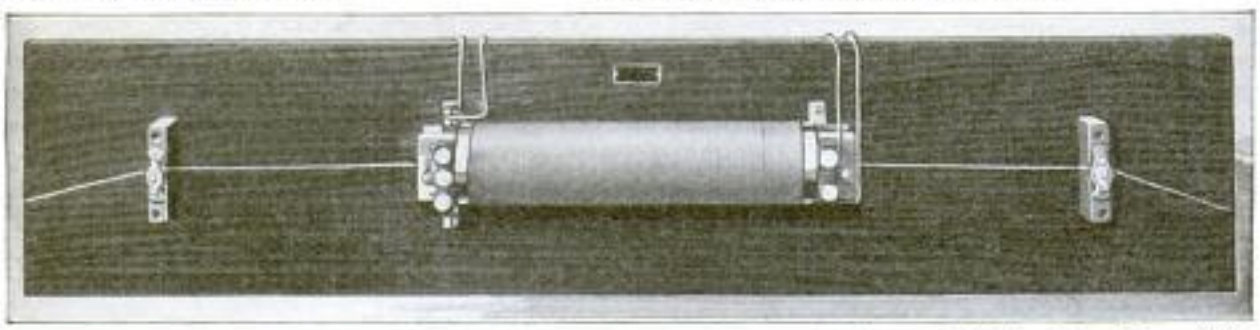
Left: Inner Test Coils for Rails. Right: For Wires and Cables

APPARATUS recently developed for testing steel rails, bars, cables, and wires by magnetic methods is proving highly successful in detecting hidden defects and irregularities of composition. The equipment is simple and easily used. A steel rail to be tested is supported at the ends and made to act as the core of a solenoid coil, wound on a brass tube, 20 in. long and 10 in. in diameter. This runs on rollers on the rail, driven by a small motor at the bottom, and magnetized by constant direct current. Within the solenoid are two small coils shaped to the rail, side by side and exactly alike. On one of the rollers is an automatic contact maker.

The two test coils, differentially connected, are wired to a



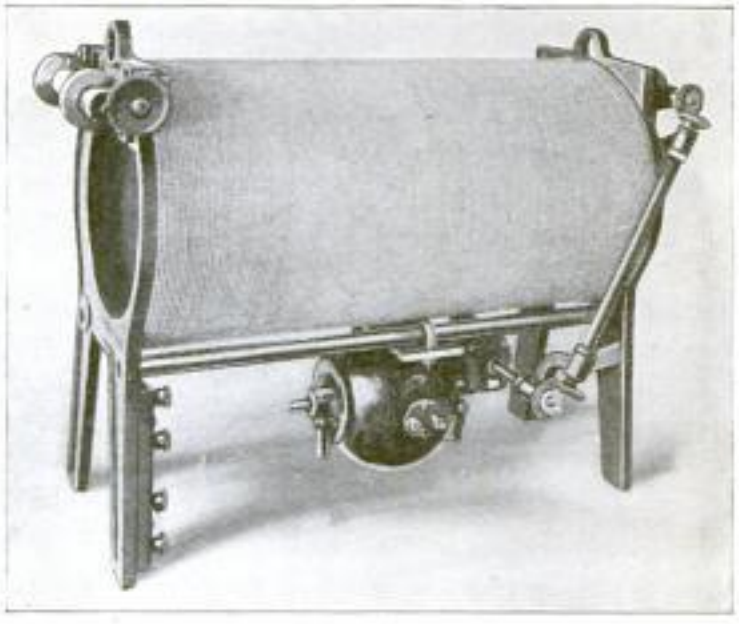
The Stationary Testing Coil Used for Steel Bars, with a Motor and Gearing for Moving the Bar through the Coil



The Stationary Testing Coil Used for Steel Wires; It Is Similar to the Equipment Used for Bars, Except That the Wire may be Drawn through the Coil in Its Process of Manufacture, if Desired

sensitive reflecting galvanometer. The beam of light from its mirror, passing through a horizontal slit, records itself on a sensitive film in a camera that is slowly moved vertically by another small motor. Any deviation in the magnetic properties of the steel, as the coils travel slowly along it, shows then as a hump or notch in the light line on the film. If no permanent record is needed, the light's movements may be visually inspected.

The tester for wires, cables, bars, and strips differs only in that the coils are stationary and the test material is moved through them. The method is particularly valuable for testing elevator cables and wire rope, as it detects breaks and defects in the inside wires, not apparent by the usual methods of inspection. Some progress has been made also in applying the system to testing large circular material, and it is expected that many other uses will be developed as experiment progresses.



A Close-Up of the Rail-Testing Coil: The Motor Below Drives the Traveling Roller at One End, and the Roller at the Other End Operates an Electrical Contact

THE FINGER-RING WATCH IS LATEST PARISIAN NOVELTY

A clever little article of personal adornment is the finger-ring watch recently introduced by a Paris jewelry manufacturer. The diminutive timepiece is so tiny that it can be worn on the smallest of the fingers, and lies so flat that a glove can be drawn over it quite easily. The more expensive specimens are studded with precious stones.

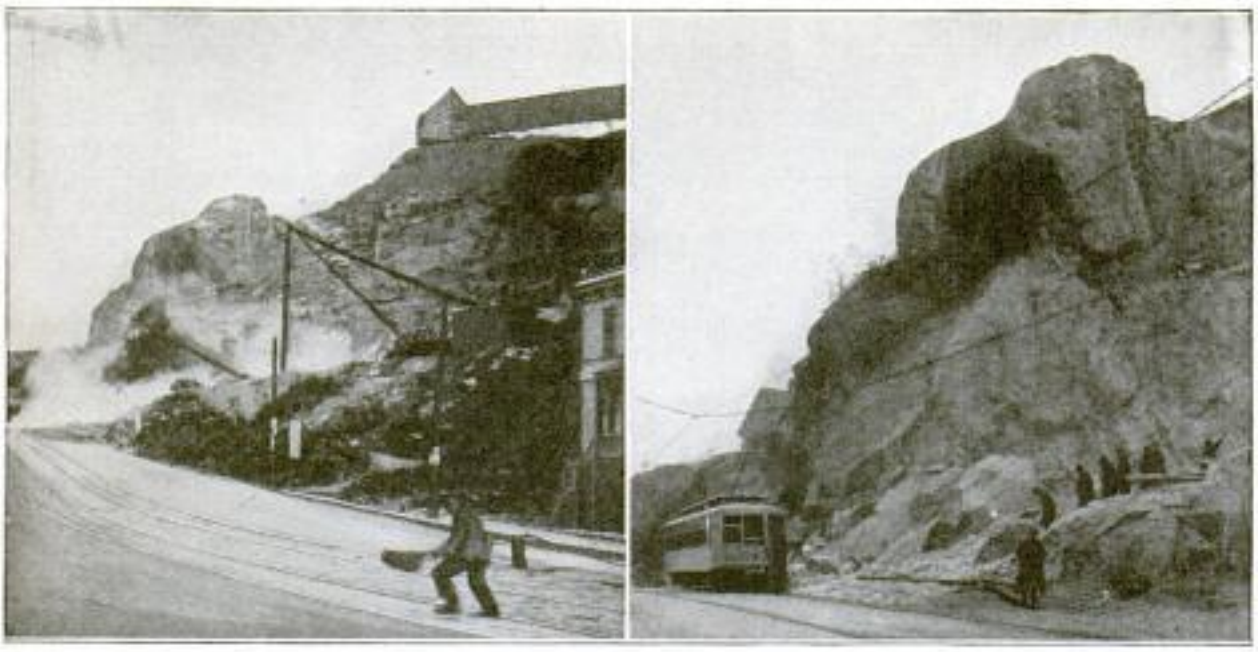
PROPOSES SCHOOL ON SHIP TO TRAIN WAYWARD BOYS

Believing that the lure of the sea might prove the winning appeal to boys who resist the conventional schooling of shore life, a Baltimore shipping expert proposes the establishment of a training ship at that port. Not only would such a school ship serve as a coöperative unit in the educational system of the city and state, but it would give additional marine training calculated to yield a supply of American sailors for the merchant vessels of the nation.

AUTO SELF-STARTER IS POWER FOR BABY CARRIAGE

The starting device of an automobile has found a new field of service, for a London curate has had one of the devices placed as a driving motor on the front axle of a perambulator. The starter is so geared as to carry the baby carriage at a moderate speed on the level, and also to take hills with ease. The body part of the machine is the same as the ordinary perambulator, while the front, or driving, wheels are appreciably smaller. Control is accomplished by levers which attach to the mechanism and are fixed in the place of the push bar.

The Motor-Driven Perambulator Uses an Automobile Self-Starter for Power. The Machine is Operated by Levers Displacing the Push Bar



Views of a Small Mountain of Almost Solid Rock Which is being Removed from the Business Section of Duluth, Minnesota. Left: Holding Up Traffic While a Blast is Fired. Right: Huge Masses of Stone Shattered by the Blast. This Débris is Crushed to Make an Excellent Paving Material

BICYCLE SIDECAR CARRIES SMALL CHILDREN SAFELY

For giving small children the advantages of bicycle transportation without having to perch them precariously on the handlebars, an eastern inventor has devised a neat shoe-shaped sidecar, mounted on a third wheel. The attachment, similar in all respects but size and tread to a motorcycle sidecar, is fixed to the bicycle by wingnut clamps, so that it may be quickly removed. Room is left between the car and the bicycle for the addition of a motor wheel if desired.

A Comfortable, Easy-Running Sidecar, Easily Attached to an Ordinary Bicycle for Carrying Children

CITY BLASTS ROCK MOUNTAIN FROM BUSINESS SECTION

A small mountain of solid rock, several blocks in extent, which had long been a drawback to the expansion of the business section of Duluth, Minn., was partly removed by blasting recently. That it was an undertaking of some magnitude is realized when it is known that a busy thoroughfare skirted the foot of the big bluff and that traffic could not be diverted while the work was under way. This almost resulted in a serious accident, when a large bowlder narrowly missed striking a street car in its fall. Although the work is not yet completed, threatening loose masses of rock have been removed, thus insuring safety to traffic. The excavated stone makes a very excellent paving material.

LIQUID OXYGEN IS HANDLED SAFELY IN NEW CONTAINER

The increasing use of liquid oxygen in life-saving respiratory apparatus, airplanes, and as a mine explosive, has made necessary the development of a container for it of a stronger, more reliable construction than the vacuum-walled glass bulbs used heretofore. To meet this demand, the Bureau of Standards has designed a durable vessel without vacuum walls, the contents being protected from heat by a coating of insulating material with which the device is covered. Another improvement is a valve mechanism which liberates the gas at a constant rate.

COMMENT AND REVIEW

[These pages were printed March 26, 1921]

OF all the reform movements those promoted in the name of religion are the most tenacious. Many such have persisted for years and even centuries. Like some striking physical or mental family characteristic, they remain dormant for one or more generations, only to reappear when almost forgotten. The present proposed Blue Law bears the unmistakable earmarks of its easily recognized ancestry—the Puritans of early New England, who, like Lenine and Trotzky of the present day, would impose their own radical beliefs upon all others, by means of force. In both cases he who dared think and act otherwise than prescribed, invited punishment, and often death even. The Pilgrim Fathers, leaving relatives and friends, and putting out upon a then but little known sea in a 90-foot boat to escape religious serfdom, brought, with their many admirable qualities, an arrogance and a bigotry no less bitter than those which they fled to escape. Time worked to annul the radical views of the Puritans, just as it is working to annul radicalism in Russia, which is already strained to the breaking point.

What Blue Sunday Means

Because the 20-foot posters which recently flung their challenge from prominent billboards in our larger cities have temporarily been removed, we cannot afford to beguile ourselves into the fond belief that the "movement" has also disappeared permanently. It has done nothing of the kind and only awaits a favorable opportunity to return. Pressure is even now being used in the form of threats of political defeat for congressmen who fail to measure up to the requirements of these reformers.

So few readers have ever seen the much discussed Blue Law, it is well to print it in full. Here it is, the most drastic law ever drafted for Sunday observance in this country:

"1. Hereafter it shall be unlawful for any person in the employment of the United States to work or carry on his ordinary vocation on Sunday.

"2. It shall be unlawful for any person or corporation to operate on Sunday any freight or passenger train, or mail train, or any other train or part of a train, in the carrying on of interstate commerce, trade, or traffic of any kind.

"3. It shall be unlawful for any post office to be open on Sunday or to deliver mail on Sunday; it shall be unlawful for any mail to be carried or delivered on Sunday by any employee of the United States, whether in city or country.

"4. It shall be unlawful for any newspaper or other paper or publication published or purporting to be published on Sunday to be received, carried, or delivered as mail to any agency of the United States, in any post office or over any route under the jurisdiction of the United States.

"5. It shall be unlawful for any person or corporation engaged in interstate commerce or carrying on any business or vocation under the laws of, or with the permission or license from, the United States, or any of its agencies, to do or carry on any ordinary vocation or business on Sunday, the purpose of this act being to express our national determination to honor the Sabbath day and keep it holy, as God commands, thereby securing for all that opportunity for spiritual and bodily refreshment decreed by our Lord for the happiness of all men and the safety of all nations.

"6. Any person who does any of the things above declared unlawful, or who procures or aids another in doing any of the things above declared unlawful, shall be guilty of a misdemeanor and punished upon conviction by due process of law by a fine of not under $100 nor over $10,000 for each offense and by imprisonment for not over six months, in the discretion of the court.

"7. And any corporation that does, or aids in doing, those forbidden things shall upon conviction be fined not less than $1,000 nor more than $100,000 for each offense, and upon conviction a second time for a like offense shall forfeit its charter and franchise and be enjoined from operating in interstate commerce; provided, however, that emergency instances of charity and necessity are not included nor punishable under the provisions of this act."

Under this law no mails can be collected, handled, dispatched, or delivered from midnight Saturday to 12:01 a. m. Monday. This would include special-delivery letters, for how can it be determined whether the letter is one of "necessity" or otherwise? There could be no early Monday morning newspaper, for the news could not be gathered or telegraphed until after midnight Sunday, by which time many morning dailies have their first edition ready to go to press. Of course, there would be no Sunday papers; that is specifically provided for. Imagine no Sunday dailies during the days when our boys were across, fighting and dying, and the agony to mothers and fathers of even 24 hours' delay in news from the front! Office buildings are not occupied on Sunday, manufacturing plants shut down Saturday night, but both require watchmen the year around, and a certain amount of heat is required to keep pipes from freezing in winter. Yet neither

can be called an "emergency necessity." Many industrial processes extend over more than six days. They cannot be accomplished in less, any more than potatoes can be raised in two weeks. Yet, any break in the continuity of the process renders the material worthless, and the offending manufacturer becomes liable to a fine of $100,000, and practically a confiscation of his business. It is unnecessary to extend comment on this feature, for many pages would not suffice to tell the half.

The last degree, however, has been reserved for the railroads, which are hit the hardest of all. Under the proposed law, passengers leaving New York for California would be limited to Monday and Tuesday of each week, as those departing later in the week could not reach destination by midnight Saturday. Points less remote would suffer relatively. However important, a man in Chicago at the week end could not reach his family in Buffalo before Monday night, unless he left Chicago Saturday morning, for the train must reach Buffalo in ample time to unload, transfer to the yards, and permit the locomotive to reach its roundhouse before midnight. If all work is to cease in roundhouses at midnight Saturday, water and fires would have to be withdrawn in winter. While a locomotive can be filled with water and fired to the steaming point in several hours, a railroad high official states, if all the motive power on a trunk line was to be so treated, the time required would consume one day before Sunday and one day after. What of trains which failed to make their terminals within the midnight deadline and were caught out on the prairie or at some small town? Yet, if all were forced to "Sunday" at terminals, the terminals could not contain them all.

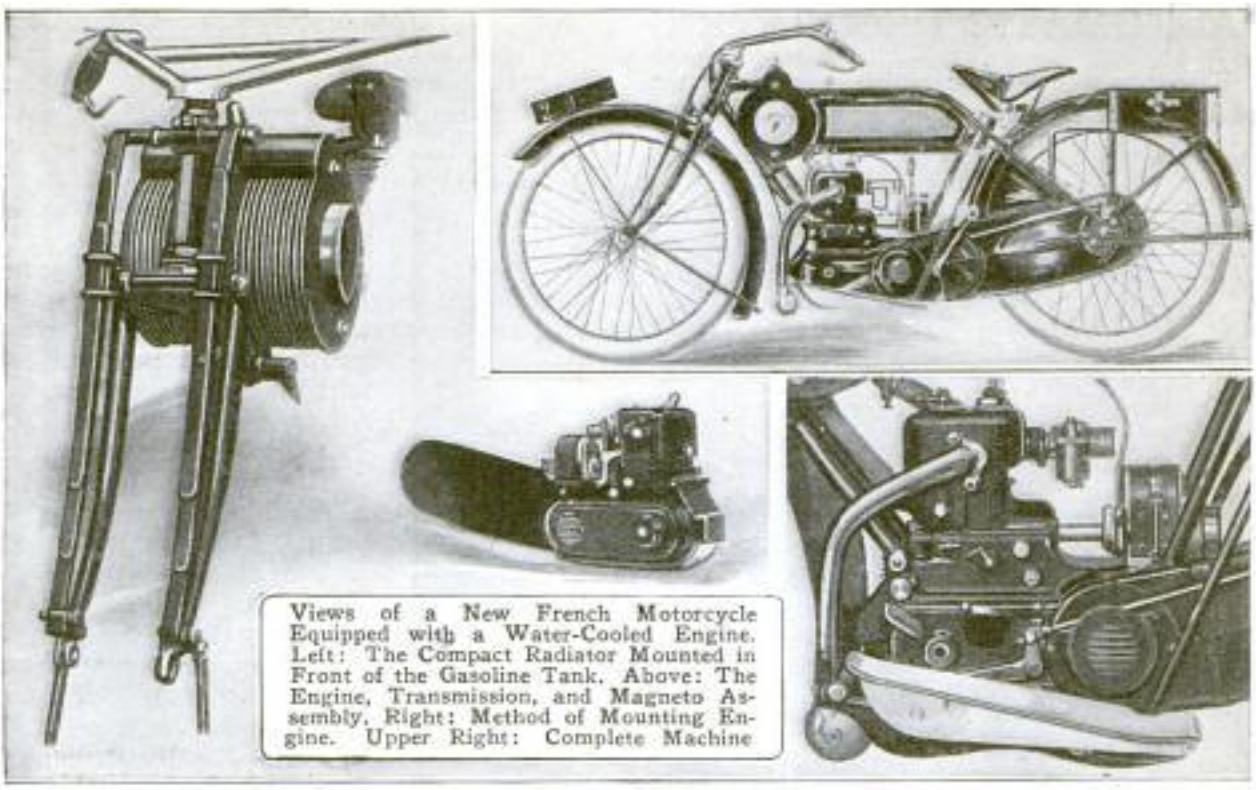
The movement of perishable freight of all kinds from coast to coast would have to cease. The limitation to a few days in the week during which passengers and freight could start on the longer journeys would require the movement of so many trains on these days, the terminals could not possibly handle them. And so on.

The reformers apparently can see only one object, and that through a very small hole. They take no account of the millions in this country who are equally sincere in the observance of *their* religion—and at great personal financial sacrifice also—by whom another day in the week is regarded and religiously observed as the Sabbath. Have these people no rights? Are their beliefs any less sacred because their one day in seven falls on the day previous? Who delegated to these reformers the divine right to determine which day in seven must be observed? Whence their authority?

Personally I do not attend Sunday theaters, and refrain from doing many other things, because I have time to do so in the week days, but that is no reason why I should strive to prevent or forbid others from doing so, thousands of whom have no other opportunity. Times have changed greatly in the past fifty years; our manner of life is different; amusements which were considered a mortal sin in the days of our grandfathers now take place in church parlors. Work which did not exist then is necessary now on seven days in the week. The reformers shut their eyes utterly. They refuse to see that Sunday labor in many lines has been almost entirely done away with. In Chicago and other cities Sunday funerals no longer take place; while in many of our southern cities they are absolutely necessary. Logical amendment to the Sunday law would be one requiring people to die on the first four days of the week only!

As printed in these pages for February, unnecessary Sunday work should be discouraged, and the only proper way to accomplish this is through an enlightened public conscience. No tongue can prophesy nor pen portray the dangers which wait beyond a now closed door, and that door is the union of Church and State, which misguided men are now striving to open.

H. H. WINDSOR



Views of a New French Motorcycle Equipped with a Water-Cooled Engine. Left: The Compact Radiator Mounted in Front of the Gasoline Tank. Above: The Engine, Transmission, and Magneto Assembly. Right: Method of Mounting Engine. Upper Right: Complete Machine

NEW FRENCH MOTORCYCLE HAS WATER-COOLED ENGINE

A water-jacketed engine, with the necessary radiator and circulation system, is the leading feature of a new-make motorcycle recently brought out in France. Those who are accustomed to the standard air-cooled types of engines as used by the American manufacturers will, doubtless, form the impression that the new machine is awkward and cumbersome. Such is not the case, as the design is so compact that the vehicle presents a very neat, trim appearance. The radiator, which is built up of flat copper tubes, together with the water tank, is cylindrical in shape and is mounted immediately in front of the gasoline tank. Being of the same width as the latter, it does not project beyond it. The engine is also no wider than the fuel tank, although rated at 3 hp. Power is delivered to the rear wheel through the medium of a two-speed planetary transmission and inclosed chain drive. It is claimed that, with a sidecar and carrying four persons, the little vehicle has no difficulty in starting from a standstill on a 12-per-cent grade.

¶A new kind of artificial stone is now being made by mixing cement with an aggregate of elastic, capsular material, such as calcined rice hulls. The substance formed is suitable for building material, having good insulating qualities against heat and sound.

ILLUMINATED WARNING SIGN MARKS SAFETY ISLAND

A combination safety-island marker and warning sign is being given a trial by the Lincoln Park board in Chicago. It is in the form of a high column surmounted by red and green electric lights, which cast their warning beams for a long distance down the boulevards. Besides this, the post bears the commands, outlined in letters of white light, admonishing motorists to "drive slow" and "keep to the right."

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A Conspicuous Safety-Island Marker at a Dangerous Boulevard Crossing in Chicago

AUTOMATIC DECORATING TOOL ADORNS THE HOME

The superimposing upon a plain coat of color of a very finely granulated coat of some other harmonizing color has a much more decorative effect than is possible with a plain-color coat alone. A starlike veil of silver on a background of blue, for instance, has the beauty of a midnight sky on a moonless night. A background of gray spangled with rose color, and many other combinations, can be made to suit any taste.

The Operator Decorates the Wall with the Spraying Instrument, While the Machine, in Any Convenient Location on the Floor, is Run by Means of the Electric Motor to Which is Attached a Cable and Plug for Connection to Any Standard Electric-Light Socket

The work is done with a machine that is composed, fundamentally, of a means for atomizing the coloring matter, and an instrument for spraying it upon the surface to be decorated. An air compressor is mounted upon a cast-iron base, together with a ¾-hp. electric motor that drives it, and a cylindrical tank into which it pumps the air as it compresses it. The spraying instrument is connected to the tank by means of a rubber hose, which enables the operator to move the instrument any way he desires. The base of the machine is mounted upon rubber-tired wheels which facilitate the movement of the machine from place to place without damage to floors. The machine has an electric cable with a plug for connection to any standard lamp socket.

ARTIFICIAL VENEER IS MADE FROM SAWDUST

The converting of sawdust and vegetable waste products of a fibrous nature into various grades of an artificial veneer is the object of a process recently evolved by an Australian inventor. The new veneer is said to lend itself readily to the manufacture of such articles as chair backs and seats, wall panels, and, in fact, the greater number of wood products in which natural veneer is used at present. It is woodlike in character and is easily worked by sawing, planing, sanding, etc. Quite flexible, it can be bent to any desired form and, being of a close, firm grain, it takes nails easily and holds them firmly.

¶The production of a new variety of alcohol from the gases liberated in the cracking process of oil refining is going forward on an extensive commercial scale. The new fluid is cheaper than either the wood or grain varieties, and is suitable for all the usual purposes except medicinal.

MAKE HOUSES FROM CARS OF BIG PARIS WHEEL

In the Big Wheel of Paris, Which has Stood for More than 20 Years as a Landmark of the Paris Exposition of 1900, Two New and Queer-Looking Spokes have Suddenly Appeared, Forming a Massive "V" in the Upper Half of the Giant Circle. They Are the Steel Scaffolds of Workmen Who are Now Engaged in Wrecking the Wheel

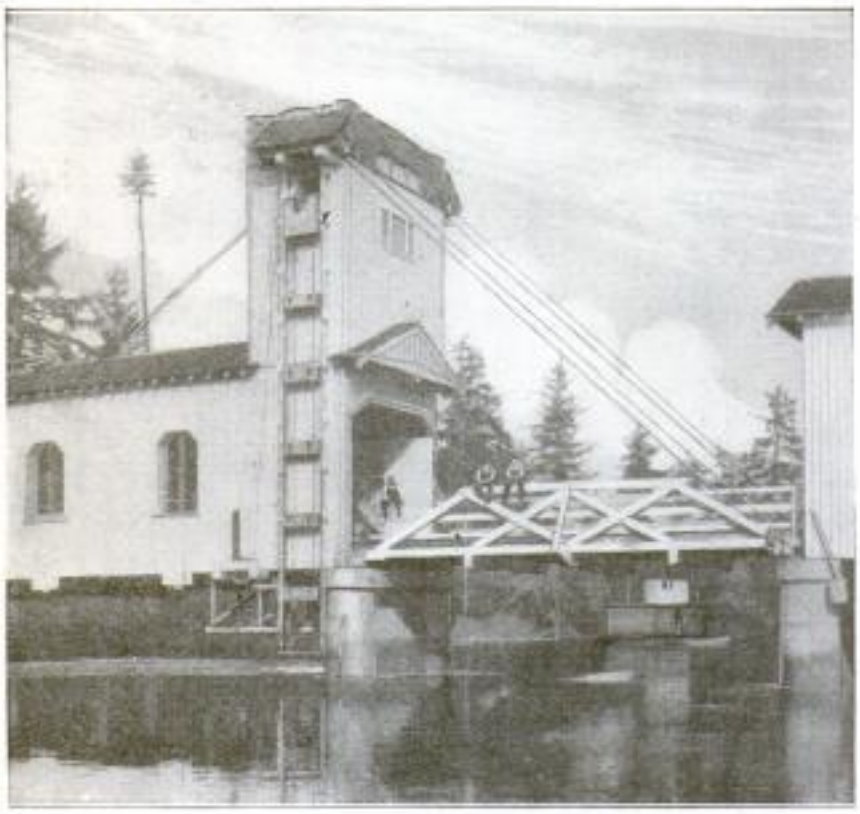
The Great Structure Is Still a Wheel, as Seen Here, but Its 40 Cars have been Removed, the Main Object of the Dismantling Work

The Wheel as It Appeared Just Before Demolition Began: It Was Practically a Copy of the Famous Ferris Wheel of the World's Columbian Exposition, in Chicago, in 1893

The Dismounted Cars, Looking Something like Street-Car Bodies, Collected on the Ground, Ready for Shipment to the Battle-Scarred Region of Northern France, Where They will be Made into Dwellings for the Homeless Inhabitants

WOODEN BASCULE BRIDGE HAS CURIOUS LIFT SYSTEM

A wooden bridge of the single-leaf bascule type, recently built across the John Day River in Oregon, is interesting for its applicaton of a new lifting and counterbalancing system. The 40-ft. span is pivoted at the base of a frame tower, and ⅝-in. steel cables run from the end of the leaf to the top of the tower, and down to 30-in. winding drums below. Cables from similar drums run to the counterweights, hung in six sections on the sides of the tower. The bridge is raised by hand, through a capstan bar in the center of the road beneath the tower, and as it rises, the falling counterweights come to rest, one by one, on a support at the bottom, gradually diminishing the load.



Hand-Operated Wooden Bascule Bridge in Oregon: The Sectional Counterweights on the Sides of the Tower Come to Rest, One at a Time, as the Span is Raised by the Cables

DUPLEX STEEL PROCESS MAKES OPEN-HEARTH METAL RAPIDLY

It is commonly conceded that open-hearth steel, when properly made, is a better grade of metal than the Bessemer, but owing to the fact that the latter may be used to very good advantage in many applications, its inferior quality is overlooked, and it is the metal manufactured in most steel plants. Because of a longer time necessary for oxidation of the undesirable elements in the raw charge, the open-hearth produces a better and finer-grained material. It has been the desire to combine the quality of open-hearth material with the speed in production afforded by the use of the Bessemer process, and this has been accomplished by combining the two methods in the so-called "duplex" process. The metal is first blown in the Bessemer vessel to a point which would ordinarily be reached only by several hours of oxidation in the open hearth. It is then placed in a second retort, very similar to the open hearth, but of the mixer style, which permits pouring. Here it receives the finishing oxidation which gives it the quality, within a very close margin, of what is obtained by the straight open-hearth practice, and the entire operation from charge to withdrawal only takes about two hours. Eight hours or more are necessary to make a good open-hearth heat, and Bessemer steel is made in from 40 minutes to 1½ hours. Thus, by the new process a good grade of open-hearth steel is obtained in almost as short a time as is required to produce the Bessemer.

BARBERING COMB MAKES FOR EVEN JOB OF HAIR CUTTING

A comb having a guide arm attached to it to keep it at the right slant for hair cutting has been introduced by an eastern inventor. The guide arm has two threaded projections which fit through the handle of the comb. Locknuts on the projections hold the arm. A fair degree of evenness is maintained in the cutting, as the guide arm keeps the comb at the right slant.

Healing-Gas Generating Plant of the "Inhalatorium," Built by the French Ministry of War as a Rehabilitation Measure, for the Treatment of Poison-Gas-Disabled Soldiers

NEW INHALATION TREATMENT FOR LUNG DISEASES

An outgrowth of the rehabilitation measures adopted by France in the reclaiming of her poison-gas-wrecked veterans, is an inhalation treatment claimed to be beneficial in affections of the lungs and air passages, such as bronchitis and tuberculosis. The healing gases are generated in large retorts and, after passing through washing and filtering chambers, are delivered to inhaler mouthpieces under pressure. From these the patients inhale certain dosages at prescribed times. The generating plant is quite elaborate, as is also the piping system, so that the whole is housed in a special institution called an "inhalatorium." The patients reside at the institution, where they are kept under constant supervision and observation. The original installation is in charge of the ministry of war, but it is safe to predict that, if the treatment proves as effective as it is hoped it may, other institutions will be built for the benefit of the public.

Patients in the "Inhalatorium" Taking Their Regular Doses of the Healing Vapors. Insert: A Gas-Poisoned Veteran Inhaling a Prescribed Quantity of the Medicated Fumes

ICE-COVERED LIGHTHOUSE LOOKS LIKE A ROCK

Recent storms that ravaged the coast of Denmark thrashed the sea into such a fury that its spray created a thick coat of ice over an outlying lighthouse, locking the keeper in and putting the lighthouse out of commission for two days, until aid arrived to chop him out. At first glance it would seem that the beacon was not a guide to those at sea, but a giant threatening rock rearing out of the ocean.

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Spray from a Heavy Sea Froze on the Danish Lighthouse, Making It Look like a Threatening Rock

LOUD-SPEAKING TELEPHONE AIDS MOVIE DIRECTOR

Among the curious uses constantly being discovered for the modern loud-speaking telephone, one of the most interesting is that of directing the production of large motion-picture scenes. A noted producer of dramatic films has recently found the magnifying receiver particularly valuable for handling mob scenes, for with it he can make his orders heard half a mile away, without any vocal exertion. The set he uses consists of a special powerful receiver in a small pedestal, surmounted by a curved horn with a 22-in. bell, a light hand transmitter, and a boxed induction coil, all connected to a standard six-volt automobile storage battery.

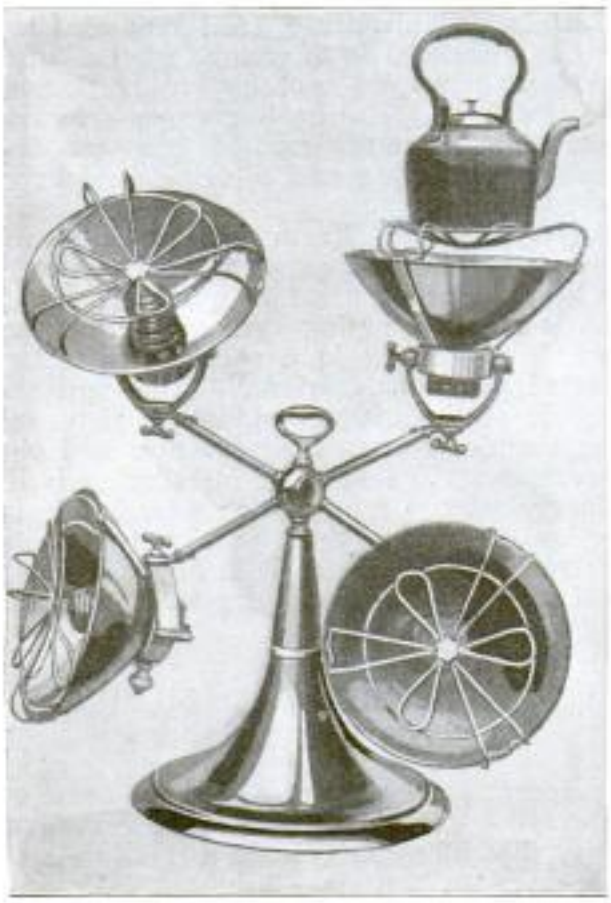
A Movie Producer Directing an Extensive Scene with the Aid of a Loud-Speaking Telephone

SWEDISH RED CROSS DEVISES TYPHUS-PROOF ARMOR

The Swedish Red Cross ambulance corps, sent to Poland last year to assist in fighting the frightful typhus scourge which ravaged that country, devised an armor which protected its wearers perfectly against inoculation by the millions of lice which are believed to spread the infection. The garment is loose, to allow untrammeled movement, and in one piece, with openings in the sleeves and at the chest only. This latter is protected with a sheet of rubber smeared with a germicide. An attached hood has a rim, made of nickeled metal, a trifle over an inch wide, which frames the face, experience having proved that the vermin cannot secure a foothold on the smooth surface. Rubber elbow gloves protect the hands and the sleeve openings. The armor was frequently disinfected by immersion in a hydrocyanic-acid bath.

FOUR-WAY ELECTRIC HEATER WILL DO COOKING ALSO

The popular reflector type of radiant electric heater is being made in an interesting form by an English manufacturer, four units being mounted at the ends of an X-shaped spider on a single pedestal. Each heater is adjustable for direction, and independently controlled. The two upper heaters may also be turned up to a horizontal position, and used for cooking or toasting, the dished center of the wire guard serving as a rest. Using 600-watt heating elements, a pint of water is boiled in 10 minutes. The units are made of coiled wire on a fire-clay core, and are easily removable. Two and three-way models are also made, with the same features of adjustability and adaptability to various uses.

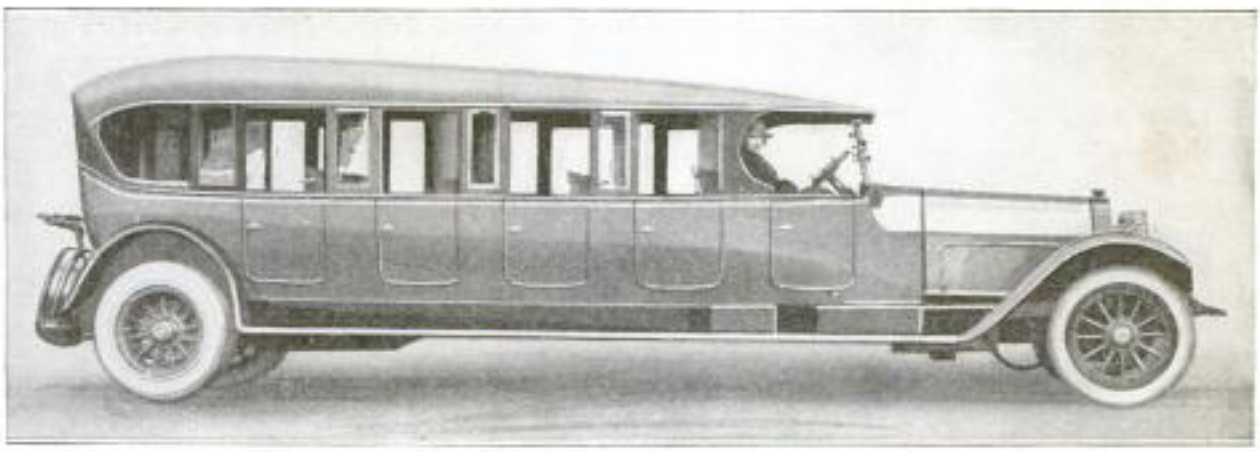


The New Four-Way Electric Radiant Heater, Showing the Adjustment of One Unit in a Horizontal Position, for Use in Cooking

NEW UNITED STATES NAVY GAS MASKS ARE INDEPENDENT UNITS

THERE has been time since the close of the war greatly to improve the gas masks that were the hasty product of an emergency that brooked no delay. One of the most recent has been perfected by the Navy Bureau of Ordnance. In the new mask, the use of a mouthpiece, which was such an objectionable feature to the wearer of the old masks, has been eliminated. The clumsy bag that was used in the old masks for carrying the chemical tank, and which, hanging on the wearer's chest, was in many ways an incumbrance, has been dispensed with. The chemical tank now forms part of the mask itself, and is carried on the head. Short feed pipes lead from it to two openings just above the eyes. The canister has been greatly improved, and strengthened. Most of these features are apparent in the accompanying picture, giving a front view of the mask as worn by a sailor. The other photograph shows a group of bluejackets being drilled in the manipulation of the new mask.

For naval use it has the particular advantage of being specially adapted to safeguard the crews of submarines from the danger that so frequently occurs in underwater work on account of the formation of carbon monoxide, one of the most deadly gases in existence. The Navy Department has proved, by tests, that with the new masks work can be done on damaged submarines, without risk to the workers, that, without the masks, would have fatal results to all of them.



MOTOR STAGECOACHES OF THE PACIFIC NORTHWEST

ALTHOUGH the picturesque eight-horse stagecoach was driven from the field some time ago by the all-invading motor car, it is only recently that the amount of business procurable has warranted the construction of machines especially designed for such traffic. Heretofore stock cars, with the springs and frames reinforced by the owners, have been pressed into passenger-carrying service on a commercial scale, but have not proved entirely satisfactory or profitable, owing to limited capacity. Latterly specialization and reliable service have attracted such a volume of patronage that a new type of car has been evolved to care for it. The novelty of the new design lies in the exceptional length of the wheelbase, which is from 25 to 30 ft. This great length permits the mounting of a body of conventional lines which will accommodate 22 passengers comfortably. The luxurious coach is divided into compartments, on the order of the English railway-car arrangement, one of which is a smoking room. All parts of the chassis are stock, readily procurable, as are the 6 and 12-cylinder engines of 60 to 125 hp. Stage lines operating from Seattle are placing the novel vehicles in service as rapidly as they can be built.

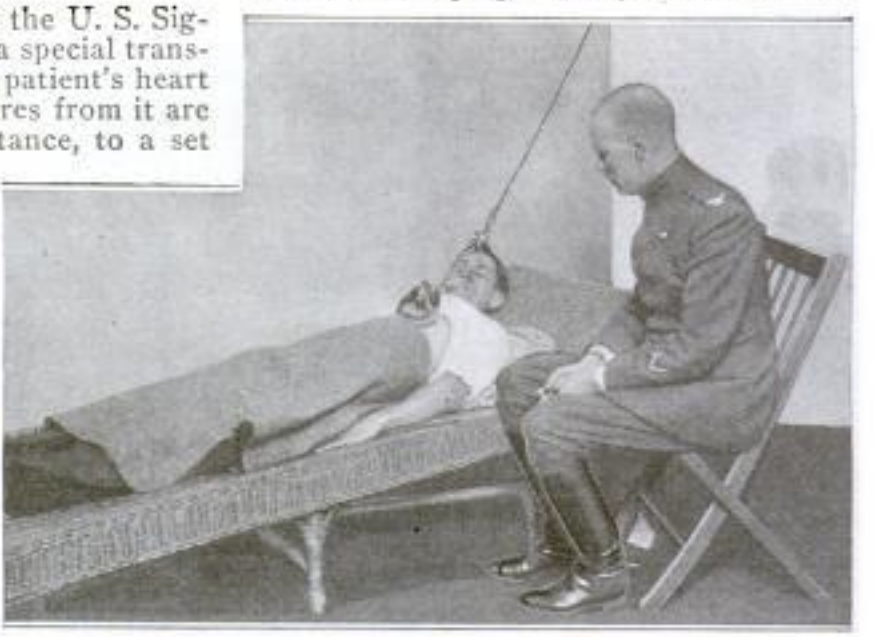
AUDIENCE HEARS HEARTBEATS THROUGH RADIO AMPLIFIER

With a curious telephone transmitter resting on his body, a man lay on a couch in a small room in Washington the other day, and in an adjoining auditorium a group of medical men discussed the beating of his heart, the rhythmic sounds of which issued loudly from a large horn on a table. The occasion was the test of a new method of amplifying, transmitting, and reproducing heartbeats in greatly magnified form, by electrical means.

The Set of Vacuum-Tube Amplifiers and the Loud-Speaking Receiver with Its Horn, by Which an Entire Audience is Made to Hear the Beating of a Man's Heart, Magnified Thousands of Times

The system, developed in the U. S. Signal Corps' laboratory, uses a special transmitter that is held over the patient's heart by its own weight. The wires from it are run, over any required distance, to a set of amplifiers of the type employed in modern radio work. These in turn are connected to a loud-speaking receiver, fitted with the usual horn. With this apparatus, the feeble sounds of the heart are augmented literally thousands of times, and are plainly heard all over the room.

The patient, of course, unless he is in the room with the receiver, hears nothing of the amplified reproduction. If the transmission distance is long, wireless may be used as well as wire. It is found, indeed, that the new system of "wired wireless" gives the best results, because the confusing side tones of the wire telephone are absent. The amplified stethoscopic method thus provided is expected to prove highly valuable in the study of circulatory disorders, especially in clinical work.



The Special Transmitter for Sending the Sound of Heartbeats: Major General George O. Squier, Chief of the Signal Corps, is Seen Sitting beside the Patient; He is Here Wearing the Uniform of a Brigadier General, His Superior Rank Not Yet being Officially Confirmed

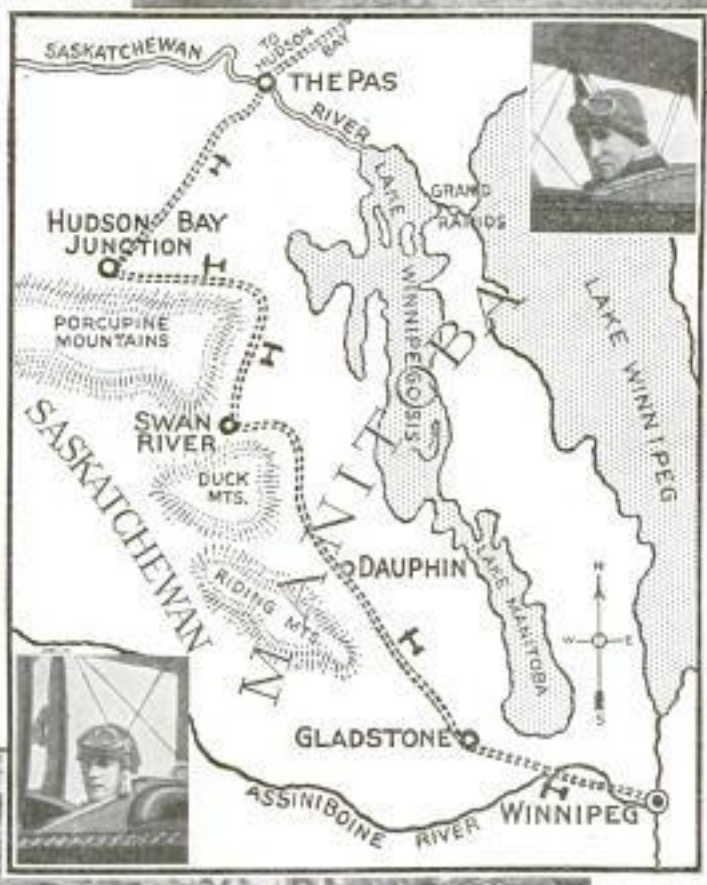
RECLAIM PRINTED BOOK PAPER BY NEW PROCESS

Though chemical processes for the reclamation of printed book paper have been in use for some time, their efficiency is reduced by the fact that the mechanical pulping forces the ink permanently into the fibers. By a method recently patented, a mixture of 10 lb. of borax, 10 lb. of soap, 2 gal. of kerosene, and 2 gal. of pine oil is used for soaking 2,000 lb. of stock, with enough water to make a 3 to 6-per-cent pulp. The beater used pulls the stock apart gently, with a minimum breakage of the fibers, and the process is continued for an hour or less, with the pulp heated to from 165 to 190° F. by live steam. The separated ink and the chemicals are then washed away by the usual method, and the reclaimed pulp is ready to be bleached.

LONGEST COMMERCIAL FLIGHT IN CANADA

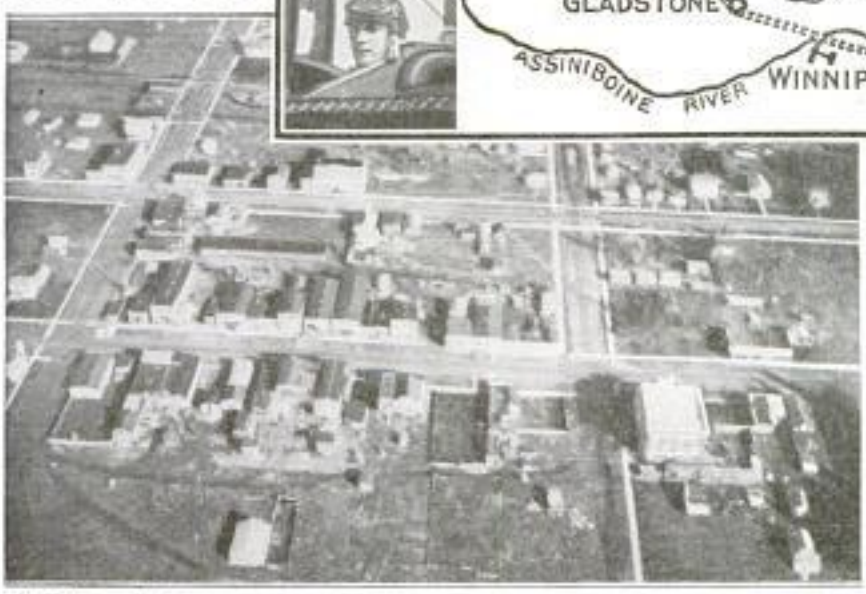
The longest commercial passenger flight in Canada was accomplished a few weeks ago, when an airplane with pilot, passenger, and mechanic, flew from Winnipeg, Man., to The Pas, Sask., a distance of 487 miles. The flying time for the trip was six hours twelve minutes.

The long flight was into the north country, and was made without previous arrangements having been made for landing grounds, gasoline, etc. The landing at Hudson Bay Junction had to be made in a "muskeg," or swamp, there being no other place, and great difficulty was experienced in "taking off." Incidentally there were only some 20 gal. of gasoline to be had at Hudson Bay Junction. There are no automobiles in that country, and the only thing gasoline is used for is lighting purposes. This is the first machine to fly north of 53° latitude in Saskatchewan, Manitoba, and Ontario.



Above: The Biplane That Made the Trip with a Passenger and a Mechanic besides the Pilot. At the Left: The 487-Mile Route Followed from Winnipeg to The Pas, the Trip Consuming 6 Hours 12 Minutes

On its arrival at The Pas, tremendous excitement ensued, and Indians from afar came by the score to view the "Thunder Bird," as one old Cree Indian appropriately named the machine.



The First Aerial Photograph Ever Taken of The Pas, the Terminus of the Unusual Journey: The Occasion Was Also the First Time Many of the Inhabitants Ever had Seen an Airplane

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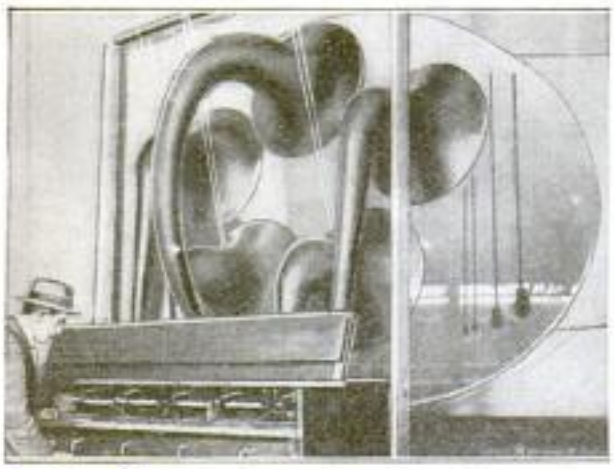
It has recently been discovered that the bacteria of the wilt disease, afflicting cucumber plants, is carried in the jaws of the striped cucumber beetle, and is communicated whenever the insect bites into a new leaf. Furthermore, the beetle may carry the bacteria in its intestinal tract all winter, and begin to spread the disease with its first spring activity. Any injury to the leaf serves as a focal point for the infection.

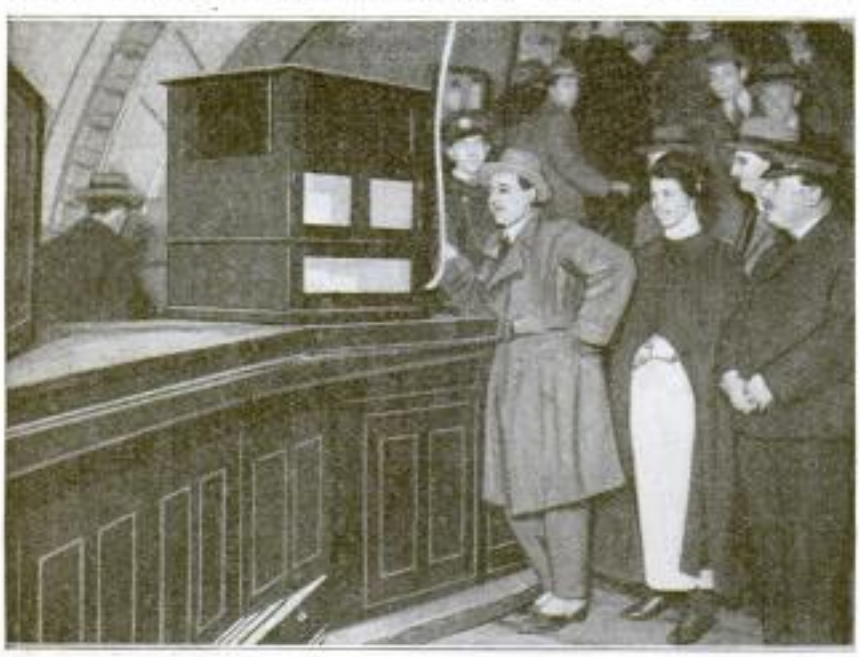
AUTOMATIC STENTORPHONE DEPOSES HUMAN VOICE

Many passengers in the "tube," or subway stations, of London, Eng., have been



The Huge Horns in Connection with a Stentorphone, to Which the Chimes of the Great Clock "Big Ben" were Transmitted by Wireless

surprised by stentoriously shouted warnings, from absolutely invisible sources, to such effects as: "Keep moving, please;" "If you must stand, stand aside;" "Some are in a hurry, don't impede them;" and when they do finally discover the source of these warnings they find that it is a simple innocent-looking box. But inside the box is the automatic stentorphone, which is a combination of phonograph and sound amplifier, operated by compressed air. The instrument was installed at an exhibition recently held in London, with a quintette of huge horns, through which, by means of wireless, the great Westminster clock, "Big Ben," struck the hours and the chimes, so that every visitor heard them at each quarter hour.



With One Hand the Operator Controls the Stentorphone That is Concealed in This Box, and Causes It to Shout Warnings to "Tube" Passengers

THREE WIRELESS FOG SIGNALS FOR NEW YORK HARBOR

Three wireless fog-signal stations, each equipped with automatic apparatus for sending continuous signals, are to be established at once at the entrance of New York Harbor. Ships carrying the form of radio compass recently developed by the Bureau of Standards will be able to observe the direction of signals from the new stations and to find their exact position at once, without further dependence on unreliable horns and whistles.

EARTH'S RIGIDITY IS PROVED TO BE A MYTH

Science continues to explode old theories daily, sometimes substituting new ones and, again, figuratively throwing up its hands and leaving the human race without a peg upon which to hang its opinions and beliefs. The latest upsetting intelligence is that the supposedly rigid earth is really in a constant state of agitation, the comparatively thin crust being traversed by long waves—really imperceptible earthquakes—which follow each other at four to eight-minute intervals. These "microseisms," as they are called, flow from north to south at a speed of about two miles per second, and have wave lengths of from 8 to 16 miles. The distance between the hollows and crests of the waves varies from .00002 to .0005 in. This means that the whole of the earth's surface is constantly rising and falling to this extent. These measurements were made by instruments of such sensitivity that they detect earth movements between points only 60 ft. apart. When stationed two miles apart, they showed that .8 seconds was required for the impulses to travel from the northern to the southern station. The origin and cause of the waves are unknown.

BABY TRACTOR-FLUSHER BLOWS SNOW AND SLUSH FROM NEW YORK STREETS

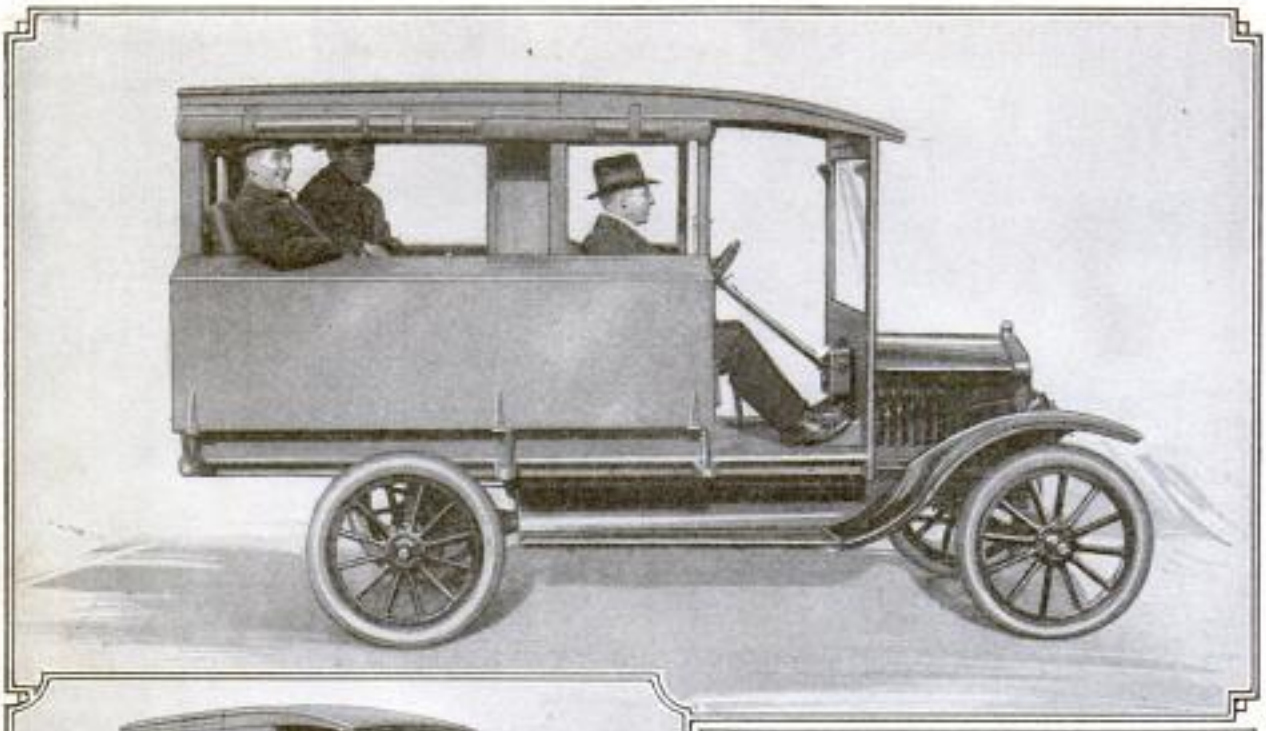
FREQUENT and costly blockades caused by heavy snowfall in the city of New York last winter led the officials of the city to consider new ways and means of keeping the streets clear. Among the new apparatus tested out was a street-flushing machine. A baby tractor of endless-tread type was equipped with a fire-hose nozzle pointing forward and located so as to train a powerful stream of water into the snow banks. Attached to this nozzle, which hangs under the body of the tractor, is a length of hose connected to a supply plug and carrying 150 lb. of pressure. As the machine moves forward, the water blows the slush and snow from the traffic right of way, and the hose to the fire plug is stretched until a new connection becomes necessary. The test trip of the flusher was made at Moore and Varick streets.

AIGRETTES NOW OBTAINABLE WITHOUT INJURING BIRDS

Aigrettes, the feathery personal decorations forbidden import to this country because, in obtaining them, the birds that bear them are killed and their young left to starve, are likely to become again a welcome article of commerce. A noted Venezuelan official and naturalist is declared to have discovered a method of extracting the valuable plumes without injuring the egret herons. In certain seasons, when the natural oil of the bird is abundant, the root of the feather is anointed with a vegetable oil of tropical source, and the plume is then easily plucked. The method causes the egret no discomfort and does not interfere with the care of its young. To insure its use, a law has been passed in the South American country providing a severe penalty for killing or maiming any of the birds, which, if treated well, may be kept in preserves, like other wild fowl.

Egret Herons on the Plantation of a Venezuelan Official: The Aigrette Plumes are Plucked from These Birds without Injury by the New Method

DEMOUNTABLE BODY TURNS ANY AUTOMOBILE

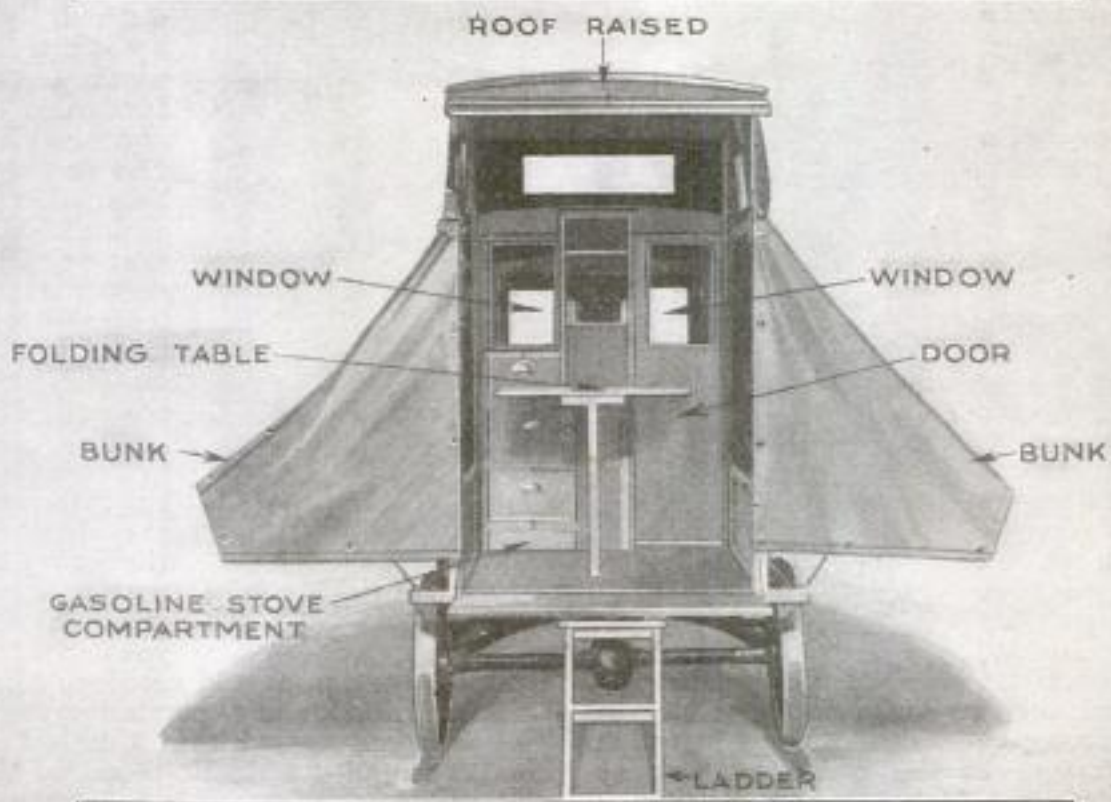


The Special Body, Which is Made in Two Sizes, is Seen Above in Side View as It is Applied to Light Cars, a Three-Quarter Front View being Given at the Left. The Folded Bunks, Containing Their Mattresses, Form the Sides of the Car in the Day Position, Curtains at the Top being Rolled Down to Meet Them if Desired, as at the Left. There Are Two Electric Lights inside the Car, One in the Driving Compartment and One in the Back

To Make Camp at Night, the Rear Steps are Unstrapped, the Bunks are Let Down, Making Two Three-Quarter Size Beds, and the Furniture That is Not Needed is Stored under the Front Seat. There Is a Door between the Front and Rear Compartments

INTO TRAVELING CAMP FOR THE WHOLE FAMILY

When Camp is All Made, It Looks like a Big Comfortable Tent, of Double-Texture Waterproof Khaki Cloth, with Glass and Celluloid Windows, and Completely Protected against the Weather. A Seven-Gallon Water Tank Makes the Occupants Independent of Natural Supply



With the Rear Inclosure Removed, the Conveniences of the Interior Become Visible: They Include a Folding Table That is Used with the Bunks for Seats, a Commodious Cupboard with Three Shelves in the Lower Compartment, and a Gasoline Stove. The Whole Body Costs Little More than a Good Winter Top. Two Sizes are Manufactured, the Smaller Selling for $400, and the Larger for $500

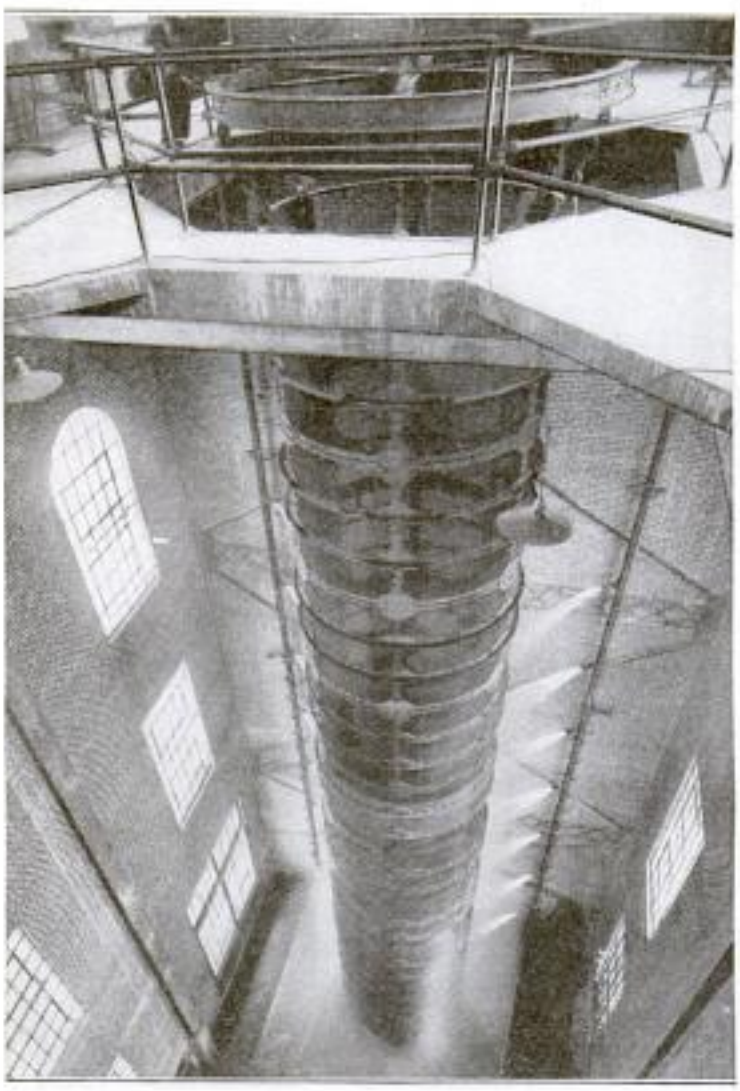
NESTED CYLINDRICAL SCREENS SOLVE CITY'S WATER-STRAINING PROBLEM

BY GEORGE T. HOLMES

CONSUMERS of gas and electricity in the modern American city have little conception of the difficulties encountered and overcome in the generating station that furnishes their daily light and heat. It would be difficult for them to believe that one of the big problems in the generating station is that of straining leaves and twigs from the water used in its turbines. When the station is located on a river or lake, this problem, at certain seasons of the year, presents such difficulties that it becomes a question of either closing down the plant or finding some magic way to screen out the débris.

In one city at least, this magic way has been discovered. Engineers of the gas and electric company in Louisville, Ky., have found what they believe to be a permanent solution of the difficulty.

For years they had been using, in common with all other similar plants in the country, flat, vertical screens for straining the immense amount of water used in their power house. In 1916 the general manager of the company—a practical engineer—conceived the idea of constructing cylindrical screens in which the pressure of the water, as well as the débris, would be equally distributed to all points inside the cylinder. His idea was worked out and was soon afterward put into practical operation in the form of three concentric cylindrical screens, 60 ft. high and from 10 to 12 ft. in diameter. The screens were installed in a tower, 120 ft. high, on the river bank, the water entering through a huge tunnel and coming up into the screens through the bottom. All the leaves and trash were effectively strained out, collecting on the inside of the smallest screen, which, whenever it became clogged up, was elevated by hydraulic pressure to a height of 15 or 20 ft. from the bottom. While thus elevated and being cleaned, the two other screens performed the same function in freeing the water of leaves until they in turn had to be cleaned.



Looking Down, inside the Tower, at the Nest of Three Cylindrical Screens, 60 Feet High and 10 to 12 Feet in Diameter; For Cleaning, the Inner Screen is Raised and Sprayed with Water

It thus results that two screens are always performing the function of screening the water, while the third is elevated and being cleaned. The system has worked satisfactorily for more than three years. Soon after the device had been successfully demonstrated, its inventor obtained a patent on it, but refrained from making public to the engineering fraternity the details of the invention until several months or years of successful operation should convince him of its practical value in a generating station. The company has within the last few months installed a duplicate set of these screens. When a screen is being cleaned, strong sprays of water are played upon its outside, and the leaves and dirt are washed off, falling with the water into a pan, from which they are washed back into the river. The pan is set on wheels

so that it can be rolled from under the screen when the time comes to lower the latter. The jets of water strike the screen tangentially, thus imparting a rotary motion to it, so that all parts of it are struck by the jets without the necessity of turning the screen by other means.

The screen consists of a framework stiffened with lattice like the mast of a battleship. This frame is covered with a tube of wire netting which is attached to the framework only at the top. It will be seen that the wire is not subjected to any other strain than the tension caused by the bursting effect of the water. The framework is exposed to no strain at all. Its only function is to keep the screen a true cylinder while it is being raised and lowered.

It has been found that a sudden freshet brings leaves so fast that sometimes the water inside the screen stands as high as 10 ft. above the water outside. The screens, therefore, are designed to resist hydrostatic pressure of 20 feet.

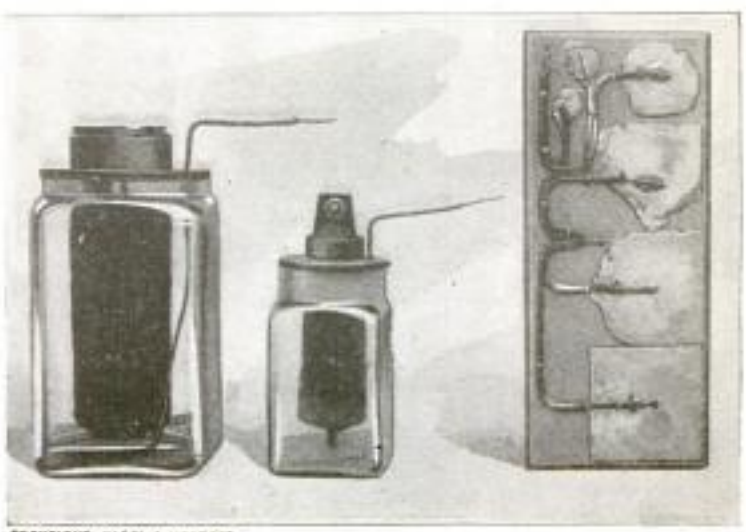
Two complete nests of the screens are provided, with three screens in each nest. All the water reaching the condensers must first pass through all three of the screens except when one is being cleaned; then the water passes through only two screens. The cleaning of the water is so effective that it has been found necessary to clean the condensers only once in three weeks, and even then a man's hat will easily hold the material that is taken out of them.

The first nest of these screens was installed at a cost of $18,000, to which must be added $15,000 for the hoisting machinery. The cost of maintenance and cleaning was nominal until recently, when it was found necessary to renew the wire on the bottom section of the inside screen. In renewing this wire the screen was first woven and bent, and then galvanized, which is expected to give the screen a much longer life than the first ones, which were made of wire bent after galvanization. In 1920 the amount of water required had increased considerably, and a second nest of three screens was installed to maintain the efficiency of the plant.

A talk with the engineer in charge of the station developed the fact that these screens have never given one hour of trouble or anxiety since they were installed. "My troubles came to an end when we installed these cylindrical screens," he said. "During the worst periods of the year we were compelled to clean our old flat screens as often as every 90 seconds. An idea of the variation in service required of these new screens can be gained from the fact that during ordinary conditions of the river a cleaning once in three weeks is sufficient. During an extraordinarily heavy run of leaves it has occasionally been necessary to clean them as often as once an hour. The time for cleaning is about 12 minutes. The whole process frequently is performed by a single man, but ordinarily two men are employed."

FRENCH SCIENTIST INVENTS EVERLASTING BATTERY

The first decided improvement in wet batteries made in a number of years must be credited to a French inventor. Of conventional appearance, with nothing to indicate its peculiar properties, the new battery has surprised scientists by the power it delivers on a very low zinc consumption. The record shows that during a 250-day test on the post-office installation at St. Denis, only 120 gr. of zinc were consumed. The meaning of these figures is better comprehended when it is remembered that 7,000 gr. are required to equal 1 lb. avoirdupois. Another cell of the same make-up has been giving continuous service since Sept. 18, 1918. Though the term "perpetual battery" is something of an exaggeration, this battery is the nearest approach to a perpetual one of which there is reliable record.



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Views of the "Perpetual Battery" and Its Elements. Right: Zinc Plates in Various Stages of Decomposition, from New Plate, at Bottom, to One over Two Years in Service, at Top

Left: The Parts of the New Light Stethoscope, Showing Its Easy Portability, the Transmitter Section being Carried in the Vest Pocket. Right: The Instrument Assembled for Use

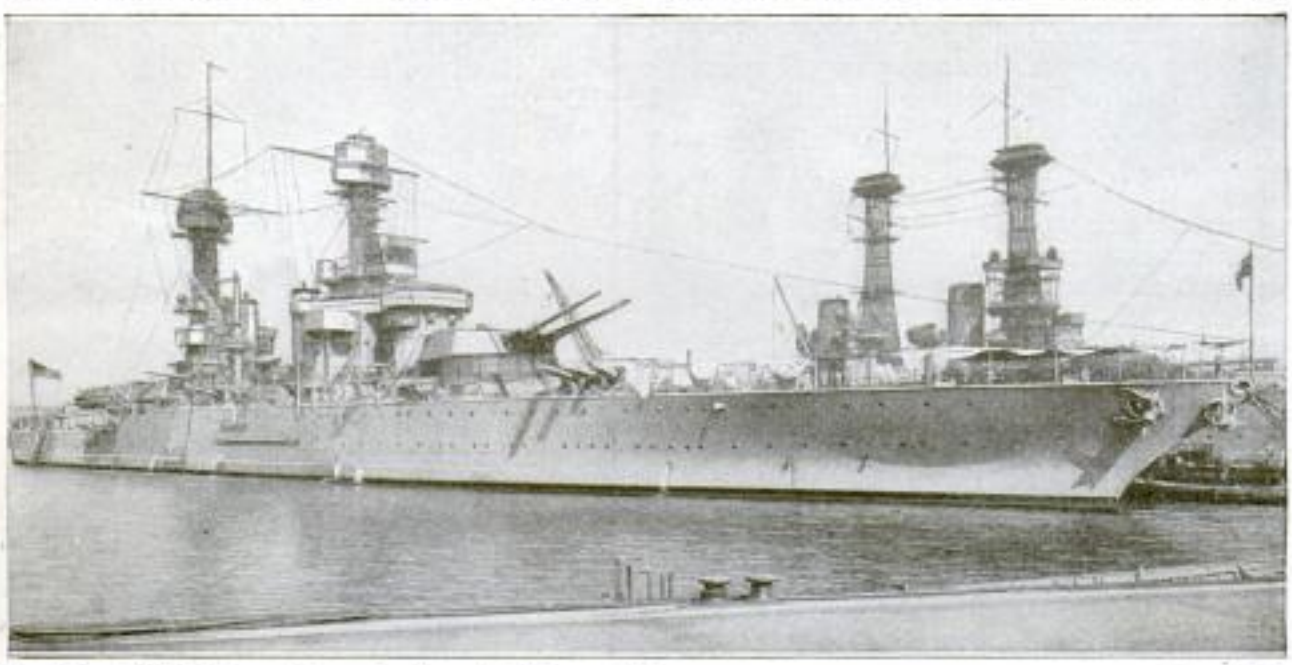
IMPROVED LIGHT STETHOSCOPE REDUCES RESONANCE

Some physicians contend that the resonance of the ordinary stethoscope is a bar to its accuracy. In an improved form recently invented by a telephone man, the bell is attached to an aluminum case containing two concentric air chambers. The inner one, shaped to give the maximum reproduction of small sounds, is sealed with a diaphragm. The outer chamber serves to insulate the inner one from extraneous sounds, hand tremors, and similar disturbances. Soft-rubber ear tubes are used, and two sizes of bell are supplied, the larger for respiratory and the smaller for circulatory tests. The whole instrument weighs but 3 oz., and may be carried in the pocket.

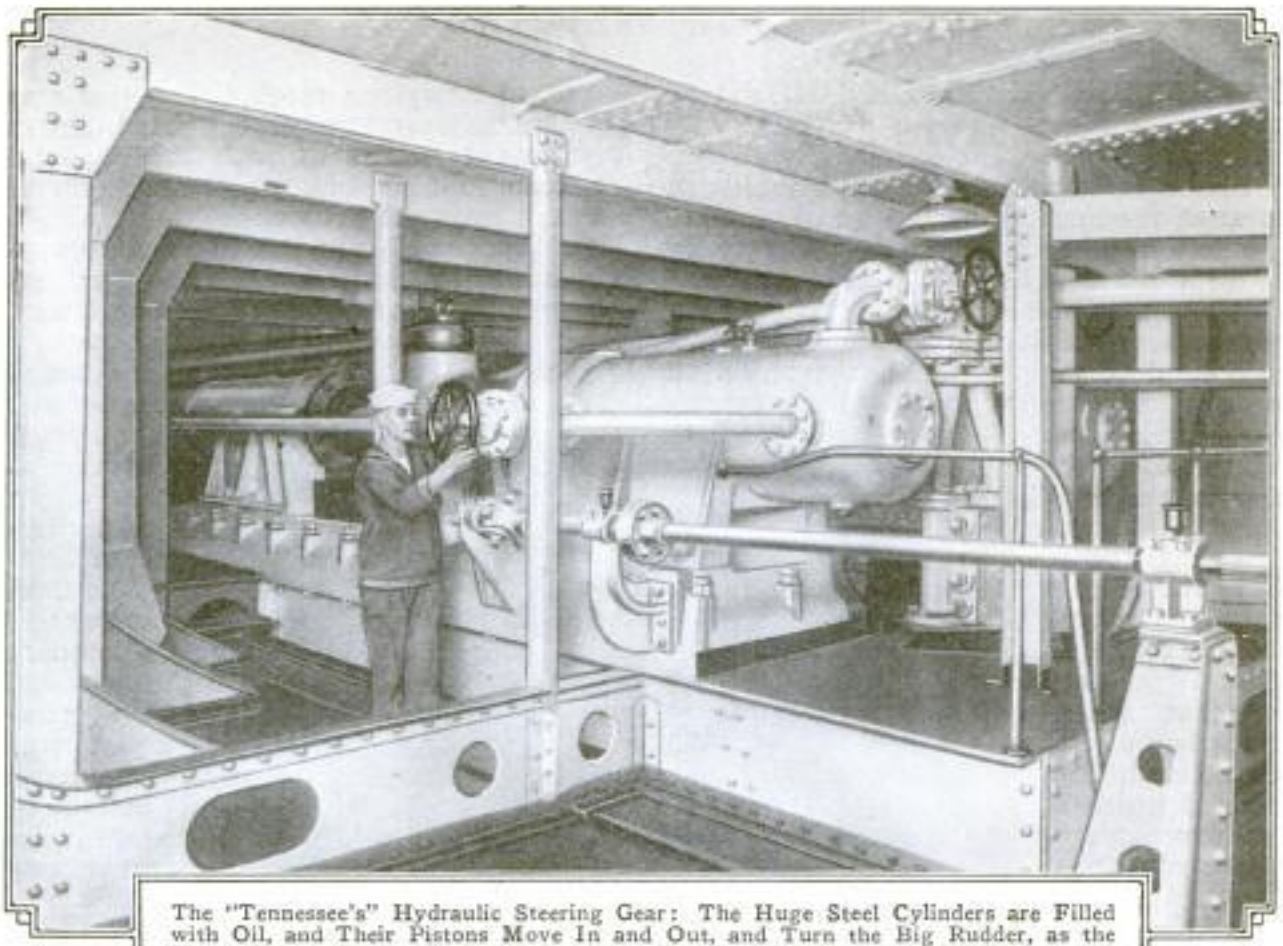
¶To connect northern Manitoba, Canada, with civilization, 12 new wireless stations, two large and ten small, are planned between The Pas, where one already is in operation, and Piquiconi.

ALL-ELECTRIC EQUIPMENT ON AMERICAN WARSHIP

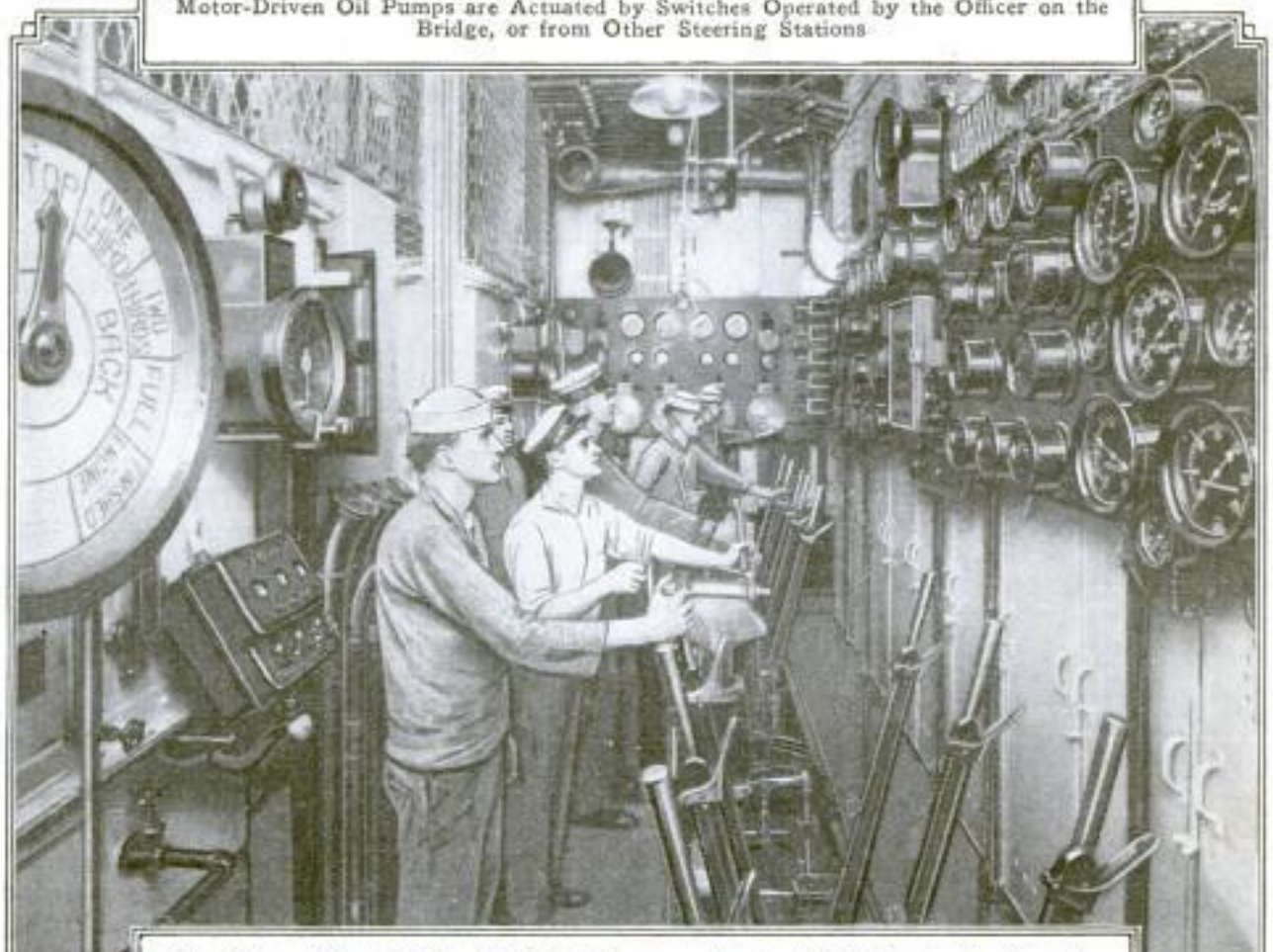
Typical of the new order of first-class naval units is the new United States superdreadnaught "Tennessee," embodying all the improvements dictated by the fast-moving events of the past few years, and electrically equipped throughout. The radical change from old methods is well represented by the fact that the entire operation of the ship is handled by a few men stationed in the "general control room," a small torpedo-proof chamber, in which are situated all the levers and instruments of its steam and electrical equipment. Order dials on the wall are actuated electrically from the bridge, and the four 8,000-hp. motors that drive the propellers are controlled with the utmost precision. Another interesting item of the equipment is the set of oil-operated hydraulic cylinders that turn the rudder.



The New United States Superdreadnaught "Tennessee" at Anchor: A Ship That Represents the Most Modern Thought in First-Class Naval Units, with Electrical Propulsion and Control Throughout



The "Tennessee's" Hydraulic Steering Gear: The Huge Steel Cylinders are Filled with Oil, and Their Pistons Move In and Out, and Turn the Big Rudder, as the Motor-Driven Oil Pumps are Actuated by Switches Operated by the Officer on the Bridge, or from Other Steering Stations



The "General Control Room" of the "Tennessee": In This Remarkable Torpedo-Proof Chamber are Situated All the Levers and Instruments That Pertain to the Ship's Steam and Electrical Equipment, and on the Walls Are the Dials by Which Orders are Received from the Bridge

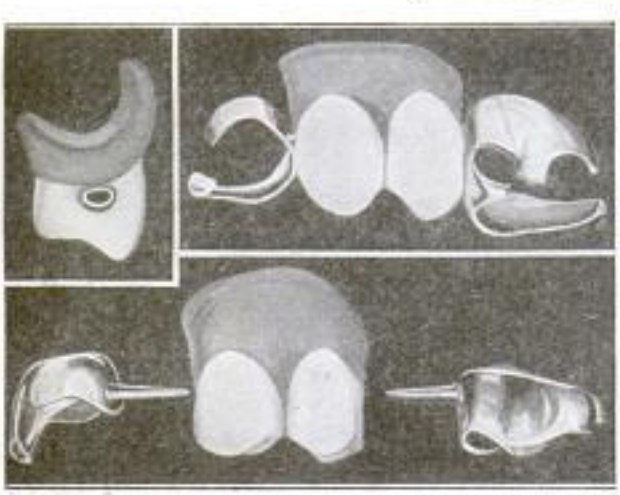
ACETYLENE TORCH UNDER WATER SAVES SHIP

Flame under water always holds a strange fascination, because it represents an action that is seemingly contrary to natural laws. The use of the acetylene torch in a completely submerged position makes a particularly striking demonstration, and it is interesting, therefore, to note its application to actual emergency service in the U. S. Navy, at the Azores during the famous transatlantic flight of the "NC-4" in May, 1919. The occasion was an accident to a supply ship, through the side of which a maneuvering destroyer had rammed a hole, below the water line.

The Acetylene Torch, with Its Improvised Guard Cup, being Used under Water for Emergency Repairs to a Sinking Ship

With the sinking ship supported by a destroyer on each side, hasty preparations were made for an emergency repair. In the machine shop of the "mother ship," a small brass cup, like the bowl of a pipe, was quickly turned, and fitted around the tip of a standard acetylene torch. The gas was then turned on, the torch lighted, and a diver went overboard with it. A cloud of steam and gas bubbles at once poured upward from the projecting mouth of the little brass shell, but the flame continued undiminished, the pressure of the gas supply and the protection of the cup effectively forcing the water out of its path.

Holding the guard cup of the torch close to the damaged steel plating of the ship, the operator was able to cut the jagged hole to a clean square in little more time than the process would require in the open air. Over this opening a plate was quickly fitted and bolted in place, and the repair was completed in a few hours. The facility with which the torch was adapted to a work usually requiring special tools, and the speed and workmanship of the entire job, constitute an interesting record of American resourcefulness, especially as the patch so deftly if oddly applied remained wholly effective.



Above: Right, Front View of the Bridge Complete. Left, Side View Showing the Metal Tube That Protects the Bridge. Below: Bridge with Attachment on Either Side, Shown Withdrawn from the Metal Tubes

MOVABLE PORCELAIN BRIDGE FOR FALSE TEETH

The ordinary tooth bridge is a fixture. There is now being produced a bridge that is removable. All parts of the device are made of porcelain, which makes it sanitary, because insanitary matter will not adhere to it. In connection with the bridge proper are removable attachments, or clasps, which have semicircular projections, fitting exactly into iridoplatinum tubes, located in the center of the bridge. The stresses to which the bridge is subjected are all absorbed by the metal tube, and are not transmitted to the porcelain body of the bridge, so that the porcelain is not liable to damage. The porcelain is tinted the exact color of the gums.

SEWER SYSTEM MORE THAN A MILLION YEARS OLD

By CHARLES E. MACE

THE only city in the United States boasting a sewer system in which all the "pipes" were laid by Mother Nature is Bowling Green, Ky. Although the prosperous little municipality has a population of 15,000 there is not a foot of man-made sewer pipe in any of the streets or alleys.

The explanation is that the city is built over a formation of oölitic white limestone which is a maze of connected crevices extending to a considerable depth below the surface; much the same formation as that of the famous Mammoth Cave just 30 miles distant. This limestone is said to be composed of the fossilized eggs of prehistoric marine animals. The "logs" of oil wells drilled in the western Kentucky fields, of which Bowling Green is the center, show that limestone of one kind or another is encountered as deep as drilling has ever yet been carried.

When a new residence is being built in the Bowling Green region, a "sink finder" is employed, who merely goes out in the back yard and digs about in the surface soil, which is seldom more than 3 ft. deep, until he locates a fissure. A garden hose is then placed in the crevice, and the water is allowed to run until it is free from obstructions. It is then approved by the city inspector, and the house has perfect sewer connection. No city has a more sanitary system. Chemists say the sewage would be purified in a very short distance by passing through the limestone. Seepage never comes to the surface, the explanation of geologists being that it flows through these natural passageways in the stone until it finally finds an outlet in the river bed.

Once a Fissure in the Limestone is Found, It is Tested with a Hose to Prove It Free from Obstructions, Then Approved by the Inspector, and the House Has Sewer Connection

Outcropping of Oölitic Limestone in Bowling Green's City Park, Which Shows Very Clearly the Cavernous Structure of This Formation Which Underlies the Entire City, Hidden for the Most Part by a Light Covering of Surface Soil

"Uncle" Henry Jameson, Aged Negro Specialist, with the Divining Rod, or "Witch Stick": He Uses This Peach-Tree Fork to Locate a Crevice in the Underground Formation

An interesting character is found in "Uncle" Henry Jameson, an aged negro who has specialized in locating fissures and digging "sinks" for the past 25 years. When asked just how many he had dug, he laughed and said "Lawdy, Boss, I reckon I couldn't count that many." Uncle Henry uses the divining rod, or "witch stick," as he calls it, in locating the fissures, and declares he would never dig without first employing his forked peach-tree branch. The frequency with which his attempts are successful is amazing. Although Henry is 74 years of age,

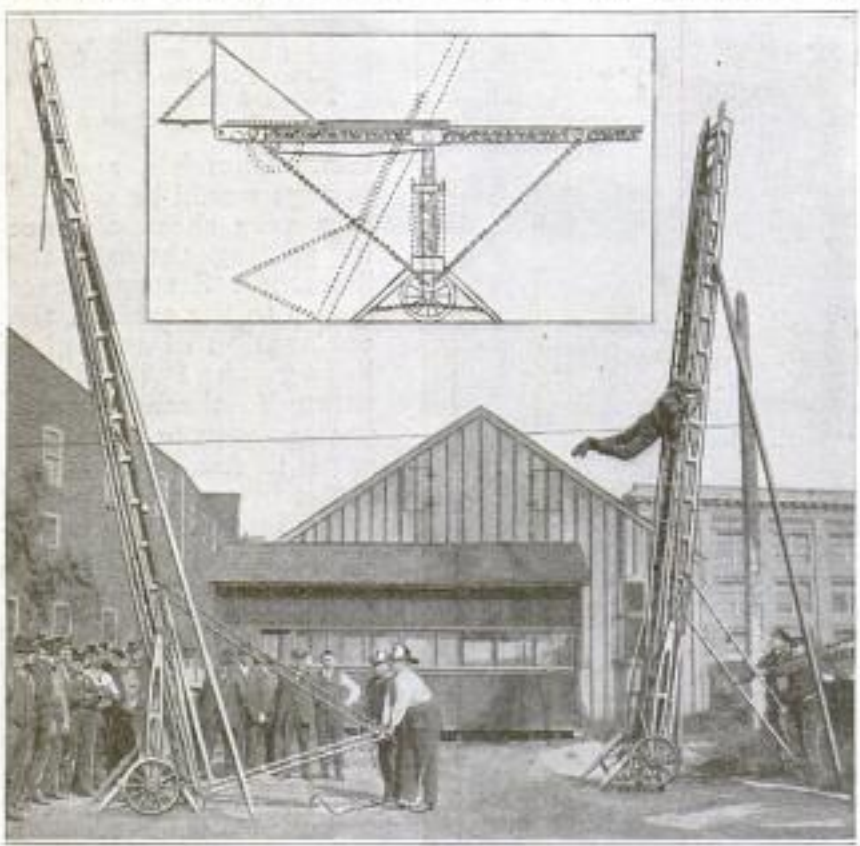
his services in this capacity are in such demand that the builders will not let him retire, and he has just signed a contract to locate sinks for 25 new residences now under construction in the city.

A syndicate of oil operators who are wont to bank on superstition rather than geology, recently sought to employ Uncle Henry to locate sites for oil wells, but he declined, saying that it was not the oil or water that attracted the forked twig but the crevices in the limestone.

It is fortunate for Bowling Green that nature has provided this elaborate and efficient scheme. When one considers that the surface soil is not sufficiently deep in many places to bury the sewer pipes, it is obvious that the expense of digging trenches in the usual way would be prohibitive.

TWO MEN RAISE FIRE LADDER WITH WHEEL ATTACHMENT

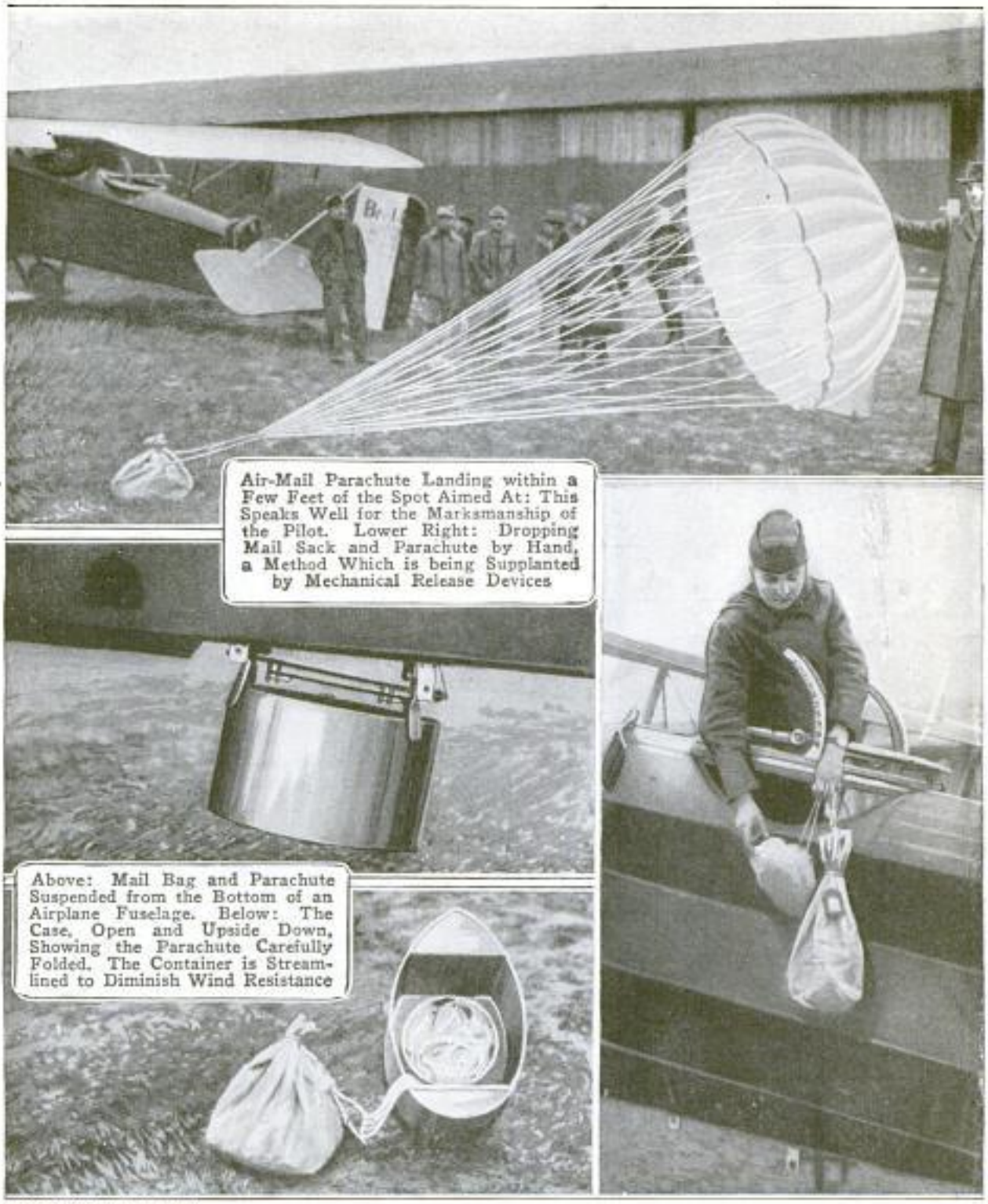
Two men are able to raise a 50-ft. extension fire ladder, with the aid of an attachment invented by a California fireman, in less time than six men ordinarily need for the job. Pivoted arms with wheels at the ends, carried folded on the foot of the ladder, drop to the ground when it is pulled about 6 ft. from the truck, and lock in place, permitting the ladder to be rolled to its position. Struts are then dropped to take the place of the wheels, and the two men, bearing down on folding foot braces, raise the ladder. Ratchet wheels and chains lock it in perpendicular position, and it can be arranged to travel on its wheels after raising. A collapsible truss, running the whole length, is automatically tightened by a pivoted member on the bottom of the extension, which is swung out by the weight of the latter pulling on chains.



Firemen Testing Ladders Equipped with the New Attachment. Insert: Diagram of the Arrangement That Raises and Supports the Ladder

GRASS VARIETIES INTRODUCED IN GUAM STIMULATE GRAZING

The Island of Guam is dependent upon imports for its meat supply, because of the unfitness of its native grasses for grazing purposes. In an effort to solve the problem, the Department of Agriculture has introduced two new grass varieties there. From observations of their growth, it is expected that the new grasses will stimulate the cattle industry, for the plants thrive well and furnish good cattle feed. It has been found that the low, swampy areas of the island would be ideal acreage for the cultivation of Para grass, which grows in a flat, runner-like manner and has a stem about the size of a lead pencil. Younger stems grow from the center of the plant and take a more upright position than the earlier ones, making a vigorous growth of from 2 to 5 ft. in height. Three to ten cuttings a year are made of this highly nutritious grass, which, when cut in time, will remain sweet and succulent. Paspalum grass, the second of the introductions, is considered the better, since it is able to stand trampling and abuse, being spread by the stamping impact, which tends to keep the plant from tufting and bunching. Both varieties stand up well under weather conditions, and, it is hoped, will meet grazing requirements.



Air-Mail Parachute Landing within a Few Feet of the Spot Aimed At: This Speaks Well for the Marksmanship of the Pilot. Lower Right: Dropping Mail Sack and Parachute by Hand, a Method Which is being Supplanted by Mechanical Release Devices

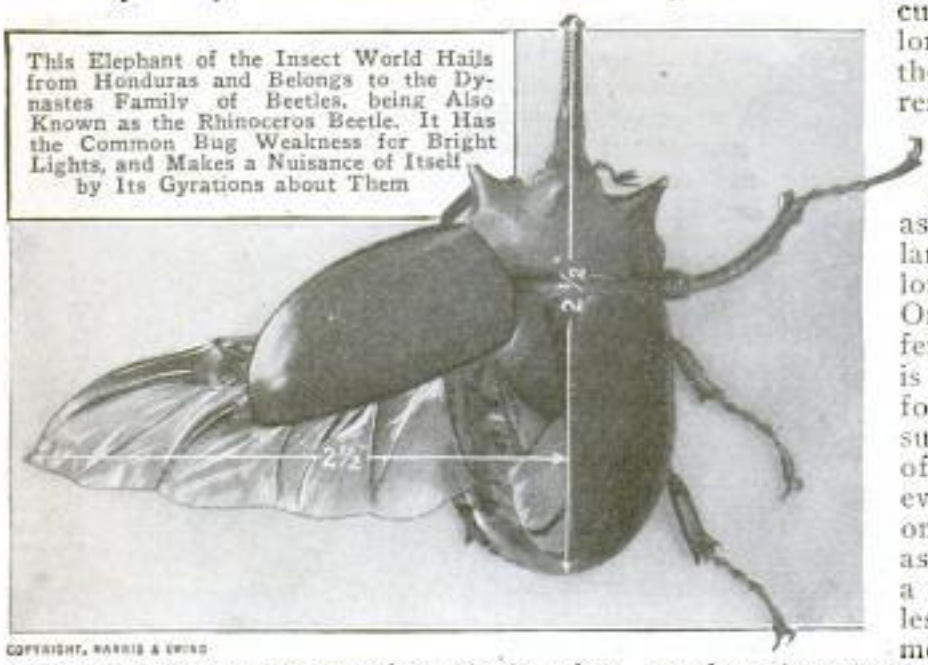
Above: Mail Bag and Parachute Suspended from the Bottom of an Airplane Fuselage. Below: The Case, Open and Upside Down, Showing the Parachute Carefully Folded. The Container is Streamlined to Diminish Wind Resistance

NONSTOP AIRPLANE MAIL DELIVERY BY PARACHUTE

The nonstop delivery of airplane mail via parachute is being rapidly developed in the United States, France, and England. Upon first thought the matter seems simple enough, but when it is considered that valuable matter—the only kind carried by airplanes—must be carefully guarded, which means, among other things, that it must be landed within a few feet of the person authorized to receive it, the problem becomes complicated. At present the accuracy with which the bags are landed within a reasonably small area depends entirely upon the skill and aim of the airman. However, some astonishingly close "hits" are being made with, and still greater accuracy is expected from, a two-speed parachute which is being developed in France. In the meantime it is quite safe to predict that parachute delivery will sometime become the rule.

RHINOCEROS BEETLE IS "ZEPPELIN" OF JUNE BUGS

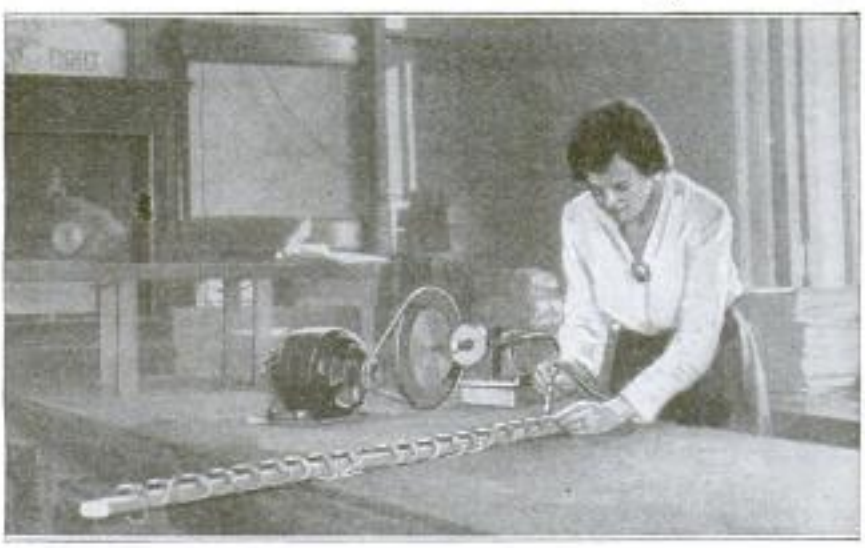
Those who have a dislike for bugs had best stay away from Honduras, as that country is the residence of an elephantine cousin of our familiar June bug which oftens attains the size of a small bird. A specimen sent to the Department of Agriculture measured 2½ in. long by about 1 in. across the shoulders, when at rest, and had a wing span of 5 in. With wings spread, the big fellow covers a space as wide as two columns of Popular Mechanics and as long as the width of one. On account of its rather ferocious appearance, it is somewhat feared, and for a time was unjustly suspected of being guilty of crop damage. However, the best authorities on insects express the assurance that it is just a big, overgrown, harmless booby and, like other members of the family, prefers decaying vegetation to any other diet, being a scavenger by nature.



This Elephant of the Insect World Hails from Honduras and Belongs to the Dynastes Family of Beetles, being Also Known as the Rhinoceros Beetle. It Has the Common Bug Weakness for Bright Lights, and Makes a Nuisance of Itself by Its Gyrations about Them

ENGINE WINDS WATCHES UNDERGOING TEST

A machine for winding watches is shown in the accompanying photograph. This was tried out at the Bureau of Standards where, on account of the war, hundreds upon hundreds of watches had to be tested, including a multitude of wrist watches. A motor mounted on a board is connected by means of a belt to a disk-shaped wheel. The face of this makes contact with and drives the edge of a smaller wheel mounted at right angles to the first. The speed can be adjusted by setting the small wheel at the proper distance from the center of the disk. The small wheel in turn drives a flexible shaft, taken from a dentist's drilling equipment, which is provided at one end with a rubber friction cup that is pressed against the stems of the watches in winding them. Overwinding and accidental damage therefrom are prevented by a friction coupling in the shaft, but it is found that the sense of touch is the most sensitive means of telling when a watch is wound. By this device the watches can be easily and quickly wound and a large amount of time saved. The average time of winding a large number of watches is three seconds per watch.



A Flexible Shaft Geared to an Electric Motor Saves Much Time in Winding the Multitude of Watches That are Undergoing Test

¶Engineers in England are organizing a research association for the cast-iron and allied industries, not for profit.

The Big Chicago Bank Building, Built of Steel and Granite, Which It is Proposed to Sell for Dismantling and Removal to Some Other City, There to be Rebuilt at a Fraction of a New Building's Cost

TO SELL BIG BANK BUILDING FOR DISTANT DELIVERY

Chicago architects and bankers, preparing for the erection of a new and greater structure, are making the extraordinary proposal to sell a magnificent granite bank building, 165 ft. 5 in. by 178 ft. 10 in., for removal to any distant site desired. The building, a beautiful example of classic architecture, is remarkable for the fact that its roof height is only 56 ft. at the street line, though it occupies expensive ground in the heart of the city. It was on this low roof that a blazing dirigible fell in the strange disaster described in the September, 1919, issue of Popular Mechanics Magazine.

Though built of massive blocks and columns of hard Maine granite on a steel framework, it is declared that the structure will not be difficult to dismantle, and that it can be transported and reërected without encountering any serious problems. Its original cost, with its modern vault equipment, was about $650,000, but rising costs have brought its present value to well above $1,000,000. It is estimated that its purchase, transportation a reasonable distance, and reconstruction, would cost but a fraction of the latter figure.

¶Printing presses are being installed in the public schools of Evanston, Ill., to give all pupils elementary practice in journalism and presswork.

SIDECAR TANK CARRIES EXTRA GASOLINE

The motorcyclist's gasoline supplies often give out when he is obliged to make long runs over sparsely settled country, despite the fact that a motorcycle covers many miles on a single gallon. One rider who travels lonely western highways has installed an additional supply tank in the sidecar attachment of his machine. This tank carries 3 gal. and fits snugly in place on the floor below the sidecar seat, where it is held by straps. The tank-filler plug is replaced by a spout when pouring the gasoline into the motorcycle reservoir, and the extra supply is sufficient for most long trips.

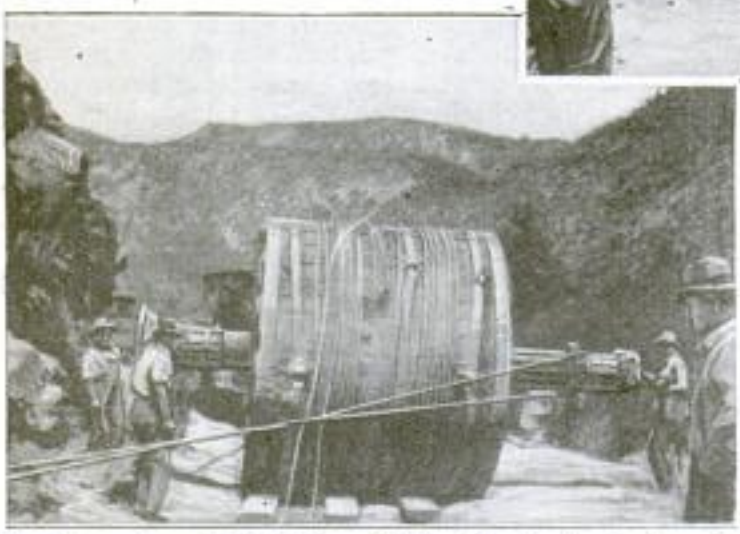
The Sidecar Tank Carries an Additional Supply of Gasoline for Long Trips. Below: Emptying Tank into Cycle Reservoir

GIANT ROTORS ROLLED OVER MOUNTAIN ROADS

Narrow highways, sharp corners, soft roadbeds, steep inclines, and a tremendously heavy load were some of the problems encountered in rolling two 70-ton rotors to a Pacific-coast hydroelectric plant over a mountain range. Timbers, 8 in. thick, 8 in. wide, and running the full length of the great drums, were used as an armor to protect the wiring as the rotors were jostled over the rocky roads to their destination. Two 750-ft. cables were used to pull the load, and were attached to a caterpillar tractor. The two cables, with loops at their ends, were used alternately to haul the drums. The middle of the first cable was secured to an eyebolt set in the wooden armor at the center line of the rotors. After each half of the cable had been wound around the drum from the center outward, the loops were secured, and the middle of the cable released from its eyebolt. The tractor was then hitched to the middle of the cable and moved ahead, rolling the drum and unwinding the cable. Meanwhile, as the first cable unwound, the second was attached and wound by the drum as it rolled. The tractor was again hitched, and the process repeated until the rotors were finally delivered at their destination.

Unwinding Cables Pulled by a Caterpillar Tractor, Rolled the Giant Rotors over a Mountain Road to the Power Station. Two 750-Foot Cables and Two Tractors were Used for the Job

Narrow Uphill Passes Were Some of the Difficulties Overcome. The Picture Shows a Rotor Passing through One of Them. The Cables in Front are the Pulling Lines



The Rotors were Rolled Up on Pivot Blocks for Turning. A Second Tractor was Used When Corners were Encountered

To steer the cumbersome drums, two $\frac{5}{8}$-in. cable slings and another tractor were used. The second tractor was kept behind the rotors and the slings were thrown over the ends of the shaft, and connected to the tractor, so that when the latter pulled back on either sling, as the drums rolled forward, a turn could be effected on a 20-ft. radius. Whenever a sharp turn was necessary, a pivot block of two 4 by 12-in. planks was built. When poised upon this block, the rotors could be turned at right angles. In case the rotors refused to turn when placed upon the pivot, water was thrown upon it for lubrication, which effected the turning at once. Considering the difficulty involved

Hauling 70-Ton Electric-Generator Rotors Over Ten Miles of Mountain Road by Tractor: The Rotors were Lagged with Wood to Nearly 10 Feet in Diameter, and Rolled Along by Cables Wrapped around Them

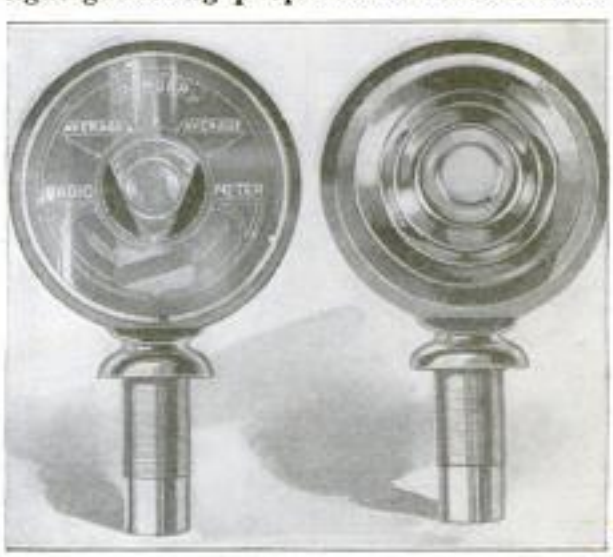
and the distance traveled—10½ miles—the performance must be considered a skillful engineering feat.

WEAVES HARDING'S PORTRAIT WITH HUMAN HAIR

Of all the varied portraits that are now familiarizing the people of the United States with the features of their new president, none is more curious than the one recently completed by A. E. Goormachtig, a barber of Holland. The picture is made, with remarkable skill and patience, entirely of human hair, using the natural shades of gray, white, black, and light blond. The artist in 1916 made a picture of the ship "Lusitania" of the same queer material, which was reproduced in Popular Mechanics Magazine.

AUTO-RADIATOR METER GLOWS RED IF ENGINE OVERHEATS

A new thermometer for automobile radiators is operated by a small but sensitive thermostat, located in a chamber which extends through the filler cap down into the water. This sensitive member is connected, by a light rod, to two transparent red-celluloid shutters which normally fold downward into the disk-shaped instrument body, one to each side of a centrally positioned white semaphore-type lens. As the water heats, the thermostat expands and, acting on the shutters, causes them to come together, partly or entirely covering the lens, depending upon the degree of temperature. So long as a section of the white lens, between two points marked "average," is visible, the temperature is normal. Should the lens show solid red, an overheated engine is indicated. At night the light-gathering properties of the lens enable it to pick up enough of the headlight rays to cause it to glow white or red according to the heat of the water.



Auto-Radiator Meter Which Changes Color with Temperature. Left: Red-Celluloid Shutters Partly Covering White Lens Show Normal Engine Heat. Right: Front of the Device, Showing Light-Gathering Lens

NEW TRANSCONTINENTAL AIR RECORD IS ESTABLISHED

Though failing to make the coast-to-coast flight within an elapsed time of 24 hours, as originally intended, Lieut. W. D. Coney established a transcontinental record, flying the southern route, by covering the 2,079 miles from North Island Aviation Field, San Diego, to Camp Johnson, near Jacksonville, Fla., in the actual flying time of 22 hr. 32 min. It was through no fault of his that the officer failed in his undertaking, and he is to be congratulated for his persistence in continuing the flight after having been robbed of all chances of accomplishing the principal object by a most unseasonable blizzard, which drove him down at Bronte, Tex., on the morning of February 22, a few hours after having left San Diego. Leaving Dallas, Tex., at 10:14 p. m., February 23, he completed the last lap of the flight without mishap, landing at 7:27 a. m., February 24, at Camp Johnson.

WIDE WORLD PHOTO

Lieutenant W. D. Coney and His Special DH-4B Airplane, Snapped Immediately after Landing at Camp Johnson: He Established the Transcontinental Air Record by Flying 2,079 Miles in 22 Hours 32 Minutes

FLOOR POLISHER USED TO BRIGHTEN BOWLING PINS

Electric rotary floor machines have been commonly used to scrub, scrape, or polish wooden floors, but a new and equally useful work is found for the machine in the polishing of bowling pins. A wooden rack is constructed to hold the rotating disk in a convenient position and the machine and rack are placed on a chair and the motor set in motion. When pressed against the bristles of the spinning disk, the maplewood pins assume a new brilliancy.

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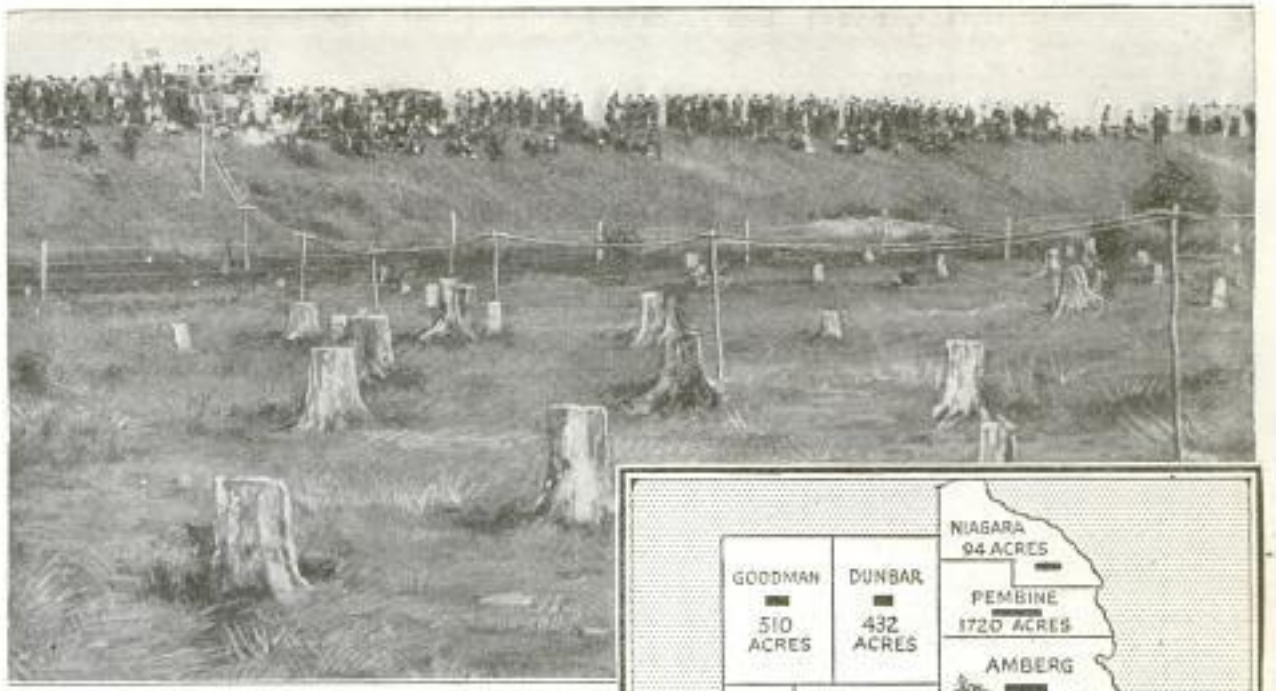
Among Its Many Other Uses, the Rotary Floor Machine Polishes Bowling Pins. It is Here Shown in a Rack for the Job

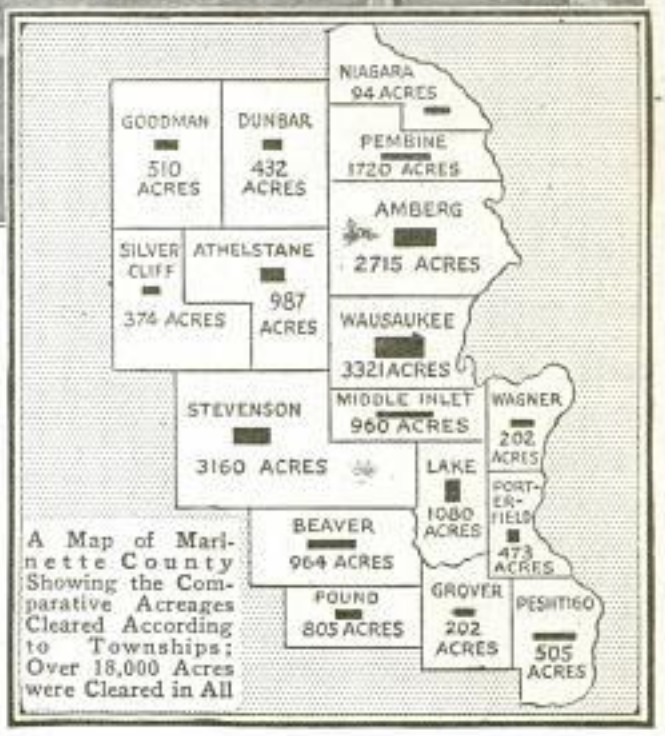
FIRE HOSE IS BURNED UP BY ITS OWN STREAM

That high-pressure hose lines may take fire spontaneously was observed during fire-department tests in Boston recently. This might prove disquieting were it not that the causes of the phenomenon are well known, and that they are easily avoided. With the outlet valve of a fire-engine pump in a certain position, a fluttering is set up in the stream, which causes a high-frequency vibration in the hose. This sets up a friction between the inner lining and the outer jacket, which generates sufficient heat to ignite the latter in from 8 to 15 minutes. The fluttering can be stopped by opening the valve to its limit.

¶Appropriate phonograph music now gives zest to the study of geography in the rural schools of Cook County, Ill.



Marinette County, Wisconsin, Broke All Land-Clearing Records in Returning a Vast Acreage to Use in the Available Months of 1920. The Photograph Shows an Acre of Stumps Prepared for Removal by One Blast



A Map of Marinette County Showing the Comparative Acreages Cleared According to Townships; Over 18,000 Acres were Cleared in All

WISCONSIN COUNTY BREAKS LAND-CLEARING RECORD

A total of over 18,000 acres of land in Marinette County, Wis., were cleared during the season of 1920. This is a record, and the increase will represent at least $1,000,000 per year in crops. Considerable organization was necessary to put over a job of this size so quickly, and the progressive farmers in the neighborhood, aided by newspapers, universities, and business men, went at it in earnest. The closing of the immense task was marked by a great blast of an acre of stumps near Wausaukee. At this point 158 sticks of dynamite were set off simultaneously as an electric impulse was trans-

After the Blast: The Photo Shows the Remains of Stumps Blown Out at a Single Blast from an Acre of Ground near Wausaukee. The Big Blast Was the Closing Celebration of the Clearing Job

How the Acre of Stumps Looked When the Dynamite Went into Action: A Sufficient Amount of the Explosive was Placed under Each Stump and Connected by Wiring. An Electric Impulse was Transmitted to All Simultaneously

mitted by a presiding official who closed a switch. Many people interested in the project aided in devising the various methods employed, which saved $125,000 in costs for materials, to do the work. A land-clearing school and 57 educational meetings were part of the campaign that made their efforts so successful, and explosives to the extent of 14 carloads were used in the undertaking.

STREAMS OF MOLTEN SOLDER REPAIR AUTO RADIATORS

A high-speed method of performing one of the most difficult and time-consuming of automobile-repair operations—that of stopping leaks in radiator tubes without cutting away the radiating fins—has been worked out by an Iowa manufacturer, and the necessary equipment is now procurable. This consists of a large melting pot, from which the molten solder is forced by an electrically driven rotary pump through a pipe and nozzle, the latter manipulated by the workman. After leaving the pump, the solder stream is kept hot in the conducting pipe by means of a surrounding jacket, through which blows the blue-flame blast from a large Bunsen burner. The radiator is first thoroughly cleaned in three baths of paint remover, muriatic acid, and a special flux material. It is then laid upon the top of the apparatus, where it is very quickly heated throughout. The solder stream is then played over the leaky tubes and, tinning them perfectly all around, searches out and fills all holes. Should the radiator be insufficiently preheated, the solder will pile up at first, but, as the stream continues, the surplus will quickly melt and, flowing away and falling through into the pot, leave a smooth, tight repair.

Repairing a Leaky Auto Radiator with a Jet of Melted Solder: The Hot Stream Quickly Stops All Leaks and Carries the Surplus Solder Back into the Melting Pot Below

ZINC CHAMBER TAKES PLACE OF COIL IN CAMPHOR STILL

Displacing the coils of the old-time camphor still, is a government-designed copper or zinc chamber which is cooled by spraying its exterior surface with water instead of by submerging, as was formerly the method. After the twigs of the camphor trees are gathered, they are boiled with water in a distilling tank. The steam and vapor from this tank

flows through an outlet pipe to a second drum or tank made of zinc or copper. Water is sprayed on the outside of the zinc chamber and condensation of the vapor takes place on the inner walls. The purified liquid is then drawn off.

AUTO ENGINE AND AIR SCREW DRIVE MOTORIZED SLED

Out of various odd parts of cars and pieces of timber, a western autoist has built a motorized sled of the air-propeller type that runs 25 to 30 miles an hour and turns corners without difficulty. The engine and radiator are mounted about midway of the frame, with the gasoline tank above the runners in front. The driving shaft terminates at the rear in a sprocket wheel, connected by chain to the 5-ft. high-pitch air screw, mounted in roller bearings on an A-shaped frame above. The four short runners are shod with angle iron to grip the ice and snow. The engine can be started by the propeller or the usual crank, and the sled runs backward as well as forward, the transmission being retained and the gears being shifted in the usual manner.

SHALLOWS OF LAKE MICHIGAN WOULD MAKE MUCH LAND

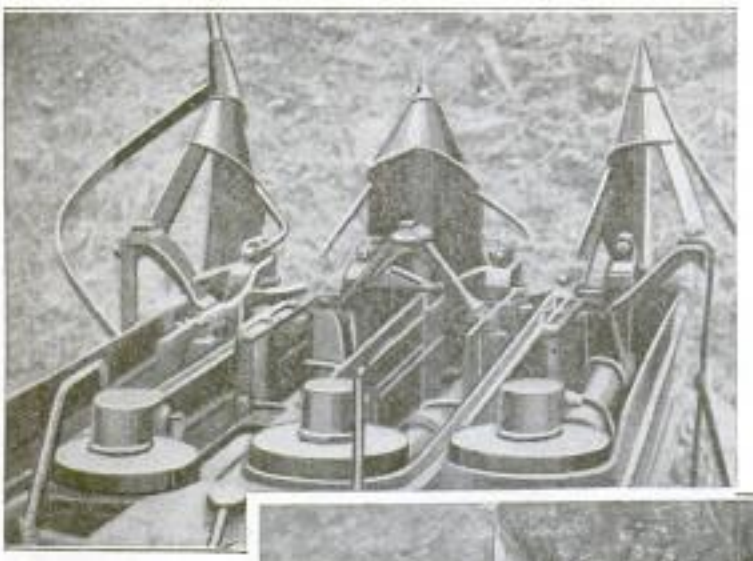
Government engineers suggest interesting possibilities in the conversion of shoal water along the southwestern coast of Lake Michigan into made land, for new wharves and port facilities. Off Chicago, the lake's seven-fathom line is four miles out, and the district's submerged land inside the line amounts to nearly 100 square miles, which may be reclaimed. In connection with the projected improvement of Wolf Lake and Lake George, on the Illinois-Indiana line, and the St. Lawrence and Mississippi canals, the proposal for increasing Chicago's water front assumes great importance.

At the Top: Side and Rear View of the Motorized Sled, Showing the Mounting of the Air Screw and Its Chain-and-Sprocket Drive. At the Bottom: Another View, Giving the Power-Plant Details, Which Include Moving the Engine and Radiator Back to the Center of the Frame, and Setting the Gasoline Tank on the Front. The Forward Runners Turn on a Central Pivot

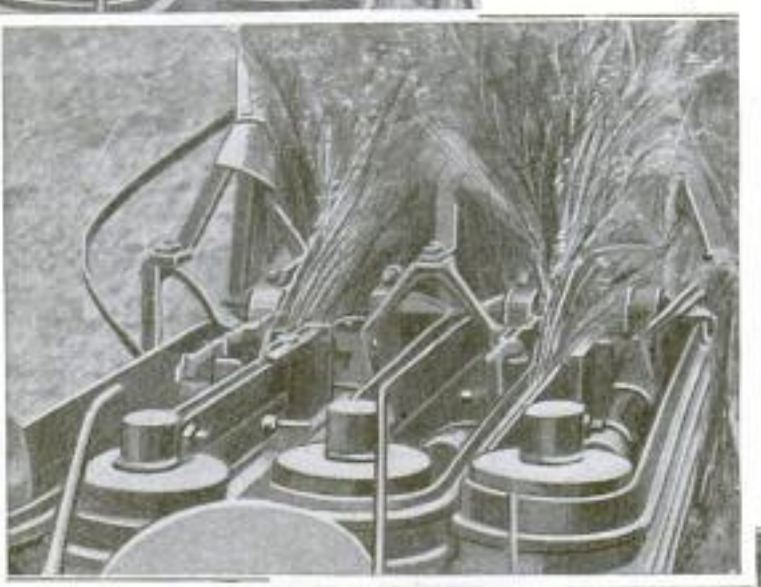
PROMISING FLAX HARVESTER DEMONSTRATED

BY FRANCIS K. KYLE

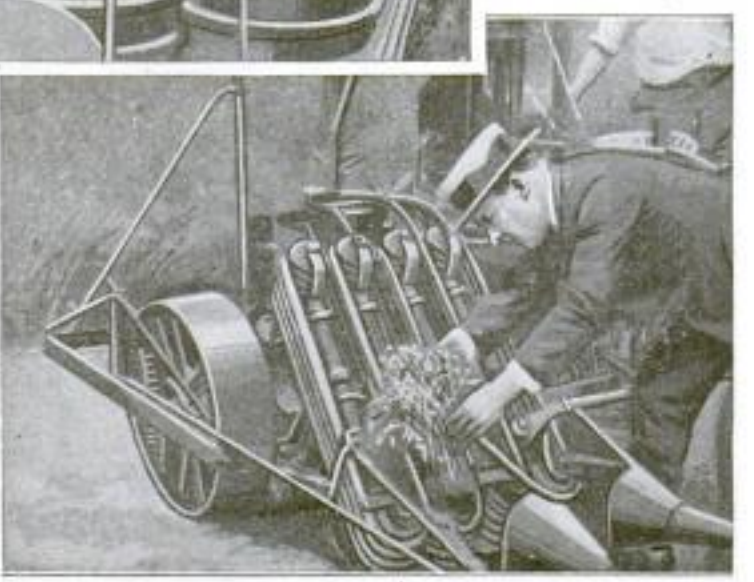
WHAT the cotton gin did for cotton, a recently invented flax-pulling machine is intended to do for the linen industry. It was demonstrated for the first time last fall in the East, in the presence of representatives of interested industries. On this occasion, the machine, a horse-drawn type, performed satisfactorily both when the flax in the field was heavy with dew and also, later in the day, when it was dry. To make the test conclusive, a force of skilled flax pullers was put to work in competition with the machine, and the latter was found to do better, cleaner work, besides accomplishing as much as 16 men in the same time.



A Close-Up of the Top of the Harvesting Machine as It Approaches the Ripe Flax in the Field with Its "Gathering Fingers" Extended



The Stalks of Flax being Drawn into the Machine as It Moves Forward, by the Belts with Staggered Ribs



The Rubber-Ribbed Belts, Moving Backward and Upward as the Machine Progresses, Pull the Flax Stalks Vertically from the Ground

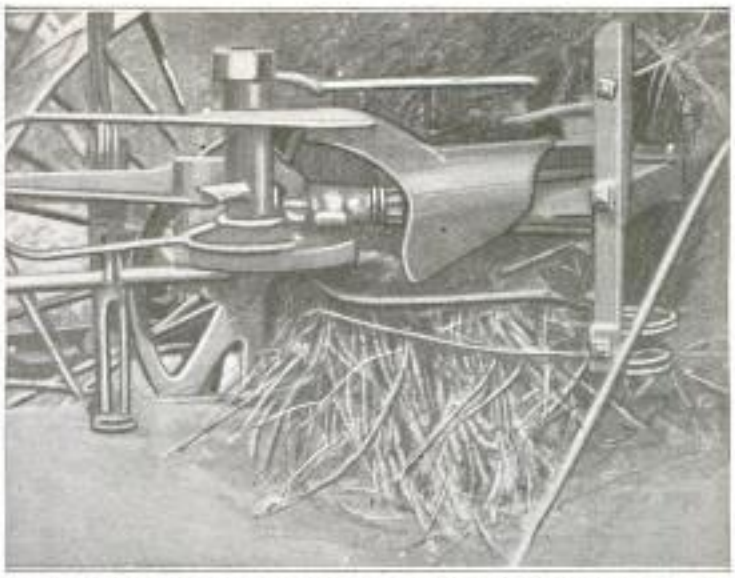
The fundamental principle of any flax-pulling machine is that it must not cut or mow the flax; the stalk must be pulled unbroken from the ground with the roots attached, or the tender fiber will be torn or bruised. This difficulty was solved in the present machine by an indirect, or zigzag, grip on the stalk in pulling, somewhat similar to the manner in which a string may be wound alternately over and under the fingers of a man's hand. The machine bends the stalks back and forth a sufficient number of times to establish a frictional contact between the stems and the pulling mechanism, and gives ample lifting force to withdraw the stalks in a vertical position from the ground. The pulling is done by a pair of belts, standing on edge with two faces parallel, and moving in the same direction upwardly from front to rear. The belts are spaced some distance apart and are provided with longitudinal ribs, or projections, of rubber, the ribs of one belt lying between but not touching the ribs of the other.

In front of each unit—and there may be as many units as desired on a machine—are "gathering fingers," which extend into the field and guide the plants in between the belts as the machine moves forward. The stalks are seized between the ribs of the belt faces, and, as

the belts travel upward at substantially the same rate of speed as the machine moves forward over the ground, the result is that the stalks are pulled out vertically, lifting the roots entirely clear of the soil.

As the stalks are never at any time compressed between directly opposing surfaces, there is no danger of crushing or fracturing the fiber, and the pulling machine will hold and carry a single stalk as firmly as a dozen or a hundred.

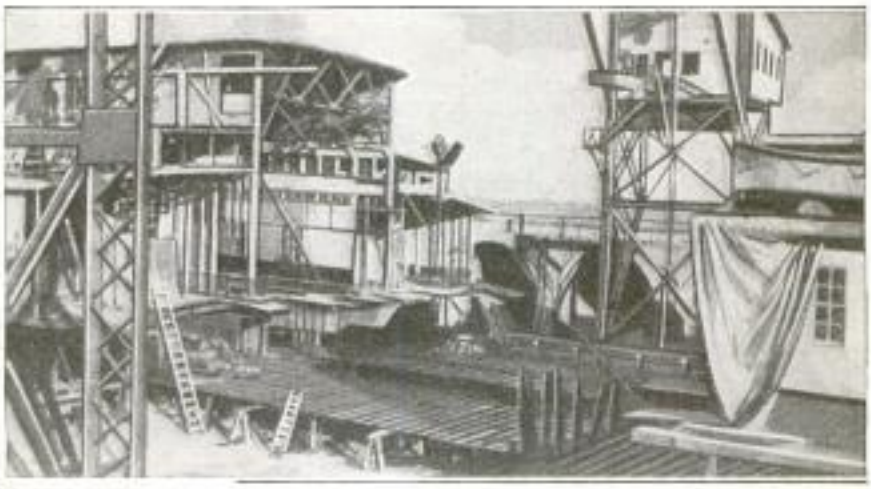
The new flax harvester is an important addition to the group of machines, all relatively new, by which this oldest of industries is modernized.



The Binder Mechanism, Which Takes the Pulled Stalks from the Top of the Belts, Automatically Assembles and Binds Them into Bundles, and Throws Them to the Ground

BIG STEEL CAR FERRYBOAT IS "STRETCHED" 57 FEET

Built in 1907, the steel railway-car ferry "Albatross," plying between Vicksburg, Miss., and Delta, La., was being rapidly outgrown by the modern freight cars coming into use. Affairs last year had reached such a stage that a full string of cars could no longer be accommodated on the 308-ft. deck of the boat, so the owners decided that the only way to remedy the failing was to make it "grow" 57 ft. longer. Accordingly the ship was sent to the government drydock at Keokuk, Ia., part of the big dam and power-house installation. After being cut in two, the aft portion of the boat was flooded and sunk. The forward section was then dragged ahead exactly 57 ft. and lowered to the cradles by draining the dock. The necessary steel plates, ready-shaped and punched at a big steelmill in the south, were then riveted into place. So accurate was the whole operation, that all parts matched within $\frac{3}{8}$ in. This small error, caused when the bow slipped on the cradle, presented no great difficulty. Bolts of a smaller size than the holes were first used to pull the parts into line, after which the full-size bolts and rivets were inserted, and pulled up. The Keokuk dock is the largest on the river, being the same size as those at Panama.

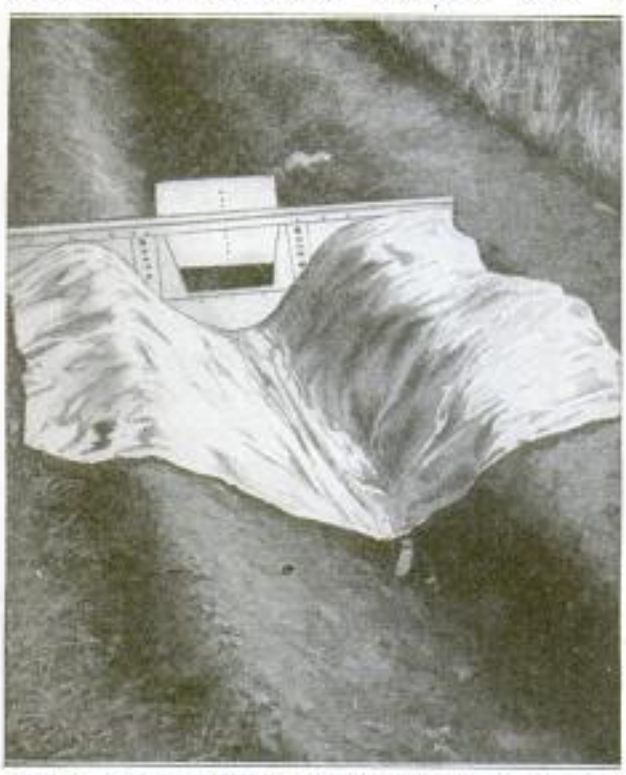


The Car-Ferry "Albatross" in Drydock at Keokuk, Iowa, being Lengthened to Accommodate Longer Strings of Freight Cars: The Gap in the Center is Where the Ready-Cut, Shaped, and Punched Steel Plates were Inserted

The Reconstructed Ship: Note the Distance from the Paddle Box to the Smokestacks; This was Increased 57 Feet in the Rebuilding Process

IRRIGATION DAM OF CANVAS HAS CHECK GATE AND WEIR

To make possible the measurement and control of water in irrigation ditches, a portable canvas dam, equipped with a



The Portable Irrigation Dam is Fastened Lengthwise in the Ditch. It Has the Additional Advantage of Being a Measuring Weir

weir, or gate, has been placed on the market. It was formerly the practice to lay the canvas lengthwise of the ditch, with the dam end secured to the bank, allowing the water to run into the ditch in any amount. The new dam is anchored at its end by hooks, and the dam end is applied to the bank as in the earlier method. It is equipped with a gate, which may be lowered or raised by hand and the water measured to the field. Each dam weighs only 4 lb., and many may be carried at a time. The canvas lasts about two years. It may then be removed by loosening certain bolts and replaced by new material.

MAKE ALL NEW YORK CHILDREN IMMUNE TO DIPHTHERIA

New York City's health department is undertaking the enormous work of rendering all the children of the metropolis, of school age or under, immune to diphtheria. Tests already have been made on more than 10,000 children, the results indicating that 30 to 60 per cent of those in public schools, and as high as 85 per cent of those in private schools, are susceptible to the disease. The process, known as the "toxin-antitoxin" treatment, is to inject a toxin in the arm, the point of entrance becoming slightly inflamed in 36 hours if the subject is susceptible. If this occurs, three injections of antitoxin are given, a week apart. In six to eight weeks, 95 per cent of those so treated have acquired an immunity that is declared to persist from seven years to life. An interesting incident of the tests was that more than 2,000 scarlet-fever patients in a hospital, who tested negative to diphtheria and were not given antitoxin, were later exposed to the latter disease without a single case developing.

FIVE LOADED BOATS PULLED BY TINY AERO MOTOR

A tiny rowboat motor, rated at only 1½ hp., has been made to do remarkable work by a French engineer, who uses it to drive a two-blade air propeller, the whole being mounted on a light iron frame at the stern of the boat. With four passengers in the little craft, a string of four more boats, carrying a total of 20 additional passengers, was taken in tow, and the diminutive power plant pulled the heavy load at a speed of five miles an hour. The whole attachment weighs only 66 lb., and its consumption of gasoline is but one pint an hour.

The 1½-Horsepower French Rowboat Motor and Air Screw That Pulled Five Boats, with 24 Passengers

FANTASTIC HEADS ARE COMEDY FEATURE OF CARNIVAL

The grotesquely ludicrous can always be depended upon to tickle the fancy of a holiday crowd and provoke noisy mirth when finely humorous attempts would be almost certain to fall flat in dismal failure. This peculiarity of human nature in the mass was taken advantage of to the full by those in charge of a carnival in Mainz, Germany, recently. No less than six enormous, fantastic heads, made of papier-mâché, appeared in the parade and were greeted with gales of laughter by the pleasure seekers. Two of the faces expressed more of melancholy than any other mood, and four others were chiefly remarkable for sheer unrelieved ugliness, expressing nothing in particular. Three of these last had huge padlocks hanging from their chins. The significance of the locks is not known, but it is quite likely that they typified a local sentiment well understood by the citizens, which, if put into words would probably be a paraphrase of the old saw, "the least said is the soonest mended," or, perhaps, "silence is golden."

CAR-TICKET HOLDER KEEPS CROWDS MOVING

Jams at street-car doors are quite often caused by the inability of one or another

Tickets are Withdrawn from the New Holder by the Thumb. The Holder Has a Ring for Attaching to a Watch Chain

of the passengers ahead to find his ticket, causing much inconvenience to fellow commuters. To relieve such disadvan-

The Anti-Chatter Quartette: The Mouths of the Three Fantastic Masks were Sealed by Huge Locks, While the Fourth Doubtless Represented That 25 Per cent of Humanity Which Knows the Value of Silence

A Feature of the Carnival Held at Mainz, Germany, Last January, Was the Grotesque Heads Carried by Six of the Paraders. Those Pictured Above, Although of Melancholy Aspect, Excited the Mirth of the Crowds by Their Ludicrously Calm, Dignified Carriage and Demeanor

tages, a little watch-chain ticket holder has been introduced. It has capacity for 12 of the standard-size tokens, with an open end to facilitate withdrawal. A ring is fitted to one end of the case, so that it can be conveniently attached to the watch chain for carrying.

SANITARY FOUNTAIN HAS COVER FOR WATER SPOUT

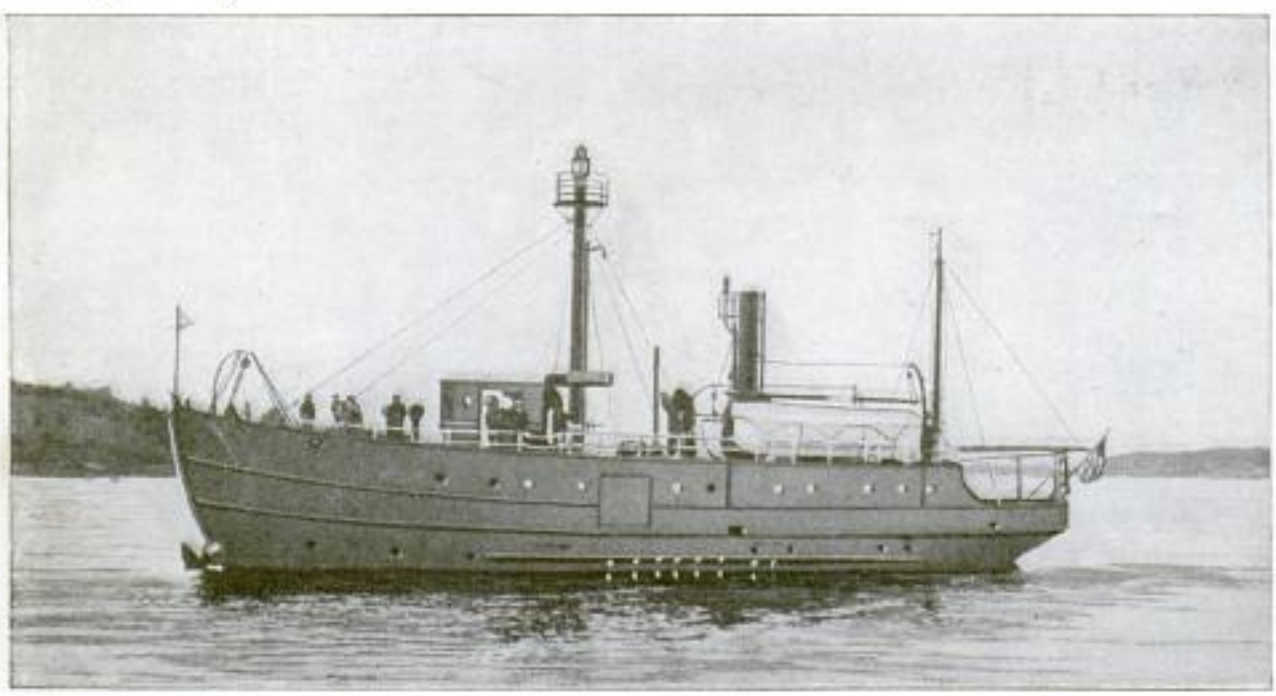
A new type of drinking-water fountain has a little protector hood for the water nozzle. Attached to the handle which opens the valve that releases the water through the nozzle, is a small rod connected to the hood. Thus, when the handle is depressed, the rod pulls the cap from the nozzle and the water flows out. A suitable cooling arrangement is built in connection with the fountain, and the water leaves the spout in a slanting stream, which is very handy for filling tumblers, as well as for drinking directly from it.

NEW-PROCESS CONCRETE VERY LIGHT AND POROUS

Concrete of exceptional lightness and porosity is now being produced by a new process in which pellets of wax, about the size of large bird shot, are mixed with the conglomerate and afterward melted out, leaving small cavities throughout the mass. Up to the present the process has been used only in the making of wall and roof slabs, 32 in. long, 24 in. wide, and 1 to 1⅛ in. thick. A reinforcement of 2-in. mesh wire netting is used to impart the necessary tensile strength. Where the slabs are exposed to the weather, they are treated with cement stucco, felt, tar, slag, or other suitable waterproofing materials.

U. S. LIGHTSHIP "99" IS BUILT FOR GREAT LAKES SERVICE

The all-steel lightship, "No. 99," designed for service on the Great Lakes, was recently launched at East Boothbay, Me., from the easternmost shipyard in the United States. The stanch little craft is but slightly larger than a steam yacht, being 91.8 ft. long, over all, with a beam of 22 ft. and a hold depth of 10 ft. 7½ in. A steam engine of 125 hp. drives the ship at a maximum speed of 9½ miles an hour. The signaling devices consist of a gas-lighted flasher lamp, operated by clockwork, and a steam foghorn. Gas for the light is contained in steel drums, stowed on deck.

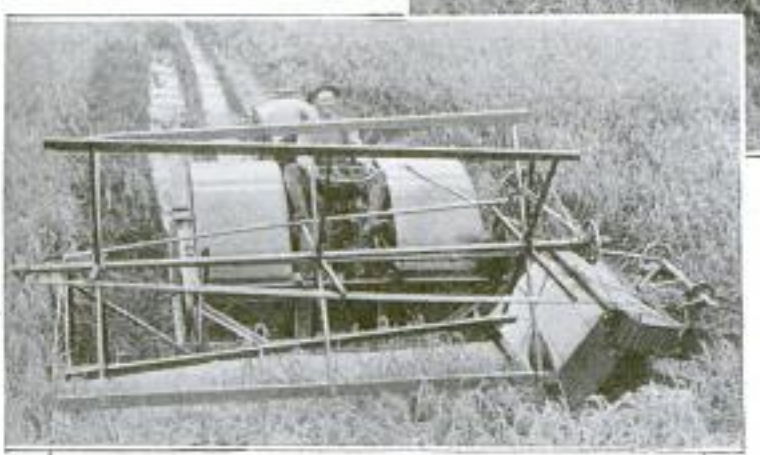


The United States Lightship "Number 99": This Stanch Little All-Steel Vessel will Soon Go into Service Somewhere on the Great Lakes, Warning the Great Passenger and Freight Liners of Shoal Water: Gas to Operate the Flashlight is Contained in Steel Tanks on Deck, and the Big Foghorn is Blown by Steam

RICE-HARVESTING TRACTOR WORKS IN DEEP MUD

Operating on ground literally buried under mud and water, a new combination tractor and binder, recently tested in a typical Arkansas rice field, demonstrated its ability to harvest the difficult grain under the most adverse conditions. The machine, developed in the rice country, is remarkable for the size and construction of its two drive-wheels, which are really hollow, buoyant, air-tight drums, 62 in. in diameter and 24 in. wide. It is steered with one wheel, turns sharp corners by confining the drive to one side, and runs equally well, with four speeds, either forward or backward, the driver's seat being reversible. This arrangement allows one man to handle both the tractor and its load of plows or binder.

The New Rice-Harvesting Tractor Working in a Field Covered with Deep Mud and Water, Buoyed Up by the Huge, Air-Tight Drums That Compose Its Drivewheels: It Crossed Ditches and Levees with Ease



The Machine Cutting Its Own Way down the First Swath in a Rice Field, with Its Binder Directly in Front: The Binder Is Adjustable by Power, from the Ground to Three Feet above It

Besides Its Special Use for Harvesting Rice, the Tractor Has All the Regular Capabilities of Such a Machine, Including Driving Farm Machinery by Belt, as Seen Here. In the Field, It Has Four Speeds Forward or Backward

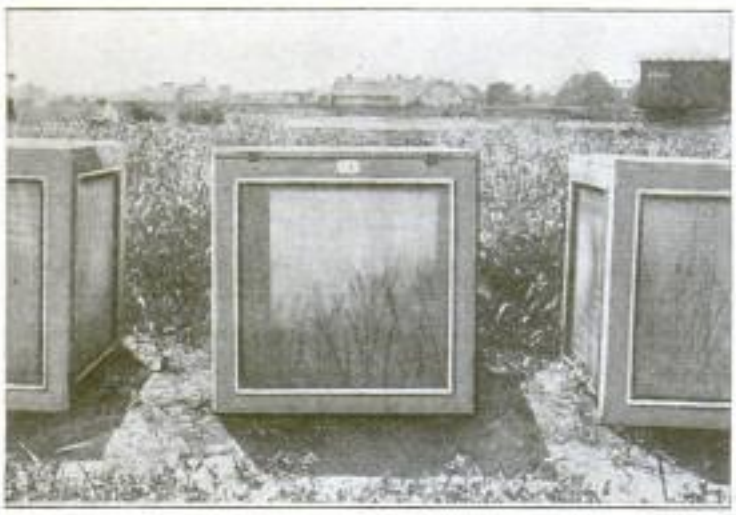
By attaching a 10-ft. binder on cradle arms directly in front, the machine can cut its own way down the first swath in a new field. A power connection enables the binder to be lifted from the ground to 3 ft. above it, for varying the cut, handling down grain, or clearing the levees. Besides operating in rice fields hub-deep in mire, where it is declared to do the work of five men, the new implement may be used for all the regular tractor purposes.

LEASING PORTABLE GARAGES IS PROFITABLE BUSINESS

Three years ago a business man of Portland, Ore., conceived the idea of relieving the shortage of garage space by leasing vacant lots and placing single-machine portable garages upon them. The idea proved most successful from the start, and the originator is now the owner of 105 of the quickly erected units, scattered throughout the city, which command rentals of from $8 to $10 per month.

BUG INCUBATORS ASSIST INSECT STUDY

The use of incubators for raising insect crop pests under ideal conditions is the peculiar practice of the Bureau of Entomology of the United States Department of Agriculture, in its fight against such pests. Wire cages, 3 ft. long, 3 ft. wide, and of like height, are placed over alfalfa growing in the field, and the life habits of certain parasites are watched in the improvised observatories. A different sort of cage is used for collecting the eggs. It consists of two glass chimneys, turned end to end and held together with adhesive tape, one end being covered with muslin. This is placed over a single alfalfa plant. Two methods of observation are utilized with the aid of these glass cages. The eggs laid by the adult insects overnight are easily collected and then placed on a piece of damp blotter for hatching. Hatching accomplished, the larvæ —in this case stem borers— are inserted within alfalfa stems and allowed to pursue their destructive work, but confined in the stem by plugging its upper end with cotton and placing the lower in a cup of water. The second method is to split a clover stem longitudinally and place the open side against a glass, and watch the insects work unmolested. Both methods have resulted in new knowledge of the insects, and it is hoped that the continued study of their habits will suggest some means to aid in their extermination.



The Bug Incubators Furnish the Pests Ideal Living Conditions. They are Studied within the Cages and Methods for Their Destruction Worked Out

PRICKLY-PEAR ERADICATOR IS WANTED IN AUSTRALIA

Introduced by the first Australian governor in 1788, as an experiment, the variety of cactus known as prickly pear has far exceeded all the expectations ever held by its sponsor, and has spread over such vast areas of the continent that it has assumed the proportions of a menace, occasioning considerable alarm among those far-visioned ones who foresee a time when the whole country will be denuded of other vegetation, unless the growth of the hardy pest can be checked.

To this end valuable concessions are offered to homesteaders who will contract to clear and keep clear their holdings. Many have tried it, but have gone down to defeat, as, no matter how well a tract may be cleared one year, a new crop springs up the next or second succeeding year. A large syndicate at one time undertook the wholesale eradication of the plant on a tract 100,000 acres in extent. The plan was to fell all the timber upon the land and kill off the pest in one mighty conflagration. It was expected that the resulting potash would offset the cost. However, this plan, like many others, failed and was abandoned. It is not claimed that the plant cannot be killed, but, as the minimum cost per acre for

An Australian Prickly-Pear Wilderness: The Black Portion of the Map Represents 22,000,000 Acres of Rich Land, 6,000,000 Acres in Excess of That under Cultivation, Rendered Untenable by the Pest, Which, Up to the Present, has Resisted Fire, Insect Enemies, and Various Other Efforts Aimed at Its Eradication

clearing the land is in excess of $10, and the value of the land only a fraction of this figure, such an operation amounts almost to a philanthropy, and cannot be classed as a good business venture. Great hopes were placed in the experiment of importing cochineal insects from Ceylon. They consume certain varieties of prickly pear as food, and have cleared central and northern Queensland of these varieties. The results of the experiment are not yet conclusive. Mexican rats have been suggested as an agency of destruction, but it is feared that these would prove as great or a greater menace than the plant. Chemical warfare has failed, and as 22,000,000 acres of extremely productive land are devastated by the pest, a rich reward undoubtedly will be reaped by the discoverer of an economical method of controlling its spread or of some commercial use for it.

NOVEL SAW USED TO UNDERCUT MICA COMMUTATOR INSULATORS

When commutators are placed on the armature shaft of a motor, mica liners are inserted between them to prevent short-circuiting. The liners must be kept at a proper distance below the rubbing surface of the commutators. This is done by sawing, and to perform the work conveniently, a saw-blade holder of aluminum, equipped with setscrews for depth adjustment, has been introduced. The nose end of the saw holder is fitted with a buffer to prevent injury to the intricate armature wiring by jamming as the saw is worked back and forth. Conveniently located handles assist in performing the sawing operation.

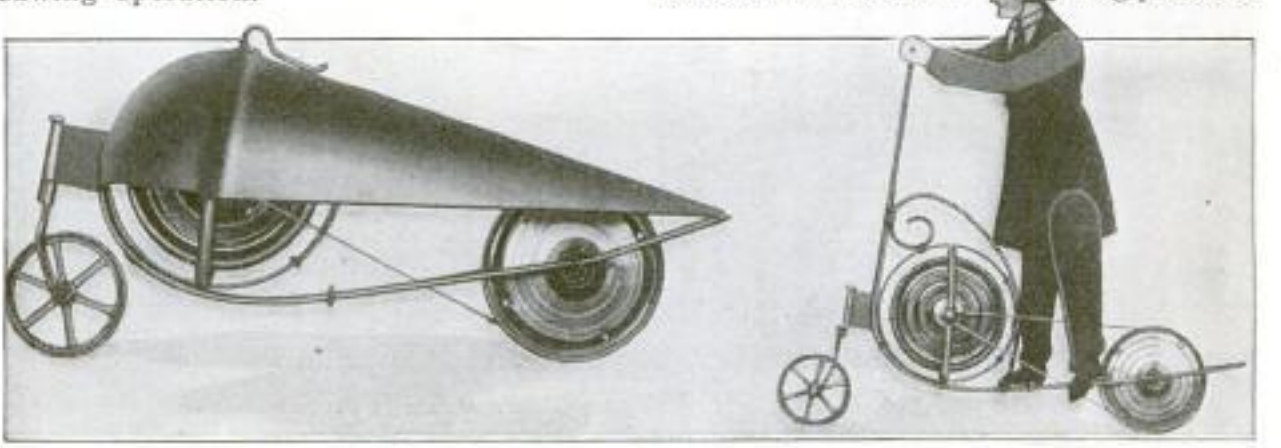
DETACHABLE GOLF STICK USES THREE HEADS

A detachable stick which can be fitted into the heads of three golfing irons, namely the putting cleek, iron, or mashie niblick, has been originated by a British golfer. The shank of the heads is bored out and threaded to receive a similarly shaped and threaded point that forms part of a ferrule attached to the end of the stick.

The Heads of the Detachable Golf Stick may be Changed. A Threaded Connection in the Shank Permits Fitting of the Head Desired

GYROSCOPIC TOY MAKES SPEED AND MAINTAINS BALANCE

A gyroscope located in the frame of a small toy cycle serves the double purpose of maintaining balance and furnishing power. The rear wheel of the cycle is grooved, to permit the passage of a string, which is used as a belt from the center shaft of the gyroscope and serves to pull the toy along. By adjusting the gyroscope to different angles, the cycle may be made to run in a slant ing position.



The Rear Wheel of the Gyroscopic Toy is Grooved to Receive a String Which Runs over It from the Center Shaft of the Gyroscope. The Toy Runs at High Speed and Maintains Its Balance

SPRAYED-CONCRETE PILING HAS PAPER-TUBE CORE

BY FRANK B. HOWE

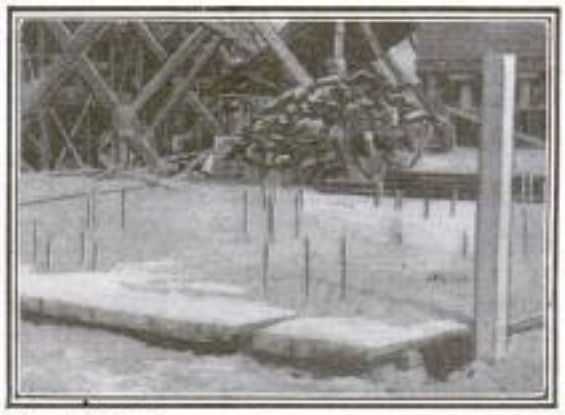
CONCRETE piling with hollow centers and a paper foundation, and made by spraying with a hose! Briefly that describes the revolutionary type of piling being constructed by the municipality of Los Angeles at its new harbor.

A collapsible drum is first wrapped with ordinary tar roofing paper, and this is loosely tied with ordinary twine, to hold it in place. Starting at one end, another layer of tar paper is wound slantingly around the first until the other end is reached. The length varies from 42 to 60 ft., depending upon the length of the desired piling. This outer layer of tar paper is cut narrow and wound off from a spool that slides along a track behind the collapsible drum. Hot glue is applied to the paper as it is wound. Wire is then bound around the outside of the paper, about 8 in. apart, to hold the tube solid while the glue is drying. The diameter of this tube varies from 6 to 8 in. The winding being completed, the tube is slipped from the drum, by collapsing the latter, and set away to dry.

Meanwhile a solid point for the piling is constructed in the yard

Winding Tar Paper on the Collapsible Drum to Make a Core for a Concrete Pile: The Drum in the Lathe is Seen Partly Wrapped, While Overhead Is an Unwrapped Drum Hung in Storage

Stacked in the Foreground Are the Paper Tubes, Ready for Spraying with Concrete. Standing at the Left Is a Framework for One of the Solid Points Used on Each Pile

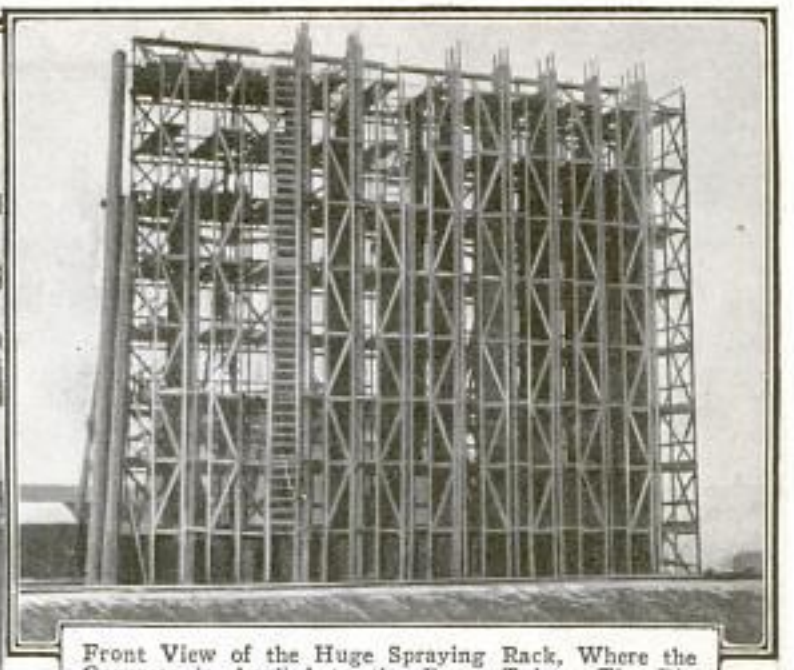


The Solid Points are Made with the Help of the Platform and Its Vertical Steel Rods. A Paper Tube is Used, but It is Filled with Concrete Instead of being Left Hollow

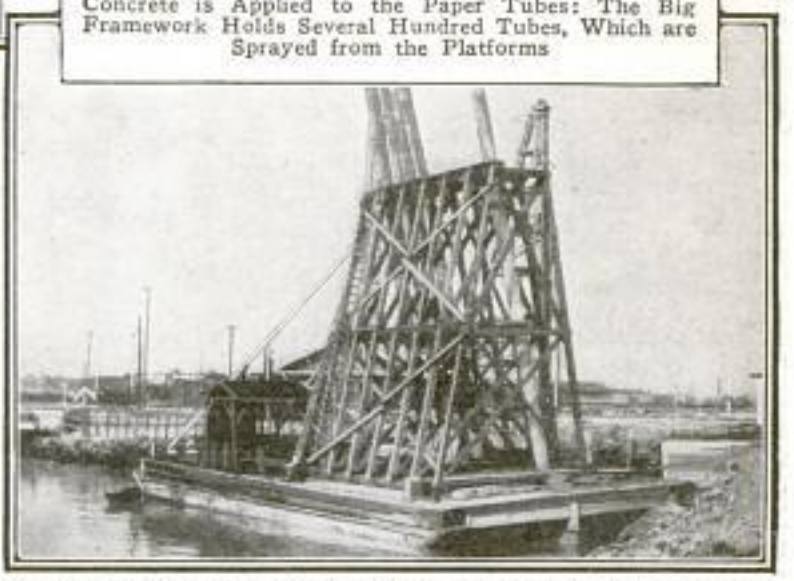
Hundreds of the Paper Tubes are Set in a Huge Wooden Frame, and Sprayed with Concrete by the Man on the Platform

A Cluster of Solid Points in Process of Drying: When Set, They are Joined to the Paper Tubes with Reinforcing Rods in the Framework, and the Sprayed Concrete Completes the Junction

Finished Piling Standing in the Curing Frame, Where It is Allowed to Remain for 30 Days, and is Sprayed with Water Every Day



Front View of the Huge Spraying Rack, Where the Concrete is Applied to the Paper Tubes: The Big Framework Holds Several Hundred Tubes, Which are Sprayed from the Platforms



The Piling, When Finished and Cured, is Transported to the Place of Its Use on a Special Boat, Equipped with a Rack for Storing the Piles in Upright Position

and also set away to dry. This point is built in the same fashion as the tube, but its center is filled with cement, instead of being left hollow.

When both are dry, the solid point and the tar-paper tube are set in the "spraying frame," a large wooden framework which accommodates hundreds of piles at a time, and around the outside of these, 2 or 3 in. apart, are set steel rods, such as are commonly used in reinforced concrete. A mixture of sand and cement is then sprayed on the outside of the skeleton of the piling with a special hose and nozzle. This is continued until a layer of cement, 4 in. thick, has been deposited around the tar paper. The top is sealed in the same manner.

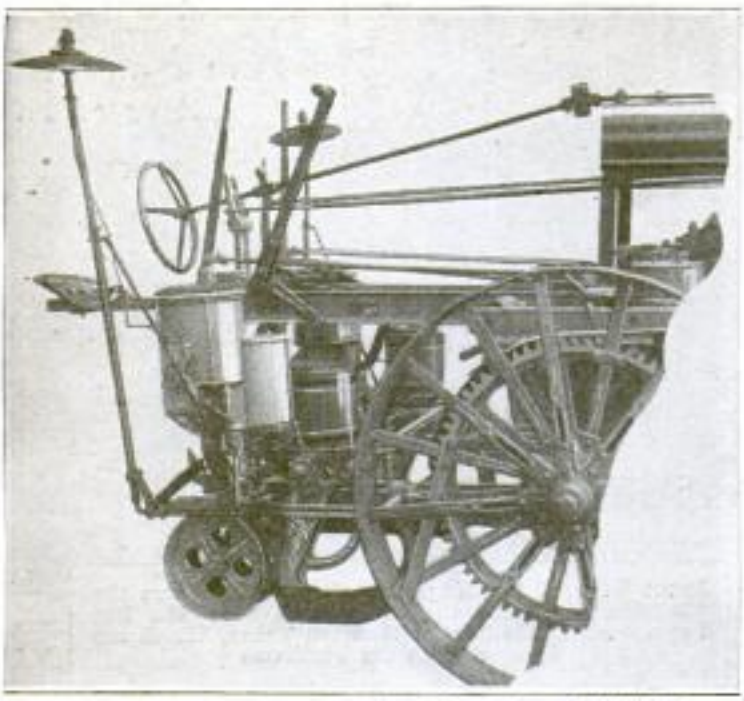
The piling is then complete and, after a month of curing, which consists in letting it stand in another framework and spraying it with water daily, it is ready to be set. The completed piling is then a piece of reinforced concrete, with a hollow center and a paper base.

A special boat is used to transport the piling to the point at which it is to be set. This boat is also equipped with a framework, similar to the spraying frame, and the piles are lifted into this by cranes.

The setting is done in the usual hydraulic manner, and the resulting pier is fully equal to one of solid concrete, so far as strength is concerned, while the saving in material is a very considerable item. The air space in the center of the piles serves as a sort of cushion, when a shock is sustained by the pier, and in addition takes care of changes of temperature, so that the piles do not crack.

¶One of the Ferris-type hulls, that was being built for the shipping board during the war at a southern port, is now being cut up into firewood. All of the metal that could be taken from the hull was removed, and then a gang of men with saws set to work cutting the vessel down. As the timber used in the construction of the ship was of excellent grade, the firewood made is in great demand.

COWPEA ATTACHMENT FOR MOTOR CULTIVATOR

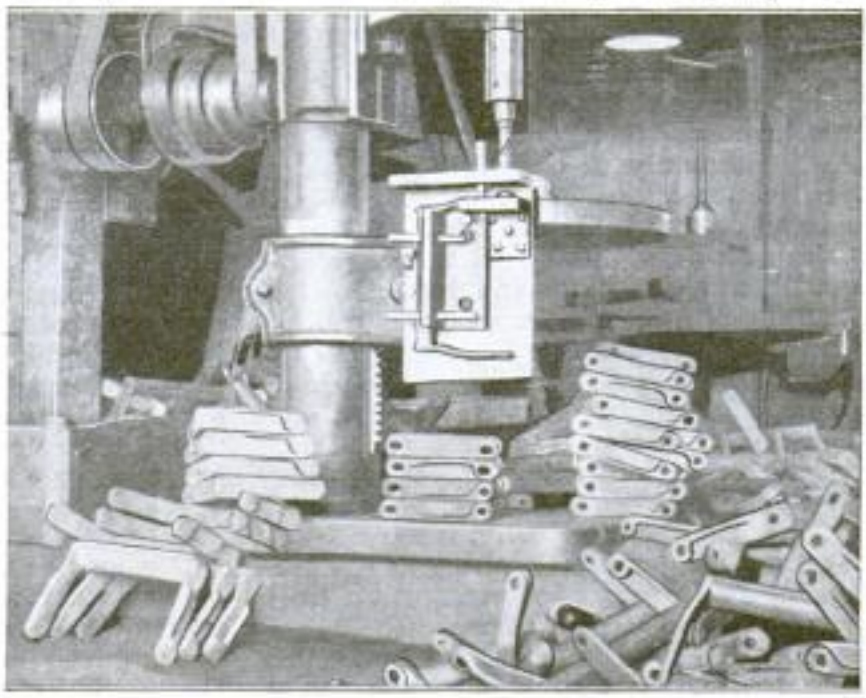


On Either Side of the Corn-Planting Mechanism of This Motorized Cultivator are Placed the Hoppers of the Cowpea Attachment

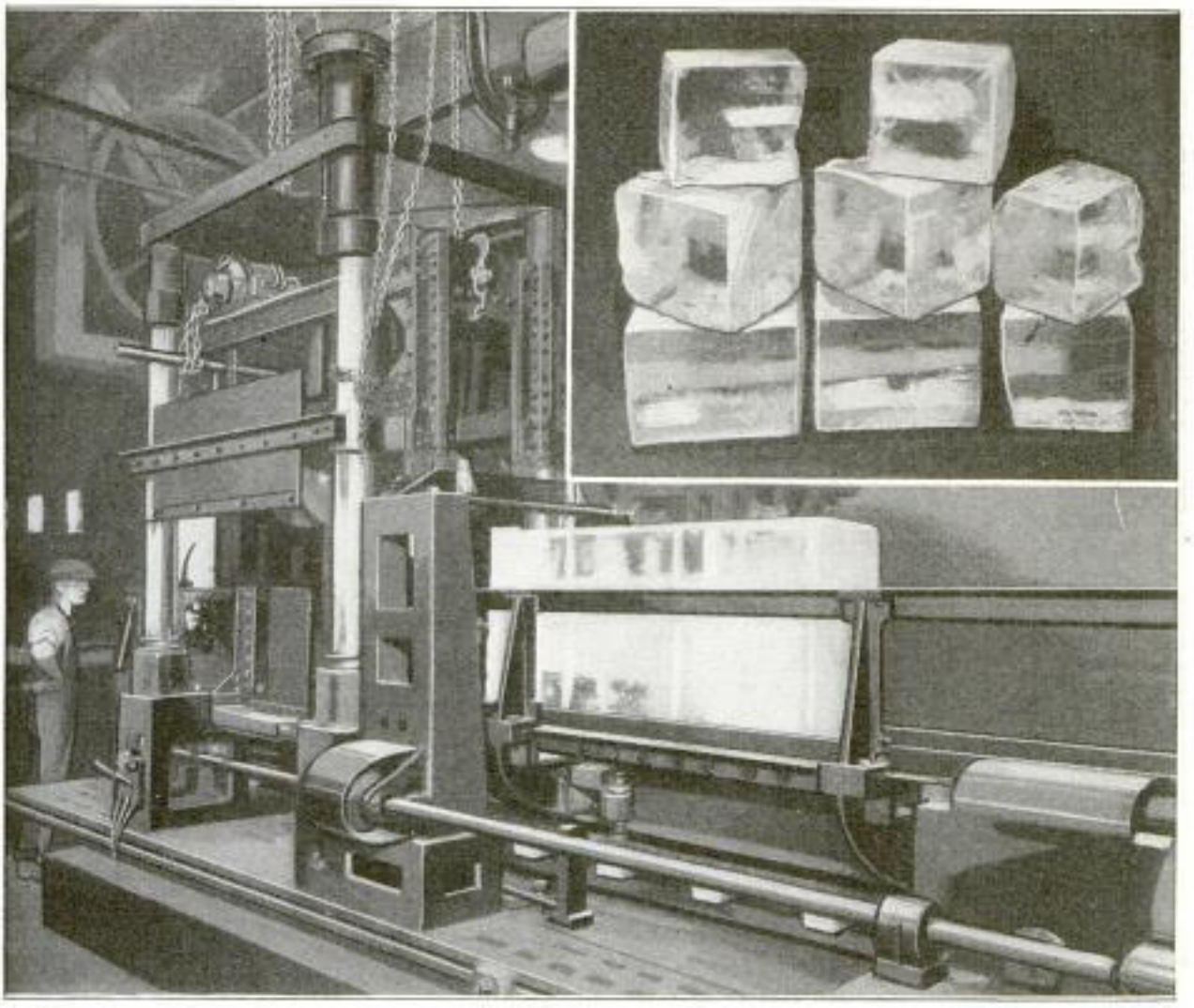
The American farmer has learned of late years that the cowpea, when planted with corn, affords excellent fall pasturage, and rivals red clover in its tonic effect on the soil. And to get the best results, he believes peas and corn should be planted simultaneously. Working from this assumption, at any rate, the manufacturers of a motorized cultivator have recently put on the market an attachment to do this work. It consists of two cylindrical hoppers for the cowpeas and two for the fertilizer, one of each being placed on each side of the corn-planting mechanism. From the hoppers pipes descend to the main corn shoe, thus placing corn, cowpeas, and fertilizer in each hill. The flow in these pipes is so controlled that the operator can use any one or all of the hoppers together, or the corn planter alone.

SAWMILL RECLAIMS MACHINE PARTS BY ARC WELDING

From a large sawmill in Westwood, Calif., comes an interesting account of how arc-welding apparatus of exceptional size and capacity was used to rebuild worn machine parts which would have been very expensive to replace, when it was possible to procure them at all, during the war. Starting with a stationary outfit with 5/32-in. electrodes, it was quickly found that one of larger capacity was needed. The next step was a portable set, with 3/8-in. electrodes, which could be tapped into a 440-volt alternating-current line anywhere about the plant. Finding that even this did not give heat enough for building up the broken and worn parts of hog disks, log-turner arms, donkey-engine and crane gears, etc., a still larger outfit, with 5/8-in. electrodes, was constructed, which worked perfectly, salvaging many thousands of dollars worth of these costly parts. Perhaps the most valuable service rendered was in the taking up of the wear in the links of sawdust conveyors, of which thousands of feet are used and which cost in excess of $1 per link. The badly worn holes were welded solid with any small lengths, or pieces, of scrap available.



Sawdust-Conveyor Chain Links being Drilled after Welding: In the Center Are Some with Badly Worn Holes. To the Left: Holes Welded Solid. Right: Drilled with New Round Holes



The Large Cakes are Carried into the Kerfing Machine and the Cutting Rig Carrying the Saws is Lowered. The Pieces of Ice are Withdrawn from the Opposite Side and Taken to Delivery Conveyances. Above: Pieces Kerfed by Machine and Broken Apart for Delivery

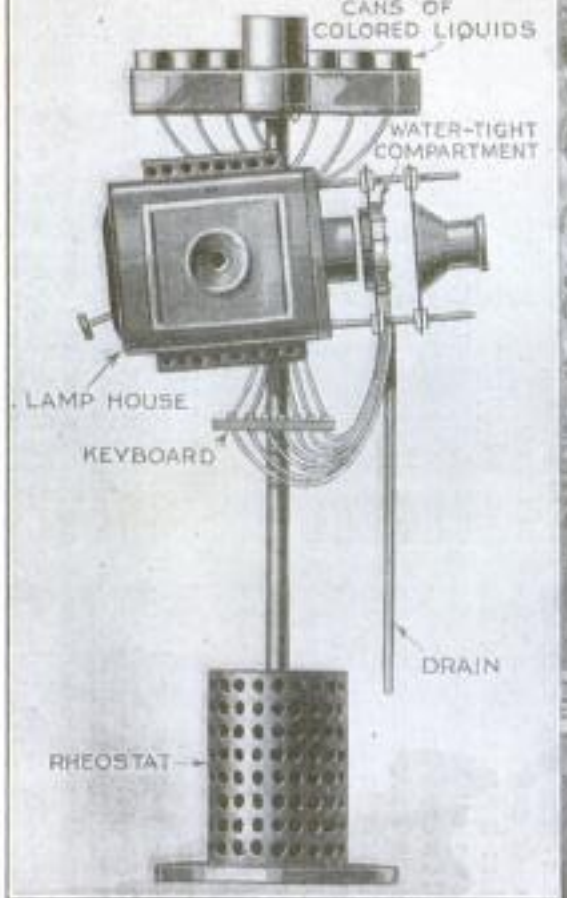
ICE-KERFING MACHINE MAKES WEIGHING UNNECESSARY

An ice-kerfing machine that will do away with the use of weighing apparatus for ice delivery, is now introduced by an eastern inventor. The machine is fitted with a rig of eight disk saws and a mechanical conveyor. The large cakes of ice are carried to the saws on the conveyor and the blades are lowered to a predetermined depth. The saws are arranged in such a way as to cut kerfs in the cakes to mark pieces of various weights, in multiples of 25, up to 100 lb. The deliverymen simply strike their ice pick into the kerfed line to release a piece of the desired weight from the marked cake.

¶German and Russian war maps have, at last, found a place in constructive activities. Sold to paper manufacturing concerns they have been made up into serviceable envelopes by folding the printed sides inward.

WORLD'S RAT-KILLING RECORD IS HELD BY AUTOMOBILE

Smothering rats by wholesale is the latest achievement of the all-conquering motor car. Poisons, traps, cats, and terriers having proved unequal to the task of arresting the growth of the rat population of a farm near Norcatur, Kan., the owner, happening to think of the deadly nature of engine exhaust gases decided to give them a trial. Selecting a promising hole under his barn, he connected it with the car exhaust pipe and started the engine. In a few moments rats began to pour from holes, cracks, and crannies. Most of them were dazed and somewhat uncertain as to what best to do. Those of clearer mind hastily departed for parts unknown. A disused chicken house was treated next, with even more satisfactory results. No count was kept of the victims, as it was easier to measure them, the final net results being about 2 bu. of full-grown adults, and 2 gal. of young ones.



Above: A Diagrammatic View of the New Stereopticon Attachment for Color Effects. Pressure on the Various Valves of the Keyboard Permits Fine Streams of Colored Water, from the Cans Above, to Flow into the Optical Cell, or to Drain Out Again, Giving Light of Any Tint, or Producing, by Lens Inversion, a Rising-Curtain Effect on the Screen. At the Right: The Stage Setting for Projecting Images of Bright-Hued Robes upon the White-Clad Figure in the "Ice Cave"

NEW STEREOPTICON EFFECTS WITH COLORED WATER

A stereopticon attachment that makes possible a whole series of new color effects, and does away with the dissolving shutter, has been invented by an eastern showman. A water cell, 1¼ in. thick, with mica sides, is fitted in front of the slide carrier, and connected by tubes with a series of cans mounted above, containing water variously colored with dyes. A keyboard at the side of the machine permits the operator to inject fine streams of any desired color into the water cell at will. The slide is changed when the cell has received enough color to obscure the image. The cell is then drained through a bottom tube, and the lens reversal on the screen gives the effect of a rising curtain. The device is particularly effective with "pose slides," by means of which various costumes are projected upon a living model, who poses on the stage in white fleshings against a white background, amid scenery representing an ice cave, or other unusual setting.

WELLESLEY COLLEGE GIRLS HAVE "SNEEZORIUM"

When the young misses attending Wellesley College feel that tickling sensation in the nose, which is a forerunner of an irrepressible sneeze, they retire hurriedly to the "sneezing closet," where they enjoy the relieving spasm without endangering the health of others by infection. The atmosphere of the small room is kept saturated with mild antiseptics.

¶The U. S. Navy made a new wireless record recently by sending messages directly from Cavite, P. I., to Washington, D. C., some 10,000 miles. A new automatic control used eliminates the relaying of messages.

RUNNERS ON BABY CARRIAGE TAKE PLACE OF WHEELS

In Switzerland, where ice and snow abound during the winter months, perambulators frequently are equipped with

In Switzerland, the Baby Carriage is Fitted with Runners Instead of Wheels, for Winter Service. The Sleighs are Easily Propelled over the Frozen Surface

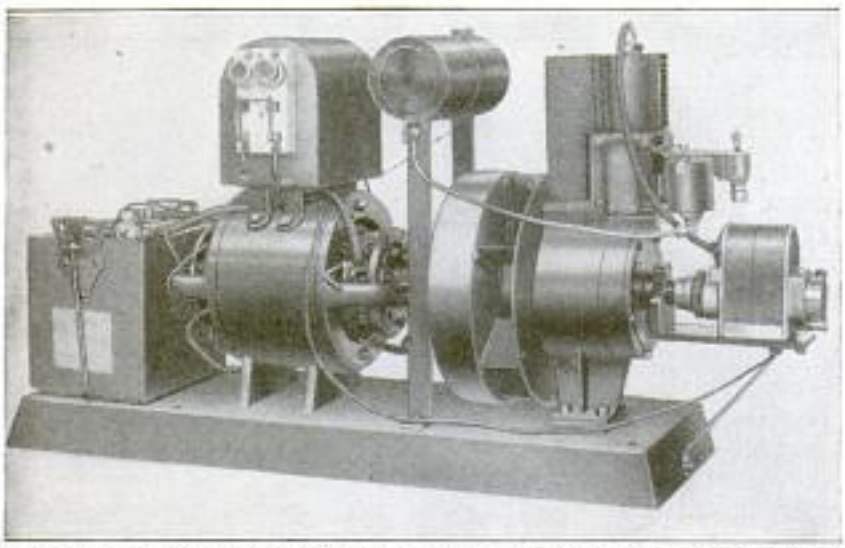
runners instead of wheels. Nurses push their tiny charges about in the little sleighs, and the youngsters seem to enjoy the ride greatly. The baby sleigh is as common there as are wheeled vehicles in this country.

FRENCH RAILROAD REBUILDING SHOWS RAPID PROGRESS

France's swift recovery from the devastations of war is best demonstrated by the remarkable progress made in rebuilding the great amount of railroad line that was entirely destroyed. The total of 1,490 miles of double track has been completely restored, and 1,122 miles of the 1,727 miles of single track, the balance of 605 miles being under conversion to double track. From November, 1918, to December, 1920, the number of locomotives in use increased from 14,537 to 18,429, with 1,200 more ordered. In the same period, freight cars in use jumped from 410,308 to 518,810, with 2,500 more ordered. In addition, Alsace-Lorraine has 1,566 locomotives and 42,297 cars. New repair shops have been opened, equipment orders are constantly being placed, and much electrification work is in progress.

HOUSE-LIGHTING PLANT USES SIX-VOLT AUTO BATTERY

An improved, independent house-lighting system for rural homes, village lighting, and like purposes, has recently been offered by the inventors, two electricians and mechanics residing in Kentucky. The design is what is known as the full-automatic type, which means that no large battery is needed, and that the engine will be started automatically whenever a demand for current is made, by turning a switch or lighting a bulb anywhere in the whole system. It will continue to run so long as current is required for any purpose, and stop when all lights or other devices are turned off. The dynamo delivers current at a voltage of 110, permitting the use of appliances of this voltage, which are standard and procurable anywhere. The only battery required is one six-volt automobile-type unit, such as is used in starting motor-car engines. It serves the same purpose in the new system, and is automatically recharged as soon as the engine starts.

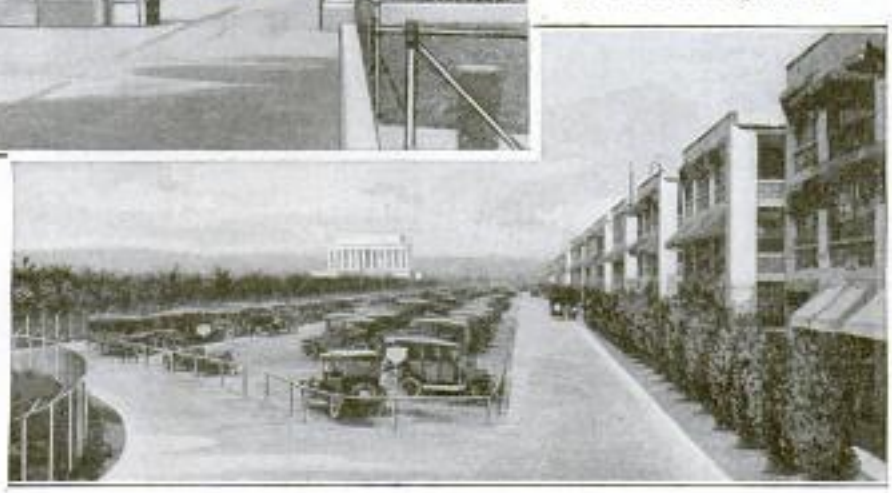


Arrangement of Full-Automatic, Isolated Power Plant: Left, Six-Volt Auto-Type Battery; Center, Dynamo and Control Box; Right, Engine

AUTOMOBILE-PARKING GROUNDS FOR GOVERNMENT EMPLOYES

Recognizing the menace of automobile thieves, the War and Navy departments have provided what is probably the best arranged parking space in the country for the cars of departmental employes. Several acres in the rear of the buildings are wholly inclosed by a 7-ft. wire fence, with a top strand of barbed wire, and thus the inclosure can only be entered from the ends, where a guard is stationed. A 16-ft. concrete drive surrounds the central parking space, which is divided into numbered stalls. Traffic along the drive is in one direction only so that the danger of collision is reduced to a minimum. When conditions warrant, checks will be issued and no car may be removed without presenting the stub to the guard.

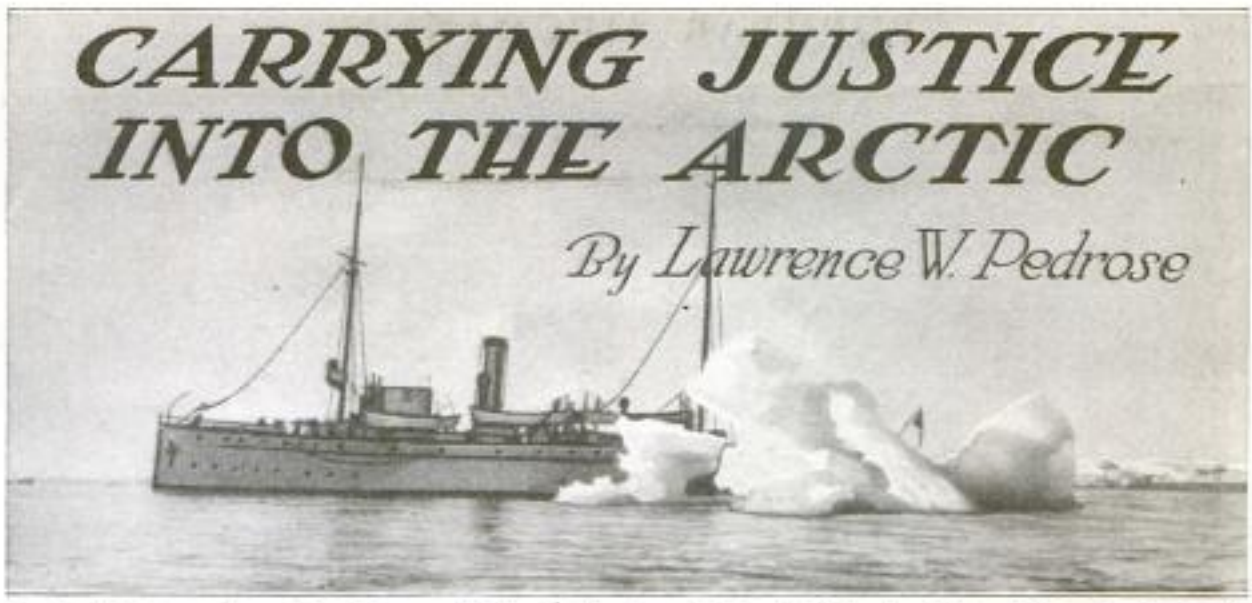
The House of the Guard at the Entrance of the Parking Space, Facing the 16-Foot Concrete Drive: All Parked Cars must Pass It



The Parking Space of Several Acres, Inclosed in a Seven-Foot Wire Fence, Barbed at the Top, and Entered Only at the Ends

CARRYING JUSTICE INTO THE ARCTIC

By Lawrence W. Pedrose

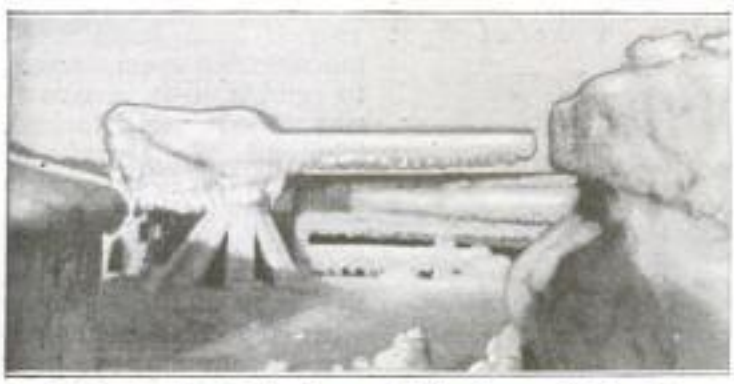


The United States Coast-Guard Cutter "Unalga," the Type of Stanch Little Steel Vessel That Carries Justice into the Arctic, Its Devoted Men Cruising the Cold Northern Waters Year after Year

IN the remote parts of Alaska evaders of the law are often not brought to justice—justice is carried to them. To the far-off Aleutians and up through Bering Sea, Bering Straits, and into the Arctic, traveling courts carry, at certain seasons of the year, the machinery for the administration of the law, minor cases, such as thefts, civil suits, etc., being tried "on the ground," while preliminary trials of serious cases are held and the alleged culprits taken to a regular court.

United States coast-guard cutters are utilized to carry the traveling courts into the Northland. Each vessel has a certain "beat" to cover; one, the 1,500-mile-long string of islands known as the Aleutian group; another, the sea and straits of Bering and the arctic shore of Alaska to Herschell Island, or Point Barrow. The territorial judge and marshal are picked up at Valdez. At various points of call submarshals are taken aboard. Juries, if defendants request them, are obtained from villages visited; and if sufficient numbers of white men are not to be found, officers and the members of the cutter's crew are called to serve.

It Is a Matter of Common Occurrence to Find Everything above Deck in This Condition. The Sailor is Standing beside the Captain's Launch



An Icebound Three-Inch Gun on Deck, after a Sudden Storm: The Mass of Ice at the Right Is a Capstan, and All the Deck Fixtures have Suffered a Similar Change

The north Pacific and the Arctic oceans are treacherous bodies of water; the men who ply them are heroes. Within a few hours the "bottom may fall out of the barometer," and the sturdy cutter, with no refuge within hundreds of miles, must ride out the storm. During hurricanes, the temperature sometimes drops to 50 and 60° below zero, and the wind-whipped sea spray, deluging the ship from stem to stern and reaching the topmost spars and guys, freezes on

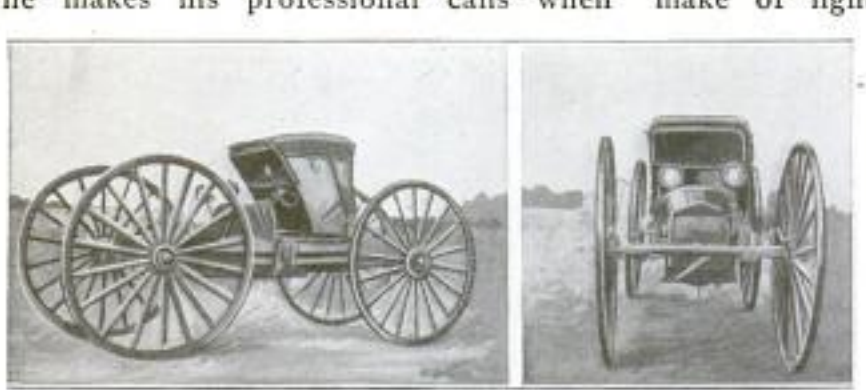
Clearing the Decks after a Storm: Axes, Pickaroons, and Steam and Hot Water are Used, with a Vast Amount of Hard Manual Labor, in the Herculean Task of Breaking the Ice Coating

contact, incasing every exposed part of the ship in ice from one to several inches in thickness. With the accumulating ice, the burden of the ship increases, and it labors heavier in the seas. Human beings must stay below decks except in emergencies. Casualties occur often, but to the hardy cutter crews accidents are "all in the day's work."

In addition to their patrol work and the part they play in carrying justice into the Arctic, the cutters are sometimes called upon to go to the rescue of traders trapped in the northern floes. They speed to the edge of the ice fields, put ashore a landing party with necessary equipment, then dodge the ice floes and await the return of the expedition. Perhaps the expedition does not return—and another must be sent. During the storms only the stanch hulls stand between the sailors and death. Davits, tackle, lifeboats—everything above deck—is frozen solid. Should the ships founder, the crews would drown like rats in a trap. But the men never complain—they "play the game."

PHYSICIAN FITS AUTO WITH SIX-FOOT WHEELS

An ingenious physician of Elmo, Kan., has designed an odd vehicle with which he makes his professional calls when other automobiles in his neighborhood would become hopelessly bogged in the deep mud or snow. The power plant, transmission, frame, and rear axle of the novel machine are those of a popular make of light car. These have been mounted on special axles, to which 6-ft. narrow-rim wheels are attached. The ends of the shafts of the standard rear axle are equipped with special pinions, which mesh with and drive roller gears on the hubs of the big rear wheels. This has the effect of reducing the gear ratio to 6 to 1, giving a great pulling power but reducing the speed to a maximum of 15 miles an hour. The sharp rims of the big wheels cut through the mud or snow down to solid bottom.



Two Views of the Mud-Navigating Auto with Six-Foot Wheels: It will Remind Many of the High-Wheelers in Vogue a Few Years Ago

FIND VENOM IN "HARMLESS" SNAKES AND REPTILES

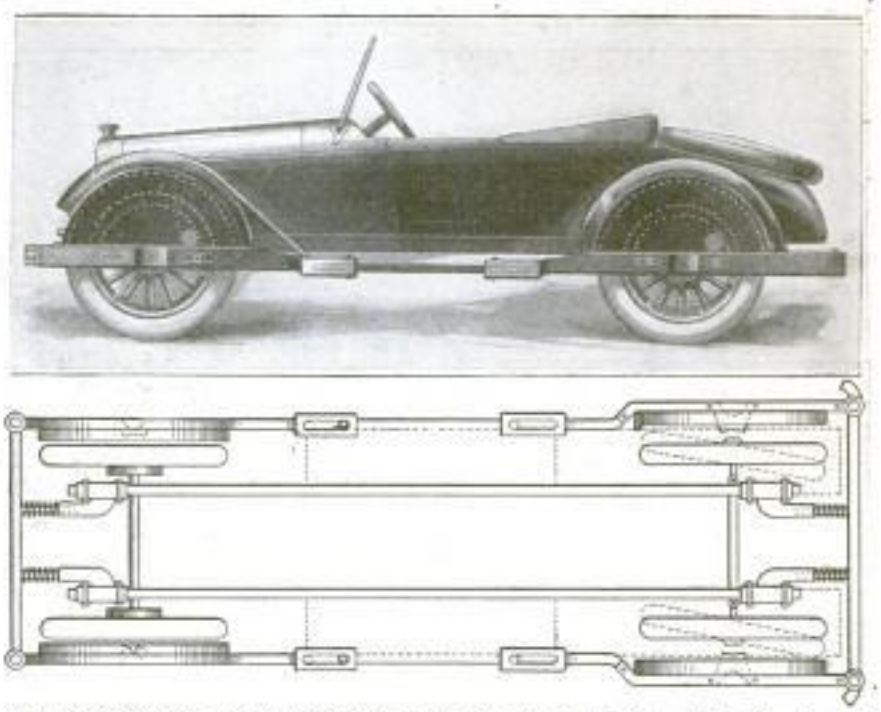
While naturalists have been gradually narrowing the group of so-called poisonous snakes by labeling many of them harmless, two French scientists have worked in the opposite direction, with such startling effect that their report indicates the presence of venom in all snakes. The toxic principle is found in the blood and saliva of snakes possessing no poison fangs, and its potency is sufficient to cause severe symptoms, and even death, in small animals treated by injection. One curious experimental discovery is that serum from the blood of certain snakes renders the virus of rabies innocuous. Frogs, toads, lizards, and even fishes also yield small amounts of venom, as demonstrated by the effect of their blood and mucus upon sensitive organisms, but all the carriers are immune to their own poison. Remarkable experiments in the treatment of epilepsy with snake venom indicate the possible development of a remedy, as the attacks were shown to be materially relieved by its use.

READY-MIXED WET CONCRETE TRANSPORTED BY TRUCK

The usual method of locating a concrete mixer within easy reach of the work has been completely reversed by the engineers in charge of a Philadelphia paving contract. A single large mixing plant has been erected at a central point, permitting the adoption of the most modern and economical arrangements, and the freshly mixed, wet concrete is carried as far as five miles to the work in two-ton motor trucks. The water-tight steel truck bodies are sprinkled with water and sanded before the concrete is loaded, and finally covered with heavy sheeting. Concrete can be mixed and delivered five miles in 35 minutes, or two miles in 15 minutes. Not only is the new system proving economical and otherwise satisfactory, but the laid concrete is declared to be of uncommon quality.

FRONT, SIDE, AND REAR GUARDS TO PROTECT AUTOMOBILES

The lessening of the damage resultant from automobile collisions is the object aimed at in the invention of an all-round-the-car bumper attachment recently patented by a North Carolina mechanic. Front and rear bumpers having proved a most decided protection, there is no reason why the idea should not be carried farther. The device consists of the familiar type of spring-cushioned front and rear bumpers with the addition of side members, extending lengthwise of the car, outside of the fender and running-board line, and anchored to the transverse bumpers at one end and to the running boards at the other. These members are so shaped that they come opposite the centers of the wheel hubs, and, in the event of a collision from the side, they bulge in until they contact with the hubs, transmitting the force of the blow to the hub.



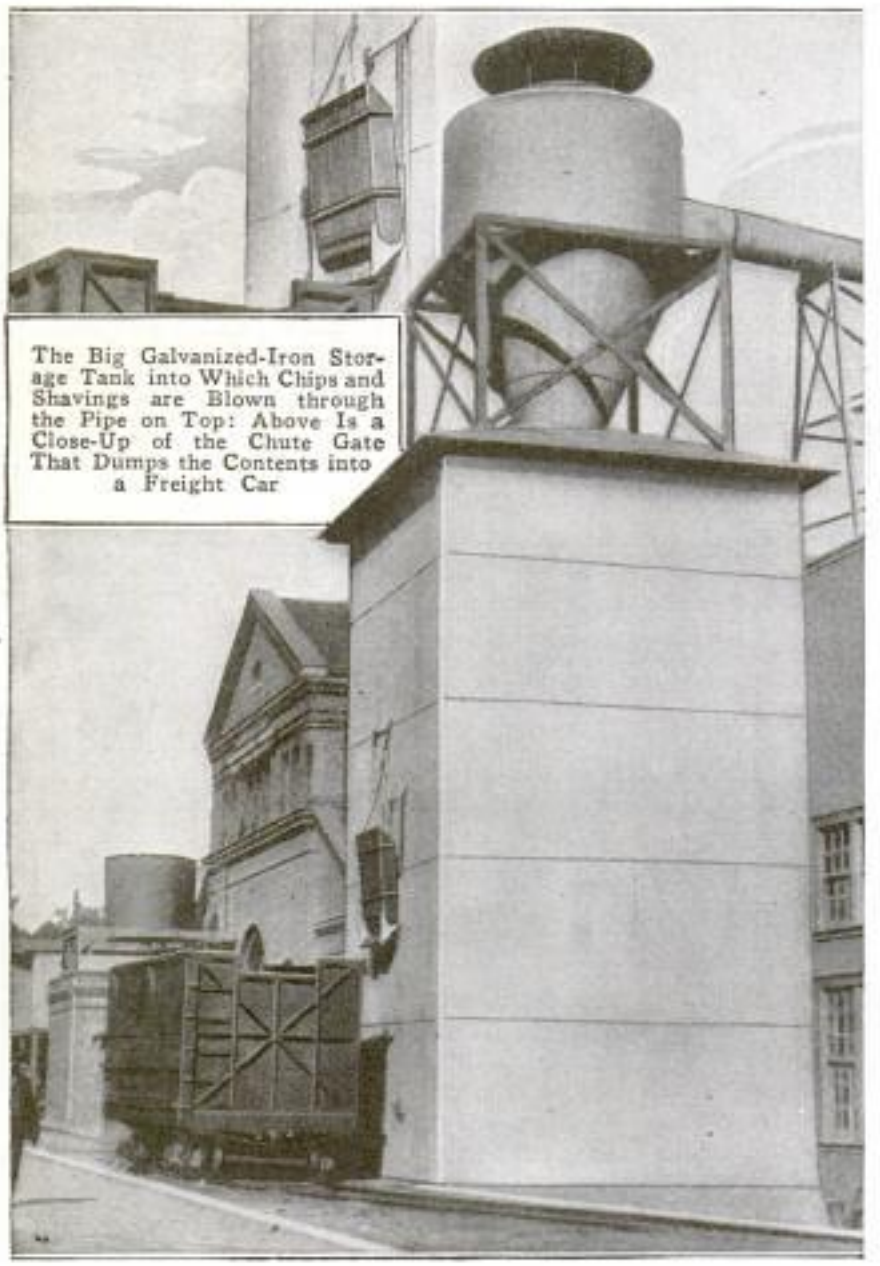
The Side Guards for Automobiles may be Unpinned from the Front and Rear Bumpers and Swung Aside to Permit Easy Access to the Wheels

CHANGE ANCIENT SCHOONER TO FLOATING TEA ROOM

Unusual marine activities of late have brought about many queer changes, but none more odd than the transformation, now in process, of the ancient schooner "Allen Gurney," of Providence, into a tea room. The old freighter, which for 57 years has hauled cargoes of molding sand, is to be completely refitted as a highly aristocratic floating salon.

MECHANICAL KINDLING LOADER COLLECTS REFUSE

Odds and ends of chips, sticks, and shavings, with sawdust and other combustible refuse, are not allowed to go to waste at the Mare Island Navy Yard. A sucking device gathers them up and deposits them in a large galvanized-iron house. At the side of this is a chute leading into a box car, spotted on the track beside the building. A gate allows the wood to slide into the car, in which it is hauled to the furnaces and used to furnish the fuel, which operates the motors, which turn the saws, which cut off more shavings, which make more fuel, and so on. No attention is required for the device, other than to keep empty cars under the chute, and the expense for fuel is materially cut down.



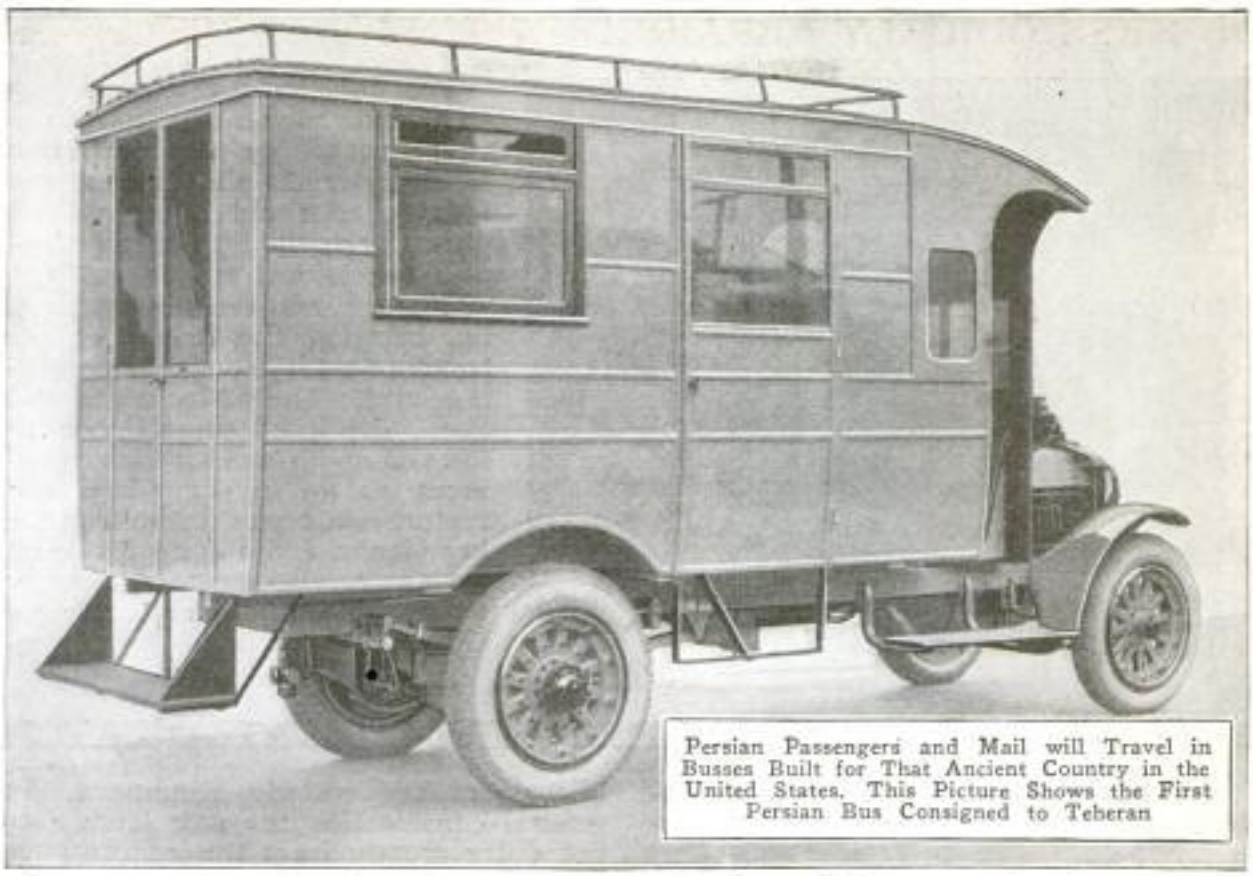
The Big Galvanized-Iron Storage Tank into Which Chips and Shavings are Blown through the Pipe on Top: Above Is a Close-Up of the Chute Gate That Dumps the Contents into a Freight Car

ELECTRICAL RESISTANCE OF THE HUMAN BODY

Very surprising and significant facts have been obtained recently respecting the electrical resistance of the human body. These may go a long way toward explaining many mysterious deaths that have resulted from low voltages. Doctor Wenner, in an investigation made lately at the Bureau of Standards, finds that the resistance of the human body itself is rather constant and unexpectedly low in value. He devised and employed a method by which the effects of the resistance of the skin were eliminated.

It was found that the resistance of the trunk of the ordinary adult varied from about 20 to 30 ohms, according to the person and circumstances; and from a limited number of experiments, it appears greater in the summer than in the winter time. One person suffering from a diseased condition, in which the sodium-chloride content of the blood was much above the normal, had a resistance of about one-half that of the normal person of the same size and weight. Holding the muscles tense increases the resistance of the body very perceptibly. The resistance also appears to be greater standing up than sitting down.

According to some records, deaths have been caused by the passage through the body of currents as low as .1 ampere. If this fact is considered in connection with the value of the resistance of the human trunk given above, it appears that there was only a potential drop along the body of from two to three volts. This is startling. If it were not for the skin, which has a high resistance, fatalities might easily arise from a pair of ordinary doorbell cells, or from a small automobile storage battery used for the spark coil.



Persian Passengers and Mail will Travel in Busses Built for That Ancient Country in the United States. This Picture Shows the First Persian Bus Consigned to Teheran

In another investigation, reported lately from Germany, very wide variations in the resistance of the human body were recorded. Doctor Wenner's experiments show that all of this appears to come from the skin, which is the seat of the greatest part of the resistance under ordinary conditions, and which may vary widely in its relative insulating properties.

DYNAMITE DIGS DITCH IN RECORD TIME

A drainage ditch, 2,000 ft. long, 3½ to 4 ft. deep, and 7 to 8 ft. wide, was blasted with dynamite through a pasture near Millen, Ga., recently. Half-pound charges of the explosive were planted at 1 ft. intervals and fired in relays of 400 to 500 at a time. So perfectly was the work performed that drainage water began to fill the big ditch as soon as it was completed, and flow away into a connecting stream. Over 2,000 cu. yd. of earth was displaced in a few moments after the blasting signal was given.

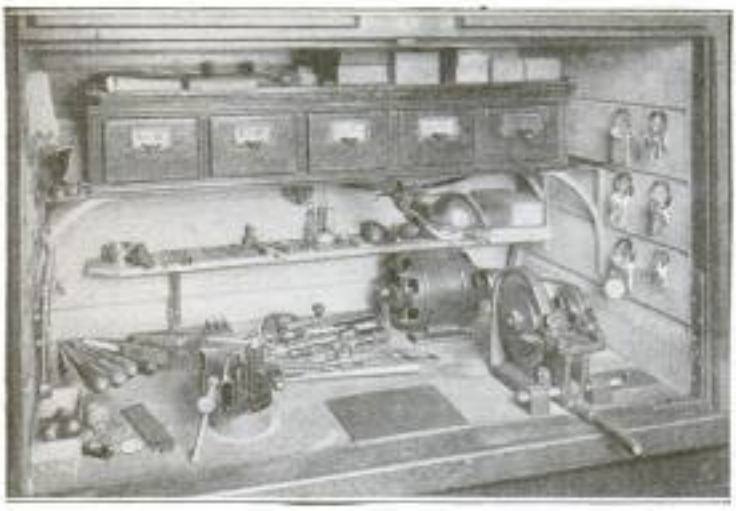
PERSIAN PASSENGERS AND MAIL TO TRAVEL BY MOTOR BUS

A motor-bus line, composed of auto trucks built in America and having passenger and baggage compartments, will be instituted to carry mail, luggage, and passengers between the cities of Persia. The first of these trucks is to go to Teheran, the capital, and will have a capacity of 10 passengers. A step at the rear of the truck provides approach to a set of double doors, through which the passengers gain entrance to the compartment of upholstered seats provided for them. The baggage compartment is separated from this by a screen equipped with double doors, and additional room for luggage is provided on top of the busses. The motor-bus line is an entirely new departure in the line of transportation in Persia, for up to the present time the people have almost exclusively depended on the ox, the camel, and the lowly donkey for the purpose.

TERRIFIC PRESSURE FAILS TO BREAK WELDED JOINTS

A tank made of two ½-in. plate-steel ends and a shell of the same thickness, which has been in use at the plant of a mid-western oil company for holding hot oil under pressure, has indicated the strength of welded joints in unfired pressure-vessel construction. No rivets were used on the tank, and it was subjected to 1,800-lb. pressure without injury to the welds, although the ends of the tank bulged from the pressure. The plate steel ends were flanged and inserted within the shell, and the joints between the ends and shell were effected by welding.

KEYS QUICKLY REPAIRED IN TINY WORKSHOP

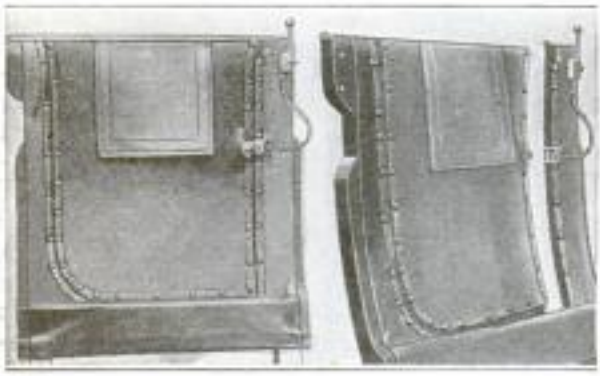


The Tiny Workshop is Used to Repair Keys for a Cincinnati Skyscraper. It Has a Motor-Driven Emery Wheel, Vise, and All Other Necessary Locksmith Tools

The door-locking system of a Cincinnati skyscraper has been supplemented by the installation of a key-repair shop and manufactory. An old filing cabinet, which holds the little array of repair necessities, stands on legs, 30 in. high, and the box part is 22 in., bringing the height of the bench to a very convenient working level. The 40-in. width and 26-in. depth of the cabinet allows enough room for such equipment as an emery wheel and motor, vise, boxes for holding the key blanks, and other tools. With such an arrangement, keys can be made, numbered, and corrected without loss of time.

HANDLELESS AUTO DOOR HAS WIRE-OPERATED LATCH

By the use of a new latch, recently developed in France, handles on automobile doors are entirely eliminated. In general construction the new latch does not differ greatly from the conventional pattern. It is the method of releasing it, when opening the door, that possesses novelty. This is accomplished by means of a small lever, which may be placed anywhere on the inside of the body, and which is connected to the latch by a length of piano wire which slides inside a flexible tube. The same arrangement has been used on carburetor-adjusting fittings for several years. The tubing prevents the wire from bending or straightening under a pushing or pulling force, and, consequently, the force can be transmitted around quite sharp curves.



Views of the Wire-Operated Auto-Door Latch: The Lever may be Concealed below the Body Edge

TARGETS GUIDE BOATS THROUGH CHANNEL

Two artificial landmarks of simple and distinctive character, recently erected alongside a dredged channel leading to a mill at Oakland, Calif., now make it easy for the pilots of incoming boats to steer a safe passage. Triangular frames of wood, covered with planking and painted white, are mounted, point up, on heavy black posts set in the ground some distance apart. So long as the pilot keeps these conspicuous targets in line, his boat is in no danger of encountering shoal water, and because of their distinctive shape, he is not likely to mistake them for other objects.

One of the Triangular Targets Is Visible in the Center of the Picture: Another Is Barely Discernible in the Distance

The Railroad or Wagon Bed of the Pontoon Bridge Rests on Cribbing Piers. Blocks in the Piers are Removed or So Placed as to Keep the Roadbed on a Constant Level. Machinery Holds the Bed Up While the Blocks are Changed

HOW A PONTOON BRIDGE MAINTAINS ITS LEVEL

Persons uninitiated in the art of bridge engineering would naturally assume that a bridge built on pontoons would rise with high water on a river and drop when the water recedes. However, such is not the case, for the railroad bed or wagon road rests on cribbing piers located on beams crossing the pontoons. The cribbing consists of blocks, of which a sufficient number is removed to bring the bed level with the solid approaches, when the water becomes high, as is the case in spring. Low water necessitates replacement of the blocks. The roadbeds thus built with the blocks as foundation piers are held in the air by electrically operated machinery while the blocks are changed. The bridge here in question crosses the Mississippi between Marquette, Ia., and Prairie du Chien, Wis., and has two pontoon spans which are swung open to allow the passage of shipping.

¶Comparative tests of industrial trucks and tractors, some equipped with plain, and others with flexible, roller bearings, have shown that the latter effect a power saving of 50 to 75 per cent besides attaining higher speeds. Another economy is in the life of the storage batteries of electric trucks, the demand for current in starting being less when flexible roller bearings are used.

TRAINED CANARY WORKS FOR ITS LIVING

A resident of London found that the family canary bird possessed a special aptitude for tricks. In order to test the bird's powers, a special cage was constructed. The upper portion of the cage has a little balcony built into the wall, with a hole in the floor, through which a tiny bucket drops into a glass of water suspended on a shelf immediately below. When the bird desires water, it draws up the little bucket by hauling on the string with its beak, and then holds the string with its claws while it drinks its fill. To obtain its food, the bird has to pull a tiny locomotive, filled with seed, up a wooden slide, which is attached to the bottom of the outside of the cage.

MOVABLE FORM USED ON CHANNEL-CONCRETING JOB

By ALLEN P. CHILD

IN deepening the channel of Onondaga Creek at Syracuse, N. Y., the contractor used a special steel form for the concreting work, which had several interesting features. The forms were designed so that they could be easily reset and adjusted in position on tangents or curves.

The Excavator at Work, Deepening the Channel of Onondaga Creek at Syracuse, and Preparing Its Bed for the Concrete Lining

The Finished Concrete Floor, 28 Feet Wide, Ready for the Construction of the Side Walls on the Sloping Earth Banks

The inside top width of the channel, as improved, was 48 ft., while the concrete lining of the "invert," or floor, was 28 ft. in width. The sand and gravel removed from the old bed of the drained creek, by a walking dragline excavator traveling backward upstream, was deposited in dump cars on a narrow-gauge track on the top of the slope. This material was either sent to spoil banks or used in sections of the channel which required embankment. Near the end of the deepened channel the placing of the concrete invert was begun, and the work progressed downstream. By using grade boards, the top surface of the concrete was brought to the required height. Steel channels, set to line and grade at the outside edges of the invert, were all that was required in the way of forms.

The side-wall form consisted of five units. Each unit was 14 ft. in length, and was mounted on flanged wheels. The entire device traveled on a 16-ft. gauge track laid on the concrete invert. A unit was made of three rigid trusses, spaced 6 in. apart and cross-braced. The steel face of the forms against which the concrete was deposited was attached to arms sliding with the upper and lower chord members of the trusses. For adjustments, it was possible to move the face forms horizontally by means of three jackscrews at the ends of each truss. When set, the face forms were rendered completely rigid.

The Channel of the Creek Completely Lined with Concrete, with a Top Width of 48 Feet inside the Walls: Expansion Joints are Placed Every 30 Feet

On tangent stretches of the creek, the units were spaced 4 ft. apart. Planks, for which grooves were provided at the end of the faceplates, filled up the intervening spaces. On curves, the spaces between units were also filled with planks, the units being set not less than 12 in. apart.

Top: Preparing for the Pouring of the Side Walls, with the Special Forms Arranged to Travel on a Track of 16-Foot Gauge, Laid on the Floor of the Channel. Bottom: The Five-Unit Forms for Pouring the Side Walls, Each 14 Feet Long, Made of Three Rigid Trusses, and Mounted on Flanged Wheels to Fit the Rails

When setting the form, the track was alined between the two outside edges of the invert. Then the form units were rolled forward, and the face of the forms was jacked out to the back line, or earth face, of the concrete side walls. After setting the planks between the units, the space between the face of the forms and the excavated bank was filled with earth, compacted by puddling and tamping. When this was completed, the base forms were pulled horizontally away from the earth banks about 17 in. by the jacks, and the space required to be filled was ready for lining. The concreting was done from a secondary traveler, running on a track placed on top of the form trusses. Extending over to the side slopes, chutes carried the concrete from hoppers on top of the car into the lining space. The concrete was brought from a central plant and hoisted into the hoppers; the hoist also serving to jog the chutes up and down, and as the concrete rose in the space being filled, the chutes were raised.

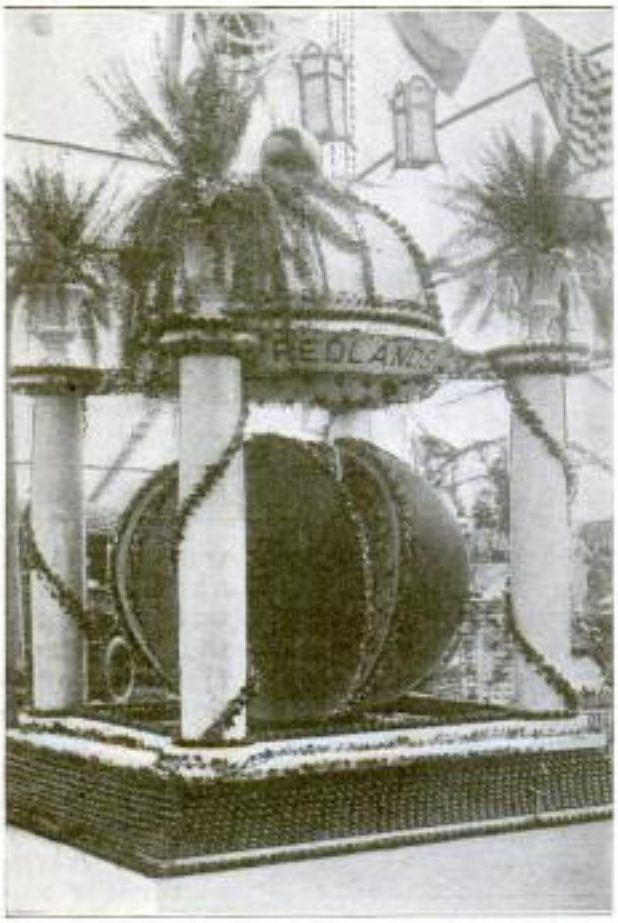
By using these form units it was possible to puddle and concrete a 90-ft. section in a working day, and the framework was pulled ahead by its own power for the next section. Expansion joints were provided by inserting a steel plate into the side slope every 30 feet. Altogether the undertaking, though not extraordinary for its size, presents an interesting example of the way in which concrete problems are met by engineering ingenuity.

U. S. BUREAU OF MINES ISSUES OIL-REFINERIES DIRECTORY

Every oil refinery in the United States, together with the statistics covering equipment, capacities, etc., is listed in a directory recently compiled and published by the Bureau of Mines for free distribution. The report shows 415 completed plants, producing or ready to produce, and 44 more building. The daily capacity of all refineries is 1,888,800 bbl., of which Texas, with 70 plants, leads with an output of 330,800 bbl. California comes second with 312,000 bbl., and Oklahoma follows with 248,000 bbl. from 68 refineries. The most remarkable showing is made by New Jersey, where seven refineries produce 215,000 bbl. per day.

GIANT MECHANICAL ORANGE MAKES TASTY EXHIBIT

A huge artificial orange, built in quarters which were opened and closed mechanically, was used as an exhibit at the annual



The Sections of the Giant Show Orange, Constituting Part of the Redlands Exhibit, Drop Apart Mechanically

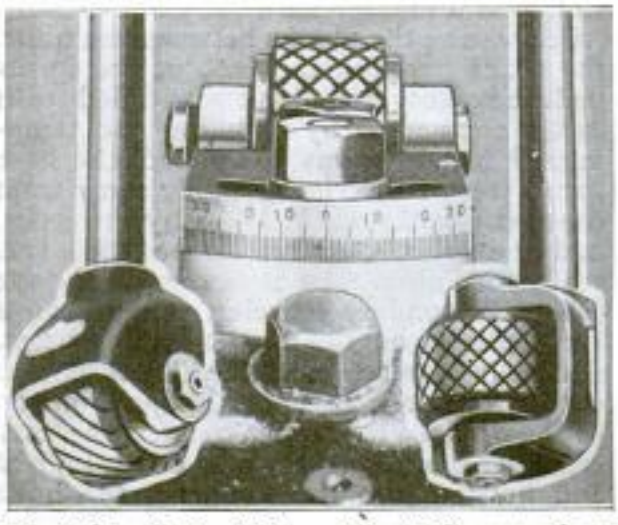
orange show held at San Bernardino, Calif., this year. The parts were painted to simulate the luscious sections of the fruit, and the opening and closing of the parts was effected by gearing concealed in a box below. To make the exhibit more novel, a young lady was concealed within the orange, and as the sections parted she tossed real oranges to the spectators.

COMPRESSED-AIR EXPLOSIONS HAVE ELEMENT OF MYSTERY

An Arizona copper mine was the scene of an explosion in a high-pressure compressed-air line last October, the cause of which so far has baffled the ingenuity of experts. That it was an actual explosion, and not merely the splitting of the pipes by straight pressure, is proved by the facts that these were splintered, torn, and twisted, and that the floor, walls, and roof of the power house were partly demolished. One of the operators missed death by inches, being knocked down and cut by the flying pieces. Among the theories advanced to solve the mystery of this and other compressed-air line explosions of a similar nature is that the oil used to lubricate the compressors becomes broken down by the action of the heat generated, and, vaporizing, forms an explosive mixture which the high temperature of the air, compressed to 1,000 lb. per square inch, and sometimes even more, ignites. If this is the case, the expression "compressed-air explosion" is erroneous, for the reason that the action is caused by the sudden burning and expansion of highly inflammable gases and not by the straight pressure which the pipes are made to withstand. The theory is the same as that upon which the operation of high-compression engines is based.

GRINDER-TRUING TOOL CUTS FACE ANY ANGLE

A truing tool for grinding wheels has been developed recently that serves the twofold purpose of cutting out the grooves in the face of a wheel and cutting an angular face if desired. The tool is made of hardened steel, and is held in rigid position by an arbor. The arbor fits in a casting which is held in the stock bed of the wheel by heavy bolts. On top of the casting is set a pivoted turntable, which swings the cutting tool to any angle desired as indicated by a scale, and may be rigidly locked in position. The tool being set, it is placed in contact with the spinning wheel, and at the angle fixed by the turntable. As the whirling wheel



The Grinder-Truing Tool as Mounted Permanently on the Grinding-Wheel Bed, and, at the Sides, Two Different Forms of the Tool

comes into contact with the rough, hard surface of the tool, it is milled to the surface desired.

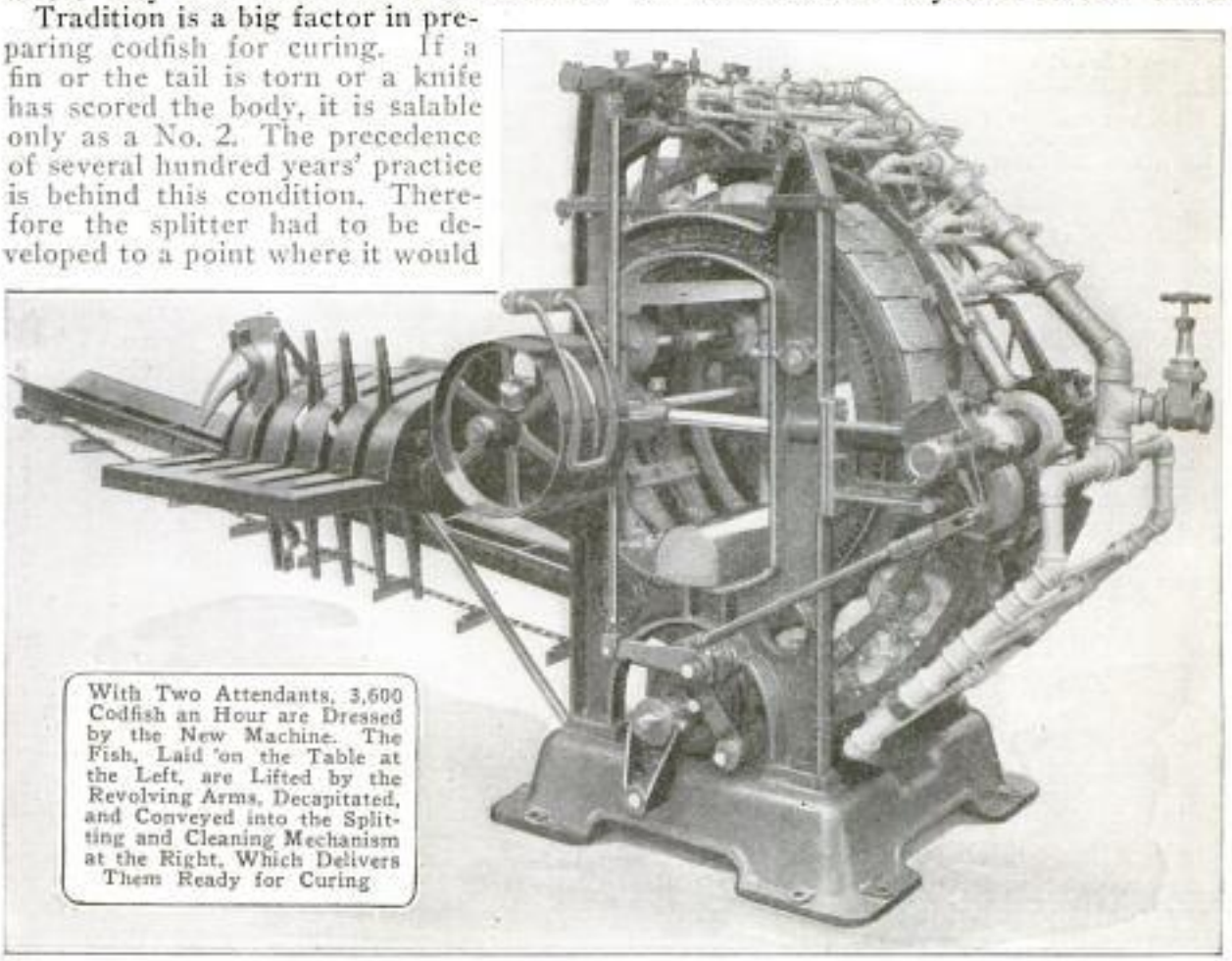
CODFISH RAPIDLY DRESSED BY NEW MACHINE

Following two years of experimental work, a Pacific-coast firm, inventors and developers of the machine which revolutionized the salmon-canning industry, has now brought out a machine known as a "splitter," which dresses codfish in the same efficient way the earlier machine prepares salmon.

Tests of the splitter conducted at the company's plant with Alaska cod, showed that it could handle 60 fish per minute, or 3,600 an hour. Two men are required in operating it. It previously took 20 to 25 men to prepare 3,600 cod an hour.

The cod are placed on the table of the machine and arms lift them through an odd-shaped concave knife, which severs the head. They are then dropped in a trough, where talons on a revolving drum grasp and drag them through a splitting saw, which scoops out the entrails, and through a cutter that removes the backbone as far back as the vent; then they go down through a series of cotton-faced washing rolls, which remove the slime, finally delivering them, ready for drying or salting, to a conveyor near the point where they first went into the machine.

Tradition is a big factor in preparing codfish for curing. If a fin or the tail is torn or a knife has scored the body, it is salable only as a No. 2. The precedence of several hundred years' practice is behind this condition. Therefore the splitter had to be developed to a point where it would turn out 99 per cent No. 1 fish. Besides the labor-saving feature of the new machine, the assured sanitation and the reduction of the accident hazard are important considerations.



With Two Attendants, 3,600 Codfish an Hour are Dressed by the New Machine. The Fish, Laid on the Table at the Left, are Lifted by the Revolving Arms, Decapitated, and Conveyed into the Splitting and Cleaning Mechanism at the Right, Which Delivers Them Ready for Curing

ADJUSTABLE PLUG GAUGE BUILT LIKE MICROMETER

To reduce the number of plug gauges, each representing a particular measurement, which are used for testing the accuracy of cylinder bores, etc., the machine shop is now offered an adjustable gauge. It is provided with a micrometer handle, the turning of which operates two lugs, recessed in the body of the gauge, so that its width can be adjusted to .001 of an

The Adjustable Plug Gauge is Built like a Micrometer and Takes the Place of Many of the Standard Gauges

inch within a range of 1 in. In use, the gauge is set to the proper measurement by turning the micrometer barrel, thus widening or contracting the outside distance between the lugs, and locking them in position by means of a screw at the top of the handle. The device can also be used as an inside caliper, in which case the gauge is first placed in the bore, then expanded and set, and the measurement read on the micrometer scale.

MARKED SPEEDWAY CHECKS SPEEDOMETER ACCURACY

Motorists living in the vicinity of a long level straightaway drive, in a western state, have the opportunity of verifying

A Milepost on the Speedometer-Testing Speedway: Speed Calculations Based on the Time Required to Cover a Mile, and the Speedometer Indication should Agree

the accuracy of their speedometers as often as they choose. The long stretch has been correctly measured and spaced with markers, placed at exact one-mile intervals. By timing himself between markers, a motorist can easily determine his speed, and compare it with the speedometer indication at the same time. Checking the mileage reading is, of course, even simpler, as the mileage recorder should turn up a higher figure for every post passed.

MAKES MOVING MACHINERY APPEAR STATIONARY

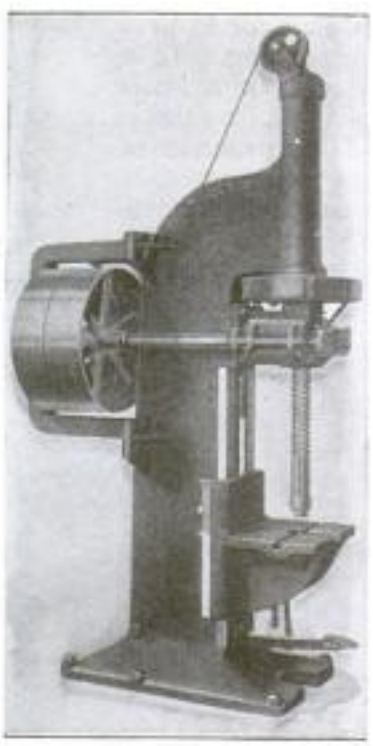
A very ingenious scheme of simple character has been devised for observing the action of rapidly moving machinery. An electrical contact in the primary circuit of a spark coil is arranged to be broken at the instant the parts have a certain relation which is to be examined. A vacuum tube is substituted for the ordinary spark gap, which lights up with a flash that lasts but a fraction of a second.

When a rapidly moving gas engine is examined by this means in an otherwise dark room, the parts appear to be stationary. By devising a suitable dial, or timer head, to control the phase at which the electrical circuit is broken, the relation of the parts at any point in the cycle of motion can be examined. On turning such a dial, the parts under observation appear to move slowly to correspond.

Excellent photographs have been taken with this arrangement. This scheme should prove very valuable in the study of the rapid motions of machines. In many of these, the elastic nature and inertia of the parts cause them to be disposed differently in running at high speed from what is the case at lower speeds or when standing still.

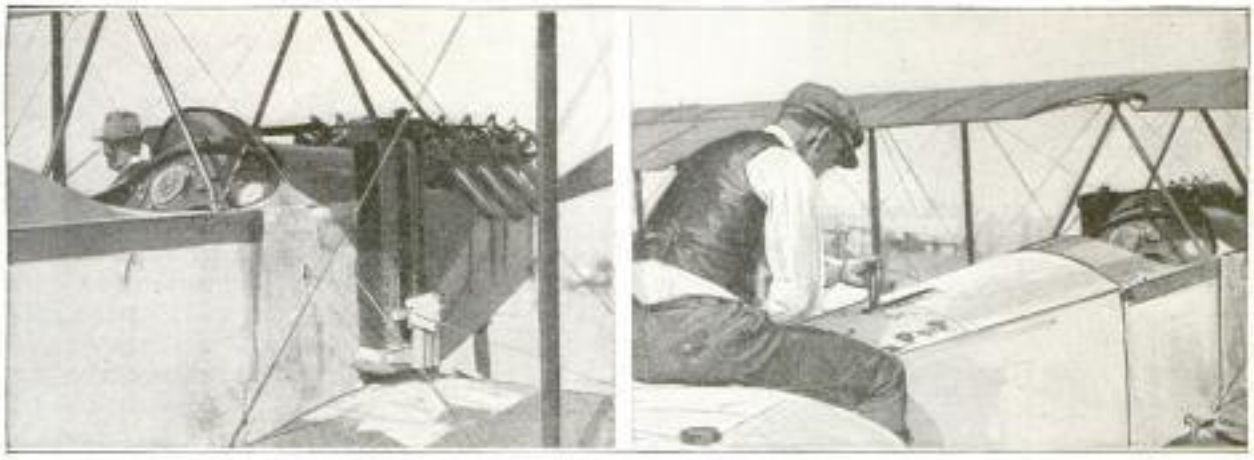
FLEXIBLE POWER PRESS GIVES GRADUATED FORCE

Straightening of metal pieces, pressing in bushings, and other operations that require accuracy in the application of force, can now be performed satisfactorily by the use of a new flexible power press. The



pressing bar of the machine is driven by a worm and wheel and is also threaded. A large nut, which runs on the thread of this bar, or ram, is also a drum for a friction brake and turns when the ram is not moving vertically. The brake is applied by operating a foot lever, thus stopping the nut from turning and allowing the ram to move downward. The tighter the brake is applied, the greater the force obtained at the base of the pressing ram. The machine exerts a pressure of from a few pounds to 20 tons. The ram, when released from the nut, is raised by counterweights in the housing.

PLANE BURNED IN FLIGHT FOR MOVIE THRILLER



At the Left: The Ignition Bombs on the Side of the Gasoline-Soaked Plane, Ready to be Set Off by a Switch. At the Right: The Auxiliary Control on the Fuselage, for Handling the Burning Plane

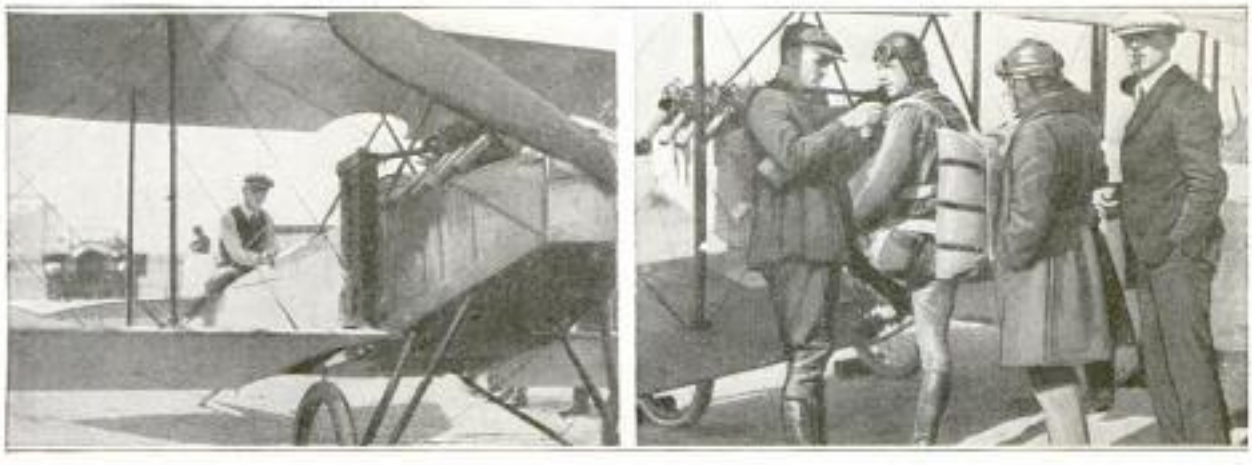
A motion-picture concern was recently confronted with the task of having an airplane catch fire at an altitude of 2,500 ft. and plunge to earth ablaze for the destruction of the villain of the play under production. To accomplish this without loss of life became quite a problem, for a pilot was necessary to get the plane up and to set it afire.

The Wreck of the Burning Plane, Fallen from an Altitude of 2,500 Feet, at Which Height the Daring Pilot Left It by Way of a Parachute

The plane was first wired for ignition and gasoline generously distributed on the wings and elsewhere. A switch was so arranged that, when thrown in, a spark would set off the gasoline. Then a hole was cut in the fuselage, nearly to the tail, and a second "joystick" attached, so that the pilot could control the plane from this point during the first stages of the fire.

A parachute of the government type was provided for the pilot. Three camera planes followed to film the scene.

At 2,500 ft., the daring airman threw the switch and clambered back to the rear control. Here he managed the plane until the fire had gained complete headway, then jumped to safety in his parachute, while the plane plunged to the ground in flames. The gasoline tank exploded just after he had jumped. It is worth recording, also, that the airman had never made a parachute jump before. This thriller is said to be the most dangerous of all.

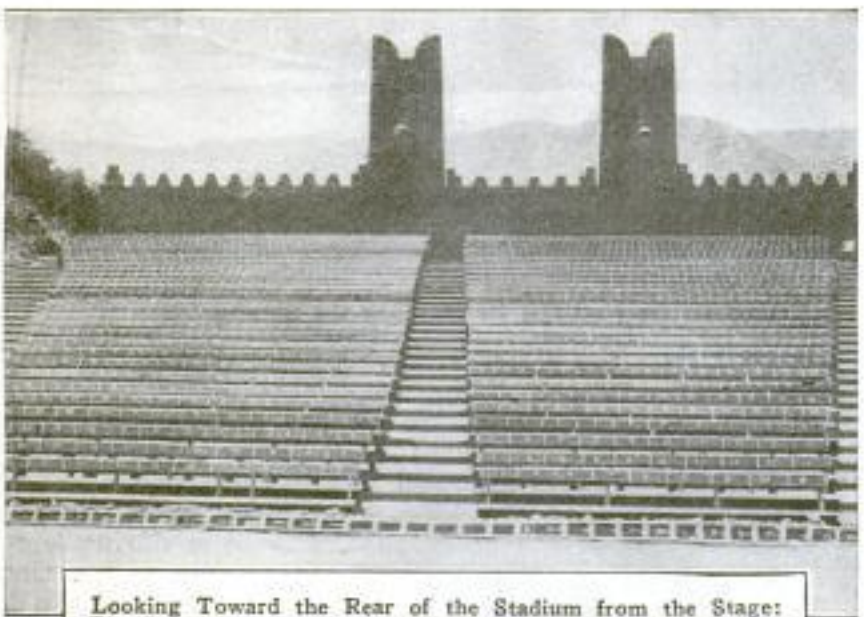


At the Left: Testing the Control of the Plane by Means of the Extra Lever at the Tail. At the Right: The Airman, with the Government-Type Parachute on His Back, Ready for the Perilous Flight

SPECIAL STADIUM BUILT FOR PASSION PLAY

By HAROLD J. WOOD

WHAT is probably the most beautifully situated outdoor theater or stadium in the world has been built at Hollywood, Calif., as a home for "The Pilgrimage Play," an American version of the "Passion Play," portraying the life of Christ from the cradle to the grave, in a superdrama which features all the words spoken by Him in His earthly life.



Looking Toward the Rear of the Stadium from the Stage: The Seats Accommodate an Audience of 1,000, and are Built on Heavy Scaffolding at the Highest Point of the Cañon

The Approach to the Stadium in the Hills: The Ticket Office and Entrance are Seen in the Foreground, and the Grandstand Is Just Back of the Wall

When a group of artistic and dramatic persons in Hollywood had completed the manuscript of the play in collaboration with prominent eastern divines and literary men, they cast about for a satisfactory setting in which to stage the production. A rustic cañon in the foothills at Hollywood offered the best possibilities, but architects and contractors said it would cost upward of $50,000 to erect a theater there.

The nights are balmy at Hollywood, and the play was only to run 10 weeks each summer, so the producers decided to build an outdoor stadium. They secured $15,000, and in the course of a few weeks had completed an altogether satisfactory theater. Many of those who later joined the cast and played in the piece during its first season, assisted in constructing the stadium.

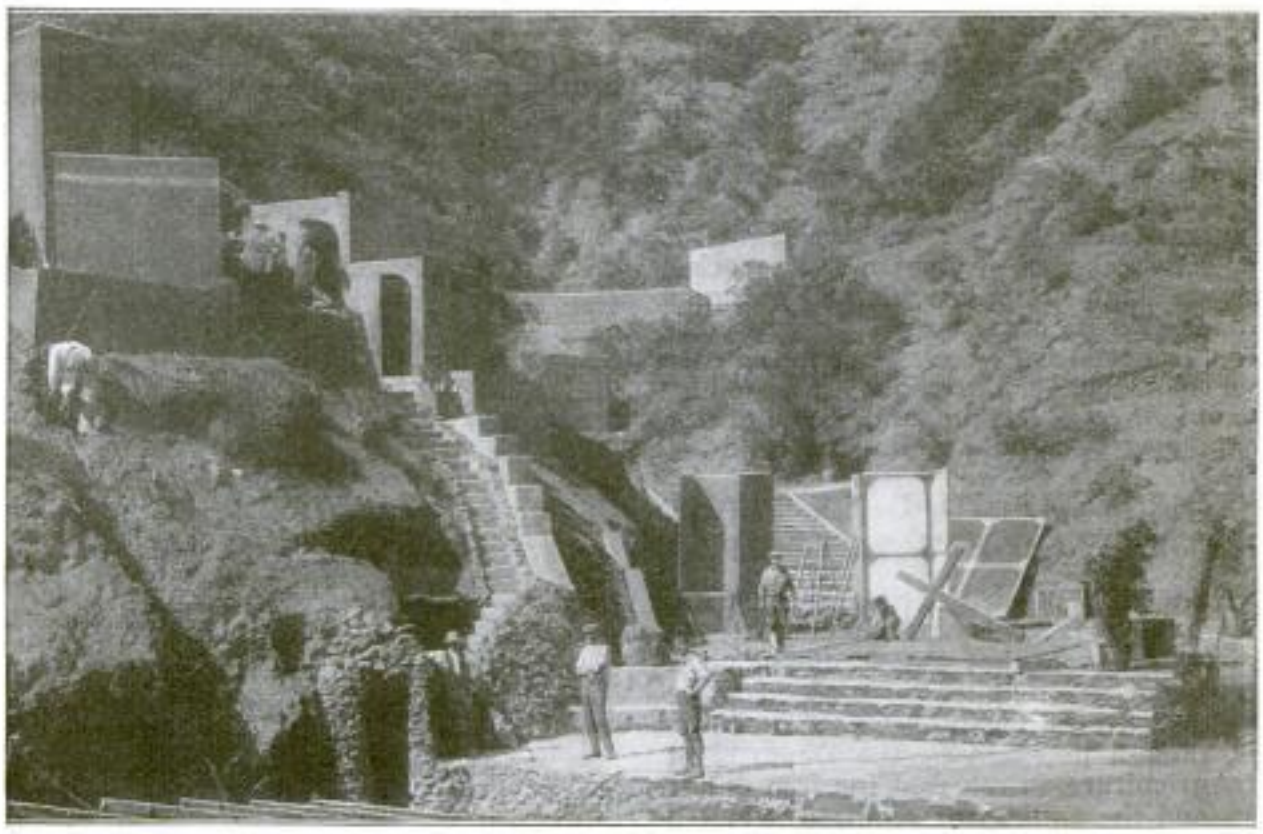
The auditorium proper was erected on heavy scaffolding at the highest point of the cañon. It was made to hold only 1,000 seats, since the management desired that everyone in the audience should have a seat where everything could be plainly seen and heard. The stage is a ground-floor affair, leveled off in the hillside. There are a dozen smaller stages scattered around at distances of from 50 to 200 ft. from the audience, where minor scenes in the production are taking place while the big drama occupies the main stage.

The approach to the stadium features winding gravel paths, with a small box office in the foreground. The rear is walled up and covered with plaster board, which endures in the mild climate. The architecture is decidedly that of Palestine and Bethlehem in the days of Christ, faithful copies having been made from descriptions in the Bible. The stadium has no roof other than the blue and star-studded vault of the sky.

Early Stages of the Construction Work on "The Pilgrimage Play" Stadium in the Cañon: At the Right, Workmen are Seen Building the Scaffolding for the Seats, While the Site of the Stage at the Left is Concealed in the Ravine. More than 200 Players Appear in the Production

More than 200 players participate in the production each summer. By special arrangement with a Los Angeles fiesta committee, which underwrites the Biblical drama to the extent of any deficit at the end of a season, no player gets more than $50 a week, excepting the actor portraying the life of Christ, and no player is permitted to continue in that rôle for more than half a season, as the purpose of the production is to avoid individuality, and stress the life of Christ. The production is nonsectarian, and is given moral and financial support by the leading clergy of many different denominations.

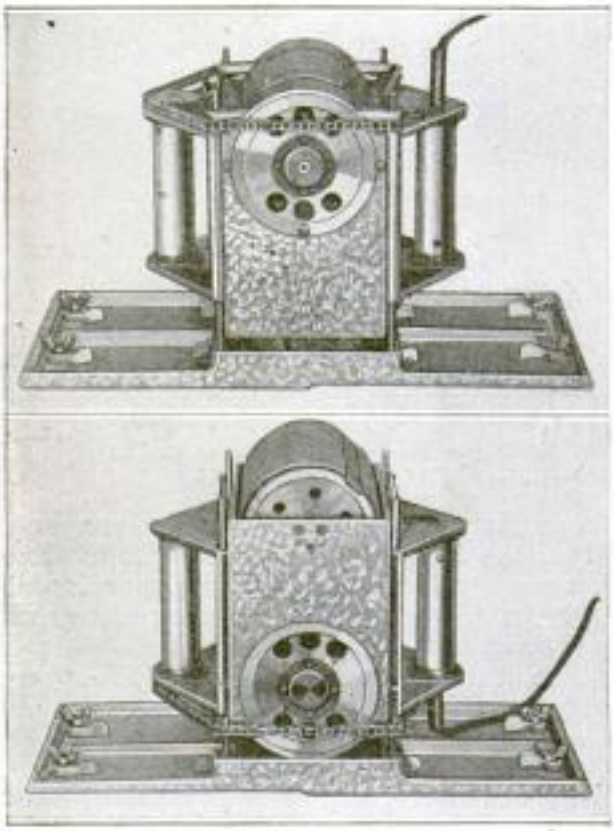
The famous Passion Play of Oberammergau, Bavaria, also is produced in an open-air theater, accommodating 6,000 spectators, and some 700 actors participate; but it is given only every 10 years.



A Part of the Rustic Stage, as It is Built into a Leveled Area of the Hillside: The Architecture Is That of Palestine and Bethlehem in the Days of Christ, Reconstructed from a Careful Study of the Bible

PORTABLE SANDER FOR BOTH FLAT AND CURVED WORK

A portable sander that can be used on curved as well as flat work, is a new product. The driving motor and the side plates



The Drum of the Sander is Lowered by a Chain-and-Sprocket Arrangement. Below: Machine Inverted for Curved Work

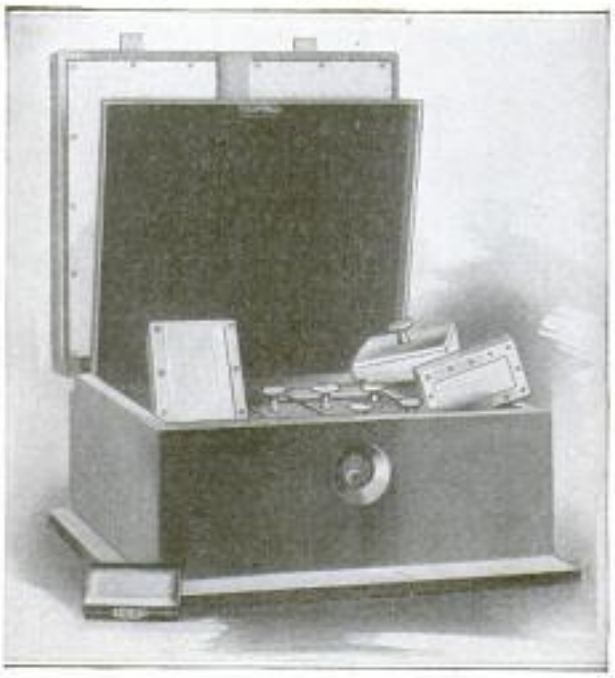
are affixed to four uprights, which in turn are set in an aluminum base. The sanding drum is driven at 4,000 r.p.m. by gearing from the motor, and can be moved up and down, to accommodate pieces of varying thickness, by a chain-and-sprocket arrangement, the four uprights serving as guides. To do curved work, the uprights are unscrewed from their place in the base and the mechanism inverted. The sanding drum is then at the top, and pieces of any shape may be applied to its surface.

GOVERNMENT TO OPEN PLANT FOR SWEET-POTATO SIRUP

Production of sirup from sweet potatoes has progressed experimentally to so practical a stage that a government plant for that exclusive purpose is about to be established at Fitzgerald, Ga. The process, though patented by the Department of Agriculture, is released for free public use, and the equipment required is stated to be simple and inexpensive. The object of the plant is to test the cost of commercial production and the marketability of the new product, which is declared to rival the best corn sirup, and to be valuable for cooking or table use.

PRECIOUS RADIUM IS STORED IN MASSIVE LEADEN SAFE

Gold and precious jewels are no more carefully guarded than is the most fabulously valuable of all substances, radium. However, the reasons underlying the precautions differ greatly. Whereas the former are guarded against theft and harm, the latter is restrained from doing harm, safeguarding against theft being of secondary importance for the reason that no sensible thief would burden himself with a compound only a trifle less dangerous than dynamite, and one which it would be almost impossible to dispose of. The object therefore of the 400-lb. safe in which the mysterious substance is kept, is to prevent its high-speed rays from escaping and interfering with delicate experiments, or causing unsuspected injuries to the laboratory workers. The walls, bottom, and lid of the small but heavy box are made of a 2-in. thickness of lead, with all joints solidly welded. Even this is considered insufficient, and, as a further measure of security, each of the small compartments have lead-covered lids. The massive cover of the safe is counterweighted so that it may be easily raised and lowered. Despite these elaborate precautions, there is a constant seeping away of the all-penetrating rays.



The Radium Safe Has Lead Walls, Two Inches Thick, and Weighs 400 Pounds. It is Designed to Prevent Escape of the Rays Rather Than Theft of the Element

APPALLING WRECK AS ONE PASSENGER TRAIN CUTS THROUGH ANOTHER

ONE of the most disastrous wrecks of all railroad history occurred on February 27 when two fast passenger trains came together at a crossing at Porter, Ind. One, on its way to Canada, had left Chicago at 6:00 p. m., and the other, west-bound, was due in that city a little after 7:00. The Canada train, missing its stop signal, hit the automatic derail at high speed, and plowed over the crossing on the ties. In this position, half across, it was struck by the west-bound train, traveling at practically a mile a minute. So terrific was the impact that the day coach in its path was hurled 50 ft., and literally reduced to splinters. The locomotive, its gruesome work accomplished, and itself torn to a mass of scrap, spun around and rolled over on its side, covered with sinister débris. The list of recovered dead reached a total of 43, and it was concluded that of all those in the crowded day coach, none escaped.

STRANDS OF GLASS IN LAYERS MAKE NEW COLORED PANES

Ornamental windows, colored lamp shades, and all the other wares that call for panes of figured glass, are readily made by the use of a new and remarkable Japanese manufacture just being introduced here. The sheets of glass are not continuous, but are curiously built up of two or more layers of straight, round glass filaments or strands, of a size running about 36 to the inch. Strands in adjacent layers are laid at right angles, like the grain in plywood, and are cemented together with transparent, insoluble glue. Between two such layers, a sheet of oiled paper, bearing a colored design, may be cemented, giving a stained-glass effect of unusual beauty. Designs are also made by the skillful use of strands of colored glass, resulting in a charmingly interwoven geometrical pattern. The completed panes are remarkable for a considerable degree of flexibility. They are easily cut to size, and not so readily broken as sheets of solid glass.

Sample Cut from an Ornamental Window Pane, Made of Layers of Glass Strands, Cemented on Both Sides of a Figured Oil Paper by the New Japanese Process

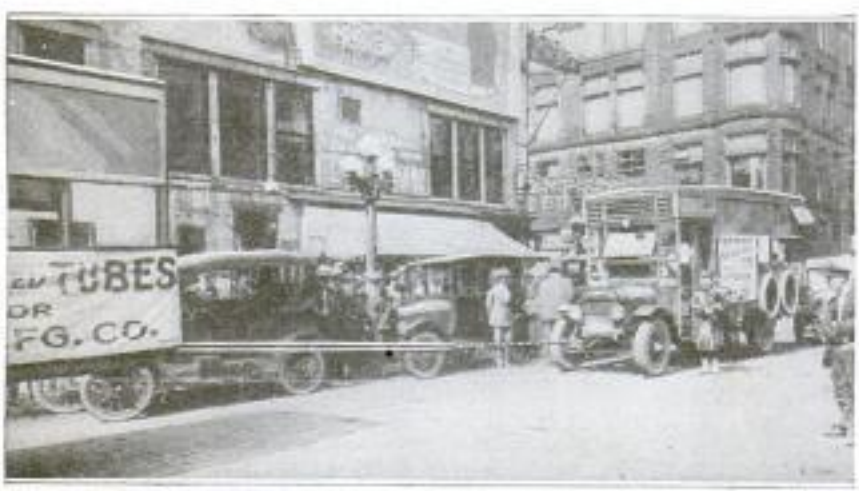
WINE FLOWS IN TORRENTS DOWN CITY GUTTERS

The Huge Tanks Seized by the Revenue Officers Contained $30,000 Worth of Good Wine

There is an ancient figure of speech that pictures wine as flowing like water, but history record no such actual occurrence until the days of national prohibition. Under the still new law, however, many a contraband cask has spilled its potent contents into the gutter. No common casks, but huge tanks, holding $30,000 worth of wine, were the catch of the "revenuers" in a recent Los Angeles raid. Driven by pump through a fire hose, a torrent of the forbidden fluid billowed over the pavement and into the sewer, while the police kept busy preventing souvenir hunters from collecting samples. Tin cups and old cans appeared as by magic in the charmed circle of onlookers, but before they could see service the flood was over.

An Actual Flood of the Forbidden Beverage Flowed in the Street, as the Police Worked to Keep Eager Admirers, with Their Cups and Cans, Away from the Spouting Hose Nozzle

USE INNER TUBE AS TOWLINE TO PULL HEAVY TRUCK



Using an Auto-Tire Inner Tube as a Towline for Pulling a Heavy Truck, a Remarkable Demonstration of the Strength of Good Rubber: The Tube, though Stretched to Its Elastic Limit, Came through the Drastic Test Uninjured

That extraordinary strength may be hidden in the thin rubber of an auto tire's inner tube was spectacularly demonstrated recently in an Indiana city. The tube, of standard endless form, was looped over a coupling pin on the rear of a motor truck, and shackled to a towing chain on another heavy truck. The first vehicle then proceeded to pull the second about by its rubber towline, which came through the remarkable test without losing its integrity.

PRIBILOF FOX INDUSTRY YIELDS BIGGEST HARVEST

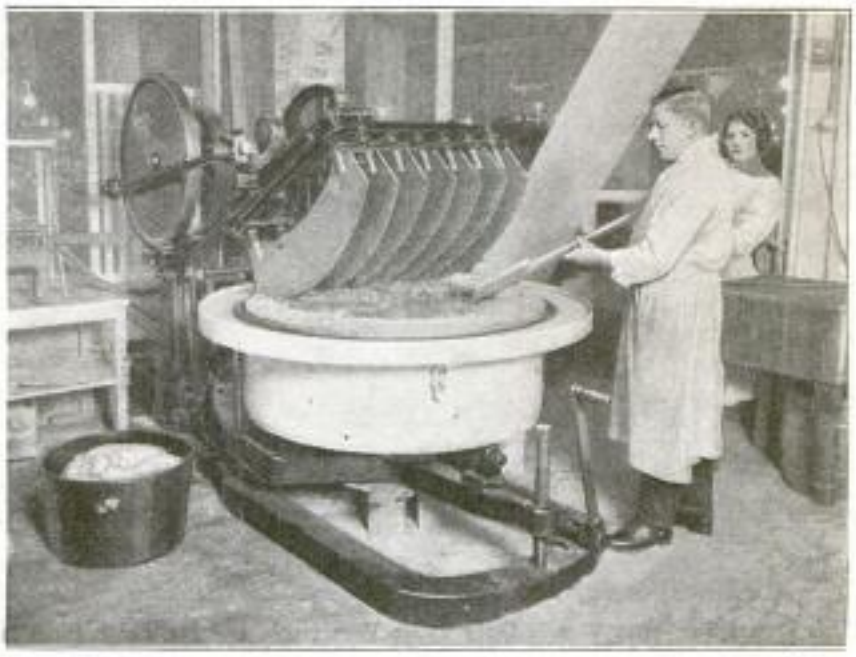
A total of 1,063 blue-fox skins and 15 whites were taken from animals trapped on the Pribilof Islands during the season 1920-21, as compared with 901 blues and 37 whites the previous winter, making the late season the banner year in fox-pelt returns since 1893, announces the Bureau of Fisheries. During the season, 240 pairs of blue foxes caught in a large pen without injury, were freed for breeding purposes in conformity with the policy of the bureau to keep the island well stocked with fur bearers. There were 225 pairs freed last year, and 200 pairs the previous season. In order to avoid duplication in counting the animals, all freed foxes are marked before their release. As a rule, three or four animals out of every average litter born on the St. George Island of the group, attain full size.

BATTERY PLATE REMOVER SAVES WORK

Plates in storage-battery cells are connected together by welding to a long lead part known as a strap. It has been the usual practice to saw off the plates to facilitate their removal when repairing or rebuilding the unit. This narrows the strap and somewhat complicates the process of reassembly. A machine is now introduced which is arranged with a die and pressing lever in such a way that, by slipping the slotted base under the bottom side of the strap and bringing the die down with the lever, the plates may be punched from their position and the strap kept intact.

SAUSAGE MEAT PREPARED BY CHOPPING MACHINE

It is the contention that chopping sausage rather than grinding it, will tend to retain a better flavor and sweetness in the meat. For this reason, a packing company in the Pacific Northwest has installed a device that has the same knife action and rocking motion as the hand chopper commonly used by the housewife. The chopping rig of the machine carries a number of large knives and is propelled back and forth over the meat block by a rod attached to a rotating drivewheel. The block turns so that the whole mass of meat is evenly chopped.



Sausage Meat Prepared with This Machine is Chopped. The Knife Moves Like a Hand Chopper, and the Table Turns Slightly at Each Stroke

AERIAL SUPREMACY DEPENDS ON LIGHTEST METAL

Since the advent of the Liberty airplane engine, developing approximately 1 hp. per 2 lb. of weight, aeronautical engineers seem to have acknowledged that the limit has been reached, at least temporarily, in this direction in the struggle of engine power against weight, and to have turned their attention toward the development of new and light metal alloys or even the commercial production of metals such as magnesium. At present German metallurgists are leading the field, with those of America and France running second. It is generally conceded that future supremacy in the air is destined to rest with that nation which can produce the lightest metals in the greatest quantities.

DWARF SUNFLOWER HAS MANY LEAVES AND WHITE SEEDS

The latest development of the sunflower family stands only 3 ft. high, and its thick, short stalk is covered by a dense mass of large leaves, the flower being white in color, with a large yield of seeds. The leaves not only aid in keeping birds from the bent head of the plant, but offer protection from the wind. It is said that the little sunflower is a record breaker in its line, yielding more seeds per acre than its taller competitors, and that it will ultimately supplant the older kinds. Sunflower seed is coming into more general use as time goes on, and the new variety is looked upon as a thrifty producer of the commodity.

The Dwarf Sunflower Stands Only Three Feet High, and Its Thick Stem is Covered with a Mass of Leaves. The Flower Yields Many Seeds

ABANDONED DOMESTIC CATTLE BECOME WILD AND SAVAGE

That the "veneer of civilization" makes an even thinner cloak for animal nature than for human, is shown by the evolution of a herd of cattle abandoned by their owner, some 25 years ago, in the Olympic Mountains of Washington. These formerly docile creatures, forced to shift for themselves in a wild and inaccessible country, have multiplied to a great herd of savage and dangerous animals, wilder than the old-time buffalo, displaying a decided enmity to man, and with horns developed by necessity into truly formidable weapons. The herd is being tracked, for purposes of study, by scientists of the state museum at the University of Washington.

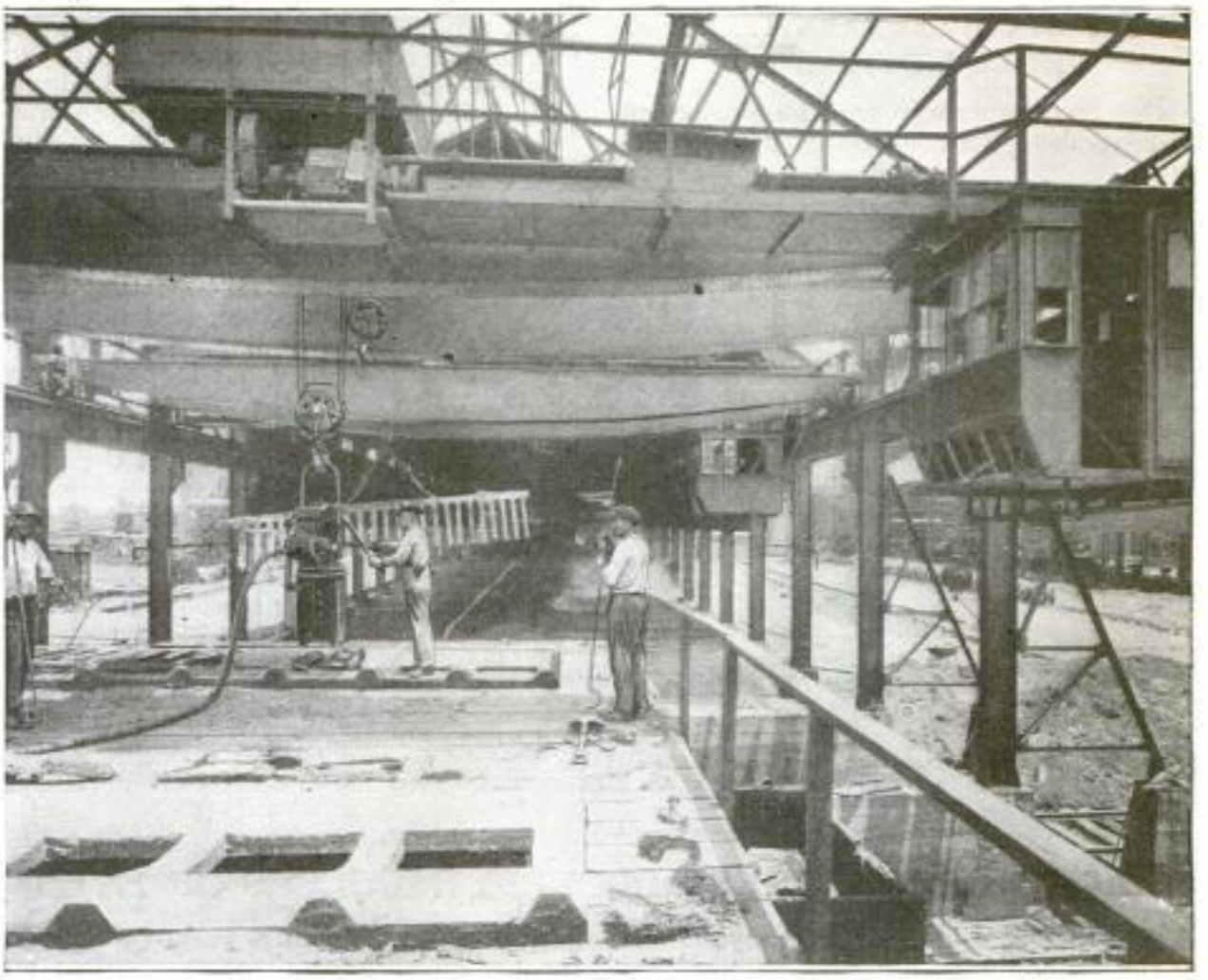
NOBLEST OF AMERICAN RANGES IN ROCKY MOUNTAIN PARK

No less an authority than the U. S. Department of the Interior is responsible for the statement that the most impressive features of the Colorado mountains are included within the boundaries of Rocky Mountain National Park, within a half-day's ride of the city of Denver. From its wooded and flowered valleys, themselves 8,000 ft. above the sea, the Snowy Range lifts its white-patterned ridges until the culminating point, Long's Peak, reaches an elevation of 14,255 ft. The scientific history of the region is declared to be a "romance of geology," for here the strangest and most monstrous of prehistoric creatures lived, pursued their curious prey, and died. The unusual accessibility of the park, the uniform excellence of its weather, and its great health value, promise to make it an increasingly popular resort.

AUTO ROBES CHAINED TO CAR BY THIEF-PROOF LOCK

By means of a device made something like a sugar tong, with needlelike teeth projecting inward from the jaws, robes, coats, and other articles can be securely locked in automobiles or other vehicles. After clamping the jaws shut upon any cloth article, they are fastened by means of a padlock. As the needles penetrate the fabric, any attempt to remove the article simply results in its destruction. The device is attached to the vehicle floorboards by a length of casehardened chain.

The Thief-Proof Auto-Robe Lock. Left: Open, Showing the Interlocking Needle Teeth Which Penetrate the Fabric. Right: Locked



The Pneumatic Pig-Iron Breaker is Hung on the Hook of an Electric Traveling Crane and Poised over the Piece to be Broken. Air Pressure is Admitted to the Piston through a Valve, and the Hammer Descends with Terrific Force

PNEUMATIC PIG-IRON BREAKER DISPLACES MANY MEN

An air-driven hammer for breaking pig iron and castings around blast furnaces, mills, and foundries, has been introduced in the Southeast. One blast furnace follows the method of arranging the rows of iron pigs on a solid base, where they are broken apart by the hammer, after which they fall into railroad cars, completing all the operations in pig-iron production from the sand bed to the railroad cars. The pneumatic hammer is hung on the hook of an electric traveling crane and poised to strike the piece. Air is fed to the piston chamber of the machine through a valve that is operated by moving a lever up and down. When the pressure is applied, the piston drives the hammer down at a terrific rate, and one of these machines has been known to break a piece 8 in. thick. An automatic stroke check is provided to prevent damage in case the machine fails to connect with the piece.

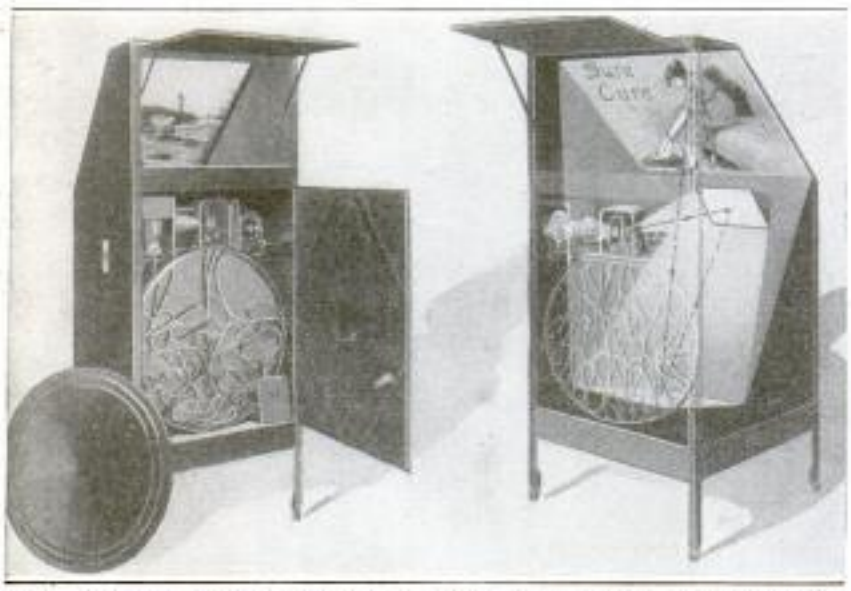
INDUSTRIAL MOVIE THEATER HAS NOVEL ARRANGEMENT

It is not always the theaters conducted for profit that show the most enterprise in pleasing their audiences. An auditorium in a large factory, where movies are shown for the benefit of employes and customers, has recently installed a screen consisting of a single huge plate of ground glass. The pictures are projected upon this from the rear, using wide-angle lenses, so that the machine is quite near the screen. The result is a soft, pleasing picture that cannot be intercepted from the audience, and the usual machine noise is banished.

¶For guiding the patrons of the New York subway through the sometimes intricate passages of the various stations, a continuous black tracer line painted on the ceiling, with instructional marking, is proving very effective. The system might be adopted with advantage in other public places.

STEEL CABINET CONTAINS WHOLE MOVIE SHOW

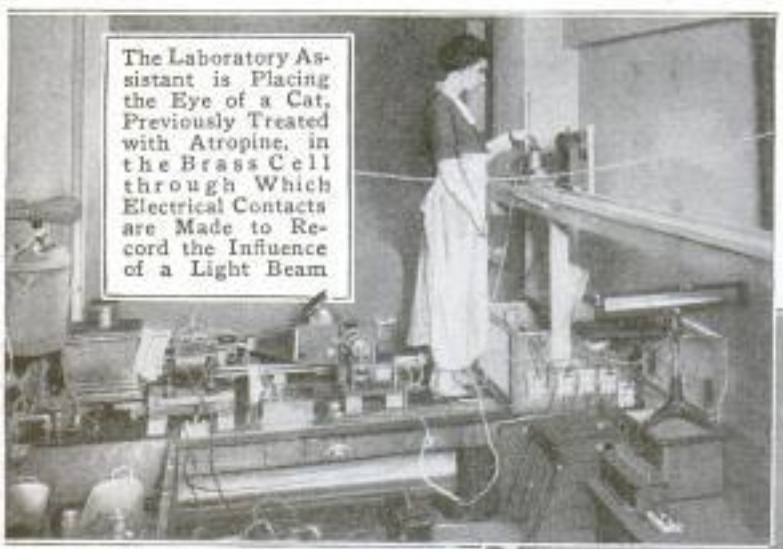
Designed especially for the projection of advertising or educational motion pictures, a novel self-contained unit now on the market is mounted, screen and all, in an enameled-steel cabinet, only 68 in. high, 27 in. wide, and 26 in. deep. It uses non-inflammable film, 1⅛ in. wide, printed from standard negatives, and handles lengths up to 300 ft. The film runs continuously through the machine, repeating itself if desired, and needs no rewinding, as it is not coiled but looped loosely in the magazine. The screen, about 2 ft. square, is in the top of the cabinet, and is observed through a window, being brilliant enough for daylight showing. An incandescent lamp is used, with an automatic switch for shutting off the current if the film should break, and the whole machine operates without attention or risk of fire.



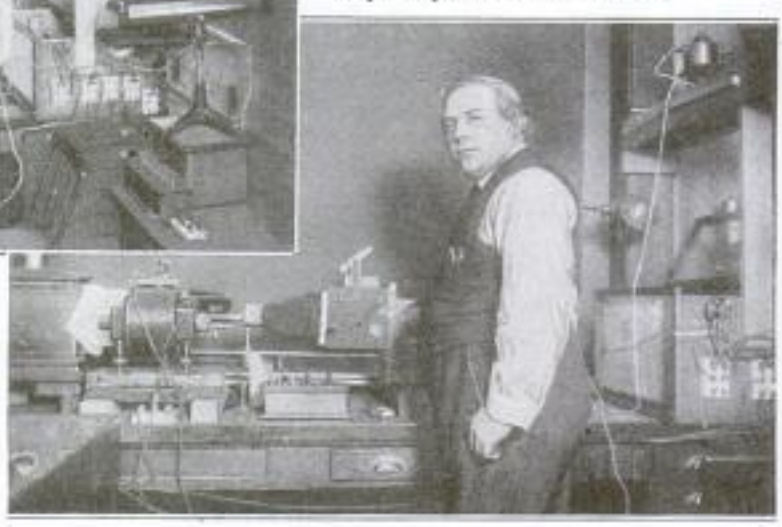
Left: The Movie Cabinet with the Door Open and the Film-Magazine Cover Removed. Right: A "Phantom" View of the Machine and Its Parts

MACHINE MEASURES ELECTRIC IMPULSES OF EYES

That the sense of sight, most mysterious of the functions of life, may be electrical in nature is a strange theory apparently capable of demonstration by a machine now installed at the Harvard Medical School laboratory. In this curious instrument, a cat's eye, treated with atropine to dilate the pupil, is placed in a brass cell, and the optic nerve and iris connected by wires to an extremely sensitive reflection galvanometer. When a beam of light is thrown on the eye through a prism on top of the cell, a minute current is generated, which may be recorded on a photographic chart as a curve. Study of this action is expected to solve many obscure problems of the optical function, and to explain such phenomena as the ability of some blind persons to identify objects near them.



The Laboratory Assistant is Placing the Eye of a Cat, Previously Treated with Atropine, in the Brass Cell through Which Electrical Contacts are Made to Record the Influence of a Light Beam



The Laboratory Equipment for Demonstrating, with Photographic Charts, That the Action of Light on the Eye Generates Electric Current

AUTOMOBILE CONSTRUCTED IN HOME KITCHEN

An Amateur Job of Automobile Building, in the Kitchen of an Upper Flat: The Car Has a Motorcycle Engine and Wheels, and, the Body Being Only 20 Inches Wide, It was Readily Lowered through the Window When Finished

When Albert Pelzel, of Cincinnati, auto mechanic, found himself laid off from his regular job on account of slack work, he did not idle away his time but set to work at once building himself an automobile in which to take his wife and family of three children auto riding this coming summer. The fact that he lived in an upstairs flat and had no place to build it did not discourage him in the least, for he set right to work in the family kitchen and dining room combined, and while his wife prepared the meals, he worked busily on the automobile for five weeks.

How is he going to get it out? Easily. The body is 20 in. wide and the window is 26 in. Just take off the wheels and axles, slide it right through, and let it down to the ground below.

The engine of the machine was taken from a motorcycle, the hood from a "low-priced car," wheels were bought from a secondhand motorcycle dealer; the body of the auto is made of tin taken from a wrecked freight car. All the materials cost less than $100. There is room for the driver and one child in front, and mamma and the other two in the rear.

Run? Yes, Pelzel tried it out the other day as she stands here. The motor hits fine, but as the lady downstairs has a plate rack around the room, he couldn't run the motor very long because she yelled upstairs that the whole house shook, and half the plates fell off the rack.

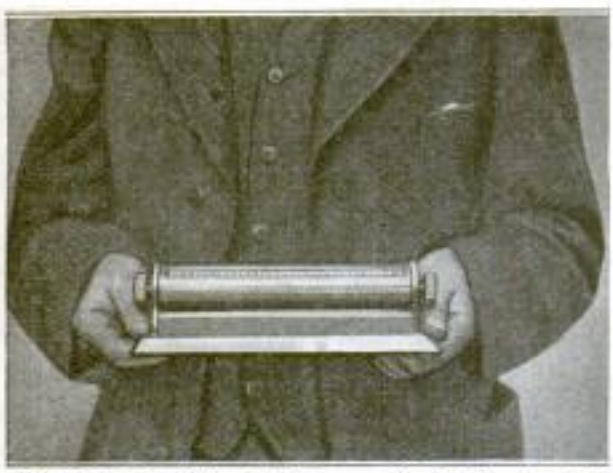
CIRCULAR SAW IS EQUIPPED WITH REMOVABLE TEETH

A circular saw which is equipped with high-speed steel removable teeth, and which has a cutting range of from one-quarter to three-quarters of an inch, is now introduced. Tongues are milled in the saw body, which fit into corresponding grooves in the teeth. The teeth are held in place by cams which jam them against a screw, and the teeth are made with slots to permit depth adjustment. Sash and door factories, box factories, and similar concerns, find the

tungsten-steel face on the teeth very serviceable, and facilities for their removal permit sharpening. In the event of breakage, the teeth are the only loss, for the saw body can be refitted.

RAPID CALCULATOR COUNTS DAYS TO ANY FUTURE DATE

A clever device, invented by a court clerk in a western city, shows upon what



A Handy Calculating Device, on the Order of a Rotating Slide Rule, Which Instantly Shows upon What Date Any Day in the Future will Fall

date any day in the future, counting from the present, will fall. The contrivance consists of a rotating drum, inside a metal cylinder, upon which are printed the months of the year, followed by the year number of the days instead of the month number; for example, December 31 appears as December 365. Directly above a slot in the containing cylinder, in which the figures appear as the drum is turned, are engraved the days of the month from 1 to 31. To find the day of the month 60 days after such a date as, for instance, February 2, the drum is turned until February appears. The figure which appears under the engraved figure 2 will be 33. This shows that February 2 is the 33d day of the year. Adding 60 days to this gives 93—the 93d day of the year. When this last figure is brought into view, the desired date is found to be April 3.

LARGE CANNEL-COAL DEPOSIT FOUND IN SOUTHERN UTAH

Cannel coal, from which petroleum first obtained its name of "coal oil," has been found to exist in a large deposit in the southern part of Utah, on a plateau 3,000 ft. above the north fork of the Virgin River. The product, which yields about 70 gal. of oil to the ton, is composed of yellow, or brown, translucent globules imbedded in a brownish-black mass, and splinters of it are easily ignited with a match. The region is wild and picturesque, making access difficult, but a good wagon road is being constructed from the deposit to the town of Cedar City, which is 35 miles from the nearest railroad. The cannel bed, which is unusually clean, is 5½ ft. thick, overlaid with about 2½ ft. of bituminous coal.

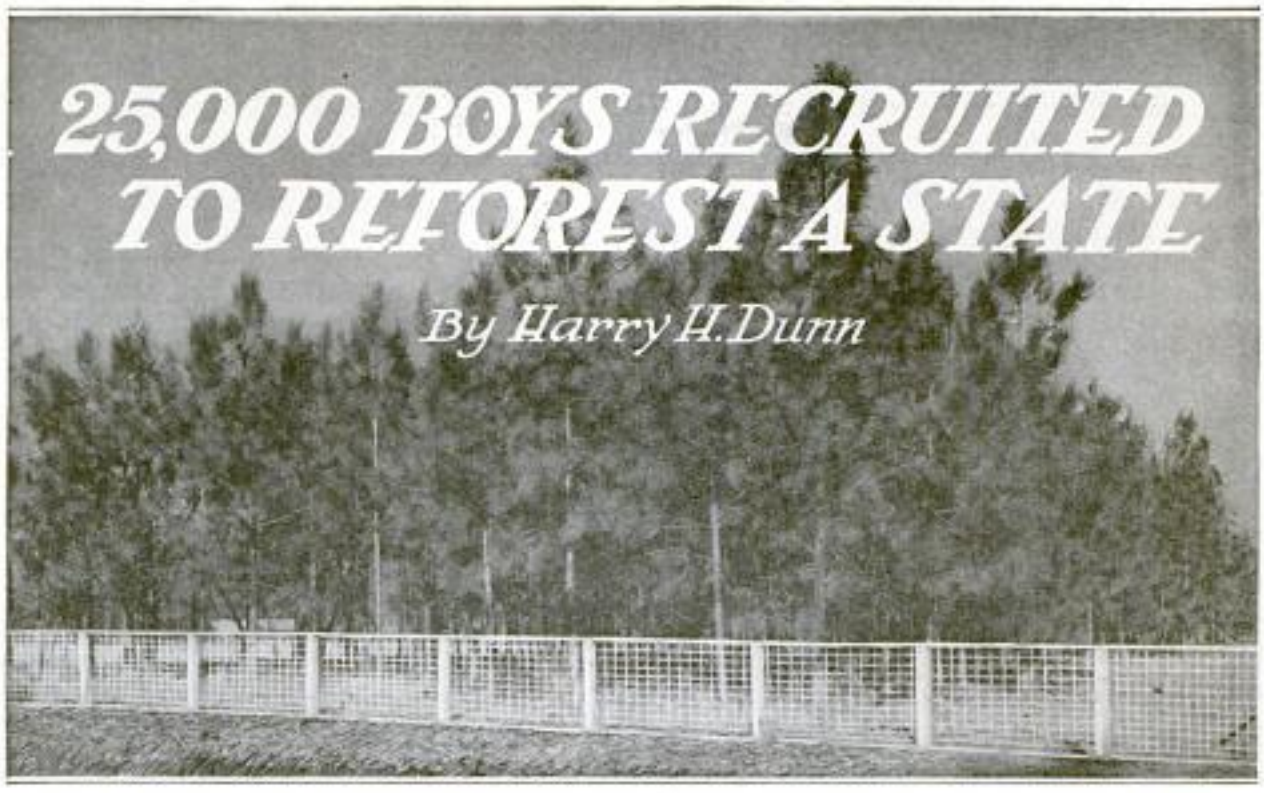
SECTIONAL MILL ROLLS MAKE FOR CHEAP WIRE PRODUCTION

Light rods, such as knurled concrete reinforcers and streamline airplane wire, quickly get out of size during the process of rolling, due to the wearing of the grooves in the rolls which are cut to their size and shape. Such eccentricities necessitate the frequent dressing of the rolls, renewal of the grooves, etc., which entails considerable expense. An attempt to economize in this respect has led an eastern mill to make up the rolls of rings, placed on a central shaft in such a way as to permit the removal of worn sections. The rings are locked into place on the shaft, and each set of two opposite rings represents one pass. Thus as the roll grooves become worn, the sections of the roll may be wedged out from the center shaft until they regain their proper size, or entire removal may be effected without disturbing usable operating parts. Passes irreclaimably damaged are discarded, and new ones fitted in their place, eliminating the necessity of throwing away the entire roll, as was formerly the practice.

The Rolls for Making These Irregular-Shaped Rods are Built Up Segmentally. Such Construction Effects Economy, For It Is Not Necessary to Discard an Entire Roll with Good Passes Left in It, When the Segments Forming the Defective Pass may be Removed

25,000 BOYS RECRUITED TO REFOREST A STATE

By Harry H. Dunn



A Growth of Yellow Pine, 10 Years Old, Properly Planted on a Louisiana Farm Lot, and About Ready to Supply Small Lumber: The Boys' Campaign Seeks to Cover the State with Such Reforested Lots

THE state of Louisiana has called upon its boyhood to replant 4,000,000 of the 12,000,000 acres which have been denuded of forests, and to endeavor to counterbalance the annual cut of 250,000 to 300,000 acres now going on. At the end of January, though the campaign was started only in December last year, approximately 5,000 boys had answered the call to join the reforestation clubs established by the state department of conservation, and, by the end of 1921, it is expected that the 25,000 limit set for the first year's enrollment will have been reached.

The call is being sent especially to farmers' sons, though all boys between the ages of 10 and 18 years are invited to join. Prizes totaling $500, annually, are offered by a large lumbering corporation of the state, to be awarded through the department of conservation, which has complete charge of the campaign. So far as can be learned, this is the first state to enlist its boys as aids in the restoration of its forests, and the idea of beginning with the farm boys is due to the fact that, from the 122,000 farms in Louisiana, 100,000 acres of virgin timber were cut last year. In 1910, with one of every four farms reporting forestry products, sales from these farm timber lands alone totaled $3,600,000. In 1921 the value of timber cut from Louisiana farms is estimated to exceed $7,000,000 in value.

Illustrated Circulars, Giving Information about Trees and Some of the Simpler Lessons in Forestry, are being Distributed Free to All the Schoolboys of Louisiana Who have Enlisted in the Campaign to Replant 4,000,000 Acres of Woodland

It is through the "woodlot," the vacant corner, the bit of uncultivated deforested land on the farm, and the farm boy's familiarity with it, that the state seeks to lay the foundation for the restoration of Louisiana's forests; first the fuel supply for the farm, then timber for the fences, then lumber for the barn, and corncrib, and other outbuildings, and, finally, a last-

ing interest in the restoration and conservation of the forestry resources of the state on the part of the coming generations of men. It is estimated that there are at least 60,000 boys of suitable age for this work on the farms, and that at least half of these farms have from two to twenty acres of woodland, or land which is unused and suitable for the production of timber.

Under these conditions, the work of the boys, leading to the prizes mentioned, has been classified in two divisions: first, the planting of vacant lands, either with seeds or seedlings, and the care of such artificial forests; and, second, the thinning, selection, and care of natural thickets and young forests. There were still standing in Louisiana, at the beginning of this year, approximately 4,500,000 acres of virgin timber, consisting of pine, cypress, and hardwoods. Forestry experts believe that this can be increased by at least 50,000 acres in 1921, and another 50,000 acres in 1922, and so on indefinitely, as soon as the interest and competitive zeal of the state's boys are aroused, since there is an annual "boy crop" becoming 10 years old every spring, interested and instructed by the forestry work of the preceding year, and anxious to "get into the game" with the boys of their neighborhood who already are interested. Thus, the boy crop will keep pace with the reforestation of the state and furnish continually new power to keep the state supplied with timber and lumber.

The state has placed a forester, who formerly was connected with the public schools, and thus is familiar with the American boy, and methods of teaching him, in charge of this reforestation plan, and has issued 5,000 copies of a bulletin describing in simple language the trees best adapted to the lands in various sections of the state; how to tell the ages of standing trees, and how to plant, care for, and protect natural or artificial forests, as well as how to dispose of the products of these forests with the best financial result. Special attention is being paid to the value of standing timber, which has been sold by Louisiana farmers with reckless prodigality in the past, at from one-tenth to one-half its actual value. The lumber companies are interested in the success of the project not alone because it promises to give them a new and permanent supply of

Above: Numbering Trees for Cutting Out on Reforested Land, and for Study by the Amateur Foresters. At the Right: Specimens of Lumber Cut from 10-Year-Old Trees on Replanted Farm Lots. Though This Material Is Not Suitable for Heavy Construction, It Is Quite Satisfactory and Useful for Fences and Some Farm Buildings, and being Grown on the Spot, It Is Decidedly Economical

Reforesting Burned-Over Timber Lands: A More Difficult Work than Ordinary, as the Burned Top Soil must be Plowed Under before Planting

Boys Studying the Age and Growth of Young Pine Trees, for the Practical Application of Their Newly Acquired Knowledge of Transplanting, and for First-Hand Observation of Growing Conditions: Prizes in the Annual Competition Apply to Seedlings and Saplings as Well as Older Trees

lumber by the time the present stand is cut, but because it also will provide men who know lumber from the time it starts to grow on the hillside or in the valley until it leaves the saw for the planing mill.

In another respect, too, the mills are interested. A vast acreage of timber has been cut, and this land is not suitable for cropping for several years after the trees have been cut. This is especially true of cut-over pine lands, since the acids and oils in the pine-needles and rotting stumps destroy the fertility of the soil until they have been cleared off or plowed under several times. If this land can be replanted immediately to pine timber, it will become an asset instead of a liability. The cut-over lands in the cypress and hardwood belts are more suitable for agriculture, but the need for replacement of the hardwood forests is just as great for other reasons. There are about 8,000,000 acres of cut-over pine lands in Louisiana, with some 4,000,000 acres of cut-over cypress and hardwood lands. In the neighborhood of 4,000,000 acres of both classes are included in the farms of the state.

Of course, the boys entering these reforestation clubs are not limited to sons of farmers, any more than the 20,000 boys now enrolled in the cattle, pig, corn, and other agricultural, clubs of the state are all farm boys, but it is expected that the majority of them will come from the farms, since these can raise their own forests on their own lands, provide fuel and timber supply for their own families, and have the product of their labor for their own use. Virtually all the cut-over lands in the state, however, are open to the work of boys who care to take it up, and suitable provision will be made by all the lumber companies for the purchase of the forestry products of these lands, even though the lands themselves do not belong to the boys or to their parents. Experiments made by the department of conservation on individual farms, have shown that a boy can plant and care for at least five acres of forest, yet have plenty of time to attend to his school and other duties. It is doubtful, however, if so high an average will be reached by the boys to be enrolled in the new project. If the average reaches three acres, the proponents of the plan will be more than satisfied, while expectations are for an average of between two and three acres.

Little difficulty will be experienced in obtaining permission for the use of farm lands from the farmers, since an arrangement is to be made with the state government, whereby certain reductions in taxation will be given to those owners of agricultural lands who allow the boys to reforest parts of such areas. The annual prize money of $500, which has been offered through the state department of

conservation by a large lumber company, is available for the present year, and will be divided as follows:

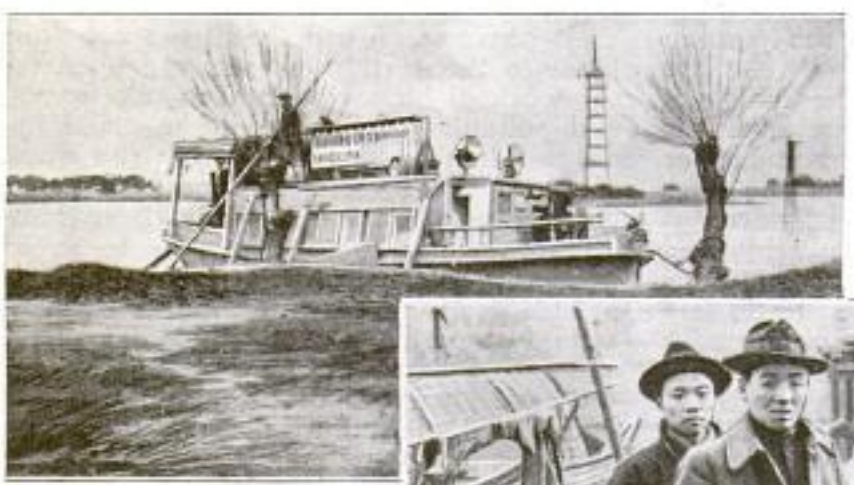
Prizes of $35 each will be awarded to the boys producing the best stand of pine, and of cypress, or hardwoods, of any age, on an artificial plantation; pine seedlings, one to five years old; pine saplings, six to ten years old; small pine poles, 11 to 15 years old; large pine poles, 16 to 20 years old; pine standards, 21 to 25 years old; cypress or hardwood seedlings, one to five years old; cypress or hardwood saplings, six to ten years old; small cypress or hardwood poles, 11 to 15 years old; large cypress or hardwood poles, 16 to 20 years old; and cypress or hardwood standards, 21 to 25 years old.

These 12 classes account for $420 of the prize money, and the remaining $80 will be awarded as a sweepstakes prize to the boy producing the best stand among all classes. This is in addition to whatever class prize he may receive. If no entries in any class or classes are received, the prizes for the class or classes will be divided equally among all the other prize winners, or used as second prizes, according to the judgment of the state forestry bureau, by which all judging and awarding of prizes is to be done.

The prize awards will be based on the following considerations: proper spacing of trees; general thrift, vigor of growth, and freedom from injury of the trees; skill shown in scientific care, the only assistance given the boys being advice and instructions by the agents of the bureau of forestry; value and quality of material produced; judgment shown in marketing this material, which, for the first three or four years, of course, will consist only of small timber taken out in thinning of natural thickets and groves for development, and accuracy and completeness of accounts and records kept.

CHINESE BOAT LIGHTED BY PLANT IT ADVERTISES

An electrically lighted houseboat using a farm-lighting plant made by an American manufacturer, is employed as an advertisement of the outfit, and travels on the water highways of China. Railroad systems are scantily developed in China, and the enterprising native salesman took advantage of its system of waterways to make his territory. The boat is equipped with electrical appliances, such as fans, motion-picture machines, etc. Many of the Chinese living in the interior regions have never seen electric lights, and the appearance of the brilliantly lighted boat causes much wonder among them. Coolies with oars furnish the necessary motive power for the boat, as the humble Chinese do not yet realize the value of equipping their water craft with motors, thereby increasing the value of their waterways.



The Electric-Lighted Houseboat is Shown in the Picture, as It Appears when Docked. Ads are Hung on the Rail Across the Top

The Light Plant of the Houseboat Also Furnishes Power for Fans and Other Electrical Conveniences. Above: The Salesman Aboard the Ship Advertising the Plant He Sells

A View Taken Just before Christmas, 1920: The Susitna River Bridge under Construction during an Alaskan Winter, with the Steelwork Nearly Completed. The Picture was Taken Looking West, and Downstream

BUILD NEW ALASKAN BRIDGE IN DEAD OF WINTER

However pleasant Alaskan summers may be, the winter season is such that sojourners there usually head for the southbound boats in early fall. Wholly uninfluenced by that fact, however, a crew of bridge builders landed at Anchorage, October 22, started work three days later on a bridge across the Susitna River, and removed the falsework from the finished structure on February 2, this year. The big steel span, of 503 ft., weighs 2,000 tons, and rests on two piers 70 by 40 ft., and 50 ft. high, each containing 1,500 cu. yd. of concrete. The bridge is 71 ft. high at the center. Its location, just below a curve of the river, was carefully studied through three winters, to avoid the enormous ice jams of the region.

ENGLISH PEOPLE TO REPRODUCE GARDEN OF SHAKESPEARE

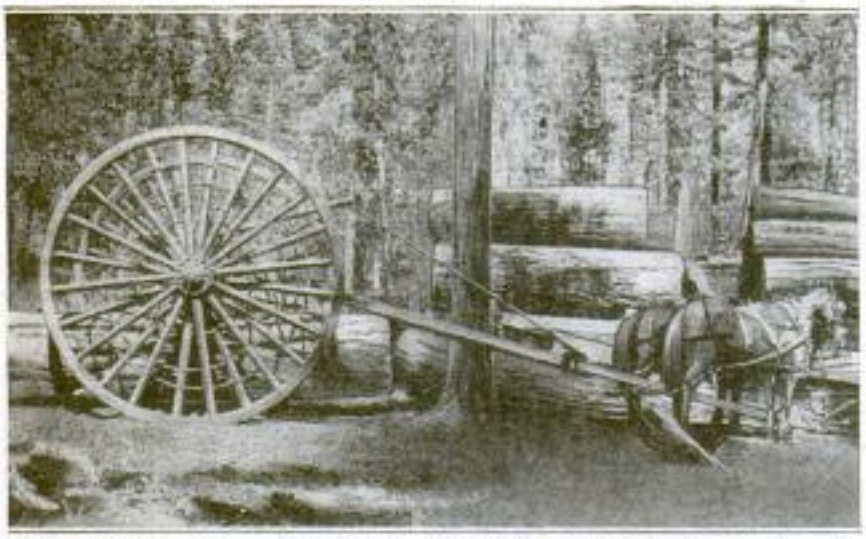
The trustees of the home of William Shakespeare, at Stratford-on-Avon, have reproduced the garden that the poet loved and cultivated in his day. Old literature which tells of the flowers and plants common then was consulted for direction in laying out the garden, and a general appeal to the people of England to contribute the plants met with an eager response from all classes. The king and prince of Wales contributed their share, and from palace gardens in which Shakespeare is known to have acted, came the old-fashioned rose trees. The planting of the rose trees was done by Lady Fairfax-Lucy, who is a descendant of the magistrate that punished Shakespeare for poaching deer in the days of his wild youth. The garden is Elizabethan in design, having its walks bordered with box, and it is expected that the historical spot will soon look and bloom very much as it did when Shakespeare walked there.

WEDGE THAT WAS LINCOLN'S NOW IN NATIONAL MUSEUM

One of the most cherished of recent additions to the historical exhibits in the National Museum, at Washington, D. C., is a plain iron wedge, such as was used for splitting rails to make old-time fences. Its only decoration is the initials "A. L." on one of its parallel sides, chiseled, it is said, by the great rail splitter Abraham Lincoln himself, for the wedge is attested to have been his property. It was unearthed in 1885 near the abandoned original site of New Salem, Ill., and was given to the museum by Henry W. Allen of California.

AUTOMATIC TONGUE ON WAGON AIDS LOGGING OPERATIONS

By adding a simple device called a "slip tongue" to the familiar type of big-wheeled logging wagon, a western lumber operator has converted the crude vehicle into an automatic load-handling machine. A lever rising from the axle is attached to a sliding sleeve on the tongue. Starting the horses pulls the sleeve and lever forward, which lifts the log from the ground and suspends it below the axle. On a downgrade, when the pull on the slip tongue is slackened, the log rests on the ground and acts as an effective brake.



A Log-Hauling Wagon Fitted with a "Slip Tongue": The Lever above the Axle is Pulled Forward When the Team Starts, Lifting the Log. On a Downgrade, the Log Drops and Acts as a Brake

OIL MAN USES SMALL DERRICK FOR RADIATOR-CAP ORNAMENT

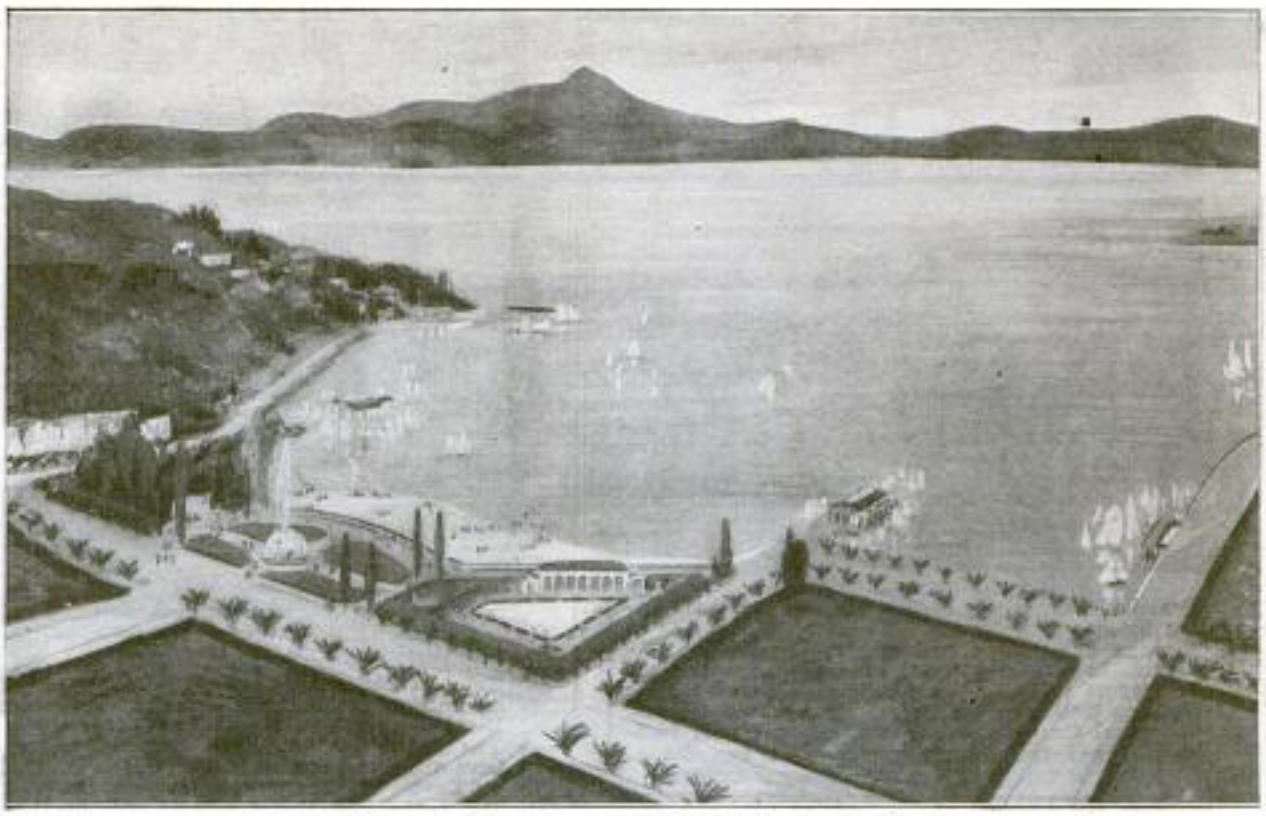
A small nickel-plated oil derrick is poised on the radiator cap of a Kentucky oil man's automobile, as a symbol of the industry with which he is connected. It is made of sheet brass and stands five inches high. Protruding through the radiator cap and in the center of the little derrick, is a thermometer which tells the temperature of the water in the radiator and may be read through the cross supports of the derrick.

ROCK SQUEEZER ELIMINATES BLASTING OF COAL DEPOSITS

By the use of telescoping rams which are operated with hydraulic pressure, it is now possible to force out rocks and seams of coal without blasting. This new method is in use in England. Holes are bored in the rock or coal to the depth required and of a diameter that will suitably accommodate the rams. Hydraulic cylinders, located behind the rams and at right angles to them, furnish the power, and as the pressure is applied, the rams enter the holes. The telescoping takes place, and as the larger sections come into place, a tremendous outward pressure is exerted, and the rocks give way. The rams are built in various diameters and arranged in multiples. Pressures of from three to five tons per square inch are usually employed.

SAN FRANCISCO AQUATIC PARK TO BE CITY'S PLAYGROUND

Work is well under way, in San Francisco, on what is expected to be a masterpiece of city-park building. The site chosen for Aquatic Park, as it will be named, is on the shores of a cove sheltered by the terraced slopes of Fort Mason promontory, on the west, and an artificial breakwater, a continuation of Hyde Street, on the east. So perfect is the protection that, even during high winds, the tranquil locked-in waters of the cove invite swimming and boating. Other natural beauties of the setting are broad views of magnificent Golden Gate, and a hazy vista of Mt. Tamalpais and the beautiful Marin Hills. Designed as a recreation center, the splendid playground will be equipped with athletic fields, bathing beaches, and bathhouses; an open-air swimming pool, and a smaller wading pool for children, a boat clubhouse and pier, bandstand and dancing platform, and many other attractive features. In response to a prize-contest offer, two famous artists submitted designs of such excellence that both were awarded first prize, and the best features of both were blended into one harmonious whole. The initial expenditure will amount to $40,-



The Design of San Francisco's New Aquatic Park Is a Blending of the Best Features of the Drawings Submitted by Two Famous Artists. To the Left Are the Terraced Gardens of Fort Mason Heights, While Away in the Hazy Distance, across the Expanse of the Golden Gate, Towers Mount Tamalpais, Flanked by the Marin Hills

000 or $50,000, while an estimated total of $250,000 will be needed to complete the undertaking.

WILL ERECT STONE PYRAMIDS ON WESTERN BATTLE LINE

Simple pyramid-shaped monuments of white stone, distributed at intervals from the North Sea to the border of Switzerland, are to be erected to mark the last battle line of the World War's western front. They will bear no decoration but a soldier's helmet, crowned with laurel, and the inscription, "Here was Stopped the Onrush of the Barbarians." Sculptor Paul Moreau Vaultier is the designer, and the Touring Club of France is the donor, while Marshal Pétain will decide the number and location of the markers. The original idea of a great national highway, to run the length of the battle line, has been abandoned because of its high cost.

¶Aerial bombs to the number of 298, weighing up to 1,000 lb. or more, will be dropped by U. S. Navy fliers upon nine former German warships, next June or early July, in the greatest of target tests. Four of the German vessels are submarines. The obsolete American battleships "Iowa" and "Kentucky" also will serve as targets, but only for dummy bombs.

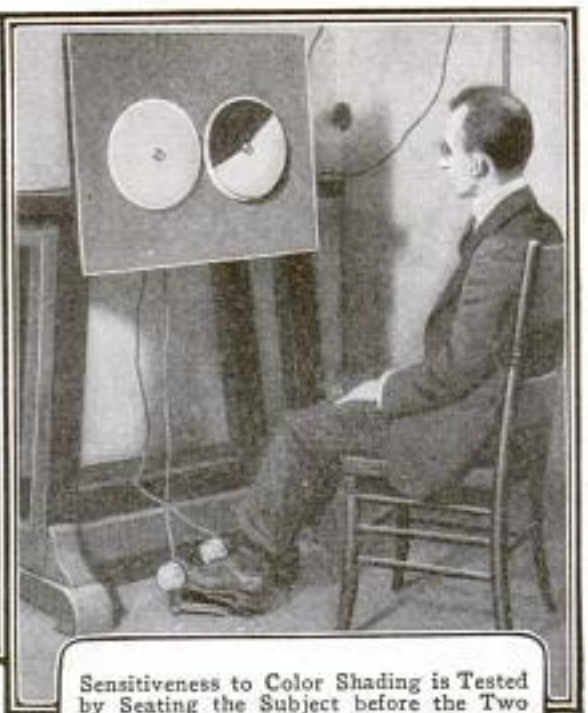
PYRAMIDAL STRAWBERRY PATCH BUILT OF CONCRETE

A novel example of the intensive working of soil is the scheme adopted by an eastern fruit grower in planting a quite extensive strawberry patch on a limited area. A four-sided pyramid of concrete, divided into steps, or terraces, which are hollowed out to form trenches, occupies a small space. Soil in the trenches furnishes sufficient food for the plants, and a sprinkler pipe, protruding through the top of the structure, makes the owner practically independent of weather conditions. Covering the whole deeply with straw in the fall, prevents killing of the plants.

The Four Sides of the Concrete Strawberry Patch Support More Plants Than would the Small Area of Soil Which the Pyramid Occupies

COLLEGE USES CURIOUS INSTRUMENTS TO TEST

Practical Psychology has Become Virtually an Exact Science at Columbia University, by the Use of Strange but Simple Instruments. Here, for Example, Is a Nerve Test, in Which the Subject Endeavors to Put a Needle through a Small Hole without Touching the Sides. If Contact Occurs, Electrical Connection is Made, and a Signal Indicates That the Person under Test has Failed



Sensitiveness to Color Shading is Tested by Seating the Subject before the Two Disks with Black and White Sectors. The Proportion of Black Required to Give the Sensation of Gray is Decided by Revolving One or the Other of the Disks, the One at the Left in the Picture being Seen in Revolution

The Various Tests are Applied to Prospective Students at the University, to Determine Their Relative Mental Fitness and General Efficiency. The One Seen Here is Designed to Try the Subject's Control of Vision. He is Required to Concentrate His Gaze upon the Reflecting Prisms before Him, in Which Appear the Images of the Two Similar Pictures Mounted on Adjustable Supports at the Left and Right. These Two Images must be Made to Coincide and Blend into One by a Mental Effort of the Subject, and It Is the Ease or Difficulty with Which This Result is Achieved That Determines His Particular Rating in the Test

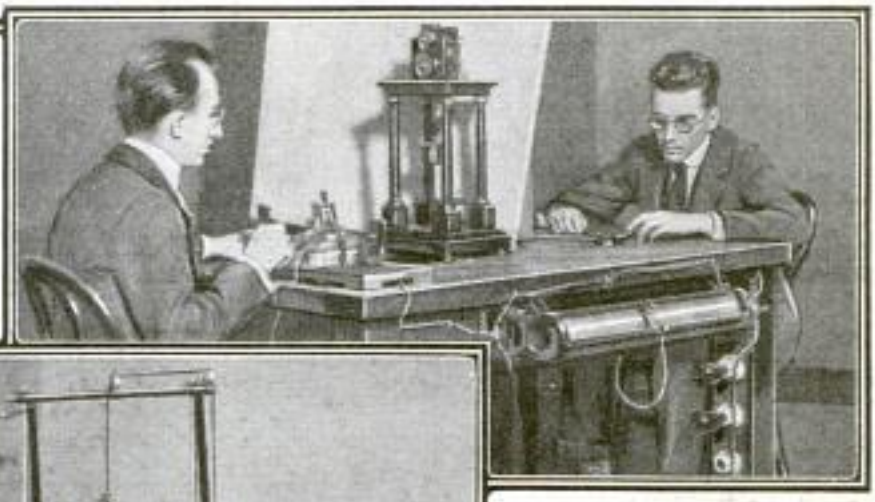
Determining Sensitiveness to the So-Called "Labyrinthine" Sensations, a Test to Which Candidates for the Air Service were Subjected during the War: The Subject is Strapped to a Tilting Board, Which can be Balanced at Varied Angles by the Sliding Weight, and Revolved as Well as Gyrated Most Erratically. The Differences of Individual Response to This Treatment Are Quite Pronounced

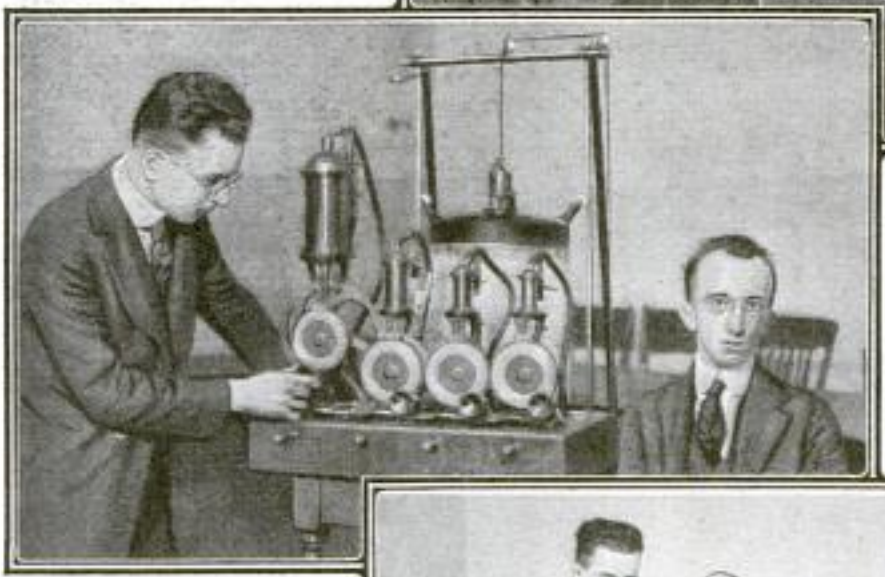
MENTAL ALERTNESS OF PROSPECTIVE STUDENTS

The Subject's Judgment as to the Weight of Various Samples is Determined with the Aid of a Revolving Table, around Which the Weights are Placed. They are Picked Up as They Pass, and Their Weight Estimated as Accurately as Possible

A Color Perimeter is Used to Measure the Subject's Field of Vision, and the Color Zones of His Retina. His Head Being Held Immovable and His Vision Fixed, the Angle of Perception is Indicated on the Semicircular Member

The Test Depicted at the Right is Designed to Measure the Elapsed Time between the Production of a Signal and the Subject's Indicated Reception of It. The Tester, at the Near End of the Table, Creates the Signal with a Telegraph Key, and the Subject, at the Far End, Records It as Soon as He Can, the Instrument Indicating the Time Required





Perception of Differences in Tone is Accurately Estimated by the Use of the Intricate Mechanism Seen at the Left, in Which the Air in the Miniature Gas Holder at the Rear, Forced Out as the Bell Descends, is Employed to Actuate the Various Tone-Producing Units. Both Physical Hearing and Mental Response are Indicated by This Method of Trying the Prospective Collegian

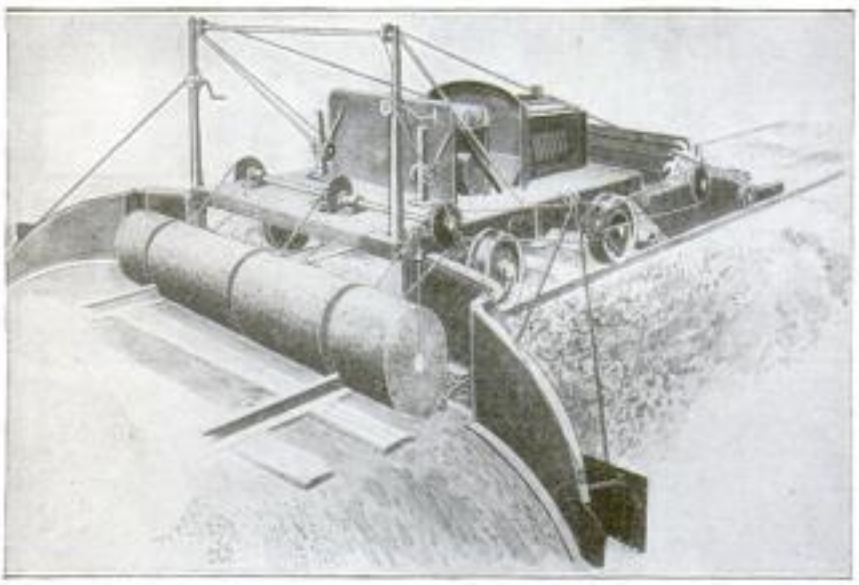
The Ability to Perceive Slight Differences in Length Is the Subject of Another Interesting Test, and the Student is Required to Record His Decision as the Instructor Conducts the Trial with the Aid of the Apparatus Shown, Which is Called a Galton Bar. In Another Test, Not Illustrated Here, a Pendulum Swings Down through the Arc of a Circle and Strikes against Its Base, and the Subject Estimates the Distance of Its Drop by the Sound

KEYSTONE VIEW CO.

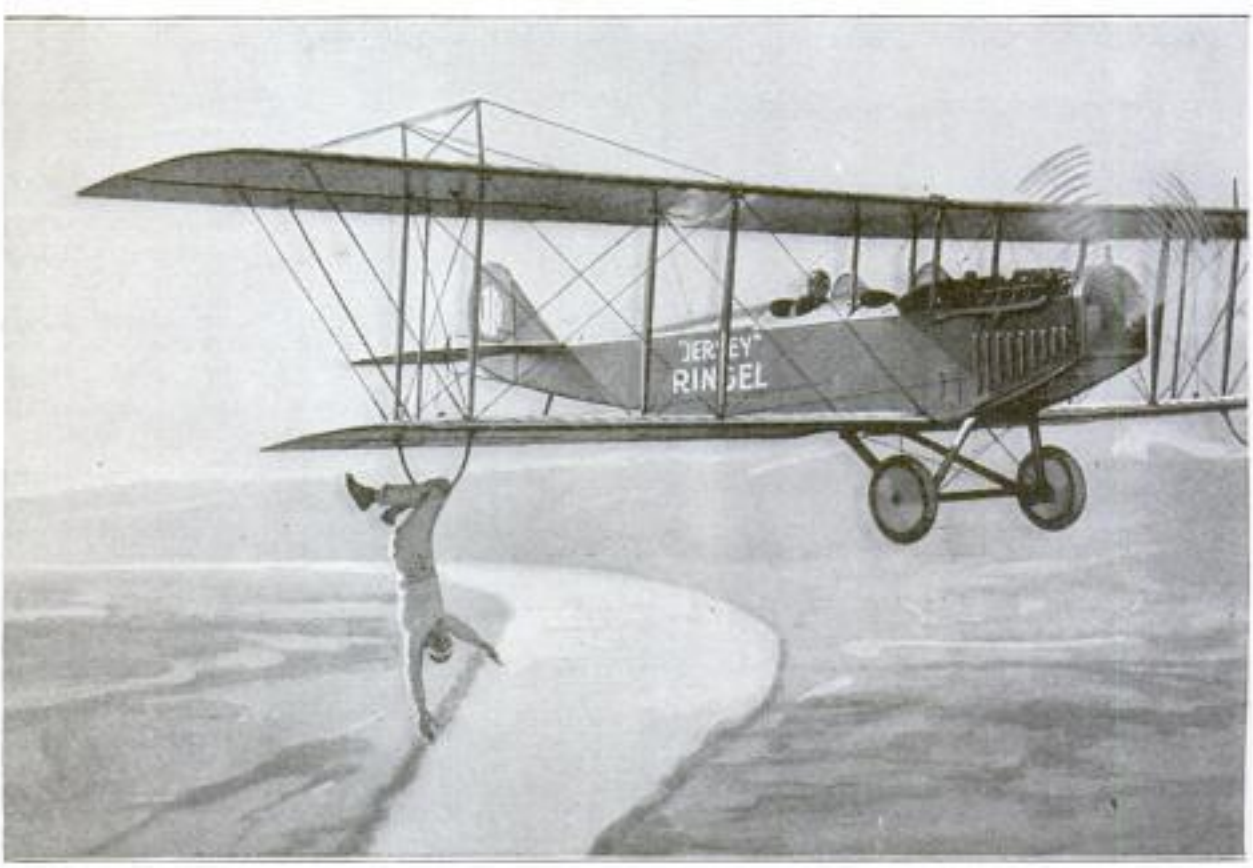
MECHANICAL SECTION GANG REPAIRS RAILROAD TRACKS

A gasoline-driven roadbed machine for use on railroads combines a large number of operations. The machine is equipped with a spreader, weed cutter, tamper, and sweeper, and travels on the rails.

The material for ballasting the roadbed is thrown on before the arrival of the machine, and the spreading roller distributes it to all points evenly. Following the distributing roller, another roller tamps the ballast down. The weed-cutting knives project from the sides of the car and are backed by plate-steel plows, which throw the weeds to the sides. In the rear of the machine is the cylindrical sweeping brush, which passes over the newly laid bed, giving it a clean appearance. The car is operated by one man, and by its general use a great deal of track labor may be dispensed with, materially reducing roadbed upkeep costs.

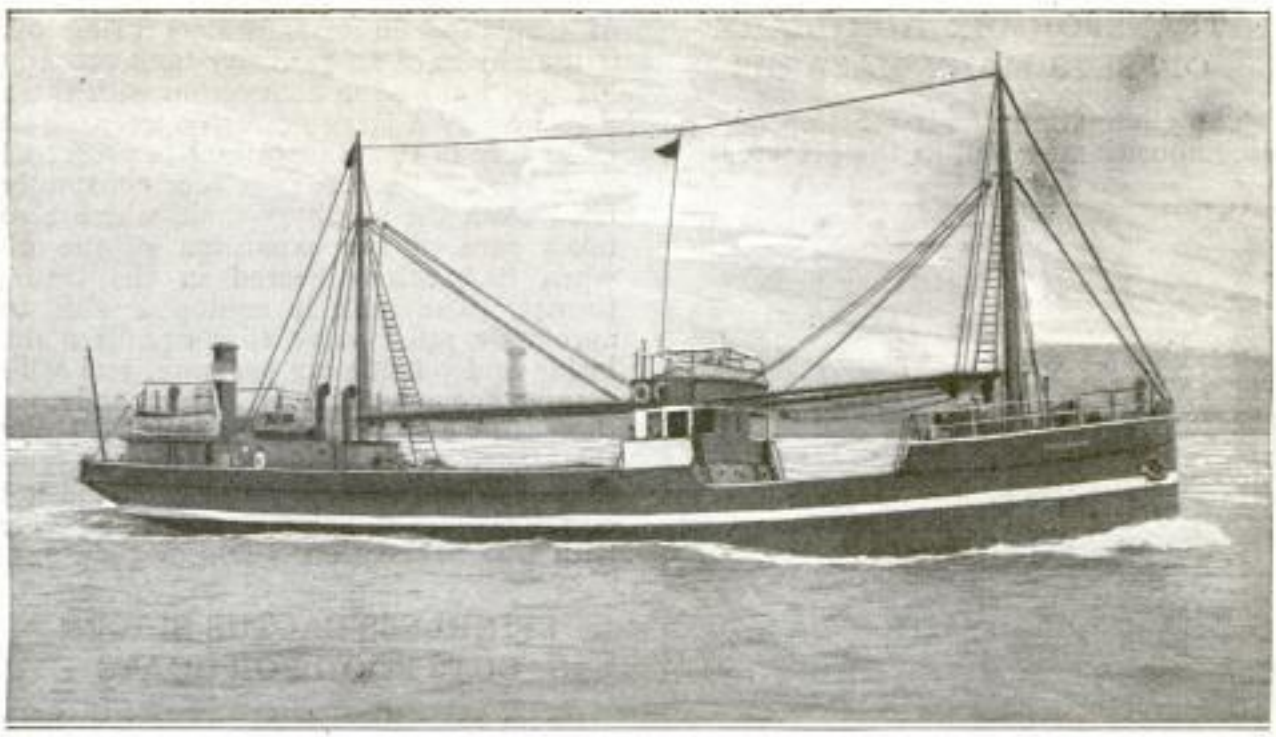


The Mechanical Section Gang Travels on the Rails. The First Roller Spreads the Ballast, the Second Tamps It, While in the Rear, Weed-Cutting Knives and Sweeping Brushes Clean the Roadbed. Only One Man is Needed for the Operation of the Machine



AIRPLANE ACROBAT PERFORMS HAIR-RAISING STUNTS

AIRPLANE acrobats are becoming more daring despite the fact that the slightest miscalculation usually results in sudden death. The stunt pictured above is part of the routine performance of a particularly courageous aerial performer claimed as a native son by the city of Newark, N. J. Besides this favorite he also indulges in the pastime of hanging by his heels from a swaying, whipping rope ladder suspended from the bottom of the plane or standing upright between the planes while the machine "loops" and "rolls." **As a tribute to his native state, he is known by the nickname of "Jersey" Ringel.**



The Steamship "Fullagar," Recently Launched in an English Shipyard: All of the Joints of Its Hull were Made by Welding. The Ship Is an Experiment to Decide the Value of Welding in Ship Construction

WELDS TAKE PLACE OF RIVETS IN OIL-DRIVEN STEAMSHIP

The steamer "Fullagar" recently launched in a British shipyard is a model of the welding method of fabrication. The hull was built in the usual way, with the exception that the plates were prepared for welding instead of riveting. Inasmuch as the steamer is a test of the service and practicability of welded joints, many different types of joints were used, and a new system of welding, known as the quasi-arc, applied. Some of the plates were lapped and continuously welded inside and out. Others were placed end to end and reinforced with light metal strips, to resist breakage due to vibratory shock, and then welded. At points where watertight joints were not necessary, tack welds were used, the joints being located at intervals instead of continuously. It was necessary to train welders especially for this work, as it is an entirely new departure in the welding art.

MODERN INDUSTRY AND ANCIENT SUPERSTITION MEET IN CHINA

Chinese superstitions may be groundless but, having the momentum of centuries of belief, they must be taken into serious consideration when dealing with laborers of the Celestial empire. This was strikingly illustrated when a factory employe in Shanghai lost two fingers in a buzz saw. By some chance the report became current that evil spirits were at the bottom of the accident, and the timid, though highly efficient and intelligent, workers called an impromptu strike until a native priest was summoned to drive the demons out. This he did by burning a paper image of the saw. Satisfied, the crews cheerfully returned to their tasks.

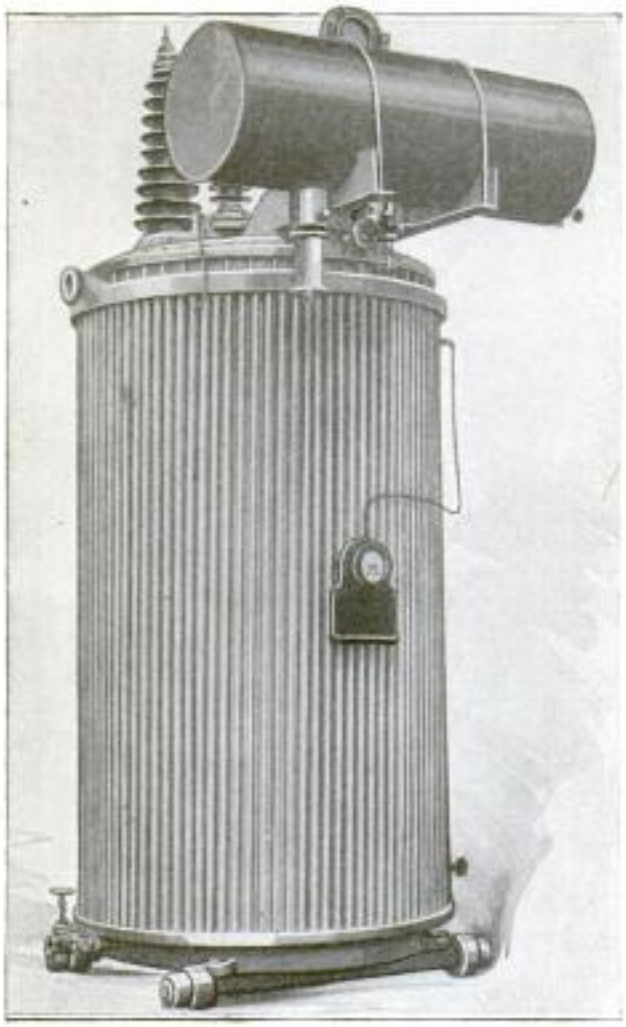
NEW PROCESS QUICKLY CURES SQUEAKY AUTO WHEELS

The annoying squeaking of automobile wheels usually indicates wear between the rims and felloes, or at the hub ends of the spokes, which, if not remedied, will eventually result in the collapse of the wheel. The usual repair practice is to build up the worn parts with sheet iron, burlap, or coarse canvas, and again shrink the rim in place. This is a makeshift expedient at the best, as the filler quickly wears and the looseness returns. A new filling material which, according to the claims, is heat and waterproof, is said to make a permanent repair for the reason that it is made up of a specially compounded fabric which is very tough and wear-resisting. The application is practically the same as that of the older materials.

¶A curious form of phonograph needle is now being manufactured from the thorns of a plant found in the Ozark Mountains, set in tiny metal tubes. Each needle plays up to 30 records.

TRANSFORMER AUXILIARY OFFSETS MANY HAZARDS

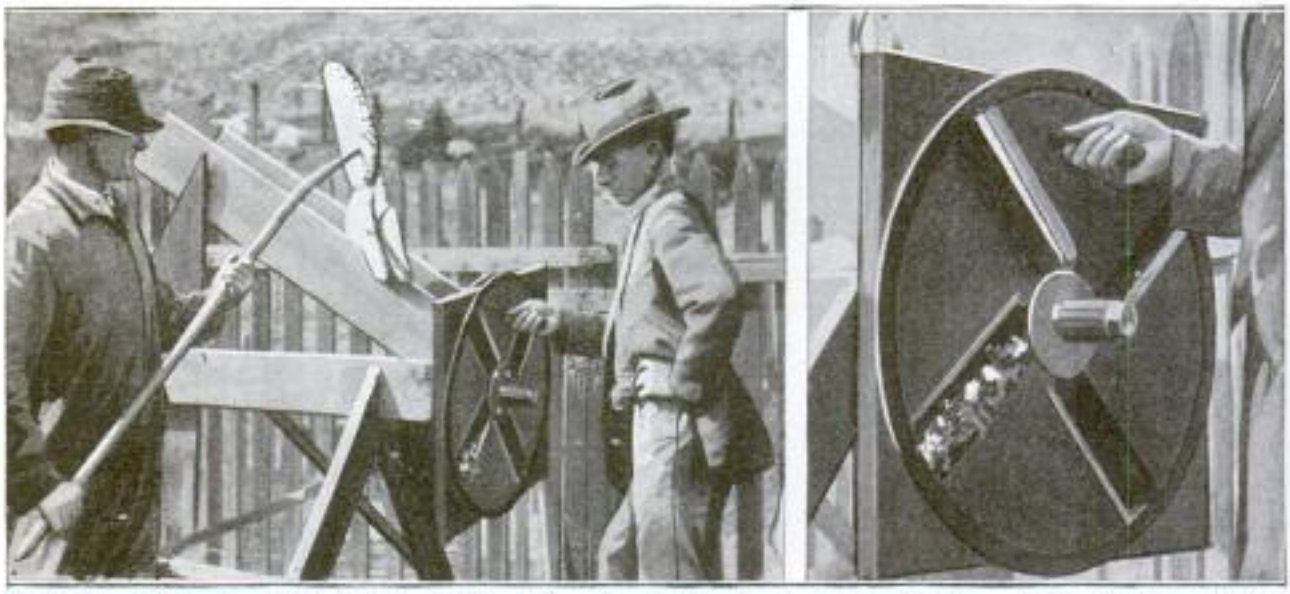
The elimination of air reaction and oil decomposition as well as the preservation of insulation in transformers using oil, is the object of an auxiliary tank recently brought into use in connection with these machines by a large power concern. The oil supply in the transformer is protected from the air because it is kept constantly filled from the auxiliary tank, which also takes care of the expansion of the oil when it becomes heated in the transformer. The tank is equipped with an automatic relief valve that equalizes the inside and outside air pressure, and with a sump from which any water condensation can be drawn off without reaching the transformer. Explosions due to ignition of a mixture of air and gas from hot oil are claimed to be practically impossible with this installation.



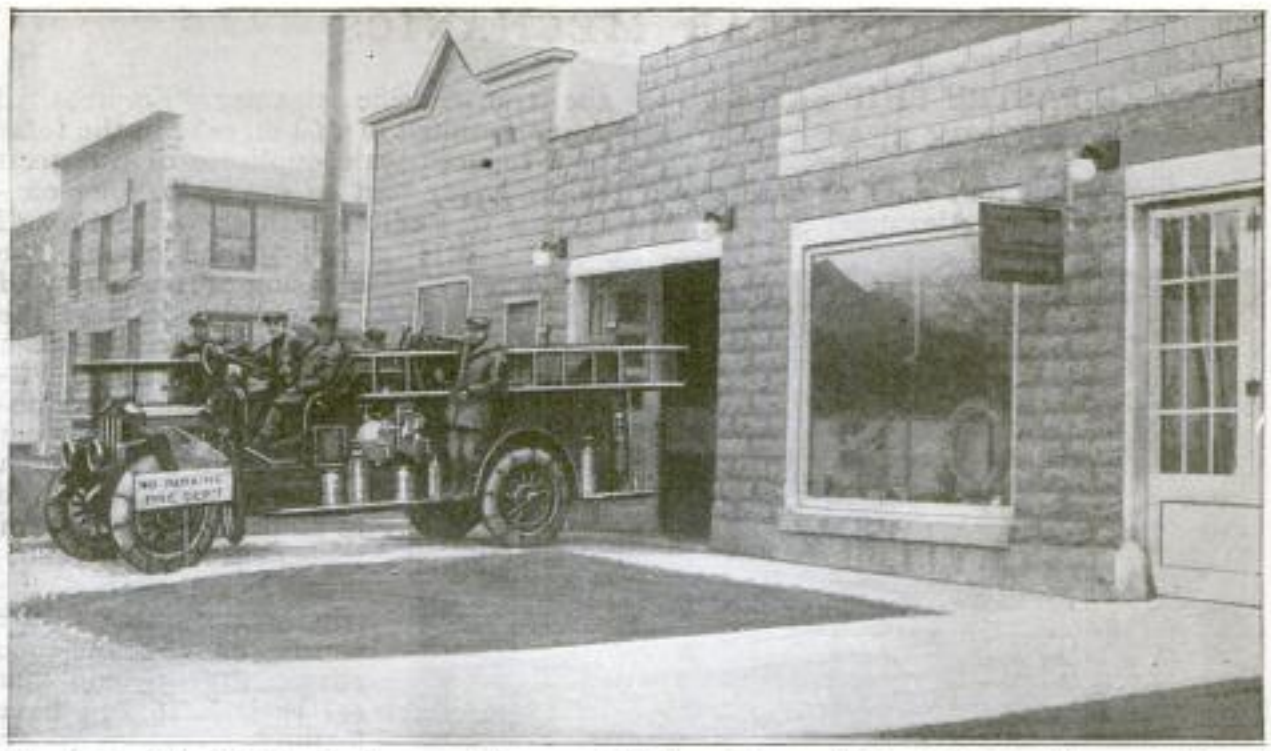
The Auxiliary Tank Keeps the Transformer Completely Filled with Oil, Preventing Contact with Air and Troubles Arising Therefrom

SPINELESS-CACTUS SLICER CUTS FOOD FOR GOATS

Goats eat spineless cactus in southern California regions, but it must be sliced for them before they will touch it. Inasmuch as goats are common domestic animals and cactus is abundant in that section, a Los Angeles man has improvised a machine for doing the slicing. An inclined trough feeds the cactus to the bottom end, where an old automobile wheel is mounted. The spokes of the wheel were removed and replaced by a solid wooden disk, slotted at four points to receive cutter blades. The wheel is rotated by a handle, and as the cactus comes into contact with the blades, it is sliced. The machine, which is of such light construction that it requires little effort to operate, takes only 10 minutes to do work that would ordinarily take a man a day.



The Inclined Trough of the Spineless-Cactus Slicer Feeds the Cactus to the Bottom. A Slotted Wheel Fitted with Sharp Blades is Revolved, and the Cactus is Sliced as It Meets the Blades



The Modern Fire-Fighting Equipment of Sycamore, Illinois, a Town of Only 4,500 Population; an Unusual Possession Made Possible by Arrangement with the Public Garage, Whose Employes Serve as Firemen When Occasion Arises

PUBLIC GARAGE OPERATES FIRE DEPARTMENT

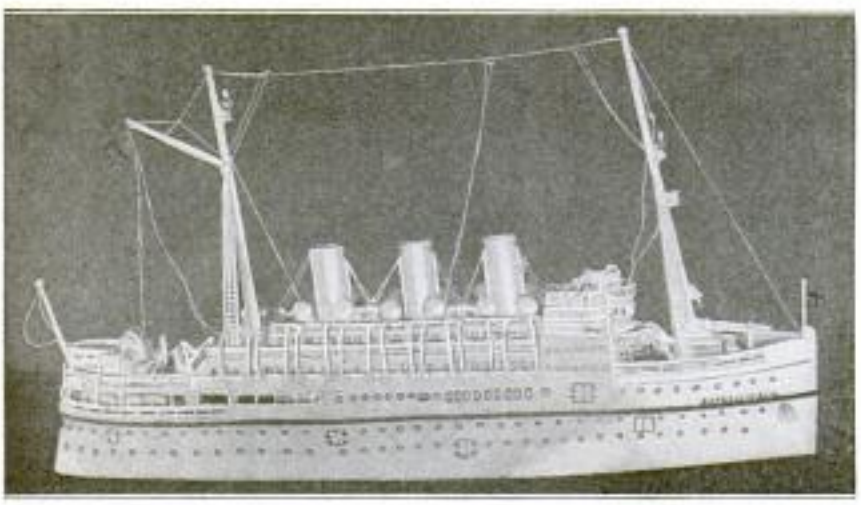
By E. E. PIERSON

Perhaps the most perplexing municipal problem that confronts the smaller cities of the United States, is that of fire protection. Those of less than 5,000 inhabitants cannot afford the force of fire fighters, constantly on duty and with costly apparatus and buildings, that are so essential in the larger centers of population. As a result, a volunteer department, with antiquated pumps and hose reels, is about all that most towns of small population can depend upon for protection against the destroying element. An exception is Sycamore, an enterprising town of central Illinois with only 4,500 inhabitants, but possessing first-class fire protection, the cost of which is but $150 per month. Most aldermen will declare that it cannot be done. Sycamore, however, is doing it, and is ready to prove it. The arrangement is somewhat out of the ordinary. A contract has been entered into with the owners of a public garage. A modern motor-driven combination pump and ladder truck and hose reel was purchased, and is stored in the garage and manned by its employes. The garage gives the starter a daily test, and there is constant inspection in order that the apparatus may be always in good working order. Whenever there is a fire, the machine is handled by four employes of the garage, the day and night shift responding as the case may be. But a few minutes are required to reach a fire, and the garage mechanics have achieved a notable record in their prompt response to alarms, efficient handling of the apparatus, and attacking the fire. The fire loss in Sycamore is at its lowest point since the new system was inaugurated. There is no longer the worry that prevailed in the days of the volunteer department and the bucket brigade. The garage proprietors find that the truck adds but little to the expense of operating the plant, while the monthly revenue is very welcome. The employes are paid a fixed sum for each alarm they respond to. They enjoy this feature of their work, and take pride in the maintenance of the machine and their service for the public. Should there be any accident because of the negligence of the employes, the city is not to be held liable, under the contract. The city has installed a telephone and fire-alarm system, and also pays for any parts of the machine required. The ordinary upkeep is looked after by the garage attachés. The coöperative system has proved so satisfactory and so economical, that it is attracting the attention of other towns, and they may take similar action.

¶The arctic islands north of Baffin Bay are to be explored soon by Sir Ernest Shackleton, with the Norwegian ship "Foca I," in a new two-year expedition.

CAKE-PASTRY SHIP SAILS SUGARY SEA

Ingenuity and four days of hard work on the part of Chef Alexander Stewart, of the trans-Pacific steamer "Empress of Asia," resulted in a 60-lb. cake in the form of a reduced-scale duplicate of the great ship. Every part of the 38-in. long confection was edible with the exception of the flags and lamps. The occasion of the serving of the novel cake was the dinner given in mid-ocean last Christmas Day. Fitting ceremonies were observed, the cake being cut in the main dining room and equal portions served to all passengers, most of whom kept their allotments as souvenirs of the trip, as, according to the words of the old-time adage, they "could not eat their cake and have it too." The keepsakes make the trip a long-remembered one.



This Small-Scale Reproduction of the Steamship "Empress of Asia" was Made Almost Entirely of Pastry

The Home and the High Concrete Wall Are Suggestive of an Old Fort

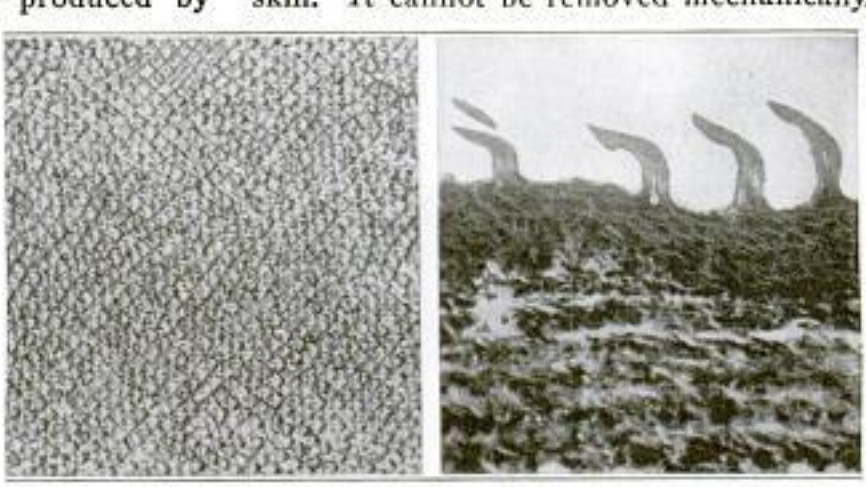
HIGH CONCRETE WALL KEEPS PACIFIC-COAST HOME SAFE

Thieves would have a hard time making a haul in one Pacific-coast home because of the fact that it is surrounded by a high concrete wall having only one door, and that built of heavy timber reinforced with steel rods. The general aspect of the home and wall is somewhat suggestive of an old fort. The door in the wall is kept securely locked, and is guarded from a tiny window.

REMOVING THE SHAGREEN OF THE SHARK

Every one who has read "Swiss Family Robinson" knows that sharks have rough skins. This roughness is produced by what is known as the shagreen, which consists of a sort of forest of very small projections which extend outward from the surface of the skin. The accompanying photographs from the Bureau of Standards show this in two magnified views of a shark's skin.

Sharks' skins in the past have been used for polishing wood and for many purposes for which sandpaper is now employed. Shagreen is removed by dissolving in an acid solution, which does not affect the remaining portion of the skin. It cannot be removed mechanically.



Left: Top View of Skin of a Sleeper Shark, Shagreen Left On, Magnified Six Diameters. Right: Cross Section of Skin with the Shagreen On

AIRMAN CLEARS LANDING FIELD OF COWS BY DROPPING NOTE TO FARMER

BY JOHN EDWIN HOGG

FLYING a 90-hp. biplane, the writer "hopped off" the Presidio Aviation Field in San Francisco a few days ago with Los Angeles as his destination, 375 miles by air line, and nearly 500 miles by the conventional methods of surface travel. The stock of gasoline in the airplane was low, but there was another aviation field at Redwood City, 28 miles south of San Francisco. This field lay directly in the line of flight, so it would be a convenient point to drop onto the earth for fuel, and by so doing I would have the advantage of being able to buy almost a tankful of fuel instead of a small supply.

It took 22 minutes to spiral upward for elevation over the San Francisco field, and then at a height of 4,000 ft. to wing down over the bay to set the "ship" down on the Redwood City field. "Taxiing" up in front of the hangars, I was informed by the attendant that their stock of gasoline was sold out, and the motor truck bringing a new supply would not be due until 3 p. m. This was at nine o'clock in the morning, and by three I had planned to be home.

The next chance for gasoline would be King City, 100 miles south of San Francisco, and 72 miles beyond Redwood City. There was still fuel enough in the tank for this trip, but to attempt to go farther than King City would result in a forced landing. The attendant declared he was sorry, and so was I, but that didn't supply the much desired fuel. He gave the propeller a whirl, and two minutes later I was soaring southward over Palo Alto, San Jose, and the other peaceful little communities nestled in the valley about the south shores of San Francisco Bay.

Between San Jose and Salinas Valley I had to go over a range of mountains, so I pulled the "joystick" back and sent the airplane climbing as fast as the motor could lift it. By the time I got over San Jose, the plane was 5,000 ft. in the air. The hand of the altimeter moved steadily around, and as the towering mountain peaks crept under the wings a height of 9,000 ft. was recorded. This was plenty of elevation to take the tail of the plane safely over the pine trees of the mountain tops. On the other side of this range was the fertile Salinas Valley, a long slender lowland between two ranges of mountains, where the agricultural activities of man have created an abundance of "safe harbors" for airmen.

Over this level farmland there was no necessity of flying at a high elevation, so I dropped down to 8,000 ft., and bored holes in the air southward. There was a strong wind blowing south through the valley, and flying with it I realized that the airplane was traveling at terrific speed. I passed over a fast passenger train moving in the direction of my flight, and saw that the smoke from the locomotive was blowing ahead of it. I also saw several windmills, and all were turn-

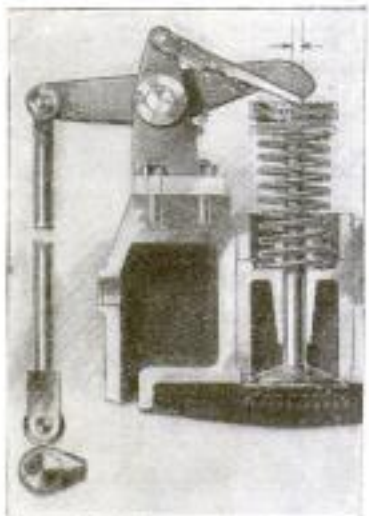
ing at high speed. Tall trees on the ground were also bending deeply under the force of the gale.

There is no aviation field at King City, and knowing this I expected to find a landing place as near the town as possible in order to reduce the charges of delivering the fuel. Forty minutes after leaving Redwood City, King City loomed into view. Right up in the center of the town adjoining the high school I "spotted" a little barley field from which the grain had been harvested. It was about 500 ft. long, nearly as wide, and just about big enough to set the ship down in. Almost as soon as the field caught my eye, I was spiraling downward. At about 4,000 ft. I poked my goggles over the side of the cockpit for another survey of the contemplated landing field. It was full of cows! There must have been two dozen of them scattered all over the field. "No chance of landing there," thought I, "without slaughtering some beef, and 'cracking the ship' in the bargain." The chances of landing there were mighty slim, but I decided to go down and have a look at the place anyway. Possibly bovine clannishness or stupidity would give me a place to set the "big bird" down with no worse consequences, perhaps, than starting a stampede.

I dropped down to some 500 ft., took another look at the field, and had about decided there wasn't a chance there, when my eye glimpsed a man tinkering around an old grain binder in one corner of the field. His face was tilted upward. Evidently airplanes were not everyday vehicles over his cow pasture. His presence gave me an idea. I pulled the stick back and "zoomed" over the city. I took the stick between my knees to have the use of both hands, tore a page out of my notebook, and scribbled a note. The note read: "Please drive the cows over in one corner of the pasture. I would like to land. Gasoline supply dangerously low." I pinned this note to my handkerchief, and tied a little bolt that I happened to have in my pocket to one corner of the handkerchief, to make it fall without drifting much with the wind. Then I circled low over the field, waving to the man by the grain binder until I caught his attention. He waved back, and then I tossed the note-bearing handkerchief overboard. The man ran across the field and picked it up, and while I was turning a few more circles over the city, I saw him out in the pasture rounding up the live stock. In about two minutes more I had brought the airplane around into the wind and "pancaked" in on the field.

NEW DEVICE CLEANS VALVES WHILE ENGINE RUNS

Automobile, and other gas-engine exhaust valves of the bevel-seat poppet type, very quickly become fouled with smoke, pitted, and warped, and have to be reground. To avoid this trouble a Canadian inventor has evolved a method of causing the valves to rotate a slight amount during the time of closing and just as the seats touch. As the rotation is always in one direction, it is claimed that smoke and particles of carbon will be ground from the valve seats as rapidly as they are deposited, resulting in clean and polished surfaces. The device consists of a steel washer, with an upturned toothed edge, which is placed on the valve stem outside of the spring-retaining cup. A pin, passing through the washer and stem, secures them together. Attached to the cylinder head is a casting which supports a short pawl, the point of which bears on the teeth of the washer. As the latter moves down the pawl moves backward the space of one tooth, and when the valve seats, pushing the washer up, it moves forward the same space.



BULLETS FROM TWO REVOLVERS MEET IN BARREL OF ONE

Bullets that have met in midair and fused together are common war-museum relics, but a pair of revolver bullets performed a still more remarkable "stunt" during an impromptu duel at a Georgia convicts' camp the other day. The weapons, one of .45 and the other of .38-caliber, had both discharged four of their five cartridges at a range of about 10 ft., when, on the fifth shot, the lead .38 bullet entered the muzzle of the .45 gun just as the steel-jacketed bullet of the latter was

on its way out. Both were so firmly imbedded in the barrel, about 3 in. from the breech, that they had to be punched out.

MOTORCYCLE RIDER EXCEEDS 100 MILES PER HOUR

The question of whether a motorcycle is capable of attaining a speed of 100 miles an hour was answered in the affirmative on February 22, at Fresno, Calif., when Otto Walker, mounted on a machine of a popular make, reeled off one mile in 33⅘ sec., or at the rate of 107.78 miles per hour; and 50 miles in 29 min. 34⅘ sec., equal to 101.43 miles an hour. Intermediate distances were traveled at rates in excess of the flat rate. The trials were made on the new one-mile board track, built especially for motor racing. Application has been filed to have the above figures entered as official international records.

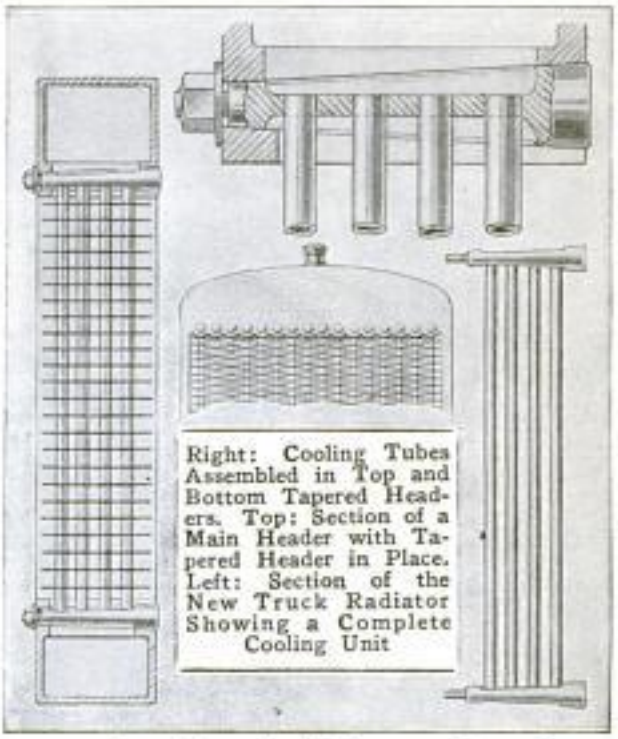
RAZOR-SHARPENING DEVICE HAS HANDY ARRANGEMENT

The blades of either the ordinary razor or the safety razor can be sharpened by a new device, recently put on the market.

Located over a stabilizing bed, so shaped and located as to receive the blade, is a small metal rod for carrying a hand-operated sharpener. The razor is laid with the thick side down in the groove which is fitted to receive it, and the edge upward, to receive the strokes of the sharpening stone. The stone is held in a small clamp, which slides back and forth on a steel guide rod, and engages both sides of the razor edge at once. By drawing the stone over the blade thus arranged, a very keen edge is obtained.

AUTO RADIATOR IS BUILT UP OF TAPER-FITTED SECTIONS

Owing to its inherent weakness and exposed position, the radiator of a motor truck is easily damaged, and the consequent delays and repairs are expensive. What the inventor, a Chicago truck maintenance expert, believes will greatly minimize the latter is a new sectional radiator in which no gaskets are used in either the main headers or in the 16 or more vertical cooling elements. These are built up in the conventional tubular form, each tube being solidly soldered or brazed, top and bottom, into short bronze headers which



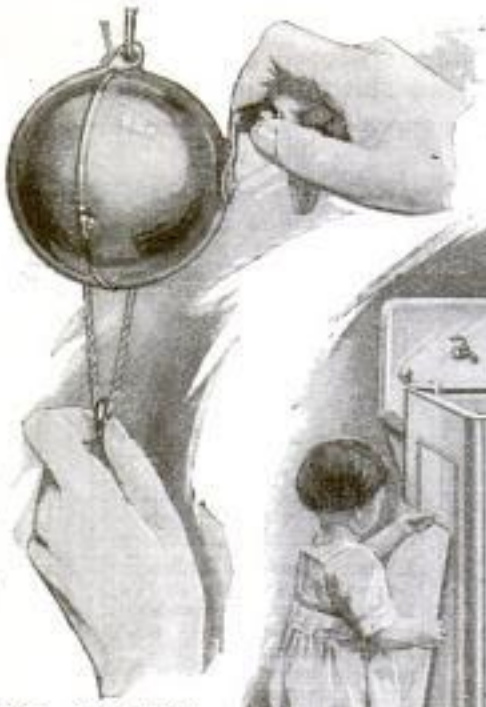
Right: Cooling Tubes Assembled in Top and Bottom Tapered Headers. Top: Section of a Main Header with Tapered Header in Place. Left: Section of the New Truck Radiator Showing a Complete Cooling Unit

are made with a decided taper from front to back. As the top and bottom main radiator headers are machined with holes, passing from front to back, of exactly the same size and taper as that of the cooling-element headers, the latter make watertight joints when they are inserted therein and secured by means of nuts on the back side. Extra sections can be installed in a few moments.

NAILLESS FRUIT-BASKET COVER IS QUICKLY APPLIED

The covers of fruit-shipping baskets are quickly locked in place by means of simple sheet-metal clamps recently offered to large-scale fruit growers and handlers. The top halves of four of the clamps are attached to the basket covers when these are made. The bottom halves fasten to the top hoops of the baskets. When applying the cover, a sheet-metal tongue of the bottom half of the device is passed through a loop in the top half and bent down, thus making a most secure fastening.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

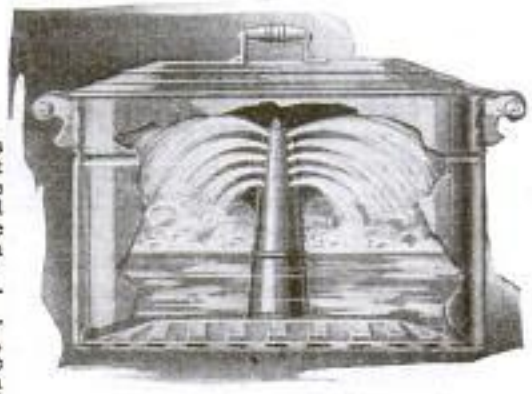


The Four-Inch Globe of Polished Nickel, Rustproof, Holds 50 Feet of Clothesline That is Easily Taken Out or In

A Cabinet, All White-Enameled, Incloses the Entire Working Mechanism of a New Washing Machine, So That Children Are Safe around It. The Side Panels Are Removable to Reach the Machinery, and Large Casters Make It Roll Easily. The Wringer Also is Protected

A Simple Extension Socket, Inserted in Place of a Lamp, Permits the Easy Attachment of a Cord for Other Appliances, without Removing the Shade

Folding Coat Hangers are Now So Made That Three of Them may be Carried in a Small Leather Case While Traveling — an English Idea

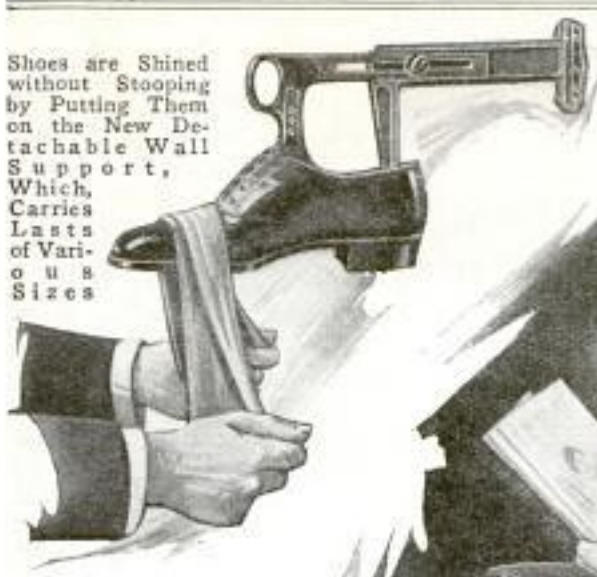


A Washing Machine That Works like a Huge Coffee Percolator is Made by Setting the Percolating Attachment in a Regular Oval Boiler. It Sends Four Gallons of Hot Suds a Minute through the Clothes

Thumb Tacks Are Useful but Generally Ugly, So a Brand Shaped like a Clover Leaf has been Brought Out. Wall Hooks for Hanging Pictures are Made the Same Shape

The Many-Sided Phonograph Now Appears as a Very Acceptable Floor Lamp. The Curved Doors in the Round Pedestal Give Access to the Machine and Records, the Sound Issuing from the Grating at the Top. The Light, of Course, Works Independently

 Anyone wishing to purchase any of the devices described in the editorial pages can obtain the



Shoes are Shined without Stooping by Putting Them on the New Detachable Wall Support, Which, Carries Lasts of Various Sizes

A Milk Bottle may be Carried or Hung Up by the Use of a New Top Fitting, Which Is Easily Removable

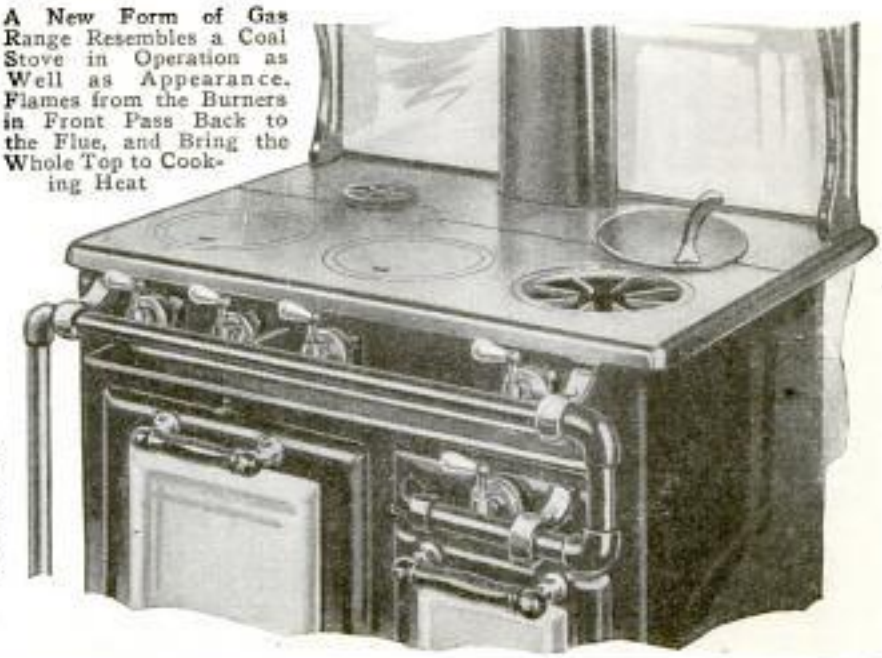
One Operation Is Sufficient Now to Give a Shoe a Rubber Sole and a Rubber Heel, as Sole and Heel are Made in One Piece

A Chair Lamp, All His Own, is Now Provided for the Smoker, with the Ash Tray and Cigar Rest Given as Important a Position as the Light, It is Made in Several Designs, the One Shown Having a Mahogany Pedestal with a Flexible, Adjustable Arm for the Light

Electric-Light Fixtures Are Self-Centering and Certain to Hang Straight When Screwed to a Novel Combination of Stiff Joint, Insulating Joint, Hickey, and Tapered Locknut

A Steel Jacket on the Bottom, Containing an Air Space, Is the Feature of a New Aluminum Cooking Pot, Which is Said Never to Burn Its Contents. If the Water Boils Over through the Holes in the Rim, It Runs Back through the Central Valve

A New Form of Gas Range Resembles a Coal Stove in Operation as Well as Appearance. Flames from the Burners in Front Pass Back to the Flue, and Bring the Whole Top to Cooking Heat



COMBINED COUCH AND SWING OF NOVEL CONSTRUCTION

A combination swing and couch, made entirely of furniture tubing, and the swing portion of which is suspended from two archlike end frames by light cables, is now on the market. A convenient footrest is incorporated in the construction of the combination in such a way as to become the means by which the swing may be rocked back and forth. There are removable bolts at the base of the lounge legs to permit the release of the lounge from the swing frame. The swing may then be folded under the ends of the davenport thus produced, so as to be out of the way and view of the user.

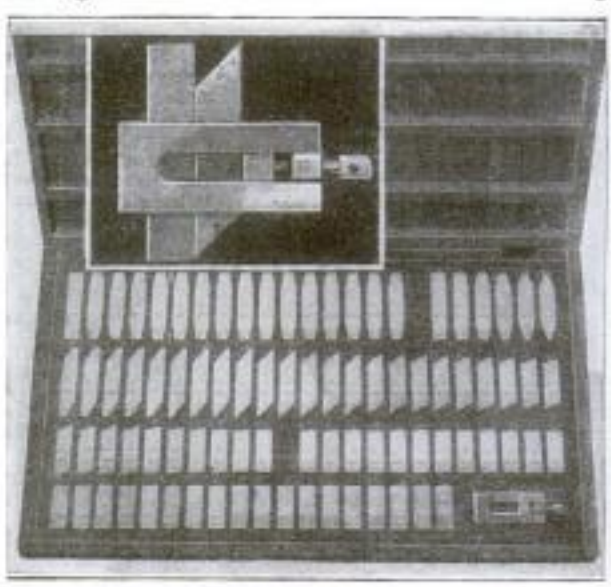
The Swing Portion of the Combination Couch-Swing is Folded under the Couch When Not in Use. Above: The Couch Hung from End Frames for Swinging

AUTO HEATER MAINTAINS EVEN TEMPERATURE AT ALL TIMES

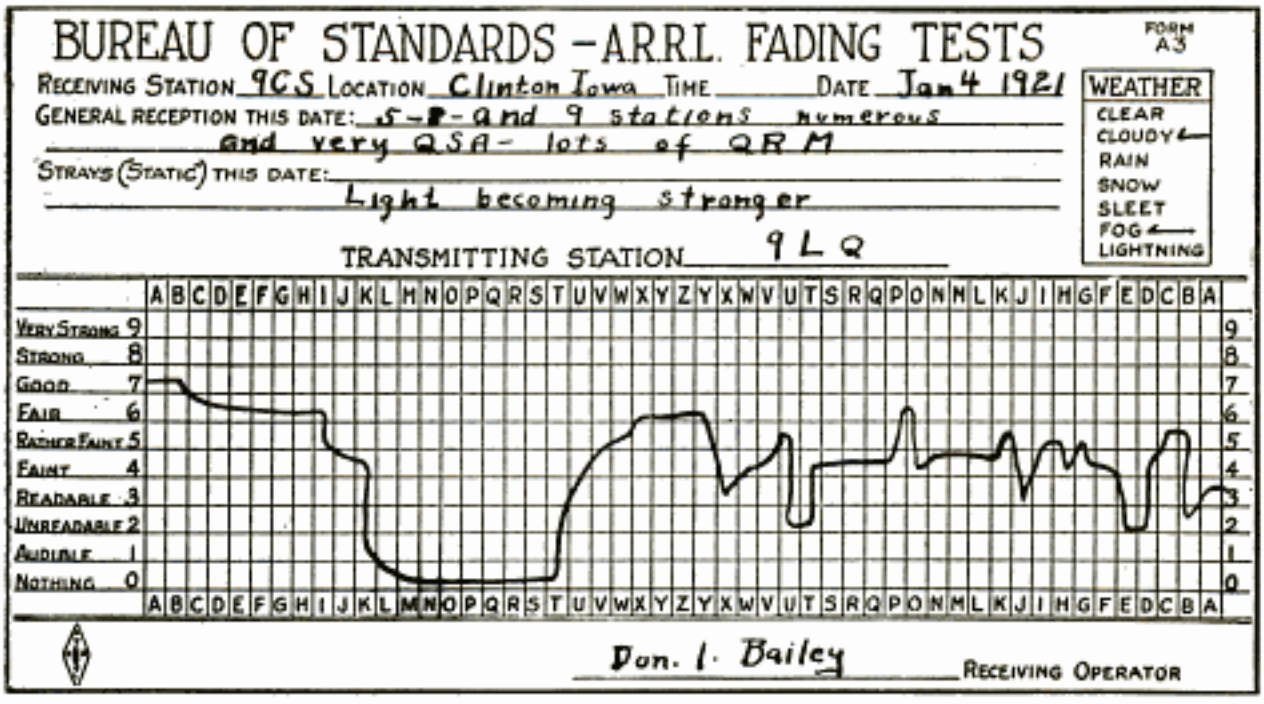
A successful heater for motor cars is built on the ejector principle. The exhaust gas sets up a vacuum in the independent pipes of the heating system, which draws heated air from a combination muffler and heating drum. Speeding or working the engine hard does not raise the temperature of the system but simply causes a greater volume of air, of a practically uniform temperature, to pass through it.

LATE-DESIGN ANGLE GAUGES GIVE PRECISE RESULTS

A set of newly designed angle-gauge blocks, to be used for checking machine work on bevel gears, milling cutters, and other angular surfaces, has been placed on the market. There are 85 gauges in the set, arranged in three series, the first being a "minute" series, the second a "degree" series, and the third a "minute" series differing from the first in that each angle is one degree larger than the next previous one. Being arranged in steps of one degree up to 10 degrees, and thence in steps of one minute from 10 degrees to the complete circle of 360 degrees, the set is complete. The gauges are used in combination by applying the flat surface of one block to the flat side of the work, which throws the angular gauging surface of a second block in contact with the slanting surface of the work, the blocks being held together by a specially devised clamp. If the angle of the work is not correct, the fact will be disclosed by the appearance of space between the slanted surface in question and the angular edge of the gauge block, which is selected to conform with the angle specified for the work in hand. The box for holding the gauge blocks is arranged for convenience in withdrawing the gauges for use, and the latter are plainly marked with the respective angles.



The Angle-Gauge Blocks Check Slanting Surfaces. Insert: Combination of Angle and Square Gauge Blocks in Clamp for Application



BUREAU OF STANDARDS – A.R.R.L. FADING TESTS

FORM A3

RECEIVING STATION 9CS LOCATION Clinton Iowa TIME DATE Jan 4 1921

GENERAL RECEPTION THIS DATE: 5-8- and 9 stations numerous and very QSA- lots of QRM

STRAYS (STATIC) THIS DATE: Light becoming stronger

TRANSMITTING STATION 9LQ

WEATHER: CLEAR, CLOUDY ←, RAIN, SNOW, SLEET, FOG ←, LIGHTNING

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Y X W V U T S R Q P O N M L K J I H G F E D C B A

VERY STRONG 9, STRONG 8, GOOD 7, FAIR 6, RATHER FAINT 5, FAINT 4, READABLE 3, UNREADABLE 2, AUDIBLE 1, NOTHING 0

Don. I. Bailey RECEIVING OPERATOR

FADING WIRELESS SIGNALS STUDIED

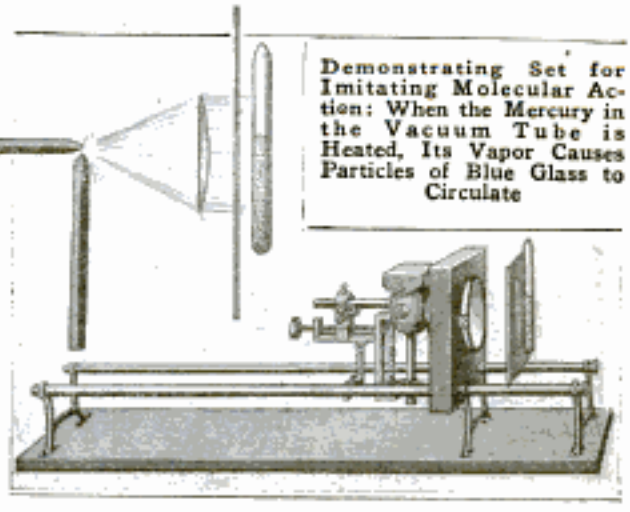
BY C. A. BRIGGS

In receiving wireless messages, particularly those of short wave lengths, difficulty is frequently experienced on account of a variation in the intensity of the signals heard. These changes may take place in a few seconds, and are as serious a factor as the trouble from "static" or from interference. The matter is now being studied by the Bureau of Standards in cooperation with the stations of the American Radio Relay League throughout the northeastern part of the country. In the months selected for the observations, signals are sent out during two evenings of the week from stations at Chicago, Indianapolis, Hartford, New York City, and Washington, D. C., each station taking its turn. The record is made by observing and recording the intensity with which the letters of the alphabet are heard when they are sent in ordinary sequence and then backward. This record is made on a card designed for the purpose and distributed by the Bureau of Standards.

The January test was the third of a series of four to be made according to the present program. The results are being studied at the Bureau of Standards for the purpose of obtaining practical information on the subject and to get as precise an explanation of the phenomena as possible.

MERCURY-VAPOR TUBE EXPLAINS MOLECULAR MOTION

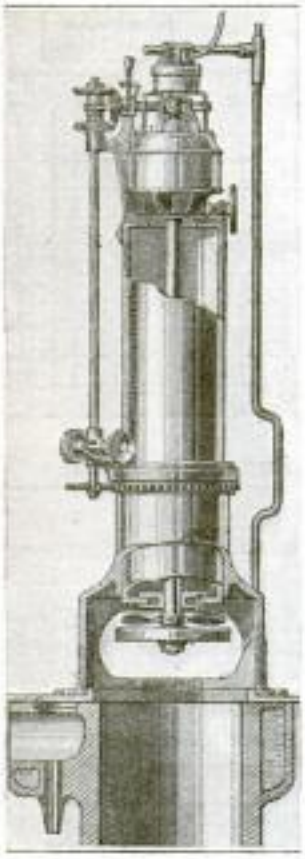
For classroom demonstration of the hypothetical motion of gaseous molecules, there is now made an apparatus that is both simple and effective. It consists of a sealed glass tube, 10 in. long and 1 in. in diameter, exhausted to a high vacuum, and half filled with mercury. Upon the surface of the mercury floats a small quantity of crushed blue glass. When the tube is heated, the boiling mercury carries the glass particles into the space above, where they dart about, colliding with one another and with the sides of the tube, in a manner similar to the supposed motion of molecules.



Demonstrating Set for Imitating Molecular Action: When the Mercury in the Vacuum Tube is Heated, Its Vapor Causes Particles of Blue Glass to Circulate

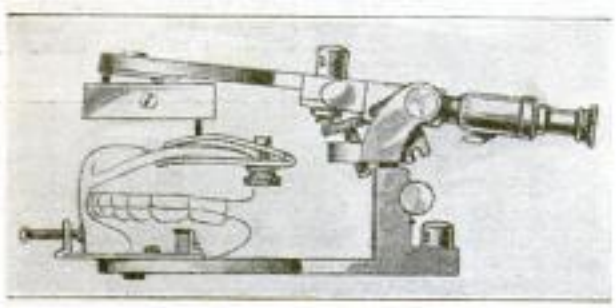
REGRINDS ENGINE CYLINDERS WITHOUT DISMOUNTING

A portable cylinder-regrinding machine, that will work to .0003 in., and will enlarge the bores of a four-cylinder engine block .025 in. in 1½ hours, is the invention of a North Carolina man. The machine is centered on the engine block with a gauge, and bolted in place with the aid of a slotted plate. The cutting is done by a grinding disk at the bottom of a vertical shaft, driven by an electric motor at the top. By an arrangement of worm gearing, the whole upper part of the mechanism, motor and all, slowly revolves and advances vertically while grinding, electrical connections being made through contact rings. Since the entire vertical shaft is adjustable laterally to press the grinding disk against the inner side of the cylinder, and covers all parts of the surface by its travel, a uniform cut of any desired delicacy is made.



DENTAL VISE DEMONSTRATES CHEWING MOTION

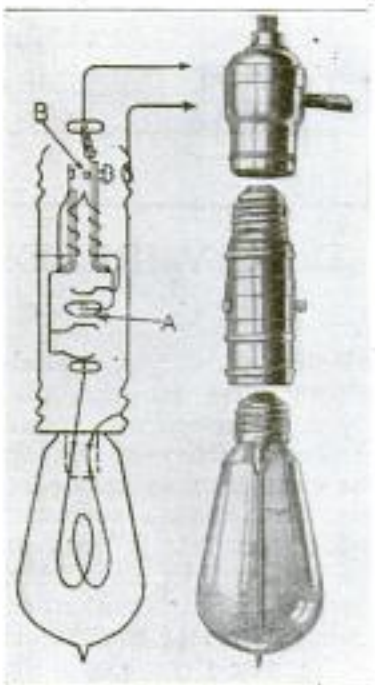
Articulators, or vises, generally in use in the dental profession, are so arranged as to make removal of parts from their jaws very inconvenient. A new device not only has a handy and speedy release of pieces being held, but also has a very human action imitating the motion in chewing. The bottom half holds the teeth for the lower jaw and forms a base in which is held the tongue of the upper portion, holding the teeth of the upper jaw. The top half swings in a pivoted yoke and may be moved from side to side, demonstrating to the dentist the tooth clearance as it would be in the patient's mouth.



This Articulator Permits Easy Removal of the Set of Teeth. The Upper Half Is Movable So That the Dentist can Study and Correct the Clearance of the Teeth

INTERMEDIATE PLUG KEEPS AFTERGLOW IN LAMPS

By the use of an intermediate plug in the electric-light attachment, a light may be kept in an electric lamp for a few seconds after the extinguishing switch has been turned. When the switch A in the plug has been turned to allow the current to flow into the lamp, two circuits are completed: the ordinary one through the lamp, and a second through small heating coils, which surround, but are insulated from, a thermostatic contact switch. This action raises the temperature of the element of the thermostatic switch, which causes it to warp, and the time required for the element to straighten out after the current is shut off, will be the time the light is visible. This time can be varied by means of the screw B.



PANAMA CANAL 1920 TRAFFIC BREAKS ALL RECORDS

Reports for the calendar year 1920 show that traffic through the Panama Canal exceeded that of 1919 by about 50 per cent. During the month of December, $1,007,875 was collected, which was in excess of any amount previously levied during the existence of the canal with the exception of the collections during the previous September. During the year, 2,814 commercial vessels, with 11,236,000 tons of cargo, paid tolls to the amount of $10,295,000. This does not take into account government craft.

CAGES FOR BANK CUSTOMERS TO FOIL HOLDUP MEN

Protection of banks against invasion by armed bandits is a subject of much current interest. In a system devised by a New York inventor, a small metal cage is installed in front of each teller's window, accommodating one customer at a time, who enters through a turnstile and leaves through another. An electrically actuated lock prevents the stiles from turning except when released by an employe in another part of the bank, the teller being unable to operate them if urged to do so by an entrapped robber. By means of a floor button, the teller can flash a red-light signal for help, and cause all the cages to be locked. Privacy for the customer is claimed as a by-product advantage of the system, a feature that many would appreciate.

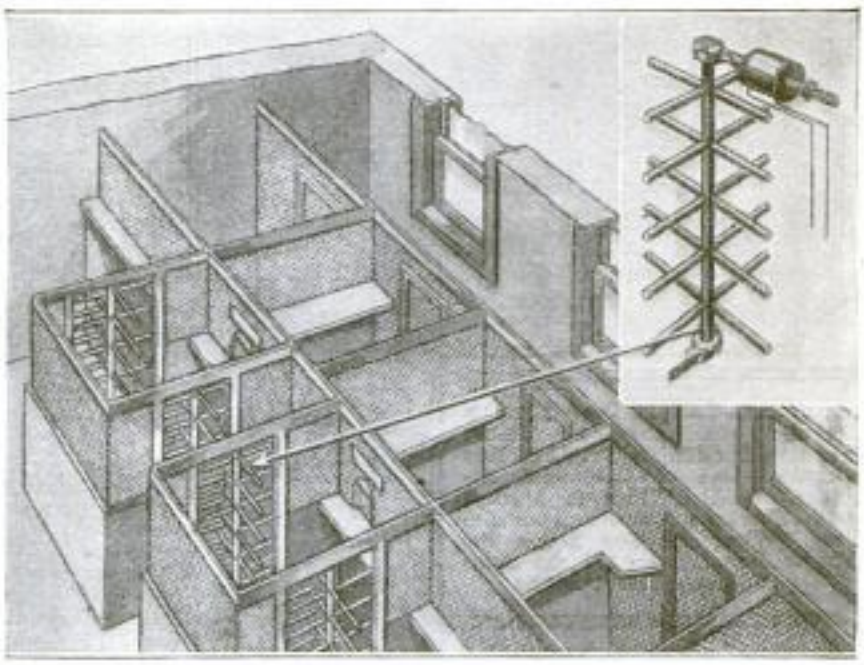


Diagram Showing the Proposed Arrangement of Customers' Cages in Banks: The Corner Insert Is a Detail of the Electrically Operated Turnstile

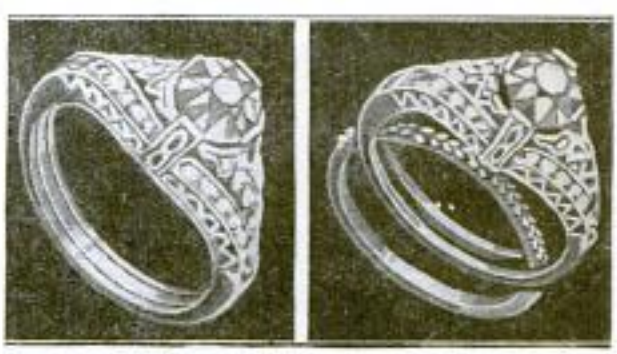
NEW AUTO-LICENSE BRACKET AND REAR LIGHT IN ONE

From France comes announcement of a very neatly designed combination rear license bracket and light for automobiles. The device is made up of two parallel tubes, both of which are slotted in such a way that license plates, or separate numbers, can be inserted from one end and secured in position by ball-like fittings, which are screwed onto the tubes afterward. The illuminating part is a short barrellike body, clamped to the top tube. It is slotted at the bottom and fitted with a ruby lens at the rear, so that it projects a white light onto the number and a red ray rearward.

¶A course in automobile maintenance and repair, inaugurated at Wellesley College, includes not only theory but actual work in the dismantling, assembly, and repair of the various car parts. The women students also master the electrical system, which is explained in the laboratory of the physics department.

COMBINATION RING FOR BOTH ENGAGEMENT AND WEDDING

A two-part finger ring, combining in one unit the symbols of both engagement and marriage, is a jewelry novelty recently patented and now being introduced to the retail stores. The stone-mounted, highly ornamented engagement ring, of conventional appearance, is so slotted at the back and recessed inside, that the narrow-band wedding ring slips snugly into it, the assembly making a single ring of great beauty, expressing the combined sentiment without ostentation. The standardized parts, made of platinum, may be purchased separately, and worn singly or in combination, as desired.

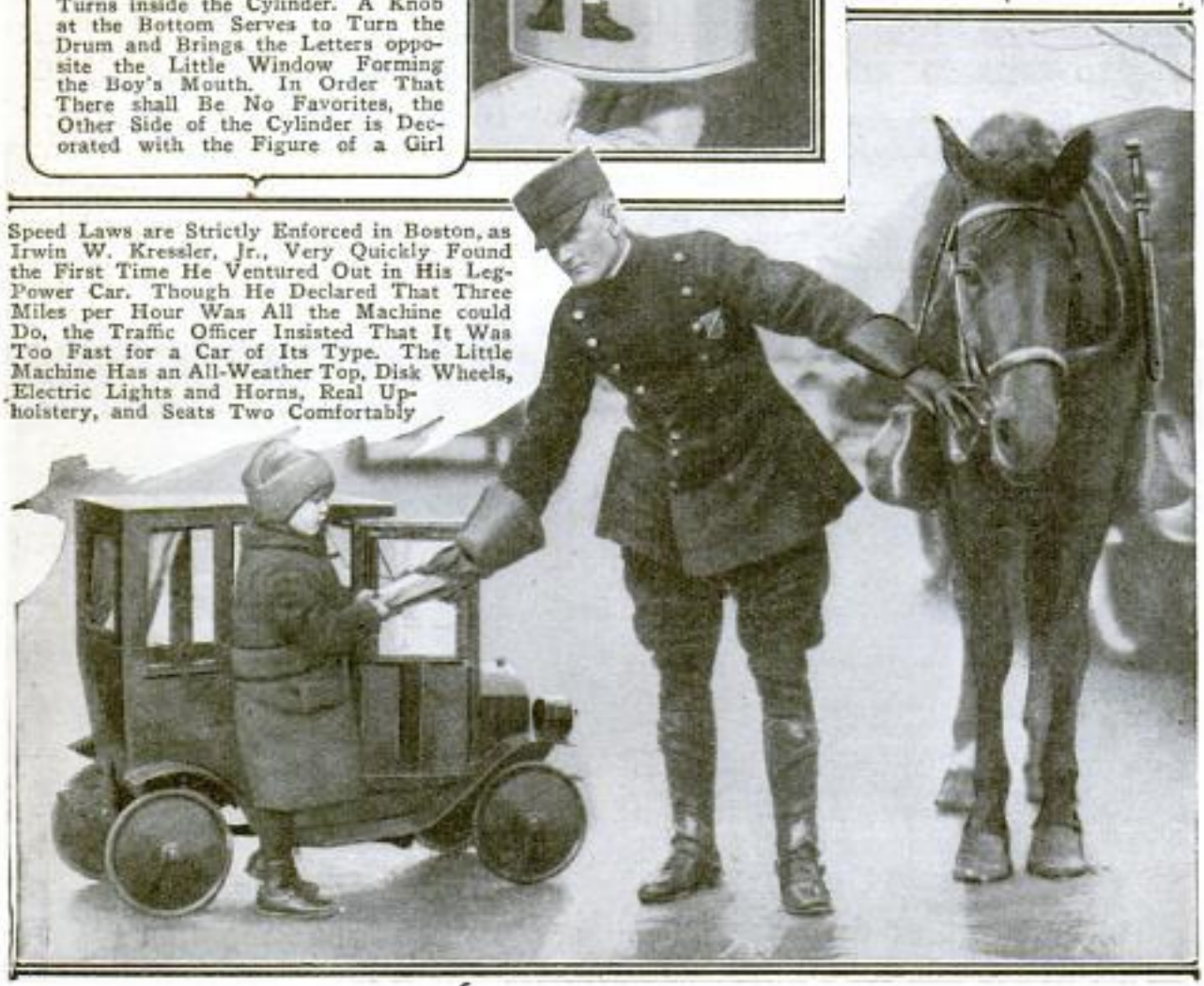


Left: The Double Ring as One. Right: The Wedding Ring Partly Separated from the Engagement Ring, Making Two Separate Pieces of Jewelry

A Fortune-Telling Top Offers a Popular Amusement at Young People's Parties. A Tin Disk Has Another One of Cardboard Attached to It, Which is Marked with Short Sentences and an Arrow. When the Top Stops, the Arrow Pointing toward the Spinner Shows His Fortune

A Celluloid Bather on a Celluloid Raft Afloat on a Real Water Sea! Doll Raft and Water, Inclosed in a Transparent Ball, Make a Very Interesting Toy for Children, and Grown-Ups as Well. The Doll and Raft are Finished in Colors. No Matter How the Ball is Rolled, a Weight in the Bottom of the Raft Keeps the Bather Right End Up

To the Right Is the Spelling Teacher Shouting the Letter "G" with Wide-Open Mouth. The Alphabet is Printed on a Small Drum Which Turns inside the Cylinder. A Knob at the Bottom Serves to Turn the Drum and Brings the Letters opposite the Little Window Forming the Boy's Mouth. In Order That There shall Be No Favorites, the Other Side of the Cylinder is Decorated with the Figure of a Girl



Speed Laws are Strictly Enforced in Boston, as Irwin W. Kressler, Jr., Very Quickly Found the First Time He Ventured Out in His Leg-Power Car. Though He Declared That Three Miles per Hour Was All the Machine could Do, the Traffic Officer Insisted That It Was Too Fast for a Car of Its Type. The Little Machine Has an All-Weather Top, Disk Wheels, Electric Lights and Horns, Real Upholstery, and Seats Two Comfortably

One of the Sights of Atlantic City, New Jersey, Is "Brownie," the Irish Terrier Pictured Above, Stumping along the Famous Board Walk on His Wooden Leg. Following an Automobile Accident the Doctor Cut Off Brownie's Real Leg and Replaced It with One of His Own Make

The Traffic Police of Paterson, New Jersey, Welcome the Help of the Junior Force Which Relieves Them of Much of the Tiresome Crossing Duty near the Public Schools. Each 15-Year-Old Junior Officer is Allowed to Wear an Official Badge on His Left Arm While on Duty

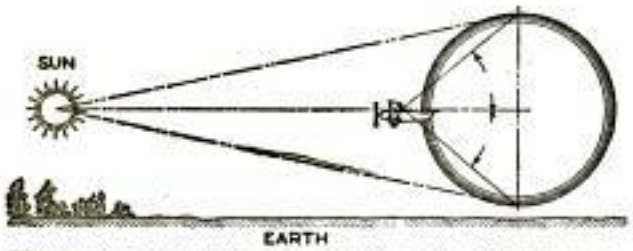
Working under the Orders of Officers of the Army Air Service, the Boy Scouts of Washington, District of Columbia, a Short Time Ago Laid Out the First Official Airway Marker on the New Air Route Between Bolling Field and Dayton, Ohio. The White Letters and Figure, DC1., can be Plainly Seen from a Great Height

This Fierce-Looking Battle Plane, Built for Very Low Flying Only, Strikes Terror to the Hearts of Toy Soldiers, Lions, Tigers, and Other Wild Beasts of the Nursery Jungles. The Armament Is Two Wicked Rapid-Fire Guns Placed within Easy Reach of the "Flier"

AIRMEN SOMETIMES SEE RAINBOW AS CIRCLE

The little girl of the fairy story should have consulted an experienced airman before undertaking her search for the pot

Diagram of a Rainbow Seen from the Earth's Surface, Showing How the Observer's Vision is Cut Off

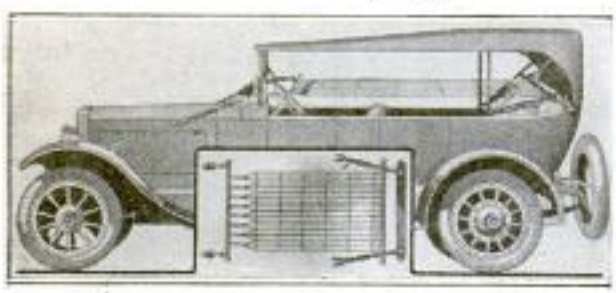


Illustrating How the Airman Sees the Rainbow as a Complete Circle, When His Altitude Is Sufficient and the Sun Is Not Too High

of gold at the rainbow's end. The airman could have spared her the adventuresome journey; for he knows that the rainbow has no end. Ascending to a sufficient altitude, that is, the airman sees more and more of the beautiful arc until, at last, if the sun is not too far from the horizon, the ends meet to form a perfect circle. This surprising, though obvious, phenomenon has been observed infrequently from balloons, from mountain peaks, and rarely, from near sea level. With the coming of the airplane, however, the sight is becoming one of comparatively common experience.

SPRING AUTO BED PROVIDES SLEEPING ACCOMMODATIONS

A bed spring of the type which fits from corner to corner on the inside of a touring car and which does not decrease the capacity of the auto in any way, is now introduced. The spring is held in place at a level even with the top of the rear-seat back rests and the middle of the windshield in front. A metal crossbeam, braced against the car-top supports, holds the rear end of the spring in place, and the front end is drawn into position by a set of turnbuckles which are linked to a triangular lug swung from the windshield brackets. These lugs are held firmly by a set of tackle hooked on the front end of the car frame. The springs are built in sizes suitable for large or small cars.



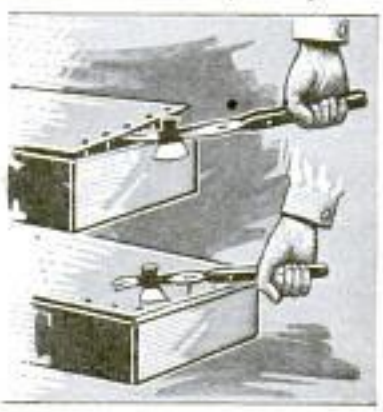
Turnbuckles at the Front Tighten the Spring Auto Bed in Position from Corner to Corner on the Inside of the Car. Insert: Spring Detached

DRYDOCK AT BALBOA IS ENORMOUS FISH TRAP

Every time a vessel is admitted to the big drydock at Balboa, C. Z., hundreds of fish swim in and are imprisoned and stranded when the gates are closed and the water pumped out. Recently a large school happened along during a docking. After the commissary division had taken 650 lb. and the dock tenders and natives had satisfied their needs, a steam crane was pressed into service to scoop the remaining two or three tons of struggling fish over the gates to the open sea. Though stunned by the long exposure to the air and the rough handling, most of the creatures made good their escape without loss of time.

CONVENIENT TOOL FOR SHOP AND DOMESTIC PURPOSES

A handy little tool that will find many applications around the home, shop, or office is a recently introduced device which combines a hatchet, hammer, nail puller, and box chisel in one. The instrument is made in two parts; the metal part is a solid forging of high-grade steel, to which a two-piece hardwood handle is riveted. The tool is 13 in. long and weighs 22 ounces.



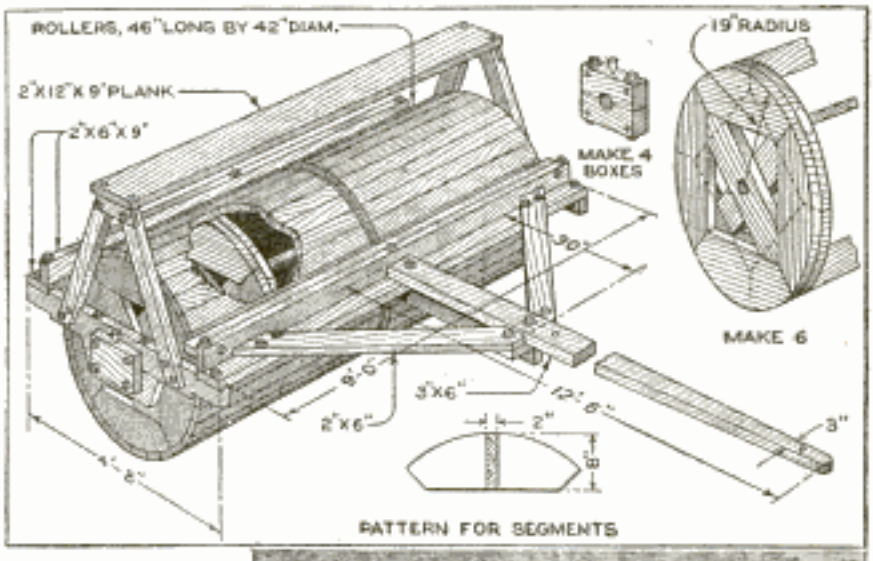
¶Taxicab patrons in Paris while away the tediousness of the rides by reading their favorite books or magazines, the cab bodies being fitted with strong electric lights placed at the correct angles for ease in reading.

Farm or Road Roller

BY CHARLES A. KING

A SATISFACTORY roller for making the surface of a newly planted field firm, for rolling a road, or, in winter, to make a surface for heavy sleighing, may be built entirely of wood, no ironwork but bolts and nails being necessary. A roller of the design and dimensions shown in the illustration, made of oak or other heavy hardwood, will weigh about 1,300 lb., and will be a suitable haul for a team of medium-weight horses; this weight may be more than doubled if a balance load is added, to prevent weight on the backs of the horses.

The rolls should be built up on six disks, one at each end and one in the middle of each roll. The cross braces of the four end disks should be halved together where they cross, and a 3½-in. round hole cut in the exact center, through which the axle may pass. The middle disks will have an open center, but are the same in all other respects.



In making the six disks, the 48 segments must be cut accurately to a pattern made according to the diagram. They should be cut from a 2 by 12-in. plank, although any narrower plank not less than 8 in. wide may be used, but with a greater waste of material. The outside, or face of the roll, should be of square-edged 2 by 4-in. pieces; it is not necessary to bevel the edges to form a tight joint on the face, as the open joint will quickly fill with dirt, and the pieces will have room to swell without being forced away from the frames.

In nailing the roll disks together, a circle the correct size should be drawn upon the floor, and each disk assembled to conform to the circle, as it is important that all should be alike. They should be strongly nailed together from both sides and the slats nailed on with 20-penny common nails, driven slanting. The slats should be cut about 4 ft. long, to allow for sawing to exact length after they are nailed in place. In nailing the rolls together, the outside, or end, disks should be set 3 ft. 10 in. apart, outside measurement, which will allow the boxes to run against the frame of the roller and prevent the end of the face of the roll from striking as it turns, and will allow each roll a ½-in. end motion, thus distributing the wear on the axle.

Good Roads Are Not a Luxury, but an Economic Necessity. The Roller Shown will Help to Make and Maintain Good Roads in the Rural Community

The boxes in which the axle turns, or on which the rolls revolve, should be of well-seasoned hard maple or beech, with

a ⅜-in. hole for lubricating with a heavy mixture of grease and graphite. A plug should be fitted to the hole, to prevent dirt from filling it. The end frames, which also bear upon the shaft, should have a plugged grease hole, and a piece of leather may also be fastened to these pieces to keep dirt from working down into the bearings. The junctions of the roller-frame pieces, and the back and front braces, should be jointed, as shown, and securely bolted, to prevent the frame from racking.

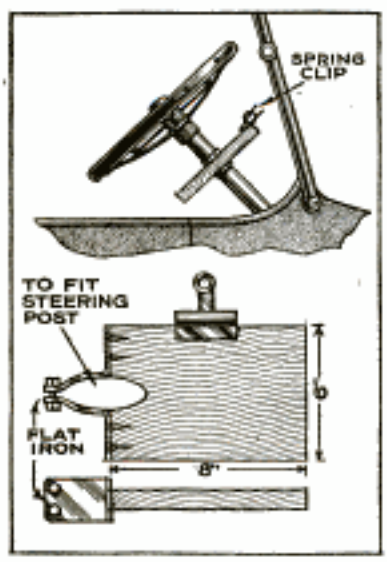
The axle may be made of a piece of young hardwood tree, preferably one in which there is no pith, worked to the desired size; this will last a long time, and may be easily replaced by supporting the roller frame, removing the cap block, shown on the end frames, pushing out the old axle, and inserting the new one. The axle should be fitted closely, but not so tightly that it will not revolve in each bearing, as both the boxes and the axle turning will so distribute the wear that each will last much longer.

The following material will be necessary:

1 axle, 3 by 3 in., by 8 ft. 2 in.
48 roll-disk pieces, to pattern shown.
72 pieces, rough-sawed to 4 ft., to finish 2 by 4 in., by 3 ft. 10 in.
1 seat, 2 by 12 in., by 9 ft.
1 tongue, 3 by 6 in., by 12 ft. 6 in.
16 cross braces, 2 by 8 in., by 2 ft. 6 in.
16 boxes, 2 by 4 by 10 in.
2 braces, 2 by 6 in., by 3 ft. 9 in.
1 brace, 2 by 6 in., by 2 ft. 1 in.
2 frames, 2 by 6 in., by 4 ft. 8 in.
1 frame, 2 by 6 in., by 6 ft. 10 in.
4 frames, 2 by 6 in., by 9 ft.
3 boxes, 2 by 4 by 13 in.
2 end caps, 2 by 4 by 9 in.
4 seat frames, 2 by 4 in., by 2 ft. 8 in.
2 seat frames, 2 by 4 by 14 in.
1 footrail, 2 by 4 in., by 9 ft.
Bolts and lag screws with washers.

Order-Pad Holder for Autos

A small shelf clamped to the steering post, about 10 in. below the steering wheel of a car used for commercial purposes, affords a convenient place for keeping orders, etc., to which the driver can refer without stopping the car. The same idea can be similarly applied to touring cars for holding maps, road guides, and the like. The attachment can be made, as shown in the drawing, from a piece of board with the two-piece clamp fastened to one end with screws. A spring clip serves to hold the orders, or other papers, to the board.—G. A. Luers, Washington, D. C.



Wooden Sign in High Relief

An interesting window sign with the lettering in high relief, to advertise a display of wooden ware, was made from a pine board in the following manner:

The design was laid out on the face of the soft-grained board, which was thoroughly dry and free from knots and pitch. The entire surface inclosed by the outlines of the design was gone over with a round-nose punch, countersinking that portion of the board to a depth of about ¼ in. The remainder of the surface was next planed down until flush with the countersunk portion, and the board was soaked in warm water.

Naturally, the absorption of water caused the board to swell, and the design, containing more of the fibers, on account of the compression caused by the punching, expanded considerably above the surface, causing it to stand out in strong relief.—G. E. Hendrickson, Argyle, Wis.

Making a Square Out of a Rule

The man who likes to carry as few tools as possible, often feels the need of a square, whether he is in the shop or merely fixing a shelf at home. The ordinary square is bulky and heavy, and is not always handy when wanted.

To convert an ordinary folding rule into a square sufficiently accurate for most purposes, a small hole is drilled through it in such a manner that two sections of the rule will be at right angles to each other. A nail through the hole will serve to hold the square in position.—James Ellis, Memphis, Tenn.

Easily Made Fire Extinguishers

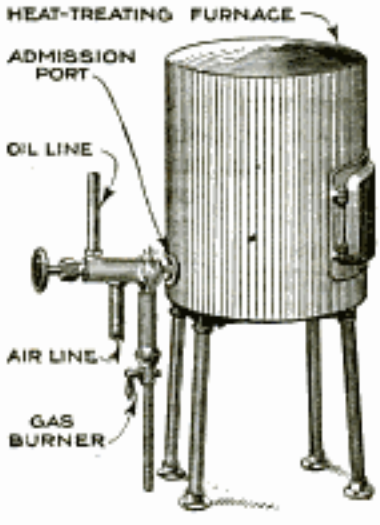
Carbon-tetrachloride bombs have found favor in many plants, according to the National Safety Council, and their use has resulted in the prompt quenching of fires that might have resulted in serious consequences had prompt action not been taken.

Burned-out lamp bulbs of suitable size may be made into bombs by removing the metal base and filling the bulb with the liquid.

The filling operation may be accomplished by breaking the tip from the bulb while it is immersed in a bucket of carbon tetrachloride. The tip is sealed by a drop of wax placed over the hole after the bulb has been filled. The bulbs should be mounted in racks placed in suitable places around the plant, or may be stocked in specially constructed baskets in a central location, ready to be carried to the point of danger. This is a very good method of utilizing otherwise useless objects.

Gas-Heated Fuel-Mixing Valve

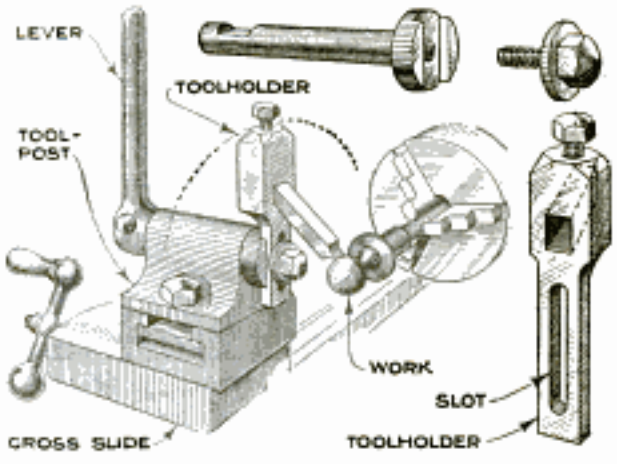
A certain factory used in its toolroom an oil-fired heat-treating furnace of the type shown. The mixing valve that atomized the fuel was located outside the furnace body, and, as in all valves of this type, preheating was essential in order to start the burner. This made it necessary for a toolmaker to consume about 15 minutes each time the furnace was used, in heating the burner with a blowtorch. To eliminate this waste of time, the gas burner shown was installed under the valve. It is now only necessary to light this burner, which is of the Bunsen type, about 15 minutes before the furnace is used, and turn it off when the mixing valve is at the necessary temperature.—W. Burr Bennett, Honesdale, Pa.



¶An ordinary twist drill can be made to drill a hole larger than its diameter, by grinding one of the lips a trifle longer than the other.

Ball-Turning Tool for Small Lathe

Upon obtaining an order to make some ball-head bolts for automobile steering knuckles, I devised the toolholder shown in the drawing, for use on a small lathe.

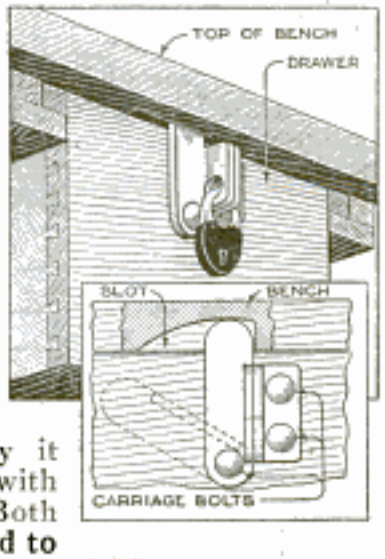


Ball-Turning Tool That Possesses Some Novel Features: It may be Adapted to Any Engine Lathe

A piece of cast iron was bolted to the cross slide and bored, at the exact height of the lathe centers, for a stud. This forms the toolpost. The toolholder is shaped, as shown, of machine steel, fitted with a slot for a capscrew, and a square hole, broached at an angle, for the tool bit. The toolholder slides in the slot in the stud, which is rotated by the lever pinned to the rear end. Adjustment is effected by moving either toolholder or tool.—S. Magis-Frankart, Ouffet, Belgium.

A Handy Drawer Lock

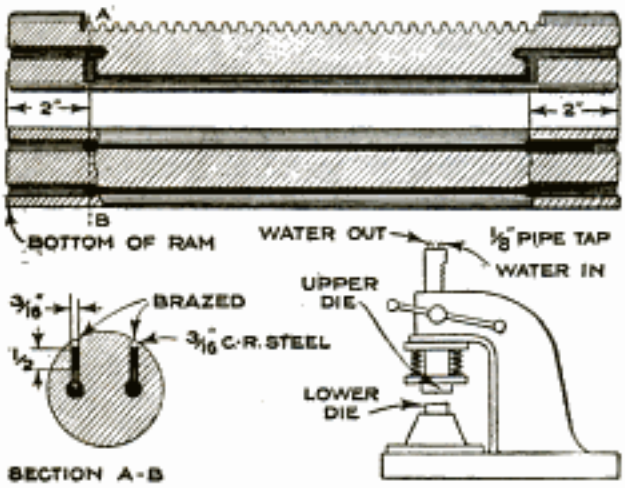
An efficient drawer lock designed for shop use, where padlocks are generally used, is made by bolting two pieces of light angle iron to the front of the drawer. One of the angles is bolted rigidly while the other is pivoted at the lower end in such a manner that when raised vertically it will be parallel with the other. Both pieces are drilled to accommodate the padlock, and the upper end of the pivoted angle is cut away on



one side, to leave a tongue which fits into a slot on the underside of the bench or table, making the drawer, when locked, practically jimmy-proof.—Arthur F. Cox, Chicago, Ill.

"Drilling" Deep Holes

A small machine shop undertook a simple job of die casting, and prepared to use a small arbor press for the job. It



A Method of Machining Deep Holes Where Proper Drilling Facilities Are Not Available. Slots are Milled in the Piece, and Partly Filled Up with Steel Rod

was necessary to water-cool the dies, and, as with the type of die employed it was necessary to introduce the cooling water for the upper die through the ram, it was at first thought necessary to drill the ram from end to end, a job beyond the facilities at hand.

The work was eventually done as illustrated. Two holes of the proper size were drilled in each end of the ram for a short distance; these were intersected by other holes drilled from the ram surface. Two 3/16-in. slots, 11/16 in. deep, were then milled along the ram, connecting the end holes, and two pieces of 3/16-in. cold-rolled steel were brazed into the slots as shown, thus leaving a 3/16 by ½-in. passage for the water. The outer surface of the ram was then filed round and polished, completing the job.

Preventing Screen Wire from Tearing

It commonly happens that the screen wire on door and window screens becomes torn from the tacks which fasten it to the screen frame. When retacking the wire cloth to the frame, a small drop of solder, placed where the tacks are driven, forms a reinforcement that will prevent the wire from pulling loose at the same place.—Wm. L. Hunter, Iowa City, Ia.

Cross-Section Paper in the Print Shop

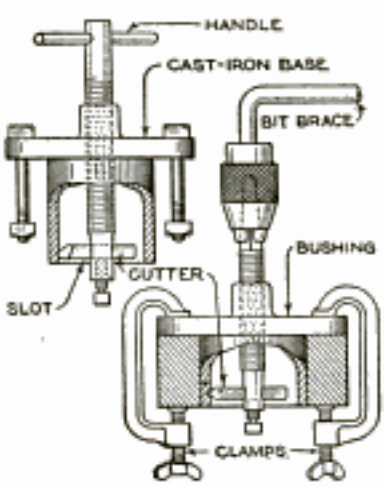
Ordinary cross-section paper, such as used by draftsmen, ruled 12 squares to the inch, can be used to excellent purpose in the printing shop, or in the layout departments of advertising agencies. Such paper can be obtained from dealers in artists' and draftsmen's supplies and comes in sheets about 16 by 20 in. By means of this section-ruled paper a dummy or layout can be made to approach very closely the finished product in size and appearance.

Using the paper ruled to 12 squares per inch it is possible to indicate the size of the type to be used with considerable accuracy because each square will represent 1/72 in., which, according to the point system, is the equivalent of a 6-point type; two squares will show 12-point; 3, 18-point, and so on.

Also, two squares, measured in any direction, will indicate an em-pica, so that the actual width and height of cuts, borders, and type faces, and the spacing and arrangement of the type lines, can be very accurately determined, and the work laid out with the minimum possibility of error, before it is turned over to the compositor.

Simple Hand-Boring Fixture

Many boring jobs may be expedited by improvising methods of doing the work without dismantling the machine being overhauled or machined. A simple fixture that can be applied to many jobs is shown herewith. It consists of a cast-iron base, having a tapped boss through which works the threaded boring bar. The threads should be about 20 per inch, and suitable holes for clamping the fixture to the work should be drilled in the base.



When boring bronze, or similar metals, a square-end boring bar may be used, the end being held in the brace chuck, thus speeding up the work. The bar feeds itself through the work, and the threads must be kept well lubricated.

Removing Scum from Cisterns

Cisterns that become putrid and foul, and in which a scum gathers on the surface, can be cleaned without pumping the cistern dry.

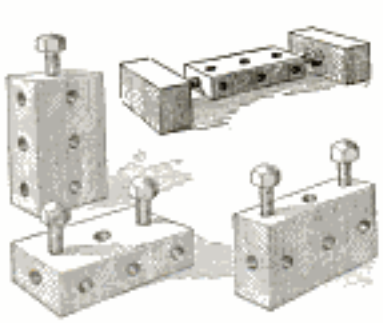
One or two ounces of potassium permanganate are dissolved in a pail of warm water; this produces a red solution, which is poured into the cistern. The water is thoroughly agitated so that it will be uniformly mixed with the permanganate solution. After standing overnight it will usually be found that the odor and scum have disappeared.—Edward H. Carus, La Salle, Ill.

Cleaning Marble Walls and Floors

To clean marble walls and floors, use a paste composed of ordinary soda, finely powdered chalk, and pumice, mixed in the proportion of two parts of the former to one part of each of the latter, in water, and rub well over the surface, then clean off with soft soap and hot water. All stains that do not disappear after this treatment should be removed by potash and lime, or nitric acid. It is essential that the work be then thoroughly rinsed with several changes of clean water.

A Handy Block Jack

The type of jack shown in the drawing has been found exceedingly useful in an eastern machine shop. It is very easily made, consisting only of a block of machine steel, drilled and tapped, as shown, and provided with a couple of machine screws. The block and screws may be casehardened, if desired.

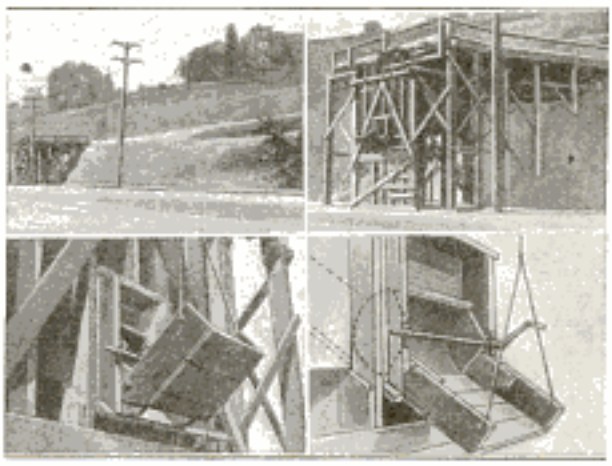


This jack provides a number of different heights, according to the surface used, and, by using a screw at each end, as shown in the upper right-hand drawing, its usefulness is still further increased.

A few jacks of this kind, made up and kept around the drilling machine, shaper, or miller, will more than repay the time spent in making them, since the operators need waste no time in hunting for packing blocks of the proper height.—C. H. Willey, Concord, N. H.

Handling a Grading Job Cheaply

An efficient method of handling dirt scraped off a hillside, upon which a road was to be built, is shown in the illustration. A heavy wooden framework was erected, jutting out from the side of the hill, and on this a heavy flooring was laid.



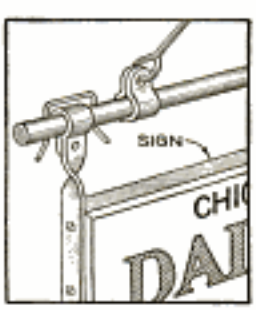
An Easily Built Structure That will Save Money for the Contractor Handling Dirt on Grading Jobs: The Teamsters Load Their Own Wagons, the Flow of Dirt being Readily Controlled

A chute was built from this floor to the front side of the framework, and an adjustable slide and gate fitted. A semicylindrical gate was used instead of a common sliding one, and is revolved by means of the handle shown in the lower right-hand corner of the illustration. The scrapers used in grading deposit the dirt on top of the platform, and it slides down the chute to the gate. A wagon drives under, the slide is lowered, and the gate opened. When the wagon is filled, it is an easy matter to shut the gate, raise the slide, and drive off.

By using this system, it is not necessary to employ a gang of men to fill the wagons, each teamster doing this himself.

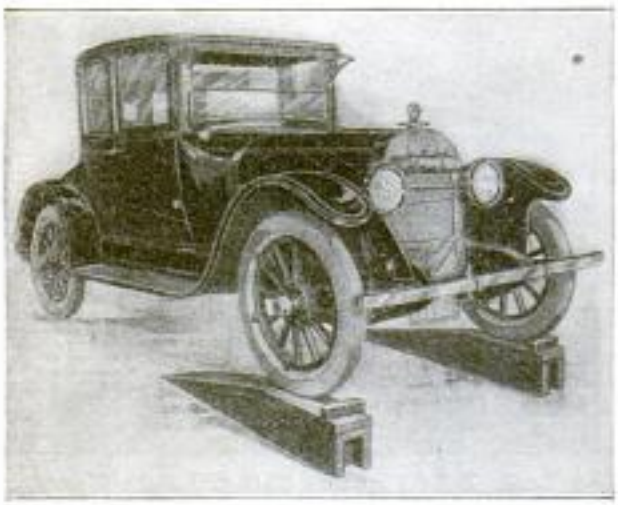
Pin for Swinging Sign

An improved method of securing a swinging outdoor sign in place is shown in the drawing. A piece of ¼-in. rod, about 6 in. long, is bent to form a U-shaped pin which is inserted into holes drilled on either side of the sign hangers. This will also prevent the loss of pins while signs are being moved or shipped. These pins are also more easily spread than the cotter pins usually employed, and more easily extracted.



Handy Skids for the Garage

A pair of skids such as those shown in the illustration will prove very convenient around the garage. They can be knocked



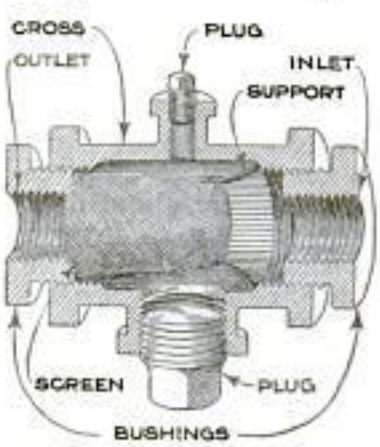
These Skids will Prove Very Convenient in the Garage. They may be Made of Any Size, Scrap Lumber being Used

together in a short time from pieces of scrap lumber, and three or four pairs will not cost as much as one good jack. When the car is in position, as shown, there is no fear of the skids being accidentally knocked over, as often happens with the common jack, endangering both the car and the limbs of the person working under it.

By making the skids high enough, plenty of light will reach the underside of the car, and the necessity of lying on the back to reach any part of the chassis may be eliminated.

A Simple Pipe-Line Strainer

The strainer shown in the illustration is easy to put together, will last as long as the pipe line, and, when necessary to clean it, no pipes need be disconnected to do so.



The screen is made of heavy brass gauze, the small end being closed by a circular piece of the same material; the larger end is open.

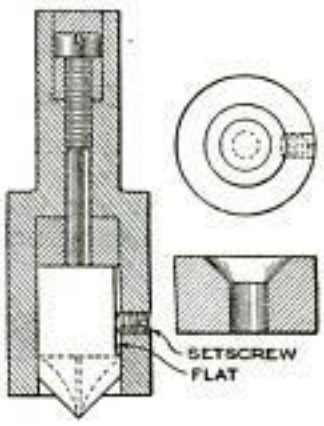
Three pieces of brass strip are soldered to the smaller end, 120° apart, to keep this end central, the larger end being the full size of the run of the cross. To clean the strainer, it is only necessary to remove the plugs, insert a hose connection in the smaller opening, and force the accumulated dirt, by water pressure, through the larger one.

Priming Coats for Wood

A subject that will repay the painter is a little study and experimenting in priming coats for wood. The character of a wood determines the kind of priming that should be used on it. Some woods require more turpentine in the first coat than others; some demand an even more penetrating solvent, like benzol, while others, again, need only raw oil in the primer, and little lead. Benzol must not be used in any but the first coat, as it is a paint remover.

An Adjustable Countersink

Where flat-head screws are used in machine work, nothing looks worse than screws countersunk either too deeply or not deeply enough. In the latter case, the projecting screw heads, in addition to their ugly look, may be positively dangerous. It is difficult, using an ordinary countersink, to gauge accurately the depth of the countersink, as even when using a depth stop on the drill press, small inequalities of the surface may cause varying depths.



With the tool shown in the drawing, countersinks may be made of equal depth, whether or not the surface is quite true, or whether the work is done on a drill press or with the hand drill.

The main body is made of 1½-in. cold-rolled steel, drilled, tapped, and counterbored at the top for the adjusting screw, and bored at the bottom for the countersink. The countersink has four milled flutes, and a milled flat on one side, against which a setscrew bears. In order to avoid a long adjusting screw, a piece of steel rod is dropped between screw and countersink, as shown. It is advisable to case-harden the end of the body that comes in contact with the work.

Corks Help in Washing Blueprints

Floats to hold blueprints in a vertical position in a washing tank are made from small bottle corks, split lengthwise, and trimmed as indicated in the drawing. The two halves of each cork are then fastened together with a rubber band, which is wound tightly around them. By pressing the smaller ends together, the opposite ends are separated to admit the edge of a blueprint, which they grip when the pressure is released. Two floats are used on each print. Their use prevents the prints from sticking together, and makes it possible to wash a number of prints in a small tank.

Estimating Brickwork in Veneered Structures

When estimating the number of bricks required for a brick-veneered building, the following rule will be found to operate quite accurately:

Multiply the entire distance around the structure by the height to the eaves, both measurements being made in feet. To find the area of the gables, multiply the length of the base by the height and take ½ of the product; this is done for all the gables, and the area of gables and sides are added together. Find the number of square feet in the window and door openings by multiplying their height by the width, and then deduct the sum of all these products from the combined areas of sides and gables. The remainder is multiplied by 7½, which will give the number of bricks required.

To Tighten Loose Nuts

After tapping out a nut for a shaft or bolt, it will sometimes be found that it is a trifle too large, when a tight fit is demanded. To overcome this trouble, and avert the necessity of making a new nut, heat it, and drop it into cold water. This treatment will usually shrink the nut enough to make a tight fit; if the nut is still too large, the operation may be repeated.—L. E. Brundage, Norwood, Colo.

Handy Sign with Removable Panels

A sign that is especially suitable for nurserymen, or other dealers whose stock changes rapidly, is shown in the illustration. The upper panel, which may be stationary and form part of the frame, is 10 in. wide, and 5 ft. long. The frame, which is made with grooved ways for the removable panels, is 35 in. wide and 28 in. high. Each of the sliding panels is 28½ in. by 6¼ in., and the right-hand side of the panels is grooved transversely to afford an easy grip for the hand. The sign may be made of pine, painted in any manner to suit the individual taste.—Hogg and Ford, Los Angeles, Calif.

A Convenient Sign for Nurserymen, Newsdealers, and Others with Changing Stock

Tracing Outline of Uneven Objects

Tracings of articles with such irregular outlines and surfaces that a tracing cannot be made in the usual way, can be easily done with the simple little tool shown in the drawing.

A piece of 3/16-in. celluloid is cut to the

This Simple Little Aid, Made from a Piece of Thick Celluloid, Is Indispensable for Making Outline Tracings of Spoons and Other Articles Which do Not Lie Flat on the Tracing Surface

shape and dimensions given, and an opening is made in the center; one of the outside corners is cut off at an angle of 45°, and a small hole is drilled in the exact center of the angular edge, to take a scribing point, or compass lead. The scriber, or lead, is held against the surface to be marked by a small flat spring which bears against the inner end.

In use, the celluloid square, with its vertical face in contact with the object being traced, is made to follow the outline of the article. A perfectly accurate tracing will be obtained if the point of the tracer is exactly alined with the vertical face.

A Handy Post Puller

A post puller that is easily made and convenient to carry around is made as shown in the illustration. The handle is

An Easily Constructed Device That Enables One Person to Pull Posts with Slight Effort: It is Quickly Set Up and Is Portable

made of iron, 2 in. wide, ¾ in. thick, and about 7 ft. long, bent as shown. This handle is fastened between two L-shaped uprights formed of flat iron, by means of a bolt, on which the handle pivots. The uprights are mounted on any convenient piece of lumber.

A log chain is fastened to the end of the handle, and, in use, is wound once or twice around the post and fastened by means of a log hook, as tightly as possible. A pull on the handle will lift the post in quick time.—Hugo Engel, New Braunfels, Tex.

¶To drill chilled cast iron, first draw the chill, by laying the piece on a slow fire in the forge, covering the spot to be drilled with sulphur, and keeping the heat going slowly until the sulphur is burned off; then proceed with the drilling.

Precipitating Silver from Alloy

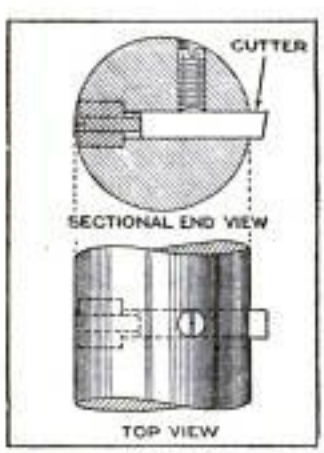
Sometimes it is desired to obtain pure metallic silver from objects in which the silver is alloyed with other metals; the pure silver can be easily obtained by chemical means without the use of a furnace and crucible, the usual process.

The alloyed article is first dissolved in nitric acid, without using an excess of acid; the silver nitrate thus obtained is filtered and diluted with 20 times its bulk of distilled water. Distilled water should be used, as plain water generally contains chlorides and would precipitate silver chloride. The solution is now heated to the boiling point, and a piece of clean sheet aluminum is placed in it. The silver will be immediately precipitated on the aluminum in the form of beautiful shining flakes, the boiling being continued until all the silver has been precipitated.

If chemically pure silver is desired, the precipitated metal is collected, washed with water and boiled in dilute hydrochloric acid to eliminate any of the aluminum that might have become combined with it, although such a quantity would be very small. A final washing produces the metallic silver in a very pure form.

Simple Boring-Bar Adjustment

A convenient method of adjusting the tool in a boring bar is shown in the illustration. Before the bar is slotted for the tool, a hole, larger than the intended slot, is drilled about one-third of the way through from one side of the bar. A smaller hole is then drilled through the bar, in the center of the large one, this smaller hole being squared out to take the tool. The large hole is tapped, and a plug screwed tightly into it, the plug, in turn, being drilled and tapped for a setscrew, as shown. The tool is held, when adjusted, by the setscrew bearing on the top. This device is especially useful when boring work clamped to the lathe saddle, where several cuts must be taken, the necessary adjustment being easily effected, and the tool securely locked, when set. This adjustment eliminates much of the usual lost time.

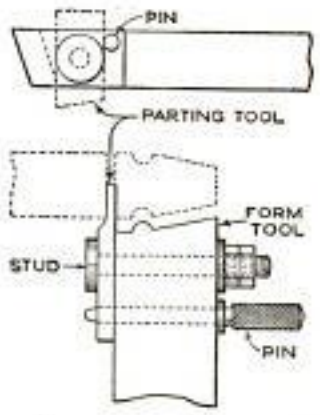


Plastering on Old Lath

When replastering over old lath, there are several important points to be kept in mind if the work is to be successfully done. Be sure that all the plaster, particularly that which sticks between the lath and formed the "key" of the old plaster, has been removed. It is possible also that many of the lath will be found loose, and any such should be securely nailed to the studding. All broken lath should be replaced with new ones. If the old lath are very dry, as they are almost sure to be after the old plaster is pulled off, they should be saturated with water before the new plaster is applied; if this is not done, the new plaster is quite likely to crack and dry in an unsightly manner.

Combination Form and Parting Tool

The combination tool illustrated will prove of considerable value when using a form tool in the engine lathe, on work that requires cutting off. The use of separate form and parting tools means much lost time in changing and setting up. The arrangement shown is very simple. The parting tool is drilled for the stud and for the pin. The stud, which passes through both tools, must be a good fit, to prevent chatter, and the locknuts on the stud must be adjusted so as to permit the parting tool to be turned with the fingers, without sideplay. The pin must also be a nice fit in both tools.

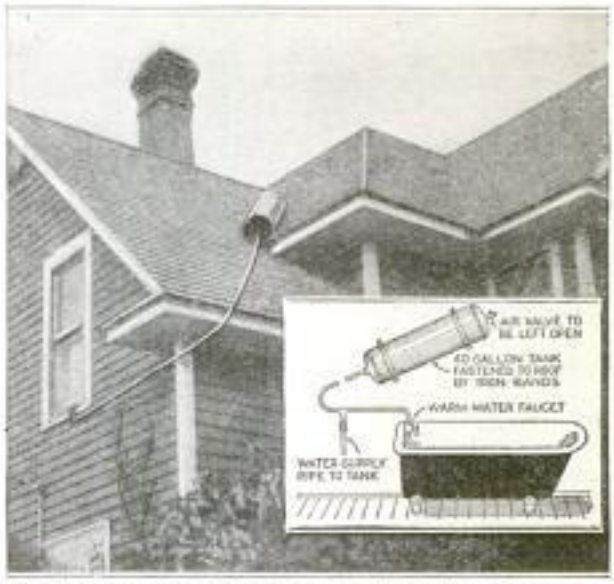


When forming the work, the parting tool is swung to the position shown by the dotted lines in the upper figure. After forming, the tool is withdrawn, the parting tool moved down to cutting position, and the pin inserted; the work is then cut off, as shown in the lower drawing.

Sun Heats Water for Bathing

The photograph shows how a clever individual solved the problem of getting warm water during the summer season, when the furnace and kitchen range were not in use.

An ordinary range tank is anchored to the roof with a southern exposure. The tank is painted black to absorb the sun's heat more readily. The tank is filled in the morning from the service pipe shown



Water Tank on Roof Absorbs Heat from the Sun and Provides Warm Water for Bathing at No Expense for Fuel

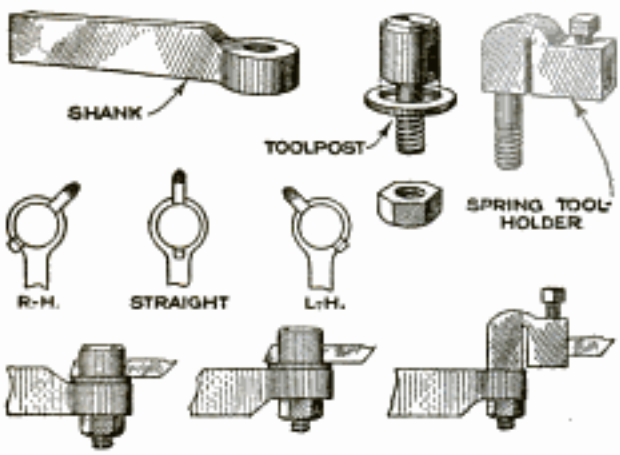
in the drawing and in a few hours the water is warm enough for bathing. The system is independent of the regular plumbing system, and is merely drained in cold weather.—Ruth Darling Shultis, Greeley, Colo.

Chip Pit for Lathes

When a new cement floor is laid in the small workshop, a chip pit underneath the lathe will not only keep the floor clean of turnings, but the operator, standing on a wooden grating, will be more comfortable. The dimensions of the pit will necessarily vary according to the size of the lathe used, but it should be at least 18 in. deep at the lowest point and about 1 ft. shorter than the length of the lathe. A 1-in. shoulder is provided on all four edges of the pit, so that the wooden grating will come flush with the floor surface. The grating is made of 1-in. strips, 2 in. wide; these are spaced about 2 in. apart where the operator stands, and about 6 in. apart underneath the machine.

A Combination Toolholder

The man in the small shop can appreciate a tool that has many uses. Too many such tools are poor makeshifts, but



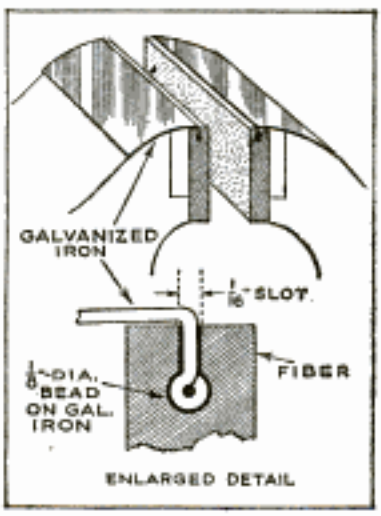
A Tool of Many Uses and Simple to Make, This Combination will Appeal to the Man in the Small Shop

the tool shown in the drawing is an exception; it has proved to be practical and to stand up under hard use.

The shank is forged out of ⅝ by 1¼-in. cold-rolled steel, with a ½-in. hole drilled in the boss, the faces of which are filed parallel. The toolpost is of ⅞-in. machine steel, with a ½-in. thread. The spring toolholder can be of cold-rolled steel, or tool steel, hardened and tempered, as desired. Further description is unnecessary, as the drawing fully illustrates the various ways of using the tool.

Improved Fiber Vise Jaws

One of the necessary attachments for the vise in the machine shop is a pair of soft vise jaws. Fiber is rather better than brass for this purpose, as it will not scratch metals softer than brass. Many different designs of fiber jaws have been used, sheet-metal shrouds riveted to the fiber being perhaps the commonest. One objection to this form, however, is that when the fiber wears, the rivet heads are exposed, bruising the work. If the jaws are made as shown in the drawing, this cannot happen. A bead is formed on the sheet metal, fitting into the slot shown, the bottom of which is formed by a circular-ended tool, in the shaper. The jaws are made of 5/16-in. vulcanized fiber. Where the jaws are narrow enough, a hole can be drilled for the bead, completing the slot with the hacksaw or milling cutter.

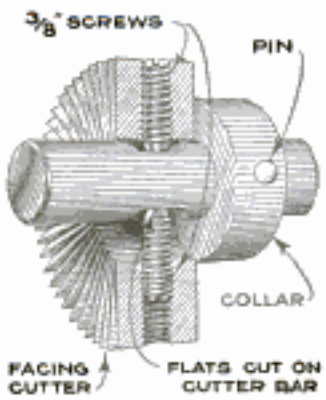


Measuring Stonework

A "perch" of stone for masonry is 1 ft. high, 1½ ft. thick, and 16½ ft. long, and contains 24¾ cu. ft. When estimating the amount of stone required for construction purposes, 25 cu. ft. are figured as a perch, but in some localities only 16½ cu. ft. are figured and the estimate made accordingly. However, in actual practice, after the stone is laid the work will consist of about 22 cu. ft. of stone and 3 cu. ft. of mortar. An allowance of about one-fifth is made for waste.

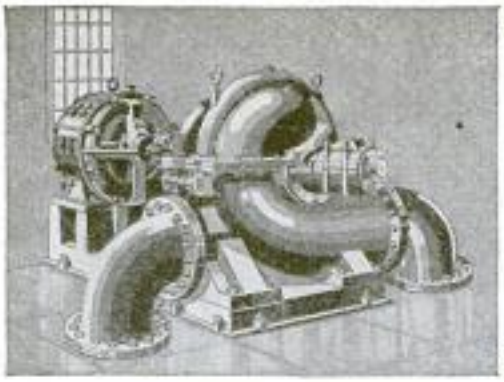
An Adjustable Facing Cutter

When facing bosses in the drill press, it often happens that the hole is not concentric with the boss; when this occurs, one side of the boss is faced clean, while on the other side a ridge is left, which subsequently must be chipped or filed. A tool that will face bosses clean, whether or not the hole is eccentric, is shown in the drawing. The cutter hole is slotted to permit sidewise movement, adjustment being effected by two setscrews, as indicated. Two flats are milled on the bar, upon which the screws bear, while the thrust of the cutter is taken by a collar pinned to the bar.—Harry Moore, Rosemount, Montreal.



Reducing Thickness of Sheet Brass

A quick method of reducing brass in thickness, used in a jobbing shop, is to dip the sheet repeatedly, for a few seconds at a time, into nitric acid, and then in water. The process is kept up until the correct thickness is obtained.—A. MacCullough, Chicago, Ill.



PUMP TROUBLES

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

[This is the first of several articles by these writers, who have had over 20 years' experience in the design and installation of pumps. This installment deals with troubles met with in suction lines; the succeeding articles, to appear at intervals, will take up other difficulties encountered in pumping units. Opportunities for obtaining such authentic data are few, and the articles should therefore be welcomed by men engaged in designing and operating pumping equipment.—Editor.]

CHECK valves in suction lines have been proved to be "the root of evil" in numerous unsuccessful installations, and furnish much interesting material for discussion. These valves, if properly installed, should give no trouble whatever. Often it is found necessary to place them (instead of foot valves at the end of suction pipes) part way between the pump and the suction water, to keep the pump primed when located above the water level.

In one case, on shipboard, where the writers were called upon for advice, a steam-turbine-driven pump of 500-gal.-per-minute capacity, had been arranged as shown in Fig. 1. It will be noted that a foot valve could not readily have been placed at the end of the suction pipe, and the draftsman adopted the plan shown, as next best. The pipe connections, as indicated, may be practically free from criticism, but the draftsman, not having the foresight to anticipate what the shop men might have to contend with, came in for a royal "panning."

The angle check valve was the seat of the trouble. Upon starting up, with the ship unloaded at the builder's dock, the height of the angle check above the water line was approximately 15 ft. Water for priming was let back into the pump and suction pipe from another system, by opening the discharge gate valves. The angle check, being seated, prevented the priming water from filling the vertical suction leg, and on account of air binding in this leg, the pump, when started, would not deliver any water. Repeated trials brought no results, and all that could be accomplished in the way of pumping was to raise the hands of the suction and discharge gauges a few pounds momentarily, and the hands would promptly fall back to zero. Even though a slight vacuum was created by discharging the water in the horizontal leg and partly opening the check, a gulp of air from the vertical leg would immediately destroy the vacuum, and the pump "laid down."

It is possible that a large number of starting trials of this kind, with the sea valve open, would have eventually exhausted sufficient air for the pump to catch the water, but after trying for two days to pump, the mechanic in charge condemned the unit, with a flow of strong words, and reported to his engineering department that the outfit was "no good." The ship was completed, steam up, ready for trial, and held at the wharf only because of the apparent failure of a small flushing pump. A sharp phone message brought the pump engineer hurriedly to the scene, with condemnatory remarks as a greeting.

A hasty survey of the layout, the witnessing of one faulty start, and the impatience of the shipyard employes prompted the pump man to action. Instructions were issued to take off the cover of the angle check, remove the valve proper, and replace the cover. With the sea valve then closed, priming water was allowed to fill the pump and suction pipe, the air being expelled through the air cock usually furnished with centrifugal

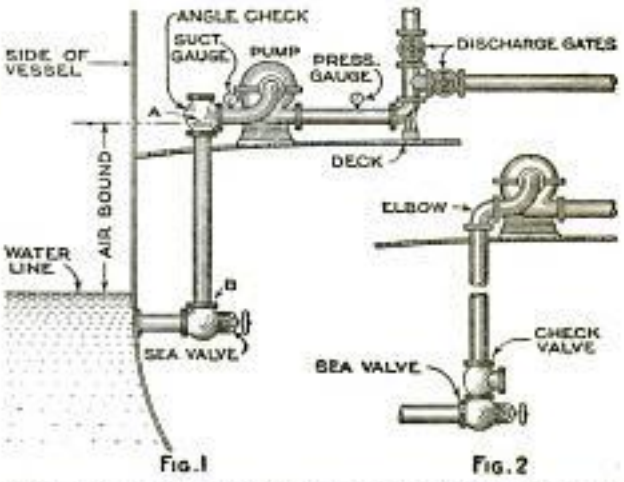
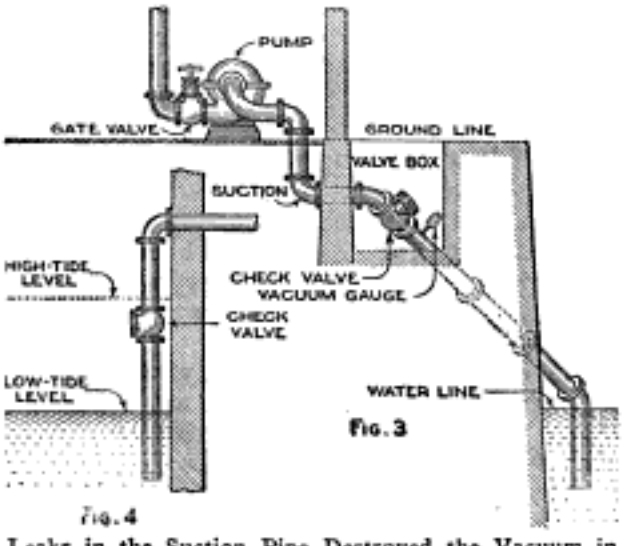


Figure 1 Shows the Layout of a Marine Pumping Installation That Proved Troublesome; Figure 2 Shows How It should have been Installed

pumps, and located at the highest point on the casing. With the discharge gate closed, the pump was started, and the sea valve gradually opened. The hands on both gauges climbed steadily as the pump came up to speed and held without fluctuation, showing that the pump had the water. The discharge gate was then slowly opened and water pumped freely to all parts of the system.

Before further instructions could be given, the ship's engineers protested because the check valve was out of commission. They could not be bothered opening the sea valve whenever the pump had to be started—the check was intended for that purpose—and they were still certain that the pump would not operate satisfactorily if the check were in place. Further instructions were given to close first the discharge valve, then to shut the



Leaks in the Suction Pipe Destroyed the Vacuum in the Plant Shown in Figure 3. The Trouble in the Unit Shown in Figure 4 was Caused by an Improperly Placed Check Valve

sea valve, and stop the pump. Following this, the angle check valve was reassembled. The closed sea valve now held the vertical pipe full of water, hence upon starting again, with the same schedule of valve manipulation, the check valve opened readily and the pump properly performed all required functions.

A half dozen equally successful starting trials convinced all hands interested that the "nigger in the woodpile" had been uncovered, and before another hour had elapsed, the ship went downstream to her trial spin, to the shipbuilder's delight and the pump man's solace.

Had an elbow been used by the draftsman at point A, Fig. 1, and a vertical check valve at point B, with other conditions unchanged, as shown in Fig. 2, trouble would not have been encountered.

Another case developed in the pumping plant of a large eastern blast furnace. A 15-in. horizontally split case pump, rated at about 500 gal. per minute, against 110-ft. total head, was the seat of trouble. This pump discharged into an elevated tank, and was driven by a 200-hp., 1,100 r.p.m. direct-current motor, fitted with starting and field rheostats, for speed adjustment by field weakening.

In this instance the static suction lift was about 18 ft. to the pump center line, and the 18-in. suction pipe was quite long and rather tortuous. A swing check valve had been placed about one-half the distance between the pump and the water, in the suction line to the river, approximately as shown in Fig. 3.

When the complaint was registered, it was not the usual, "pump is no good," nor "it will not pump water." The steel company made the claim that only at the maximum speed of the motor, about 15 per cent above normal, could they get water enough to run the plant at full capacity. This was fatal, and they had already taken steps toward the purchase of a new pump and motor.

On visiting the plant, it was learned that they had managed to get the pump working by priming as far as the check, simply letting the water from the tank flow back through the line. The pump was then started, and run at normal motor speed for about three minutes, after which the unit would be stopped, reprimed, and restarted at about 30 or 40 r.p.m. greater speed than the previous time. This procedure was repeated several times, adjusting the field rheostat on each occasion for higher speed. Finally the pump would pick up the water and discharge some portion of its rated capacity.

They therefore erroneously assumed, and perhaps it was quite natural for them so to conclude, that the additional speed above normal was necessary to make the pump perform. What really occurred was, that at each starting trial, the check valve was partly raised, and some of the air beneath drawn up above the valve, thus rarefying the air in the pipe below the check, until a degree of vacuum had been produced that would enable the pump to draw sufficient water to prevent it from loosing the suction. Approximately a half hour was wasted each time in getting the pump going, and about a busy steelmill this could not be tolerated. Things must be done quickly here, and water supply was of vital importance.

From the mechanics in charge, it was learned that when the pump was shut down overnight, the same method of start-

ing must be employed on the following morning. The pump designer, with his knowledge of the construction of this pump, knew that the excess speed was not required, and from the information given, he scented air leaks between that check valve and the river. This idea, when advanced to the master mechanic, was received with derision and ridicule—such a thing was an impossibility. Finally, however, the master mechanic was prevailed upon to tap into the suction pipe below the check and install a vacuum gauge, and after observing the degree of vacuum when running and also when shutting down, which observations were witnessed by the master mechanic, the pump man left to return the following morning, it having been agreed to leave the pump idle overnight.

The initial observation the next day showed that the vacuum in the suction pipe was destroyed, substantiating the pump man's argument, much to the chagrin of the master mechanic. All joints were then carefully examined, and a number of leaks located. In some flanges the bolts were only finger-tight. It was fortunate for the pump man that the suction-line trench had not been refilled, but probably much more so for the master mechanic. The men installing the unit and auxiliaries had either only tested the piping as far down as the valve, with water pressure from the overhead tank, having taken it for granted that the joints below the check were as good as those above, or else failed to examine them at all, through carelessness or neglect.

After making all joints as tight as possible, the pump was started at the low speed of 1,100 r.p.m., and on the second trial it had sufficiently rarefied the air below the check to enable it to pick up the water. Before long, the discharge tank was overflowing, a performance never theretofore witnessed at the plant. In the course of a few days, the pump man was again called upon, but this time his advice was requested concerning the possibility of reducing the pump capacity, as the fallacy of pumping against a partly closed gate valve had long been known to their engineers. It was very gratifying to the pump designer to issue instructions to the master mechanic for reducing the output of the pump at the normal speed.

Had a foot valve been located at the suction-pipe terminus, the situation described above would not have occurred, as the entire suction line would have been subjected to a pressure of about 45 lb. due to the head from the tank, and the leaky joints readily observed. When questioned concerning the substitution of the check for a foot valve, the master mechanic said that with other pumps in his plant, he had found it necessary on various occasions to repair foot valves in the midst of winter, below water, with the river frozen over, and he sought for all future installations to obviate this trouble, which, from a practical standpoint, is a very excellent idea. By placing a valve box around the check, it was kept from freezing, and accessible at all times.

Another incident was as follows: A centrifugal fire pump was behaving erratically: at times it would start up without trouble, and at other times positively refused to operate at all. The pump drew its water from the river through a somewhat long suction pipe. In this pipe line had been placed a check valve about halfway up in the vertical leg, as shown in Fig. 4, so that when the tide was high, the valve was submerged, but at low tide it would stand some 3 or 4 ft. out of the water. As the pump was primed from the city-water pressure, it often occurred that, at low water in the river, there would be an air leg in the vertical pipe, from the valve down to the river level. The pump was unable to exhaust this air, and therefore could not be started at low tide. Substituting a foot valve at the end of the pipe, for the check, solved the problem.

Numerous other similar cases could be cited, but these few should suffice to warn against improperly locating check valves in suction lines, and perhaps furnish clews useful in tracing trouble in some vexatious situations. The best practice in piping up is to eliminate as far as practicable all valves (except possibly gates) between the pump and the suction-pipe terminal, at which point a foot valve can generally be employed advantageously. While it is acknowledged that this procedure cannot always be followed, in the majority of installations it is feasible. On the other hand, if a foot valve cannot be used, the check should be located as near the suction water as possible.

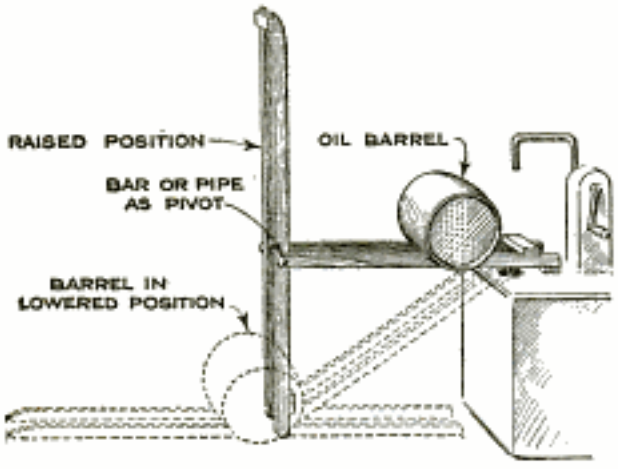
Penholder Made from an Old Horseshoe

From an old horseshoe and a few small horseshoe nails, an attractive penholder can be easily fashioned. The nails are pushed through the nail holes at a slight upward angle, and soldered in place. A leg is fitted to the back of the toe to form an easel. The completed holder is finished with bronze paint.—S. Leonard Bastin, Bournemouth, Eng.

Hand Hoist for Barrels

The rig shown in the drawing was devised by a dealer in motor lubricants for raising the barrels of oil to the top of his measuring-pump tanks, when filling them.

Only four lengths of 2 by 4-in. lumber and a few braces are needed; two of the



A Hand Hoist for Lifting Barrels from a Lower to a Higher Level: With It, One Man can Easily Elevate a Filled Barrel into a Wagon or Freight Car

2 by 4-in. pieces are placed parallel, as a support for the oil barrel; the other two are pivoted to them as shown, and serve as levers to raise the shorter lengths to a horizontal position after the barrel has been rolled into place.

The same idea may be applied to the raising of other heavy objects from a lower position to a higher one, such as loading barrels into wagons, trucks, or freight cars, single-handed.

Increased leverage, needed to make the handling of very heavy weights easier, is obtained by lengthening the levers back of the pivot.

Soapstone for Marking Blueprints

Every draftsman is familiar with the necessity of using marked prints to make temporary changes, references, etc., and he also knows how difficult it is to make a neat job by using colored pencils. On account of the soft and brittle character of the material used in such pencils, it is not easy to hold a suitable point.

A much more satisfactory material for the purpose, and one that is easily obtainable, consists of the soapstone crayons, about ¼ in. square and 6 or 7 in. long, used by sheet-metal workers for laying out work. If a flat chisel point is made on each end of such crayons, their superiority over the usual marking material will be immediately apparent.—M. P. Laurent, Three Rivers, Mich.

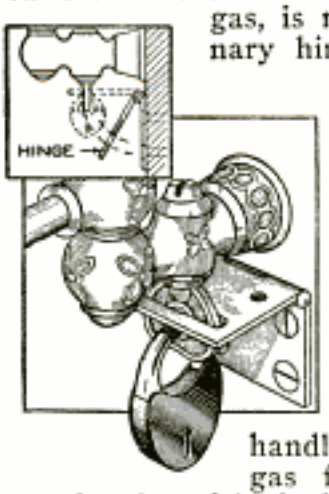
Installing New Belts

Many shops make use of a patented belt lacing made up of wire staples clinched into the ends of the belt, and held together by a rawhide pin, inserted through the loops formed when the ends of the belt are brought together.

When installing new belting and using fasteners of this type, it is good practice to cut the belt somewhat shorter than the required length. Short pieces of various lengths are kept on hand with these fasteners on each end and used to fill out the belt to the required length, a shorter section being substituted as the belt stretches, until the ends of the belt are finally brought together. This plan saves cutting the belt more than once, and incidentally affords a slight saving in the cost of belting and belt fasteners, as the pieces are used repeatedly.—Lloyd Reeve, Dover, New Jersey.

Lock for Valve on Gas Jet

A lock for a gas jet, that prevents children and others from turning on the gas, is made from an ordinary hinge. As shown in the drawing, a slot is cut in one leaf of the hinge to fit over the cock when the other leaf is screwed to the wall, and a hole large enough to take a small padlock is drilled through the cock handle. To prevent the gas from being turned on, the slotted leaf of the hinge is raised over the cock handle and the padlock applied, as indicated; when not in use the hinge lies flat against the wall and the padlock may be allowed to hang from the cock handle.—J. F. Convery, Worcester, Mass.



Removing Paint

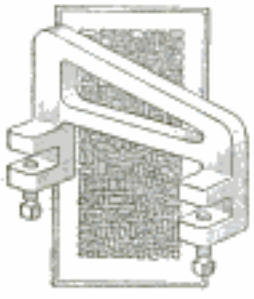
To remove the finish from carriage and automobile bodies adjacent to the upholstering, where a torch cannot be used, heated irons can be applied. Heavy pressing irons, very hot, should be used. The irons are drawn over the finished surface and followed up with a scraper. They should be handled with an asbestos pad.

Spring Holds Radiator Cover

When covering the radiator of an automobile with a robe, or similar cover, that is likely to be blown off, a screen-door spring can be used to hold it in place. One end of the spring is hooked to the front hood fastener, on one side of the radiator, the covering is placed in position, and the free end of the spring is brought over the top of the hood and hooked to the fastener on the opposite side. If the spring is too short it can be lengthened with suitable pieces of wire at one or both ends.—Wm. J. Morgan, Danville, Ill.

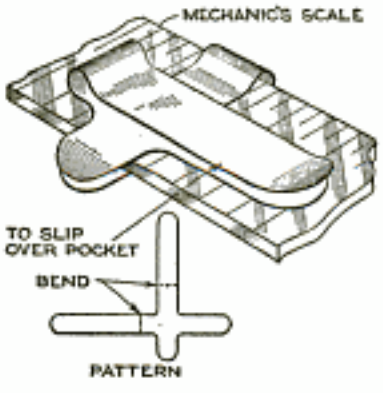
A Novel Lathe-Dog Wrench

A wrench for lathe dogs, that is always at hand when required, is shown in the illustration. It may be machined from any material at hand, although cold-rolled steel, casehardened, will probably be the most convenient. The wrench is slotted and provided with two setscrews for fastening to the lathe bed. The setscrew of the dog is inserted in the tapered slot, and tightened or loosened as desired. The tapered slot is proportioned to fit the various sizes of setscrews used.



Pocket Clip for Steel Scale

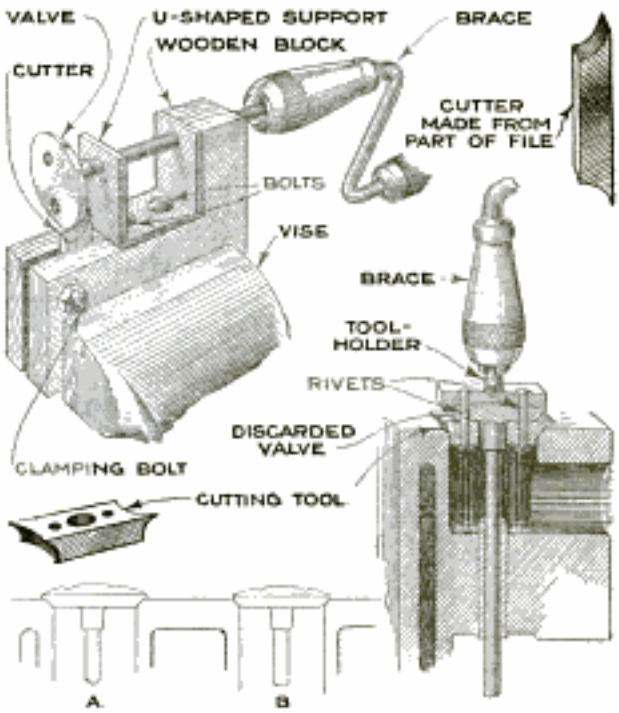
A practical device for holding a mechanic's scale, or similar flat article, to prevent it from falling out of the pocket, is the clip shown in the drawing. It is a common experience with machinists, and others, that the heavy metal scale will almost invariably drop out of the pocket every time they bend to pick something from the floor.



The drawing shows the pattern from which a clip, as neat and handy as a fountain-pen clip, is formed. Sheet metal is used, bent and formed to fit over the scale in the manner indicated.—Warren D. Ferris, Buffalo, N. Y.

Valve-Seating and Refacing Tools

The valves and valve seats of gas engines become shouldered, as shown at A, after being ground several times. The



Valve-Seating Tools That can be Easily Assembled from Odds and Ends for Resurfacing Pitted and Shouldered Valve Heads and Seats

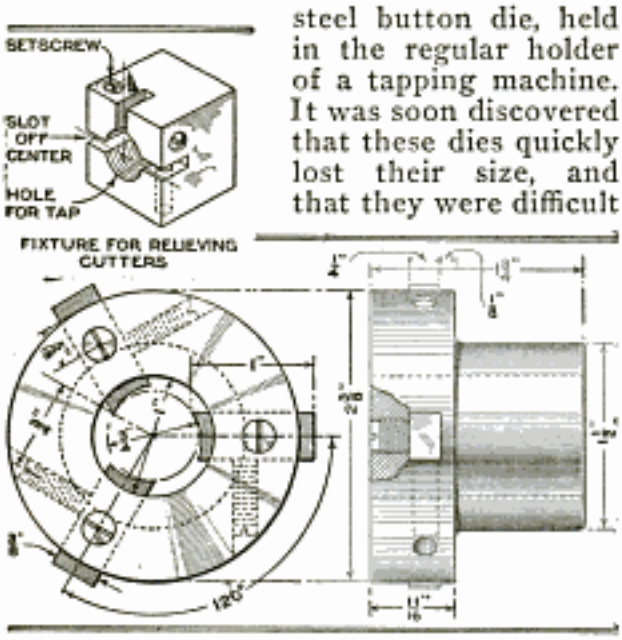
disadvantage of these shoulders is that carbon lodges in them and prevents the valves from seating properly, with a consequent loss in power. To obtain the utmost engine efficiency, the shoulder should be removed, and it has been found of advantage to shape the valve and its seat as shown at B.

Improvised refacing and seating tools for this purpose, which can be assembled from odds and ends in a short time, are shown in the drawing. The refacing tool is made of an L-shaped hardwood block, having a U-shaped metal support bolted to it. A piece of an old flat file is ground to correspond with the desired contour of the valve, and is fastened into the slotted end of the hardwood block by drawing up the clamping bolt. The device is held in a vise, and the valve is rotated against the edge of the cutter with a bit brace, in the manner indicated.

The valve-seat reamer consists of an old valve to which a suitable cutter, that may also be ground from an old file, is attached. It will be necessary to anneal the cutter, if made of a file, in order to drill it, subsequently hardening it again by heating to a red heat and plunging into water. An extension is welded in the center of the valve head for rotating the tool with a bit brace.

An Inserted-Blade Die

Upon receiving an order for the manufacture of several thousand parts of ¾-in. stock, with a threaded end, about 1 in. long, 20 threads to the inch, the work was undertaken with a commercial carbon-steel button die, held in the regular holder of a tapping machine. It was soon discovered that these dies quickly lost their size, and that they were difficult



A Simple Inserted-Blade Threading Die Is Particularly Adaptable for Production of Work in Quantities

to sharpen and adjust; these defects led to the development of the inserted-blade die shown in the drawing. The important feature of this die is the high-speed steel cutters, each of which is held in place with two ¼-in. setscrews. The cutters are made of ¼ by ⅜-in. stock, inserted in the body 120° apart, thus making a three-blade die.

To make the cutters, the annealed stock, 1 in. long, was inserted in the holder and, after chucking in the lathe, was run onto a trap held in the tailstock. The die was then put into the relieving fixture shown, which throws the tap off center, and the tap was again run through, thus relieving the cutters. This relieving fixture is simply a hardened bushing with the hole for the tap off center, and with three slots cut into its face for the insertion of the blades. After the cutting blades are relieved, they are hardened at a temperature of 2,200° F., drawn down to 600° F., lapped to remove the scale, and inserted into the holder. The blades are adjusted on center by setting them up against a piece that has previously been threaded. With this inserted-blade die, the production jumped to 180 pieces per hour, and the die would cut about 500 pieces before sharpening was needed; when this became necessary, the blades were sharpened by grinding across the cutting face.

Improvised Oil-Indicator Cover

Accidentally breaking the circular glass window in the oil indicator on the dash, and being in urgent need of the car, the owner made a quick and satisfactory repair with two tin disks and a cardboard milk-bottle cap.

The broken glass was removed, the rim holding it in place unscrewed, and two tin disks were cut to fit the inside of the rim. In order to obtain a thickness equal to that of the glass, a milk-bottle cap, although about ¼ in. smaller than the tin disks, was placed between them. With this substitute for the glass, the rim was replaced and screwed down tight. On starting the engine it was found that the improvised covering kept the oil from running out, and also showed, by the pulsations of this fairly flexible diaphragm, that the oil was circulating properly, so that, although not transparent, the tin was quite effective as a substitute for the glass.—Leo Rosasco, Indianapolis, Ind.

Sensitive Drilling in Heavy Lathe

It frequently happens that a small hole must be drilled in a piece while it is chucked in the lathe; if the lathe is a heavy one, and the drill held in a chuck mounted on the tailstock, the "feel" of the tailstock is not sensitive enough to allow the operator to judge how much pressure he is exerting on the drill. Many drills are broken for this reason, and the devices shown in the drawing will be welcomed by those who have much of this work to do.

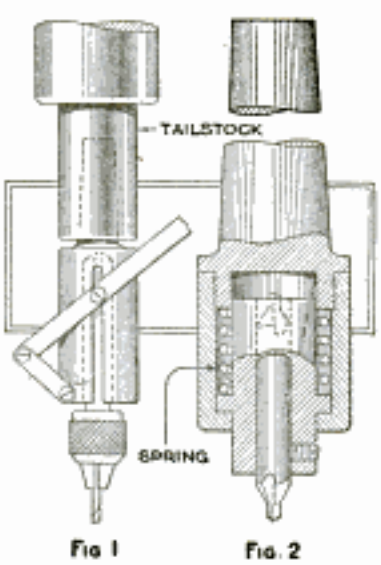


Fig. 1 Fig. 2

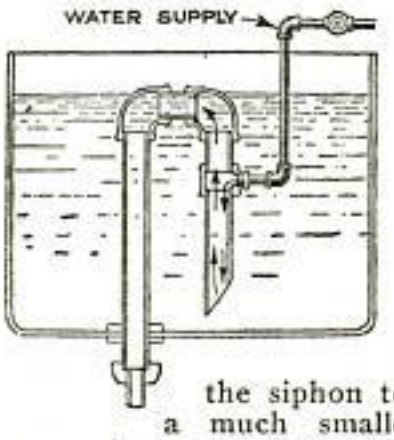
Figure 1 shows a sensitive drilling attachment for the lathe tailstock. The part that fits in the tailstock is made of 2-in. machine steel, bored to fit the chuck shank, which is turned parallel, and slotted for a ⅜-in. screw. A piece of ½-in. square stock is fitted to the end of this piece, at one side of the slot, to make a bearing for the link. This link, and the feed lever, are made from flat stock of

suitable size, and the device is assembled as shown. The action of the attachment is obvious, and, as it can be slipped into position as easily as a center, it will be found very useful.

The tool shown in Fig. 2 is intended mainly for center drills, although, of course, it may be used for ordinary drilling as well. This type of holder is designed especially to prevent the small drill from breaking when the center drill is first set up to the work. The drill holder proper is keyed to the body so that it cannot turn, while free to move back and forth. It is made with a flange against which a spring bears, the strength of the spring being proportioned to the size of drill used. It will be seen that, even if the tailstock spindle is advanced a little too rapidly, the pressure on the drill is only that due to the compression of the spring, except, of course, where the tailstock spindle may be fed so hard as to compress the spring until the coils close. This type of holder may also be used on the drill press.

An Intermittent Siphon

A new way of connecting an intermittent siphon, such as used for periodically flushing urinals and closets, is shown in the sketch.



The siphon will not act until the water reaches the level shown.

The peculiar connection of the water-supply pipe, as indicated, allows the siphon to operate with a much smaller volume of water than other types. When the tank fills to the level indicated, the entering water meets a slight resistance and tends to flow up the siphon.

The siphon leg should be cut off at an angle at the lower end; this will allow the flush to "break" without the disagreeable sucking noise. By experiment I have found that a ⅜-in. city water-supply pipe will operate a siphon made from 1¼-in. pipe.—James E. Noble, Toronto, Ont.

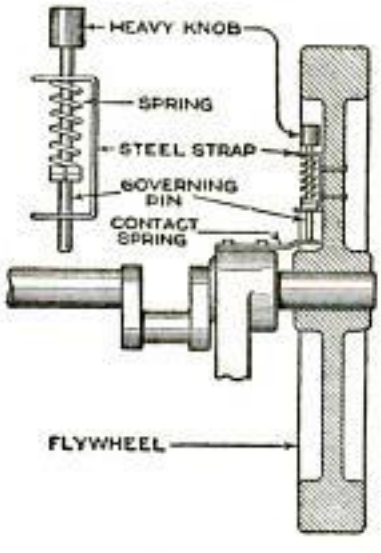
¶A thimble, or the finger of an old glove placed over the end of a curtain rod, will prevent it from catching and tearing the curtain when it is inserted.

Air Hose Protected by Old Tank

A large automobile-accessory concern made a housing for the protection of its free-air hose out of a discarded range boiler. One end of the tank was cut off with an oxyacetylene torch, and on the side, a door of suitable dimensions was cut out by the same means. Strong hinges, a handle, and lock were attached to the door with bolts. The completed housing was given a coat of paint and installed over the air line, where it emerged from the ground.—Frederick C. Davis, St. Joseph, Mo.

Improvised Governor for Gas Engine

A gas engine, operated by a farmer, was not provided with a governor, and the owner was rather chary of operating it, as it got beyond control every time it was started. After a consultation with the local machinist, the governor shown in the drawing was applied to the flywheel, proving very satisfactory in operation.

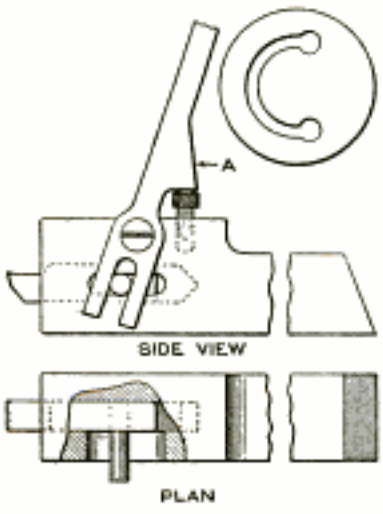


A guide strap, formed of flat steel, bent to a U-shape, was screwed to a spoke of the flywheel. A governing pin, with a heavy knob on one end, was inserted through two holes drilled in the strap, being held in place by a spring, adjusted by means of the nuts shown. A contact spring, insulated by means of a fiber block, is mount-

ed on the outboard bearing, making contact with the pin at the proper moment for the explosion. As the speed increased beyond that for which the spring was set, the governing pin was thrown outward by centrifugal force, thus opening the circuit, and causing no explosion to occur until the speed dropped to the point where contact was once more made.—John Homewood, Ontario, Calif.

Cutting a Semicircular Slot in the Lathe

An improvised tool that was designed to cut a semicircular slot on work in the lathe is shown in the drawing. The tool itself is made of ½-in. round stock, to avoid the necessity of broaching a square hole. The ¼-in. pin in the side of the tool engages in the forked end of the lever, and serves to keep the cutter in position, as it bears in a slot on the side of the holder. The part A of the lever, which is made of ¼-in. flat stock, is a shoulder, which bears against the adjusting screw in the holder.



The work has two holes drilled in it, one at each end of the arc. With the lathe running at its slowest speed, the cutter is thrust forward, by manipulating the lever when the first hole comes in line with the tool, and is released when the next hole comes in line by the same means. After each cut, the adjusting screw is given a slight turn downward so that the lever stop can be brought down to the right cut instantly. Since the holes are larger than the slot, it is easy to advance and withdraw the cutter with the lathe at low running speed.

Gold for Stenciling

A good gold for stenciling is made by mixing the gold with pure honey to a stiff paste. A little refined glycerine, about a teaspoonful to a gill of honey, is added, and enough soft water to bring it to the proper consistency. If it sets too rapidly, add more glycerine.

Testing Prints for Hypo

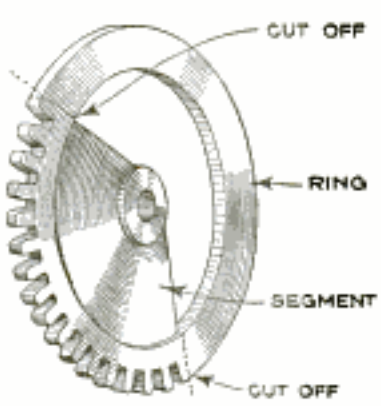
Photographic prints may be tested to determine whether or not they have been washed free of hypo, by means of iodide of starch. A drop or two of tincture of iodine are added to a little starch paste to produce a good blue color. The paste is then diluted so that, when applied to the back of the print, it will show only a slight blue tinge. If the hypo has been entirely eliminated, the blue tint will remain visible at the end of a minute. If the blue stain disappears, washing should be continued.

Cement Unaffected by Age

Cement does not deteriorate with age, provided that no hydration occurs, which is only possible through contact with moisture. Occasionally, when cement is stored in high piles for a long time, the lower bags will become compacted; this is known as "storage caking," although often mistaken for caking caused by moisture. The lumps can be easily broken up, and the strength of such cement is in no way impaired, although it usually requires a trifle longer to set or harden than new cement.

Casting Gear Segments

The common method of casting a gear segment is to make a pattern, and cast just the segment wanted. A better method of doing this job was observed during a visit to a foundry where I saw a segment that had just been cast. A machinist had suggested that the piece be made as shown in the drawing, the outer ring being cut off as indicated, after the turning and milling operations were completed. By this method, the turning of the rim is made much easier, as the tool takes a continuous cut, and the piece is not so hard to balance. Measurement of the outside diameter is also more apt to be accurate than where the piece is made in the usual way.—M. E. Duggan, Kenosha, Wis.

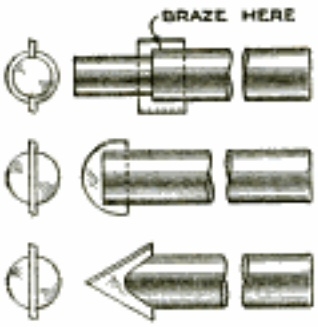


Adding Ether to Gasoline

It is inadvisable to mix ether with gasoline if the engine is equipped with a carburetor having a shellacked cork float. The ether will dissolve the shellac and the float will become logged through the absorption of gasoline. Benzol also has a solvent action on the shellac coating of carburetor floats. Of course, metal carburetor floats are unaffected by either substance. To start the engine with ether, the cylinders should be primed direct.

Counterbores for Light Work

Counterbores and countersinks for very light work may easily be made of pieces of broken hacksaw blades and scraps of steel rod. The accompanying drawing shows three such tools. The end of the rod, in the upper one, is turned down to act as a pilot, the rod is then slotted, the cutter inserted and brazed into place. The other two tools are countersinks of different form; to make these, simply slot the rod end, insert the scraps of blade, braze, and then grind to shape. It is well to insert the blade as far as possible, for the sake of strength.—E. A. Telfer, San Jose, Calif.

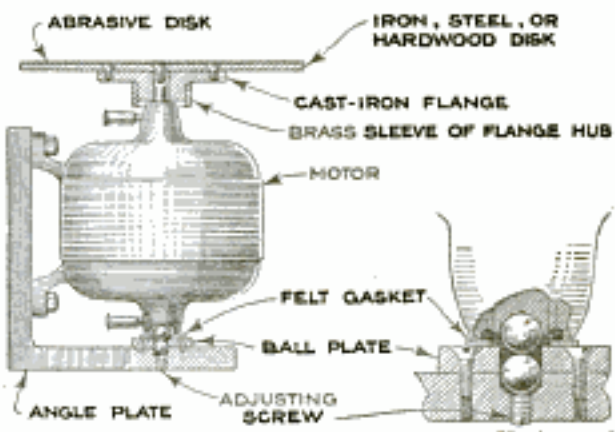


A Horizontal Disk Grinder

For a large variety of work, such as polishing steel specimens for testing, for grinding small machine bases, and other castings, the form of grinder shown is preferable to the ordinary type, and the direct-connected motor eliminates all trouble due to quarter-turn belt drives.

The motor, which is of ordinary stock type, is mounted vertically upon a cast-iron angle plate, provision being made for a thrust bearing below the motor. The end of the motor shaft is drilled for a standard bearing ball of suitable diameter, the hole being of such a size that the ball will be tightly held, while easily removed when worn. A casehardened steel plate, drilled a few thousandths larger than a similar bearing ball to that used in the shaft, is screwed to the base, and the base is drilled and tapped for the bearing-adjusting screw.

The screw hole is counterbored, through the steel plate, for the reception of the ball. The bearing housing of the motor should fit down tight on a felt washer resting on the bearing plate; this washer



A Grinder That will Prove Useful for a Variety of Work is Built by Using a Standard Motor and a Cast-Iron Angle Plate

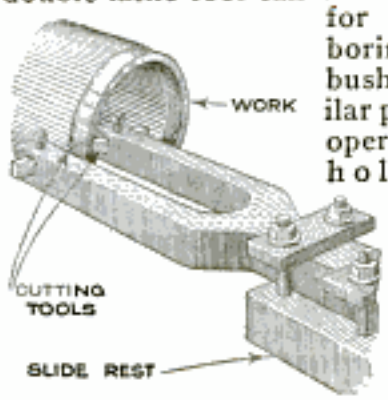
serves to exclude dirt from the bearing. The adjusting screw should have its end shaped spherically, and be hardened.

A cast-iron flange is fastened to the upper end of the motor spindle, and over the hub of the flange is pressed a brass sleeve, as shown; this sleeve should extend down over the bearing housing as far as possible. A steel or iron, or even hardwood, disk is attached to the flange by means of flat-head machine screws, and care should be taken to see that this disk runs true. Either a carborundum or sandpaper disk, depending on the character of the work, is then glued to the disk surface. If a steel or iron disk is used, first glue a circle of tissue paper to the surface, before gluing the abrasive disk; this will then adhere much better.

A sheet-metal case should be built over the motor to protect the windings from the flying particles of grit.

A Double Lathe Tool

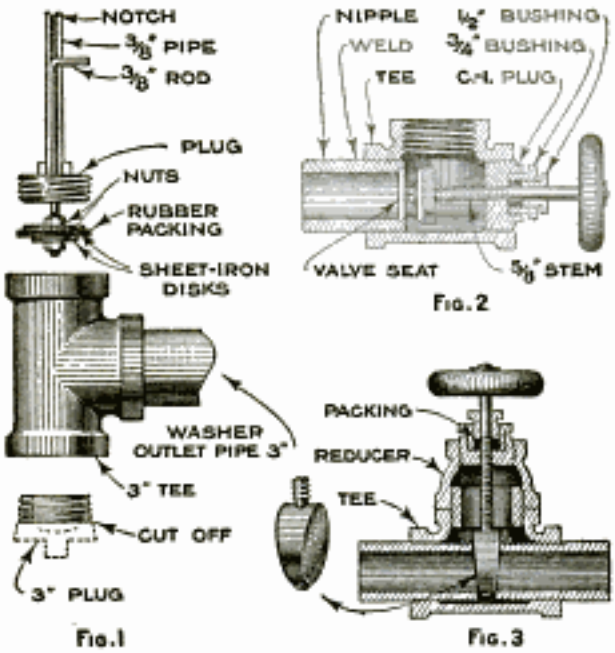
For saving time in railroad shops, a double lathe tool can be used to advantage for such work as boring and turning bushings, and similar parts, at a single operation. The tool holder is forged from suitable steel stock, to the required dimensions, and each end of the U-shaped part is provided with a square hole to take the bits, which are held in place by setscrews.



Improvised Low-Pressure Valves

For use with low pressures, effective valves of various types can be made from pipe fittings, as shown by the three examples in the drawing.

Figure 1 shows an outlet valve which



Low-Pressure Valves of Various Types That can be Easily and Cheaply Improvised from Ordinary Standard Pipe Fittings

is in successful use in a commercial laundry. The body of the valve is a 3-in. tee, the bonnet and valve seat being made of plugs. The upper plug is drilled and tapped to take a suitable length of 3/8-in. pipe, while the lower one is faced off true and smooth. The head of the lower plug is cut off, as indicated, and drilled, leaving a threaded ring which is screwed into the tee. A 3/8-in. iron rod, long enough to permit about 4 in. to be bent at right angles for a handle, is threaded at its lower end to take the nuts, and iron and rubber washers which make up the valve disk, the lower iron washer being just small enough to fit into the opening through the bottom plug, so that the rubber washer will seat against the plug and prevent the escape of liquid. The top of the 3/8-in. pipe is provided with a notch, for holding the valve open, and a slot into which the handle can be dropped to stop the flow.

Figure 2 illustrates the construction of an angle valve from pipe fittings. A valve seat was turned on the inner end of a nipple, and the nipple was then screwed into the run of a standard tee, and welded. Through a cast-iron plug, screwed into the opposite run of the tee, a hole was drilled, reamed, and tapped, for half its depth, to take a 3/4-in. bushing, the lower half of the plug being drilled and tapped to take a 5/8-in. valve stem, to which the valve disk is fastened. The packing arrangement shown in this example, as well as in Fig. 3, was made by filing out the inner threads of a 1/2-in. bushing and screwing it into the 3/4-in. bushing.

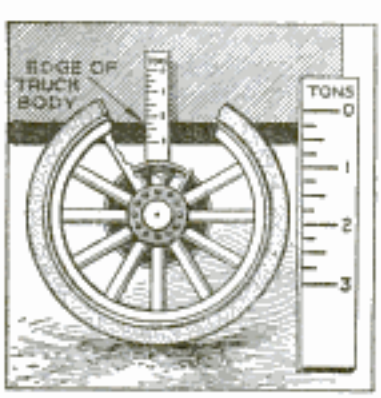
In making the gate valve of Fig. 3, a tee was used having the branch a size larger than the run. Two nipples were screwed and welded in the run of the tee, the valve seat being cut on the inner ends. A third nipple, screwed in the branch opening, received a reducer, in which the bonnet and packing arrangement, in Fig. 2, were used. The stem and valve disks were turned out as shown, no guide for the valve disk being provided, as it did not rise entirely above its seat and thus would always return properly.

Using Pocketknife as a Pen

As an emergency pen or marking brush, the blade of an ordinary pocketknife can be used. First wet the blade between the lips so that it will take up the ink like an ordinary pen, and do the writing or marking, with the cutting edge of the blade held to the right. The character of the writing can be varied by touching up the point of the blade on an oilstone.—George H. Holden, Chesterfield, Eng.

Determining Weight of Load

A simple method for determining the load being carried by a truck, in order to prevent the destructive effect of overloading, consists of a graduated scale. The scale is first laid off by applying known weights, and measuring from some part of the axle or spring supports to the edge of the body. This should be done with the truck on the level, and the scale marked for the different deflections of the springs as the weight is increased. To weigh the load, a reading should be taken from each side of the body, and the average of the two will be the approximately correct weight, even though the truck is not on level ground.



Simple Furnishings for the Home Grounds

By ROY BROWN

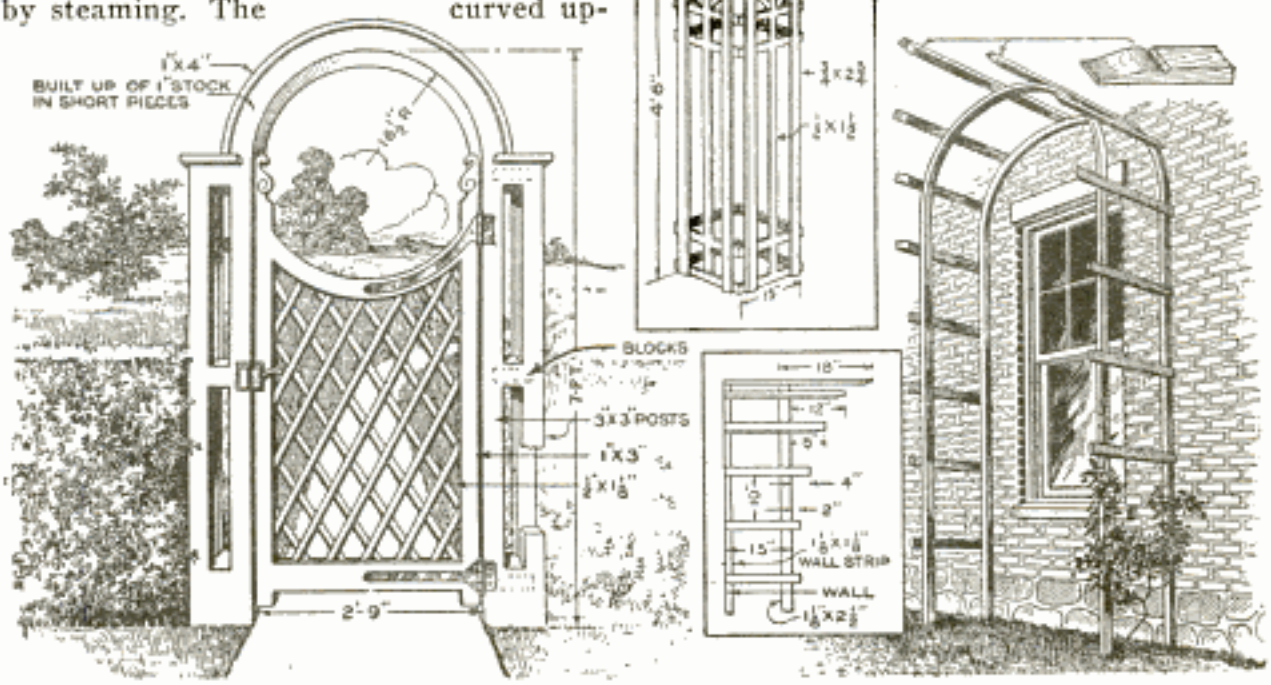
AT a surprisingly small outlay for materials, the home owner can add materially to the beauty of his surroundings, by the judicious use of trellises and similar furnishings made of wood.

Any kind of wood may be used, but as this class of woodwork is exposed, and in contact with moisture, cypress, which is almost immune to rot from this cause, should be given the preference.

A pleasant first impression is given to the visitor who passes through a gate of the type illustrated. The side pillars are each built up of four 3 by 3-in. posts, which are joined together by blocks, nailed to, or mortised into, the posts so as to keep them 3 in. apart. The joints between blocks and posts should be glued, and will be invisible when the pillars are painted. The gate itself is a latticework of ½ by 1⅛-in. slats, held in place between side and end rails of 1 by 3-in. material. The heavy portion of the arch joining the top of the pillars is built up of 1-in. stock in short pieces, the 1 by 4-in. rail being bent by steaming. The curved upper hinge, if beyond the ability of the amateur to make, can be made by any blacksmith. These few directions should enable anyone to build this charming gate.

A sundial adds immensely to the appearance of the lawn, and the simple one shown will appeal to those who do not want to go to the trouble of making or purchasing a more elaborate one. Little need be said of its construction beyond the fact that each side is nailed up separately, then the whole assembled, allowing some of the vertical posts, of ¾ by 2¾-in. stock, to project about a foot, so they can be set into the earth.

The severity of plain walls can be offset in some cases by a simple trellis placed over a window, as shown. The inner frame is of 1⅛-in. square stock, and the outer one of 1⅛ by 2½-in. stock; the latter is placed with its narrow face outward, and both are steamed



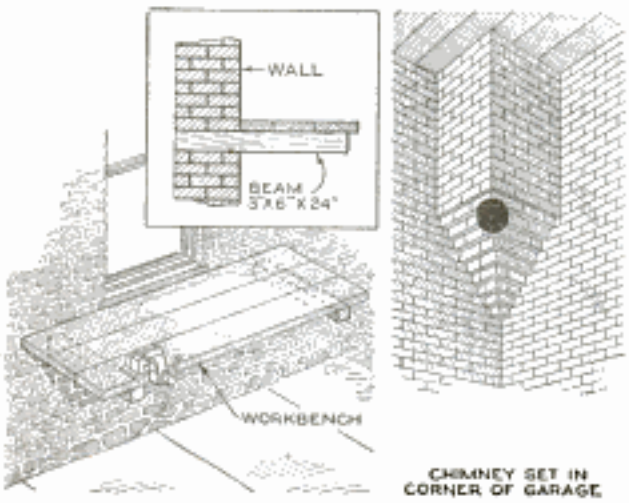
Attractive Garden Furnishings That Materially Enhance the Beauty of the Home Garden: The Material Cost Is Low, and by Using Cypress, Immunity from Rot Due to Moisture is Obtained

and bent to the proper radius. The outer ends of the cross strips, also of 1⅛ by 2½-in. cypress, are shaped as shown in the enlarged detail.

By setting out plants of climbing habit at the sides of this trellis, a considerable amount of shade may be obtained, particularly desirable when the window so treated is exposed to sunlight during a large part of the day.

Refinements in Garage Building

Two details that any garage owner will readily appreciate can be incorporated into the brick or concrete work at prac-



A Method of Mounting Bench Supports and of Building the Chimney in the Garage So As to Obtain a Clear Floor Space

tically no cost, provided the designer has the foresight to include them. The first is supports for a workbench in the sidewall, which does away with the need of vertical legs extending to the floor. These supports are 2-ft. beams, about 3 by 6 in. in cross section, set into the wall about 3 ft. from the floor. All that is required to complete the bench is the lumber to form the top.

The second is a chimney for the heater or stove that is so desirable in cold weather, in making repairs, or for preventing the circulating system of the car from freezing. The chimney is corbeled at the bottom so that it can be built without taking up any of the floor space, which is usually at a premium.

Washing Prints in Plate-Washing Box

An ordinary negative-washing box can be used for washing prints, particularly those made on double-weight paper. Two such prints are placed back to back and inserted into the grooves of the washing box, and washed in the same manner as glass plates.

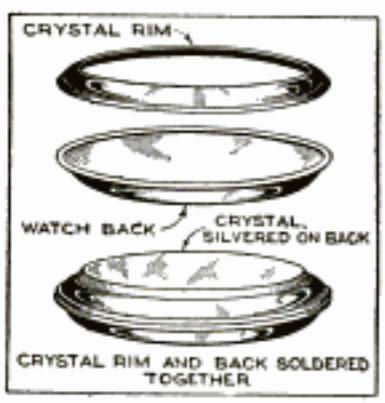
Remedying Leaky Fountain Pen

Fountain pens that ordinarily feed ink at the proper rate often feed too fast during the first few minutes of use. The reason is that the heat from the hand causes the air in the barrel to expand and so forces the ink out. If the fountain pen is held point upward and a slight pressure made on the self-filling device until a few bubbles escape through the ink feed, and then, maintaining this pressure and placing the point of the pen downward, the pressure is released, the ink on the pen will be drawn in, and a blot averted. Usually the pen will then feed at the proper rate but sometimes, especially when it is nearly empty, it may be necessary to repeat the operation.

For fountain pens not equipped with a self-filling device, the remedy is to hold the pen, point upward, a moment, until it has attained the temperature of the hand, so that the expansion will force out air instead of ink.—K. M. Bard, Manawa, Wisconsin.

Vest-Pocket Mirror from an Old Watch

A neat and substantial vest-pocket mirror can be easily made from an old watch. The front and back parts of the case are neatly soldered together on the inside, the works and middle part of the case being discarded. The crystal, which is removed before soldering the two parts of the case together, is silvered on the back and replaced.



Any of the various silvering formulas may be used, but perhaps the best for this particular purpose is made in two separate solutions. The first solution is made of 8 oz. of distilled water heated to the boiling point, when 12 gr. of silver nitrate and 12 gr. of Rochelle salts are added. After the solution has boiled for about five minutes, it is cooled and filtered. The second solution consists of 8 oz. of distilled water, in a small quantity of which 19 gr. of silver nitrate is dissolved. Several drops of ammonia are added, until the solution becomes clear, and 16 gr. more of silver nitrate is then added and dissolved. The remainder of the distilled water is added

and the solution filtered. The two solutions are kept in separate bottles, marked so that they may not be confused.

To silver the glass, clean it with ammonia and wipe with a piece of clean, damp chamois skin. Then stir up equal parts of each solution together in a glass, pour the contents into the concave back of the crystal, and allow it to remain until the solution precipitates.

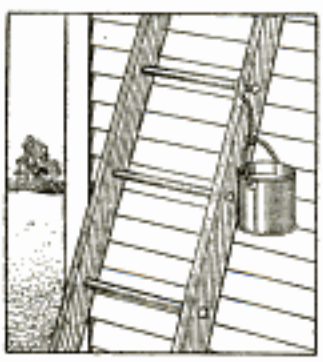
A Simple Mole Trap

A cheap and effective mole trap can be made from two empty tin cans. With a can opener, cut the lid of each can until it is held in place by only ¼ in. of tin, in which condition it should be "springy," and press it slightly inward.

To set the trap, carefully remove the earth from the mole run, taking pains to prevent the hands from contact with the soil, for the mole is suspicious and keen of scent. Then lay the two cans in the burrow with the blind ends touching. Cover up the hole carefully, to exclude the light, and await results. The mole traversing the runway in either direction, arrives at the partly open can and pushes on past the yielding lid. On finding no outlet at the blind end, it attempts to back out, whereupon it comes against the springy lid which prevents its escape.—B. A. Reynolds, Sacramento, Calif.

Wire Hook for Paint Bucket

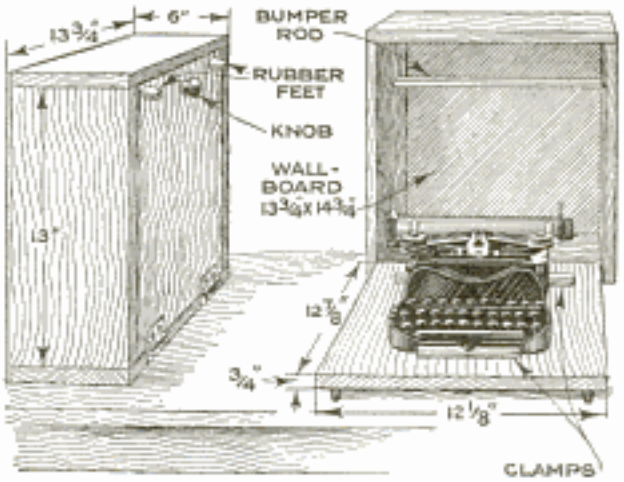
An improved wire hook, for holding a paint bucket out of the way when working on a ladder, consists of a piece of heavy wire, about 10 or 12 in. long, with one end fastened to the handle of the bucket and bent at the opposite end to fit over a rung of the ladder. After the hook is formed, it is placed over the rung and bent so that it reaches across the edge and down the side of the ladder rail, as shown in the drawing. A hook of this kind holds the bucket out of the way, and keeps it level at all times.—Jesse L. Blickenstaff, North Manchester, Ind.



¶A whist-score marker is convenient for keeping count of the stitches when knitting.

A Space-Saving Typewriter Cabinet

The style of cabinet shown in the drawing is one of the handiest and best ways of stowing a typewriter in stores and similar places where space is scarce. It is designed and built to hold a writing machine of the portable, folding type, although it may be made for standard machines by altering the dimensions.

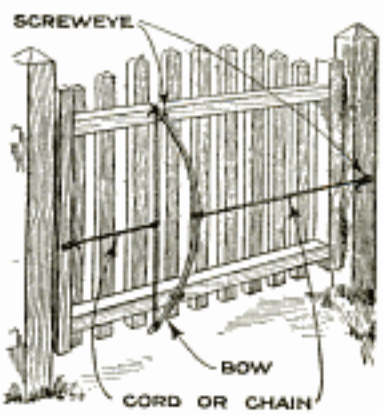


A Space-Saving Typewriter Cabinet in Which the Machine can be Protected and Pushed Out of the Way in the Busy Store or Office

The machine is held to the hinged cover with clamps at the front and rear, the rear clamp being a 10-in. strip of 1⅜-in. material; the front clamp consists of a ⅝ by 3-in. block held in place with a wing screw. The bumper rod is so placed that it will take up all lost motion when the cabinet is closed, and is covered with rubber where it comes into contact with the machine.

A Bowspring for Closing the Gate

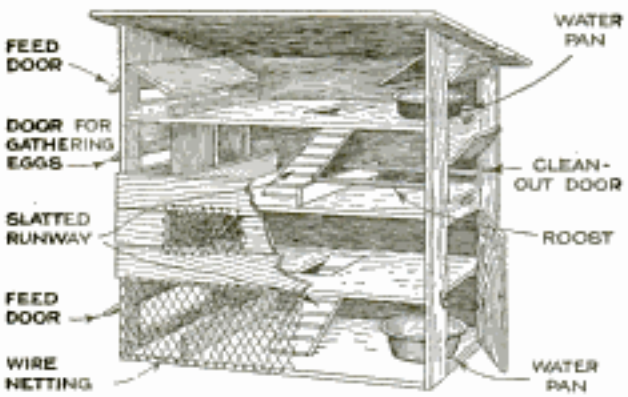
A novel method of using a bow, resembling the primitive weapon of the Indians, is to apply it as a gate or door-closing device. The bow, which is made of some tough, flexible wood, like hickory, is attached to the gate as shown in the drawing. Screw-eyes are turned into the top and bottom stringers of the gate, on the inside, and the ends of the bow are inserted through these. The bow is connected to the gatepost with a light chain, or strong cord, attached to its center, and



a similar connection is made from the bowstring to the edge of the gate in the manner indicated in the drawing. The gate must open away from the side on which the bow is mounted.—J. G. Allshouse, Vandergrift, Pa.

A Combination Rabbit Hutch and Poultry House

Lack of ground space prevents many city dwellers from raising rabbits and poultry, although they would like to do



A Combination Poultry House and Rabbit Hutch by Means of Which the Dweller in Crowded Surroundings can Raise His Own Poultry and Rabbits

so. The drawing shows a combination rabbit hutch and poultry house that is sufficiently large to accommodate about half a dozen hens and the same number of rabbits. As the drawing shows, the combination coop is a four-decked structure; the two lower compartments are for the rabbits and the upper ones for chickens, or other poultry, each division being made about 1½ ft. high. Small doors, hinged at the top, permit water and food to be inserted easily; suitable doors are also provided at the opposite end of the coop for the removal of litter. Slatted runways are provided between the decks of the rabbit and chicken compartments, respectively.—J. H. Van Nice, Waukon, Ia.

Silver Contact Points for High Voltages

The radio-telegrapher handles much heavier currents through his key than the wire operator, and is subject to more or less trouble by reason of the contacts wearing under the high voltage; this causes a reduction of the alternating-current potential fed to the primary of the transformer, and lowers the efficiency of the transmitter. The trouble is easily remedied by soldering two small silver coins to the contacts, having first filed down and leveled the old points.—F. L. Brittin, Chicago, Ill.

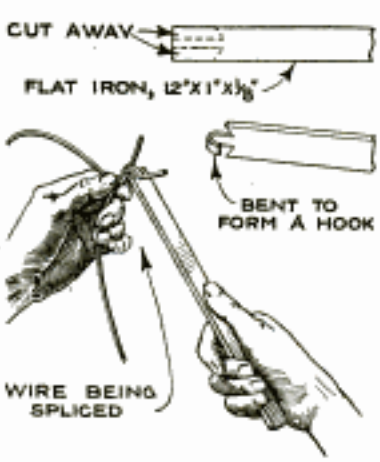
Resetting Window Panes

Loose window panes are usually caused by the putty yielding to the repeated contraction and expansion of the glass and woodwork under the influence of temperature changes. Sooner or later the putty will become loose and fall away, and some of the panes will be loose enough to make a disagreeable rattle.

When reglazing, the pane should be removed and reset in a putty seat, because if the glass is merely set into the sash and puttied around the outside, the moisture that collects and condenses on the glass inside the room will trickle down between the sash and glass; there it freezes, and pushes the glass and putty a trifle outward. Unless the water should evaporate, this action is repeated indefinitely until the putty has been broken away, and an opening is made which allows the water to drain out. Thick paint, brushed around into the corners and on the edges of the pane groove and seat, will largely prevent this action, the glass being set before the paint dries.—G. G. McVicker, North Bend, Neb.

A Wire-Splicing Tool

In splicing fence, telephone, and other wires, the simple little tool shown in the drawing will prove its value. It is made from a piece of flat iron of a convenient size, and formed as indicated. A hacksaw, or file, is used for cutting out sections ¼ in. wide by 1¼ in. long, on each side, leaving a projecting tongue which is bent over into the form of a hook.



To use, cross the wires to be joined, hook the tool over one piece, and let the other wire fit into one of the notches. The tool is then turned until the wire is securely wrapped, the operation being repeated with the remaining end of the wire.—G. A. Tibbans, Galena, Kan.

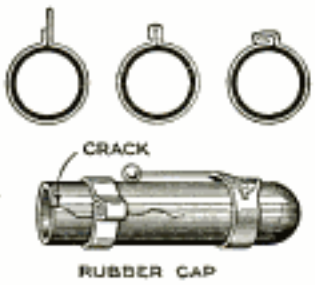
¶A nasal atomizer can be used with telling effect for spraying the underside of plant leaves with insecticide solutions.

Notches Aid Loading of Plate Holders

Most camera plate holders have each side of the slide marked or colored differently to indicate whether the plate has been exposed or not. However, when loading the plates in a dark room without a light, the slide is sometimes inserted backward, causing confusion later as to whether or not the plate has been exposed. To remedy this trouble, cut a row of fine notches on the wooden finger piece at the top of the slide, putting the notches on the "exposed" side. Then, when the notches do not show on the outside, it proves that the plate has not been exposed. This little dodge may sometimes be the means of preventing a double exposure on a valued plate.—Harold E. Benson, Boulder, Colo.

Repairing a Cracked Fountain Pen

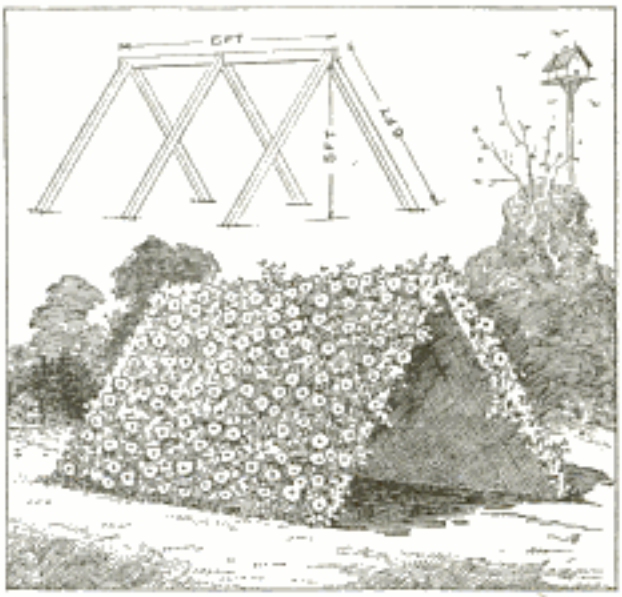
The hard-rubber cap of a fountain pen frequently sticks, and in employing the force necessary to unscrew it, it is not an uncommon thing to crack it; it is then a case of getting a new cap or repairing the old one in the best way possible.



A method of repairing such breaks is shown in the drawing, and consists in placing a thin metal band around the broken part. A piece of thin sheet metal is cut about ¼ in. wide, and long enough to go around the cap, with an extra ½ in. allowed for making a joint; the exact length can be found by wrapping a strip of paper around the cap. Having cut the metal strip, it is bent around the cap and pinched into the position indicated in the upper left-hand corner of the drawing with a pair of pliers. Fold over the projecting single thickness of metal, and finally turn over the folded joint parallel with the cap. Thin sheet aluminum, such as is used in the manufacture of small advertising novelties, is very good for this purpose, as it can be cut with a pair of ordinary scissors and is easily bent.—C. H. Patterson, Pomona, Calif.

Tepee Covered with Vines

An attractive children's playhouse which does not spoil the appearance of the lawn, can be made as shown in the drawing. It consists of a wooden frame covered with wire netting, over which vines are grown. The frame is made of seven 6-ft. two-by-fours, the rafters being set

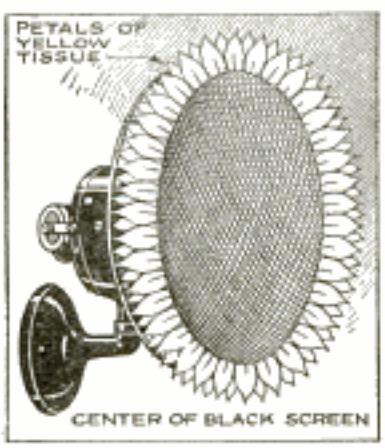


A Vine-Covered Playhouse Pleases the Children and does Not Injure the Appearance of the Lawn

with their bases 5 ft. apart. These are then covered with wire netting, and the seeds of wild morning-glory, clematis, or other rapid-growing vines are planted along the edges. The frame may be painted green for better appearance. In six or eight weeks, the playhouse is very attractively covered with vines and furnishes a fine place for the children to play.

Electric Fans Disguised as Sunflowers

The owner of a moving-picture theater, wishing to brighten the appearance of his place, conceived the idea of disguising his electric fans as sunflowers. Petals were cut from yellow crêpe paper and were mounted around the outer rim of the fan guard with library paste; to produce the black-center effect of the blossoms, circular pieces of black screen wire were stitched to the guard so that the proper convexity was obtained.—G. E. Hendrickson, Argyle, Wis.



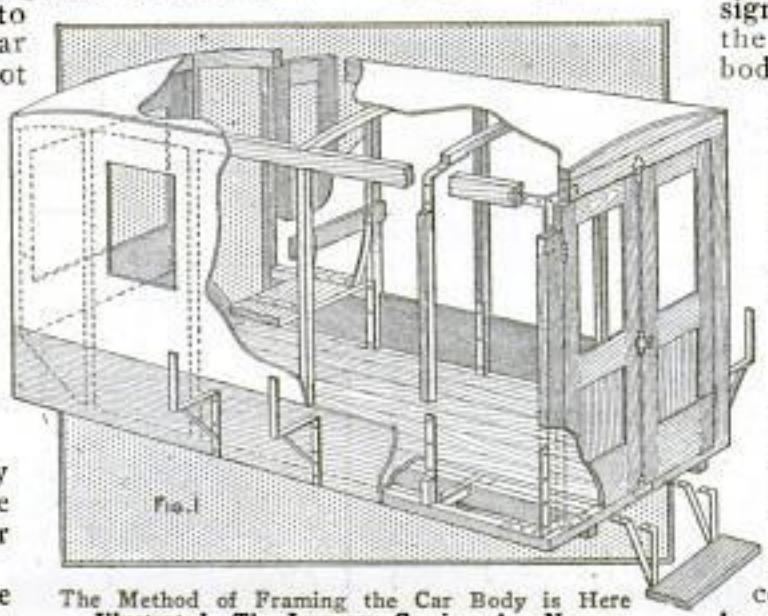
TOURING IN THE AUTO

By H. F. JOHNSON

Part II—The Land Cruiser

SINCE there are so many ways in which an automobile can be converted to touring purposes, and so many ideas of personal comfort and convenience to be taken into consideration, it is manifestly impossible to lay down any set rules and regulations for construction and arrangement. Much depends upon the size of the party that is making the trip; if there are not more than two, a touring-car chassis will perhaps answer, but if there are to be three or more, a truck is recommended, unless, of course, the party wants to carry tents and camp out literally.

If a touring car is to be rebuilt into a traveling dwelling, the first thing that must be done is to strengthen the rear spring, if it is not already stiff enough, to support the additional weight of the new body, without letting it down against the axle every time the car goes over a bump in the road, and it may also be necessary to lengthen the frame by one or two feet.



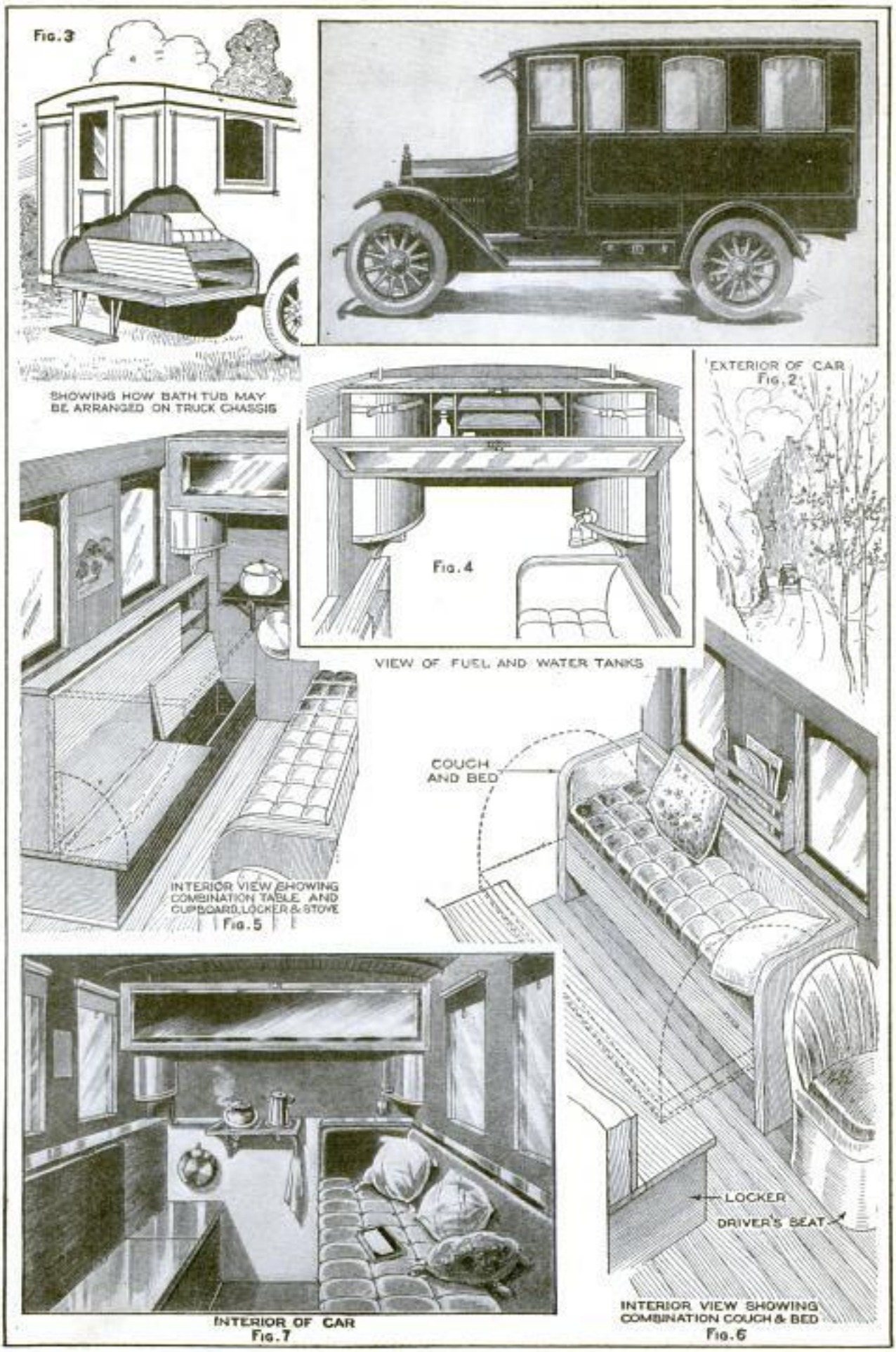
The Method of Framing the Car Body is Here Illustrated. The Luggage Carriers Are Necessary for the Body Shown in Figure 8

Next will come the construction of a body and here the builder gets his first opportunity to exercise his originality and ingenuity in devising new features that will add to his comfort on the road. Figure 1 illustrates a type of body that is easily built. It will be noticed that all corners are secured with body irons of various kinds and, if the owner is also the builder, he can have these made by "the village blacksmith" or buy them ready-made. Hardwood should be used throughout and the sides covered with plywood, or heavy wallboard suitably waterproofed. Unless the owner is an experienced "hand" and has considerable skill, it would perhaps be better and ultimately more economical, to have the work done by a professional body builder. Also, for use on a popular make of light car, ready-made bodies for both passenger and truck chassis can be bought.

Figure 2 shows a type of automobile that is particularly pleasing in appearance, various views of its interior arrangement being shown below.

The drawing at the left, Fig. 3, shows an original idea of one bath-loving tourist who arranged a bathtub of his own designing underneath the floor of the body. During the daytime, and when not in use, the tub served to hold the "crew's" bedding, and similar articles.

At the rear of the car are tanks for water, and fuel for the stove used for cooking, as shown in Fig. 4. These tanks are placed in the corner on suitable brackets and held in place with straps, the space between them being taken up by a locker for toilet materials, or it may be used as a storage for cooking utensils. An alternative arrangement, by means of which a larger quantity of water could be carried, would be to mount a single tank horizontally in the corner against the roof; then again, the tank might be mounted on the outside, above or below the car.



Various Views of the Exterior and Interior of an Up-to-Date "Land Yacht:" While the Interior Arrangement Is Entirely Suggestive, It will be Found Very Practical and to Afford a Maximum Amount of Space and Comfort, without Adding Too Much Weight

It might here be mentioned that the presence of a door at the rear of the car will influence the interior arrangement.

Another view of the convenient interior of this car is given in Fig. 5; this shows the combination table and cupboard, locker, and stove. When not in use, the table serves as a door for the cupboard, and is raised to the position shown by the dotted lines when in use. The locker, which extends beyond the cupboard, serves as a support for the bed when it is opened out, as shown in Fig. 6, and, like everything else, this idea will immediately suggest variations of design and arrangement. The bed may be one of those folding ones best known as a "sanitary couch," fitted with wooden ends and suitably fastened to the body.

A more complete view of the interior is shown in Fig. 7, which shows everything ship-shape, at it would be on the road, with the exception that the steaming pot on the "galley" range would perhaps be endangered by careless driving. This views shows how the oil stove is connected to the fuel tank. Also, like all the other ideas, the arrangement of the stove is susceptible of considerable elaboration, and shelves on either side of the stove would also add to the convenience.

An arrangement that furnishes a maximum of interior space and sleeping accommodations is afforded by a body of the type shown in Fig. 8. In this design, one or both sides are hinged to open up at the center, the lower half resting upon what during the day serves as a luggage carrier. Underneath the beds, which form comfortable seats when the sides are closed, provision is made for stowing clothing and other articles. With the sides in the open position, as shown in the drawing, roller curtains are pulled down at the side and across at the ends, to obtain the necessary privacy. Naturally, such an arrangement is more suitable for use in warmer parts of the country, although by altering the sleeping arrangements slightly, it could be used with equal satisfaction in any latitude and in any season.

The interior view shows the arrangement of the "mess" and "galley," the door of the cupboard, or food locker, forming a table when not in use as a door. By placing the stove on top of a cupboard, or chest of drawers, additional storage place would be obtained with no sacrifice of space. The hinged sides of the car are held in their open and closed positions by means of chains and bolts respectively, as indicated. Of course, every spare bit of space can and should be utilized for the storage of clothing, food, and supplies, and the ingenious builder, while profiting from the suggestions illustrated in these two types, will doubtless be able to devise any number of additional comforts and conveniences that will meet the special re-

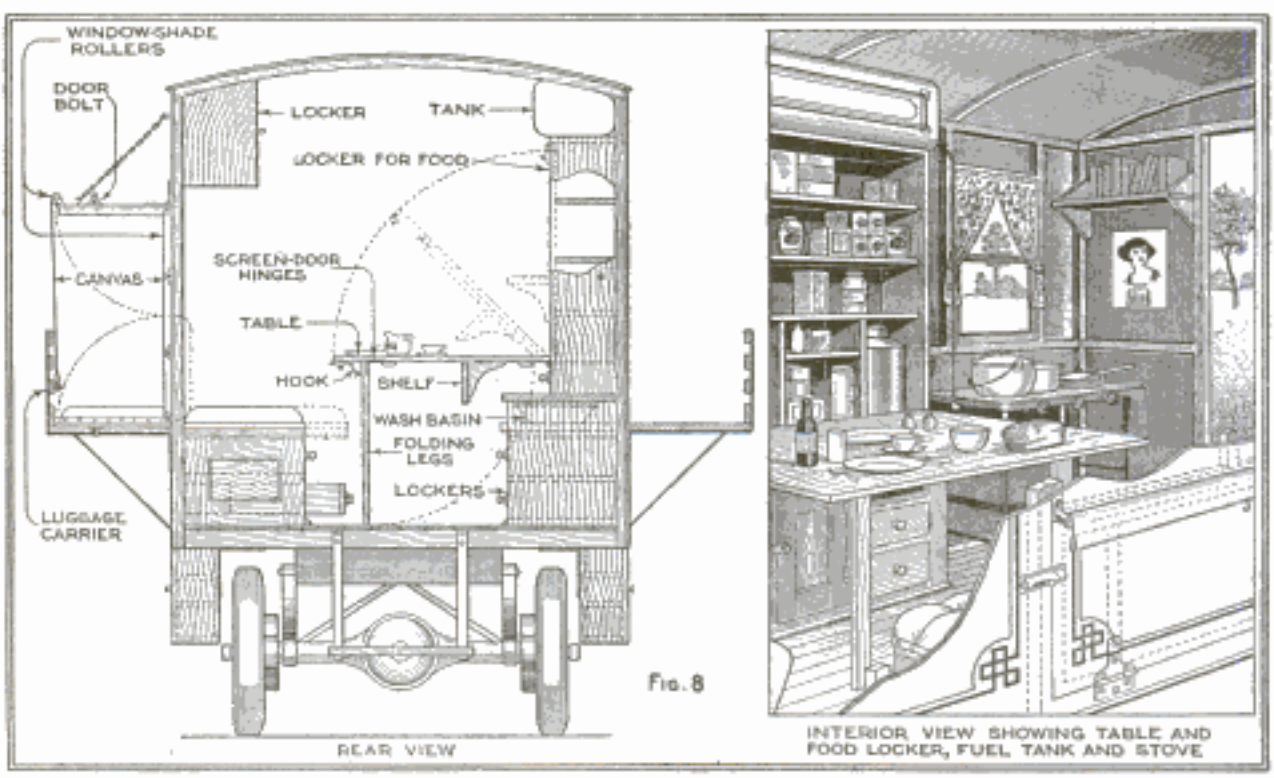


Fig. 8

An Alternative Arrangement of the "Cruiser" Body, More Suitable for Use in Warm Climates: In This, as in the Other Design, Space is Conserved as Much as Possible

quirements of his own "crew." These designs have been stripped to the mere essentials for providing comfortable living quarters while on the road, and no attempt has been made to encumber the car with shower baths, refrigerators, or similar arrangements, the inclusion of which is left entirely to the builder. The cost of a body such as is shown here, will, of course, vary as the interior arrangement is more or less elaborate, but for $300 or $400, in addition to the cost of the car, a very comfortable "auto cruiser" may be fashioned.

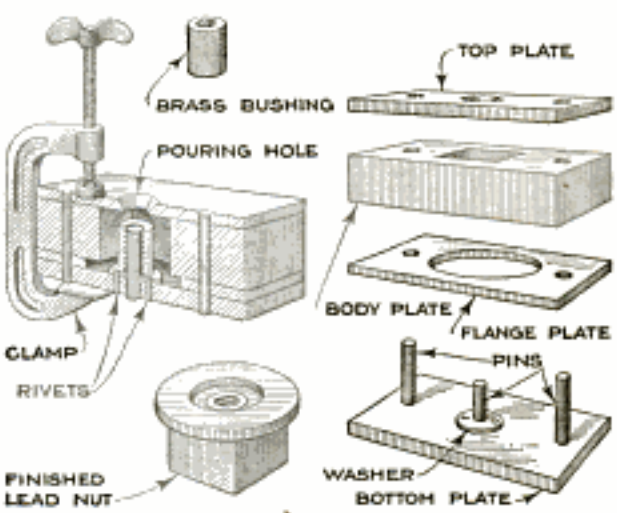
Casting Terminal Nuts for Storage Batteries

A mold for casting storage-battery terminal nuts is a convenient accessory about the garage or private lighting plant.

Such a mold can be made of hardwood, or hard fiber, if but a few nuts are to be cast, but a more substantial article is made of iron or steel plates; if brass is used, the surface must be oxidized to prevent the lead from sticking.

A top plate is first made; this to have a countersunk pouring hole, about 3/16 in. in diameter. Next comes the thicker plate with a square hole, the size of the nut body; this is easily chiseled out of wood or fiber, but if metal is used, a square or triangular file must be used to form the corners after the hole has been drilled to the diameter of the flats. The square hole must be tapered slightly toward the bottom so the casting can be easily removed. Then comes the bottom plate, in the center of which is driven a pin the length of the brass bushing to be used and small enough to enter the bushing after it has been tapped. An iron washer, rusted or coated with graphite to prevent the lead from sticking to it, is placed over the pin and riveted to the bottom plate. The purpose of this washer is to form a shallow cavity in the bottom of the nut. This cavity is filled with vaseline or grease before the nut is screwed into place on the battery, to protect the brass stud and exposed end of the bushing from corrosion. After all the parts have been completed, they are assembled in their proper relationship, clamped together, and a hole is drilled in each end to take the dowel pins which are fitted into the bottom plate.

A bushing is made of round, or square, brass bar, drilled and tapped for the stud it is to fit. The outside is tinned with solder to make the lead stick to it, and to prevent it from working loose and turning inside the lead casting. When ready to use, the bushing is placed over the central pin of the bottom plate, and the mold is assembled, sheets of paper being placed between adjacent plates, and care being taken to see that the paper does not extend into the mold cavity. One or two small clamps are used to hold the parts of the mold together, and everything is ready for pouring the melted lead. If the mold is made of metal, it should be heated before the metal is poured. The casting is easily removed from the metal mold by removing the two dowel pins and driving off the top plate edgewise, thus shearing off the "gate," but if wood or fiber is used, the top plate should be made in two parts, the dividing line being through the countersunk pouring hole.



Lost or Battered Battery Nuts may be Replaced by Using Scrap Lead in Connection with This Simple Mold

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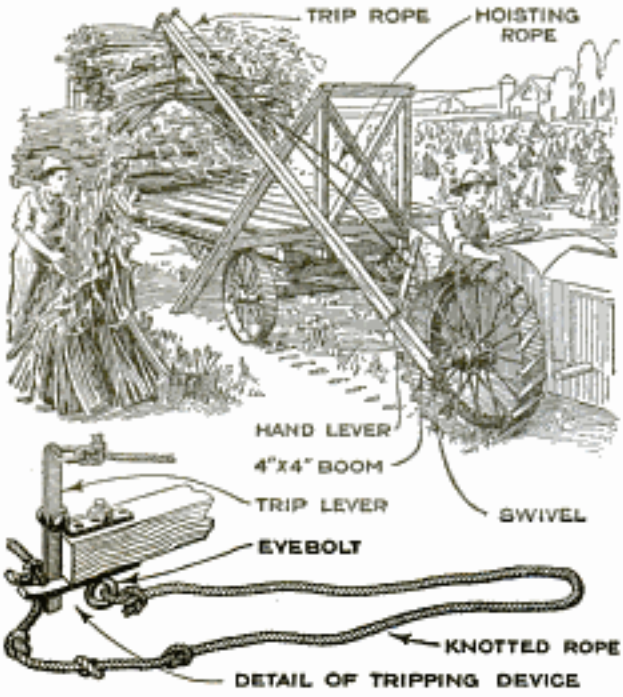
Straightening an Auto Axle

Often when an automobile will not keep to the road, it will be found that the radius rods are bent, thus allowing the axle to tip forward and throw the steering knuckles out of perpendicular. If this should be the trouble, clamp a large monkey wrench on the underside of the axle, allowing the handle to point ahead of the car. Raise the end of the handle by means of the jack and thus bend the top of the axle back into place. Each end is bent separately in the same manner, if two wrenches and jacks are not available. The axle is often bent in the manner described if the front wheels drop into a ditch while driving fast.—Harold E. Benson, Boulder, Colorado.

¶White paint will not wear as well on exterior work as tinted or colored paints.

Using the Tractor as a Crane

A western farmer considerably reduces the labor of loading cut fodder on a wagon by making the tractor hoist the



A Simple Hoist Which Considerably Reduces the Manual Labor Required in Harvesting Corn Fodder

shocks. The only equipment necessary is a long piece of 4 by 4-in. lumber, fitted with a swivel eyebolt at one end, and a tripping device at the other; a ¾-in. rope, 25 ft. long, and a ½-in. rope, 14 ft. long. The end of the 4 by 4-in. boom is attached to the hub of the tractor wheel by means of the swivel, so that it is free to move vertically and horizontally. The device shown at the outer end of the boom consists of a piece of rope, long enough to pass around a shock; this is fastened to the boom and knotted at short intervals, so that, when it is slipped between the two pieces of flat iron, the knot will prevent its pulling out. When the trip rope is pulled, the lever forces the knot out, permitting the shock to fall into the wagon. In operation, the tractor and rack are driven until the end of the boom is at the center of the shock to be lifted, the knotted rope is passed around the shock and hooked in place. The tractor operator then snubs the lifting rope around one of the mud lugs on top of the driving wheel and lets in the clutch, driving the tractor forward and lifting the load. A guide, made of 2 by 4-in. lumber, is fastened to the corner of the rack, to hold the boom out until the load is high enough, when it will swing in. The trip is then operated, and the cycle of operations repeated. This device not only enables much heavier shocks to be handled, but can be used for a variety of other hoisting around the farm.—G. McVicker, North Bend, Neb.

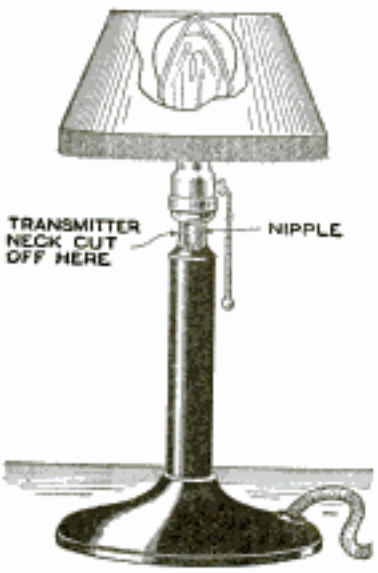
A Kerosene-Dispensing Kink

A rural resident stopping at a cross-roads general store for supplies observed with interest how the merchant had applied his ingenuity to the dispensing of kerosene. His small retail trade demanded that many a can of kerosene be filled; a greasy and disagreeable job at best when following the usual practice of drawing it through a spigot from the barrel.

To save space, and, at the same time, prevent his hands from being covered with oil, he installed a small kitchen sink, with a drain and an ordinary pitcher pump, in a corner of the store. Both the pump and drain were connected to the oil barrel in the basement below. In this way he could quickly pump up a can of oil for his customer and all drip and overflow drained back into the barrel.—T. W. Ingersoll, Buffalo, Minn.

Making a Cheap Bedroom Lamp

Almost every telephone exchange has a number of old desk-type telephones which are either obsolete or out of commission, and therefore can be obtained by the amateur mechanic at little or no cost. The only part needed for making an attractive and inexpensive bedroom lamp is the base and column, as indicated in the drawing.



The transmitter neck is sawed off at the point indicated, and is tapped with a ⅛-in. pipe thread, to make a nipple, 1 in. long. A standard chain-pull-type light socket is screwed onto the nipple, and a very rigid lamp base is thus obtained.

The base may be finished to match the decorative scheme of the bedroom by giving it a coat of enamel.—A. G. Buchman, Kenosha, Wis.

Substitute for Ground Glass

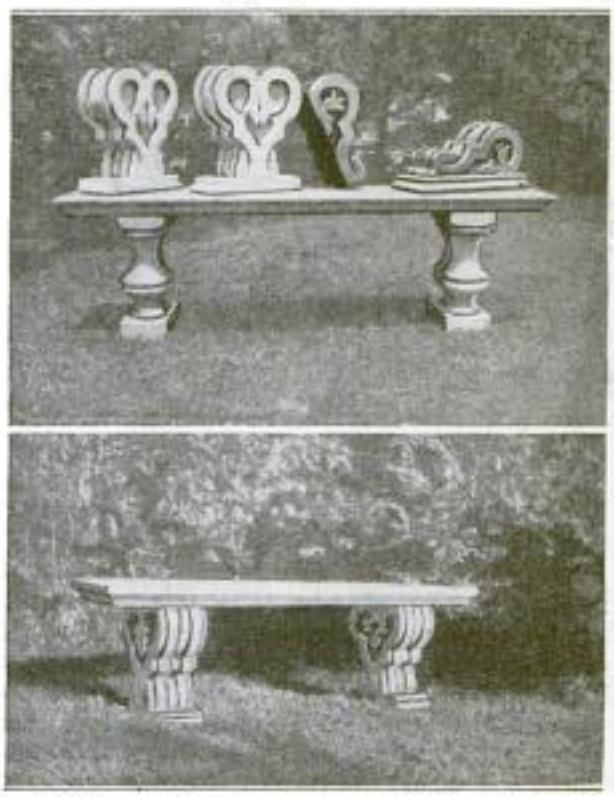
A device for focusing an ordinary roll-film camera, without the necessity of using a plate-back attachment, can be made of a strip of draftsman's tracing cloth fastened to two film spools. The spools are put into the camera in the usual way and the tracing cloth is wound across the opening in the back. As the tracing cloth is pretty sure to be on the same plane as the film on which the image is to be recorded, a focus obtained in this manner will be almost certain to give a sharp picture. The objection to this system is that it can only be used once, before the first picture on each roll is taken, as the tracing cloth must be removed to insert the film.—H. R. Howie, Swansea, Ont.

Flower Stand of Pipe and Fittings

Pipe and fittings, which are easily obtainable at low cost almost anywhere, can be combined to make an attractive flower stand, such as the one in the drawing. It will be observed that the pipe is all in straight lengths and that no bending is needed, which reduces the construction to its simplest elements. The central pedestal is extended above the circular table, and a small platform is provided for a jardinière filled with trailing vines. The circular table may be made of two or more sections of wood. The materials composing such a stand are: one ½-in. railing floor flange; one piece of ½-in. pipe, 12 in. long; one ¾-in. six-way cross; eight pieces of ¾-in. pipe, each 9 in. long; four ¾-in. railing floor flanges; four ¾-in. malleable tees; four ¾-in. malleable ells; eight ¾-in. acorns; one ¾-in. side-outlet cross; one piece of ¾-in. pipe, 20 in. long, and four ¾-in. close nipples.—Lester A. Hitchcock, Kewanee, Ill.

Garden Benches from Discarded Trim

The architectural horrors of the past as embodied in highly ornamented cornice



Attractive Lawn Benches Made from Discarded Building Trim: The Upper Photograph Shows a Bench Supported on Old Porch Balusters; on Top of It is Seen Some of the Old Cornice Brackets Used in Making the Seat Shown in the Lower Picture

brackets can be made into attractive garden benches or seats.

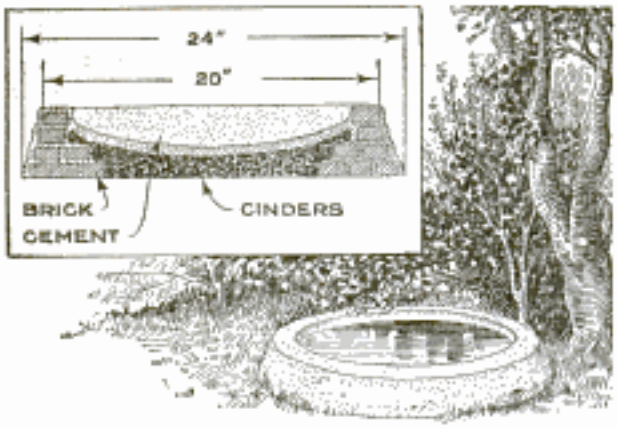
Two pairs of the heavy brackets are nailed together, back to back, and a small section is sawed from the narrow end to give a flat base that can be nailed to a block. The top of the seat is made by nailing a molding around the four edges of a board of suitable size, the corners of the moulding being mitered. The upper photograph shows a similar bench which is supported in the same manner by old porch balusters.—Mrs. Alexander Nettleroth, Louisville, Ky.

A Hint on Shingling

When shingling a roof, avoid the use of very wide shingles, as they are much more likely to split, warp, and buckle; use no shingle wider than 6 in. Use the old-fashioned cut nails or, better still, copper nails. Any roof under the influence of alternate dryness and moisture will sweat sufficiently to rust ordinary wire nails. Galvanized nails add but slight additional protection, hence the desirability of using copper nails.

Bird Bath of Brick and Cement

Many lovers of wild birds have on their grounds a "wild corner," which is usually planted with native wild shrubs, vines, and



The Bird Lover will Find Himself Amply Repaid in the Society and Friendship of His Feathered Pals by Providing Them with Drinking and Bathing Facilities

flowers. The birds like such surroundings and both the birds and their friends would enjoy it more if a bird bath were provided. There are any number of ideas along this line, but the bird bath built by one admirer of the feathered songsters has the merit of blending well with its surroundings and being economical to make. A circular form of old bricks was made about 14 in. high and 2 ft. in diameter at the base, tapering to about 20 in. at the top. The brick form was filled with cinders to within a few inches of the top, leaving a depression which sloped from 5 in. at its deepest point to about ½ in. below the rim. In this way bathing and drinking accommodations are provided for birds of all sizes, from a wren to a flicker. The whole structure was covered with a coat of one part cement to three parts of clean sand. Both the inside of the basin and the exterior are finished rough, and when completed, the whole has the appearance of a large bowlder that harmonizes well with its surroundings.—Mrs. Lillian S. Loveland, Lincoln, Neb.

Playing Phonograph Music at a Distance

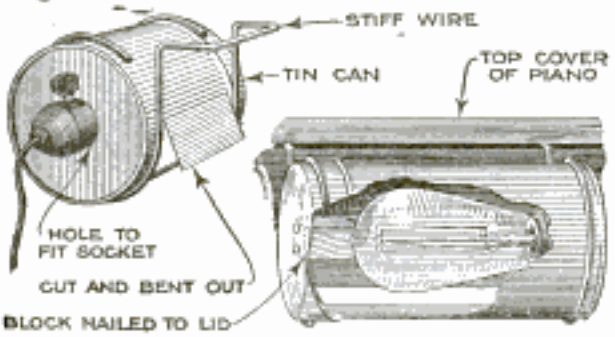
For the entertainment of a sick person it was desired to reproduce the music from a phonograph in another part of the house, without moving the instrument.

This was accomplished by firmly tying a sheet of stout wrapping paper over the top of a metal dish. Through the middle of the drumhead thus produced, a small hole was made and a silk thread passed through and knotted on the underside to prevent it from slipping out. The paper was then wetted thoroughly and permitted to dry, making a very tight diaphragm. Allowing sufficient thread to reach from the phonograph to the side of the bed, the other end was tied to the needle bar of the reproducer, near the center. By moving the dish, the thread was stretched taut, and the phonograph then started, the tone issuing from the improvised reproducer in astonishing volume. Variations of this experiment will readily suggest themselves.—Charles I. Reid, Millersburg, Pa.

An Electric Piano Lamp

An electric piano lamp, to reflect the light downward upon the score in the darkened interior of theaters and similar places, is easily made from an ordinary 1-lb. coffee can, about 4 in. in diameter and 6 in. tall.

A hole, just large enough to fit over the threaded part of the socket, is made in the bottom of the can, and a small block of soft wood is fastened to the underside of the lid, as shown in the drawing. A small depression is made in the end of the block, in which the tip of the bulb fits, to hold it in a horizontal position. With a can opener, or chisel, a three-sided cut, about 2½ in. wide and 5 in. long, is made, the metal is opened out as shown, and the edges smoothed off with a file.



An Electric Piano Lamp, for Reflecting the Light Downward upon the Score in Dimly Lighted Situations, is Quite Easily Made from a Tin Can

A suitable bracket can be made of stiff wire for holding the lamp, as shown in the drawing; this type can be used if the top cover of the piano is not to be raised, but if it is, a hook must be provided to fit over the edge of the piano cabinet.—J. A. Stevens, East Boothbay, Me.

¶To clean a chamois skin, soak it in a weak solution of sal soda, then in soap suds for two hours; rinse in clear water, and finally in a solution of soap and soda, and hang up to dry.

CONCRETE GARDEN FURNITURE

By Donald MacKay

Part I—Flower Boxes and Vases

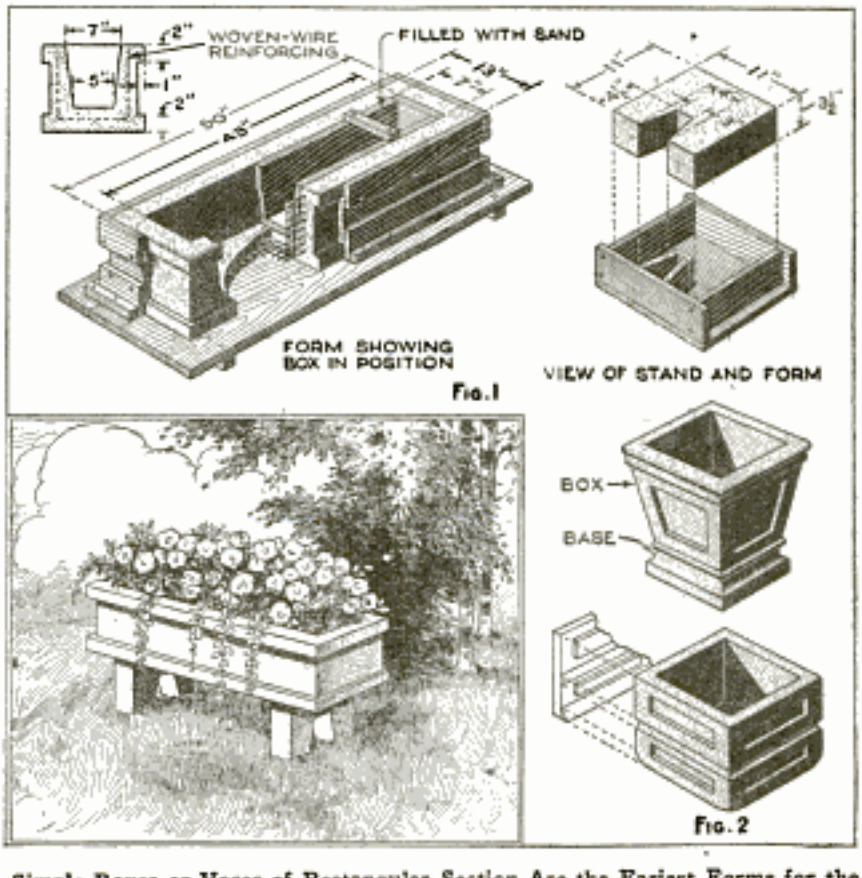
PERMANENT flower vases, urns, and boxes of concrete are easily made by the home worker. The materials required are not expensive, and, by choosing simple designs, and exercising reasonable care, many pleasing effects may be secured.

The easiest method of molding a simple flower box is by using a wooden mold. This is built as shown in Fig. 1, 1-in. boards being used for the form. The form is made like a box without top or bottom, and is placed on a foundation board, being held in position by a cleat screwed to the board, at each end of the form. The interior of the form should be oiled or greased, or at least well wetted, before any concrete is placed in it.

When filling the box form, first place a 1½-in. layer of concrete in the bottom, then put in the reinforcing; this is ½-in. mesh, No. 20 galvanized-wire lath, and is procurable at most hardware stores. It is bent up on the sides and ends as indicated. Next fill in more concrete so that the bottom is about 3 in. thick. The inside form is then placed in position, centered, and filled with sand, to prevent its collapsing under the pressure, and the remainder of the concrete poured. The concrete used throughout this job should be a mixture of one part cement to two parts sand. The pouring of the cement in the stand form is performed in a similar manner, except that the reinforcing may be omitted, if desired.

Remove the forms in about 24 hours and paint the pieces all over with a cement and water mixture. To erect, place the stands in position at the proper distance apart, and set the box on them, using a mortar of cement to bond the stands to the box bottom.

Simple vases, square or rectangular, without stands, of designs similar to those shown in Fig. 2, are made in forms as described for the making of the box. The panels in the upper design are made, as indicated for the lower one, by blocks of



Simple Boxes or Vases of Rectangular Section Are the Easiest Forms for the Beginner. They are Cast in Wooden Molds, Which may be Used Repeatedly. Figure 2 Shows How Panels are Made by Blocks Nailed to the Form

suitable size nailed to the form. Molding, half-round or quarter-round, may also be utilized in forming rounded sections on the pieces.

There are several methods of making vases and urns having curved outlines; this article will, however, be confined to the simplest methods and designs, while more elaborate methods will be taken up in succeeding articles.

The easiest method of making a vase such as shown in Fig. 3, is by means of a template, or "sweep," and the first step consists in making the core that forms the inside of the vase. The vase itself is shown half in section and half in elevation in the upper left-hand corner.

First make the foundation board. This should be of 1-in. lumber, well braced, and about 2 ft. 6 in. square. An old door will answer, if the surface is perfectly flat and the joints tight. In the center of the board, screw a ½-in. floor flange, and into the flange a length of ½-in. pipe, cut to the same length as the intended depth of the core. The top end of the pipe is fitted with a hardwood bushing, drilled to receive a pin on the template. The template is made of ¾-in. boards, as shown, cut to the required taper of the core, and faced with a piece of galvanized iron, projecting ⅛ in. from the edge of the template. This forms a cutting edge, and the template is beveled back of it, as shown in the section A-B. Exactly at half the core diameter, as measured from the edge of the galvanized iron, either drill a hole in the edge of the template and drive in a pin to fit the hole in the pipe bushing, or fasten the pin by means of a strap and by bending the galvanized iron over it, so that the center of the pin is exactly on the edge of the template. The latter is the better method, and is the one shown in the drawing. In order to economize cement, build up around the pipe, which is first coated with oil or grease, with broken rock, bricks, or any similar material, bonding them with a little cement, if necessary. This should form the bulk of the core. Then mix one part cement with two parts sand as before, drop the template into place, give it a turn to see that none of the rough core strikes it anywhere, and proceed to lay on the cement.

This should be liquid enough to percolate through the stone mass, but not thin enough to run all over the board. Plaster it well over the sides, building from the bottom upward, and as it comes near the required diameter, commence turning the template around; this will form the surface. The template must be pressed to the foundation board, which should be kept clean. During the last stages, thin the concrete a little, and pour it over the core from the top, always keeping the template on the move, and keeping the edges of the latter free from hardening cement. The finished core should be left on the board until thoroughly dry, and then be given two or three coats of shellac.

While it is drying, proceed to make the template for the outside of the vase. This is made in a similar manner to the one for the core, half the pattern of the outside being used, and, as the galvanized iron forms the true template, too much care need not be taken in cutting out the wooden frame.

Unscrew the pipe from the core and screw a longer one into place, the exact length of the vase, lifting off the core, if necessary, before unscrewing the pipe. When the shellac has hardened on the core, give it a coat of paraffin, or heavy oil. Plaster on concrete until it is as heavy as half the desired thickness of the wall, then place the previously prepared reinforcing on the concrete. This reinforcing should be placed so as to support the overhanging portions of the vase, such as the base, and may be prepared in either of the two ways shown in the drawing. One side of the reinforcing shown is made of twisted galvanized wire, the other is made of wire lath, such as used for the flower box in Fig. 1. The drawing is made as shown merely to illustrate the two methods of reinforcing, and must not be followed literally. If wire mesh is used, make the entire reinforcing of mesh, bracing it with hoops made of wire, and similarly with the twisted-wire reinforcing, which may be held to the hoops as illustrated in the enlarged detail.

Spread the concrete over the reinforcing and proceed to build upward, dropping the template into place as the diameter approaches the desired size, and keep on building and turning the template as described for the core. When nearly completed, thin down the concrete with water until it is more pasty than before; this will smooth up better and make a somewhat finer surface.

Instead of the pipe as a center support, a piece of 1-in. square hardwood, tenoned into the base, may be used. This is shown in the lower right-hand corner of Fig. 3. The pipe is a little more substantial; the results obtained by using either support will, however, be the same.

If any difficulty is met with in making the base, that is, if trouble is encountered

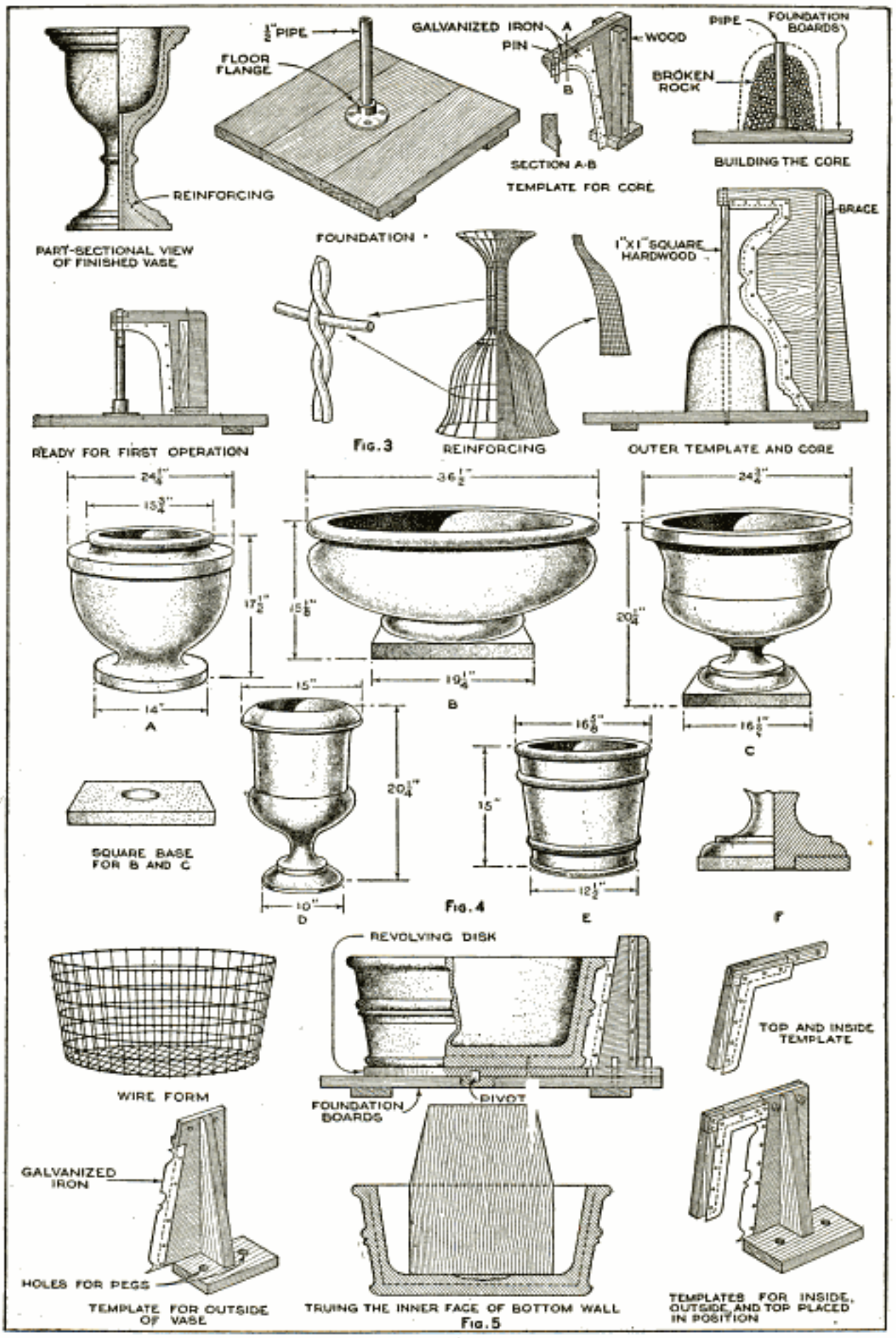


Fig. 3

Fig. 4

Fig. 5

The Various Tools, Forms, and Methods Used in Making Circular Urns and Vases by the Template Process are Shown in Detail in This Illustration. The Designs Chosen are Well Adapted to This Process, the Square Bases Shown in Designs B and C, Figure 4, being Cast Separately in Simple Wooden Molds. Figures 3 and 5 Show Alternative Methods of Using the Templates, the Only Difference Being in the Method of Application

in holding the concrete up while forming, it may be made separately, as shown in Fig. 6. The main former or template will then be as at B, the base template as at C,

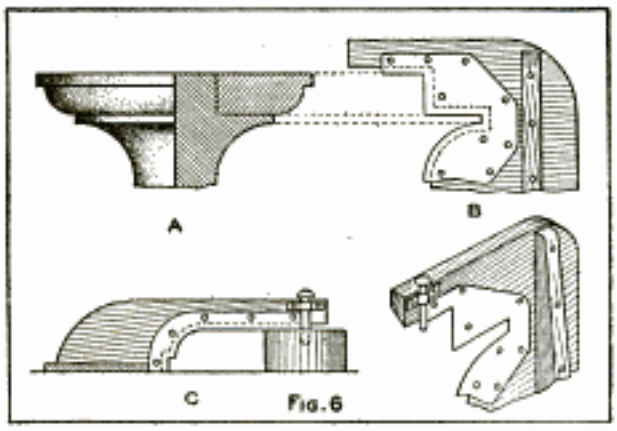


Fig. 6

One Method of Forming the Base, Where Difficulty is Encountered in Making the Vase in One Piece

the hole in the base being formed by a circular block of wood, in the center of which the pin turns. The base and vase can afterward be joined as shown at A by a good cement mortar.

Figure 4 shows a number of pleasing, yet simple, designs. The square bases of B and C may be cast in a wooden box mold, being assembled as shown at F.

Another method, especially applicable to designs such as shown at E, Fig. 4, consists in rotating the work against a stationary template. A wire-mesh frame is made, upon which is plastered a roughing coat of one part cement to two parts sand, together with some plasterers' hair. The last can be purchased at any plasterers' supply house. Do not get the mixture too wet, just wet enough to squeeze through the holes in the wire mesh. Cover both sides and bottom of the frame, leaving the surface rough; then let the cement set.

A good mixture for the finishing coat consists of one part cement to two parts marble dust, mixed to a heavy paste.

The cement-covered form or frame is placed upon the center of the turntable, as in Fig. 5, and a nail is driven through the work and into the table; next, the template is moved up into contact with the turntable and fastened by means of pegs, then the finishing coat is plastered on, all the while rotating the table, and with it the work. Before putting on this coat, rough up the first coat with a sharp-pointed tool, and wet thoroughly.

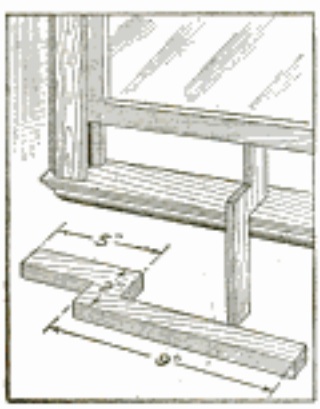
When the outer surface has been formed, a horizontal piece of wood, edged with galvanized iron, is bolted or screwed to the template at the proper height, and the top edge of the vase trued, then another piece, to form the inside of the vase, is attached to the horizontal strip, as shown in the drawing.

The bottom may be trued by holding a piece of wood as shown, and revolving the work.

The finishing coat, of cement and marble dust, spoken of in connection with the last example, may be used with any of the pieces made by the template method. This forms a surface that is light, and full of sparkle when dry, presenting a very pleasing appearance.

A Convenient Window Stick

On nights when the wind is blowing hard and the occupants of a bedroom do not want the window raised as high as when the air is still, the window stick shown in the drawing meets all requirements. By sawing the stick from a piece of 1-in. board to the dimensions indicated, the window can be raised to five different heights without a separate piece for each height. The dimensions given can, of course, be altered to conform to individual requirements, while keeping to the same design.



A Spark-Plug Cigar Lighter

An electrical-supply house devised a novel means of at once serving their customers and advertising a spark plug, by using a sample plug as a cigar lighter. The plug is soldered to the brass ferrule of a wooden handle, as shown in the illustration, the wires being led, through the handle, to a spark coil. A push button was connected in the circuit, within easy reach. Pressure on the button causes a stream of sparks to shoot between the points on the plug; while the button is depressed, the cigar is lit by being pressed between the points.

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.

AMERICAN GIFT TO MADAME CURIE TO BE RADIUM WORTH $100,000

Valuable gifts intended as tokens of appreciation do not commonly react to the benefit of the world, so there is unusual interest in the plan of American women to present Mme. Marie Curie, on her impending visit to this country, with one gram of radium, worth approximately $100,000. The distinguished French scientist, who collaborated with her late husband in the discovery of radium, used up her entire store of the rare element in contributions to her country's hospitals after the war, and is now without means to procure any more. Notified of the gift plan, she has signified her intention of using the relatively large quantity of precious mineral so placed at her disposal, for experiments in the treatment of cancer and other diseases. With the gift thus already dedicated to the welfare of humanity, those in charge of the undertaking are asking that donations be sent to the Marie Curie Radium Fund, 37 Wall Street, New York City.

BIG PRIZE OFFERED FOR DESIGN OF PAINLESS ANIMAL TRAP

Recognizing that the trapping of animals must continue so long as there is demand for furs, or vermin to be destroyed, the American Society for the Prevention of Cruelty to Animals is offering a prize of $500 for a practical design of a trap that will either kill its prisoner outright and painlessly, or hold it alive without injury. The contest, which is open to all, closes at 6:00 p. m., Oct. 1, 1921. Drawings or models may be submitted, with complete description of merits claimed, material used, estimated cost, and record of actual use, if any. All such submitted material, however, is to be marked only with a symbol of some kind, which is to be duplicated on a sealed envelope containing the competitor's name and address. The society's address is Madison Avenue and 26th Street, New York City.

COAST-GUARD SERVICE WANTS MORE CADETS AND CADET ENGINEERS

An unusually large number of vacancies in the U. S. Coast Guard is the occasion for holding a new competitive examination for cadets and cadet engineers, similar to the one announced in this magazine last January. The examination now in preparation will be held, commencing June 27, in various parts of the country, and offers young men an interesting opportunity to complete their education on salary, with commissions as coast-guard ensigns upon graduation. Cadets receive $780 a year, and cadet engineers $75 a month, each with a daily ration allowance of $1.08. Appointment age limits for cadets are 18 to 24, and for cadet engineers, 20 to 25. Since 1915, the revenue-cutter service and the life-saving service have been part of the coast-guard service, which operates under the Treasury Department in peace time, and under the Navy Department in war. It offers experience ashore, afloat, and in the air, with extended cruises to all parts of the world. The Commandant, U. S. Coast Guard, Washington, D. C., may be addressed for a pamphlet giving details of the work and examination.

UNIVERSITY WILL MANUFACTURE ITS OWN ORGANIC CHEMICALS

An actual manufacturing plant, for the production of certain organic chemicals, is being installed at the University of Wisconsin, in order to assure the school laboratories an adequate supply of materials that have either ascended to prohibitive prices, or disappeared from the market. Eight advanced students, selected for their fitness, will work with the director of the new undertaking, putting in nine or ten hours a day for a period of ten weeks, and receiving a nominal salary in addition to the valuable training. The manufacture of the chemicals will proceed on a much larger scale than is ordinarily found in school work, and a complete cost-accounting system will be used, each student-worker keeping cost records on all the materials he makes. The unusual experience gained in this specialized course is expected to prove of great subsequent benefit to its students, besides being of economic value to the school. A somewhat similar course is in operation at the University of Illinois.

NEW SERVICE GIVES INFORMATION ON METALS AND ALLOYS

Because of the vital importance of alloys to the industrial arts, and the growing likelihood that individual experimenters will waste much time and labor by repeating experiments already performed, the Alloys Research Association is being formed under the auspices of the National Research Council. An informational service for those interested in metals and alloys is the first important work of the new body, designed to supply either current information as to new results, or collections of all existing information on any phase of the subject. Over 300 two-metal alloys, and over 60 three-metal combinations, have been studied, and not less than 10,000 articles have been published in the past 20 years. It is estimated that the expense of indexing and abstracting these data will amount to $40,000 a year for the first few years, but coöperative methods will make them available to those interested at a nominal figure. A special form of detailed, subheaded abstract of data has been adopted, and tables and diagrams will be prepared on transparent paper, for reproduction in blueprint.

ARMY AIR SERVICE HAS SCHOOL TO TRAIN RADIO WORKERS

Amateur wireless experts may qualify, as well as professional engineers and operators, for attendance at a school, recently established by the Air Service of the Army, for training personnel to install, operate, and maintain the radio equipment of American air craft. The use of the radio telegraph and telephone to, from, and between military planes, now made wholly practical, is adding enormously to the value of aerial observation, as with them artillery fire is accurately directed at unseen targets; air squadrons are effectively controlled either from the ground or by their commander, and air craft in distress are enabled to call for help or guidance. The new school will provide trained experts for all the flying fields in the country. Applications may be made to the Chief of Air Service at Washington, D. C., or to any army recruiting officer.

AMERICAN FOREIGN-TRADE OFFICE OPENED IN SHANGHAI, CHINA

American business is now represented in Shanghai, China, one of the most active and important ports of entry in the Far East, by a new office of the Bureau of Foreign and Domestic Commerce. All available information on conditions of trade in that part of the world is to be kept on file in the office, which is in the Chinese-American Bank of Commerce building, and will be accessible to all American business men who visit Shanghai, this feature alone being calculated to save much time and expense to the commercial traveler. To meet the other side of the export-trade problem, a library of American catalogs, trade journals, and business publications will be maintained, to which interested houses in the United States are invited to contribute.

¶Sportsmen with questions of any kind to ask about hunting or fishing may now have them answered by authorities, through the enterprise of a large manufacturer of equipment, who has opened a bureau for that purpose. Personal calls as well as letters are encouraged, and the office is decorated with an interesting collection of heads, skins, and other trophies.

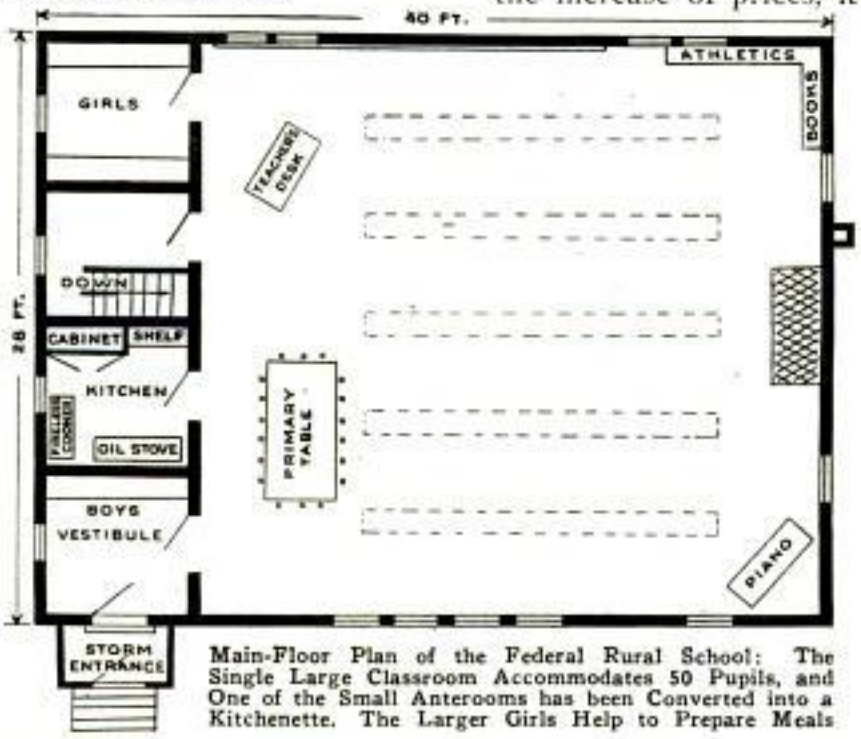
MODERN COUNTRY SCHOOL FEEDS PUNY CHILDREN

THOUGH the architecture of rural schoolhouses of the one-room type varies in style from the plain board shack to the elaborate brick or concrete bungalow, their system of operation in this country is virtually standardized. Unusually interesting, therefore, is the beneficent departure undertaken by a country school at Federal, Ill., a few miles south of the city of Alton. The large majority of the 46 children attending this school come from the homes of day laborers, whose housing conditions are classed as undesirable, and often insanitary. Recent tests revealed that about four-fifths of the pupils were from 15 to 40 per cent under weight.

The Country Schoolhouse at Federal, Illinois, Where 46 Children are Fed One Scientific Meal a Day without Charge

Convinced that this condition could be corrected, or at least that the effects of actual underfeeding could be mitigated by subjecting the children to intensive feeding, the directors proceeded to establish a fund, with the aid of donations, for equipment and provisions to serve one scientific meal a day, containing as much as 1,000 to 1,200 calories, without charge. No reconstruction was necessary, one of the small anterooms being adapted for use as a kitchenette, and furnished with an oil stove, fireless cooker, cabinet, table, and utensils. The older girls help with the meals, which are served in the basement. Athletics also are encouraged by supplying Indian clubs, dumbbells, and basketball. It is gratifying to note that the children's response has been immediate, several of them showing a 1-lb. gain the first week.

The school building is 40 by 28 ft., furnace-heated, and its single large classroom accommodates 50 pupils. Its cost was only about $3,500, but as it was erected just before the increase of prices, it cannot be expected that this figure may now be duplicated. Many thousands of such buildings, however, must be constructed in the next few years if the normal ratio of educational facilities is to be regained and maintained. The present shortage of schoolhouses, actually as great as that of dwellings, is even greater, for schools cannot adopt "doubling up" and room-renting makeshifts.



Main-Floor Plan of the Federal Rural School: The Single Large Classroom Accommodates 50 Pupils, and One of the Small Anterooms has been Converted into a Kitchenette. The Larger Girls Help to Prepare Meals

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